# GOVT. HOLKAR (MODEL AUTONOMOUS) SCIENCE COLLEGE, INDORE

(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2017-18 TO 2021-22

## CRITERION –3

## Research, Innovations and Extension

**Metric No. : 3.7.1**

**Document Title:**

**List of year wise activities and exchange**

SURESH T SILAWAT

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# List of year wise activities and exchange should be provided Academic Year 2017–2022

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# Government Holkar (Model Autonomous) Science College, Indore (M.P.)
# Bhawarkuan, A.B. Road, Indore (M.P.) 452001

## Title: - List of year wise activities and exchange should be provided
## Academic Year - 2017–2022

**3.7.1 Number of functional MoUs/linkages with institutions/ industries in India and abroad for internship, on-the-job training, project work, student / faculty exchange and collaborative research during the last five years**

| Year of Signing MoU | Year of Activity | Name of the organization with whom MOU/Collaboration being signed | Duration | Purpose of MOU/Collaboration | List the actual activities under each MOU year-wise | Date of the activity conducted |
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| 2022 | 2023 | AIC-Prestige Inspire Foundation, Indore(M.P.), India | 3 Years | Incubation Based Activities | Two-day bootcamp: Ideas-Innovations to Startups in association with AIC-Prestige Inspire Foundation, Indore (M.P.), India | 21/22-02-2023 |
| 2019 | 2023 | Govt. Institute of Forensic Science, Nagpur (M.H.) | 5 Years | Promotion of Research, Students and Faculty Training/exchange, Internship, etc | Mr. Anurag Sahu from the Govt. Institute of Forensic Science, Nagpur (M.H.) was the Resource Person in the National Workshop organized by the Department of Forensic Science. | 27-4-2023 |
| 2022 | 2022 | Research Institute of Organic Agriculture Switzerland (FiBL) and the bioRe Association (India) | 3 Years | Promotion of Research, Students and Faculty Training, Internship, etc | Guest lecture by Dr. Akansha Singh, Project Coordinator, India FiBL, Switzerland, under active collaboration with the Research Institute of Organic Agriculture Switzerland (FiBL) and the bioRe Association (India) | 26-07-2022 |

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| 2022 | 2022 | Research Institute of Organic Agriculture Switzerland (FiBL) and the bioRe Association (India) | 3 Years | Promotion of Research, Students and Faculty Training, Internship, etc | National Scientific Board Meeting under active collaboration with the Research Institute of Organic Agriculture Switzerland (FiBL) and the BioRe Association (India) | 04-11-2022 |
| 2022 | 2022 | Medilux Laboratories Pvt. Ltd. Pithampur | 10 Years | Promotion of Research, Students and Faculty Training, Internship, etc | Transfer of the HPIC system with the UV Doctor and Accessories Make: SCION, Model LC6000 by Medilux Laboratories Pvt. Ltd., Pithampur. A CSR under an active MoU | 31-05-2022 |
| 2022 | 2022 | Medilux Laboratories Pvt. Ltd. Pithampur | 10 Years | Promotion of Research, Students and Faculty Training, Internship, etc | Industrial visit to Medilux Laboratories Pvt. Ltd., Pithampur | 21-09-2022 |
| 2022 | 2022 | Anchor Software Developers and Solution Pvt. Ltd., Indore | 1 Month | Collbrative Internship/Project Work | Anchor Software Developers and Solution Pvt. Ltd., Indore, conducted a collaborative series of various training sessions for the certificate and internship programs. | 01/12/2022 to 07/01/2023 |
| 2022 | 2022 | Wild Warriors Society, Indore | 1 Year | Students and Faculty Training, Internship, etc | Environmental awareness activities: Bird Survey at college campus in association with Wild Warriors Society, Indore | 22-05-2022 |
| 2022 | 2022 | Answer Foundation, BM 70 Near Bapat Square, Indore | 5 Years | Students and Faculty Training, Internship, etc | Experiential learning for industrial start-ups based on Arduino is provided by Answer Foundation, BM 70, Near Bapat Square, Indore, under a MoU. | 13-01-2023 |
| 2022 | 2022 | Techno Scientific Instruments (Lyzer-India), Ambala | 5 Years | Promotion of Research, Students and Faculty Training/exchange, Internship, etc | Experts representative from Techno Scientific Instruments (Lyzer-India), Ambala, delivered a lecture on Instrumentation Techniques (Flame photometer, UV Spectrophotometer, TDS meter) under the MoU. | 27-05-2022 |
| 2022 | 2022 | Ultra Lab Instruments, New Delhi | 5 Years | Promotion of Research, Students and Faculty | Experts representative from Ultra Lab Instruments, New Delhi, delivered a lecture on Instrumentation Techniques (Compound | 30-04-2022 |

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| | | | | Training/exchange, Internship, etc | and Dissecting microscopes) under the MoU. | |
| 2022 | 2022 | UGC-DAE CSR, Indore | 5 Years | Promotion of Research, Students and Faculty Training/exchange, Internship, etc | Raman spectroscopy was carried out at UGC-DAE CSR, Indore | 07-09-2022 |
| 2022 | 2022 | UGC-DAE CSR, Indore | 5 Years | Promotion of Research, Students and Faculty Training/exchange, Internship, etc | Under the MoU with UGC-DAE CSR, Indore, research work on Qualitative study of structural phase transition in nickel-doped La2CoTi(1x)NixO6 double perovskite was carried out in collaboration with Dr. R. J. Choudhary, Scientist, UGC-DAE CSR, Indore. | 20-09-2022 |
| 2022 | 2022 | UGC-DAE CSR, Indore | 5 Years | Promotion of Research, Students and Faculty Training/exchange, Internship, etc | An invited lecture was delivered by Dr. Vasant V Sathe, Center Director, UGC-DAE CSR, Indore, in a Virtual workshop on Instrumental techniques. | 01-10-2022 |
| 2022 | 2022 | UGC-DAE CSR, Indore | 5 Years | Promotion of Research, Students and Faculty Training/exchange, Internship, etc | Educational visit of participants of the virtual workshop at UGC-DAE CSR, Indore, under the MoU between both institutes. | 10-10-2022 |
| 2022 | 2022 | PG- Tech Pvt. Ltd, Indore (M.P.) | 10 Years | Promotion of Research, Students and Faculty Training, Internship, etc | An educational visit was organized with PG- Tech Pvt. Ltd., Indore (M.P.) under the student exchange program of the MoU. | 15-12-2022 |
| 2022 | 2022 | Mine Instruments Private Limited, Indore | 1 Day | Collabrative students and faculty training | One-Day Visit/Training On Electronics Laboratory Equipment at Mine Instruments Private Limited, Indore, under collaboration | 19-11-2022 |
| 2022 | 2022 | Indian institute of technology indore | 1 Day | Collbrative and outreach programme | Educational visit Indian institute of technology indore | 18-11-2022 |

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| 2021 | 2022 | Soil and Soul foundation, Bangalore, Karnataka | 5 Years | Promotion of Research, Students and Faculty Training, Internship, etc | Workshop on "Eco-friendly plant stress relievers in the present scenario" in association with the Soil and Soul Foundation, Bangalore, Karnataka | 28/29 March, 2022 |
| 2021 | 2022 | Noble Alchem. Pvt. Ltd. Rohatak Road, Bhiwani, Haryana (M.P.) | 5 Years | Promotion of Research, Students and Faculty Training, Internship, etc | Workshop on "Eco-friendly plant stress reliever in the present scenario" in association with Noble Alchem. Pvt. Ltd., Rohatak Road, Bhiwani, Haryana (M.P.) | 28/29 March, 2022 |
| 2021 | 2022 | Jaiv Vatika, Biotchnology Industry Janaphav, Mhow Indore | 3 Years | Students and Faculty Training, Internship, etc | Industry educational visit to Jaiv Vatika, Biotchnology Industry Janaphav, Mhow Indore | 12-11-2022 |
| 2021 | 2022 | Azim Premji University, Bengaluru, India | 2 Years | Promotion of Research, Translation & Workshops, Students and Faculty Training, Internship, etc | Workshop on translation work in science subjects conducted by Azim Premji University, Bengaluru, India | 07-06-2022 |
| 2021 | 2022 | Ultra Lab Instruments, New Delhi | 10 Years | Students and Faculty Training/exchange, Internship, etc | The Department of Pharmaceutical Chemistry has organized a 3-day workshop on "instrumental techniques" in association with Ultra Lab Instruments, New Delhi. | 28 to 30 Sept. 2022 |
| 2021 | 2022 | IPS Academy, Indore | 5 Years | Promotion of Research, Students and Faculty Training/exchange, Internship, etc | Research Activity: Synthesis and Characterization of Zirconia Nanocrystalline Powder by Thermal Treatment Method in Association with IPS Academy, Indore | 23-Mar-22 |
| 2021 | 2022 | Techritzy Pvt. Ltd., 236 ,Clerk Colony, Indore | 5 Years | Promotion of Research, Students and Faculty Training/exchange, Internship, etc | A one-day visit and hands-on training on Python Technology were conducted by Techritzy Pvt. Ltd., Indore. | 17-01-2022 |

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| 2021 | 2022 | Techritzy Pvt. Ltd., 236 ,Clerk Colony, Indore | 5 Years | Promotion of Research, Students and Faculty Training/exchange, Internship, etc | Lectures delivered by Mr. Sunny Raikwar, CEO of Techritzy Pvt. Ltd., in the Certificate Course conducted by the Department of Electronics | 19-11-2022 |
| 2021 | 2022 | Sri Aurobindo Medical College and PG Institute, Indore, Madhya Pradesh | 10 Years | Promotion of Research, Students and Faculty Training, Internship, etc | The Department of Forensic Science organized an educational visit to the Sri Aurobindo Medical College and PG Institute, Indore. | 12/01/2022-20/01/2022 |
| 2020 | 2022 | Elite Informatics, Indore | 5 Years | Students and Faculty Training, Internship, etc | Internship training was conducted by Elite Informatics, Indroe, for M Sc Chemistry students. | 23/03/2022 to 05/04/2022 |
| 2020 | 2022 | Department of Geography, MLSU,Udaipur, Rajasthan | 3 Years | Major RUSA sponsored Titled "Electoral Information System for Governance and Developmental Planning: A G-Governance Initiative" | Various objectives undertaken for the year 2022 in the Electoral Information System for Governance and Developmental Planning: A G-Governance Initiative | 2022 |
| 2020 | 2022 | Department of Geography, MLSU,Udaipur, Rajasthan | 3 Years | Major RUSA Sponsored Project Titled "Impact of Water Quality on Health in Vagad Region of Rajasthan: An Application in Web-GIS" | Database creation, validation for next phase from both primary and secondary data of Dungarpur and Banswara district | Mar. 2022 |
| 2019 | 2022 | Electronics & Electriclas, 18a, Electronic Complex, Pardeshipura, | 5 Years | Students and Faculty Training, Internship, etc | One Day Visit/Training on Electronic Equipment Manufacture Unit of Electronics and Electrical, Indore | 19-11-2022 |

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| | | Pardeshipura, Indore, Madhya Pradesh | | | | |
| 2019 | 2022 | National Dong Hwa University, Hualien, Taiwan | 5 Years | Promotion of Research, Students and Faculty Development, etc | Thematic webinar on the International Year of Basic Sciences for Sustainable Development: Inaugural Note by Prof. Y. K. Kuo, National Dong Hwa University, Hualien, Taiwan | 09-08-2022 |
| 2018 | 2022 | Govt. Mata Jija Bai Girls P.G. College, Indore | 5 Years | Promotion of Research, Students and Faculty Development, etc | Lecture delivered by Dr. M. K. Dwivedi, Title: UV Spectroscopy under MoU activity | 03-12-2022 |
| 2018 | 2022 | Govt. Mata Jija Bai Girls P.G. College, Indore | 5 Years | Promotion of Research, Students and Faculty Development, etc | Academic student exchange for internship | 07/04/2022 to 18/04/2022 |
| 2022 | 2022 | Dr. G. S. Okram, UGC-DAE CSR, Indore | 1 Year | Collbration for Research and Development | Research activity and joint publication with Dr. G. S. Okram, UGC-DAE CSR, Indore, as Principal Collaborator from the CSR side | 28-07-2022 |
| 2015 | 2022 | Dr. Hari Singh Gour University, Sagar (M.P.) | Continued | Promotion of Research, Students and Faculty Training/exchange, Internship, etc | Faculties Exchange:Guest Lecture delivered by: 1) Dr. Navjot Kaur Kanwal on June 3, 2022; 2) Dr. Devasish Bose on August 29, 2022 under the MoU with Dr. Hari Singh Gour University, Sagar | 03/06/2022 and 29-08-2022 |
| 2022 | 2022 | Manganese Ore (India) Limited, Balaghat | 1 Week | Collbration for Student Internship | Internship of students with MOIL, Balaghat. | 01/11/2022 to 10/11/2022 |
| 2021 | 2021 | Research Institute of Organic Agriculture FiBL, Switzerland | 1 Year | SysCom India | National Scientific Advisory Board (NSAB) Meeting | 25-09-2021 |

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| 2021 | 2021 | Sak Bioenzyme T.V. Station Road, Shanker Naga, Raipur, Chattisgarh | 5 Years | Promotion of Research, Students and Faculty Training, Internship, etc | Research Activity: A Novel Approach: Stimulatory Effect of Bioenzyme Supplementation on Quality of Mung Bean, jointly conducted with Sak Bioenzyme T.V. Station Road, Shanker Naga, Raipur, Chattisgarh | 10-02-2021 |
| 2021 | 2021 | Azim Premji University, Bengaluru, India | 2 Years | Promotion of Research, Translation & Workshops, Students and Faculty Training, Internship, etc | Online meeting organized for Translation work of Physics books from English to Hindi in association with Azim Premji University, Bengaluru, India | 18-01-2021 |
| 2021 | 2021 | Faculty of Sciences & IT, Madhyanchal Professional University, Bhopal,M.P., India | 5 Years | Faculty, Staff & Studnets Exchange, Research Collaboration, Support for Research project, Guest Lectures, Seminar & Workshop | Lecture delivered by Dr. Sugandha Singh on Opportunities in Microbiology under an MoU with the Faculty of Sciences and IT, Madhyanchal Professional University, Bhopal,M.P., India | 27-12-2021 |
| 2021 | 2021 | Govt. Nirbhay Singh Patel Science College, Indore | 5 Years | NSS, faculty exchange, guidance for research work, mutual corporation in educational and social development of the both college | Institutional Educational Visit of Students to Govt. Nirbhay Singh Patel Science College, Indore | 23-08-2021 |
| 2021 | 2021 | Infutech Health Care Pvt. Ltd., Indore | 5 Years | Students and Faculty Exchange, Research Collaboration, Support for Research project, & Educational Visit | Internship training is provided to microbiology students by Infutech Health Care Pvt. Ltd., Indore, under active collaboration. | 11/02/2021 to 20/02/2021 |

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| 2021 | 2021 | Parenteral Drugs Pharmaceuticals Pvt. Ltd. Indore | 5 Years | Promotion of Research, Students and Faculty Training/exchange, Internship, etc | Parenteral Drugs Pharmaceuticals Pvt. Ltd., Indore, provided an industrial internship to microbiology students as per the MoU between both institutes. | 01/02/2021 to 09/02/2021 |
| 2021 | 2021 | Environmental and Science Institute UDYAM, Indore | 5 Years | Students and Faculty Training, Internship, etc | The Department of Zoology organized a lecture by Dr. Jayshree, Plant Tissue Culture Specialist, at the MP Forest Extension Circle, Indore, on Organic Farming and Kitchen Gardening, an initiative under the MoU. | 23-12-2021 |
| 2021 | 2021 | Sagore Aquatics Pvt. Ltd., Indore | 5 Years | Students and Faculty Training, Internship, etc | Department of Zoology organized lecture of Deepak<br>Soniya, Sagore Aquatics Pvt. Ltd. | 27-11-2021 |
| 2021 | 2021 | Codeberry Software Solution, Indore | 3 Months | Collobrative Student Internship Training | Internship Training was provided by Codeberry Software Solution, Indore, under collaborative understanding. | 10/03/2021 to 8/06/2021 |
| 2021 | 2021 | The Spark Foundation, Indore | 2 Months | Collobrative Student Internship Training | The Spark Foundation, Indore, agreed to provide internship training to Anup Rai for active collaboration between both institutions. | July-Aug, 2021 |
| 2021 | 2021 | Mantic Technologies, Indore | 3 Months | Collobrative Student Internship Training | Internship Training for Computer Science Students by Mantic Technologies, Indore | March-June, 2021 |
| 2020 | 2021 | Elite Informatics, Indore | 5 Years | Students and Faculty Training, Internship, etc | Internship training was conducted by Elite Informatics, Indroe, for M.Sc. Chemistry students. | 03/03/2021 to 13/03/2021 |
| 2020 | 2021 | MACLEC Technical Project Laboratory Pvt. Ltd. New Delhi | 5 Years | Students and Faculty Training, Internship, etc | Online lecture deleivered by Mr. Balram Bhardwaj, MD, MACLEC Technical Project Laboratory Pvt. Ltd. New Delhi | 16-08-2021 |

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| 2020 | 2021 | Answer Foundation, BM 70 Near Bapat Square, Indore | 1 Year | Students and Faculty Training, Internship, etc | Instrumental experience on Robotics a collaborative learning under the MOU Answer Foundation, Indore | 12-01-2021 |
| 2020 | 2021 | Department of Geography, MLSU,Udaipur, Rajasthan | 3 Years | Major RUSA sponsored Titled "Electoral Information System for Governance and Developmental Planning: A G-Governance Initiative" | Various objectives undertaken for the year 2021 in the Electoral Information System for Governance and Developmental Planning: A G-Governance Initiative | 2021 |
| 2020 | 2021 | Department of Geography, MLSU,Udaipur, Rajasthan | 3 Years | Major RUSA Sponsored Project Titled "Impact of Water Quality on Health in Vagad Region of Rajasthan: An Application in Web-GIS" | Preparation of questionnaire, Data collection ,compilation and preparation; Field data collection and primary survey in the collobrative research project | March, 2021 |
| 2020 | 2021 | Department of Geography, MLSU,Udaipur, Rajasthan | 3 Years | Major RUSA Sponsored Project Titled "Impact of Water Quality on Health in Vagad Region of Rajasthan: An Application in Web-GIS" | Generation of Geospatial database; Web application development in the collobrative research project | July, 2021 |
| 2019 | 2021 | Electronics & Electriclas, 18a, Electronic Complex, Pardeshipura, Pardeshipura, Indore, Madhya Pradesh | 5 Years | Students and Faculty Training, Internship, etc | One-Day Visit and Training on Industrial Electronic Instrumentation at Electronics and Electrical, Indore | 05-02-2021 |

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| 2018 | 2021 | Index Medical College and Research Centre, Indore | 3 Years | Students and Faculty Training, Internship, etc | Esteem Guest Speaker Dr. Mustafa Johar, Senior Professor from Index Medical College, Indore, gave his valuable lecture on The Future of Biotechnology in Medical Sciences. | 06-01-2021 |
| 2021 | 2021 | Dr. G. S. Okram, UGC-DAE CSR, Indore | 1 Year | Collbration for Research and Development | Research activity and joint publication with Dr. G. S. Okram, UGC-DAE CSR, Indore, as Principal Collaborator from the CSR side | 16-07-2021 |
| 2021 | 2021 | Malanjkhand Copper Mines, Hindustan Copper Limited | 1 Week | Collbration for Student Internship | Vocational Practical Training at Malanjkhand Copper Mines, Hindustan Copper Limited | 23/03/2021 to 27/03/2021 |
| 2020 | 2020 | Techritzy Pvt. Ltd., 236 ,Clerk Colony, Indore | 1 Year | Collobrative students educational training | Students educational Visit (2020) | 17-12-2020 |
| 2020 | 2020 | Jawahar Lal Nehru Institute of Corporate Social Responsibilities, Delhi | 5 Years | Students and Faculty Training, Internship, etc | Lecture by Mr. Nikhil Kumar Sarojaz on "Career in Corporate Social Responsibility and Sustainability" in the One-Day Webinar on "Placements in Pharmaceutical Industries" | 18-08-2020 |
| 2020 | 2020 | Department of Geography, MLSU,Udaipur, Rajasthan | 3 Years | Major RUSA Sponsored Project Titled “Impact of Water Quality on Health in Vagad Region of Rajasthan: An Application in Web-GIS” | Procurement of equipment, software, furniture, books, data etc., Appointment of Staff in the collobrative research project | November, 2020 |
| 2019 | 2020 | Govt. Mata Jijabai Girls PG College, Indore | 5 Years | Students and Faculty Training, Internship, etc | Two students from Govt. Mata Jijabai Girls PG College, Indore participated in Internship exchange program organized by Department of Biochemistry | 25/01/2020 to 12/03/2020 |

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| 2019 | 2020 | Tuteja's Forensic Document Examination and Research Centre, Indore (M.P.) | 5 Years | Promotion of Research, Students and Faculty Training/exchange, Internship, etc | Guest Lecture by Mr. H. S. Tuteja from Tuteja's Forensic Document Examination and Research Centre, Indore, under active collaboration between both institutes | 15-01-2020 |
| 2019 | 2020 | Sai Electronics, 1508-E, Sai Vihar Colony, Rau, Indore | 5 Years | Students and Faculty Training, Internship, etc | A one-day visit and training on the fabrication and Maintenance of Electronic Laboratory equipment was conducted in an active MoU with Sai Electronics, Rau, Indore. | 03-02-2020 |
| 2019 | 2020 | Sai Electronics, 1508-E, Sai Vihar Colony, Rau, Indore | 5 Years | Students and Faculty Training, Internship, etc | One-Day Visit/Training on Internship and Employment-Based Project at Sai Electronics, Indore | 26-11-2020 |
| 2019 | 2020 | National Dong Hwa University, Hualien, Taiwan | 5 Years | Promotion of Research, Students and Faculty Development, etc | National Conference on Physics and Chemistry of Materials: Keynote Speaker: Prof. Y-R Ma, National Dong Hwa University, Hualien, Taiwan | 14-16 Dec., 2020 |
| 2018 | 2020 | Noble Alchem Pvt. Ltd. (Agribooster), Sanwer Road, Indore, M.P. | 1 Year | Promotion of Research, Students and Faculty Training/exchange, Internship, etc | collaborative research work on "Effect of pre-sowing seed treatment with silica and fungicide on growth, photosynthetic pigments, and oxidative stress parameters of mung bean (Vigna radiata) with Noble Alchem Pvt. Ltd., Indore | 2020 |
| 2020 | 2020 | Dr. G. S. Okram, UGC-DAE CSR, Indore | 1 Year | Collbration for Research and Development | Research activity and joint publication with Dr. G. S. Okram, UGC-DAE CSR, Indore, as Principal Collaborator from the CSR Side | 16-07-2020 |
| 2020 | 2020 | Dr. Kamal Kumar Choudhary, Army Cadet College (ACC), Indian Military Academy, Dehradun, Uttrakhand | 1 Year | Collbration for Research and Development | Collaborative Research activity and joint publication | 04-07-2020 |

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| 2019 | 2019 | Research Institute of Organic Agriculture Switzerland (FiBL) and the BioRe Association (India) | 2 Years | Promotion of Research, Students and Faculty Training/exchange, Internship, etc | Guest lectures were delivered by Dr. Gurbir Bhullar and Dr. Navreet Bhullar of the Research Institute of Organic Agriculture Switzerland (FiBL) under collaborative activity. | 14/15 Dec, 2019 |
| 2019 | 2019 | Electronics & Electriclas, 18a, Electronic Complex, Pardeshipura, Pardeshipura, Indore, Madhya Pradesh | 5 Years | Students and Faculty Training, Internship, etc | One-day industrial training on 11/12/2019 at Electronics and Electrical, Indore, was organized by the Electronics Department under the MoU. | 11-12-2019 |
| 2018 | 2019 | Noble Alchem Pvt. Ltd. (Agribooster), Sanwer Road, Indore, M.P. | 1 Year | Promotion of Research, Students and Faculty Training/exchange, Internship, etc | collaborative research work on the effect of Soluble Silica on the Plant Growth, leaf Chlorophyll content, and Bulb Quality of garlic (Allium sativum L.) against Drought Stress with Noble Alchem Pvt. Ltd., Indore | 2019 |
| 2018 | 2019 | Govt. Mata Jija Bai Girls P.G. College, Indore | 5 Years | Promotion of Research, Students and Faculty Development, etc | Lecture delivered by Dr. Meenal Shrivastava, Title: Electronic Spectral Studies under MoU activity | 6 and 7 March, 2019 |
| 2018 | 2019 | Govt. Mata Jija Bai Girls P.G. College, Indore | 5 Years | Promotion of Research, Students and Faculty Development, etc | Internship for Govt. Mata jija bai girls p.g. college chemistry students | 21-01-2019 to 06/02/2019 |
| 2019 | 2019 | Dr. G. S. Okram, UGC-DAE CSR, Indore | 1 Year | Collbration for Research and Development | Research activity and joint publication with Dr. G. S. Okram, UGC-DAE CSR, Indore, as Principal Collaborator from the CSR side | 12-07-2019 |
| 2017 | 2019 | PG Tech Research Institute, Indore | 10 Years | Students and Faculty Training, Internship, etc | One-week Workshop on "Qualitative and Quantitative Analysis" under collaborative understanding | 10th -15th October 2019 |
| 2019 | 2019 | Dr. Kamal Kumar Choudhary, Army Cadet College (ACC), Indian | 1 Year | Collbration for Research and Development | Collaborative Research activity and joint publication | 03-07-2019 |

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| | | Military Academy, Dehradun, Uttrakhand | | | | |
| 2016 | 2019 | Department of Forensic Science, IEHE, Bhopal (M.P.) | Renewed in 2022 for next 10 Years | Promotion of Research, Students and Faculty Training, Internship, etc | Lecture delivered by Mr. Rajendra Prasad in the FDP Modern Tools Use in Scientific Investigation of Crime Scenes | 22-4-2019 |
| 2018 | 2018 | Noble Alchem Pvt. Ltd. (Agribooster), Sanwer Road, Indore, M.P. | 1 Year | Promotion of Research, Students and Faculty Training/exchange, Internship, etc | Research Activities were carried out: 1) Role of soluble silica in alleviating oxidative stress in soybean crops; 2). The Role of Soluble Silica in Counteracting Lead Toxicity in Wheat (Triticum aestivum L.) | 2018 |
| 2018 | 2018 | Govt. Mata Jija Bai Girls P.G. College, Indore | 5 Years | Promotion of Research, Students and Faculty Development, etc | Lecture delivered by Dr. Rajshree Somani, Title: Pericyclic Reactions under MoU activity | 2 and 3 March, 2018 |
| 2017 | 2018 | PG Tech Research Institute, Indore | 10 Years | Students and Faculty Training, Internship, etc | Internship/Training Program: 52 participants successfully completed a training program in analytical and scientific instruments. | 27/01/2018 to 10/02/2018 |
| 2018 | 2018 | Dr. Kamal Kumar Choudhary, Army Cadet College (ACC), Indian Military Academy, Dehradun, Uttrakhand | 1 Year | Collbration for Research and Development | Collaborative Research activity and joint publication | 01-07-2018 |
| 2018 | 2018 | Wadia Institute of Himalayan Geology, Dehradun | 1 Month | Collbration for Student Internship | Winter Internship of M Sc Students at Wadia Institute of Himalayan Geology, Dehradun | 01/01/2019 to 31/01/2019 |

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| 2017 | 2017 | Dr. Kamal Kumar Choudhary, Army Cadet College (ACC), Indian Military Academy, Dehradun, Uttrakhand | 1 Year | Collbration for Research and Development | Collaborative Research activity and joint publication | 05-07-2017 |
| 2021 | | Jaywanti Haksar Government Post Graduate College, Betul, (M.P.) | 3 Years | Promotion of Research, Students and Faculty Training, Internship, etc | - | - |
| 2020 | 2021 | Bherulal Patidar Govt P G College, Mhow | 5 Years | Promotion of Research, Students and Faculty Training/exchange, Internship, etc | Research Activity, Faculty/Students Exchange, Seminars, Workshops, etc | |

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2022

## CRITERION –3

## MoUs/Linkages/Collaborations

AIC-Prestige Inspire Foundation, Indore(M.P.), India

**Document Title:**

Two-day bootcamp: Ideas-Innovations to Startups in association with AIC-Prestige Inspire Foundation, Indore (M.P.), India

**Memorandum of Understanding**

Between

**AIC-Prestige Inspire Foundation, Indore (MP), India**

And

**Government Holkar (Model Autonomous) Science College, Indore, Indore (MP), India**

**Parties:**

**A. Parties to this Memorandum of Understanding (MOU)**

**AIC-Prestige Inspire Foundation**, situated Prestige Vihar, Scheme-74 C, Indore - 452010, Madhya Pradesh, India (hereinafter referred to as "AIC-Prestige") acting through its CEO- Dr. Sanjeev Patni;

And

**Government Holkar (Model Autonomous) Science College,** situated at 582 AB Road, Square, near Bhawarkua, Indore, Madhya Pradesh 452001referred hereinafter as "HSC") acting through its Principal – Dr. Vivek Raich.

(Jointly referred herein at 'the Parties')

**B. Introduction**

1. HSC is a prominent science college at Indore. It was given the status of being a "Center for Excellence" by the Government of Madhya Pradesh Government. HSC is committed to adhere to its original motive of "widening the horizon for the people" by means of imparting them adequate education. In order to facilitate the imparting of quality education, it keeps updating its laboratories and library all the time. HSC has been recently granted to put up a startup incubation center by the Government of Madhya Pradesh. It has made an application to Atal Innovation Mission (NITI Aayog, Government of India) for grant for developing an incubation center.
2. AIC-Prestige is a modern incubation center at Indore for in-campus and virtual incubation of startups. It functions under the Atal Innovation Mission Scheme of NITI Aayog, Government of India. It supports innovative and disruptive start-ups & business ideas to become viable enterprise ventures. Overall ecosystem support to startups for prototyping, validation scaleup and expansion is provided.

PRINCIPAL
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Holkar Science College
Indore (M.P.)

AIC PRESTIGE INSPIRE FOUNDATION
CEO

3. Pursuant to HSC's making an application to Atal Innovation Mission for developing an incubation center, it has approached AIC-Prestige for support and assistance in setting up and operations of their incubation center, post the approval for its application to Atal Innovation Mission. AIC-Prestige has responded with affirmation and willingness to support HSC in this specific context.

4. This Memorandum of Understanding (MOU) broad establishes understanding of the terms and conditions under which the AIC-Prestige will provide mentoring and hand-holding support to HSC for the establishment of the incubation center at the HSC.

**C. Specific Objective**

Subject to HSC getting approval from Atal Innovation Mission for setting up the incubation center, the role of AIC-Prestige will be as follows:

1. At the request by HSC, AIC-Prestige assist HSC to foster a culture of innovation and entrepreneurship at HSC by providing intellectual knowledge through lectures, guidance for arranging/organizing bootcamps and hackathons, and technological help for the development of the ecosystem for upcoming incubation center at HSC.
2. At the request by HSC, AIC-Prestige will offer advice assistance in intellectual property right strategy.
3. At the request by HSC, AIC-Prestige will offer mentorship in identifying the specific areas of mutual concern to nurture startups.
4. At the request by HSC, AIC-Prestige will assist in identifying resources required for setting up and operations of HSC's incubation center.

**D. Single Point of Contact (SPOC)**

1. The SPOC will be authorised and empowered by their respective organisations, for interacting and working out more specific details.
2. The SPOC will be
   From HSC - Dr. Netram Kaurav, Assistant Professor
3. From AIC- Prestige - Gaurav Parulkar, Incubation Manager

AIC PRESTIGE INSPIRE FOUNDATION

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Holkar Science College
Indore (M.P.)

CEO

**E. Financial Labilities**

1. This MOU imposes no financial obligations on either Parties.
2. Any expense that AIC-Prestige incurs for HSC, will be with due proper authorization from HSC. Such an expense will be reimbursed to AIC-Prestige by HSC.

**F. Period of Engagement and Termination**

1. This MOU is only applicable subject to HSC is given an approval by Atal Innovation Mission, to set up an incubation center at HSC.
2. The period of the MOU is three (3) years from the date of execution of this MOU.
3. This MOU will entail into the formation of the a more formative agreement with detailed terms and conditions;
4. The validity of the MOU can be extended by means of an addendum referring to this MOU as the base agreement to set the revised period and terms, if any.
5. If either party decides to terminate the MOU before the aforementioned 2 months or last extended date of this MOU months' validity from the date of signing of this MOU, either party has to notify each other before 2 weeks of its closure.
6. Additionally, the MOU can be terminated anytime with mutual consensus.

In confirmation of the understanding, the Parties – Government Holkar Science College and AIC-Prestige Inspire Foundation, execute this MOU on 22nd October 2022.

PRINCIPAL
Govt. Model Autonomous
Holkar Science College
Indore (M.P.)

Dr. Vivek Raich, Principal

**Government Holkar (Model Autonomous) Science College, Indore**

CEO

Dr. Sanjeev Patni

Chief Executive Officer

**AIC-Prestige Inspire Foundation, Indore**

Organized By

ATAL INCUBATION CENTRE PRESTIGE
ideate • incubate • innovate

Supported By

MADHYA PRADESH STARTUP CENTRE

# 2-DAYS BOOTCAMP

# IDEAS-INNOVATIONS TO STARTUPS



**Day 1 : Idea to Startup**

**Day 2 : Startup to Enterprise**

**Date: 21-22 Feb 2023 || Time: 10:00 am - 5:00 pm**

**Govt. Holkar (Model, Autonomous) Science College, Indore (M.P.)**

## SHOWCASE OF STARTUPS

**Exhibition starts at 01 PM, 22 Feb, 2023**

**In the gracious presence of**
**Dr. Suresh T. Silawat, Principal**
**Govt. Holkar (Model, Autonomous) Science College, Indore (MP)**



MADHYA PRADESH STARTUP CENTRE

ATAL INCUBATION CENTRE PRESTIGE

**Stalls are open to all for visit Infront of Yaswant Hall**

**Bootcamp**
**"Ideas-Innovations to Startups"**


IDEAS-INNOVATIONS
TO STARTUPS
Day 1: Idea to Startup




IDEAS INNOVATIONS
TO STARTUPS


विद्यालयीन परिवार
SAGE



## होलकर कॉलेज में दो दिनी बूट कैंप शुरू हुआ

सिटी रिपोर्टर | अटल इन्कयूबेशन सेंटर प्रेस्टिज इंस्पायर फाउंडेशन और मध्य प्रदेश स्टार्टअप सेन्टर द्वारा होलकर साइंस कॉलेज में मंगलवार से दो दिवसीय बूट कैंप की शुरुआत हुई। इस कैंप में 127 स्टूडेंट्स भाग ले रहे हैं। कैंप की शुरुआत के मौके पर डॉ. संजीव पाटनी ने संबोधित किया। कॉलेज प्राचार्य डॉ. सुरेश टी सिलावट



ने स्टूडेंट्स को शुभकामनाएं दीं। संचालन प्रो. अमिय पहारे ने किया। आभार डॉ. नेतराम कौरव ने माना।

CITY PLUS



# होलकर कॉलेज में 127 छात्रों को दिए स्टार्टअप के टिप्स

इंदौर | मप्र स्टार्टअप सेंटर द्वारा होलकर कॉलेज में अटल इन्क्यूबेशन सेंटर प्रेस्टीज फाउंडेशन के सहयोग से दो दिनी बूटकैंप आयोजित किया गया। इसमें 127 विद्यार्थियों को स्टार्टअप प्रारंभ करने से संबंधित जानकारी विशेषज्ञों ने दी। कार्यक्रम में 10 सफल स्टार्टअप के स्टॉल भी प्रदर्शित किए गए। इसमें इन स्टार्टअप के फाउंडर द्वारा सफलता के सूत्र भी साझा किए गए। कार्यक्रम का शुभारंभ डॉ. संजीव पाटनी ने किया। प्राचार्य डॉ. सुरेश सिलावट ने कहा इससे छात्रों को स्टार्टअप शुरू करने में मदद मिलेगी। डॉ. अमिय पहारे, डॉ. नेतराम कौरव मौजूद रहे।

# 127 विद्यार्थियों को दी स्टार्टअप की जानकारी

इंदौर। होलकर विज्ञान महाविद्यालय में 21 और 22 फरवरी को मध्य प्रदेश स्टार्टअप सेंटर द्वारा दो दिवसीय बूट कैंप का आयोजन किया गया। इसमें 127 विद्यार्थियों को स्टार्टअप शुरू करने की जानकारी दी गई। यह अटल इनक्यूबेशन सेंटर प्रेस्टीज फाउंडेशन के सहयोग से आयोजित किया गया था। कार्यक्रम में विशेषज्ञों ने विद्यार्थियों को स्टार्टअप शुरू करने के सुझाव दिए और स्टार्टअप के फाउंडर ने सफलता के सूत्र भी बताए। इसके साथ ही 10 सफल स्टार्टअप के स्टाल भी प्रदर्शित किए गए। कार्यक्रम का शुभारंभ डा. संजीव पाटनी द्वारा किया गया।

# Ideas-Innovations to Startups
# List of Participants

| S.No. | Name | Institute Name |
|---|---|---|
| 1 | Aashish Jat | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 2 | Abbas Dhariwala | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 3 | Abhay Dubey | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 4 | Abhishek Grjar | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 5 | Abhishek Upadhyay | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 6 | Aditya Dubey | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 7 | Afreen Bhimani | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 8 | Aishvarya Gaur | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 9 | Akanksha Verma | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 10 | Altaf Mansuri | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 11 | Amit Gain | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 12 | Amrita P Nair | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 13 | Anand Patidar | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 14 | Anant Patel | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 15 | Anjalee Rahangdale | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 16 | Anshul Kala | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 17 | Anubhav Jain | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 18 | Anurag Sahu | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 19 | Ashutosh Chaturvedi | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 20 | Bhavana Pal | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 21 | Bhawna Solanki | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 22 | BHUMIKA AGRAWAL | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 23 | Chhotu Ahirwar | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 24 | Deepak Thakur | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 25 | Dev Raja Bundela | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 26 | Dheeraj Harode | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 27 | Dheeraj Yadav | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 28 | Dimple Joshi | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |

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|---|---|---|
| 29 | Divyansh Jain | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 30 | GOUTAM LODHI | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 31 | Harsh Dapkara | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 32 | Harsh Vishwakarma | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 33 | Harshita Hardha | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 34 | Hema Rawat | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 35 | Hemant Malviya | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 36 | Himanshu Makwana | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 37 | Himanshu Sutrakar | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 38 | Isha Tiwari | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 39 | Ismail Khan | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 40 | Janmejay Chandrol | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 41 | Jayant Dhurvey | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 42 | Jayesh Rajvanshi | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 43 | Kamlesh Kanesh | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 44 | Kashish Chilhate | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 45 | Kratika Rathi | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 46 | Kuldeep Panchal | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 47 | Kuldeep Sharma | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 48 | Lali Soni | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 49 | Luckey Harode | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 50 | Mahesh Bhiyaja | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 51 | Mangal Singh Ahirwar | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 52 | Manisha Singh | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 53 | Manish Dawade | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 54 | Mayank Tiwari | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 55 | Mohit Satankat | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 56 | Moin Shah | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 57 | Muskan Mansoori | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 58 | Muskan Wadhwa | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 59 | Neelima Chaurasia | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 60 | Neha Kumari Yadav | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 61 | Nidhi Tiwari | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |

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|---|---|---|
| 62 | Nikky Jaj | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 63 | Nilesh Shah | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 64 | Nimish Sharma | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 65 | Ojas Chandekar | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 66 | Omika Pateliya | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 67 | Pallavi Tyagi | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 68 | Paridhi Agrawal | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 69 | Paridhi Bodse | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 70 | Piyush Sonakiya | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 71 | Pooja | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 72 | Pooja Naskar | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 73 | Pragati Singh Baghel | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 74 | Prakrati Patidar | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 75 | Priti Rawat | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 76 | Purva Pande | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 77 | PUSHPENDRA KUMAR KUSHWAHA | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 78 | RAJEET KUMAR PANDEY | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 79 | Rajeshwari More | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 80 | Rakesh Tomar | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 81 | Ranu Rajput | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 82 | Ravina Khandelwal | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 83 | Richa Pandey | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 84 | Ritesh Solanki | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 85 | Riya Borkhade | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 86 | Roshni Rane | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 87 | Rupal Baraskar | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 88 | Sakshi | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 89 | Saloni Verma | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 90 | Satyam Shivhare | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 91 | Shivani Khoiwal | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 92 | Shivank Mishra | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 93 | Shivankshi Mishra | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 94 | Shreya Mishra | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |

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|---|---|---|
| 95 | Shriya Biyani | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 96 | Shruti Singh | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 97 | Shweta Dwivedi | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 98 | Siddhartha Sharma | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 99 | Snehal Choudhary | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 100 | Sonali Mittal | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 101 | Sourabh Ramtekkar | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 102 | Urmika Saxena | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 103 | Vikash Patel | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 104 | Vikash Tripathi | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 105 | Vineet Chaturvedi | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 106 | Vishakha Parihar | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 107 | Yash Dubey | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 108 | Yashasvi Kamde | Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.) |
| 109 | Sanju Biloniya | Govt. College, Rau |
| 110 | Vicky Panchal | Govt. College, Rau |
| 111 | ARJUN SINGH PARMAR | Govt. Nirbhay Singh Patel New Science College, Indore (MP) |
| 112 | AYUSHI SAHU | Govt. Nirbhay Singh Patel New Science College, Indore (MP) |
| 113 | Deepisha Sisodiya | Govt. Nirbhay Singh Patel New Science College, Indore (MP) |
| 114 | Devendra Gadge | Govt. Nirbhay Singh Patel New Science College, Indore (MP) |
| 115 | Madhuri Pal | Govt. Nirbhay Singh Patel New Science College, Indore (MP) |
| 116 | Manisha Singh Bhandari | Govt. Nirbhay Singh Patel New Science College, Indore (MP) |
| 117 | Priyal Lovevanshi | Govt. Nirbhay Singh Patel New Science College, Indore (MP) |
| 118 | Sanjay Kumar Kushwaha | Govt. Nirbhay Singh Patel New Science College, Indore (MP) |

# SSR DOCUMENT

2023

## CRITERION – 3

## MoUs/Linkages/Collaborations

Govt. Institute of Forensic Science, Nagpur (M.H.)

**Document Title:**

Mr. Anurag Sahu from the Govt. Institute of Forensic Science, Nagpur (M.H.) was the Resource Person in the National Workshop organized by the Department of Forensic Science.

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न्यायसहाय्यक विज्ञान संस्था, नागपूर
जावक क्रमांक 768
दिन 09/09/2019

# MEMORANDUM OF UNDERSTANDING

## For Academic and Scientific Cooperation

## BETWEEN

**Govt. [Model, Autonomous] Holkar Science College, Indore, M. P.**
**&**
**Government Institute of Forensic Science, Nagpur, Maharashtra**

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This Memorandum of Understanding (MOU) is entered into on the 9th day of September 2019 by and between the representatives of Govt. [Model, Autonomous] Holkar Science College, Indore and Government Institute of Forensic Science, Nagpur. The aforesaid institutions are hereinafter referred to individually as 'institute' and collectively as 'institutes'.

The Memorandum of Understanding (MOU) establishes the following:

### 1. OBJECTIVE OF THE AGREEMENT

To establish a mutually beneficial relationship built on academic and scientific cooperation. Areas of cooperation between the Govt. [Model, Autonomous] Holkar Science College, Indore, M. P. and Government Institute of Forensic Science, Nagpur include the exchange of researchers, students, publications, books, academic programs and research projects.

### 2. GOALS AND FORMS OF COOPERATION

The signing institutions agree to provide opportunity, as appropriate, for the following activities towards the completion of the objective of this MOU.

a. Exchange of students and/or researchers with the objective of offering courses and realizing research projects in areas mutually agreed upon by both institutes through prior invitation and in accordance with the procedures and expectations established by each institute and specific department.
b. Exchange of books, scientific publications, study programs, academic projects, course information, seminars, conferences and any other data and information of common interest.
c. Develop joint research projects and joint publications.
d. All joint activities will be realized through the mutual agreement and clearly established conditions and mutual obligations of the appropriate institute entity.

### 3. IMPLEMENTATION OF THE MEMORANDUM OF UNDERSTANDING

The objectives of the MOU will be implemented and regulated in the following manner:

***i. Student Exchange***

a. Students and research scholars may visit the corresponding departments of these institutes after finalizing a mutually acceptable schedule.
b. All the expenses shall be the direct responsibility of the student concerned (subject to any agreements on payment arrangements made by either institution with its own students). These expenses include (but not limited to):
    - Travel expenses
    - Reprographic and Internet Usage Expenses
    - Required student services fees at the host institution
    - Books and academic supplies
    - Administrative fees, if any.

Director
Institute of Forensic Science
Nagpur

*ii. Exchange of researchers*

With the objective of strengthening ties through joint projects and research activities of both institutes, the MOU allows for the creation of researcher exchange. The following conditions will apply:

a. The researchers will maintain their status as research scholars at their home institution for the duration of the exchange.
b. The researchers will be allowed to make use of the instruments and other research facilities available in various departments of these institutes after prior approval of the visiting schedule.
c. The appropriate academic departments and administrative offices will assist in securing housing and other necessary arrangements for living in the host institution's city, whenever feasible.

*iii. Research and Resources*

a. Both the institutes agree to jointly hold/conduct, whenever feasible, National/International events, workshops, conferences, training programs, demonstration (of procedures and working of the instruments available in the laboratories of the institutions).
b. Faculty members shall be encouraged to develop joint research projects and joint publications.
c. All the joint activities shall be realized through the mutual agreement and clearly established conditions and mutual obligations of the appropriate university entity.
d. In case of Joint-Research Project(s) by the Faculty members of the institutes is/are funded by any agency (such as UGC, DBT, DST, etc.), the funds as well as the conduct of such a project shall be governed as per the established norms, direction and/or regulations of such agency.

**Coordinators**

Both Institutes will designate persons who will have responsibility for co-ordination and implementation of this agreement.

## 4. DURATION AND RECINDENCE OF MOU

a. This MOU, unless extended by mutual written consent of the institutes, shall expire in Three years after the effective date specified in the opening paragraph. However, on review, the MOU may be extended for another One year by mutual consent.
b. Changes to this agreement shall be made by mutual consent between both institutions. In cases of disagreement, the Institute wishing to depart from the agreement shall, wherever possible, give two months' notice of its intention to do so. The agreement shall be reviewed after a period of one year.
c. This MOU is being signed purely with the intention of academic and scientific cooperation without any financial liabilities.
d. IFSC-N comes under the jurisdiction of Department of Higher Education (DHE) and is run directly by Government of Maharashtra (Department of Higher & Technical Education). The terms and condition of this MOU shall be governed by the existing rules and regulations and their modifications (if any), as issued from time to time by DHE &/or (any competent authority of) Government of Maharashtra.

Director
Govt. Institute of Forensic Science
Nagpur.

(03)

**Signed**

By signing below, the institutes, acting by their duly authorized officers, have caused this Memorandum of Understanding to be executed, effective as of the day, month and year first above written.

---

On behalf of

Principal
**Govt. [Model, Autonomous] Holkar Science College, Indore, M.P.**

On behalf of

Director
**Govt. Institute of Forensic Science Nagpur, Maharashtra**

In presence of the following witnesses / MoU coordinators:

1. Dr. Vijay R. Chourey
Head & Professor
Dept. of Forensic Science
Govt. (Model, Autonomus) Holkar
Science College, Indore, M.P.

Dr. Vijay R. Chourey
Professor and Head
Forensic Science Department
Govt. Holkar Science College
Indore (M.P.)

2. Ms. Neeti Kapoor
Asst. Professor
Dept. of Forensic Science
Govt. Institute of Forensic Science
Nagpur, Maharashtra

Director
Govt. Institute of Forensic Science
Nagpur.

Govt. Holkar (Model, Autonomous) Science College, Indore
(M.P.) Pin - 452017
Department of Forensic Science

Memorandum of Understanding
Between
Government Institute of Forensic Science, Nagpur, Maharashtra
And
Department of Forensic Science, Govt. Holkar (Model, Autonomous) Science College, Indore

We jointly enter into a MOU for the Expertise sharing, training, collaborative research, promote projects/ internship programs, organization of moot courts, workshop etc for learning and training purpose of students, faculties and other associated personnel's.

Following Activity has been conducted under this:

- **Faculty Exchange/ Guest Lecture**
  Invited Resource Person- Mr. Anurag Sahu
  A National Workshop on "Skill Enhancement in Multiple Domain of Forensic Science"
  Date: 27/04/2023

Govt. Holkar (Model, Autonomous) Science College, Indore
(M.P.) Pin - 452017
Department of Forensic Science

Date : 20/04/2023

To,
Mr. Anurag Sahu,
Assistant Professor,
Department of Forensic Science,
Govt. Institute of Forensic Science,
Aurangabad, Maharashtra

Subject: Invitation Letter for Resource Person in National Workshop

Dear Sir,
We are pleased to inform you that you are cordially invited as a "Resource Person" for the National Workshop on **"Skill Enhancement in Multiple Domain of Forensic Science "** organized by the Department of Forensic Science, Govt. Holkar (Model. Autonomous) Science College, Indore (M. P.)
We would be delighted with your presence in the Workshop.

| Domain | Topic | Date | Time |
|---|---|---|---|
| Questioned Documents | Forensic Examination of Fraudulent Documents | 27/04/2023 | 12:00 PM |

Thanking You!

Dr. Geetha Sarasan
HOD
Department of Forensic Science
Govt. Holkar (Autonomous, Model)
Science College, Indore
(M.P.), 452017

# SSR DOCUMENT

2022

## CRITERION –3

## MoUs/Linkages/Collaborations

**Research Institute of Organic Agriculture Switzerland (FiBL) and the bioRe Association (India)**

**Document Title:**

**Guest lecture by Dr. Akansha Singh, Project Coordinator, India FiBL, Switzerland, under active collaboration with the Research Institute of Organic Agriculture Switzerland (FiBL) and the bioRe Association (India)**

Office of the Principal
Govt. (Model Autonomous) Holkar Science College
Indore (M.P.)
0731-2464074(O), 2446806, 2764027 (Exam)
e-mail : principalhsc@rediffmail.com, Web Address: www.collegeholkar.org
(Re-accredited 'A' Grade by NAAC)

Date:-

# Memorandum of Agreement

between the

Research Institute of Organic Agriculture, Switzerland (FiBL)

and the

Government Model Autonomous Holkar Science College Indore (India)

As well as the

Remei India Limited and bioRe Association (India)

concerning the doctoral project entitled

**"Developing socio-economically and ecologically resilient cotton rotational farming systems"**

And concerning

**Scientific exchange between the four institutions**

The Research Institute of Organic Agriculture (hereafter called "FiBL"), the Government Model Autonomous Holkar Science College Indore (hereafter called "Holkar College"), the Remei India Limited and the bioRe Association (hereafter called "bioRe") wishing to strengthen their collaboration in international agricultural research agree to engage in a doctoral research project.

## Article 1: Objectives

1.1 The collaboration shall provide international doctoral research experience to a "research fellow". The research fellow shall be assigned to the project entitled "Developing socio-economically and ecologically resilient cotton rotational farming systems" (hereby called "the project").

1.2 The research to be conducted and a timetable for the project are set out in the project proposal.

1.3 The overall objective is to strengthen the established institutional collaboration between FiBL, Holkar College, Remie India Limited and bioRe (hereby called "collaborating partners") by conducting the project of the research fellow as described below.

1.4 The collaboration further aims to strengthen the socio-ecological research exchange between the collaborating institutes. For this purpose two interdisciplinary workshops will be organised at Holkar college.

## Article 2: Period and Place of Assignment

2.1 The research fellow shall be assigned for a time period of three years (January 2023 – December 2026).

2.2 The place of assignment will principally be at the bioRe research station, located at the 5th Km Milestone, Kasrawad Mandleshwar road, Tehsil Kasrawad, District – Khargon, Madhya

## Article 3: Infrastructure, Budget and Payment to the Research Fellow

3.1 A consolidated fellowship amounting to twenty-eight thousand Indian rupees (28,000 INR) per month will be provided to the research fellow, by the bioRe Association, corresponding to the respective head in the FiBL SysCom Project.

3.2 The infrastructure and staff resources necessary to conduct the project field activities are either available at the research station or these will be arranged by the research staff together with the research fellow.

3.3 Basic analysis of the samples could be carried out at the field lab at bioRe research station.

3.4 For more advanced analysis Holkar College will make arrangement with the specialised labs in other institutes as needed.

3.5 The research project will support four internship projects of four PG students to support the assigned research fellow. The research project will support these master students for food and accommodation at the research station. The project will also support the students for basic analysis needed and for their travel required (one travel per month) to the bioRe research station.

## Article 4: Supervision, Backstopping and Publication

4.1 The PhD project of the research fellow will be jointly supervised by a supervising committee comprising Dr. Sanjeeda Iqbal (Holkar College) and Dr. Akanksha Singh (FiBl). Dr. Iqbal - being the main supervisor - will ensure the punctuality of planned research activities, along with sound quality of data and appropriate publication of results.

4.2 The research fellow will work in close collaboration with the researchers responsible for the long-term trial at bioRe, lab technician of bioRe and dissemination specialist of bioRe. The research staff at bioRe will provide the support and basic information required to carry out field activities.

4.3 The results obtained from this project will be published in international peer reviewed journals. The research fellow supported by the main supervisor will be responsible for sound data analysis and preparation of first draft of the manuscript(s). Both members of the supervising committee will support and contribute towards the publication process.

4.4 As a general rule, the data obtained from the field trials and surveys of FiBL is owned by FiBL and therefore all the publication rights are reserved by FiBL. No part of the data obtained from this project could be published or presented in any form without the approval of FiBL. Upon approval by FiBL, the results could be presented in national and international conferences.

4.5 The research fellow and both members of the supervising committee (depending upon their contribution), will gain authorship on the publication originating from the project. The order of authorship and corresponding authorship will be jointly decided by the supervising committee. In general, Dr. Singh will serve as a last author on these publications.

4.6 Plagiarism is a serious offence in scientific publication. Therefore, the research fellow and the main supervisor will ensure that the manuscripts produced from the project are free from Plagiarism.

4.7 In addition to the scientific publications, the fellow will compile a doctoral thesis and submit to his affiliating university (Devi Ahilya Vishwavidyalaya, Indore) as per the requirements and regulations set forth by the doctoral programme.

4.8 Considering the political nature of the project, the research fellow is instructed not to discuss or present anything related to this project in print or electronic media.

4.9 The envisaged internships of the four PG students will be conceptualised and supervised jointly by the research fellow and the supervising committee.

Signed at Frick, Switzerland on 10 August, 2022
For the Research Institute of Organic Agriculture (FiBL), Frick, Switzerland

FiBL Switzerland

Dr. Akanksha Singh (SysCom India – Country Leader)

Signed at Indore, India on 10 August, 2022
For the Government Model Autonomous Holkar Science College

Dr. Suresh T. Silawat (Principal, Holkar Science College)

Signed at Frick, Switzerland on 27 August, 2022
For Remei India

Vivek Kumar Rawal (Director Remei India Limited, General Secretary, bioRe Association India)

Signed at Indore, India on 27 August, 2022

Dr. Sanjay Vyas (Head of Department of Botany, Holkar Science College)

Signed at Indore, India on 27 August, 2022

Dr. Sanjeeda Iqbal (Main Supervisor, Department of Botany, Holkar Science College)

## Department of Botany, Govt. Holkar Science college, Indore

Date – 24-07-2022

### Notice

All the students of M.Sc. Classes are informed to gather in final class lab. for the guest lecture of Dr. Akansha sing project Co-Ordinator, Research Institute of Organic agriculture, Switzerland on 26/07/2022 "Organic farming: impact and importance in present scenario" at 1:30 PM.

Head of Department
Department of Botany
Govt. Holkar Science College,
Indore

M.Sc II Sem  Date - 26/07/22

| | | |
|---|---|---|
| 1. | Pooja Kanojiya | Pooja. |
| 2. | Simran Thawani | Phawani |
| 3. | Pragati Patidar. | Pragati |
| 4. | Sneha Trivedi | Sneha |
| 5. | Pooja Pawar | Pawar |
| 6. | Radhika Gadriya. | Bedukar |
| 7. | Priti Badole. | Priti |
| 8. | Sunita Bardod. | Sunita |
| 9. | Rakesh Bamniya | Rakesh |
| 10 | Rajendra Damar. | Rajendra |
| 11 | Praveen Keshari. | Praveen |
| 12 | Kapil Dangi. | Kapil |
| 13. | Kajal gawad | Kajal |
| 14. | Vinita Bariya | Vinita |
| 15. | Sheetal Kanesh. | Sheetal |
| 16. | Manisha Mussel. | Manisha |
| 17. | Rupali Patidar. | Rupali |
| 18. | Ayushi Tomar. | Ayushi |
| 19. | Sapna Patel. | Sapna Patel |
| 20. | Mahima Dasar Dubey | Mahima |
| 21. | Kapil Kanesh | Kapil |
| 22. | Jitendra verma | |


Holkar Scie
College
Google
Indore, Madhya Pradesh, India
1 , Holkar Service Road, Bhawarkua Main Rd, Janki Nagar, Indore, Madhya Pradesh 452001, India
Lat 22.694199°
Long 75.869552°
26/07/22 02:54 PM

# SSR DOCUMENT

2022

## CRITERION – 3

## MoUs/Linkages/Collaborations

**Medilux Laboratories Pvt. Ltd. Pithampur**

**Document Title:**

**Transfer of the HPIC system with the UV Doctor and Accessories Make: SCION, Model LC6000 by Medilux Laboratories Pvt. Ltd., Pithampur. A CSR under an active MoU**

Office of the Principal

**Govt. (Model Autonomous) Holkar Science College**
**Indore (M.P.)**

✆ 0731-2464074(O), 2446806, 2764027 (Exam)

e-mail : principalhsc@rediffmail.com, Web Address: www.collegeholkar.org

(Re-accredited 'A' Grade by NAAC)

D.No./1414/22 Date:- 28/03/2022

**Memorandum of Understanding for Academic and Industrial Cooperation**
**Between**
**Department of Pharmaceutical Chemistry, Govt. Holkar (Model, Autonomous) Science College Indore (M.P.) INDIA**
**And**
**Medilux Laboratories Pvt. Ltd., Sector-1, Pithampur, Indore (M.P.), INDIA**

The purpose of this agreement is to promote cooperation in educational, technical, and industrial environment between the Department of Pharmaceutical Chemistry, Govt. Holkar (Model, Autonomous) Science College, Indore (M.P.), India and Medilux Laboratories Pvt. Ltd., Sector-1, Pithampur, Indore (M.P.), INDIA

The Memorandum of Understanding (MOU) establishes the following:

**PURPOSE OF THE AGREEMENT**

1. The MOU has been signed with the primary purpose to strengthen the research and development in the field of Pharma sector.
2. To conduct/deliver the lectures on relevant technologies, trends, and upgradation of analytical Knowledge to support students.
3. To conduct collaborative research project.
4. To design curriculum for students as per industry requirement.
5. To conduct placement drive for UG and PG students.
6. To facilitate industry visit for students and faculties.
7. Other activities as mutually agreed.

**ROLE OF PARTIES**

The Government Holkar (Model, Autonomous) Science College , Indore, will assign a Faculty member from the department and the cooperative side, the director will designate a faculty/staff member.

**COMPLETION PERIOD OF MOU**

This MOU will be signed between Government Holkar (Model, Autonomous) Science College,Indore and Medilux Laboratories Pvt.Ltd., Sector-1, Pithampur, Indore. It will be effective for ten years from the date of agreement, with the possibility of extension based on mutual agreement.

**FINANCIAL LIABILITIES**

The Medilux Laboratories Pvt. Ltd. Pithampur, Indore will provide Instruments like HPLC as per their norms to promote the research activities in the department of Pharmaceutical Chemistry.

**Date of Implementation:- 28 March-2022**

This MOU is signed by

| | | |
|---|---|---|
| **Dr. M.K. Dwivedi** | **Dr. Suresh T. Silawat** | **Mr. Sanjay Kewalramani** |
| **HOD** | **Principal** | **Director** |
| Department of Pharmaceutical Chemistry Govt. Holkar (Model, Autonomous) Science College, Indore. (M.P.) | Govt. Holkar (Model, Autonomous) Science College, Indore (M.P.) | Medilux Laboratories Pvt. Ltd. Sector-1 Pithampur, Indore (M.P.) |

| | | | |
|---|---|---|---|
| 01 | Medilux Laboratories Pvt. Ltd., Pithampur | Transfer of HPIC system with UV Doctor and Accessories<br>Make: SCION, Model LC6000 | 31-05-2022 |

Original
Duplicate
Triplicate

**Delivery Challan Cum Invoice**
**(Non-Returnable)**

Medilux

| |
|---|
| **MEDILUX LABORATORIES PVT. LTD.** |
| Plot No. 98-99, Sector-1,Industrial Area, |
| Pithampur, Dist.: Dhar |
| Madhya Pradesh (State Code - 23) |
| **GSTIN :** 23AABCM1739L1ZI |

| | |
|---|---|
| **Sr. No - NR/22-23/047** | |
| **Date** | **31-05-2022** |

**Details of Receiver(Billed To)**

| |
|---|
| Government Holkar Science College |
| AB Road, near Bhawarkua Square Indore |
| Madhya Pradesh 452001 |
| IND 452001 |
| Madhya Pradesh (State Code - 23) |
| **GSTIN :** |

**Details of Consigneen (Shipped To)**

| |
|---|
| Government Holkar Science College |
| AB Road, near Bhawarkua Square Indore |
| Madhya Pradesh 452001 |
| INDORE-452001 |
| Madhya Pradesh (State Code - 23) |
| **GSTIN :** |

| S No | Description of Goods | HSN Code | Packing Detail | Qty. Unit (Kg) | Rate (Per Item) | Total Value | Discount | Taxable Value | CGST | | SGST/UGST | | IGST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Rate% | Amt. | Rate% | Amt. | Rate% | Amt. |
| 1 | HPLC SYSTEM WITH UV DETECTOR & ACCESSORIES MAKE SCION, MODEL LC6000 | 902730 00 | 01Cs/Nos | 1.00 NOS | 13,35,623 00 | 13,35,623.00 | | 13,35,623 00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | | | | **1.00** | | **13,35,623.00** | | **13,35,623 .00** | | **0.00** | | **0.00** | | **0.00** |
| | | | | | | | **Freight** | 0.00 | | | | | | |
| | | | | | | | **Insurance** | 0.00 | | | | | | |
| | | | | | | | **Packing and Forwarding Charges** | 0.00 | | | | | | |
| | | | | | | | **Total Bal. Value(In Figure)** | **13,35,623.00** | | | | | | |
| | | | | | | | **Total Bal. Value(In Words)** | Rupees Thirteen Lakh Thirty Five Thousand Six Hundreds Twenty Three Only | | | | | | |
| **Remarks:** | Under C.S.R. | | | | | | | | | | | | | |

| **Transporter Details** | |
|---|---|
| Name Of Transporter | Self |
| LR No. | |
| Date | |
| Vehicle No. | MP09BD1787 |

Medilux Laboratories Pvt. Ltd.

**Signature of Authorised Signatory**

31/5/2022
PROFESSOR & HEAD
Deptt. of Pharmaceutical Chemistry
Govt. Holkar Science College
INDORE (M.P.)

# SSR DOCUMENT

2022

## CRITERION – 3

## MoUs/Linkages/Collaborations

**Anchor Software Developers and Solution Pvt. Ltd., Indore (MP)**

### Document Title:

**Anchor Software Developers and Solution Pvt. Ltd., Indore, conducted a collaborative series of various training sessions for the certificate and internship programs.**

SKILL DEVELOPMENT PROGRAM
2022-23

| S. No | Component/Activities | Details |
|---|---|---|
| 1 | Name of the Department / Unit / Agency: | Department of Electronics |
| 2 | Name of the Activity: | Practical training on Web Design |
| 3 | Name of the Scheme: | Practical training |
| 4 | Date and Year of the Activity: | 1 December 2022 to 07 January 2023 |
| 5 | Number of Students Participated in the activity: | 104 |
| 6 | Report of the Activity (in 100 words): | Web Design is the design of websites that are displayed on the internet. To give future scope in the field of Web Design, the Electronics Department, Government Holkar (Model, Autonomous) Science College, Indore has organized a Practical training on Web Design at Anchor Software Developers and Solution Pvt. Ltd. Students developed some Web Page during this activity. The industry has allowed 104 students for this, and this hands-on training is held on 1 December 2022 onwards. Mr. Akhilesh Khare has approved this event on the industry side; Dr. Suresh T. Silawat, the principal, and Dr. Netram Kaurav, have approved this event from the institution side. |

CIN: U72200MP2010PTC024998

# ANCHOR SOFTWARE
## DEVELOPERS AND SOLUTIONS PVT. LTD.

Ref. No :_____ Date : 10/11/2022

To,

Head,

Department of Electronics,

Govt. Holkar Science College, Indore

Subject: -Acceptance Letter for Lecture/Training/Learning of your Students.

Dear Sir,

This is to inform you that we have cordially accepted your request for a hands-on training session we are drafting a Module with the Practical session included in it.

You are requested to arrange a required module.

Thanking you

Anchor Software Developers and Solutions P. Ltd.
Director

B.O. : 201-BABARI COMPLEX, NEAR PIPLIYANHA SQUIRE, MYH LINK ROAD, INDORE (M.P.) 452016 MOB. NO. : 9993915996

# Department of Electronics
## Web Design Class
## Time Table

| S.No. | Date | Theory Class Time | Practical Class Time |
|---|---|---|---|
| 1 | 01-12-22 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 2 | 02-12-22 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 3 | 03-12-22 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 4 | 05-12-22 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 5 | 06-12-22 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 6 | 07-12-22 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 7 | 08-12-22 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 8 | 09-12-22 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 9 | 10-12-22 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 10 | 12-12-22 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 11 | 13-12-22 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 12 | 14-12-22 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 13 | 15-12-22 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 14 | 16-12-22 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 15 | 17-12-22 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 16 | 19-12-22 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 17 | 20-12-22 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 18 | 21-12-22 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 19 | 22-12-22 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 20 | 23-12-22 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 21 | 24-12-22 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 22 | 26-12-22 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 23 | 27-12-22 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 24 | 28-12-22 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 25 | 29-12-22 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 26 | 30-12-22 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 27 | 31-12-22 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 28 | 02-01-23 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 29 | 03-01-23 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 30 | 04-01-23 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 31 | 05-01-23 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 32 | 06-01-23 | 9:30 to 10:30 am | 10:30 to 11:30 am |
| 33 | 07-01-23 | 9:30 to 10:30 am | 10:30 to 11:30 am |

| | | |
|---|---|---|
| 7 | List of Participants | Enclosed |

Govt. Holkar(Model, Autonomous) Science College, Indore (M.P)
Department of Electronics
Student List

| S. No. | NAME OF STUDENT | CLASS | SIGNATURE |
|---|---|---|---|
| 1 | ABHISHEK PANDEY | B.Sc. III Year | |
| 2 | AMAN PARMAR | B.Sc. III Year | |
| 3 | AMBIKA NAGAR | B.Sc. III Year | |
| 4 | AMISHA PATEL | B.Sc. III Year | |
| 5 | ANJALI TIWARI | B.Sc. III Year | |
| 6 | ARTI KARMA | B.Sc. III Year | |
| 7 | ARVIND DEVDA | B.Sc. III Year | |
| 8 | ARVIND MANDLOI | B.Sc. III Year | |
| 9 | ASHISH SAINI | B.Sc. III Year | |
| 10 | ASTHA CHOUHAN | B.Sc. III Year | |
| 11 | DEEPA JOSHI | B.Sc. III Year | |
| 12 | DEVYANI KOLTE | B.Sc. III Year | |
| 13 | DIVYANSHU AHIRWAR | B.Sc. III Year | |
| 14 | FARHEEN KHAN | B.Sc. III Year | |
| 15 | HARSHAL JOSHI | B.Sc. III Year | |
| 16 | HRISHABH MEENA | B.Sc. III Year | |
| 17 | JAGRATI NAMDEV | B.Sc. III Year | |
| 18 | JYOTI BALA DAMOR | B.Sc. III Year | |
| 19 | KARTIKA PATHAK | B.Sc. III Year | |
| 20 | KAUSTABH GAUTAM | B.Sc. III Year | |
| 21 | MUSKAN SOLANKI | B.Sc. III Year | |
| 22 | NANDINI SONI | B.Sc. III Year | |
| 23 | SONIYA SANKLIYA | B.Sc. III Year | |
| 24 | NIDHI TAWDIYA | B.Sc. III Year | |
| 25 | OM NAYAK | B.Sc. III Year | |
| 26 | PALAK SHARANAGAT | B.Sc. III Year | |
| 27 | PRACHI SONWANE | B.Sc. III Year | |
| 28 | PRANSHU SINGH | B.Sc. III Year | |
| 29 | PRITIKA PATEL | B.Sc. III Year | |
| 30 | PRIYANKA KURMI | B.Sc. III Year | |
| 31 | PRIYANKA LODHI | B.Sc. III Year | |
| 32 | RADHIKA KARAHE | B.Sc. III Year | |
| 33 | RAHUL GULWANI | B.Sc. III Year | |
| 34 | RAVINA PATIDAR | B.Sc. III Year | |
| 35 | RISHABH KHATRI | B.Sc. III Year | |

| S. No. | NAME OF STUDENT | CLASS | SIGNATURE |
|---|---|---|---|
| 36 | SAGARIKA SONI | B.Sc. III Year | |
| 37 | SAINABH CHAURASIYA | B.Sc. III Year | |
| 38 | SANJAY BHAYDIYA | B.Sc. III Year | |
| 39 | SANSKRATI JAIN | B.Sc. III Year | |
| 40 | SATAYM PANDEY | B.Sc. III Year | |
| 41 | SHUBHAM BARASKAR | B.Sc. III Year | |
| 42 | SHUBHAM PATEL | B.Sc. III Year | |
| 43 | SUMIT ASTAYA | B.Sc. III Year | |
| 44 | SUMIT SONI | B.Sc. III Year | |
| 45 | VIKASH GOYAL | B.Sc. III Year | |
| 46 | RINKI YADAV | B.Sc. III Year | |
| 47 | PRACHI KAURAV | B.Sc. III Year | |
| 48 | PRANJAL JAIN | B.Sc. III Year | |
| 49 | SAHIL KHAN | B.Sc. III Year | |
| 50 | AJAY SINGH RANG | B.Sc. III Year | |
| 51 | MOHIT RATHORE | B.Sc. III Year | |
| 52 | ABHAY BHASKAR | B.Sc. III Year | |
| 53 | ABHIMNYU PARIHAR | B.Sc. III Year | |
| 54 | ADARSH SHARMA | B.Sc. III Year | |
| 55 | ADITYA RAJAK | B.Sc. III Year | |
| 56 | AKASH CHOUHAN | B.Sc. III Year | |
| 57 | AKSHAD JOSHI | B.Sc. III Year | |
| 58 | AMAN SEN | B.Sc. III Year | |
| 59 | AMIT DWIVEDI | B.Sc. III Year | |
| 60 | AMITA MAKWANA | B.Sc. III Year | |
| 61 | ANIL BHURIYA | B.Sc. III Year | |
| 62 | ANISHKA GUPTA | B.Sc. III Year | |
| 63 | ANJALI PADMOR | B.Sc. III Year | |
| 64 | ANKITA SOLANKI | B.Sc. III Year | |
| 65 | ANUSHKA JAIN | B.Sc. III Year | |
| 66 | ANUSHKA LATH | B.Sc. III Year | |
| 67 | ANUSHRI CHANDOLIYA | B.Sc. III Year | |
| 68 | ARMAN SONI | B.Sc. III Year | |
| 69 | ARYAN KHAN | B.Sc. III Year | |
| 70 | ASHISH JAAT | B.Sc. III Year | |
| 71 | ATUL JAAT | B.Sc. III Year | |
| 72 | AYUSHI SUROSHI | B.Sc. III Year | |
| 73 | BHAGWATI DAS BAIRAGI | B.Sc. III Year | |

| S. No. | NAME OF STUDENT | CLASS | SIGNATURE |
|---|---|---|---|
| 74 | BHAGYASHRI DAS | B.Sc. III Year | |
| 75 | BHUPENDRA DHAKAR | B.Sc. III Year | |
| 76 | CHANCHAL PATEL | B.Sc. III Year | |
| 77 | CHARVEE SHARMA | B.Sc. III Year | |
| 78 | CHELSI PORWAL | B.Sc. III Year | |
| 79 | DAMINI JAMOD | B.Sc. III Year | |
| 80 | DEEPSHIKHA CHOUGDE | B.Sc. III Year | |
| 81 | DEEVESH CHAUSIYA | B.Sc. III Year | |
| 82 | DIPIKA BAGHEL | B.Sc. III Year | |
| 83 | GAURAV PANDEY | B.Sc. III Year | |
| 84 | GUNJAN GADRIYA | B.Sc. III Year | |
| 85 | ABHISHEK KUMAR MISHRA | B.Sc. III Year | |
| 86 | IMRAN KHAN | B.Sc. III Year | |
| 87 | KAIVALYANSHI CHAUBEY | B.Sc. III Year | |
| 88 | LALIT PRAJAPAT | B.Sc. III Year | |
| 89 | MAHENDRA SINGH CHAUHAN | B.Sc. III Year | |
| 90 | NEHA SHUKLA | B.Sc. III Year | |
| 91 | POOJA SASTYA | B.Sc. III Year | |
| 92 | PRANJALI | B.Sc. III Year | |
| 93 | RINKI LOVANSHI | B.Sc. III Year | |
| 94 | ROHAN CHOUDHARY | B.Sc. III Year | |
| 95 | SANJAY THAKUR | B.Sc. III Year | |
| 96 | SANKRATI YADAV | B.Sc. III Year | |
| 97 | SHIVAM GUPTA | B.Sc. III Year | |
| 98 | SUDHANSHU MISHRA | B.Sc. III Year | |
| 99 | SWATI KUSHWAHA | B.Sc. III Year | |
| 100 | UMESH KUSHWAHA | B.Sc. III Year | |
| 101 | URJA SAHU | B.Sc. III Year | |
| 102 | VAGESH SHARMA | B.Sc. III Year | |
| 103 | VISHWASI YADAV | B.Sc. III Year | |
| 104 | RAJ BATHRE | B.Sc. III Year | |

# SSR DOCUMENT

2022

## CRITERION – 3

## MoUs/Linkages/Collaborations

Wild Warriors Society, Indore

**Document Title:**

Environmental awareness activities: Bird Survey at college campus in association with Wild Warriors Society, Indore (MP)

Registration No. 03/27/01/23145/21
Mob. 9575300232, 9425900083
E-mail : wildwarriorsindore@gmail.com

Registered Address : 59/4, Vallabh Nagar, Indore (M.P.)

Sr.No

Date .....

**MEMORANDUM OF UNDERSTANDING FOR NATURE & WILDLIFE RELATED ACTIVITIES**

**BETWEEN**

Govt. [Model, Autonomous] Holkar Science College, Indore, M. P.
AND
*Wild Warriors Society*, Indore.

---

The representatives of Govt. [Model, Autonomous] Holkar Science College, Indore and *Wild Warriors Society, Indore*, agree to this Memorandum of Understanding.
The Memorandum of Understanding (MOU) establishes the following:

**1. OBJECTIVE OF THE AGREEMENT**

To establish a mutually beneficial relationship built on nature and wildlife related activities between the Govt. [Model, Autonomous] Holkar Science College, Indore, M. P. and *Wild Warriors Society, Indore* include the theoretical and field work related to nature and wildlife within and outside the premises of Govt. Holkar Science College involving the students of the college in the activities.

**2. GOALS**

The signing institutions agree to provide opportunity, as appropriate, for the following activities towards the completion of the objective of this MOU.

1. Bird Watching and field visit to any of the nearby jungle/wetland etc.
2. Online/Offline lecture on environment and wildlife related subject.(on chargeable basis)
3. Session on Basics of Photography.
4. Trekking/Nature Walk in the nearby areas. (on chargeable basis)
5. Participation in the bird and butterfly survey to be organised at Govt .Holkar Science College.
6. Organization/Participation in Plantation Drives.
7. Organization/Participation in Nature Cleanliness Drives.
8. Internships & Projects.
9. Any other projects related with nature and wildlife.

**3. IMPLEMENTATION OF THE MEMORANDUM OF UNDERSTANDING**

The objectives of the MOU will be implemented and regulated in the following manner:

All the expenses shall be the direct responsibility of the participating student (subject to any agreements on payment arrangements made by either institution with its own students). These expenses include:
i. Any transportation related cost to & fro to reach up to the base camp/destination to commence activities.
ii. Any related equipment's like binoculars, camera etc needs to be procured by the student itself.

Registration No. 03/27/01/23145/21
Mob. 9575300232, 9425900083
E-mail : wildwarriorsindore@gmail.com

Registered Address : 59/4, Vallabh Nagar, Indore (M.P.)

Sr.No. Date .....

iii. Any type of administrative or lodging, boarding expenses in case of moving out of the Indore City will be borne by the students only.

iv. Wild Warriors will/may charge a subsidised/discounted (in comparison to current market rates) nominal amount from the students and if student actively participate in the activities and fulfill all the parameters they will be provide an internship completion certificate.

v. If any expenses required for conducting any such activity other than that mentioned in the above MOU will be discussed and agreed mutually by both the parties.

**4. DURATION AND RECINDENCE OF MOU**

a. The agreement shall come into effect on **16th Day of May 2022** .Changes to this agreement shall be made by mutual consent between both institutions. In cases of disagreement, the Institute wishing to depart from the agreement shall, wherever possible, give two month's notice of its intention to do so. The agreement shall be reviewed after a period of one year.

b. This MOU is being signed purely with the intention to inculcate and nurture students of Govt. Holkar Science College about Nature & Wildlife.

This MOU is signed by,

Dr. Suresh T Silawat, Principal,
**Govt.** [Model, Autonomous] **Holkar Science College**,
Indore, Madhya Pradesh

And

Shri Swapnil Phanse
Secretary - Wild Warriors Society,
Indore, Madhya Pradesh

WILD WARRIORS SOCIETY * INDORE *

In presence of the following witnesses:

1. .....

2. .....

# BIRD SURVEY

## GOVERNMENT HOLKAR SCIENCE COLLEGE

## INDORE (M.P.)



22 MAY 2022

A SURVEY REPORT

**BY**

Wild Warriors

&

GOVERNMENT HOLKAR SCIENCE COLLEGE



# ABOUT GOVERNMENT HOLKAR SCIENCE COLLEGE

Govt.(Model, Autonomous) Holkar Science college, Indore was established by, the then King of erstwhile Holkar state, Hon'ble Maharaja Shivaji Rao Holkar, in June 1891. The visionary king selected Mr. Cholmondeley from UK as its first principal. The college started with the best talent available in teaching in India and abroad. At the time of opening of the new building of the college, the manager of the state stressed the need of girls' education. The king could foresee that conservatism and dogmatic religious beliefs would soon give way to scientific outlook and rationalism. With the increasing number of students and multiplication of disciplines, the college was split into two separate and independent units. One of these two colleges was designated as Govt. Arts and Commerce College while this college retained its prestigious original name i.e. Holkar College and continued to be housed in the old college building.

Ever since its inception the institution has striven hard to fulfill its promises of providing quality education to produce thoughtful, intelligent and competent human beings, capable of facing the challenges of the life bravely. The alumni of the college has occupied prestigious positions in almost every walk of life. Perhaps this is the only college which produced Chief Justice of Supreme Court of India, Hon'ble Justice R.C.Lahoti and Chief Justice of Pakistan Hon'ble Justice Alvin "Bobby" Robert Cornelius.The father of Justice Cornelius was a faculty member of the college. At present, the institution is imparting education in science with the emphasis on scientific research. The college has the privilege to be visited by VVIPs like Pt. Jawaharlal Nehru (First Prime Minister of Independent India),Dr.S. Radhakrishnan, Dr.A.P.J.Abdul Kalam (Former President of India),Dr. Shankar Dayal Sharma (Former Vice President of India), Shri L.K.Advani(Former Home Minister of India) and almost all the Chief Ministers of Madhya Pradesh.Besides these dignitaries, the college also witnessed the presence of Shri Prithviraj Kapoor (Actor), Shri Hemant Kumar (Singer), Shri Anil Biswas (Music Director), Pt.Madan Mohan Malviya (Indian educationist), Shri Shard Joshi (Poet), Mrs. Malti Joshi (Literature) etc. to name a few.



# ACKNOWLEDGEMENT



## DR SURESH T SILAWAT

PRINCIPAL

GOVT. HOLKAR SCIENCE COLLEGE, INDORE

WE WOULD LIKE TO EXTEND OUR SPECIAL THANKS TO DR SURESH SILAWAT PRINCIPAL FOR THIS WONDERFUL INITIATIVE TO INVOLVE STUDENTS IN SUCH A UNIQUE ACTIVITY WHICH NOT ONLY HELPS IN IDENTIFICATION OF FLORA & FAUNA OF THE AREA BUT ALSO BRING THEM CLOSE TO NATURE. HIS SCINECER EFFORTS IN PROMOTING NATURE RELATED ACTIVITIES IS HIGHLY APPRESIABLE.

## DR SANJAY VYAS

HOD-BOTANY, SEED TECHNOLOGY & HORTICULTURE

WE ARE THANKFUL TO DR SANJAY VYAS FOR HELPING IN SMOOTH EXECUTION OF THE SURVEY. HIS IMMENSE SUPPORT AND PRESENCE DURING THE SURVEY MOTIVATED THE SURVEY TEAM.



## MANAGING TEAM WILD WARRIORS



SHRI RITESH KHABIA WILD WARRIORS



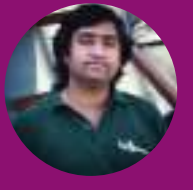
SHRI SACHIN MATKAR WILD WARRIORS



SHRI KAMLESH NACHAN WILD WARRIORS



SHRI ANSHUMAN SHARMA WILD WARRIORS



SHRI SWAPNIL PHANSE WILD WARRIORS

# OBJECTIVE

## BIRD SURVEY

- To introduce Birds and Birding to the students of Govt. Holkar Science College.
- To inculcate love for nature amongst the students.
- To document the bird species available at Govt. Holkar Science College Campus.
- To spread awareness amongst the students and staff of Govt. Holkar Science College about birds and nature.
- To draw up a base data of birds species available.
- To record the bird diversity on eBird, so that the compiled data is easily accessible to students, academicians, nature volunteers researchers scientists seamlessly.
- To make future strategies as how to increase the green cover of college to get biodiversity rich





# METHODOLOGY & PROTOCOL USED

## BIRD SUREY

- A total of 2 different birding routes/trails were identified on which the 02 teams travelled on foot and documented the different species of bird that came across.

- Each team constituted of 12 members and every team was expected to be in the field for minimum 1.30 hrs. The team walked an approximate distance of 2-3 kms. The walk started at 6.30 hrs.

- During the survey, the list of birds is made on eBird All the eBird checklists were uploaded on the eBird site and shared with one common group account named online.

- The team's task was to record as many species as possible, but it was more important to record correct identity of the bird.

- Birders were also encouraged to record bird calls, as some of the times it is very helpful in identifying a bird species. The team leaders had the responsibility to submit the completed checklists on eBird.

- To record the bird diversity on eBird, so that the compiled data is easily accessible to students, academicians, nature volunteers researchers scientists & researchers seamlessly.

# BIRD SPECIES DOCUMENTED

| S.NO | SPECIES | SCIENTIFIC NAME |
|---|---|---|
| 1 | LITTLE SWIFT (INDIAN HOUSE SWIFT) | APUS AFFINIS |
| 2 | INDIAN POND-HERON | ARDEOLA GRAYII |
| 3 | PURPLE SUNBIRD | CINNYRIS ASIATICUS |
| 4 | ROCK PIGEON (BLUE ROCK PIGEON) | COLUMBA LIVIA |
| 5 | LAUGHING DOVE (LITTLE BROWN DOVE) | STREPTOPELIA SENEGALENSIS |
| 6 | GREATER COUCAL | CENTROPUS SINENSIS |
| 7 | ASIAN KOEL | EUDYNAMYS SCOLOPACEUS |
| 8 | WHITE-BREASTED WATERHEN | AMAURORNIS PHOENICURUS |
| 9 | RED-WATTLED LAPWING | VANELLUS INDICUS |
| 10 | LITTLE EGRET | EGRETTA GARZETTA |
| 11 | SHIKRA | ACCIPITER BADIUS |
| 12 | BLACK KITE | MILVUS MIGRANS |
| 13 | INDIAN GREY HORNBILL | OCYCEROS BIROSTRIS |
| 14 | COPPERSMITH BARBET | PSILOPOGON HAEMACEPHALUS |
| 15 | ROSE-RINGED PARAKEET | PSITTACULA KRAMERI |
| 16 | BLACK DRONGO | DICRURUS MACROCERCUS |
| 17 | RUFOUS TREEPIE | DENDROCITTA VAGABUNDA |
| 18 | COMMON TAILORBIRD | ORTHOTOMUS SUTORIUS |
| 19 | ASHY PRINIA | PRINIA SOCIALIS |
| 20 | RED-VENTED BULBUL | PYCNONOTUS CAFER |
| 21 | JUNGLE BABBLER | ARGYA STRIATA |
| 22 | BRAHMINY STARLING | STURNIA PAGODARUM |
| 23 | COMMON MYNA | ACRIDOTHERES TRISTIS |
| 24 | PURPLE-RUMPED SUNBIRD | LEPTOCOMA ZEYLONICA |

# TEAM MEMBMERS

| S.NO | STUDENT'S NAME |
|---|---|
| 1 | MR ANIMESH SHARMA |
| 2 | MR RANA PRATAP PATHAK |
| 3 | MR SOURABH PATIDAR |
| 4 | MR MOHIT PATIDAR |
| 5 | MS NEHASHWARI TIWARI |
| 6 | MR RAJ KUMAR SOUR |
| 7 | MR RAHUL PARIHAR |
| 8 | MS BHAVNA JAGTAP |
| 9 | MR YOGESH BHURIYA |
| 10 | MR MAHENDRA MANDLOI |
| 11 | MR ANKIT YADAV |
| 12 | MR SATRUDHAN PATEL |
| 13 | MR DHEERAJ MALVIYA |
| 14 | MR HRITIK BAGRI |
| 15 | MR RAVINDRA SISODIYA |
| 16 | MS PRAGYA MASOORKAR |
| 17 | MS DIVYA SING THAKUR |
| 18 | MR NIKHIL CHAUHAN |
| 19 | MS NEELAM PANDAY |
| 20 | MR ANKIT BHALSE |
| 21 | MR RAMKARISHN KACHWARE |
| 22 | MR HARSHVARDHAN |
| 23 | MS ANJALI |

| S.NO | PROFESSOR'S NAME |
|---|---|
| 1 | SHRI DHARMENDRA JAT |
| 2 | SHRI GOVIND JAT |
| 3 | SHRI LOV ASATI |

| S.NO | TEAM WILD WARRIORS |
|---|---|
| 1 | MR SACHIN MATKAR |
| 2 | MR RITESH KHABIA |
| 3 | MR ANSHUMAN SHARMA |
| 4 | MR KAMLESH NACHAN |
| 5 | MR SHRIKANT KALAMKAR |
| 6 | MR SWAPNIL PHANSE |

# TEAM





# SURVEY AT A GLANCE









- PROF DHARMEDRA JAT INTRODUCED ALL THE STUDENTS ABOUT THE ACTIVITY TO BE DONE AND PURPOSE OF THE ACTIVITY.
- SHRI SACHIN MATKAR EXPLAINED ABOUT THE METHODOLOGY OF THE SURVEY AND PROTOCOLS TO FOLLOW.
- SURVEY STARTED AT 6.30 AM AND ENDED AT 8.00 AM AND COVERED ENTIRE CAMPUS OF GOVT. HOLKAR SCIENCE COLLEGE.
- POST SURVEY HOD DR SANJAY VYAS GREETED ALL THE STUDENTS AND TEAM WILD WARRIORS FOR THIS INITIATIVE AND TOLD THE PURPOSE OF THE ACTIVITY AND MOTIVATED STUDENTS TO COME CLOSE TO NATURE.
- STUDENTS SHARED THERE EXPERIENCE FOLLOWED BY BREAKFAST AND CONCLUSION OF THE SURVEY.







# FLYING JEWELS



WHITE-THROATED KINGFISHER



ASIAN OPENBILL



SPOTTED OWLET



BLACK RUMPED WOODPACKER



LONG TAILED SHRIKE



ORIENTAL MAGPIE ROBIN



ASHY PRINIA



BLACK RED START



BRONZE WINGED JACANA



BLACK DRONGO



PIED KINGFISHER



INDIAN GREY HORNBILL



GOLDEN ORIOLE



GREEN BEE EATER



BLACK WINGED STILT

# FLYING JEWELS



COMMON KESTREL



CRESTED SERPENT EAGLE



GREATER COUCAL



COPPERSMITH BARBET



PLUM HEADED PARAKEET



COMMON IORA



INDIAN SILVER BILL



SHIKRA



RIVER TERN



WHITE-EYED BUZZARD



WHITE BREASTED WATERHEN



BAYBACKED SHRIKE



LITTLE RINGED PLOVER



LESSER WHISTLING DUCK



INDIAN WHITE-EYE



Photo Courtesy: Mr Ritesh Khabia

# THANK YOU




Govt. Holkar Science College, Indore (MP)

Wild Warriors Society Indore



Wild Warriors Society - 59/4 Vallabh Nagar, Indore (9575300232)
email: wildwarriorsindore@gmail.com

# SSR DOCUMENT

2022

## CRITERION –3

## MoUs/Linkages/Collaborations

**Answer Foundation, BM 70 Near Bapat Square, Indore (MP)**

**Document Title:**

**Experiential learning for industrial start-ups based on Arduino is provided by Answer Foundation, BM 70, Near Bapat Square, Indore, under a MoU.**

कार्यालय प्राचार्य
शासकीय होलकर विज्ञान महाविद्यालय, इन्दौर
☎ 0731-2464074 • फैक्स : 0731-2446806, 2764027
Email : principalhsc@rediffmail.com • Web Site: www.collegeholkar.org

**Memorandum of Understanding for Academic and Industrial/academic Cooperation**
**Between**
**Department of Electronics, Government Holkar (Model, Autonomous) Science College Indore (M.P.) INDIA**
**And**
**Answer Foundation, BM-70 Near Bapat Square Shukliya Indore (M.P.), INDIA**

Department of Electronics, Government Holkar (Model, Autonomous) Science College, Indore (M.P.), India has inked a Memorandum of Understanding (MOU) with Answer Foundation, Indore to bridge the gap between the academic deliveries and industry needs and thereby improve technical and employability skills of the students.
The Memorandum of Understanding (MOU) establishes the following:

**RESPONSIBILITIES IN THE AGREEMENT**

1. To connive technological collaboration, training on advanced techniques/tools of the stream would be endowed by industry faculty/staff.
2. Industry will confer pilotage for major or minor projects/summer projects/projects/internships for students.
3. The industry would give stream-oriented lectures/lecture series, on academic needs.
4. Supportort in Incubation Center.
5. Students will be allowed to visit the firm to gain working skills and the culture of the firm.
6. Other activities as mutually agreed.

**ROLE OF THE MOU:**

The Department of Electronics would be implemented a nodal department from Government Holkar (Model Autonomous) Science College, Indore side, and a faculty/staff would be assigned by the chief executive officer from the firm side.

**TERM OF THE MOU:**

This MOU shall be effective upon signature by the institute and the firm, shall remain in force for 5 years, and will be extended further on mutual understanding.

**FINANCIAL LIABILITIES**

There are no financial liabilities for either participant in implementing the MOU.
This MOU is signed by,

Head of the Department
ELECTRONICS

**Dr. Netram Kaurav, HOD**, Department of Electronics,
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

**Dr. Suresh T. Sikawat, Principal**
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

Govt. Model Autonomous
Holkar Science College
Indore (M.P.)

ANSWER FOUNDATION SOCIETY
President / Treasurer / Secretary

**Mr. Mudit Thakkar, Founder and President**
Answer Foundation, BM-70 Near Bapat Square Shukliya Indore

**Date of Implementation 07/Apr/2022**

**Memorandum of Understanding for Academic and Industrial/academic Cooperation**
**Between**
**Department of Electronics, Government Holkar (Model, Autonomous) Science College Indore (M.P.) INDIA**
**And**
**Answer Foundation, BM-70 Near Bapat Square Shukliya Indore (M.P.), INDIA**

Department of Electronics, Government Holkar (Model, Autonomous) Science College, Indore (M.P.), India has inked a Memorandum of Understanding (MOU) with Answer Foundation, Indore to bridge the gap between the academic deliveries and industry needs and thereby improve technical and employability skills of the students.
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**FINANCIAL LIABILITIES**

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This MOU is signed by

Head of the Department
ELECTRONICS
Govt. Holkar (Model, Autonomous) College
INDORE

**Dr. Netram Ichhrin, HOD, Department of Electronics,**
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

**Dr. Suresh T. Sitawat, Principal**
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

PRINCIPAL
Govt. Model Autonomous
Holkar Science College
INDORE (M.P.)

ANSWER FOUNDATION SOCIETY
President / Treasurer / Secretary

**Mr. Mudit Thakkar, Founder and President**
Answer Foundation, BM-70 Near Bapat Square Shukliya Indore (M.P.)

**Date of Implementation 07/Apr/2022**

SKILL DEVELOPMENT PROGRAM
2022-23

| S. No | Component/Activities | Details |
|---|---|---|
| 1 | Name of the Department / Unit / Agency: | Department of Electronics |
| 2 | Name of the Activity: | Experiential learning for industrial start-up based on Arduino |
| 3 | Name of the Scheme: | Hands-On Training |
| 4 | Date and Year of the Activity: | 13/01/2023 |
| 5 | Number of Students Participated in the activity: | 10 |
| 6 | Report of the Activity (in 100 words): | In accordance with the Memorandum of Understanding that the industry and the college signed, Electronics Department, Government Holkar (Model, Autonomous) Science College, Indore organized a Experiential learning for industrial start-up based on Arduino on 13/01/2023 at Answer Foundation. Objective of this Activity is that encourage students for industrial start-up related the embedded system and the Arduino board. they also learn some project design and see how to make instruments. Ten departmental students benefited from this training. Dr. Suresh T. Silawat, the principal, and Dr. Netram Kaurav, the department head, have approved of this visit. Mr. Mudit Thakkar has approved this learning program from industry side. |
| 7 | Photo of Activity: | |

शासकीय होल्कर विज्ञान महाविद्यालय
इन्दौर (म.प्र.) भारत – 452 017
फोन नं. : 0731–2464074, 244049
इलेक्ट्रॉनिकी विभाग

Date:- 02/01/2023

To,

Director,
Answer Foundation,
BM-70 Near Bapat Square Shukliya,
Indore (M.P.), INDIA

Subject: -Proposal/Permission Letter for Hands-On Training for industrial start-up based on Arduino under MOU.

Respected Sir,

The purpose of this letter is to request permission for a Hands-On Training for industrial start-up based on Arduino. For the students of B.Sc. Electronics Students Employment/Learning Purpose, I request you to Kindly Provide some practical education to the students about industrial procedures, Products, and facilities. The 10 students will be part of the trip accompanied by one teacher. Your kind consideration of our request will help.

I request you to kindly confirm our student's visit/Training.

**Students List**

| S.No | Students Name | S.No | Students Name |
|---|---|---|---|
| 1 | Anoop Dwivedi | 6 | Vikrant Vaishnav |
| 2 | Sumit Bhuriya | 7 | Yashi Pateriya |
| 3 | Ajay Pandey | 8 | Yogesh Rathore |
| 4 | Gaurav Pandey | 9 | Roshni Rane |
| 5 | Nishan Singh | 10 | Samprita Pandey |

Thanks for your kind corporation

Dr. Neelam Kaurav
HOD
Department of Electronics

विभागाध्यक्ष
इलेक्ट्रॉनिकी विभाग
शा. होल्कर विज्ञान महाविद्या.



| | | |
|---|---|---|
| 7 | List of Participants | Enclosed |

**Students List**

| S.No | Students Name | S.No | Students Name |
|---|---|---|---|
| 1 | Anoop Dwivedi | 6 | Vikrant Vaishnav |
| 2 | Sumit Bhuriya | 7 | Yashi Pateriya |
| 3 | Ajay Pandey | 8 | Yogesh Rathore |
| 4 | Gaurav Pandey | 9 | Roshni Rane |
| 5 | Nishan Singh | 10 | Samprita Pandey |

# SSR DOCUMENT

2022

## CRITERION –3

## MoUs/Linkages/Collaborations

**Techno Scientific Instruments (Lyzer-India). Ambala**

**Document Title:**

**Experts representative from Ultra Lab Instruments, Techno Scientific Instruments (Lyzer-India). Ambala, delivered a lecture on Instrumentation Techniques (Flame Photometer. UV Spectrophotometer) under the MoU.**

LYZER™

1-4-22

CertificateOf

MEMORANDUM OF UNDERSTANDING (MOU)

between

Govt. (Autonomous) Holkar Science College, Indore(M.P)

&

Techno Scientific Instruments (Lyzer India) Ambala

We jointly enter into a Memorandum of Understanding for The Training, Project collaborations, Seminar, Workshop, Expertise and other allied Academic and Research Activities on terms mutually agreeable to both.

PRINCIPAL

(Prof. Suresh T. Silawat)

Dr. Rekha Sharma
HOD, Zoology

1-4-22

Head
Deptt. of Zoology
Govt. Holkar Sc. College, Indore

DIRECTOR

Techno Scientific Instruments
SCO Surafa Bazar, Ambala

## EXTENSION AND OUTREACH PROGRAMME

| S. No | Component/Activities | Details of event |
|---|---|---|
| 1 | Name of the Department / Unit / Agency: | Techno Scientific Instruments (LYZER) Ambala |
| 2 | Name of the Activity: | Lecture on Instrumentation Techniques (Flame photometer ,UV Spectrophotometer, TDS meter) |
| 3 | Name of the Scheme: | Academic and Research activity on terms of mutually agreeable to both |
| 4 | Date and Year of the Activity: | 30-04-2022 |
| 5 | Number of Students Participated in the activity: | 36 |
| 6 | Report of the Activity (in 100 words): | Department of Zoology organized lecture of Kanchan Dixit (Business Developer Manager, LYZER). She gave the information of Flame photometer, UV Spectrophotometer and TDS meter their mechanism, utility and techniques to operate Students of M.Sc benefitted this lecture.<br><br>Flame photometry is used in various industries, pharmaceuticals, clinical analysis, Agriculture etc.<br><br>It is used in determination of potassium, sodium, magnesium and calcium in biological fluids.<br><br>UV Spectrophotometer is used to study conformational changes in molecules such as monoclonal antibodies or proteins.<br><br>TDS meter is a small hand-held device used to indicate the Total Dissolved Solids in a solution, usually water |
| 7 | Photo of Activity: |   |

30.4.22

Lecture में निम्न निम्न विद्यार्थी उपस्थित रहे।

1 Vishakha Pashikar
2 Atul Patel
3 Saloni Agalcha
4 Yash Dubey
5 Chetan Wasket
6 Priyanshi Jamalkar
7 Rohan Patidar
8 Himanshu Sutrakar
9 Shivangi Ujjaini
10 Kamalnima Baghel
11 Sunil Lodhi
12 Pawan Jamre
13 Arti Lokhande
14 Motilal Pawar
15 Sumona Nocke
16 Srushti Joshi
17 Ritika Mandlai
18 Harshita Patidar
19 Pooja Nashkar
20 Naveen Rathore
21 Savitree
22 Priyanka Solanki
23 Kanul Dangi
24 Ishita Gupta
25 Harsha Lalwani
26 Asha chouhan
27 Nimju Dangi
28 Gunjan Chouhan

30.4.22

29 Isha Chouhan
30 Shikha Dubey
31 Nikita Khedekar
32 Neha Choudhary
33 Rakhi Suryavanshi
34 Vikram Mehta
35 Kuldeep Kashwah
36 HARSHIT VERMA
37
38
39
40

# SSR DOCUMENT

2022

## CRITERION –3

## MoUs/Linkages/Collaborations

**Ultra Lab Instruments, New Delhi**

**Document Title:**

**Experts representative from Ultra Lab Instruments, New Delhi, delivered a lecture on Instrumentation Techniques (Compound and Dissecting microscopes) under the MoU.**

1.4.22

# Certificate
## Of
## MEMORANDUM OF UNDERSTANDING (MOU)

between

Govt. (Autonomous) Holkar Science College, Indore(M.P)

&

ULTRA LAB INSTRUMENTS , New Delhi

We jointly enter into a Memorandum of Understanding for The Training, Project collaborations, Seminar, Workshop, Expertise and other allied Acacemic and Research Activities on terms mutually agreeable to both.

PRINCIPAL

(Prof. Suresh T. Sjawat)

Rekha 1.4.22

Dr. Rekha Sharma

HOD- Zoology

Head
Deptt. of Zoology
Govt. Holkar Sc. College, Indore

DIRECTOR

Shiv Shankar Gupta

ULTRA LAB INSTRUMENTS

S-4/7 Sad Nagar

Near Janak Puri

New Delhi-18

EXTENSION AND OUTREACH PROGRAM

| S. No | Component/Activities | Details of event |
|---|---|---|
| 1 | Name of the Department / Unit / Agency: | Ultra Lab Instrument, New Delhi |
| 2 | Name of the Activity: | Lecture on Instrumentation Techniques (Compound and Dissecting Microscope) |
| 3 | Name of the Scheme: | MOU |
| 4 | Date and Year of the Activity: | 27-05-2022 |
| 5 | Number of Students Participated in the activity: | 32 |
| 6 | Report of the Activity (in 100 words): | Department of zoology organized lecture of Kanchan Dixit (Business Developer Manager, LYZER). She delivered lecture on instruments such as compound and dissecting microscopes including mechanisms and utility. By this instruments permanent and temporary slides may be studied. Microscopic structure of animals also studied by this instruments. |
| 7 | Photo of Activity: |   |
| 8 | List of Participants | Attached |

27.5.22

Online के लिए विद्यार्थी उपस्थित रहे

1 SHIVANGI UJJAINI
2 KAMALNIMA SINGH BAGHEL
3 Srushti Joshi
4 Saloni Agalcha
5 Ritika Mandlai
6 Vishakha Parihar
7 Adeel Patel
8 Yash Dubey
9 Sunil Lodhi
10 Chetan Waskel
11 Rohan Patidar
12 Saloni Agalcha
13 Priyanka Solanki
14 RAHUL DANGI
15 Savitree
16 Mohit - Pawar
17 Pawan - Jamre
18 Sumera - Narke
19 Artee -
20 Girija Dangi
21 Neha chouhan
22 Shikha Chouhan Dubey
23 Gunjan Chouhan
24 Isha Chouhan
25 Ishita Gupta
26 Rakhi Suryavanshi
27 Harsha Lalwani
28 Nikita khedekar
29 Neha Choudhary
30 HARSHIT VERMA
31 Kuldeep Kushwah
32 Vikram Malviya

# SSR DOCUMENT

2022

## CRITERION – 3

## MoUs/Linkages/Collaborations

UGC-DAE CSR, Indore

**Document Title:**

**Raman spectroscopy was carried out at UGC-DAE CSR, Indore**

Office of the Principal
**Govt. (Model Autonomous) Holkar Science College**
**Indore (M.P.)**
0731-2464074(O), 2446806, 2764027 (Exam)
e-mail : principalhsc@rediffmail.com, Web Address: www.collegeholkar.org
(Re-accredited 'A' Grade by NAAC)

Date:- 07/05/22

*Memorandum Of Understanding for Academic and Scientific Research Cooperation*

**BETWEEN**

**Government Holkar (Model Autonomous) Science College Indore (M.P.) INDIA**

**AND**

**UGC-DAE Centre for Scientific Research, Indore (M.P.) INDIA**

In the spirit of mutual understanding, Government Holkar (Model Autonomous) Science College, Indore (M.P.), India and UGC-DAE Centre for Scientific Research, Indore (M.P.), India, agree to examine the possibility of establishing a framework for educational and research cooperation for students, faculty and staff of Government Holkar (Model Autonomous) Science College, Indore.

The Memorandum of Understanding (MOU) establishes the following:

**OBJECTIVE OF THE AGREEMENT**

1. To support academic and scientific cooperation. Faculties of consortium will provide suggestions on academic curriculum and establishing research facilities.
2. Areas of cooperation include: internship/summer projects/projects for selected students, use of research facilities on the basis of merit, framing of collaborative research projects, providing library facilities on the basis of need. Guest/invited lectures by faculties.
3. To conduct workshop/science popularization programs on a mutually agreed area of scientific interest by both the institutes. A discussion will require prior commencement of this activity.

**IMPLEMENTATION OF THE MEMORANDUM OFUNDERSTANDING:**

The Department of Physics will be implementing nodal department from Government Holkar (Model Autonomous) Science College, Indore side. A faculty/staff will be assigned by Centre Director from Consortium side.

**EFFECTIVE DATE AND DURATION OF THE MOU:**

This MoU shall be effective upon signature by the two institute and shall remain in force for a period of five (5) years. Thereafter it shall be automatically renewed for another 5 years unless it is terminated.

This MOU is signed by,

Dr. G. D. Gupta, Head of Department

Dr. Suresh T. Silawat, Principal
**Govt. Holkar (Model Autonomous) Science College, Indore, (M.P.)**

Dr. Vasant G. Sathe, Centre-Director
**UGC-DAE Consortium for Scientific Research, Indore (M.P.)**

**UGC-DAE Consortium for Scientific Research**
विश्वविद्यालय अनुदान आयोग- परमाणु ऊर्जा विभाग वैज्ञानिक अनुसंधान संकुल
(An autonomous institution of UGC, New Delhi)
(विश्वविद्यालय अनुदान आयोग, नई दिल्ली द्वारा स्थापित स्वशासी संस्थान)
(Formerly : Inter University Consortium for DAE Facilities, IUC-DAEF)
Indore Centre
इन्दौर केन्द्र

*Dr. Vasant Sathe*
*Centre-Director*

*डॉ. वसंत साठे*
*केन्द्र निदेशक*

***Memorandum Of Understanding for Academic and Scientific Research Cooperation***

**BETWEEN**

**Government Holkar (Model Autonomous) Science College Indore (M.P.) INDIA**

**AND**

**UGC-DAE Centre for Scientific Research, Indore (M.P.) INDIA**

In the spirit of mutual understanding, Government Holkar (Model Autonomous) Science College, Indore (M.P.), India and UGC-DAE Centre for Scientific Research, Indore (M.P.), India, agree to examine the possibility of establishing a framework for educational and research cooperation for students, faculty and staff of Government Holkar (Model Autonomous) Science College, Indore.

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Dr. G. D. Gupta, Head of Department

Dr. Suresh T. Shrawat, Principal
**Govt. Holkar (Model Autonomous) Science College, Indore, (M.P.)**

Dr. Vasant G. Sathe, Centre-Director
**UGC-DAE Consortium for Scientific Research, Indore (M.P.)**

**Date:** 07/05/22

विश्वविद्यालय परिसर, खण्डवा रोड, इन्दौर-452 001 (म.प्र.)
University Campus, Khandwa Road, INDORE - 452 001 (M.P.) INDIA
Phone : +91-731-2472200, 2908150 - Direct, PBX- 2463913,2762267, 2472201 Exnt 192, 311
Fax : +91-731- 2465437 ; email : vasant@csr.res.in; cd.indore@csr.res.in
www.csr.res.in

**CRS Projects:2021-22** Dear faculty members, please submit your progress report,SE/UC report, and work report for the annual report of UGC-DAE CSR.

Accepted Proposals: 8/15

Pending Comp. Report: 3

Pending Exp. Report: 3

Change in Comp. Reports: 0

## Proposals Apply for an experiment

| S. No. | Proposal No./Date | Facility/Centre | Status | Schedule | Comment | Action | Guest House |
|---|---|---|---|---|---|---|---|
| 1 | 07/2023/5240<br>2023-07-23 | Raman Spectrosc.....<br>Indore | Submitted | | 0 | | |
| 2 | 07/2023/5158<br>2023-07-10 | SEM/EDAX (Norma.....<br>Indore | Submitted | | 0 | | |
| 3 | 07/2023/5150<br>2023-07-09 | UV-Vis (UPD)<br>Indore | Submitted | | 0 | | |
| 4 | 07/2023/5149<br>2023-07-09 | FTIR (UPD)<br>Indore | Submitted | | 0 | | |
| 5 | 06/2023/4968<br>2023-06-14 | FTIR (UPD)<br>Indore | Accepted | 03 July 2023<br>07 July 2023 | 1 | Withdraw | |
| 6 | 06/2023/4967<br>2023-06-14 | XPS – VSW (UPD)<br>Indore | Comp.Rep.Verified | 1 | | | |
| 7 | 05/2023/4847<br>2023-05-26 | D8 Advance - Po.....<br>Indore | Rejected | | 0 | | |
| 8 | 05/2023/4845<br>2023-05-26 | SEM/EDAX (Norma.....<br>Indore | Submitted | | 0 | | |
| 9 | 05/2023/4831<br>2023-05-24 | Transmission el.....<br>Indore | Rejected | | 2 | | |
| 10 | 05/2023/4830<br>2023-05-24 | Zeta potential-.....<br>Indore | Submitted | | 0 | | |
| 11 | 05/2023/4829<br>2023-05-24 | UV-Vis (UPD)<br>Indore | Comp.Rep.Verified | 0 | | | |
| 12 | 09/2022/3152<br>2022-09-07 | Raman Spectrosc.....<br>Indore | Comp.Rep.Verified | 0 | | | |
| 13 | 09/2021/786<br>2021-09-02 | Heat Capacity M.....<br>Indore | Submitted | | 0 | | |
| 14 | 09/2021/785<br>2021-09-02 | Diff. Scan. Cal.....<br>Indore | Accepted | 20 December 2021<br>22 December 2021 | 0 | Withdraw | |
| 15 | 08/2021/748<br>2021-08-23 | Diff. Scan. Cal.....<br>Indore | Accepted | 30 August 2021<br>31 August 2021 | 2 | Withdraw | |

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# SSR DOCUMENT

2022

## CRITERION –3

## MoUs/Linkages/Collaborations

UGC-DAE CSR, Indore

### Document Title:

**Under the MoU with UGC-DAE CSR, Indore, research work on Qualitative study of structural phase transition in nickel-doped La2CoTi(1x)Nix06 double perovskite was carried out in collaboration with Dr. R. J. Choudhary, Scientist, UGC-DAE CSR, Indore.**

ScienceDirect

Journal of Alloys and Compounds
Volume 943, 15 May 2023, 169126

# Qualitative study of structural phase transition in nickel doped $La_2CoTi_{(1-x)}Ni_xO_6$ double perovskite

Neha Solanki [a], R.J. Choudhary [b], Netram Kaurav [c]

[a] Department of Physics, Shri Neelkantheshwar Government Post-Graduate College, Khandwa 450001, India
[b] UGC DAE Consortium for Scientific Research, Indore 452001, India
[c] Department of Physics, Government Holkar (Model, Autonomous) Science College, Indore 452001, India

Received 20 September 2022, Revised 28 January 2023, Accepted 30 January 2023, Available online 2 February 2023, Version of Record 20 February 2023.

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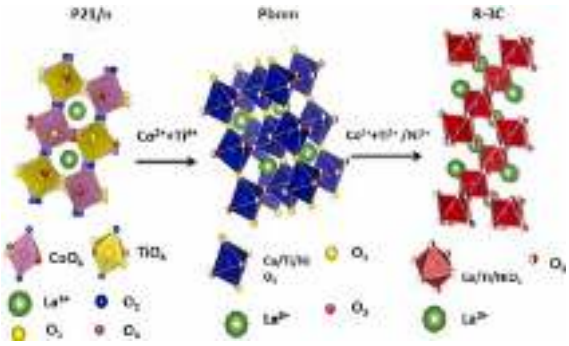
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## Abstract

$La_2CoTi_{(1-x)}Ni_xO_6$ ($x$=0, 0.2 and 0.6) ($A_2BB'_{(1-x)}B''_{(x)}O_6$) double perovskite samples in bulk pellet form were prepared successfully by using sol-gel method at a sintering temperature of 1350 °C. From the Rietveld refinement approach, crystal structures of prepared samples were investigated using X-ray powder diffraction data, wherein, a structural phase transition occurred from monoclinic (*P21/n*) to orthorhombic (*Pbnm*) to rhombohedral (***R3c***) as the nickel content is increased. X-ray photoelectron spectroscopy study reveals the presence of mixed oxidation state of cobalt ions ($Co^{2+}/Co^{3+}$) which changes significantly as the nickel concentration is increased to 20% and hence affects the bond length with the structure distortion from monoclinic to orthorhombic with symmetry *Pbnm*. In 60% nickel doped compound, there occurs a random distribution of $Co^{2+}/Co^{3+}$ and $Ni^{3+}$ among the B′ and B′′ site with added repulsions between trivalent cobalt cations seeming in the structure due to $Ti^{4+}$ located at antisite B site. Consequently, to maintain charge neutrality, distorted rhombohedral structure was observed. Tolerance factor was also estimated for all the prepared bulk compounds to further confirm the formation and structural transitions in the prepared compounds.

## Graphical Abstract



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## Introduction

Double perovskite oxides are one of the potential candidates serving as cathode/anode materials for solid oxide fuel cell (SOFC) applications. So far, several double perovskite oxides such as $Sr_2Mg_{1-x}Mn_xMoO_{6-\delta}$, $Sr_2CoTaO_{6-\delta}$, $Pr_xBaFe_2O_{5+\delta}$, $Pr_{1-x}Ca_xBa_{0.94}Co_2O_{5+\delta}$, $Nd_{1-x}Ca_xBaCo_2O_{5+\delta}$, etc. have been successfully employed as potential anode/cathodes for the fabrication of SOFCs [1], [2], [3], [4], [5]. Jiang et al. [1], reported the utility of $Sr_2Mg_{1-x}Mn_xMoO_{6-\delta}$ double perovskite oxide as anode material for SOFCs. Bu et al. [2], employed $Sr_2CoTaO_{6-\delta}$ double perovskite oxide based cathode for intermediate temperature SOFCs. $Pr_xBaFe_2O_{5+\delta}$ double-perovskite serving as cathodes was reported by Lu et al. [3], for SOFC applications. $Nd_{1-x}Ca_xBaCo_2O_{5+\delta}$ double perovskite was reported to be a new oxygen electrode material for reversible SOFCs [5]. However, for such device applications, it is highly imperative to examine the underlying physics behind the structural, and electronic properties of such double perovskite oxides because of the complexities in the coupling of different transition metal cations and their interaction with the adjacent oxygen atoms.

Double perovskites are rare complex perovskites having general stoichiometry $AA'BB'O_6$ or $A_2BB'O_6$ or $AA'B_2O_6$ with cubic symmetry belonging to $Fm\bar{3}m$ space group [6]. It is noteworthy to mention here that lanthanum-cobalt-based and lanthanum-nickel-based oxides of the form $A_2BB'O_6$ have grabbed enormous research interest among the various perovskite-type oxides owing to their remarkable electronic transport properties, mixed ionic-electronic conductivity (MIEC) and SOFC applications [7]. Interestingly, high n- or p-type conductivity can also be acquired via doping or ionic substitution, particularly, at B-site, resulting in octahedral tilts in multiple possible directions in order to adjust the substituted cation's size mismatch. [8], [9]. So far, several double perovskites such as $BaLaLiTeO_6$, $BaLaNaTeO_6$, $Ba_2SmBiO_6$, $Sr_2CoRuO_6$, $CaMnTi_2O_6$, $La_2FeMnO_6$, $La_2NiMnO_6$, $La_2CoMnO_6$ have been reported by exhibiting reduced symmetry as a result of the octahedral tilting [10], [11], [12], [13], [14], [15]. Among these, $La_2CoTiO_6$ has been suggested as a promising MIEC material due to its sensitivity to the Co/Ti ion ratio [16]. The creation of oxygen deficient oxides under reducing conditions, for example, by the reduction of $Co^{3+}$ to $Co^{2+}$, is also possible which leads to the formation of anionic vacancies and inducing oxygen conduction. Experimental studies based on the growth of double perovskite compounds including $LaCr_{0.5}Mn_{0.5}O_3$ [17], $LaCrO_3$ [18], $BiFeO_3$-$BaTiO_3$ [19], $LaAlO_3$ [20], Al doped $LaCrO_3$ [21], [22], etc. suggest structural phase transitions. In double perovskite $A_2BB'O_6$ system,

the rare earth cobaltite double perovskite $La_2CoTiO_6$ has distorted monoclinic structure at room temperature [16]. Mohanty et al. [23], have thoroughly examined the structural phase transitions in Cu doped $La_2FeMnO_6$ double perovskites.

Apart from the choice of the material, synthesis method also significantly influence the properties of the materials. It should be noted here that double perovskite oxides can be successfully prepared via solid state reaction or sol-gel method. However, both of these approaches require high processing/sintering temperatures which can be executed in air or under various gases environment. Sugahara et al. [24], have prepared $Sr_2MnMoO_6$ sample via solid state method and sintered in an Ar + 5% $H_2$ atmosphere at 1223 K for 10 h and also annealed the same at 1543 K for 6 h in an Ar + 3% $H_2$ atmosphere. Cowin et al. [25], have synthesized $Ca_2Fe_{1+x}Mo_{1-x}O_{6-d}$ compounds, sintered at 1200 °C in air for 50 h using the same method. On the other hand, Svensson et al. [26], employed sol-gel approach to synthesize $La_2CrB_{2/3}Nb_{1/3}O_6$ (B = Mg, Ni, Cu) double perovskite under sintering temperature of 1350 °C for 24 h in air. Similarly, Shafeie et al. [27], prepared $La_{2-z}Co_{1+y}(Mg_xNb_{1-x})_{1-y}O_6$ double perovskite sintered at 1100 °C in air via sol-gel technique and reported structural changes from monoclinic (space group (*P21/n*)) to orthorhombic (space group *(Pbnm)*) to rhombohedral (space group ***(R3c)***) with increasing magnesium content in $La_2CoTiO_6$. It is worthy to mention here that the sol-gel approach is much more fascinating as compared to solid state method as it ensures purity and uniformity of the doped compounds and can also be employed for preparing a wide range of materials. Mondol et al. [28], [29], [30], [31], [32], [33], [34], [35], have employed the same sol-gel technique to fabricate metal-insulator structure (MIS) from $HfO_2$ and $ZrO_2$, $ZrO_2$ and IGZO based thin film transistors, MIS structure using aluminum oxide phosphate, etc. all processed at low temperature.

Lack of experimental reports for structural phase transitions subsequent to Ni doping concentrations, particularly in case of sol-gel synthesized lanthanum-cobalt oxides based double perovskites encourages us to perform a systematic study on structural phase transitions in such double perovskite oxides.

Accordingly, the present work reports on the structural phase transitions in Ni incorporated novel double perovskite series $La_2CoTi_{(1-x)}Ni_xO_6$ ($x$ = 0, 0.2 and 0.6) synthesized by sol-gel route using room temperature X-ray diffraction (XRD) and X-ray photoelectron spectroscopy (XPS).

## Section snippets

## Experimental details

Bulk samples of double perovskite $La_2CoTiO_6$, $La_2CoTi_{0.8}Ni_{0.2}O_6$ and $La_2CoTi_{0.4}Ni_{0.6}O_6$ in the form of pellets were synthesized using the sol-gel process. High purity reagents i.e., lanthanum nitrate hexahydrate ($La(NO_3)_3{\cdot}6H_2O$, Sigma Aldrich, 99.99%), Cobalt acetate tetrahydrate ($(CH_3COO)_2Co{\cdot}4H_2O$, Sigma Aldrich, 99.99%), nickel nitrate hexahydrate ($Ni(NO_3)_2{\cdot}6H_2O$, Sigma Aldrich, 98.5%), titanium (IV) butoxide ($C_{16}H_{36}O_4Ti$, Sigma Aldrich, 99.99%), citric acid, ammonium hydroxide and de-ionized (DI)…

## Results and discussions

To probe the structure and possible phase transitions in the synthesized $La_2CoTi_{(1-x)}Ni_xO_6$ ($x$ = 0, 0.2 and 0.6) perovskites bulk pellet samples, XRD technique has been employed. The Rietveld refinement analysis using

fullproof software was employed to interpret the XRD results and to mark all the XRD peaks. Study was precisely performed by keeping into mind that the monoclinic symmetry allows the B cation ordering at two different sites while the other symmetries have only unique…

## Conclusions

In conclusion, structural phase transitions in nickel doped $La_2CoTi_{(1-x)}Ni_xO_6$ ($A_2BB'_{(1-x)}B''_{(x)}O_6$) double perovskite bulk compounds has been analyzed qualitatively employing XRD and XPS studies. $La_2CoTi_{(1-x)}Ni_xO_6$ ($x$ = 0, 0.2 and 0.6) double perovskite bulk compounds were prepared successfully using sol-gel method. XRD data shows that the bulk compound with $x$ = 0 was crystallized in a monoclinic (*P21/n*) structure, which transformed into an orthorhombic (*Pbnm*) phase for sample with $x$ = 0.2 and in …

## CRediT authorship contribution statement

**Neha Solanki:** Data curation, Software, Investigation, Writing - original draft. **R.J. Choudhary:** Supervision, Validation, Resources. **Netram Kaurav:** Conceptualization, Methodology, Software, Visualization, Software, Investigation, Writing – review & editing.…

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.…

## Acknowledgments

The authors sincerely thank to Dr. M. Gupta from UGC-DAE, Centre for Scientific Research, Indore, for providing the XRD facility. The authors are also thanks to Mr. A. Wadikar from Raja Rammana Centre for Advanced Technology, Indore for helping in XPS measurement and Dr. Rupesh Devan, Indian Institute of Technology, Indore for fruitful discussions. Financial Assistance from MP Council of Science and Technology, Bhopal is gratefully acknowledged.…

## References (41)

F. Bu *et al.*

$CO_2$-tolerant $Sr_2CoTaO_{6-\delta}$ double perovskite oxide as a novel cathode for intermediate-temperature solid oxide fuel cell

Mater. Res. Bull. (2022)

S. Lü *et al.*

A-site deficient Fe-based double perovskite oxides $Pr_xBaFe_2O_{5+\delta}$ as cathodes for solid oxide fuel cells

J. Alloy. Compd. (2022)

Z. Nie *et al.*

A-site Ca-doped layered double perovskite $Pr_{1-x}Ca_xBa_{0.94}Co_2O_{5+\delta}$ as high-performance and stable cathode for intermediate-temperature solid oxide fuel cells
J. Alloy. Compd. (2022)

J. Li *et al.*
Investigation on $Nd_{1-x}Ca_xBaCo_2O_{5+\delta}$ double perovskite as new oxygen electrode materials for reversible solid oxide cells
J. Alloy. Compd. (2022)

S.A. Dar *et al.*
Ab- initio DFT based investigation of double perovskite oxide $Ba_2CdOsO_6$ with cubic structure
Comput. Condens. Matter (2019)

A. Petric *et al.*
Evaluation of La–Sr–Co–Fe–O perovskites for solid oxide fuel cells and gas separation membranes
Solid State Ion. (2000)

Y. Xu *et al.*
Perovskite manganites: potential materials for magnetic cooling at or near room temperature
Cryst. Eng. (2002)

R. Das *et al.*
Electrical and magnetic properties of double perovskite: $Y_2CoMnO_6$
Ceram. Int. (2021)

B. Amrithakrishnan *et al.*
Crystal structure and optical properties of B site-ordered $ALaLiTeO_6$ (A = Ba, Sr) ceramics
Mater. Res. Bull. (2017)

V.L. Vilesh *et al.*
Crystal structure and dielectric properties of $BaANaTeO_6$ (A = Bi, La) double perovskites
Ceram. Int. (2017)

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Recommended articles (6)

Research article

Defect assisted magneto-tunable photoresponse in ZnO-rGO/$La_{0.7}Sr_{0.3}MnO_3$/ITO heterojunctions

Materials Science and Engineering: B, Volume 290, 2023, Article 116353

Show abstract

Research article

## Improvement of mechanical properties and elastocaloric effect in Ag doped Ni-Mn-In magnetic shape memory alloys

Journal of Alloys and Compounds, Volume 944, 2023, Article 169143

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Research article

## Strain induced structural changes and magnetic ordering in thin $MoS_2$ flakes as a consequence of 1.5 MeV proton ion irradiation

Journal of Alloys and Compounds, Volume 951, 2023, Article 169882

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Research article

## Fragmented ferromagnetic-phase and evolution of Re-entrant cluster-glass behavior in $La_{0.6}Sr_{0.4}Co_{1-x}Al_xO_3$ $(0 \leq x \leq 0.15)$ compounds

Ceramics International, Volume 49, Issue 3, 2023, pp. 5217-5227

Show abstract

Research article

## Magnetic critical behavior and room temperature magnetocaloric effect in $Ba_{1.9}Pr_{0.1}FeMoO_6$ double perovskite compound

Materials Research Bulletin, Volume 161, 2023, Article 112151

Show abstract

Research article

## Third order nonlinear optical properties and electrochemical performance of $La_2CoMnO_6$ double perovskite

Materials Science and Engineering: B, Volume 289, 2023, Article 116262

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# SSR DOCUMENT

2022

## CRITERION – 3

## MoUs/Linkages/Collaborations

UGC-DAE CSR, Indore

**Document Title:**

**An invited lecture was delivered by Dr. Vasant V Sathe, Center Director, UGC-DAE CSR, Indore, in a Virtual workshop on Instrumental techniques.**

Office of the Principal
**Govt. (Model Autonomous) Holkar Science College**
**Indore (M.P.)**
0731-2464074(O), 2446806, 2764027 (Exam)
e-mail : principalhsc@rediffmail.com, Web Address: www.collegeholkar.org
(Re-accredited 'A' Grade by NAAC)

Date:- 07/05/22

*Memorandum Of Understanding for Academic and Scientific Research Cooperation*

**BETWEEN**

**Government Holkar (Model Autonomous) Science College Indore (M.P.) INDIA**

**AND**

**UGC-DAE Centre for Scientific Research, Indore (M.P.) INDIA**

In the spirit of mutual understanding, Government Holkar (Model Autonomous) Science College, Indore (M.P.), India and UGC-DAE Centre for Scientific Research, Indore (M.P.), India, agree to examine the possibility of establishing a framework for educational and research cooperation for students, faculty and staff of Government Holkar (Model Autonomous) Science College, Indore.

The Memorandum of Understanding (MOU) establishes the following:

**OBJECTIVE OF THE AGREEMENT**

1. To support academic and scientific cooperation. Faculties of consortium will provide suggestions on academic curriculum and establishing research facilities.
2. Areas of cooperation include: internship/summer projects/projects for selected students, use of research facilities on the basis of merit, framing of collaborative research projects, providing library facilities on the basis of need. Guest/invited lectures by faculties.
3. To conduct workshop/science popularization programs on a mutually agreed area of scientific interest by both the institutes. A discussion will require prior commencement of this activity.

**IMPLEMENTATION OF THE MEMORANDUM OFUNDERSTANDING:**

The Department of Physics will be implementing nodal department from Government Holkar (Model Autonomous) Science College, Indore side. A faculty/staff will be assigned by Centre Director from Consortium side.

**EFFECTIVE DATE AND DURATION OF THE MOU:**

This MoU shall be effective upon signature by the two institute and shall remain in force for a period of five (5) years. Thereafter it shall be automatically renewed for another 5 years unless it is terminated.

This MOU is signed by,

Dr. G. D. Gupta, Head of Department

Dr. Suresh T. Silawat, Principal
**Govt. Holkar (Model Autonomous) Science College, Indore, (M.P.)**

Dr. Vasant G. Sathe, Centre-Director
**UGC-DAE Consortium for Scientific Research, Indore (M.P.)**

**UGC-DAE Consortium for Scientific Research**
विश्वविद्यालय अनुदान आयोग- परमाणु ऊर्जा विभाग वैज्ञानिक अनुसंधान संकुल
(An autonomous institution of UGC, New Delhi)
(विश्वविद्यालय अनुदान आयोग, नई दिल्ली द्वारा स्थापित स्वशासी संस्थान)
(Formerly : Inter University Consortium for DAE Facilities, IUC-DAEF)
Indore Centre
इन्दौर केन्द्र

*Dr. Vasant Sathe*
*Centre-Director*

*डॉ. वसंत साठे*
*केन्द्र निदेशक*

***Memorandum Of Understanding for Academic and Scientific Research Cooperation***

**BETWEEN**

**Government Holkar (Model Autonomous) Science College Indore (M.P.) INDIA**

**AND**

**UGC-DAE Centre for Scientific Research, Indore (M.P.) INDIA**

In the spirit of mutual understanding, Government Holkar (Model Autonomous) Science College, Indore (M.P.), India and UGC-DAE Centre for Scientific Research, Indore (M.P.), India, agree to examine the possibility of establishing a framework for educational and research cooperation for students, faculty and staff of Government Holkar (Model Autonomous) Science College, Indore.

The Memorandum of Understanding (MOU) establishes the following:

**OBJECTIVE OF THE AGREEMENT**

1. To support academic and scientific cooperation. Faculties of consortium will provide suggestions on academic curriculum and establishing research facilities.
2. Areas of cooperation include: internship/summer projects/projects for selected students, use of research facilities on the basis of merit, framing of collaborative research projects, providing library facilities on the basis of need. Guest/invited lectures by faculties.
3. To conduct workshop/science popularization programs on a mutually agreed area of scientific interest by both the institutes. A discussion will require prior commencement of this activity.

**IMPLEMENTATION OF THE MEMORANDUM OFUNDERSTANDING:**

The Department of Physics will be implementing nodal department from Government Holkar (Model Autonomous) Science College, Indore side. A faculty/staff will be assigned by Centre Director from Consortium side.

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This MOU is signed by

Dr. G. D. Gupta, Head of Department

Dr. Suresh T. Shrawat, Principal
**Govt. Holkar (Model Autonomous) Science College, Indore, (M.P.)**

Dr. Vasant G. Sathe, Centre-Director
**UGC-DAE Consortium for Scientific Research, Indore (M.P.)**

**Date:** 07/05/22

विश्वविद्यालय परिसर, खण्डवा रोड, इन्दौर-452 001 (म.प्र.)
University Campus, Khandwa Road, INDORE - 452 001 (M.P.) INDIA
Phone : +91-731-2472200, 2908150 - Direct, PBX- 2463913,2762267, 2472201 Exnt 192, 311
Fax : +91-731- 2465437 ; email : vasant@csr.res.in; cd.indore@csr.res.in
www.csr.res.in

**GOVT. HOLKAR (MODEL. AUTONOMOUS) SCIENCE COLLEGE, INDORE (M.P.), 452017**

**Department of Forensic Science**

**Date: 29/09/2022**

To,

**Dr. Vasant Sathe**
Central Director, Indore
UGC-DAE Consortium for Scientific Research

Subject: Invitation Letter for Resource Person in National Virtual Workshop on "Instrumentation".

Respected Sir,

We are pleased to inform you that you are cordially invited as a **"Resource Person"** for the **National Virtual Workshop on "Instrumental Techniques: A Virtual Reflection of the Multi-professional nature of Forensics"** organized by Department of Forensic Science, Govt. Holkar (Model, Autonomous) Science College, Indore (M. P.)

We would be delighted with your presence in the Virtual Workshop.

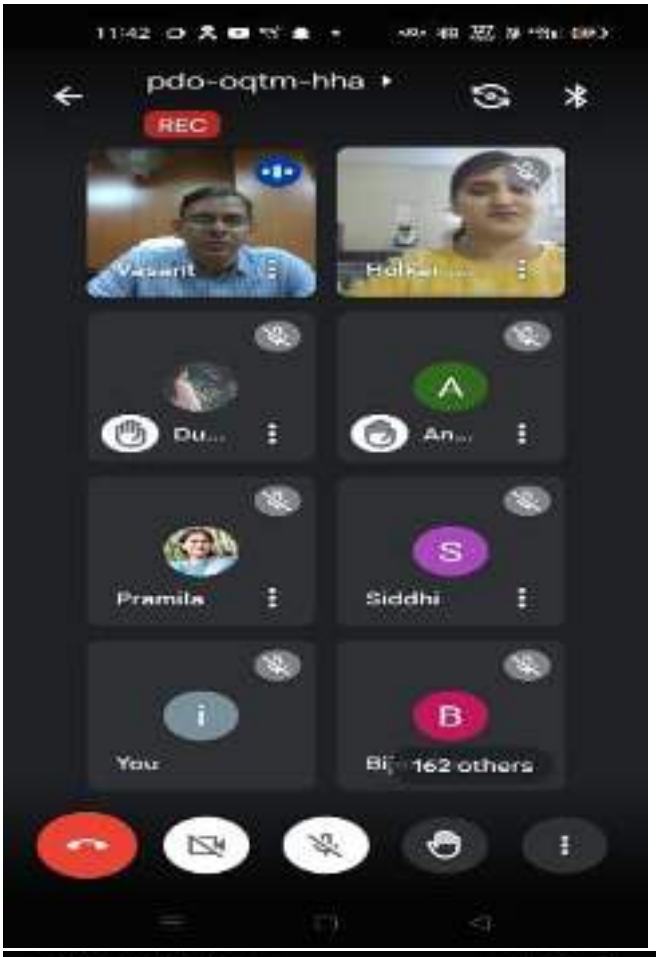
| Instrument Name | Date | Time |
|---|---|---|
| Raman Spectrophotometer | 01/10/22 | 11:00 AM |

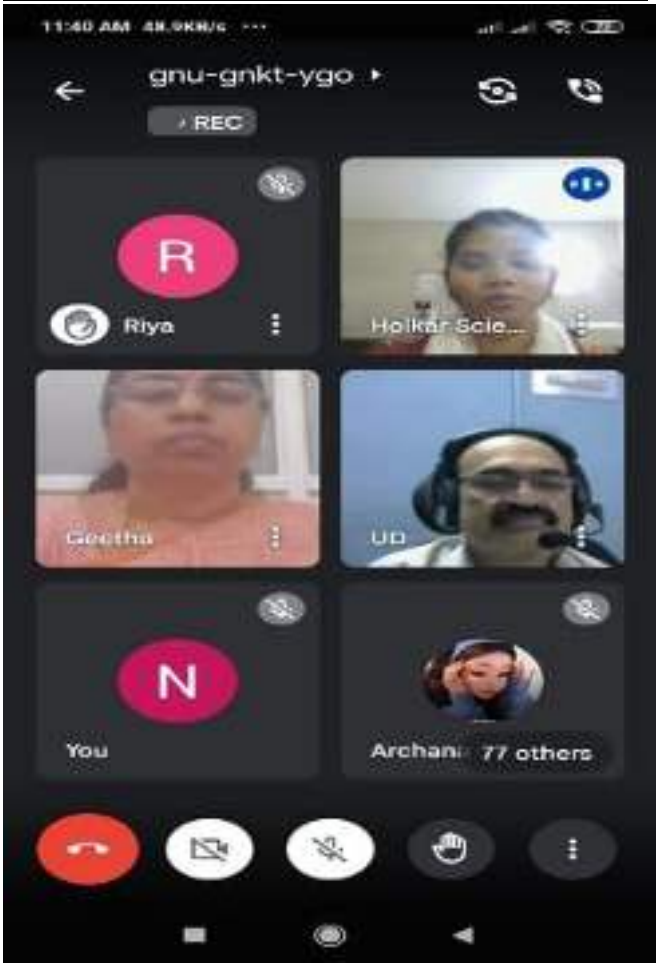
Thanking You!

29/9/22

Dr. Geetha Sarasan
HOD
Department of Forensic Science
Govt. Holkar (Autonomous, Model) Science College, Indore
(M.P.), 452017




An invited lecture was delivered by Dr. Vasant V Sathe, Center Director, UGC-DAE CSR, Indore, in a Virtual workshop on Instrumental techniques.

# SSR DOCUMENT

2022

## CRITERION – 3

## MoUs/Linkages/Collaborations

**PG- Tech Pvt. Ltd, Indore (M.P.)**

### Document Title:

**An educational visit was organized with PG- Tech Pvt. Ltd., Indore (M.P.) under the student exchange program of the MoU.**

# MEMORANDUM OF UNDERSTANDING

## For Academic and Scientific Cooperation

## BETWEEN

**Government Holkar [Model, Autonomous] Science College, Indore, Madhya Pradesh**

**&**

**PG Tech PVT. LTD. & Research Institute, Pardesipura, Indore, Madhya Pradesh**

This Memorandum of Understanding (MOU) is entered into on 15-12-2022 by and between the representatives of Govt. Holkar [Model, Autonomous] Science College, Indore and PG Tech PVT. LTD. & Research Institute, Pardesipura, Indore, Madhya Pradesh. The aforesaid institutions are hereinafter referred to individually as 'institute' and collectively as 'institutes'.

The Memorandum of Understanding (MOU) establishes the following

### 1. OBJECTIVE OF THE AGREEMENT

To establish a mutually beneficial relationship built on academic and scientific cooperation. Areas of cooperation between the Govt. Holkar [Model, Autonomous] Science College, Indore, (M.P.) and PG Tech PVT. LTD & Research Institute, Pardesipura, Indore, Madhya Pradesh include the exchange of researchers, students, publications, books, academic programs, and research projects.

### 2. GOALS AND FORMS OF COOPERATION

The signing institutions agree to provide opportunity, as appropriate, for the following activities towards the completion of the objective of this MOU.

a. Exchange of students and/or researchers with the objective of offering courses and realizing research projects in area mutually agreed upon by both institutes through prior invitation and in accordance with the procedures and expectations established by each institute and specific department.
b. Exchange of books, Scientific publications, study programs, academic projects, course information, seminars, conferences and any other date and information of common interest.
c. Develop joint research projects, internship projects, dissertation, and joint publications.
d. All joint activities will be realized through the mutual agreement and clearly established conditions and mutual obligations of the appropriate institute entity.

### 3. IMPLEMENTATION OF THE MEMORANDUM OF UNDERSTANDING

The objectives of the MOU will be implemented and regulated in the following manner:

i. Student Exchange

a. Students and research scholars may visit the corresponding departments of these institutes after finalizing a mutually acceptable schedule.
b. All the expenses shall be the direct responsibility of the student concerned (Subject to any agreements on payment arrangements made by either institution with its own students).
These expenses include (but not limited to):

- Travel expense
- Reprographic and Internet Usage Expenses
- Required student services fees at the host institution
- Books and academic supplies
- Administrative fees, if any.

## II. Exchange of researchers

With the objective of strengthening ties through joint projects and research activities of both institutes, the MOU allows for the creation of researcher exchange. The following conditions will apply:

I. The researchers will maintain their status as research scholars at their home institution for the duration of the exchange.
II. The researchers will be allowed to make use of the instruments and other research facilities available in various departments of these institutes after prior approval of the visiting schedule.
III. The appropriate academic departments and administrative offices will assist in securing housing and other necessary arrangements for living in the host institution's city, whenever feasible.

## III. Research and Resources

- Both the institutes agree to jointly hold/conduct, whenever feasible, National/International events, workshop, conferences, training programs, in the demonstration (of procedures and working of the instruments available in the laboratories of the institutions).
- Faculty members shall be encouraged to develop joint research projects and joint publications.
- All the joint activities shall be realized though the mutual agreement and clearly established conditions and mutual obligations of the appropriate university entity.
- In case of Joint-Research project(s) by the Faculty members of the institutes is/are funded by any agency (such as UGC, DBT, DST, etc.), the funds as well as the conduct of such a project shall be governed as per the established norms, direction and/or regulations of such agency.

Coordinators

Both institutes will designate person who will have responsibility for co-ordination and implementation of this agreement.

## DURATION AND RECINDENCE OF MOU

- This MOU, unless extended by mutual written consent of the institutes, shall expire in Ten years after the effective date specified in the opening paragraph. However, on review, the MOU may be extended for another term by mutual consent.
- Changes to this agreement shall be made by mutual consent between both institutions in cases of disagreement, the Institute wishing to depart from the agreement shall, wherever possible, give two months' notice of its intention to do so. The agreement shall be reviewed after a period of ten years.
- This MOU is being singed purely with the intention of academic and scientific cooperation without any financial liabilities.
- The terms and condition of this MOU shall be governed by the existing rules and regulations and their modification (if any), as issued of both the institutes.

Signed

By signing below, the institutes, acting by their duly authorized officers, have caused this Memorandum of Understanding to be executed, effective as of the day, month and year first above written.

On behalf of

प्राचार्य
शासकीय होल्कर (आदर्श स्वशासी)
विज्ञान महाविद्यालय, इन्दौर

Dr. Suresh Sirswat
Principal
Govt. Holkar (Model, Autonomous)
Science College, Indore (M.P.)

On behalf of

Deepali Tiwari
Director
PG Tech PVT. LTD. & Research
Institute, Pardesipura, Indore (M.P.)

In presence of the following witnesses/MOU coordinators:

Dr. Geetha Sarasan
Head
Dept. of Forensic Science
Govt. Holkar (Model, Autonomous)
Science College, Indore (M.P.)

Forensic Science Department
Govt. Holkar Science College
Indore (M.P.)

Dr. Pramila Kori
Co- Head
Dept. of Forensic Science
Govt. Holkar (Model, Autonomous)
Science College, Indore (M.P.)

Forensic Science Department
Govt. Holkar Science College
Indore (M.P.)

Govt. Holkar (Model, Autonomous) Science College, Indore
(M.P.) Pin - 452017
Department of Forensic Science

Memorandum of Understanding
Between
PG Tech PVT. LTD. & Research Institute, Pardesipura, Indore (M.P.)
And
Department of Forensic Science, Govt. Holkar (Model, Autonomous) Science College, Indore (M.P.)

We jointly enter into a MOU for the Expertise sharing, training, collaborative research, promote projects/ internship programs, organization of moot courts, workshop etc for learning and training purpose of students, faculties and other associated personnel's.

Following Activity has been conducted under this:

**Students Exchange**
Educational Visit: Lab Visit
For Offline Demonstration of various Instruments
Date:15/12/2022
**List of Students**: Enclosed

# Request regarding an Educational Visit

Add label

H

**HOD Forensic Science** 6/12/2022

to info

Respected Sir/Ma'am,

This is to state that the Department of Forensic Science, Govt. Holkar (Model, Autonomous) Science College, Indore (M.P.) wants to organize educational visit to your Institute for attending the Demonstration of Various Instruments available in your Centre. So, I Request you to kindly grant the permission for the proposed visit on 16/December/2022.

Thanks & Regards
Dr. Geetha Sarasan
Department of Forensic Science
Govt. Holkar Science College, Indore (M.P.)

# Govt. Holkar (Model, Autonomous) Science College, Indore (M.P)
## Department of Forensic Science
## Session 2022-2023
## List of students are selected for the lab visit:

| S.No. | Name of the Students |
|---|---|
| 1 | Aanchal Joshi |
| 2 | Anshuman Mishra |
| 3 | Anushka Yadav |
| 4 | Ashruti mandloi |
| 5 | Bagore hirkani Jitendra |
| 6 | Dipti Arora |
| 7 | Gourav Dubey |
| 8 | Rajee Patle |
| 9 | Harshita Mahajan |
| 10 | Jayant Kumar |
| 11 | Jaydeep Solanki |
| 12 | Laxmi soni |
| 13 | Lokendra Singh |
| 14 | Monu panda |
| 15 | Payal Dubey |
| 16 | Prachi Raghuvanshi |
| 17 | Priyanshi suryawanshi |
| 18 | Renuka chaporkar |
| 19 | Shruti Dubey |
| 20 | Simran Sengar |
| 21 | Supriya Soni |
| 22 | Tushar Shukla |
| 23 | Vaishnavi Kothari |
| 24 | Yugal Kishor Vaishnav |
| 25 | Vishal Patidar |

# SSR DOCUMENT

2022

## CRITERION –3

## MoUs/Linkages/Collaborations

**Document Title:**

**Educational visit Indian institute of technology indore**

भारतीय प्रौद्योगिकी संस्थान इन्दौर
खण्डवा रोड, सिमरोल
इन्दौर ४५३ ५५२, भारत

Indian Institute of Technology Indore
Khandwa Road, Simrol
Indore 453 552, India

IIT Indore

# CERTIFICATE OF COMPLETION

This is to certify that ~**89 students** of Master of Science (M.Sc.) from the Department of Physics, Government Holkar (Model Autonomous) Science College, Indore visited Indian Institute of Technology Indore, on **November 18, 2022.**

This academic visit was conducted under a *Collaborative and Outreach Programme* for the students. The visit was coordinated by Dr. Rupesh S. Devan, Department of Metallurgical Engineering and Materials Science, IIT Indore, and Dr. Netram Kaurav and Dr. V.V.S. Murthy from Holkar Science College, Indore.

With best regards,

Rupesh

Dr. Rupesh S. Devan
Associate Professor
Discipline of Metallurgy Engineering
& Materials Science
Indian Institute of Technology Indore
Simrol, Indore 453552, India

Dr. Rupesh S. Devan,
Associate Professor,
Department of Metallurgical Engineering and Materials Science,
Indian Institute of Technology Indore, Khandwa Road, Simrol, 453552, Indore.

# 18 Nov, 2022

# EDUCATIONAL VISIT INDIAN INSTITUTE OF TECHNOLOGY, INDORE




## start @8.30 AM Holkar Campus

All students are requested to gathered in campas at 8.30 AM

Trip will be Flag off by:
Dr. G. D. Gupta,
Vice Principal/HOD

## Pay attention in tour

- **Bring notebook and Identity Card**
- **There will a batch of 15 students, Total batches =05**
- **Every batch has to prepare: a digital infographic of visit, a story of my batch in IIT Campus, note on opportunities in higher studies.**



## 10.15 AM



## Presentation at Learning Resource Centre, IIT Campus

**Virtual Tour of IIT, Campus**
**Lecture by IIT Faculty**

## 11.00 AM TO 4.00 PM

## Departments/Research Labs visit



## 1.30 PM

**At Students Cafeteria, IIT Campus**



Department of Physics, Govt. Holkar (Model Autonomous) Science College, Indore (MP)


भारतीय प्रौद्योगिकी संस्थान इंदौर
Indian Institute of Technology Indore


GPS Map Camera
Indore, Madhya Pradesh, India
85,vidhya nagar, behind holkar science college, Janki Nagar, Indore, Madhya Pradesh 452001, India
Lat 22.695448°
Long 75.870915°
18/11/22 09:09 AM GMT +05:30
Google

## Department of Physics
## Government Holkar (Model Autonomous) Science College, Indore (M.P.), India

**IIT Indore Academic Visit on 18 Nov 2022.**
**Supplymentry list**

**Academic Visit to IIT Indore on 18 Nov 2022**

| S.No. | Name of the Students | Mobile No |
|---|---|---|
| 79 | Omika Pateliya | 6232887096 |
| 80 | Goutam Lodhi | 7747881314 |
| 81 | Ayushi Laboti | 9039345153 |
| 82 | Akshay Pratap Singh | 9752260477 |
| 83 | Barkha kushwah | 6268535446 |
| 84 | Anubhav Tiwari | 9893586961 |
| 85 | Amisha | 7489162301 |
| 86 | Mahima | 9174752679 |
| 87 | Swati Chouhan | 8305274983 |
| 88 | Kripanshu Nagle | 7049704041 |
| 89 | Ankit Tiwari | 6263528781 |
| 90 | | |
| 91 | | |
| 92 | | |
| 93 | | |
| 94 | | |
| 95 | | |



Scanned with CamScanner

# SSR DOCUMENT

2022

## CRITERION – 3

## MoUs/Linkages/Collaborations

**Soil and Soul foundation, Bangalore, Karnataka**

**Document Title:**

**Workshop on "Eco-friendly plant stress relievers in the present scenario" in association with the Soil and Soul Foundation, Bangalore, Karnataka**

Office of the Principal
Govt. (Model Autonomous) Holkar Science College
Indore (M.P.)
: 0731-2464074(O), 2446806, 2764027 (Exam)
e-mail : principalhsc@rediffmail.com, Web Address: www.collegeholkar.org
(Re-accredited 'A' Grade by NAAC)

# MEMORANDUM OF UNDERSTANDING FOR ACADEMIC AND SCIENTIFIC COOPERATION

**BETWEEN**

**SOIL AND SOUL FOUNDATION, BANGALORE, KARNATAKA**
**AND**
**GOVT. HOLKAR (MODEL, AUTONOMOUS) SCIENCE COLLEGE INDORE (M.P.)**

The representatives of **Soil and Soul Foundation, Bangalore, Karnataka** and **Department Of Biochemistry, Govt. Holkar (Model, Autonomous) Science College Indore (M.P.)** agree to this Memorandum of Understanding.

The Memorandum of Understanding (MOU) establishes the following:

## 1. OBJECTIVE OF THE AGREEMENT

To establish a mutually beneficial relationship built on academic and scientific cooperation. Areas of cooperation between the **Soil and Soul Foundation, Bangalore, Karnataka** and **Department of Biochemistry, Govt. Holkar (Model, Autonomous) Science College Indore (M.P.)** include the exchange of researchers, students, publications, academic programs and research projects.

## 2. GOALS AND FORMS OF COOPERATION

The signing institutions agree to provide opportunity, as appropriate, for the following activities towards the completion of the objective of this MOU.

1. Exchange of students and/or researchers with the objective of offering courses and realizing research projects in areas mutually agreed upon by both institutes through prior invitation and in accordance with the procedures and expectations established by each institute and specific department.
2. Exchange of books, scientific publications, study programs, academic projects, course information, seminars, conferences and other data and information of common interest.
3. Develop joint research projects and joint publications.
4. All joint activities will be realized through the mutual agreement and clearly established conditions and mutual obligations of the appropriate institute entity.

HEAD
Department of Biochemistry
Holkar Science College, Indore

प्राचार्य
शा. होलकर विज्ञान महाविद्यालय
इन्दौर

Office of the Principal
Govt. (Model Autonomous) Holkar Science College
Indore (M.P.)
: 0731-2464074(O), 2446806, 2764027 (Exam)
e-mail : principalhsc@rediffmail.com, Web Address: www.collegeholkar.org
(Re-accredited 'A' Grade by NAAC)

## 3. IMPLEMENTATIOION OF THE MEMORANDUM OF UNDERSTANDING

The objectives of the MOU will be implemented and regulated in the following manner:

i. Student Exchange
   a. Student and research scholars may visit the corresponding departments of these institutes after finalizing a mutually acceptable schedule.
   b. All the expenses shall be the direct responsibility of the student concerned (subject to any agreements on payment arrangements made by either institution with its own students). These expenses include.
      1. Travel expenses
      2. Reprographic and Internet Usage Expenses
      3. Required student services fees at the host institution
      4. Books and academic supplies
      5. Administrative fees, if any.

ii. Exchange of researchers

With the objective of strengthening ties through joint projects and research activities of both institutes, the MOU allows for the creation of researcher exchange. The following conditions will apply.

   a. The researchers will maintain their status as research scholars at their home institution for the duration of the exchange.
   b. The researchers will be allowed to make use of the instruments and other research facilities available in various departments of these institutes after prior approval of the visiting schedule.
   c. The appropriate departments and administrative offices will assist in securing housing and other necessary arrangements for living in the host institutions city.

iii. Research and resources

**Soil and Soul Foundation, Bangalore, Karnataka** and **Department of Biochemistry, Govt. Holkar (Model, Autonomous) Science College Indore(M.P.)** remote research and realize collaborative projects, giving priority to interdisciplinary works.

HEAD
Department of Biochemistry
Holkar Science College, Indore

प्राचार्य
श. होलकर विज्ञान महाविद्यालय
इन्दौर

Office of the Principal
Govt. (Model Autonomous) Holkar Science College
Indore (M.P.)
) 0731-2464074(O), 2446806, 2764027 (Extn.)
e-mail : principalhsc@rediffmail.com, Web Address: www.collegeholkar.org
(Re-accredited 'A' Grade by NAAC)

4. DURATION AND RECINDENCE OF MOU

a. The agreement shall come into effect on 12/03/21 changes to this agreement shall be made by mutual consent between both institutions. In cases of disagreement, the Institute wishing to depart from the agreement shall, wherever possible, give two months' notice of its intention to do so. The agreement shall be reviewed after a period of five years.

b. This MOU is being signed purely with the intention of academic and scientific cooperation

This MOU is signed by,

Preeti Rao

Founder
**(Soil and Soul Foundation, Bangalore, Karnataka)**

SOIL AND SOUL FOUNDATION Bangaluru

&

12/03/21

Head
Department of Biochemistry
**Govt. Holkar (Model, Autonomous) Science College Indore (M.P.)**

HEAD
Department of Biochemistry
Holkar Science College, Indore

Principal
**Govt. Holkar (Model, Autonomous) Science College Indore (M.P.)**

प्राचार्य
शा. होलकर विज्ञान महाविद्यालय
इन्दौर

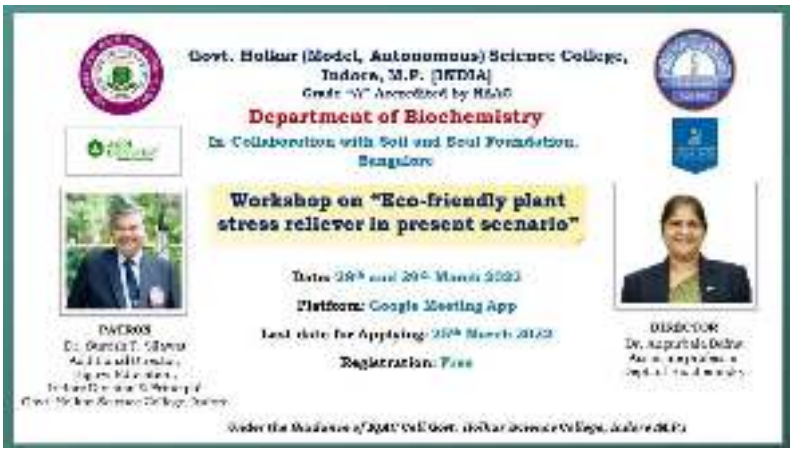
**In presence of the following witnesses:**

1. .....

2. .....

# Department of Biochemistry

| S. No. | Component/ Activities | Details of event |
|---|---|---|
| 1 | Name of the Department / Unit / Agency: | Biochemistry |
| 2 | Name of the Sponsor: | Soil and Soul Foundation, Bangalore |
| 3 | Date and Year of the Activity: | 28 March 2022- 29 March 2022 |
| 4 | Number of Students Participated in the activity: | 88 participants |
| 5 | Photo of Activity: |   |

| | | |
|---|---|---|
| 6 | Poster of Activity |  <br>  |
| 7 | Media Report of Activity: |  |

| | | |
|---|---|---|
| 8 | List of Participants | GOVT. HOLKAR SCIENCE COLLEGE, INDORE (M.P.)<br>workshop on "Ecofriendly plant stress Relievers in Present Scenario" |

| S.N | Name | Class | Dpt. |
|---|---|---|---|
| 1. | Adarsh Shah Jagat | M.sc. | Biochemistry |
| 2. | Amit Oste | M.sc. | Biochemistry |
| 3. | Anil Tiwari | M.sc. | Biochemistry |
| 4. | Anjali Chaturvedi | M.sc. | Biochemistry |
| 5. | Anjlas Panchgra | M.sc. | Biochemistry |
| 6. | Ankita Tongya | M.sc. | Biochemistry |
| 7. | Antim Bhadoriya | M.sc. | Biochemistry |
| 8. | Bhagyalaxe Mandlo | M.sc. | Biochemistry |
| 9. | Bhawana Pal | M.sc. | Biochemistry |
| 10. | Bhavika Verma | M.sc. | Biochemistry |
| 11. | Deepak Mishra | M.sc. | Biochemistry |
| 12. | Deepak Panchgre | M.sc. | Biochemistry |
| 13. | Dikshika Shah | M.sc. | Biochemistry |
| 14. | Durgesh Kevat | M.sc. | Biochemistry |
| 15. | Gowardhan Lal Nayak | M.sc. | Biochemistry |
| 16. | Harsha Goyal | Ph.D | Scholar Biochemistry |
| 17. | Jayshree Karma | M.sc. | Biochemistry |
| 18. | Kajal Marva | M.sc. | Biochemistry |
| 19. | Kavita Parmar | M.sc. | Biochemistry |
| 20. | Manisha Singh | M.sc. | Biochemistry |
| 21. | Mayuri Bisen | M.sc | Biochemistry |
| 22. | Monika Patidar | M.sc. | Biochemistry |
| 23. | Muskan Pathan | M.sc. | Biochemistry |
| 24. | Muskan Verma | M.sc. | Biochemistry |
| 25. | Nandini Kashyap | M.sc. | Biochemistry |
| 26. | Neelim Ramesh | M.sc. | Biochemistry |
| 27. | Nidhi Tiwari | M.sc. | Biochemistry |
| 28. | Preeti Choudhary | M.sc. | Biochemistry |
| 29. | Priya Malviya | M.sc. | Biochemistry |
| 30. | Ravina Khandelwal | M.sc. | Biochemistry |
| 31. | Ramasani | M.sc. | Biochemistry |
| 32. | Rinki Shah | M.sc. | Biochemistry |
| 33. | Ronak Parihar | M.sc. | Biochemistry |
| 34. | Shilla Gupta | M.sc. | Biochemistry |
| 35. | Shivanee Sonane | M.sc. | Biochemistry |
| 36. | Shraddha Rawal | M.sc. | Biochemistry |
| 37. | Shruti Tiwari | M.sc. | Biochemistry |
| 38. | Sonali Mittal | M.sc. | Biochemistry |
| 39. | Sonam Vishwakarma | M.sc. | Biochemistry |
| 40. | Surabhi Agrawal | M.sc. | Biochemistry |
| 41. | Sweta Roychoudhary | M.sc. | Biochemistry |
| 42. | Swati Mali | M.sc. | Biochemistry |
| 43. | Urmila Kanwar | M.sc. | Biochemistry |
| 44. | Urmila Sonana | M.sc. | Biochemistry |
| 45. | Vama Malviya | M.sc. | Biochemistry |
| 46. | Vijay Solanki | M.sc. | Biochemistry |
| 47. | Yasvi Chaturvedi | M.sc. | Biochemistry |
| 48. | Dheeraj Malviya | M.sc. | Seed technology |

| | | | |
|---|---|---|---|
| 49 | Divya Singh | M.sc. | Seed technology |
| 50 | Hetal Bajaj | M.sc. | Seed technology |
| 51 | Nehalkumari Tiwari | M.sc. (Agri.) | Seed technology |
| 52 | Pragya Mawandia | M.sc. | Seed technology |
| 53 | Ravikishan Kachroo | M.sc. | Seed technology |
| 54 | Sonali Parmar | M.sc. | Seed technology |
| 55 | Anjali Bhaskar | M.sc. | Zoology |
| 56 | Deepika Maru | M.sc. | Zoology |
| 57 | Deepika Rathod | M.sc. | Zoology |
| 58 | Dilip Isave | M.sc. | Fisheries |
| 59 | Hetisa Yadav | M.sc. | Zoology |
| 60 | Harshad Lodwal | M.sc. | Zoology |
| 61 | Kajal Bareth | M.sc. | Zoology |
| 62 | Mukesh Bhadkar | M.sc. | Fisheries |
| 63 | Nikky Oj | M.sc. | Zoology |
| 64 | Nitin Jain | M.sc. | Zoology |
| 65 | Sarita Gupta | M.sc. | Zoology |
| 66 | Saraswati Malviya | M.sc. | Zoology |
| 67 | Archana Sahu | M.sc. | Biochemistry |
| 68 | Bhavna Silhotra | M.sc. | Biochemistry |
| 69 | Jayshree Baiya | M.sc. | Biochemistry |
| 70 | Mamta Sharma | M.sc. | Biochemistry |
| 71 | Pooja Pandey | M.sc. | Biochemistry |
| 72 | Anju Verma | M.sc. | Biochemistry |
| 73 | Shubhangi Khare | M.sc. | Biochemistry |
| 74 | Shweta Prajapati | M.sc. | Biochemistry |
| 75 | Soniya Patel | M.sc. | Biochemistry |
| 76 | Sonu Muzalda | M.sc. | Biochemistry |
| 77 | Yamini Magarde | M.sc. | Biochemistry |
| 78 | Anshi Verma | M.sc. | Biochemistry |
| 79 | Anjali Tenamiya | M.sc. | Biochemistry |
| 80 | Ganga Ajmera | M.sc. | Biochemistry |
| 81 | Hemlata Yadav | M.sc. | Biochemistry |
| 82 | Kajal Yadav | M.sc. | Biochemistry |
| 83 | Kiran Kotwal | M.sc. | Biochemistry |
| 84 | Shivani Bhanwar | M.sc. | Biochemistry |
| 85 | Shubhangi Chaudhary | M.sc. | Biochemistry |
| 86 | Sonali Lohare | M.sc. | Biochemistry |
| 87 | Tejaswini Bhargav | M.sc. | Biochemistry |
| 88 | Vanshu Patidar | M.sc. | Biochemistry |

# SSR DOCUMENT

2022

## CRITERION – 3

## MoUs/Linkages/Collaborations

**Noble Alchem. Pvt. Ltd. Rohatak Road, Bhiwani, Haryana (M.P.)**

### Document Title:

**Workshop on "Eco-friendly plant stress reliever in the present scenario" in association with Noble Alchem. Pvt. Ltd., Rohatak Road, Bhiwani, Haryana (M.P.)**

Office of the Principal

**Govt. (Model Autonomous) Holkar Science College**
**Indore (M.P.)**

✆ 0731-2464074(O), 2446806, 2764027 (Exam)
e-mail : principalhsc@rediffmail.com, Web Address: www.collegeholkar.org
(Re-accredited 'A' Grade by NAAC)

Date:-

MEMORANDUM OF UNDERSTANDING FOR ACADEMIC AND SCIENTIFIC COOPERATION

BETWEEN NOBLE ALCHEM PVT. LTD., SANWER ROAD, INDORE, (M.P.)
AND
GOVT. HOLKAR (MODEL, AUTONOMOUS) SCIENCE COLLEGE INDORE (M.P.)

The representatives of **Noble Alchem Pvt. Ltd, Sanwer Road, Indore, (M.P.)** and **Department Of Biochemistry, Govt. Holkar (Model, Autonomous) Science College Indore (M.P.)** agree to this Memorandum of Understanding.

The Memorandum of Understanding (MOU) establishes the following:

## 1. OBJECTIVE OF THE AGREEMENT

To establish a mutually beneficial relationship built on academic and scientific cooperation. Areas of cooperation between the **Noble Alchem Pvt. Ltd, Sanwer Road, Indore, (M.P.)** and **Department of Biochemistry, Govt. Holkar (Model, Autonomous) Science College Indore (M.P.)** include the exchange of researchers, students, publications, academic programs and research projects.

## 2. GOALS AND FORMS OF COOPERATION

The signing institutions agree to provide opportunity, as appropriate, for the following activities towards the completion of the objective of this MOU.

1. Exchange of students and/or researchers with the objective of offering courses and realizing research projects in areas mutually agreed upon by both institutes through prior invitation and in accordance with the procedures and expectations established by each institute and specific department.
2. Exchange of books, scientific publications, study programs, academic projects, course information, seminars, conferences and other data and information of common interest.
3. Develop joint research projects and joint publications.
4. All joint activities will be realized through the mutual agreement and clearly established conditions and mutual obligations of the appropriate institute entity.

प्राचार्य
शासकीय होल्कर स्वशासी
विज्ञान महाविद्यालय,
इन्दौर (म.प्र.)

Office of the Principal

**Govt. (Model Autonomous) Holkar Science College**
**Indore (M.P.)**

✆ 0731-2464074(O), 2446806, 2764027 (Exam)
e-mail : principalhsc@rediffmail.com, Web Address: www.collegeholkar.org
(Re-accredited 'A' Grade by NAAC)

Date:-

3. IMPLEMENTATIOION OF THE MEMORANDUM OF UNDERSTANDING

The objectives of the MOU will be implemented and regulated in the following manner:

i. Student Exchange

a. Student and research scholars may visit the corresponding departments of these institutes after finalizing a mutually acceptable schedule.

b. All the expenses shall be the direct responsibility of the student concerned (subject to any agreements on payment arrangements made by either institution with its own students). These expenses include.

1. Travel expenses
2. Reprographic and Internet Usage Expenses
3. Required student services fees at the host institution
4. Books and academic supplies
5. Administrative fees, if any.

ii. Exchange of researchers

With the objective of strengthening ties through joint projects and research activities of both institutes, the MOU allows for the creation of researcher exchange. The following conditions will apply.

a. The researchers will maintain their status as research scholars at their home institution for the duration of the exchange.

b. The researchers will be allowed to make use of the instruments and other research facilities available in various departments of these institutes after prior approval of the visiting schedule.

c. The appropriate departments and administrative offices will assist in securing housing and other necessary arrangements for living in the host institutions city.

iii. Research and resources

**Noble Alchem Pvt. Ltd., Sanwer Road, Indore, (M.P.)** and **Department of Biochemistry, Govt. Holkar (Model, Autonomous) Science College Indore(M.P.)** remote research and realize collaborative projects, giving priority to interdisciplinary works

प्राचार्य
शासकीय आदर्श स्वशासी
होलकर विज्ञान महाविद्यालय,
इन्दौर (म.प्र.)

Office of the Principal

**Govt. (Model Autonomous) Holkar Science College Indore (M.P.)**

✆ 0731-2464074(O), 2446806, 2764027 (Exam)

e-mail : principalhsc@rediffmail.com, Web Address: www.collegeholkar.org

(Re-accredited 'A' Grade by NAAC)

Date:-

4. DURATION AND RECINDENCE OF MOU

a. The agreement shall come into effect on From 3-10.18 - 10.02.21 - 24.03.10.24 changes to this agreement shall be made by mutual consent between both institutions. In cases of disagreement, the Institute wishing to depart from the agreement shall, wherever possible, give two months' notice of its intention to do so. The agreement shall be reviewed after a period of five years.

b. This MOU is being signed purely with the intention of academic and scientific cooperation

This MOU is signed by,

For Noble Alchem Pvt. Ltd.

Authorised Signatory

Head

Department of Biochemistry

(Noble Alchem Pvt. Ltd., Sanwer Road, Indore, M.P.)

Head

Department of Biochemistry

Govt. Holkar (Model, Autonomous) Science College Indore (M.P.)

Principal

Govt. Holkar (Model, Autonomous) Science College Indore (M.P.)

प्राचार्य
शासकीय होल्कर स्वशासी
होलकर विज्ञान महाविद्यालय,
इन्दौर (म.प्र.)

In presence of the following witnesses:

1. .....

2. .....

# Department of Biochemistry

| S. No | Component/Activities | Details of event |
|---|---|---|
| 1 | Name of the Department / Unit / Agency: | Biochemistry |
| 2 | Name of the Sponsor: | Noble Alchem Pvt. Ltd. Sanwer Road, Indore, Bioenzyme Academy, Bangalore |
| 4 | Date and Year of the Activity: | 28 March 2022- 29 March 2022 |
| 5 | Number of Students Participated in the activity: | 88 participants |
| 6 | Photo of Activity: |   **Department of Biochemistry** |

| | | |
|---|---|---|
| | |  |
| 7 | Media Report of Activity: |  |
| 8 | Poster of Activity |  |


Invitation
Guest Speakers


Organizing Committee
Guest of Honor
Organizing Secretary
Mr. Nagesh Vyas
Dr. Anil Kothari


Collaboration
Mobis Alchem Pvt. Ltd.
Mr. Nagesh Vyas
Special thanks
The Department

| | | |
|---|---|---|
| 9 | List of Participants | **GOVT. HOLKAR SCIENCE COLLEGE, INDORE (M.P.)**<br>**workshop on "Ecofriendly plant stress Relievers in Presni Scenario"** |

| S.N | Name | Class | Dpt. | Contact n. | E-mail ID |
|---|---|---|---|---|---|
| 1. | Adarsh Shah Jajat | M.sc. | Biochemistry | 7067053208 | adarshjagat03@gmail.com |
| 2. | Amit Gaur | M.sc. | Biochemistry | 6296682644 | amitgaur6.6@gmail.com |
| 3. | Anal Tiwari | M.sc. | Biochemistry | 8962617368 | tiwarianal75@gmail.com |
| 4. | Anjali Chaturvedi | M.sc. | Biochemistry | 9131527414 | anjalichaturvedi841@gmail.com |
| 5. | Anjlee Pandagre | M.sc. | Biochemistry | 7610207748 | anjalipandagre672@gmail.com |
| 6. | Ankita Tongya | M.sc. | Biochemistry | 9644558558 | ankitatongya25@gmail.com |
| 7. | Antim Bhadoriya | M.sc. | Biochemistry | 7067904828 | antimbhadoriya19873@gmail.com |
| 8. | Bhagyshree Marabi | M.sc. | Biochemistry | 7828424043 | bhagyshree807@gmail.com |
| 9. | Bhawana Pal | M.sc. | Biochemistry | 7389682202 | bhawnapal5468@gmail.com |
| 10. | Bhavika Sharma | M.sc. | Biochemistry | 6260916175 | sharmabhavika678@gmail.com |
| 11. | Deepak Minhas | M.sc. | Biochemistry | 7898253658 | deepakminhas2109@gmail.com |
| 12. | Deepak Pandagre | M.sc. | Biochemistry | 9806289615 | dpandagre524@gmail.com |
| 13. | Dikshika Shah | M.sc. | Biochemistry | 7692058300 | dikshikah29@gmail.com |
| 14. | Durgesh Kewat | M.sc. | Biochemistry | 6260018130 | durgesh9962@gmail.com |
| 15. | Gowardhan Lal Nayak | M.sc. | Biochemistry | 9575687698 | nayakgln78942@gmail.com |
| 16. | Harsha Goyal | Ph.D | Soluble Biochemistry | 7738259223 | harshagoyal09@gmail.com |
| 17. | Jayshree Kanwar | M.sc. | Biochemistry | 7089143748 | kanwarjayshree5@gmail.com |
| 18. | Kapil Meena | M.sc. | Biochemistry | 9131038578 | kapilmeena21@gmail.com |
| 19. | Kavita Panwar | M.sc. | Biochemistry | 9589784131 | panwar1996kavita@gmail.com |
| 20. | Manisha Singh | M.sc. | Biochemistry | 9971094641 | manishasingh.sc@gmail.com |
| 21. | Mayuri Bisen | M.sc | Biochemistry | 7389139967 | mayuribisen22@gmail.com |
| 22. | Monika Patidar | M.sc. | Biochemistry | 9111738511 | monikapatidar98@gmail.com |

| | | | | | | |
|---|---|---|---|---|---|---|
| 23 | Muskan Padiyar | M.sc. | Biochemistry | 9981752339 | muskanpadiyar2001@gmail.com |
| 24 | Muskan Verma | M.sc. | Biochemistry | 9589867810 | muskanverma1506@gmail.com |
| 25 | Nandini Kashyap | M.sc. | Biochemistry | 9179663244 | kashyapnandini947@gmail.com |
| 26 | Nandini Ramnik | M.sc. | Biochemistry | 9669813654 | nandinisrivastava@gmail.com |
| 27 | Nidhi Tiwari | M.sc. | Biochemistry | 6265842739 | tiwarinidhi2805@gmail.com |
| 28 | Pinchi Chaudhary | M.sc. | Biochemistry | 9039916723 | choudharypinchi1999@gmail.com |
| 29 | Priya Malviya | M.sc. | Biochemistry | 7389261696 | priyamalviya129@gmail.com |
| 30 | Ravina Khandelwal | M.sc. | Biochemistry | 7024297672 | khandelwalravina1999@gmail.com |
| 31 | Remanoni | M.sc. | Biochemistry | 7898756411 | sanjaykaushal39@gmail.com |
| 32 | Rinki Shah | M.sc. | Biochemistry | 8306324882 | rinkishah2000@gmail.com |
| 33 | Ronak Parikh | M.sc. | Biochemistry | 7898986310 | patidaronak13@gmail.com |
| 34 | Shikha Gupta | M.sc. | Biochemistry | 9630913233 | shikha200gupta@gmail.com |
| 35 | Shivanee Sonane | M.sc. | Biochemistry | 9960380277 | shivanisonane@gmail.com |
| 36 | Shraddha Bansal | M.sc. | Biochemistry | 7987717774 | shraddhabansal@gmail.com |
| 37 | Shristi Tiwari | M.sc. | Biochemistry | 7999998167 | shristitiwari1003@gmail.com |
| 38 | Smriti Mittal | M.sc. | Biochemistry | 9981677832 | smritimittal033@gmail.com |
| 39 | Soumya Vishwakarma | M.sc. | Biochemistry | 9669927672 | soniam.mh06@gmail.com |
| 40 | Surabhi Agrawal | M.sc. | Biochemistry | 9340086258 | suryan2509@gmail.com |
| 41 | Sushki Roychoudhury | M.sc. | Biochemistry | 6360961711 | sushroy826@gmail.com |
| 42 | Swati Mali | M.sc. | Biochemistry | 7869288171 | swatimali282@gmail.com |
| 43 | Urmika Kanwar | M.sc. | Biochemistry | 9521621181 | urmikarwar@gmail.com |
| 44 | Urmika Saxena | M.sc. | Biochemistry | 7415287827 | urmikasaxena1999@gmail.com |
| 45 | Veena Malviya | M.sc. | Biochemistry | | veenamalviya307@gmail.com |
| 46 | Vijay Solanki | M.sc. | Biochemistry | 8982782716 | solankivinay611@gmail.com |
| 47 | Vineet Chaturvedi | M.sc. | Biochemistry | 8989738968 | thevineetchaubey@gmail.com |
| 48 | Dheeraj Malviya | M.sc. | Seed technology | 9691062876 | redheeraj880@gmail.com |

| | | | | | |
|---|---|---|---|---|---|
| 49 | Divya Singh | M.sc | Seed technology | 8455516435 | divyathakur6433@gmail.com |
| 50 | Hritik Bagri | M.sc | Seed technology | 8319367514 | ritikbagri007@gmail.com |
| 51 | Nehashwari Tiwari | M.sc., m.phil | Seed technology | 7879641668 | nehatiwari5277@gmail.com |
| 52 | Pragya Mascolkar | M.sc | Seed technology | 7617261734 | pragyamascolkar03@gmail.com |
| 53 | Ramkrishna Kachwaye | M.sc | Seed technology | 9.1917e+11 | kachwayeramkrishna@gmail.com |
| 54 | Sonali Parmar | M.sc | Seed technology | 8120233730 | sonalparmar1015@gmail.com |
| 55 | Anjali Bhadoo | M.sc | Zoology | 9522039766 | ltsanjali@gmail.com |
| 56 | Deepika Maru | M.sc | Zoology | 7879203873 | deepikamaru2715@gmail.com |
| 57 | Deepika Rathod | M.sc | Zoology | 6290772119 | deepikarathod119@gmail.com |
| 58 | Dilesp Jamre | M.sc | Fisheries | 9926746847 | dileepjamre2000@gmail.com |
| 59 | Hariom Yadav | M.sc | Zoology | 9752752529 | jhariom437@gmail.com |
| 60 | Hanibad Lodwal | M.sc | Zoology | 9009888020 | Lhanibad98@gmail.com |
| 61 | Kajal Bareths | M.sc | Zoology | 6260278343 | kajalbareths6731@gmail.com |
| 62 | Mukesh Khedkar | M.sc | Fisheries | 9644306598 | mukeshkhedkar9644@gmail.com |
| 63 | Nikky Jay | M.sc | Zoology | 8815575724 | nikkyjay117@gmail.com |
| 64 | Nishi Jain | M.sc | Zoology | 7999582543 | nishijain301996@gmail.com |
| 65 | Sakshi Gupta | M.sc | Zoology | 9977489454 | sg6860772@gmail.com |
| 66 | Savitoorni Malviya | M.sc | Zoology | 7987727389 | malviyasavita66G@gmail.com |
| 67 | Archana Saha | M.sc. | Biochemistry | 9161117892 | archanapsaha2626@gmail.com |
| 68 | Bhavna Mishrana | M.sc. | Biochemistry | 8889425707 | bhavnamishrana682@gmail.com |
| 69 | Jayshree Bariya | M.sc. | Biochemistry | 6261902910 | jayshreebariya880@gmail.com |
| 70 | Mamta Sisodia | M.sc. | Biochemistry | 6265275909 | mamtasisodia19@gmail.com |
| 71 | Pooja Pandey | M.sc. | Biochemistry | 9131678302 | pandeypooja9507@gmail.com |
| 72 | Pooja Verma | M.sc | Biochemistry | 7999168906 | pv804442@gmail.com |
| 73 | Shubhangi Khare | M.sc | Biochemistry | 9131787026 | subhangikhare1999@gmail.com |
| 74 | Shweta Prajapat | M.sc. | Biochemistry | 7828736772 | prajapatshweta1999@gmail.com |

| | | | | | |
|---|---|---|---|---|---|
| 75 | Sonam Patel | M.sc. | Biochemistry | 9993018903 | jayu941411@gmail.com |
| 76 | Sonu Mujalda | M.sc. | Biochemistry | 8085268967 | sonumujalda79@gmail.com |
| 77 | Yamini Magarde | M.sc. | Biochemistry | 8720053505 | yaminimagarde123@gmail.com |
| 78 | Ankit Verma | M.sc. | Biochemistry | 9755516227 | ankitvermascam@gmail.com |
| 79 | Anjali Tanaraya | M.sc. | Biochemistry | 9575368738 | rawat.anjali041006@gmail.com |
| 80 | Ganga Ajmera | M.sc. | Biochemistry | 8149565603 | gangaBkapil1999vk@gmail.com |
| 81 | Hemlata Yadav | M.sc. | Biochemistry | 6265035369 | hemlatayadav1248@gmail.com |
| 82 | Kajal Yadav | M.sc. | Biochemistry | 6266958294 | ky9934366@gmail.com |
| 83 | Kiran Kotwal | M.sc. | Biochemistry | 6267263546 | kirankotwal@gmail.com |
| 84 | Shivani Bhanwar | M.sc. | Biochemistry | 9752567670 | shivanibhanwar006@gmail.com |
| 85 | Shubhangi Chaudhary | M.sc. | Biochemistry | 8435666174 | shubhangichaudhary161@gmail.com |
| 86 | Sonali Lohare | M.sc. | Biochemistry | 7470588655 | sonallohare8888@gmail.com |
| 87 | Tejaswini Bhargav | M.sc. | Biochemistry | 8602525178 | gulabsinghbhargav@gmail.com |
| 88 | Vaidia Patidar | M.sc. | Biochemistry | 9131684528 | vaishapatidar318@gmail.com |

# Government Holkar Science College, Indore (MP)

## Department of Biochemistry

### Certificate of Collaboration

This is to certify that the **Department of Biochemistry, Govt. Holkar Science College, Indore, and Noble Alchem Pvt. Ltd. (Agribooster), Sanwer Road, Indore, M.P.** have signed MOU for Mutual collaborative work. Under this collaboration, a Workshop on **"Eco-friendly plant stress relievers in present scenario"** has been successfully conducted in the year 2022.



**Head**

Department of Biochemistry

# Workshop On "Eco-friendly Plant Stress Relievers in Present Scenario"

**Date : 28th & 29th March 2022**



Organized by

**Govt. Holkar (Model, Autonomous) Science College, Indore**

**Department of Biochemistry**

*In Collaboration with*

**Noble Alchem Pvt. Ltd., Indore**

# Photo Gallery



# A Manual of Workshop
# On
# "Eco-friendly Plant Stress Relievers in Present Scenario"

## Date : 28th & 29th March 2022


**EDITOR**

**Dr. A. Bafna, Associate Professor and Head**
**Biochemistry Department**

**CO-EDITORS**

**Prof. Tasneem Rangwala, Asst. Professor, Biochemistry**
**Prof. Sheetal Uikey, Asst. Professor, Biochemistry**
**Mr. Nagesh Vyas, Project Director, Agri Booster**
**Mr. Rohan Gupta, Marketing Director, Noble Alchem Pvt. Ltd.**

**Department of Biochemistry**
**Govt. Holkar (Model, Autonomous)**
**Science College, Indore (M.P.)**
**In Collaboration with Noble Alchem Pvt. Ltd., Indore**


**Year - 2022**

# ORGANIZING COMMITTEE

## Patron

**Dr. Suresh T. Silawat**

Additional Director, Higher Education, Indore Division &
Principal, Govt. Holkar Science College, Indore

## Director

**Dr. Angurbala Bafna**

Associate Professor : Dept. of Biochemistry
Govt. Holkar Science College, Indore

**Dr. G.D. Gupta**
Vice-principal

**Dr. R.C. Dixit**
Administrative officer

## Organizing Committee

**Convener**
**Prof. Tasneem Rangwala**

**Co-Convener**
**Prof. Sheetal Uikey**

## Organizing Secretary

**Dr. Bhavna Sharma**
**Prof. Deepak Choudhary**
**Prof. Shanti Patidar**

## Collaboration

**Noble Alchem Pvt. Ltd.**

**Mr. Rohan Gupta**
**Mr. Nagesh Vyas**
**Mr. Satish Jain,** Sak Bioenz, Raipur (CG)

## Guest Speakers



**Mrs. Priti Rao**
Founder: Soil and
Soul Foundation
Bioenzyme
Entrepreneurs
Academy of India, Bangalore



**Dr. C. Arun**
Associate Professor
Department of
Biotechnology
K L Deemed to be
University of Guntur



**Dr. (H) Joean Oon Siew Kee**
Medical Practitioner and
Environmentalist
Penang, Malaysia



**Dr. Kannabiran Balasubramaniyam**
B Pharma, MBA, PhD
Director
Life Pharma,
Doha, Qatar



**Dr. Annamalai M.**
Scientist (Entomology)
Crop Protection Division
ICAR
National Rice Research
Institute Cuttack

## Guest of Honor



**Dr. Anil Kothari**
Director-General
MPCST



**Mr. Nagesh Vyas**
Project Director
Agribooster
Indore (M.P.)



**Mr. Rohan Gupta**
Marketing Director
Noble Alchem Pvt. Ltd.
Sanwer Road,
Indore (M.P.)

# Workshop on
# "Eco-friendly Plant Stress Relievers In Present Scenario"

**Organized by**
**Department of Biochemistry**
**Govt. Holkar Science College, Indore**

**In Collaboration with Noble Alchem Pvt. Ltd., Indore**

**28th & 29th March 2022**

## Detailed Programme

| Date | Time | Program |
|---|---|---|
| 28/3/22 | 11:00 AM | Inauguration<br>Guest Speech- 1) Mr. Rohan Gupta<br>2) Mr. Nagesh Vyas |
| | 11:30 AM | Lecture by Mrs. Priti Rao<br>Topic- "Bioenzyme-Potentials, Experiences and Challenges" |
| | 12:30 PM | Lecture by- Dr. (H) Joean Oon Siew Kee<br>Topic – "Bioenzyme-Around the world and Medicine" |
| | 01:30 PM | Lecture by Dr. C. Arun<br>Topic- "Bioenzyme- Research & Data" |
| | 02:30-03:00PM | Lunch Break |
| | 03:00-04:00 PM | Practical Session on Proline estimation |
| | 04:00-05:00 PM | Practical Session on MDA estimation |
| 29/3/22 | 11:00 AM | Lecture by- Dr. Annamalai M.<br>Topic- "Elicitors as an Eco-friendly plant insect pest stress reliever: Opportunities and Challenges". |
| | 12:00 PM | Lecture by Dr. Kannabiran Balasubramaniyam<br>Topic- "Bioenzyme-Quality and optimization" |
| | 01:00-02:00 PM | Valedictory Session<br>Guest of Honor- Dr. Anil Kothari |
| | 02:00-03:00PM | Lunch Break |
| | 03:00-04:00 PM | Practical Session on Total Phenol Estimation |
| | 04:00-05:00 PM | Practical Session on Peroxidase Activity Determination. |

- **Venue for Inaugural Function: Biochemistry Department**
- **Venue for Lectures: Online Google Meet**
- **Venue for Practical Sessions: Biochemistry Department**



# संदेश

हर्ष का विषय है कि ''Eco-friendly Plant Stress Relievers in Present Scenario'' विषय पर जीवरसायन विभाग शा. होलकर विज्ञान महाविद्यालय इन्दौर, नोबल अल्केम प्रा. लि. के सहकार्यता से दो दिवसीय कार्यशाला आयोजन कर रहा है। आयोजित कार्यशाला में देश-विदेश के कृषि क्षेत्र से जुड़े वक्ता अपने विचारों को व्यक्त करेंगे।

इस अवसर पर प्रकाशित पुस्तिका के माध्यम से मैं, प्रतिभागियों एवं आयोजनकर्ता टीम को बधाई देते हुए कार्यशाला की सफलता हेतु अग्रिम हार्दिक शुभकामनाएं प्रेषित करता हूँ।

**डॉ. मोहन यादव**
मंत्री, उच्च शिक्षा, म.प्र. शासन, भोपाल



# संदेश

यह जानकर प्रसन्नता है कि जीव रसायन विभाग शा. होलकर विज्ञान महाविद्यालय इन्दौर, नोबल अल्केम प्रा. लि. के सहकार्यता से "Eco-friendly Plant Stress Relievers in Present Scenario" पर दो दिवसीय कार्यशाला आयोजित कर रहा है। जिसमें कई शिक्षक एवं शोधार्थी भाग ले रहे है।

यह कार्यशाला कृषि क्षेत्र में आने वाली चुनौतियों को हल करने के लिये एक सशक्त पहल करेगी।

इस आयोजन की सफलता के लिये हार्दिक शुभकामनाएं।

तुलसीराम सिलावट
मंत्री, जल संसाधन, म.प्र. शासन, भोपाल

उषा बाबू सिंह ठाकुर
मंत्री
संस्कृति, पर्यटन, धार्मिक न्यास एवं धर्मस्व
मध्यप्रदेश



निवास : बी-20 चार इमली, भोपाल-462016
दूरभाष क्रं. 0755-2551976, 2777723
E-mail : minister.tcamp@gmail.com
पत्र क्रमांक 4156/मंत्री/सं/प/ध/2022
भोपाल, दिनांक 24/03/22

# संदेश

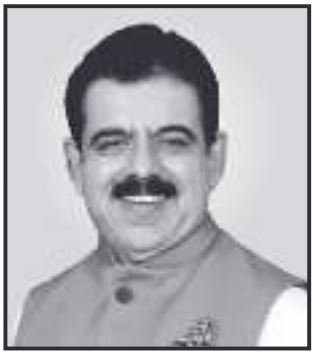
यह जानकर अति प्रसन्नता हुई कि जीव रसायन विभाग शा. होलकर विज्ञान महाविद्यालय इंदौर, नोबल अल्केम प्रा. लि. के सहकार्यता से "Ecofriendly Plant Stress Reliever In Present Scenario" पर 28–29 मार्च 2022 को दो दिवसीय कार्यशाला आयोजित कर रहा है।

मुझे विश्वास है कि इस कार्यशाला में विषयवस्तु पर गंभीरता से विचार विमर्श होगा तथा इससे महाविद्यालय के छात्र, शोधार्थी एवं शिक्षक लाभांवित होंगे।

मैं कार्यशाला के सफल आयोजन एवं प्रकाशित होने वाली पुस्तिका के सफल प्रकाशन हेतु शुभकामनाएं ।

**(उषा बाबू सिंह ठाकुर)**

कार्यालय : कक्ष क्र. 318, एन-एक्स-3, मंत्रालय, भोपाल-462004 ( म.प्र. ) दूरभाष 0755-2708769 ( कार्या. )



# संदेश

अत्यन्त प्रसन्नता का विषय है कि जीवरसायन विभाग शा. होलकर विज्ञान महाविद्यालय इन्दौर, नोबल अल्केम प्रा. लि. के सहकार्यता से 28-29 मार्च 2022 को ''Eco-friendly Plant Stress Relievers in Present Scenario'' विषय पर पर दो दिवसीय कार्यशाला आयोजित कर रहा है।

महाविद्यालय द्वारा आयोजित इस कार्यशाला से न केवल महाविद्यालय के छात्रों में ही पर्यावरण के प्रति जागरूकता होगी अपितु भविष्य में सम्पूर्ण जैविक प्रजाति को इसका लाभ मिलेगा।

**शंकर लालवानी**
सांसद, इन्दौर

# देवी अहिल्या विश्वविद्यालय, इन्दौर
## Devi Ahilya University, Indore

प्रो. रेणु जैन
कुलपति

Prof. Renu Jain
Vice-Chancellor



## संदेश

मुझे यह जानकर अत्यन्त प्रसन्नता हो रही है कि शासकीय होल्कर विज्ञान महाविद्यालय, इन्दौर में नोबल अल्केम प्रा.लि. की सहकार्यता से दो दिवसीय कार्यशाला दिनांक 28–29 मार्च 2022 को विषय "**Ecofriendly Plant Stress Reliever in Present Scenario**" पर आयोजित है।

वर्तमान में कृषि क्षेत्र को उन्नत बनाने के लिये ऐसी कार्यशाला अत्यन्त महत्व रखती है। मुझे विश्वास है कि इस कार्यशाला के आयोजन से इस विषय के ज्ञान का आदान–प्रदान एक सार्थक परिणाम देगा।

इस कार्यशाला के सफल आयोजन हेतु विश्वविद्यालय परिवार की ओर से मैं सभी प्रतिभागियों को हार्दिक बधाई देती हूँ एवं उनके उज्ज्वल भविष्य की कामना करती हूँ।

(डॉ. रेणु जैन)

इन्दौर
दिनांक : 25.03.2022

रविन्द्रनाथ टैगोर मार्ग, इन्दौर - 452 001(म.प्र.) भारत / Rabindranath Tagore Marg, Indore-452 001 (M.P.) INDIA
दूरभाष / Tel. (O) 91 731 262 1537 (R) 91 731 2401103, 2405481 ● फैक्स / Fax : 91 731 2523052
ई–मेल / E-mail : vc.dauv@dauniv.ac.in ● वेब / Web : www.dauniv.ac.in

**Dr. Anil Kothari**
**डॉ. अनिल कोठारी**
**Director-General**
**महानिदेशक**

*Madhya Pradesh Council of Science & Technology*
**मध्यप्रदेश विज्ञान एवं प्रौद्योगिकी परिषद्**
Vigyan Bhawan, Nehru Nagar, Bhopal-462 003 (M.P.)
विज्ञान भवन, नेहरू नगर, भोपाल - 462 003 (म.प्र.)
Tel.: 0755-2671800, Fax : 2671600
E-mail : dg@mpcost.nic.in, www.mpcost.gov.in

## MESSAGE



I am very pleased to know that Department of Biochemistry Govt. Holkar Science College Indore in collaboration with Noble Alchem Private Limited is going to organize a two day workshop on **"Eco-friendly plant stress relievers in present scenario".**

I firmly believe that this workshop will enrich the knowledge of participants and will be beneficial in developing research aptitude. I would like to give best wishes to the organizers for successful conduction of workshop and for publishing a workshop manual.

**(Dr. Anil Kothari)**

# Foreword



Government Holkar (Model, autonomous) Science College, Indore is NAAC "A" grade accredited and centre for excellence. It was established in 1891 and has successfully completed 131 years of its journey with golden heritage of teaching, learning, research and training. The Department of Biochemistry is also very old and have graduate, postgraduate courses along with Ph.D. It was great pleasure to know that Department of Biochemistry in collaboration with Noble Alchem Pvt. Ltd. is organizing a workshop on "Ecofriendly Plant Stress Relievers in Present Scenerio". I am sure this workshop will certainly boost enthusiasm for research among participants and develop research aptitude.

It gives immense delight to know that organizers are also publishing a manual on Ecofriendly Plant Stress Relievers in Present Scenerio. The manual includes introduction to plant stress and will be beneficial for experimental analysis of oxidative stress in plants. It also covers the research work carried out with collaborative efforts of Department of Biochemistry and Noble Alchem Pvt. Ltd.

I congratulate Dr. Angurbala Bafna, Mr. Rohan Gupta, Mr. Nagesh Vyas and their team for conducting such a useful event. I extend my best wishes for the grand success of this workshop.

**Dr. Suresh T. Silawat**
Principal

# Preface

NAAC accredited "A" grade Govt. Holkar Science College, Indore was established in 1891. The Department of Biochemistry was established in 1968 for post graduate studies. It enjoys the reputation of being the oldest in the state and providing excellent education from B.Sc. to Ph.D. It regularly organizes workshops and seminars for teachers and students.

This department in collaboration with Noble Alchem Pvt. Ltd. is organizing a workshop on Ecofriendly plant stress relievers in the present scenario from 28th to 29th March, 2022 to impart social awareness in students regarding agricultural problems and to suggest ways to solve them. The objective of this workshop is to enrich the participants with knowledge of ecofriendly product can be used in the field of agriculture and to inculcate research aptitude.

Agriculture is strongly influenced by weather and climate. Different crops show different sensitiveness towards climatic changes. Climatic variability may have effects on crop yields. To minimize crop responses to adverse effects of climatic changes or stress on growth, development and eventual yield, nowadays research is emphasized on use of eco-friendly stress relievers in the field of agriculture. Bioenzymes are prepared by using vegetable and fruit peels. Its various applications especially in the agriculture field will enable students to develop entrepreneurs' skills. Research scholars

of the Department are already working on ecofriendly product soluble silica. It has been established by their series of research that soluble silica is a potent stress reliever. It enhances stress resistance in plants and also improve quality of soil. In the upcoming workshop impact of soluble silica on different parameters will also be discussed by the experts.

Organizing committee on this occasion also prepared a manual which will help the readers to understand and perform the experiments with greater degree of clarity and precession.

We are extremely happy to extend our warm greetings and hearty welcome to all esteemed invited speakers. We firmly believe that this workshop will enrich the practical knowledge of participants. We would also like to extend our sincere thanks to Principal Dr. Suresh T. Silawat, faculty members and the entire organizing team.

**- Dr. Angurbala Bafna**

**- Mr. Rohan Gupta**

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# GUEST SPEAKERS

# BIOENZYME - Potential, Experience & Challenges

**Mrs. Priti Rao**
Social Entrepreneur

## About the Speaker:

A Postgraduate in Marketing from Bangalore University, Priti is the Founder & driving force behind Soil and Soul Foundation (www.soilandsoul.info) and Bioenzyme Entrepreneurs Academy (www.beacademy.in). With two decades of work experience, Priti wears multiple hats - Entrepreneur, Change maker, Sustainability practitioner and Yoga teacher. She has been experimenting with Bioenzymes for over a decade now & has open sourced the knowledge about Bioenzymes. Her work has been covered by print & electronic media in India.

## Abstract:

The topic is designed to bring awareness about Bioenzymes and its potential. Right from the basics to how Bioenzymes can be of help in reducing the global climate change. This foundation session will introduce the audience to Bioenzymes, its application, use cases, market opportunities, consumer behavior, career paths, etc. Mrs. Priti Rao will share her journey including insights, success stories & challenges.

# BIOENZYME - Around the world and Medicine

**Dr. (H) Joean Oon Siew Kee**
M.D. (M.A). D.N.M, BHMS
Medical Practitioner & Environmentalist

## About the Speaker:

Known for her public talks on environment and alternative medicine, Dr Joean is a medical consultant and physician, based out of Malaysia (www.enzymesos.com). She credits her learning about Bioenzymes to Dr Rosukon of Thailand. Dr. Joean has been using Bioenzymes to help cancer patients and community. She carries a wealth of experience having used Bioenzymes to solve some of the pressing environmental issues in Malaysia, China, Indonesia, Singapore, Taiwan & Hong Kong.

## Abstract:

This session is expected to expand the audience knowledge on wide variety of use cases for Bioenzymes. The participants will learn how already many countries are adopting Bioenzymes based solutions to solve some of their local civic issues. Dr. Joean, a qualified medical practitioner, will share her experience from around the world on mitigating some of the environmental issues and medical conditions using Bioenzymes.

# BIOENZYMES - Quality & Optimization

**Dr. Kannabiran Balasubramaniyam**
B Pharm, MBA, Ph.D.
Pharmaceutical & Biotech formulation Expert

## About the Speaker:

Dr. Kannabiran a Pharma & Biotech expert and founder of Arani Biotech (www.aranibio.com). With more than 20 years of global experience, he specializes in pharma production & plant operation. With his unique background, he has documented the entire lifecycle of Bioenzyme Production, Quality Control and Assurance.

## Abstract:

Understanding the harmful effect of chemicals, we use in our daily lives on our health and ecology. Eventually, understanding the Bioenzyme and its wide applications to bring the balance in ecology. Importance of Quality Assurance, Research & Development and optimization of the process to commercialize these products on large scale.

# BIOENZYME - Research and Data

**Dr. Arun C**
MTech, PhD
Research Scholar & Professor (KLEF, Guntur)

## About the Speaker:

Dr. Arun is a Research Scholar and specializes in Bioenzymes. His research work includes - investigation of the characterization, production and optimization of garbage enzyme produced from pre-consumer organic waste and subsequently, identify the effect on anaerobic digestion of dairy waste-activated sludge.
Dr. Arun studied Industrial biotechnology at PREC, Thanjavur and Environmental science and technology (Department of chemical engineering) at AC Tech, Anna university, Chennai & worked as Environmental consultant. His contribution in research about environmental & sustainable applications of Bioenzymes is commendable.

## Abstract:

The huge production of sludge and decomposable organic solid waste from food processing industries is increasing linearly with the growth of population. Solid organic waste sludge needs to be alleviated necessarily to reduce odour, organic content, and pathogen before disposing and further utilization. An environment-friendly and sustainable technology at low cost is needed for the proper management and reuse of pre-consumer organic wastes. Preconsumer organic waste can be utilized to produce value added bio-product which in turn reduces the production of greenhouse gas. Garbage enzyme was one of such products produced by fermentation of fruits and vegetable waste. During this session, Dr. Arun sheds light on his technical research with respect to garbage enzyme, its enzyme activity and potential.

# Elicitors as an eco-friendly plant insect pest stress reliever: Opportunities and Challenges

**Annamalai M**

**Scientist, Crop Protection Division,**
**ICAR-National Rice Research Institute, Cuttack**

Pesticide-based plant protection resulted in resistance and resurgence of insects and increased risks to biodiversity and human health due to frequent or indiscriminate use is a great havoc in recent days which sensitized consumers to prefer increasingly foods with low or even no pesticide residues. So, there always a look on efficient, economical and less environmental-impact option to control insect exists. One such a potential approach is the plant defense elicitors usage either alone or in combination with other control strategies like pesticides or beneficial microorganisms (Walters et al., 2013). Over the last two decades after in-depth exploration many researchers described several resistance elicitors and all have been majorly classified into two main groups, one is the molecules that are phytohormones such as salicylic acid (SA) and jasmonic acid (JA) (Pieterse et al., 2009) or its mimics like 2,6-dichloroisonicotinic acid (INA) or benzothiadiazole (BTH) which by exogenous application activates induced systemic resistance in plants and another group is the 'pathogen-associated molecular patterns' (PAMPs) or 'microbe associated molecular patterns' (MAMPs) or 'damage-associated molecular patterns' (DAMPs) like molecules that resemble the presence of a plant enemy thereby activating the plant's induced systemic resistance (Heil, 2014). Apart from the two aforementioned plant elicitors group, also present the third group of elicitors comprising compounds like mineral nutrients such as phosphorus (P), potassium (K), and silicon (Si), fertilizers containing phosphate (phosphorous acid) and some of the non-protein amino acids etc. (Reglinskietal.,2014). Use of these products for inducing resistance in plants is gaining importance in the control of insect pest. Among the elicitors employed in insect control, silicon has attracted the researchers' attention and interest and found to be used either in the form of inorganic sources viz., bagasse furnace ash or fly ash, sodium silicate ($Na_2SiO_3$), potassium silicate ($K_2SiO_3$), calcium silicate or organic sources in the form of rice husk ash etc. for the management of insect-pests. Apart from conferring resistance in plants it also provides nutritional benefits to plants resulting in increased production and quality of agricultural products. Numerous reports available on the use of silica based materials for management of field, horticultural, plantation and greenhouse pests of various crops and also the stored-product insect pests. Reports of synthesizing silica nanoparticles and testing their efficacy was also gaining the momentum. Silica as a carrier material to encapsulate insecticidal compound and their use in insect pest control also received considerable attention. Interestingly silica supplementation to plants found to cause changes in herbivore-induced plant volatiles (HIPVs) which in turn modifies the third guild i.e., natural enemies' recruitment. Though great opportunities available in employing silica material in insect pest management the main limitation is the application of silica in large quantity is not an attracting point for the researchers which induced them to test the efficacy of foliar spray application of silica in liquid form which requires less quantity and easy to apply and found encouraging results in many crops. Thus, silver bullet silica will be a growth promoter, pest reducer and yield increaser in many crops.

# Introduction

## Stress

In the widest biological sense, stress can be any factor that may produce an adverse effect in a living system. Stress is also defined as the overpowering pressure that affects the normal functions and prevent individual from fully expressing their genetic potential for growth, development and reproduction. If the stress is for short duration, then can be managed by the individual itself without having adverse effects. Moreover, long term exposure to stress can even lead to death.

## Classification of Stress

It has become traditional for ecologists, physiologists, and agronomists to divide stresses experienced by plants into two major categories: biotic and abiotic. Biotic stresses originate through interactions between organisms, while abiotic stresses are those that depend on the interaction between organisms and the physical environment. In today's scenarios sudden climate change exposes plants to episodes of abiotic stresses such as drought, salinity, elevated temperature, metal toxicity, submergence, nutrient deficiencies, and biotic stress such as virus, fungi attack. These stresses limit crop production.

## Abiotic Stress –

Abiotic stresses include Salinity, Drought, Flooding, Metal toxicity, Nutrient deficiency, High temperature and Low temperature. Abiotic stress management is one of the most important challenges faced by agricultural system. Abiotic stress can persistently limit choice of crops and agricultural production over large areas and extreme events can lead to total crop failures. Abiotic stresses adversely affect the livelihoods of individual farmers and their families as well as national economies and food security.

Plants can experience abiotic stress resulting from the shortage of an essential resource or from the presence of high concentrations of a toxic or antagonistic substance. In some cases, such as the supply of water, too little (drought) or too much (flooding) can both impose stress on plants. In reality, abiotic and biotic stresses are often inextricably linked.

## Major Abiotic Stresses Limiting Crop Yield

## Drought stress

Among the environmental stress factors, water is one of the most widely limiting factor for crop production on a global basis. Severe droughts occur periodically in several major food-producing countries, having far-reaching impacts on global food production and supply. The global production of grain has, in some years, been reduced by 5 percent or more as a result of severe droughts in key countries.

Effects of drought stress on crops ·

- Reduced seed germination and seedling development
- Poor vegetative growth
- Reduced photosynthesis
- Reduced stomatal conductance.

## Salinity stress

Salinity is defined as the presence of excessive amounts of soluble salts that hinder or affect the normal functions of plant growth. It is measured in terms of electrical conductivity (ECe), with the exchangeable sodium percentage (ESP) or sodium adsorption ratio (SAR) and pH of a saturated soil paste extract.

Salinity is predominantly a problem of arid and semiarid regions of the world. In India alone, 7 million hectares of land are salt affected. The impact of salinity on the economic exploitation of land for agriculture and forestry is very severe.

There are two main sources of salinity:

**(i)** Primary or natural sources resulting from weathering of minerals and the soils developed/derived from saline parent rocks.

**(ii)** Secondary salinization caused by human factors such as irrigation, deforestation, overgrazing, or intensive cropping.

## Effects of salt stress on plants

- Reduces the plant's ability to take up water, and this leads to slower growth.
- Salts enter the transpiration stream and eventually injure cells in the transpiring leaves, further reducing growth·
- Plants grown in alkaline soils often display a characteristic yellow color on the new growth.
- High salts can cause leaf burn, inhibit water uptake, and can interfere with uptake of certain essential elements (e.g. calcium).

## High Temperature Stress

High temperature causes excess respiration over photosynthesis which lead to loss of reserves and produces starvation condition within plants influencing overall growth.

## Low Temperature Stress

Low temperatures can damage plants both by a chilling effect, leading to physiological and developmental abnormalities, and by freezing, causing cellular damage directly or via cellular dehydration. Commonly visible symptoms of low-temperature injury to the leaves include wilting, bleaching due to photooxidation of pigments, waterlogging of the intercellular spaces, browning, and eventually leaf necrosis and plant death.

## Effects of Heat stress on Plants

- Seedling establishment is hampered
- Drying of leaf margins and scorching effect on leaves
- Reduction in plant growth
- Alteration in photosynthesis
- Total biomass is reduced
- Grain and fruit development and quality is affected.

## Biotic stress

Biotic stress in plants is caused by living organisms such as viruses, bacteria, fungi, nematodes etc. The agents causing biotic stress directly deprive their host of its nutrient can lead to death of plants. Biotic stress can become major because of pre and postharvest losses. Despite lacking the adaptive immune system plants can counteract biotic stresses by evolving themselves to certain sophisticated strategies. The biotic stress affect photosynthesis as chewing insects reduces leaf area and virus infections reduce the rate of photosynthesis per leaf area.

## Oxidative stress

Oxidative stress, defined as a disturbance in the balance between the production of reactive oxygen species (free radicals) and antioxidant defenses.

Plants are subjected to various environmental stresses throughout their life cycle. Reactive oxygen species (ROS) play important roles in maintaining normal plant growth, and improving their tolerance to stress.

Some of the markers are present in plant cell which helps to determine the level of stress. When plants are exposed to various stress conditions particularly drought results in the accumulation of certain substances such as proline which provide strength to tolerate stress. Malondialdehyde, a product of peroxidation of membrane phospholipid is an important marker of increased ROS production. Plants exposed to adverse environmental conditions produce free radicals in an excessive amount which ultimately results in peroxidation of lipid membrane thereby increasing the MDA content of the cell. Hydrogen peroxide has a dual role in plants. At a lower concentration, it is beneficial in the form of an intracellular signaling agent but higher concentrations become toxic by oxidizing cysteine and methionine residues of the active site of different enzymes involved in various metabolic processes.

ROS scavenging mechanisms can be classified into two types: enzymatic and non-enzymatic antioxidant defense systems, which work synergistically and interactively to neutralize free radicals. The enzymatic systems mainly include SOD, catalase (CAT), ascorbate peroxidase (APX) and glutathione peroxidase (GPX). Hydrogen peroxide generated by the activity of superoxide dismutase on superoxide which is an ROS is further broken into water and oxygen by the action of catalase and peroxidases. In reducing hydrogen peroxide, ascorbate peroxidase uses ascorbate as an electron donor. Ascorbic acid on oxidation is converted into dehydroascorbic acid which is reduced again to ascorbic acid by enzyme dehydroascorbic acid reductase (DHAR). For this process, electrons are obtained by the oxidation of glutathione. Glutathione reductase (GR) again reduces oxidized glutathione by utilizing reducing equivalent released by NADPH. This cycle is involving all these enzymes for regeneration of ascorbic acid and reduced glutathione is known as Halliwell-Asada pathway.

The non-enzymatic systems are mainly mediated by low molecular mass antioxidants, such as glutathione, ascorbic acid (AsA) and flavonoids, which are known to remove hydroxyl radicals and singlet oxygen. Phenol is a secondary metabolite that not only scavenges the plants from harmful ROS but also is beneficial for the humans and animals that eat products containing phenol. Glutathione is a tripeptide that plays many important roles in the differentiation and growth of the cell, cell death, removal of ROS, etc. All of these functions of reduced glutathione are due to its reducing property. Ascorbic acid is an important antioxidant because it tends to reduce various substrates involved in various enzymatic and non-enzymatic reactions.

When ROS levels in the cell exceed the range of the scavenging systems, cells enter the oxidative state, resulting in oxidative modification and cell damage which can lead to death. When ROS levels are low, the cells are in the reduced state, and ROS can be used as second messengers that participate in stem cell maintenance, cell division, and differentiation, organogenesis, and biotic and abiotic responses, etc.

## Stress reliever

To improve yield and increase production, farmers are using various products without concerning for quality of soil as well as of product. Due to continuous hazardous effects of chemical fertilizer and pesticides on environment, a major interest is being shown for the use of eco-friendly bio-products to regulate the plant growth and development. The challenges to make cost-effective and eco-friendly products with desired properties and long life is major concern raised by society.

Recent research has been proved that silica is a stress reliever for plant. Although silicon is not considered as an essential element for higher plants since it is present in abundant amount in soil but due to its limited solubility is not easily uptake by plants. Silica is beneficial for plants, especially when they are subjected to environmental stresses. Silicon (Si) is one of the most prevalent macro elements, performing an essential function in healing plants in response to environmental stresses. The purpose of using Si is to induce resistance to distinct stresses, diseases, and pathogens. Additionally, Si can improve the condition of soils, which contain toxic levels of heavy metals along with other chemical elements. Silicon minimizes toxicity of Fe, Al, and Mn, increases the availability of P, and enhances drought along with salt tolerance in plants through the formation of silicified tissues in plants. Silicon in the form of liquid silica maximize the availability of silicon as a ecofriendly product which enhances stress resistance of plants.

Different mechanisms have been proposed for silicon mediated drought tolerance. These include prevention of transpiration water loss, activation of plant antioxidant defense, keeping mineral balance, enhancing water uptake by roots, stimulating osmolyte accumulation, increasing the activity of photosynthetic enzyme and regulating growth substance levels.

The bioenzyme is an eco-friendly non-toxic organic storehouse of naturally occurring nutrients like many growth promoting hormones like auxin, gibbrellins, trace elements, vitamins, amino acids and micronutrients. It is highly compatible with fertilizers and pesticides, it also increases the resistance of plants against various pests, diseases and climatic stress, primary and secondary nutrients (Mg, Fe, B, Mn, Zn, Cu, and Mo) of bioenzyme provide nourishment required for healthy plant development. These nutrients are naturally chelated and readily assimilated by plants to improve cell division and enlargement, chlorophyll content and plant natural self - defence against pest pressure.

## Preparation Of Bio Enzyme:

**Ingredients:**

- Jaggery (Gud) or Black Strap Molasses – 1 portion
- Citrus peels - 3 portions (Orange, Sweet lime, Lemon)
- Water - 10 portions
- Quarter (1/4) teaspoon dry yeast
- 1:3:10 ratio of Jaggery: Citrus peels: water

**Steps:**

- Add everything together.
- Ferment for one month in anaerobic conditions.
- With yeast, Bio Enzyme will take one month to be ready. Without yeast, Bio Enzyme will be ready in 3 months.

**Applications of Bioenzyme**

- A bio enzyme is a multipurpose cleaner that can be used to clean your floor by adding 50ml of Bio Enzyme to a bucket of water to mop the floor.
- Use Bio Enzyme liquid to clean the kitchen and bathroom sink, Bathroom tiles, the Toilet bowl. Sprinkle the Bio Enzyme liquid, leave it for 20 minutes and scrub it.
- By adding soap nut liquid, Bio Enzyme liquid can be used to clean dishes, laundry etc,
- The use of chemical cleaning liquids contaminates our lakes, groundwater and soil. Instead, use a homemade Bio Enzyme to protect our environment.
- The post-usage discharge is completely natural and even beneficial to the soil and water. The same water can be used to water your plants
- Make your own cleaner at home, save our environment. It is very effective.
- Diluted Bio Enzyme is also used as a liquid nutrient or liquid fertilizer for plants.
- It is easy to make and easy on your pocket



# EXPERIMENTAL PROCEDURES

## A) Oxidative stress Markers

### I. Hydrogen peroxide content

It is determined using the method given by Jana and Choudhury (1981).

**Reagent**

1) 0.1 % Titanium sulphate
2) 0.05 M Phosphate buffer (pH 6.5)
   A) Dissolve 1.816 g of $KH_2PO_4$ in water and dilute to 200 ml.
   B) Dissolve 2.322 g $K_2HPO_4$ in water and dilute to 200 ml.
   Mix 188.8 ml of A and 11.2 ml of B.

**Extraction:**

1. 3 ml of 0.05M phosphate buffer is used to homogenize 0.1 g of sample.
2. It is then centrifuged at room temperature for 25 min at 6000 rpm.
3. The supernatant obtained is used for the estimation of hydrogen peroxide.

**Estimation:**

1. 1 ml of supernatant is mixed with 1 ml of 0.1 % titanium sulfate and centrifuged for 15 min at 7000 rpm.
2. The absorbance of the yellow-colored product is measured at 410 nm using a visible spectrophotometer.
3. A standard curve prepared by using 20-200 nmoles of hydrogen peroxide is used for the estimation of hydrogen peroxide in the test sample.

### II. MDA (Malondialdehyde)

One of the important products of liquid peroxidation in the membrane is malondialdehyde which is determined in samples using the method given by Heath and Parker (1968). The level of lipid peroxidation is measured by estimating MDA, a decomposition product of peroxidised polyunsaturated fatty acids of membrane lipid, using thiobarbuturic acid (TBA) as the reactive material.

**Reagents**

1. Trichloroacetic acid (TCA) - 10 gm of TCA in 100 ml of distilled water (10 %).
2. Thiobarbituric acid (TBA) – 0.5 gm of TBA in 100 ml of 20% TCA

**Extraction:**

1. 100 mg of material is homogenized with 4 ml of 10% trichloroacetic acid.

**Estimation:**

1. In a test tube 4 ml of thiobarbituric acid is added in 1 ml of homogenate and the mixture is kept in the water bath for 30 min at 95°C.

2. The tube is then quickly cooled using an ice bath and centrifuged at 1900 rpm for 10 min.
3. The absorbance of the yellow orange colored solution obtained is read at 532 nm using visible spectrophotometer.
4. The blank is prepared in the similar manner with 1 ml of 10% TCA instead of homogenate.
5. The concentration of MDA is calculated by using the extinction coefficient of 155 mM $cm^{-1}$ for MDA at 532nm using the formula.

$$A = \varepsilon l c$$

Where, A= Absorbance at a specific wavelength.

$\varepsilon$ = Extinction coefficient.
l= length of cell (1 cm)
c= concentration.

## III. Proline

The proline content is estimated using acid ninhydrin reagent based on the method given by Bates et al (1973). During selective extraction with aqueous sulphosalycylic acid, proline is precipitated as a complex. Other interfering materials are also presumably removed by absorption to the protein-sulphosalycylic acid complex. The extracted proline is made to react with ninhydrin in acidic condition (pH 1.0) to form the chromophore (red colour) and read the absorbance at 520 nm.

**Reagents**

1. 3% sulphosalicylic acid – 3 gm of sulfosalicylic acid in 100 ml of distilled water.
2. Glacial acetic acid
3. Acid ninhydrin – 1.25 g of ninhydrin is dissolved in a warm mixture of 30 ml glacial acetic acid and 20 ml of 6 M phosphoric acid with agitation. The reagent is stable for 24 h when stored at 4ºC.
4. Toluene.
5. Standard proline – 5 mg of proline is dissolved in 10 ml of 0.1 N hydrochloric acid (0.1-36 µmole).
6. Orthophosphoric acid (6M) – 38.1 ml of orthophosphoric acid is taken and volume is made to 100 ml, using distilled water to get 6M orthophosphoric acid.

**Extraction:**

1. 0.5 g of sample is homogenized using 10 ml of 3% sulphosalicylic acid and filtered through Whattman no. 2 filter paper.
2. Extraction is repeated and filtrates obtained were pooled.

**Estimation:**

1. To 2 ml extract, 2 ml glacial acetic acid and 2 ml of acid ninhydrin are added and mixed.
2. The reaction is started by keeping the tube in a boiling water bath and after 1 hr reaction is terminated by placing tube in the ice bath.
3. After removing the tube from the ice bath, 4 ml toluene is added and mixed vigorously for 20-30 sec.

4. Chromophore (toluene) layer containing red color is separated using separating funnel and absorbance is read at 520 nm against reagent blank in a visible spectrophotometer.
5. The same estimation procedure is repeated with standard proline (0.1-36 µmole).

Proline is calculated using the formula below

**Proline content (µmoles/g)** = [µg proline per ml/115.5] ×ml toluene × [5/g sample]

where 115.5= molecular weight of proline.

## B) Non enzymatic antioxidants:

### I. Total phenolic content

Total phenolic content is determined by the method of Singleton and Rossi, 1965.

**Reagents**

1. 70% acetone – 70 ml of acetone diluted to 100 ml with distilled water, prepare fresh.
2. Folin Ciocalteau reagent (FCR)
3. 20% sodium carbonate – 20 gm of sodium carbonate dissolved in 100 ml of distilled water.
4. Propyl gallate- 20 mg in 100 ml distill water.

**Extraction:**

1. 0.2 g of sample is extracted using 3 ml of 70% acetone and kept overnight at room temperature in dark.
2. After incubation, the homogenate is centrifuged for 10 min at 3000 rpm and the supernatant is collected in a dark clean vial.

**Estimation:**

1. 0.05 ml extract is taken and mixed with Folin Ciocalteau regent (0.5ml) and 20% sodium carbonate (0.5ml).
2. The content of the tube is diluted up to 5ml with distilled water and incubated for 30 min at room temperature.
3. After incubation absorbance is measured at 700 nm in a visible spectrophotometer using distilled water as blank.
4. Gallic acid equivalent (mg GAI/g fresh wt.) is used to express total phenolic content

$$\text{TPC (mg GAE per g FW)} = \text{Graph value (mg)} \times \frac{\text{Total volume of extract}}{\text{Volume of extract}} \times \frac{1}{\text{Weight of sample (g)}}$$

Where, A sample is the absorbance of the sample and A standard is the absorbance of the standard gallic acid concentration.

### II. Ascorbic acid

The estimation of ascorbic acid is based on redox titration using iodine solution. As ascorbic acid is a

potent antioxidant, it gets oxidized to dehydroascorbic acid while iodine gets reduced to iodine ions. The excess of iodine is estimated using a starch indicator which forms a blue color complex at the endpoint of the titration.

**Extraction:**

1. The sample is weighed (100g) and cut into small pieces.
2. It is crushed in mortar and pestle using distilled water.
3. The procedure is repeated several times and the liquid is collected in 100 ml volumetric flask.
4. The final extract is made up to 100 ml with distilled water.

**Estimation:**

1. 20 ml of the above extract was taken in 250 ml conical flask and mixed with 150 ml distilled water.
2. 1 ml starch solution was added as an indicator.
3. The above mixture was titrated with 0.005 mol/L iodine solution until blue-black color appeared.
4. Titration was repeated until concurrent readings were obtained.
5. The amount of ascorbic acid was calculated by determining moles of reacting iodine by using the below equation

   Ascorbic acid + $I^2$ -------- $2I^-$ + Dehydroascorbic acid

## C) Enzymatic antioxidants

### I. Catalase

Catalase (EC 1.11.1.6) activity is determined according to the method of Aebi (1984). Catalase activity is assayed in terms of reduction in absorbance at 240 nm due to the decomposition of hydrogen peroxide into water and oxygen.

**Reagents**

1) 0.05 M Phosphate buffer (pH 7.0)- Dissolve 0.2651 g of $NaH_2PO_4$ and 0.8253 g $Na_2HPO_4$ in 100 ml of distill water and add 0.372 g EDTA.

**Extraction:**

1. 1 ml of 50 mM phosphate buffer (pH 7.0) containing 1 mM EDTA is used to homogenize 0.1g of sample in ice-cold condition.
2. It is centrifuged for 20 min at 4°C in a cooling centrifuge at 8000 rpm.
3. After centrifugation, the supernatant is collected and used as enzyme source.

**Estimation:**

1. The reaction mixture is prepared from 3 ml 50 mm phosphate buffer containing 1 mm EDTA and 40 mm $H_2O_2$.
2. 0.2 ml enzyme source was used to initiate the reaction and a decrease in absorbance at 240 mm was recorded for 3 min after initiating the reaction.

3. Extinction coefficient ($\varepsilon = 39.4\ mM^{-1}cm^{-1}$) was used to calculate activity of catalase.
4. One mole of $H_2O_2$ decomposed per min constituted one unit of enzyme activity.

**II. Peroxidase (POD) activity:**

Peroxidase activity was measured according to Summer et.al., (1943).The enzyme activity assayed using o-dianisidine as hydrogen donor and $H_2O_2$ as electron acceptor. The rate of formation of yellow orange colored dianisidine dehydrogenation product is a measure of peroxidase activity and can be assayed spectrophotometrically at 430 nm.

**Reagents:**

1) Potassium phosphate buffer (pH- 6.0)-

   0.2 M KOH - Weigh 11.2 gm KOH in $H_2O$ and make upto 1000 ml.

   0.2M $KH_2PO_4$- Weigh 27.22gm $KH_2PO_4$ in $H_2O$ and make upto 1000 ml.

   Mix 5.8 ml of KOH and 50 ml $KH_2PO_4$ and dilute upto 100ml with d/w.

2) 0.01M orthodianisidine (prepare fresh) - 24 mg ortho dianisine in 100ml methanol.
3) 0.2 M $H_2O_2$ - Dilute 0.227ml of 30% $H_2O_2$ to 100 ml.
4) 2N $H_2SO_4$ – 5.5ml $H_2SO_4$ diluted upto 100ml.

**Extraction:**

**1.** Homogenize the material in ice cold 0.1M phosphate buffer, pH 6 in a chilled pestle and mortar.

**2.** Centrifuge the homogenate at 16000g for 20 min. at $4^0$C. Use the supernatant as enzyme source.

**Enzyme assay:**

**1.** Pipette out 1 ml of o-dianisidine, 0.5 ml of $H_2O_2$, 1 ml of phosphate buffer and 2.4 ml distilled water into testtube.

**2.** For Blank, exclude $H_2O_2$ but add additional volume of water.

**3.** Incubate at $30^0$C and start the reaction by adding 0.2 ml of enzyme.

**4.** After 5 min, stop the reaction by adding 1 ml of 2N $H_2SO_4$.

**5.** Read the absorbance at 430 nm.

**Calculation**

Express the specific activity of enzyme as unit/min/mg of protein or per g of sample considering one unit enzyme as increase in OD by 1.0 under standard condition.


शासकीय होलकर (आदर्श, स्वशासी) विज्ञान महाविद्यालय, इन्दौर
विजय पांडुरंग भाटकर भवन



# COLLABORATIVE RESEARCH OUTCOMES

# LIST OF PUBLICATIONS

| S.No. | Paper Published | Journal with year |
|---|---|---|
| 1. | **Role of soluble silica in reducing oxidative stress in *Trigonella foenumgracum* (Methi) grown hydroponically in sewage water** Jaiswal P., Bafna A., Rangwala T., Vyas N., Gupta R. | International Journal of Agriculture Innovations and research, 2017 |
| 2. | **Soluble Silica As A Boon For Alleviationg Toxic Effects Of Heavy Metals On *Vigna Radiata* Grown Hydroponically In Sewage** Harsha Goyal, Angurbala Bafna, Tasneem Rangwala, Nagesh Vyas and Rohan Gupta | International Journal of Agricultural Science and Research, 2017 |
| 3. | **Role Of Soluble Silica in Alleviating Oxidative Stress in Soybean Crop** T. Rangwala, A. Bafna, N. Vyas and R. Gupta | Indian Journal of Agricultural Research. Agricultural Research Communication Centre, 2018 |
| 4. | **Role of soluble silica in counteracting lead toxicity in wheat (*Triticum aestivum*)** Sandhya Sharma, Angurbala Bafna, Nagesh Vyas and Rohan Gupta | Indian Journal of Agricultural Biochemistry, 2018 |
| 5. | **Beneficial role of soluble silica in enhancing chlorophyll content in onion leaves** Tasneem Rangwala, Angurbala Bafna, Nagesh Vyas and Rohan Gupta | Current Agriculuture Research, 2019 |
| 6. | **Effect Of Soluble Silica Fertiliser on Total Sugar, Protein, Starch Content Along with Amylase and Cellulase Activity In Banana** Tasneem Rangwala, Angurbala Bafna, Nagesh Vyas and Rohan Gupta | Plant Science Today, 2021 |

| | | |
|---|---|---|
| 7. | **Comparative study of Routine Fertilizer V/S Soluble Silica Fertilization**<br>Tasneem Rangwala, Angurbala Bafna, Nagesh Vyas and Rohan Gupta | Holkar Research Spectrum, 2021 |
| 8. | **Effect of pre sowing seed treatment with silica and fungicide on growth, photosynthetic pigments and oxidative stress parameters of Mung Bean (*Vigna Radiata*)**<br>Angurbala Bafna, Shanti Patidar, Tasneem Rangwala, Nagesh Vyas and Rohan Gupta | International Journal of Agricultural Science and research (IJASR), 2021 |
| 9. | **Alleviation of Lead Induced Stress in Arhar (*Cajanus cajan*) by Application of Soluble silica**<br>Sandhya Sharma, Angurbala Bafna, Nagesh Vyas and Rohan Gupta | Agriculture Research Journal, 2021 |

# LIST OF PRESENTATION

| S.No. | Presentation Title | Presented at | Date |
|---|---|---|---|
| 1. | Beneficial role of Soluble Silica on carbohydrates, protein and oil content of soybean seed | International conference on Ecosytem Responses to Global Environmental Changes and Their impact organized by School of Life Sciences, Devi Ahilya Vishwavidyalaya Indore (M.P.) | 16-18 Feb 2017 |
| 2. | Effect of Environmental stress on Chlorophyll content counteracted by soluble silica | National Seminar on "Recent Trends in Basic Sciences – RTBS 2018" organized by the Department of Chemistry, Govt. Holkar Science College, Indore. | 3rd and 4th October 2018 |
| 3. | Effect of soluble silica on growth parameters and chlorophyll content in wheat (*Triticum Aestivum* L.) grown under lead toxicity | Workshop on Changing Environmental Scenario: Problems and solutions organized by Department of Botany, Mata Jija Bai Govt. PG Girls College, Indore | 4-10 September 2019 |
| 4. | Enhancement in Productivity and Mineral content of Banana using soluble silica | National Seminar on Cardiac Health and Fitness organized by the Department of Biochemistry, Mata Jija Bai Govt. PG Girls College, Indore | 16-17 September 2019 |
| 5. | Effect of soluble silica fertilization on Quality and yield of Banana | International Conference on Recent Advances in Life Sciences for Betterment of Environment and Human Health organized by Govt. Holkar Science College, Indore | 14-15 December 2019 |
| 6. | Role of soluble silica in counteracting lead toxicity in wheat (*Triticum aestivum* L.) | International Conference on Scientific Impact of Music, Environment and sustainable development organized by DAVV Indore | 7-9 January 2018 |
| 7. | Soluble silica a growth enhancer in crop grown under heavy metal stress | National Seminar on "Recent Trends in Basic Sciences – RTBS 2018" organized by the Department of Chemistry, Govt. Holkar Science College, Indore. | 3rd and 4th October 2018 |
| 8. | Effect of Soluble silica on growth of Arhar grown under heavy metal stress | National Seminar on "Cardiac Health and Fitness" organized by the Department of Biochemistry, Mata Jija Bai Govt. PG Girls College, Indore and secured first position. | 16 to 17 September 2019 |

| | | | |
|---|---|---|---|
| 9. | Alleviation of heavy metal toxicity in Arhar by use of soluble silica | National Seminar on "Recent Trends in Conservation of Natural Resources" from organized by the Department of Botany, Mata Jija Bai Govt. PG Girls College, Indore. | 10 – 20 November 2019 |
| 10. | Mitigating effect of Soluble Silica in Wheat (*Triticum aestivum* L.) Grown under heavy metal Lead Toxicity | International Conference on "Recent Advances in Life Sciences for betterment of environment and Human Health" organized by Govt Holkar Science College, Indore in association with the National Academy of Sciences, Indore. | 14 -15 December 2019 |
| 11. | Role of soluble silica (Si) in alleviating toxic effects of salt stress on the growth and Biochemical constituents of *Vigna radiata* (Mungbean) | 3rd International Conference on Environmental, Agricultural, Chemical and Biological Sciences organized by Voice of Indian Concern for the Environment (VOICE) in association with CAFRe & LINK CAFRE, University of Pisa, Pisa, Italy | 22,23, 26 January 2022 |
| 12. | Interactive effect of Silicon (Si) and Zinc (Zn) on the growth, biochemical constituents and pungency of the garlic bulb (*Allium sativum*) against drought stress | 2nd International Conference on Environmental, Agricultural, Chemical and Biological Sciences organized by Voice of Indian Concern for the Environment (VOICE) in association with CAFRe & LINK CAFRE, University of Pisa, Pisa, Italy | 24-26 January 2021 |
| 13. | Soluble silica as a beneficial nutrient for alleviating adverse effects of toxic metals on *Vigna radiata* (Mungbeans) plants grown hydroponically in sewage | International Conference on Recent Advances in Life Sciences for Betterment of Environment and Human Health organized by Govt. Holkar Science College, Indore | 14-15 December 2019 |
| 14. | Comparison of seed priming efficiency of soluble silica with fungicide | International Conference on Recent Advances in Life Sciences for Betterment of Environment and Human Health organized by Govt. Holkar Science College, Indore | 14-15 December 2019 |

# Photo Gallery












Arise Graphics # 98270 63937

# Govt. Holkar (Model, Autonomous) Science College, Indore

## Department of Biochemistry
## *In Collaboration with*
## Noble Alchem Pvt. Ltd., Indore

# SSR DOCUMENT

2022

## CRITERION –3

## MoUs/Linkages/Collaborations

Jaiv Vatika, Biotchnology Industry Janaphav, Mhow Indore

**Document Title:**

**Industry educational visit to Jaiv Vatika, Biotchnology Industry Janaphav, Mhow Indore**

Office of the Principal
Govt. (Model Autonomous) Holkar Science College
Indore (M.P.)
0731-2464074(O), 2446806, 2764027 (Exam)
e-mail : principalhsc@rediffmail.com, Web Address: www.collegeholkar.org
(Re-accredited 'A' Grade by NAAC)

Date:-

# MEMORANDUM OF UNDERSTANDING
# FOR
# INTERNSHIP &RESEARCH WORK

This Memorandum of Understanding is made on 25 February 2021 between JAIV VATIKA™, Biotech Industries, Indore and Govt. (Model Autonomous) Holkar Science College, Indore so as to jointly enter into an agreement for post graduate research work Terms and conditions are as follows:

(1) Both the Organization JAIV VATIKA™, Biotech Industries, Indore and Govt. (Model Autonomous) Holkar Science College, Indore will make an effort to identify the areas of common interest in which research can be pursued.

(2) Both the institution will provide research facilities and technical knowledge to the outstanding students.

(3) In order to develop interest in research both the organization will jointly organize Internship Workshops seminars regularly.

(4) Both the JAIV VATIKA™, Biotech Industries, Indore and Govt. (Model Autonomous) Holkar Science College, Indore will discuss the curriculum of some of the subjects for giving final shape if required.

(5) Both the institutions would jointly work for the promotion of research in basic and advanced branches of science using their infrastructure including laboratory and library via required formalities.

(6) The nature of research work undertaken by the students will be within the research mended by both of the institutions.

(7) The authorship issue of the publication /research paper and other agreed programme will be decided on the basis of contribution of the students guide.

(8) The students while working in both the institutions have to maintain a high degree of discipline and morale.

P.T.O.

Office of the Principal
Govt. (Model Autonomous) Holkar Science College
Indore (M.P.)
0731-2464074(O), 2446806, 2764027 (Exam)
e-mail : principalhsc@rediffmail.com, Web Address: www.collegeholkar.org
(Re-accredited 'A' Grade by NAAC)

Date:-

(9) Students fee will be decided by the coordinator (per student will be chargeable in advance at the time of reporting at the centre).

(10) Copies of Dissertation/ Thesis carried out in both the institutions will be exchanged and shall be kept in institute's library.

(11) Any additional substitution of by laws can be done by mutual consent between JAIV VATIKA™, Biotech Industries, Indore and Govt. (Model Autonomous) Holkar Science College, Indore at any time.

(12) The students form Govt. (Model Autonomous) Holkar Science College, Indore will be given a letter for their work at JAIV VATIKA™, Biotech Industries, Indore and duly signed by head of the Department of Biological sciences and vice versa, candidate.

The present memorandum shall be valid for **Three year** period agreed upon by both the partners. Either partner/institute can terminate this agreement with prior notice in writing to the other for 30 days. This agreement may be amended/deleted/modified by means of exchange of letters between the two Industries. Once approved by the two institutions, such amendment shall become part of this Memorandum of Understanding.

**Principal**
Govt. (Model Autonomous) Holkar
Science College, A.B. Road , Indore

For JAIV VATIKA

PARTNER.
**Director**
JAIV VATIKA™,
Biotechnology Industries, Indore
25/1/2, Rajpura Kunti Village
Badkua, Janapav Kuti Road
Tehsil Mhow ,Dist Indore (M.P.)

**Industrial visit under the MOU with Jaiv Vatika Biotechnology Industry, Janapav Kuti, Mhow, Indore**
**2021-22**

| S. No | Component/Activities | Details |
|---|---|---|
| 1. | Name of the Department / Unit / Agency: | Department of Biotechnology & Bioinformatics |
| 2. | Name of the Activity: | Industrial visit |
| 3. | Name of the Scheme: | Under the MOU with Jaiv Vatika Biotechnology Industry, Janapav Kuti, Mhow, Indore |
| 4. | Date and Year of the Activity: | 12 November 2022 |
| 5. | Number of Students Participated in the activity: | 67 |
| 6. | **Activity Photographs** | |
| |  |  |
| 7. | **Report of the Activity (in 100 words):** | |
| | An industrial visit organized by the Department of Biotechnology and Bioinformatics under the MOU with Jaiv Vatika Biotechnology Industry, Janapav Kuti, Mhow, Indore for M.Sc. Previous students in order to get the knowledge about advanced technology used in the production of Biofertilizers and Biopesticides. Students and faculty were overwhelmed by the warmth and cooperation of the industrial management particularly Mr. Nitesh Jesani ji. | |

**Permission Letter**

बायोटेक्नोलॉजी एवं बायोइंफरमेटिक्स विभाग

शासकीय (स्वशासी) होलकर विज्ञान महाविद्यालय,इन्दौर(म.प्र.)

दिनांक : 09/11/2022

प्रति,

प्राचार्य महोदय,

शा.होलकर विज्ञान महाविद्यालय,

इन्दौर (म.प्र.)

विषय – विजिट पर जाने हेतु अनुमति।

महोदय,

उपरोक्त विषयान्तर्गत लेख है कि बायोटेक्नालॉजी विभाग के एम एससी. प्रथम सेमेस्टर के विद्यार्थियों को दिनांक 12/11/2022 को Jaiv Vatika Biotechnology Industry Janaphav Kuti Mhow Indore ले जाने के लिए अनुमति प्रदान करने की कृपा करे।

जिनमें विद्यार्थियों की संख्या 60

विभाग के फेकल्टी मेम्बर 06

1. डॉ. किरण बिल्लौरे विभागाध्यक्ष
2. प्रो. रहीस खान अतिथि विद्वान
3. प्रो. राजेश कुमार टोकरिया अतिथि विद्वान
4. प्रो. हनी सोनी विजिटिंग फेकल्टी
5. प्रो. सोनल शर्मा विजिटिंग फेकल्टी
6. प्रो. शाक्षी चोरे विजिटिंग फेकल्टी

Yes

(डॉ.किरण बिल्लौरे)
विभागाध्यक्ष
बायोटेक्नोलॉजी एवं बायोइंफरमेटिक्स विभाग
शा.होलकर विज्ञान महाविद्यालय,इंदौर

# Participants List

GOVERNMENT HOLKAR SCIENCE COLLEGE, INDORE
DEPARTMENT OF BIOTECHNOLOGY
INDUSTRIAL VISIT- M.Sc. PREVIOUS YEAR SEM-I
VISIT DATE: 12 NOV, 2022

| S.No. | Name of Student | Contact No. | Time-In | Time-Out | Signature | Remarks |
|---|---|---|---|---|---|---|
| 1 | Aanchal Jat | 7828376613 | 9:30 | 12.20 | | |
| 2 | Aanchal Patel | 8269298031 | | | | |
| 3 | Aayushi Barmota | 9039419097 | | | | |
| 4 | Aayushi Shukla | 7879267750 | | | | |
| 5 | Abhishek Upadhyay | 6265788741 | | | | |
| 6 | Aditi Gautam | 7489540797 | | | | |
| 7 | Aditi Shukla | 9109220131 | | | | |
| 8 | Akanksha Gautam | 7898475559 | | | | |
| 9 | Akshat Choudhary | 7354410661 | | | | |
| 10 | Aman Shrivastav | 9098419760 | | | | |
| 11 | Aniket Pawar | 6261321972 | | | | |
| 12 | Ashish Singh Bais | 8871911633 | | | | |
| 13 | Ashutosh Chaturvedi | 7898432629 | | | | |
| 14 | Chanchal Kharadi | 9630490642 | | | | |
| 15 | Chetna Jharbade | 7606056528 | | | | |
| 16 | Deeksha Mandrah | 7869095853 | | | | |
| 17 | Dhanshri Pandey | 9407041636 | | | | |
| 18 | Diksha Patidar | 6260817467 | | | | |
| 19 | Geetika Dwivedi | 9685733710 | | | | |
| 20 | Harsh Vishwakarma | 7389385319 | | | | |
| 21 | Harshit Kulmodiya | 9589909[illegible] | | | | |
| 22 | Himanshu | 8120390681 | | | | |
| 23 | Kanupriya Tiwari | 8305805075 | | | | |
| 24 | Khushboo Nigam | 9340[illegible] | | | | |
| 25 | Krishna Yadav | 6265216527 | | | | |
| 26 | Kuldeep Rathod | 9131544641 | | | | |
| 27 | Kuldeep Solanki | 9179199415 | | | | |
| 28 | Manisha Ahirwar | 7566165818 | | | | |
| 29 | Manya Jain | 6260[illegible] | | | | |
| 30 | Megha Nair | 9039468250 | | | | |
| 31 | Megha Patel | 6265597281 | | | | |
| 32 | Mitali Gupta | 9589435301 | | | | |
| 33 | Muskan Singh | 7489324670 | | | | |
| 34 | Namrata Biswas | 9826499719 | | | | |
| 35 | Nandini Yadav | 7974179320 | | | | |
| 36 | Nikhat Sheikh | 7000898896 | | | | |
| 37 | Nikhil Bajaj | 9009480801 | | | | |
| 38 | Palak Meshram | 6265545182 | | | | |
| 39 | Pawan Nawal | 9301698567 | | | | |
| 40 | Piyush Choudhary | 6260491392 | | | | |
| 41 | Piyush Sohgaura | 9589878442 | | | | |
| 42 | Piyush Verma | 9039669942016 | | | | |
| 43 | Pragati Singh | 7223876171 | | | | |
| 44 | Princy Prajapati | 8109571939 | | | | |
| 45 | Priyanka Mourya | 9165255327 | | | | |
| 46 | Priyanka Thakur | 9977454379 | | | | |
| 47 | Rakhi Khapre | 9993095176 | | | | |
| 48 | Rakhi Rathod | 9770934545 | | | | |
| 49 | Raksha Parmar | 9111069933 | | | | |
| 50 | Rishabh Tiwari | 9770491909 | | | | |
| 51 | Riya Rajput | 8719869819 | | | | |
| 52 | Sabiha Sheikh | 9516002005 | | | | |
| 53 | Sachin Prajapat | 9755950337 | | | | |
| 54 | Sakshi Namdev | 8109917774 | | | | |
| 55 | Shanu Suryavanshi | 7974815451 | | | | |
| 56 | Sheetal Gehlod | 9754398102 | | | | |
| 57 | Sheetal Parihar | 7247409259 | | | | |
| 58 | Shivangi Bhatt | 7489600086 | | | | |
| 59 | Shivani Sourashtriya | 9179983907 | | | | |
| 60 | Shivani Yaduvanshi | 7440963179 | | | | |
| 61 | Shweta Dwivedi | 9589561053 | | | | |
| 62 | Sikha Singh | 9953905832 | | | | |
| 63 | Sohil Pahade | 9479417519 | | | | |
| 64 | Tarang Singh Baghel | 7470472764 | | | | |
| 65 | Vaishnavi Patidar | 7694099383 | | | | |
| 66 | Varsha Nagar | 6265055604 | | | | |
| 67 | Yuvraj Dongra | 8549537662 | | | | |

# SSR DOCUMENT

2022

## CRITERION – 3

## MoUs/Linkages/Collaborations

Azim Premji University, Bengaluru, India

**Document Title:**

Workshop on translation work in science subjects conducted by Azim Premji University, Bengaluru, India

## MEMORANDUM OF UNDERSTANDING

This Memorandum of Understanding (MOU) is entered into on this **24th day of May, 2021** by and between:

**Azim Premji University**, a private university established under the Azim Premji University Act, 2010 (Karnataka Act No. 14 of 2010) with its principal place of operations at Survey No. 66, Burugunte Village, Bikkanahalli Main Road, Sarjapura Bengaluru- 562125; and a division of Azim Premji Foundation for Development, a section 25 company registered under the Companies act, 1956 and having its registered office at #134, Doddakannelli, Next to Wipro Corporate Office, Sarjapur Road, Bangalore- 560035, hereinafter referred to as "**University**" (which expression shall, unless repugnant to the context, include its successors in interest, administrators and assigns)of the **One Part**;

**AND**

**Government Holkar Science College**, with its principal place of operations at A.B. Road, Near Bhawarkua, Indore, Madhya Pradesh – 452 017, hereinafter referred to as "**Institute**" (which expression shall, unless repugnant to the context, include its successors in interest, administrators and assigns) of the **Other Part**.

University and Institute shall be referred to individually as "**Party**" and jointly as "**Parties**".

**WHEREAS**

A. University is a not-for-profit university established in Karnataka by the Azim Premji University Act, 2010 offering undergraduate and postgraduate programmes in education and development domains.

B. Institute is an autonomous institution established in Indore with NAAC 'A' grade accreditation and is a leading science college in the State of Madhya Pradesh.

C. University is interested in generating Science, Mathematics, Economics, and other subjects' education resources in Indian languages. Institute is interested in expansion of sciences, mathematics, and their education in general. Both Parties admit students to their respective undergraduate science programs many of whom are making a transition from education in their own languages to English as a medium of instruction. These interests provide a common ground for collaboration.

D. Both Parties welcome collaboration between their members including faculty and students on projects related to resource generation for science and mathematics pedagogy and are therefore executing this MOU. Parties will respectively provide the required resources to facilitate the collaborative projects from time to time.

(c) *Applicable Law.* This MOU shall be governed by the Laws in India and each of the Parties submit to the jurisdiction of the courts of Bangalore.

**IN WITNESS WHEREOF the Parties hereto have duly caused these presents to the executed on the day, month and year first above written.**

By:

Name: Manoj P
Registrar
Azim Premji University
Date:

By:

Name:
Principal,
Government Holkar Science College
Date:

# Azim Premji University, Bengaluru, India
# (Workshop on translation work of science subject)







हदा में विज्ञान शिक्षण : चुनौतियां एवं संभावनाएं
दिनांक : 7 जून 2022
समय : दोप. 2 से 4.30 बजे तक
स्थान : कॉन्फ्रेंस हॉल



# हिंदी में विज्ञान शिक्षण की चुनौतियां और संभावनाएं विषय पर हुई बात

- दो विश्वविद्यालय समस्याओं को दूर करने का कर रहे हैं प्रयास
- पाठ्य सामग्री की उपलब्धता व मौलिक लेखन पर हुई चर्चा

इंदौर (नईदुनिया प्रतिनिधि)। शासकीय होलकर विज्ञान महाविद्यालय के वनस्पति शास्त्र और सूक्ष्मजैविकी विभाग द्वारा अजीम प्रेमजी विश्वविद्यालय बेंगलुरु के साथ मिलकर हिंदी में विज्ञान शिक्षण की चुनौतियां एवं संभावनाएं विषय पर कार्यशाला का आयोजन किया गया। इसमें हिंदी पृष्ठभूमि के उच्च शिक्षा प्राप्त करने वाले विद्यार्थियों को पाठ्य सामग्री की उपलब्धता, गुणवत्ता, संदर्भ सामग्री व मौलिक लेखन पर चर्चा की गई।

कार्यशाला में चर्चा की गई कि मध्य प्रदेश, उत्तर प्रदेश, राजस्थान, बिहार, हरियाणा और अन्य प्रदेशों में हिंदी मातृभाषा होने के कारण विद्यार्थियों को स्कूली शिक्षा के बाद महाविद्यालयों में कठिनाई का सामना करना पड़ता है। इन समस्याओं को दूर करने के लिए अजीम प्रेमजी विश्वविद्यालय हिंदी और अन्य क्षेत्रीय भाषाओं में उच्च गुणवत्तापूर्ण सामग्री विद्यालय और महाविद्यालयीन विद्यार्थियों के लिए उपलब्ध करवाने के प्रयास में कई वर्षों से कार्यरत है। विश्वविद्यालय द्वारा होलकर विज्ञान महाविद्यालय के साथ इसके लिए समझौता किया गया है। इसके तहत विद्यार्थियों के लिए अंग्रेजी में उपलब्ध विज्ञान साहित्य का अनुवाद हिंदी भाषा में किया जाएगा। कार्यक्रम के वक्ता डा. अरविंद गुप्ते, डा. अशोक शर्मा और डा. विजय पंवार थे। होलकर कालेज के प्राचार्य डा. सुरेश टी. सिलावट, देवी अहिल्या विश्वविद्यालय के इकोनॉमिक्स विभाग के विभागाध्यक्ष डा. कन्हैया आदमा, डा. संघमित्रा इकबाल, विनय जैन, फरहत्नी सांगी सहित अजीम प्रेमजी फाउंडेशन के प्रो. सिद्धार्थ जैन मौजूद थे। कार्यक्रम का संचालन डा. संजय व्यास ने किया।

# SSR DOCUMENT

2022

## CRITERION – 3

## MoUs/Linkages/Collaborations

**Ultra Lab Instruments, New Delhi**

### Document Title:

**The Department of Pharmaceutical Chemistry has organized a 3-day workshop on "instrumental techniques" in association with Ultra Lab Instruments, New Delhi.**







# MEMORANDUM OF UNDERSTANDING (MOU)

between

## Govt.( Auto.) Holkar Science College, Indore, (M.P)

&

## Ultra Lab Instruments, New Delhi

## MEMORANDUM OF UNDERSTANDING

This **Memorandum of Understanding** (hereinafter called as the 'MOU') is entered into on this the **Day 1st of JAN 2021**,

**BETWEEN**

**Govt. Holkar Science College, (GHSC), Dept. Of Pharmaceutical Chemistry,** AB Road Road, Indore, MP 452001 represented herein by its **HOD Pharmaceutical Chemistry Dr. M.K. Dwivedi** (hereinafter referred as **'First Party'**, the institution which expression, unless excluded by or repugnant to the subject or context shall include its successors – in-office, administrators and assigns).

**AND**

**Ultra Lab Instruments** , (founded in the Year 1965 due to the dearth of specialized & unique Institute covering research based Manufacturing , development, training, career counseling, job opportunities, test sampling, project & dissertation with capability to judge, & recognize contribution of scientific community at single platform with objective of Aatmnirbharat ) S 4/79 A, Old Mahavir Nagar, Near Janak Puri East Metro Station, **New Delhi-18** and represented herein by its **Director Mr. Shiv Shankar Gupta** (hereinafter referred to as "**Second Party**", company which expression, unless excluded by or repugnant to the subject or context shall include its successors – in-office, administrators and assigns).

(First Party and Second Party are hereinafter jointly referred to as 'Parties' and individually as 'Party')

**WHEREAS:**

A) First Party is a Higher Educational Institution named:

**Govt. Holkar Science College, (GHSC)**
AB Road Indore

B) First Party & Second Party believe that collaboration and co-operation between themselves will promote more effective use of each of their resources, and provide each of them with enhanced opportunities.

C) The Parties intent to cooperate and focus their efforts on cooperation within area of Skill Based Training, Education and Research.

D) Both Parties, being legal entities in themselves desire to sign this MOU for advancing their mutual interest;.

E) **Ultra Lab Instruments (ULI)**, the Second Party is engaged in Skill Development, Education and R&D Services in the fields of **Scientific, Analytical, Spectroscopic Instrumentation Techniques Manufacturing, Servicing and Hand on Training** and related fields

**NOW THEREFORE, IN CONSIDERATION OF THE MUTUAL PROMISES SET FORTH IN THIS MOU, THE PARTIES HERETO AGREE AS FOLLOWS:**

**CLAUSE 1 CO-OPERATION**

1.1 Both Parties are united by common interests and objectives, and they shall establish channels of communication and co-operation that will promote and advance their respective operations within

PROFESSOR & HEAD
Deptt. of Pharmaceutical Chemistry
Govt. Holkar Science College
INDORE (M.P.)

ULTRA LAB INSTRUMENTS

the **Institution** and its related wings. The Parties shall keep each other informed of potential opportunities and shall share all information that may be relevant to secure additional opportunities for one another.

1.2 First Party and Second Party co-operation will facilitate effective utilization of the intellectual capabilities of the faculty of First Party providing significant inputs to them in developing suitable teaching / training systems, keeping in mind the needs of the industry, the Second Party.

1.3 The general terms of co-operation shall be governed by this MOU. The Parties shall cooperate with each other and shall, as promptly as is reasonably practical, enter into all relevant agreements, deeds and documents (the 'Definitive Documents') as may be required to give effect to the actions contemplated in terms of this MOU. The term of Definitive Documents shall be mutually decided between the Parties. Along with the Definitive Documents, this MOU shall represent the entire understanding as to the subject matter hereof and shall supersede any prior understanding between the Parties on the subject matter hereof.

**CLAUSE 2 SCOPE OF THE MoU**

2.1 The budding graduates from the institutions could play a key role in technological up-gradation, innovation and competitiveness of an industry. Both parties believe that close co-operation between the two would be of major benefit to the student community to enhance their skills and knowledge.

2.2 **Curriculum Design:** Second Party will give valuable inputs to the First Party in teaching / training methodology and suitably customize the curriculum so that the students fit into the industrial scenario meaningfully.

2.3 **Industrial Training & Visits:** Industry and Institution interaction will give an insight into the latest developments / requirements of the industries; the Second Party to permit the Faculty and Students of the First Party to visit its group companies and also involve in Industrial Training Programs for the First Party. The industrial training and exposure provided to students and faculty through this association will build confidence and prepare the students to have a smooth transition from academic to working career. The Second Party will provide its Labs / Workshops / Industrial Sites for the hands-on training of the learners enrolled with the First Party.

2.4 **Internships and Placement of Students:** Second Party will actively engage to help the delivery of the Internship and placement of students of the First Party into internships/jobs, as per AICTE internship Policy. The Second Party will also register itself on AICTE Internship Policy Portal for disseminating the Internship opportunities available with them.

2.5 **Research and Development:** Both Parties have agreed to carry out the joint research activities in the fields of GAHARWAR INDUSTRIES, **specializations in Scientific, Analytical, Spectroscopic Instrumentation Techniques Manufacturing, Servicing and Hand on Training** .

2.6 **Skill Development Programs:** Second Party to train the students of First Party on the emerging technologies in order to bridge the skill gap and make them industry ready.

2.7 **Guest Lectures:** Second Party to extend the necessary support to deliver guest lecturers to the

PROFESSOR & HEAD
Deptt. of Pharmaceutical Chemistry
Govt. Holkar Science College
INDORE (M.P.)

ULTRA LAB INSTRUMENTS

students of the First Party on the technology trends and in house requirements.

2.8 **Faculty Development Programs:** Second Party to train the Faculties of First Party for imparting industrial exposure/ training as per the industrial requirement considering the National Occupational Standards in concerned sector, if available.

2.9 Both Parties to obtain all internal approvals, consents, permissions, and licenses of whatsoever nature required for offering the Programs on the terms specified herein

2.10 There is no financial commitment on the part of the **Name of institution**, the First Party to take up any program mentioned in the MoU. If there is any financial consideration, it will be dealt separately.

**CLAUSE 3 INTELLECTUAL PROPERTY**

3.1 Nothing contained in this MOU shall, by express grant, implication, Estoppels or otherwise, create in either Party any right, title, interest, or license in or to the intellectual property (including but not limited to know-how, inventions, patents, copy rights and designs) of the other Party.

**CLAUSE 4 VALIDITY**

4.1 This Agreement will be valid until it is expressly terminated by either Party on mutually agreed terms, during which period **Name of Industry**, the Second Party, as the case may be, will take effective steps for implementation of this MOU. Any act on the part of **Training Partner** or **Name of Industry**, the Second Party after termination of this Agreement by way of communication, correspondence etc., shall not be construed as an extension of this MOU

4.2 Both Parties may terminate this MOU upon 30 calendar days' notice in writing. In the event of Termination, both parties have to discharge their obligations

**CLAUSE 5 RELATIONSHIP BETWEEN THE PARTIES**

5.1 It is expressly agreed that **First Party** and **Second Party** are acting under this MOU as independent contractors, and the relationship established under this MOU shall not be construed as a partnership. Neither Party is authorized to use the other Party's name in any way, to make any representations or create any obligation or liability, expressed or implied, on behalf of the other Party, without the prior written consent of the other Party. Neither Party shall have, nor represent itself as having, any authority under the terms of this MOU to make agreements of any kind in the name of or binding upon the other Party, to pledge the other Party's credit, or to extend credit on behalf of the other Party.

**First Party**
**Govt. (Auto)Holkar Science College**
**Dept.-Pharmaceutical Chemistry**

PROFESSOR & HEAD
Deptt. of Pharmaceutical Chemistry
Govt. Holkar Science College
INDORE (M.P.)

**Second Party**
**Ultra Lab Instruments**
**Trainer, Mfg. Supplier**

Any divergence or difference derived from the interpretation or application of the MoU shall be resolved by arbitration between the parties as per the Arbitration Act, 1996. The place of the arbitration shall be at District Head Quarters of the First Party. This undertaking is to be construed in accordance with Indian Law with exclusive jurisdiction in the Courts of INDORE.

**AGREED:**

प्राचार्य
शासकीय आदर्श स्वशासी
होलकर विज्ञान महाविद्यालय,
इन्दौर (म.प्र.)

**Prof. SURESH T. SILAWAT**
**Principal**
**Govt. (Auto.)Holkar Science College**
**Indore (M.P) vf**

**HOD-Pharmaceutical Chemistry ,**
**Govt.(Auto.) Holkar Science College, Indore (M.P)**

PROFESSOR & HEAD
Deptt. of Pharmaceutical Chemistry
Govt. Holkar Science College
INDORE (M.P.)

Authorized Signatory

**Ultra Lab Instruments , New Delhi**

Authorized Signatory

| **Name of Institution –**<br>**Govt. Auto. Holkar Science College** | **Name of Industry:**<br>**Ulta Lab Instruments,** |
|---|---|
| Address: AB Road Indore | Address: S 4/79 A, Old Mahavir Nagar,<br>Near Janak Puri East Metro Station, New Delhi-18 |
| Contact Details- 9131770504 | Contact Details : 9810477927 / 9310077927 /9717366287 |
| E-mails : drmithaleshk.dwivedi@mp.gov.in | E-mails: ultralabint@yahoo.com , ultralabinstruments@gmail.com |
| Web :www.collegeholkar.org | Web: www.ultralabsindia.com |

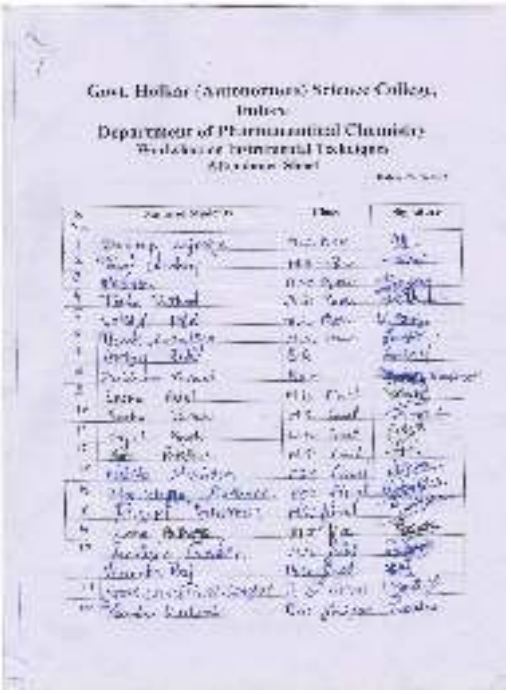
Witness1:
Prof. R. C. Dixit
13.3.21

Witness2: Konchan Dixit

Witness3:
17/03/2021
Prof. Amiya Pahari

Witness4: SANJAY AGARWAL

| S. No | Component/Activities | Details of event |
|---|---|---|
| 1 | Name of the Department / Unit / Agency: | **Pharmaceutical Chemistry** |
| 2 | Name of the Activity: | 03 Days Workshop (in collaboration with Ultra Lab, New Delhi) |
| 3 | Date and Year of the Activity: | 28th to 30th September 2022 |
| 4 | Number of Students Participated in the activity: | 104 |
| 5 | Report of the Activity (in 100 words): | **03 Days Workshop (in collaboration with Ultra Lab, New Delhi)**<br><br>Department of Pharmaceutical Chemistry has organized 03 Days Workshop on 28th to 30th Sept. 2022 " On Instrumental Techniques" Workshop was Inaugurated by Dr. Suresh T. Silawat Principal Govt. Holkar Science College & Additional Director Higher Education Indore District. The eminent speaker and trainer of this workshop was Mr. Arun Kumar Mishra consultant of WHO GMP he give training on various instruments like HPLC UV Spectrophotometer, Dissolution he also took theoretical and practical session on these instruments. Workshop was sponsored by world bank scheme. Dr. M.K. Dwivedi HOD Department of Pharma Chemistry Convenor of this workshop around 100-110 Students of B.Sc. Final Year and M.Sc. students participated in this workshop. |

| | | |
|---|---|---|
| 6 | Photo of Activity: |  <br>होलकर विज्ञान महाविद्यालय में उन्नत उपकरणों का प्रशिक्षण मिला<br>स्वदेश समाचार ■ इंदौर<br>फार्मास्युटिकल विभाग शासकीय होलकर विज्ञान महाविद्यालय द्वारा इलेक्ट्रोनिक्स टेक्निक पर तीन दिवसीय कार्यशाला का आयोजन किया गया।<br>कार्यशाला का उद्घाटन डॉ. सुरेश डी. शिलावट प्राचार्य शा. होलकर विज्ञान महाविद्यालय एवं अतिरिक्त संचालक उच्च शिक्षा इंदौर संभाग द्वारा किया गया। प्राचार्य डॉ. सुरेश डी. शिलावट ने कार्यशाला को विद्यार्थियों के लिए कौशल विकास तथा व्यवसाय के लिए अतिउपयोगी बताते हुए विद्यार्थियों को भविष्य निर्माण के लिए शुभकामनाएं दी।<br>इस कार्यशाला में मुख्य वक्ता एवं प्रशिक्षक के रूप में अरूण कुमार मिश्रा डब्ल्यूएचओ जी.एम.पी. परामर्शदाता उपस्थित हुए। उन्होंने कार्यशाला में छात्रों को एचपीएलसी, यूवी स्पेक्ट्रोफोटोमीटर, डिजोल्यूशन, अपरेटस तथा कई उन्नत उपकरणों का व्यवहारिक एवं क्रियात्मक प्रशिक्षण दिया। मुख्य वक्ता द्वारा इन उपकरणों का छात्रों को सैद्धांतिक ज्ञान भी दिया गया।<br>यह कार्यशाला विश्व बैंक परियोजना द्वारा आयोजित की गई, जिसमें आईक्यूएसी सेल प्रभारी डॉ. गणेश डगावकर, डॉ. अनिल खरे, ओएसडी डॉ. स्वाति गुप्ता तथा नैक प्रभारी डॉ. विजेन्द्र राय उपस्थित रहे। कार्यशाला के संयोजक विभागाध्यक्ष डॉ. एम.के. द्विवेदी ने बताया कि, कार्यशाला में बीएसी फाइनल वर्ष, एमएससी प्रीवियस व एमएससी फाइनल के लगभग 110 छात्र-छात्राओं व विभाग के सभी प्राध्यापकों ने प्रतिभागिता की। कार्यशाला का संचालन प्रो. हेमा कोचर ने किया। |
| 7 | List of Participants |  <br>Govt. Holkar (Autonomous) Science College, Indore<br>Department of Pharmaceutical Chemistry<br>Workshop on Instrumental Techniques |



Govt. Holkar (Autonomous) Science College, Indore

Department of Pharmaceutical Chemistry

Workshop on Instrumental Techniques

Attendance Sheet

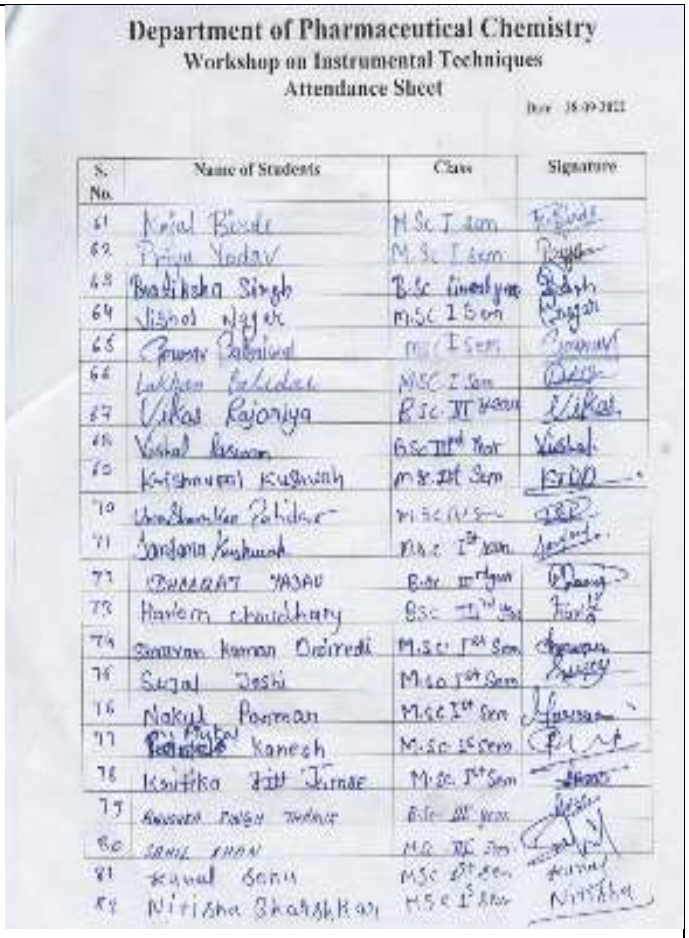


Govt. Holkar (Autonomous) Science College, Indore

Department of Pharmaceutical Chemistry

Workshop on Instrumental Techniques

Attendance Sheet



**Department of Pharmaceutical Chemistry**
**Workshop on Instrumental Techniques**
**Attendance Sheet**

Date: 15-09-2022

| S. No. | Name of Students | Class | Signature |
|---|---|---|---|
| 61 | Kajal Borde | M.Sc I sem | |
| 62 | Priya Yadav | M.Sc I sem | |
| 63 | Pratiksha Singh | B.Sc final yr | |
| 64 | Jignesh Nayee | M.Sc I Sem | |
| 65 | Gaurav Patel | M.Sc I Sem | |
| 66 | Lakhan Pahadiya | M.Sc I Sem | |
| 67 | Vikas Rajoriya | B.Sc III Year | |
| 68 | Vishal Barman | B.Sc IIIrd Year | |
| 69 | Krishnamani Kushwah | M.Sc IIIrd Sem | |
| 70 | Umashankar Pahadiya | M.Sc I Sem | |
| 71 | Sandeep Kushwah | M.Sc I Sem | |
| 72 | BHARAT YADAV | B.Sc IIIrd Year | |
| 73 | Harlem chaudhary | B.Sc IIIrd Year | |
| 74 | Sanjay kumar Dudiredi | M.Sc I Sem | |
| 75 | Sujal Joshi | M.Sc I Sem | |
| 76 | Nakul Parmar | M.Sc I Sem | |
| 77 | Ganesh | M.Sc I Sem | |
| 78 | Ksitika Jitt Tirkar | M.Sc I Sem | |
| 79 | Ankush Singh Thakur | B.Sc III year | |
| 80 | ABDUL KHAN | M.Sc IIIrd Sem | |
| 81 | Kajal Soni | M.Sc I Sem | |
| 82 | Nitisha Bhardwaj | M.Sc I Sem | |



**Department of Pharmaceutical Chemistry**
**Workshop on Instrumental Techniques**
**Attendance Sheet**

Date: 15-09-2022

| S. No. | Name of Students | Class | Signature |
|---|---|---|---|
| 87 | ARLIYA KHAN | B.Sc IIIrd year | |
| 88 | Nikhat Khan Khan | B.Sc III years | |
| 89 | Ghanshyam Gurjar | M.Sc III Sem | |
| 90 | Gaurav Nagar | M.Sc III Sem | |
| 91 | Rahul | M.Sc III Sem | |
| 92 | Rahul Lilhare | M.Sc III Sem | |
| 93 | Kalpana Bhandari | M.Sc III Sem | |
| 94 | Ramchandra Sahakand | M.Sc III Sem | |
| 95 | Pooja Panika | M.Sc III Sem | |
| 96 | yogesh gurjar | M.Sc III Sem | |
| 97 | Meena Mahati | M.Sc III Sem | |
| 98 | Apurva Rahangdale | M.Sc II Sem | |
| 99 | Ayush Rathore | M.Sc II Sem | |
| 100 | Vijay Bhagat | M.Sc II Sem | |
| 101 | Pawan Sahare | M.Sc II Sem | |
| 102 | Shraddha Rathore | M.Sc II Sem | |
| 103 | Sagar Dongre | M.Sc II Sem | |

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2022

## CRITERION –3

## MoUs/Linkages/Collaborations

IPS Academy, Indore

**Document Title:**

Research Activity: Synthesis and Characterization of Zirconia Nanocrystalline Powder by Thermal Treatment Method in Association with IPS Academy, Indore

To,
The Principal
Govt. Holker Science College, Indore
Indore (M. P.)-452001

Date: 01/12/2021

**Sub: Mutually agreeable MoU for academic and scientific research cooperation.**

Dear Sir,

This is in continuation with your conversation with Dr. Jitendra Tripathi, Associate Professor and Head, Physics Department ISR, IPS Academy, Indore. We would like to make a Memorandum of Understanding for academic and scientific cooperation with Govt. Holker (Model, Autononous) Science College, Indore. We hope that the rich laboratories, libraries and state-of-the-art research facilities of our institutions will help the students and researchers a lot. You are requested to kindly go through the attached draft of the proposed MoU and suggest the modifications if needed.

Looking forward for a positive and prompt reply from your end.

Thanking you,

Yours sincerely,

P. K. Jain

Principal,
ISR, IPS Academy
Indore (M.P.)

PRINCIPAL
IPS ACADEMY INDORE

**Encl: Draft of proposed MoU**

**DEPARTMENT OF PHYSICS**
Institute of Science & Laboratory Education
Approved by MP Government & Affiliated to DAVV Indore
Phone : 0731-4014584/580 Email : hod.physics@ipsacademy.org, www.ipsacademy.org
Knowledge Village, Rajendra Nagar, A.B. Road, Indore -452012 (MP) - 452012 (M.P.) India

*Memorandum of Understanding For Academic And Scientific Research Cooperation*

**BETWEEN**

**Institute of Science and Research (ISR), IPS Academy, Indore (M.P.)**

**AND**

**Govt. Holkar (Model, Autonomous) Science College, Indore, M.P.**

The representatives of **Institute of Science and Research (ISR), IPS Academy, Indore and Govt. Holkar (Model, Autonomous) Science College, Indore, M.P**, agree to this Memorandum of Understanding.

The Memorandum of Understanding (MOU) establishes the following:

## 1. OBJECTIVE OF THE AGREEMENT

1. To establish a mutually beneficial relationship built on academic and scientific cooperation.
2. Areas of cooperation between the **Department of Physics, Institute of Science and Research (ISR), IPS Academy, Indore (M.P.)** and **Department of Physics, Govt. Holkar Science College, Indore, (M.P)** include the exchange of research students, joint publications, joint collaborative research projects, mutual use of research facilities at both research centers.
3. To conduct workshop/conference on a mutually agreed area of scientific interest by both the departments. A discussion will require prior commencement of this activity.

## 2. GOALS AND FORMS OF COOPERATION

The signing institutions agree to provide opportunity, as appropriate, for the following activities towards the completion of the objective of this MOU.

1) Exchange of students and/or researchers with the objective of offering courses and realizing research projects in areas mutually agreed upon by both institutes through prior invitation and in accordance with the procedures and expectations established by each institute and specific department.

2) Exchange of scientific publications and materials, study programs, academic projects, course information, seminars, conferences and any other data and information of common interest.

3) Develop joint research projects and joint publications.

4) All joint activities will be realized through the mutual agreement and clearly established conditions and mutual obligations of the appropriate institute entity.

## 4. IMPLEMENTATION OF THE MEMORANDUM OFUNDERSTANDING

The objectives of the MoU will be implemented and regulated in the following manner:

A. Students and research scholars may visit the corresponding departments of these institutes after finalizing a mutually acceptable schedule.

B. The department of physics from institute will be implementing authority of this MOU.

C. All the expenses shall be the direct responsibility of the student concerned. (Subject to any agreements on payment arrangements made by either institution with its own students). These expenses include:

1. Travel expenses
2. Reprographic and Internet Usage Expenses
3. Required student services fees at the host institution
4. Maintenance fee of experimental facilities.
5. Exchange of research through faculty members.
6. Open access charges.

## 5. EFFECTIVE DATE AND DURATION OF THE MOU:

This MoU shall be effective upon signature by the two Parties and shall remain in force for a period of five (5) years. Thereafter it shall be automatically renewed for another 5 years unless it is terminated.

This MOU is signed by,

HEAD
Deptt. of Physics
Institute of Science & Leb Educati
IPS Academy, Indore

Principal,
**Institute of Science and Research (ISR), Indore, M.P**

PRINCIPAL
IPS ACADEMY INDORE

And

Prof. & Head
Department of Physics
Govt. Holkar Science College
Indore

Principal,
**Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)**

Date: 14/12/2021

**Govt Holkar (Model, Autonomous) Science College, Indore**

*in collaboration with*

**IPS Academy, Indore**

# Synthesis and Characterization of Zirconia Nanocrystalline Powder by Thermal Treatment Method

Dr. Jaiveer Singh
IPS Academy, Indore

Dr. Jitendra Tripathi
IPS Academy, Indore

Dimple Soni
Govt Holkar (Model, Autonomous) Science College, Indore

Dr. Netram Kaurav
Govt Holkar (Model, Autonomous) Science College, Indore

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journal homepage: www.elsevier.com/locate/matpr

# Synthesis and characterization of zirconia nanocrystalline powder by thermal treatment method

Dimple Soni [a], Jaiveer Singh [b,*], Netram Kaurav [a], Jitendra Tripathi [b], Anupam Sharma [c]

[a] Department of Physics, Govt (Model, Autonomous) Holkar Science College, Indore, M.P. 452001, India
[b] ISR, IPS Academy, Indore 452012, India
[c] Department of Physics, Manipal University Jaipur, Jaipur, Rajasthan 303007, India

ARTICLE INFO

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Available online 10 December 2021

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Zirconia nanoparticles
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ABSTRACT

The production of nano crystalline zirconium dioxide using the heat treatment method is described in this present study. Ethylene glycol was used as a surfactant substance to control the size of the nanoparticles. X-ray diffraction (XRD), UV–Vis absorbance spectroscopy, and FT-IR spectroscopy were used to understand the effect of the surfactant material on structural and optical properties. Analysis of XRD provided the average crystallite size of about 4.61 nm for $ZrO_2$ sample, and UV–Vis spectroscopy was used to obtain the band gap energy and it is 5.33 eV. At different wavelengths, the FT-IR spectra revealed various stretching bonds in the $ZrO_2$ compound.
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## 1. Introduction

Metal oxide nanoparticles are used in the fabrication of high-functioning materials with changeable characteristics. The development of chemical techniques for controlling the growth of nanoparticles during the synthesis has made significant progress. While there are still many obstacles to overcome, one of the most significant roadblocks to understanding the crystallization process and chemical routes employed in growth-controlling agent synthesis is an insufficient understanding of the process and pathways involved.

Zirconium dioxide is a significant transition metal oxide having the wide range of applications in the field of technology based on its optical, chemical, physical, dielectric and mechanical properties. Zirconium dioxide is also known as Zirconia [1]. The three distinct phases of Zirconia can exist in isolation and are stable across a wide temperature range. The three phases of $ZrO_2$ are monoclinic, tetragonal, and cubic. Monoclinic phase is thermodynamically stable up to 1100 °C, but transferable to tetragonal phase in the range of 1100–2370 °C, and cubic phase is stable above 2370 °C [2].It's a crystalline powder with a white tint. $ZrO_2$ has a high thermal resistance, mechanical resistance, and abrasion resistance, as well as being colorfast, chemically stable, corrosion resistant, strong, tough, and microbiological resistant, and having a high refractive index and dielectric constant [3,4]. $ZrO_2$ is a p-type semiconducting semiconductor. $ZrO_2$ has a high capacity for transferring oxygen ions, making it ideal for use as a catalyst.

Zirconia can be made by a multitude of methods. Hydrothermal approach [5], Sol-gel method [6], Precipitation method [2], Chemical method, Vapor phase method, RAPET method (Reaction under Autogenic Pressure at Elevated Temperatures) [7], and others are a few examples. The fully stabilized Zirconium oxide nanoparticles are well-suited for application in methods for high temperature energy conversion due to their enhanced oxygen ion transport capacities, as well as their long-lasting stability. $ZrO_2$ nanoparticles are used in a variety of applications, including solid oxide fuel cells and oxygen gas sensors [8]. It has applications in dentistry, as catalysts, and as antibacterial additions in paints.

This study discusses a synthetic route to cubic $ZrO_2$ by thermal treatment method by regulating crystallite formation. To fabricate the $ZrO_2$ nanostructure, Zirconium oxychloride was used as Zirconium salt and Ethylene glycol was used as the surfactant material with the citric acid. Further, to analyze the properties of as prepared sample, the structural and optical characterization were carried out.

* Corresponding author.
*E-mail address:* jaiveer24singh@gmail.com (J. Singh).

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Selection and peer-review under responsibility of the scientific committee of the International Conference on "Materials Science and Mathematics for Advanced Technology".

## 2. Experimental details

### 2.1. Materials

Precursors, such as Zirconium oxychloride ($ZrOCl_2{\cdot}8H_2O$), Citric acid ($C_2O_4H_2$) for pH balancing and surfactant material ethylene glycol ($C_2H_6O_2$) were purchased from the Sigma-Aldrich.

### 2.2. Characterizations

X-ray Diffraction (XRD) spectra were recorded by a Proto AXRD (X-ray Diffractometer) with Cu-Kα radiation (wavelength = 1.5406 Å) in the range of 2θ from 20° to 90°. UV–Vis's measurement was done by UV-2600 in the range of wavelength of 200–900 nm in the absorbance and transmittance mode. The Fourier Transform Infrared (FT-IR) Spectrometer Bruker Alpha was used to measure the FT-IR spectra in the range of 500–4000 $cm^{-1}$.

### 2.3. Synthesis of $ZrO_2$ nanoparticles

The thermal treatment method was used to prepare $ZrO_2$ nanoparticles. The precursor was zirconium oxychloride, while the distilled water was taken as solvent. All of the compounds employed in the synthesis were of the highest analytical quality. Zirconium oxychloride ($ZrOCl_2{\cdot}8H2O$) was solvated in distilled water and agitated for 5 min to make $ZrO_2$ nanoparticles. Ethylene glycol was later added to the solution. As a surfactant, ethylene glycol ($C_2H_6O_2$) was used, and the pH of the solution was adjusted with citric acid ($C_2O_4H_2$). After thoroughly combining all of the components, the solution was heated in an oven at 70 °C for 5 min. Finally, the solution was transferred to a ceramic crucible and placed in the furnace at 450 °C for 3 h. The result was a black-coloured substance that, when ground, transformed into a Gray-coloured fine powder, which was then utilised for further characterization.

## 3. Results and discussions

### 3.1. XRD (X-ray diffraction) analysis

Fig. 1 displays the XRD pattern of the sample prepared by heat treatment method. The crystallographic phase of the synthesized Zirconia nano powder was obtained at the room temperature by X-ray diffractometer (XRD) [Proto AXRD] operated at. Cu-kα source radiation with a wavelength of 1.5406 Å. Diffraction peaks obtained at the specific angle are the fingerprint of the crystal. The Debye-Scherrer formula was used to compute the crystallite size of the produced $ZrO_2$ nanoparticles, and the results were obtained by the following equation.

$$D = \frac{k\lambda}{\beta cos\theta} \quad (1)$$

In this equation, $D$ is the crystallite size, β representing the full width at half maximum (in radian) of the diffracted X-ray, k is the shape factor that takes the value 0.9, λ is the wavelength of the X-ray (1.5406 nm for Cu-K radiation), and the diffracted Bragg's angle is represented by θ. The mean crystallite size of the synthesized Zirconia nanostructure is obtained as 4.61 nm. As the sample was calcined at the temperature of 450 °C, which was sufficient to get the prominent peaks in the range of 2θ is from 20° to 90°. The crystalline nature starts to show up as peaks indexed by the (111), (200), (220), (311), (222). It was observed that the smaller size of the crystallite is due to the Ethylene glycol as surfactant. It has worked as it helps to reduce the surface tension at the interface between atoms and reduce the size of the particle. It also worked as shaping the particle and decreasing the agglomeration of the particles. Lower size nanoparticles have excellent application in gas sensors, solar cell, in opto-electronic devices and in solid oxide fuel cell. Refractive index is another characteristic to investigate the optical properties of materials.

### 3.2. UV–vis absorption spectra

In order to investigate the optical response of the prepared Zirconia, the UV–vis absorption spectra were recorded in the wavelength range of 200–900 nm. Fig. 2 depicts the absorbance spectra obtained from UV–Vis measurements. The spectra show the weak and broad absorption peak at the wavelength of 283 nm, 307 nm and 317 nm. The transition between the valence band and the conduction band can cause such observations. However, the absorption peak for the $ZrO_2$ nanoparticles in the ultraviolet area is at a higher energy side when comparing to the previous results [9]. The poor absorption in the near UV and visible range is thought to be caused by a transition involving extrinsic states, such as surface trap states, defects, or pollutants. Tauc plot is the com-

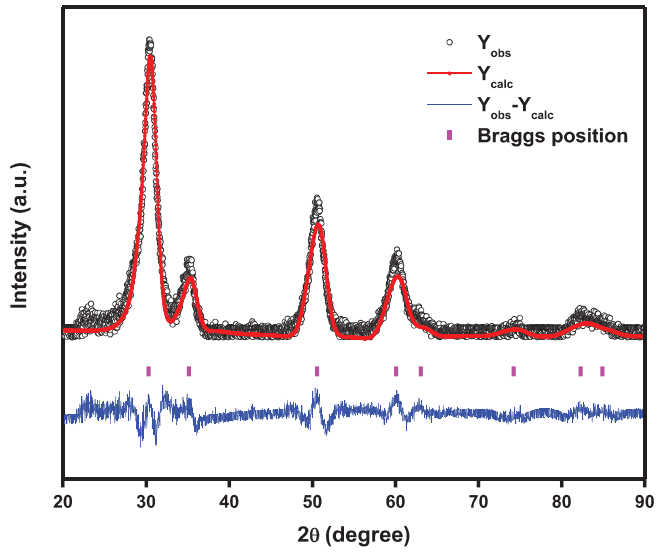



**Fig. 1.** XRD pattern of the Zirconium oxide calcined at 450° C.

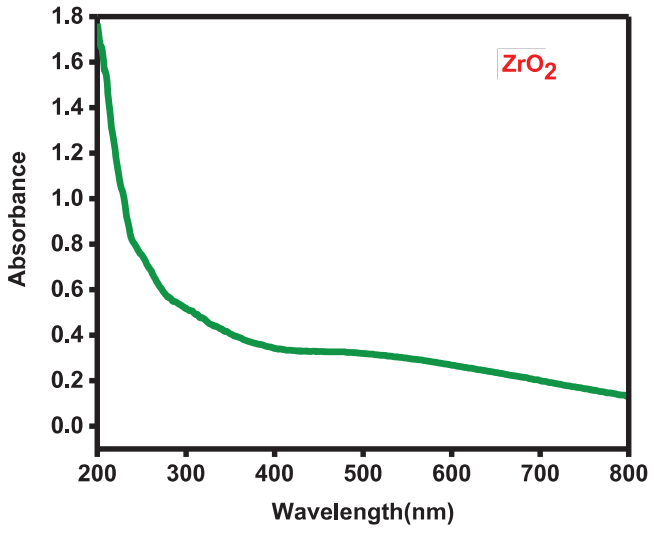



**Fig. 2.** UV absorption spectrum of the prepared $ZrO_2$.

mon way to calculate the band gap energy from the optical absorption spectra, which is based on the assumption that energy-dependent absorption coefficient can be expressed as [3].

$$\alpha(h\nu) = \text{constant}(h\nu - E_g)^n$$

Where α is the absorption coefficient at energy hν, $E_g$is the band gap energy and n is the constant. The value of the n depends on the probability of transition with values of ½ and 2 for the direct and indirect allowed transition. Fig. 3 displays $(\alpha h\nu)^2$ vs energy (hν) to estimate the band gap energy of the prepared sample, wherein, α is the absorption coefficient and (hν) is the photon energy. According to the absorption spectra, the estimated value of optical band gap is about 5.33 eV for the ZrO2 nanostructure sample. Optical band gap is important in the application of solar cell. It has wide range of application in opto-electronic devices, and in solid oxide fuel cell. Refractive index is another characteristic to investigate the optical properties of material. In the Fig. 4, a plot between the refractive index and wavelength was shown. Refractive index is the measurement of how fast the light propagates via a material. To measure the refractive index, percent transmittance calculated by the following expression

$$T_S = (10)^{-A} * 100$$

The equation to calculate the refractive index is as below

$$n = \frac{1}{T_S} + \sqrt{\frac{1}{(T_S - 1)}}$$

where $T_s$ is the percent transmittance, A is the absorbance and n is the refractive index. Graph shows that the refractive index decreases with the wavelength increases, which indicate that the light is deflected (or reflected) in small amount by the material.

### 3.3. FT-IR analysis

Fig. 5 depicts the FT-IR spectrum of $ZrO_2$ nanoparticles in the range of 500–4000 $cm^{-1}$. This was carried out to establish the molecular structure and presence of functional groups adsorbed by the $ZrO_2$ sample. Different bonds were found at the different wave number ($cm^{-1}$). The plot shows the strong and sharp absorption peak at 526 $cm^{-1}$ due to the Zr–O vibration, which indicates the formation of Zr–O. The broad absorption peak in the region of 1393 $cm^{-1}$ corresponds to O–H bonding (carboxylic acid), but the peak at 1539 $cm^{-1}$ may be due to absorbed water. A minor rise in the 3460 $cm^{-1}$ range is related to the stretching of O–H groups, which is a hallmark of highly hydrated compounds. The structural O=C=O stretching of the nanomaterials is shown by a peak at 2348 $cm^{-1}$.

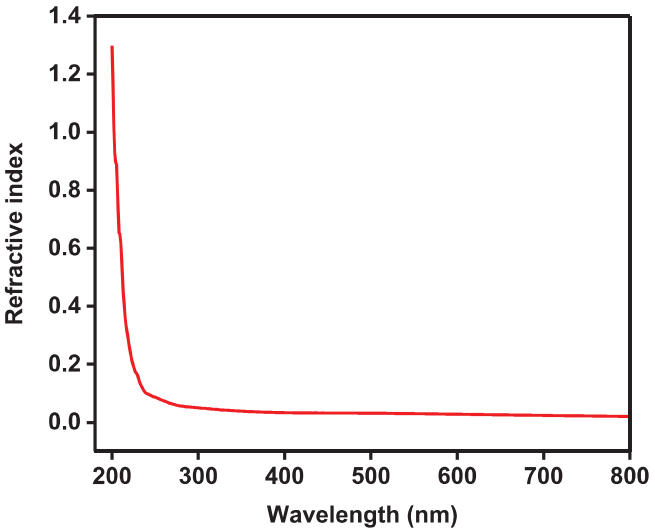



**Fig. 4.** Refractive index vs wavelength graph of $ZrO_2$.

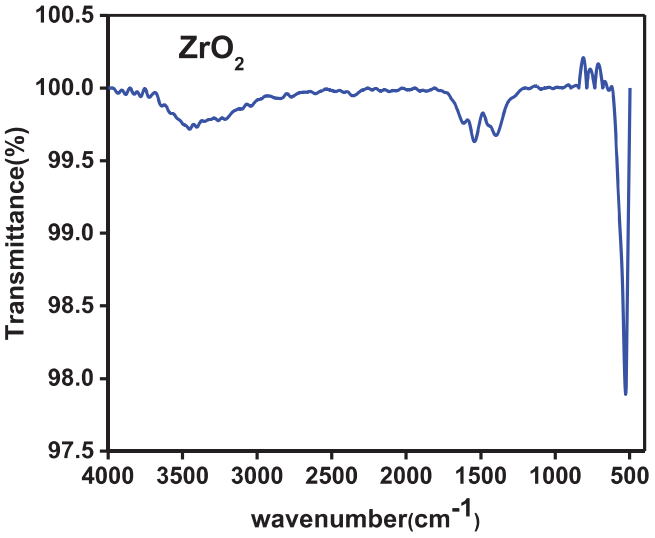



**Fig. 5.** FT-IR spectrum of the synthesized zirconia.

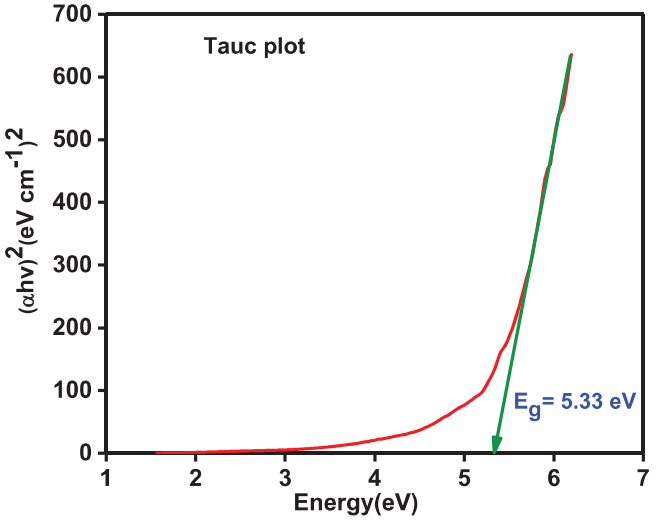



**Fig. 3.** $(\alpha h\nu)^2$ vs Energy (hν) plot for Zirconium oxides nanoparticles.

## 4. Conclusion

The nanosized $ZrO_2$ was successfully synthesized through the thermal decomposition method. The crystallite size of about 4.61 nm and cubic phase of the prepared ZrO2 was analyzed by XRD. The UV–Vis absorption spectra provided the optical band gap of about 5.33 eV. The FT-IR spectra showed that the various stretching bond at different wavelength are present in the sample.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Acknowledgements

One of us (NK) acknowledges the partial financial assistance from Govt. Holkar Science College, Indore, as seed money.

## References

[1] M.S. Santos, J.C.C. Freitas, C.J. Dalmaschio, CrystEngComm. 22 (2020) 1802–1811.
[2] J.A. Wang, M.A. Valenzuela, J. Salmones, A. Vazquez, A. Garcia-Ruiz, X. Bokhimi, Catal. Today 68 (2001) 21–30.
[3] Rajababu Chintaparty, Bhavani Palagiri, Ramamanohar Reddy Nagireddy and Venkata Subbha Reddy, Imma Reddy, Phase Transit. 88, 929–938 (2015).
[4] C. Suciu, L. Gagea, A.C. Hoffmann, M. Mocean, Chem. Eng. Sci. 61 (2006) 7831–7835.
[5] S. Sagadevan, J. Podder, I. Das, J. Mater. Sci. Mater. Electron. 27 (2016) 5622–5627.
[6] A. Gossard, F. Grasland, X. Le Goff, A. Grandjean, G. Toquer, Solid State Sci. 55 (2016) 21–28.
[7] M. Eshed, S. Pol, A. Gedanken, M. Balasubramanian, Beilstein J. Nanotechnol. 2 (2011) 198–203.
[8] R. Arreche, N. Bellotti, M. Blanco, P. Vazquez, Procedia Mater. Sci. 9 (2015) 627–634.
[9] M.A. Gondal, T.A. Fasasi, U. Baig, A. Mekki, J. Nanosci. Nanotechnol. 18 (2018) 4030–4039.

# SSR DOCUMENT

2022

## CRITERION – 3

## MoUs/Linkages/Collaborations

**Techritzy Pvt. Ltd., 236 ,Clerk Colony, Indore**

**Document Title:**

**A one-day visit and hands-on training on Python Technology were conducted by Techritzy Pvt. Ltd., Indore.**

कार्यालय प्राचार्य
शासकीय होलकर विज्ञान महाविद्यालय, इन्दौर
☎ 0731-2464074 ● फैक्स : 0731-2446806, 2764027
Email : principalhsc@rediffmail.com ● Web Site: www.collegeholkar.org

**Memorandum of Understanding for Academic and Industrial/academic Cooperation**
**Between**
**Department of Electronics, Government Holkar (Model, Autonomous) Science College Indore (M.P.) INDIA**
**And**
**Techritzy Pvt. Ltd., 236 Clerk Colony Indore (M.P.), INDIA**

It is hereby agreed that the Department of Electronics, Government Holkar (Model, Autonomous) Science College, Indore (M.P.), India and Techritzy Pvt. Ltd., 236 Clerk Colony Indore (M.P.), India will investigate the possibility of establishing a framework for educational, technical, and industrial cooperation for students and faculty of the Department of Electronics, Government Holkar (Model, Autonomous) Science College.
The Memorandum of Understanding (MOU) establishes the following:

**OBJECTIVE OF THE AGREEMENT**

1. On academic demand, the industry would give specific, stream-oriented lectures.
2. Industrial staff would provide training in advanced technologies and tools.
3. Industry will provide internship/major or minor projects/summer projects/projects for students as examples of areas of cooperation.
4. Students and faculty will be able to visit the Industry to learn about the environment of the industry.
5. Other activities as mutually agreed.

**IMPLEMENTATION OF THE MOU:**

From the Government Holkar (Model, Autonomous) Science College in Indore, the Department of Electronics will establish a nodal department. From the cooperation side, staff will be designated by the CEO.

**EFFECTIVE DURATION OF THE MOU:**

This MOU will become effective upon signature by the two institutes and will be in effect for 5 years, with the possibility of extension based on mutual agreement.

**FINANCIAL LIABILITIES**

There are no financial liabilities for either participant in implementing the MOU.
This MOU is signed by,

Head of the Department
ELECTRONICS
Govt. Holkar Science College
INDORE

Dr. Netram Kaurav HOD, Department of Electronics,
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

Dr. Suresh T. Silawat, Principal
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

Sunny Raikwar, CEO
Techritzy Pvt. Ltd., 236 Clerk Colony Indore (M.P.), INDIA

**Date of Implementation**
20/3/2021

TECHRITZY

**TechRitzy Private Limited**
Address : 236 Clerk Colony Indore
Contact : (+91)99264-90045
Website : www.techritzy.com
TAN - BPLT02776E

**Memorandum of Understanding for Academic and Industrial/academic Cooperation**
**Between**
**Department of Electronics, Government Holkar (Model, Autonomous) Science College Indore (M.P.) INDIA**
**And**
**Techritzy Pvt. Ltd., 236 Clerk Colony Indore (M.P.), INDIA**

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This MOU is signed by

Head of the Department
ELECTRONICS
Govt. Holkar Science College

**Dr. Netram Kashyap, HOD**, Department of Electronics,
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

**Dr. Suresh T. Silawat, Principal**
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

**Sunny Ratkowar, CEO**
Techritzy Pvt. Ltd., 236 Clerk Colony Indore (M.P.), INDIA

**Date of Implementation**
20/03/2021

SKILL DEVELOPMENT PROGRAM
2021-22

| S. No | Component/Activities | Details |
|---|---|---|
| 1 | Name of the Department / Unit / Agency: | Department of Electronics |
| 2 | Name of the Activity: | One Day Visit/Hands-On Training on Python Technology |
| 3 | Name of the Scheme: | Hands-On Training under the MOU |
| 4 | Date and Year of the Activity: | 17/01/2022 |
| 5 | Number of Students Participated in the activity: | 10 |
| 6 | Report of the Activity (in 100 words): | One of the most widely used programming languages nowadays is Python. Under the terms of the Memorandum of Understanding that the company and the college signed, Electronics Department, Government Holkar (Model, Autonomous) Science College in Indore organized a hands-on training session on Python technology on 17/01/2022 at Techritzy Pvt. Throughout this assignment, students created some Python applications. The industry has approved ten students for this tour, which will include hands-on instruction. This activity has received industrial approval from Mr. Sunny Raikwar and institutional approval from Dr. Suresh T. Silawat, the principal, and Dr. Netram Kaurav. |

शासकीय होल्कर विज्ञान महाविद्यालय
इन्दौर (म.प्र.) भारत – 452 017
फोन नं. : 0731-2464074, 244049
इलेक्ट्रॉनिकी विभाग

Date:- 13/01/2022

To,

Director,
Techritzy Pvt. Ltd.,
236 Clerk Colony,
Indore (M.P.),
INDIA,

Subject: -Proposal/Permission Letter for One-Day Visit/Training in Company

Respected Sir,

The intention of this letter is to seek permission for a one-day visit/training for the students of B.Sc. Electronics request you to kindly Provide some practical education with the hands-on training session. 10 students will be part of the visit accompanied by one teacher your kind consideration regarding the same will help.

I request you to kindly confirm our student's visit/Training.

**Students List**

| S.No | Students Name | S.No | Students Name |
|---|---|---|---|
| 1 | Gaurav Shrivastava | 6 | Sachin Chouhan |
| 2 | Aashish Rathore | 7 | Anjali Chimnani |
| 3 | Medinee Shukla | 8 | Sonam Bariya |
| 4 | Kshitij Yadav | 9 | Pinki Shukla |
| 5 | Kundan Chouhan | 10 | Divya Khichi |

Thanks for your kind corporation

Dr. Netram Kaurav
Head of the Department
HOD
Department of Electronics
ELECTRONICS
Govt. Holkar Science College
INDORE

TECHRITZY

**TechRitzy Private Limited**
Address : 236 Clerk Colony Indore
Contact : (+91)99264-90045
Website : www.techritzy.com
TAN - BPLT02776E

To,

Head,

Department of Electronics,

Govt. Holkar Science College, Indore

Subject: -Consent Letter for One-Day Industrial Visit/Training of your Students.

Dear Sir,

This is to inform you that we have cordially accepted your request for a one-day visit for a hands-on training session we are drafting a Module with the Practical session included in it.

You are requested to arrange a visit on 17/01/2022 date

Thanking you

TECHRITZY PRIVATE LIMITED

Director

| | | |
|---|---|---|
| 7 | List of Participants | Enclosed |

**Students List**

| S.No | Students Name | S.No | Students Name |
|---|---|---|---|
| 1 | Gaurav Shrivastava | 6 | Suchin Chouhan |
| 2 | Aashish Rathore | 7 | Anjali Chimnani |
| 3 | Medinee Shukla | 8 | Sonam Bariya |
| 4 | Kshitij Yadav | 9 | Pinki Shukla |
| 5 | Kundan Chouhan | 10 | Divya Khichi |

# SSR DOCUMENT

2022

## CRITERION –3

## MoUs/Linkages/Collaborations

**Techritzy Pvt. Ltd., 236 ,Clerk Colony, Indore**

**Document Title:**

**Lectures delivered by Mr. Sunny Raikwar, CEO of Techritzy Pvt. Ltd., in the Certificate Course conducted by the Department of Electronics**

कार्यालय प्राचार्य
शासकीय होलकर विज्ञान महाविद्यालय, इन्दौर
☎ 0731-2464074 • फैक्स : 0731-2446806, 2764027
Email : principalhsc@rediffmail.com • Web Site: www.collegeholkar.org

**Memorandum of Understanding for Academic and Industrial/academic Cooperation**
**Between**
**Department of Electronics, Government Holkar (Model, Autonomous) Science College Indore (M.P.) INDIA**
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5. Other activities as mutually agreed.

**IMPLEMENTATION OF THE MOU:**

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**EFFECTIVE DURATION OF THE MOU:**

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**FINANCIAL LIABILITIES**

There are no financial liabilities for either participant in implementing the MOU.
This MOU is signed by,

Head of the Department
ELECTRONICS
Govt. Holkar Science College
INDORE

Dr. Netram Kaurav HOD, Department of Electronics,
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

Dr. Suresh T. Silawat, Principal
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

Sunny Raikwar, CEO
Techritzy Pvt. Ltd., 236 Clerk Colony Indore (M.P.), INDIA

**Date of Implementation**
20/3/2021

TechRitzy Private Limited
Address : 236 Clerk Colony Indore
Contact : (+91)99264-90045
Website : www.techritzy.com
TAN - BPLT02776E

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**Between**
**Department of Electronics, Government Holkar (Model, Autonomous) Science College Indore (M.P.) INDIA**
**And**
**Techritzy Pvt. Ltd., 236 Clerk Colony Indore (M.P.), INDIA**

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This MOU is signed by

Head of the Department
ELECTRONICS
Govt. Holkar Science College

**Dr. Netram Kashyap, HOD**, Department of Electronics,
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

**Dr. Suresh T. Silawat, Principal**
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

**Sunny Ratkowar, CEO**
Techritzy Pvt. Ltd., 236 Clerk Colony Indore (M.P.), INDIA

**Date of Implementation**
20/03/2021

SKILL DEVELOPMENT PROGRAM
2021-22

| S. No | Component/Activities | Details |
|---|---|---|
| 1 | Name of the Department / Unit / Agency: | Department of Electronics |
| 2 | Name of the Activity: | Lectures in Certificate Course |
| 3 | Name of the Scheme: | Certificate Course and MoU |
| 4 | Date and Year of the Activity: | 19/11/2022 |
| 5 | Number of Students Participated in the activity: | 43 |
| 6 | Report of the Activity (in 100 words): | One of the most widely used programming languages nowadays is Python. Under the terms of the Memorandum of Understanding that the company and the college signed, Electronics Department, Government Holkar (Model, Autonomous) Science College in Indore organized a Certificate Course on hands-on training session on Python technology at Government Holkar Science College, Indore, from 19/11/2022 onwards. Throughout this assignment, students created several Python applications. |

शासकीय होल्कर विज्ञान महाविद्यालय
इन्दौर (म.प्र.) भारत – 452 017
फोन नं. : 0731-2464074, 244049
ईलेक्ट्रॉनिकी विभाग

To,

Date: 03.11.2022

Director

Techritzy,

Pvt. Ltd. Indore (M.P.)

Subject: Regarding lecture for Python Certificate Course under MOU.

Respected Sir,

The intention of this letter is to seek permission for lecture of certificate course on Basic programing with python is being organized by the Department of Electronics, for which a Basic programing with python Programmer Mr. Sunny Raikwar is being invited for the lecture.

So please kindly provide permission for that.

Thankyou

Dr. Nertam Kaurav
HOD
Department of Electronics





| 7 | List of Participants | Enclosed |
|---|---|---|

Govt. Holkar(Model, Autonomous) Science College, Indore (M.P.)
Department of Electronics
Certificate Course on Basics Programing with Python
Attendance Sheet
Exame March- 2022-23

Date: 20/03/2023

| S.No. | Enrollment No. | Roll No. | Student Name | Father Name | Mother Name | Amount | Mobile No. | Signature |
|---|---|---|---|---|---|---|---|---|
| 1 | BS2209482 | | Aastha Soni | Chandrakant Soni | Sadhna Soni | 1200 | 7869553289 | |
| 2 | DS2111601 | | Aayushi Pathak | Mr. Ramprasad Pathak | Hema Pathak | 1200 | 7828780431 | |
| 3 | DS2011333 | | Abhishek Kumar Malhotiya | Mr. Ashok Kr. Malhotiya | Mrs. Urmila Malhotiya | 1200 | 7224897034 | |
| 4 | | | Ajay Tanwar | Mr. Santosh Tanwar | Dev Tanwar | 1200 | 9685876752 | |
| 5 | DS2111195 | | Akash Mishra | Mr. Chandreshwar Mishra | Sulochana Mishra | 1200 | 9425131792 | |
| 6 | | | Akshat Awasthi | | | 1200 | 8827150817 | |
| 7 | DS2011401 | | Akshay Zade | Gyaneshwar Zade | Kalpana Zade | 1200 | 9926614821 | |
| 8 | DS 2111268 | | Amar Singh | RANJIT SINGH | SHIVA SINGH | 1200 | 9.1969E+11 | Amar |
| 9 | | | Amitabh Tiwari | Rajesh Kr. Tiwari | Shubha Tiwari | 1200 | 9893586963 | |
| 10 | | | Aryan Gwale | Dilip Gwale | Indira Gwale | 1200 | 9111653410 | |
| 11 | DS2010657 | | Baghel Sohan Bhagwan | Bhagwan Baghel | Jamoti Baghel | 1200 | 7972393534 | |
| 12 | DS2010660 | | Bhagwat Das Kushwaha | Tulsiram kushwaha | Radhabai Kushwaha | 1200 | 9691702195 | |
| 13 | | | Biswajit Singh | Pribhchandra | Sangeeta Singh | 1200 | 9977344979 | |
| 14 | | | Chandni Shiv | Dharmendra Shiv | Parvati Shiv | 1200 | 8269233918 | |
| 15 | | | Damru Shankar Khajuriya | Ramprasad | Nirmla Bai | 1200 | 9584073271 | |
| 16 | | | Deshna Jain | Deepak Jain | Neeta Jain | 1200 | 7987361325 | |
| 17 | DS2111966 | | Gaurav Parsai | Mr. Vinod Parsai | Mrs. Preeti Parsai | 1200 | 9584543695 | |

| S.No. | Enrollment No. | Roll No. | Student Name | Father Name | Mother Name | Amount | Mobile No. | Signature |
|---|---|---|---|---|---|---|---|---|
| 18 | | | Hareesh Kumar Singh Sotiya | Krishna Pratap | Shakuntala Singh | 1200 | 9407330463 | |
| 19 | DS2118647 | | Harshita Singh | Himmat Singh | Kamlesh Singh | 1200 | 8982113700 | |
| 20 | | | Janhavi Ghode | Sukhdeo ghode | Sulochana g. | 1200 | 9691707644 | |
| 21 | DS2013458 | | Jatin | Devendra Mujalda | Anjna mujalda | 1200 | 8269457179 | |
| 22 | DS2112269 | | Kaushal Amratiya | Ashok Amratiya | Rekha Amratiya | 1200 | 8770705676 | |
| 23 | 10115203625258 | | Khushi Daharwal | Parmanand Daharwal | Sangeeta Daharwal | 1200 | 8236068579 | |
| 24 | | | Kratika Yadav | Vikrant Singh Yadav | Rashmi Yadav | 1200 | 8319284756 | |
| 25 | DS2112555 | | Mansi Gupta | Mr. Rajendra | Mrs. Neetu | 1200 | 7869196423 | |
| 26 | DS2112675 | | Nandini Bhatt | Mr. Rakesh Bhatt | Mrs Sangeeta Bhatt | 1200 | 7415019622 | |
| 27 | DS2112843 | | Omsingh Patel | Mr. Anil patel | Mrs Shraddha Patel | 1200 | 7999667505 | |
| 28 | | | Rashi Sahija | Mr Harbans Singh | Mrs. Mandeep Kaur | 1200 | 9111430130 | |
| 29 | | | Ritesh Uikey | Manglu Uikey | Koushalya Uikey | 1200 | 8226013038 | |
| 30 | | | Sajal Suryavanshi | Pushpa Suryavanshi | Alka Suryavanshi | 1200 | 7440646691 | |
| 31 | DS2113595 | | Saloni Rana | Deepchand Rana | Asha Rana | 1200 | 9302882446 | |
| 32 | DS2112031 | | Seema Parte | Ganpat Parte | Hareli Parte | 1200 | 8827528437 | |
| 33 | DS2113788 | | Shivam Prajapati | Mr Amit Kumar Prajapati | Rajkali Prajapati | 1200 | 7581009067 | |
| 34 | DS2113788 | | Shraddha Tiwari | Mr Narendra Tiwari | Mrs Aneeta tiwari | 1200 | 7489817970 | |
| 35 | | | Shreya Pandey | Deepak pandey | Vinanti pandey | 1200 | 8871037952 | |
| 36 | DS2113926 | | Sonali Upadhyay | Mr Sanjay Upadhyay | Mrs Savita Upadhyay | 1200 | 9005405017 | |
| 37 | | | Suraj Jat | Narmada Prasad Jat | Rekha Jat | 1200 | 7067433092 | |

| S.No. | Enrollment No. | Roll No. | Student Name | Father Name | Mother Name | Amount | Mobile No. | Signature |
|---|---|---|---|---|---|---|---|---|
| 38 | | | Tanmay Gupta | Dharmendra Gupta | Rekha Gupta | 1200 | 9111596169 | |
| 39 | | | Tanya Keshari | mr. Dharmendra Gupta | mrs. Rekha Gupta | 1200 | 7898226194 | |
| 40 | DS 2114288 | | Virat Singh Chauhan | Pradeep Singh Chauhan | Savita Singh | 1200 | 9301448386 | |
| 41 | | | Yash Ranje | Rakeshchand Ranje | Savitou Ranje | 1200 | 6263077119 | |
| 42 | | | Yashi Pateriya | Devendra Pateriya | Sunita Pateriya | 1200 | 9589705755 | |
| 43 | DS2011934 | | Yeeshoo Digarse | Tikendra Kumar Digarse | Komal Lata Digarse | 1200 | 8602115370 | |
| 44 | | | | | | 1200 | | |
| 45 | | | | | | 1200 | | |
| 46 | | | | | | 1200 | | |

Dr. N. Kaurav
HOD
Department of Electronics

# SSR DOCUMENT

2022

## CRITERION –3

## MoUs/Linkages/Collaborations

Sri Aurobindo Medical College and
PG Institute, Indore, Madhya Pradesh

**Document Title:**

The Department of Forensic Science organized an educational visit to the Sri Aurobindo Medical College and PG Institute, Indore.

1757
20-21

# MEMORANDUM OF UNDERSTANDING

**For Academic and Scientific Cooperation**

**BETWEEN**

**Government [Model, Autonomous] Holkar Science College, Indore, Madhya Pradesh**

**&**

**Sri Aurobindo Medical College and PG Institute, Indore, Madhya Pradesh**

---

This Memorandum of Understanding (MOU) is entered into on the **1st day of November 2021** by and between the representatives of Govt. [Model Autonomous] Holkar Science College, Indore and Sri Aurobindo Medical College and PG Institute, Indore, Madhya Pradesh. The aforesaid institutions are hereinafter referred to individually as 'institute' and collectively as 'institutes'.

The Memorandum of Understanding (MOU) establishes the following

## 1. OBJECTIVE OF THE AGREEMENT

To establish a mutually beneficial relationship built on academic and scientific cooperation. Areas of cooperation between the Govt. [Model, Autonomous] Holkar Science College, Indore, M.P. and Sri Aurobindo Medical College and PG Institute, Indore, Madhya Pradesh include the exchange of researchers, students, publications, books, academic programs, and research projects.

## 2. GOALS AND FORMS OF COOPERATION

The signing institutions agree to provide opportunity, as appropriate, for the following activities towards the completion of the objective of this MOU.

a. Exchange of students and/or researchers with the objective of offering courses and realizing research projects in areas mutually agreed upon by both institutes through prior invitation and in accordance with the procedures and expectations established by each institute and specific department.
b. Exchange of books, scientific publications, study programs, academic projects, course information, seminars, conferences and any other date and information of common interest.
c. Develop joint research projects, internship projects, dissertation, and joint publications.
d. All joint activities will be realized through the mutual agreement and clearly established conditions and mutual obligations of the appropriate institute entity.

## 3. IMPLEMENTATION OF THE MEMORANDUM OF UNDERSTANDING

The objectives of the MOU will be implemented and regulated in the following manner:

*i. Student Exchange*

a. Students and research scholars may visit the corresponding departments of these institutes after finalizing a mutually acceptable schedule.

Warade
DEAN
Sri Aurobindo Medical College & P.G. Institute
INDORE (M.P.)

b. All the expenses shall be the direct responsibility of the student concerned (subject to any agreements on payment arrangements made by either institution with its own students).

These expenses include (but not limited to):

- Travel expense
- Reprographic and Internet Usage Expenses
- Required student services fees at the host institution
- Books and academic supplies
- Administrative fees, if any.

### *ii. Exchange of researchers*

With the objective of strengthening ties through joint projects and research activities of both institutes, the MOU allows for the creation of researcher exchange. The following conditions will apply:

i. The researchers will maintain their status as research scholars at their home institution for the duration of the exchange.
ii. The researchers will be allowed to make use of the instruments and other research facilities available in various departments of these institutes after prior approval of the visiting schedule.
iii. The appropriate academic departments and administrative offices will assist in securing housing and other necessary arrangements for living in the host institution's city, whenever feasible.

### *iii. Research and Resources*

- Both the institutes agree to jointly hold/conduct, whenever feasible, National/International events, workshop, conferences, training programs, and demonstration (of procedures and working of the instruments available in the laboratories of the institutions).
- Faculty members shall be encouraged to develop joint research projects and joint publications.
- All the joint activities shall be realized though the mutual agreement and clearly established conditions and mutual obligations of the appropriate university entity.
- In case of Joint-Research Project(s) by the Faculty members of the institutes is/are funded by any agency (such as UGC, DBT, DST, etc.), the funds as well as the conduct of such a project shall be governed as per the established norms, direction and/or regulations of such agency.

### Coordinators

Both Institutes will designate persons who will have responsibility for co-ordination and implementation of this agreement.

Sri Aurobindo Mahavidyalaya & P.G. Institute
INDORE (M.P.)

## 4. DURATION AND RECINDENCE OF MOU

a. This MOU, unless extended by mutual written consent of the institutes, shall expire in Ten years after the effective date specified in the opening paragraph. However, on review, the MOU may be extended for another term by mutual consent.
b. Changes to this agreement shall be made by mutual consent between both institutions. In cases of disagreement, the Institute wishing to depart from the agreement shall, wherever possible, give two months' notice of its intention to do so. The agreement shall be reviewed after a period of ten year.
c. This MOU is being signed purely with the intention of academic and scientific cooperation without any financial liabilities.
d. The terms and condition of this MOU shall be governed by the existing rules and regulations and their modification (if any), as issued of both the institutes.

**Signed**

By signing below, the institutes, acting by their duly authorized officers, have caused this Memorandum of Understanding to be executed, effective as of the day, month and year first above written.

---

On behalf of

Principal
Holkar Science College
INDORE

**Principal**
**Govt. [Model, Autonomous] Holkar Science College, Indore M.P.**

On behalf of

DEAN
Sri Aurobindo Medical College & P.G. Institute
INDORE (M.P.)

**Dean**
**Sri Aurobindo Medical College and PG Institute, Indore, M.P.**

In presence of the following witnesses / MOU coordinators:

**Dr. Vijay R. Chourey**
**Professor & Head**
**Dept. of Forensic Science**
**Govt. [Model, Autonomous] Holkar Science College, Indore, M.P.**

Dr. Vijay R. Chourey
Professor and Head
Forensic Science Department
Govt. Holkar Science College
Indore (M.P.)

Professor & Head
Dept. of Forensic Medicine
SAIMS, INDORE

**Dr. Praveen Kumar Arora**
**Professor & Head**
**Department of Forensic Medicine & Toxicology, Sri Aurobindo Institute of Medical Sciences Indore, M.P.**

Govt. Holkar (Model, Autonomous) Science College, Indore
(M.P.) Pin - 452017
Department of Forensic Science

Memorandum of Understanding
Between
Sri Aurobindo Medical College and PG Institute, Indore
And
Department of Forensic Science, Govt. Holkar (Model, Autonomous) Science College, Indore

We jointly enter into a MOU for the Expertise sharing, training, collaborative research, promote projects/ internship programs, organization of moot courts, workshop etc for learning and training purpose of students, faculties and other associated personnel's.

Following Activity has been conducted under this:

- **Student Exchange**
  Educational Visit: Morturary
  Date: 15/01/2022
  **List of Students**: Enclosed
  **Student's Feedback**

A visit to the Mortuary on 15th of January 2022:
I want to thank our faculties on behalf of everyone who were a part of this visit for making it a great learning experience for all of us.
Dr. Abhishek Sir, who was the Assistant Professor of the Department of Forensic Medicine, he took us to the museum and explained and gave knowledge about:
Types of crime weapons.
Firearm injuries.
Mechanical injuries.
Various bones and skull.
Preservation of viscera and foetus.
Types of Poisons, etc.
Later, Dr. Pankaj Sir took us to the Mortuary where we learned about Cold storage (where an unknown body is not kept for more than 72 hours), X- ray room (Examination of a deceased body is done who has been killed by firearm.), Types of weapons used during an autopsy. Weighing machine (to weigh an organs), Mortuary headrest, etc.
Lastly, we got an opportunity to see an Autopsy of a man who was 38 years old. He was a truck driver whose battery exploded in Dewas and he got burnt due to fire. Before proceeding to an Autopsy Dr. Abhishek sir explained us about panchnama and who gives panchnama to the Doctor. Here, panchnama was given by Head Constable but in other states panchnama is only given by S.I and upper rank of S.I. Abhishek Sir also took statement of deceased body's brother.
This was the case of Burning, who was fighting for life and death in Aurobindo Hospital from 25th December to 15th January, but could not survive in the end. He died at 11.30 am. During Post-mortem, Sir showed us the organs of deceased body from inside because his body was already infected. His body was burned with red yellowish-green discolouration. With the help of rule of nines Sir, calculated the burns of the whole body. Due to multi-organ failure, the size of his organs like spleen, liver, kidney was larger than normal.
Ideal size of spleen is 198.45 gm whereas his size was 360 gm and normal size of kidney is 150 gm whereas his size was 230 gm.
When he opened his brain with the help of a brain knife, his brain was filled with pus. His stomach was full of ulcers.
Once again, Thankyou ma'am for giving us chance to gain precious knowledge from professionals.

Govt. Holkar (Model, Autonomous) Science College, Indore (M.P)

Department of Forensic Science

Session 2021-2022

List of students are selected for the Morturary visit:

| S.No. | Name of the Students |
|---|---|
| 1 | aakanksha kushwah |
| 2 | Mayuri solanki |
| 3 | Komal jadhav |
| 4 | Saloni mitola |
| 5 | preeti dangi |
| 6 | Nirmala mori |
| 7 | shivangi gavliya |
| 8 | Tanushri johari |
| 9 | Manjula kirade |
| 10 | Sneha Agnihotri |
| 11 | Sheetal chourasia |
| 12 | Sharon Gautam |
| 13 | Ishika bhawsar |
| 14 | Muskan Patil |
| 15 | Vaishali Sahu |
| 16 | Aditya Joshi |
| 17 | Hema Rawat |
| 18 | pragya tekam |
| 19 | Abhishek singh |
| 20 | Soumya verma |
| 21 | Sharad patidar |
| 22 | Anshika Mahor |
| 23 | Israr Ahmed |
| 24 | Swati Pandey |
| 25 | Megha Malviya |
| 26 | BHUMI MEENA |
| 27 | Khushboo shukla |
| 28 | palak shrivastav |
| 29 | Aayush bhalse |
| 30 | Shreyasi Nag |
| 31 | Vrinda Patidar |
| 32 | vishakha kashyap |
| 33 | saloni mahour |
| 34 | Kshitij Kumar Pandey |
| 35 | Deepak parihar |
| 36 | Himanshu rathore |
| 37 | Nikita Thakur |
| 38 | Reeta gain |

# SSR DOCUMENT

2022

## CRITERION –3

## MoUs/Linkages/Collaborations

Elite Informatics, Indore

**Document Title:**

Internship training was conducted by Elite Informatics, Indroe, for M Sc Chemistry students.

ELITE ANALYTICS INC.

*All that your lab Needs...*

**ELITE ANALYTICS INC,INDIA**

310 , KALANI NAGAR,AIRPORT ROAD, INDORE

# CERTIFICATE

**Issued To : GOVERNMENT HOLKER SCIENCE COLLEGE, INDORE**

This is to confirm that we Elite Analytics Inc, INDIA, has a MOU with Govt. HOLKER SCIENCE COLLEGE,Indore (under document number: 24 Chem ).

We are organising Technical Trainings over Analytical Instrumentation and Analysis Techniques every Year since 2020 for M.Sc / B.Sc final year in the Institute and in Our labs.

We are conducting this training based on Industrial requirment and with our speakers from Varios PHARMA companies in M.P. Also we provide below activity during every year training :

1. ANALYTICAL INSTRUMENT HAND ON TRAINING.
2. ANALYTICAL ANALYSIS OF VARIOUS DRUGS IN FOOD AND PHARMA.
3. CROSS AREA TRAINING IN OUR LABS AND TO PHARMA COPANIES.
4. PROVIDING ANALYTICAL PROCUDURE DOCUMENTATION FROM VARIOUS GUIDELINES.
5. HELPING STUDENTS FOR THEIR P.hd RESEARCH WORK, PROVIDING PAPERS & BOOKS.

We are bide to provided our technical knowledge and experties to help improve students knowledge and hands on experiance over analytical instruemntation, Globel document process training, method development on instruemntation, and research work.

We are thankfull to Dr.Anamika Jain HOD Chemsitry department for their help during trainings, and to all the staff helping us for conducting trainngs sucessfully.

With Best Regards:
Elite Analaytics Inc, India.
Subodh Thakur.
info@eliteanalytics.in
+917000660259

Digitally signed by subodh thakur
DN: cn=subodh thakur, o=ELITE ANALYTICS INC, ou=Admin, email=info@eliteanalytics.in, c=IN
Date: 2021.06.21 15:12:28 +05'30'

SUBODH THAKUR

**MEMORANDUM OF UNDERSTANDING FOR ACADEMIC AND SCIENTIFIC COOPERATION**

**BETWEEN**

Govt. [Model, Autonomous] Holkar Science College, Indore, M. P.

&

Elite Analytics Inc, Indore

The representatives of Govt. [Model, Autonomous] Holkar Science College, Indore and Elite Analytics Inc, Indore agree to this Memorandum of Understanding.

The Memorandum of Understanding (MOU) establishes the following:

**1. OBJECTIVE OF THE AGREEMENT**

To establish a mutually beneficial relationship built on academic and scientific cooperation. Areas of cooperation between the Govt. [Model, Autonomous] Holkar Science College, Indore, M. P. and *Elite Analytics Inc. Indore* include the exchange of researchers, students, publications, academic programs and research projects.

**2. GOALS AND FORMS OF COOPERATION**

The signing institutions agree to provide opportunity, as appropriate, for the following activities towards the completion of the objective of this MOU.

1. Exchange of students and/or researchers with the objective of offering courses and realizing research projects in areas mutually agreed upon by both institutes through prior invitation and in accordance with the procedures and expectations established by each institute and specific department.
2. Exchange of books, scientific publications, study programs, academic projects, course information, seminars, conferences and any other data and information of common interest.
3. Develop joint research projects and joint publications.
4. All joint activities will be realized through the mutual agreement and clearly established conditions and mutual obligations of the appropriate institute entity.

## 3. IMPLEMENTATION OF THE MEMORANDUM OF UNDERSTANDING

The objectives of the MOU will be implemented and regulated in the following manner:

### *i. Student Exchange*

a. Students and research scholars may visit the corresponding departments of these institutes after finalizing a mutually acceptable schedule.

b. All the expenses shall be the direct responsibility of the student concerned (subject to any agreements on payment arrangements made by either institution with its own students). These expenses include:

1. Travel expenses
2. Reprographic and Internet Usage Expenses
3. Required student services fees at the host institution
4. Books and academic supplies
5. Administrative fees, if any.

### *ii. Exchange of researchers*

With the objective of strengthening ties through joint projects and research activities of both institutes, the MOU allows for the creation of researcher exchange. The following conditions will apply:

a. The researchers will maintain their status as research scholars at their home institution for the duration of the exchange.
b. The researchers will be allowed to make use of the instruments and other research facilities available in various departments of these institutes after prior approval of the visiting schedule.
c. The appropriate academic departments and administrative offices will assist in securing housing and other necessary arrangements for living in the host institution's city.

### *iii. Research and Resources*

Govt. [Model, Autonomous] Holkar Science College, Indore and Elite Analytics Inc, Indore promote research and realize collaborative projects, giving priority to interdisciplinary works.

## 4. DURATION AND RECINDENCE OF MOU

a. The agreement shall come into effect on 10.10.20. Changes to this agreement shall be made by mutual consent between both institutions. In cases of disagreement, the Institute wishing to depart from the agreement shall, wherever possible, give two months' notice of its intention to do so. The agreement shall be reviewed after a period of one year.

b. This MOU is being signed purely with the intention of academic and scientific cooperation without any financial liabilities.

This MOU is signed by,

Dr. Suresh T. Silawat
Principal,
Govt. Holkar Science College,
Indore (M.P.)

Principal
M. Holkar Science College
INDORE

And

Shri Subodh Thakur
DIRECTOR, *Elite Analytics Inc. Indore* Madhya Pradesh -

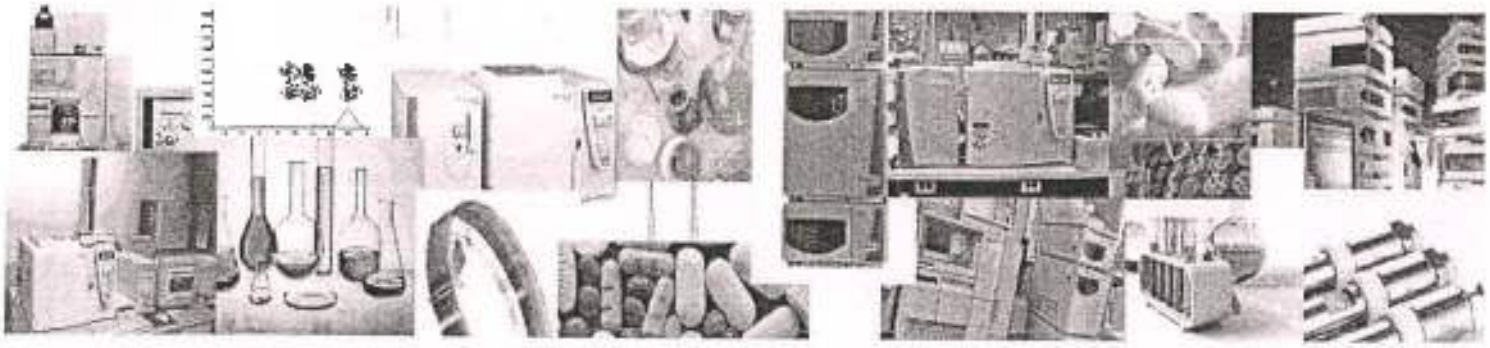
In presence of the following witnesses:

1. Dr. Vijayshri Nilosey
2. Dr. Rajshri somani

Govt. Holkar Science College

# ELITE INSTITUTE

OF ADVANCE ANALYTICAL & RESEARCH TRAINING



## About Us

We are one of the most recognized Industrial training institute in Central India & M.P. Since last few years, our institute retain the strengths of a small organization - quick decision and cajole structures. But we have grown by leaps and bounds in our confidence that we can be the best Chromatography training institute in India. This is our quest that steers us to perform better and better. Our institute is a leader in the use of environment friendly technologies.

## Mission & Goals

The Elite institute of Advance Analytical Research & Training Institute was founded on the belief that both laboratories and instrument suppliers could be better served through an independent organization whose desire is to improve the flow of factual information concerning chromatography instrumentation, theory and operation. We are committed to providing the services in the best, most effective and reasonably priced structure.

# ELITE INSTITUTE

OF ADVANCE ANALYTICAL & RESEARCH TRAINING

## Understanding of Pharmacy Equipment

Duration: 15 Days x 2.5Hrs.
Eligibility: Fresher's / Experience with B.Sc./M.Sc./B.Pharm/M.Pharm/P.hd

- Basic principal of instrument and it'sworking .
- Identification of instruments
  - pH meter
  - Analytical balance
  - GC
  - HPLC
  - FTIR
  - GC with headspace and auto sampler
  - UV visible spectrophotometer
  - Atomic Absorbance Spectrophotometer
  - Dissolution

* We will provide practical training on the avilable instruments in the college premises.
* Also will discuss about hte various pharmacopia and GMP GXP modules.
* Regulatory affairs and their guidelines.
* Local Lab Compliance and procedures of reading SOP and other documentation procedures.
* Interview Questations asked in pharma sector.
* advice on intrest of students to choose thier stream like QC/QA/ Stability/ Microbiology etc.

# ELITE INSTITUTE

OF ADVANCE ANALYTICAL & RESEARCH TRAINING

One of the most frequently heard comments at our courses are "This course has exceeded my expectations!" Course after course, they tell as how much better our courses are.

How understandable, concise, enjoyable, practical, and helpful they are. The material we provide is sound in the fundamentals, and clear in its presentation. Our courses are also personal. Class size is manageable (usually about 7-8), allowing the instructor to customize the presentation according to the applications and needs of the participants. Questions are encouraged and answered simply and practically.

For Any Further Query Regarding above stated course or content of the document please contact us at given contact number or email ID. We will be happy to assist you for any query or enquiry.

With Best Regards:

Subodh Thakur | Elite Institute (EI-Art) | Elite Analytics Inc. |

+91.7000660259, +91.9584992661 | Info@eliteanalytics.in | Subodh_thakur@outlook.com |

रसायनशास्त्र विभाग, शासकीय होलकर विज्ञान महाविद्यालय, इन्दौर म.प्र.

दिनांकः 23.03.2022

## / / आवश्यक सूचना / /

विभाग के समस्त प्राध्यापकों/अतिथि विद्वानों को सूचित किया जाता है कि कल दिनांक 24/03/2022 को दोपहर दो बजे प्राचार्य महोदय द्वारा, एम.एस–सी. चतुर्थ सेमेस्टर के विद्यार्थियों की इंटर्नशिप का विधिवत उद्घाटन किया जायेगा।

अतः विभाग के समस्त प्राध्यापक/अतिथि विद्वान दो बजे यशवंत हॉल में अनिवार्यतः उपस्थित रहे।

आज्ञा से विभागाध्यक्ष

*Department of Chemistry, Govt. Holkar Science College, Indore*
*[M.P.]*

# *Internship Training on Instrumentation*

Total Hours: 60

| Date & Day | Time | Topic | Lecture/Practical | Guest Lecture |
|---|---|---|---|---|
| 23.03.2022 Wednesday | 02:00 pm | Inauguration | | Mr. Subodh Thakur *Analyst* *Mob. : 7000660259* |
| | 01:30 to 02:30 pm | Lunch Break | | |
| | 02:30 to 5:00 pm | Introduction to Training / Pharma Overview & Instrument Brief | Lecture | |
| 24.03.2022 Thursday | 10:00 to 01:30 pm | pH Meter Introduction & Analytical Balance | Lecture | Mr. Subodh Thakur *Analyst* *Mob. : 7000660259* |
| | 01:30 to 02:30 pm | Lunch Break | | |
| | 02:30 to 5:00 pm | Usages and Procedure of use / Balance need, usages and practices | Practical | |
| 25.03.2022 Friday | 10:00 to 01:30 pm | HPLC System | Lecture | Mr. Subodh Thakur *Analyst* *Mob. : 7000660259* |
| | 01:30 to 02:30 pm | Lunch Break | | |
| | 02:30 to 5:00 pm | Usages Pharma and Food | Practical | |
| 26.03.2022 Saturday | 10:00 to 01:30 pm | HPLC System | Practical | Mr. Subodh Thakur *Analyst* *Mob. : 7000660259* |
| | 01:30 to 02:30 pm | Lunch Break | | |
| | 02:30 to 5:00 pm | Usages Pharma and Food | Practical | |
| 28.03.2022 Monday | 10:00 to 01:30 pm | UV Visible Spectroscopy System | Lecture | Mr. Subodh Thakur *Analyst* *Mob. : 7000660259* |
| | 01:30 to 02:30 pm | Lunch Break | | |
| | 02:30 to 5:00 pm | Usages Pharma and Non Pharma | Practical | |
| 29.03.2022 Tuesday | 10:00 to 01:30 pm | FTIR System | Lecture | Mr. Subodh Thakur *Analyst* *Mob. : 7000660259* |
| | 01:30 to 02:30 pm | Lunch Break | | |
| | 02:30 to 5:00 pm | Usages Pharma and Non Pharma | Practical | |
| 30.03.2022 Wednesday | 10:00 to 01:30 pm | AAS System | Lecture | Mr. Subodh Thakur *Analyst* *Mob. : 7000660259* |
| | 01:30 to 02:30 pm | Lunch Break | | |
| | 02:30 to 5:00 pm | Usages Pharma and Non Pharma | Practical | |
| 31.03.2022 Thursday | 10:00 to 01:30 pm | GMP & GXP Overview | Lecture | Mr. Subodh Thakur *Analyst* *Mob. : 7000660259* |
| | 01:30 to 02:30 pm | Lunch Break | | |
| | 02:30 to 5:00 pm | Pharma Appearance | Practical | |

| Date & Day | Time | Topic | | Guest Lecture |
|---|---|---|---|---|
| 01.04.2022 Friday | 10:00 to 01:30 pm | Dissolution System / Interview Preparation | Lecture | Mr. Subodh Thakur *Analyst* *Mob. : 7000660259* |
| | 01:30 to 02:30 pm | Lunch Break | | |
| | 02:30 to 5:00 pm | Usages Pharma and Food | Practical | |
| 02.04.2022 Saturday | 10:00 to 01:30 pm | Gas Chromatography | Visit | Mr. Subodh Thakur *Analyst* *Mob. : 7000660259* |
| | 01:30 to 02:30 pm | Lunch Break | | |
| | 02:30 to 5:00 pm | Q & A Session | | |
| 04.04.2022 Monday | 10:00 to 01:30 pm | BOD / COD | Lecture | Mr. Subodh Thakur *Analyst* *Mob. : 7000660259* |
| | 01:30 to 02:30 pm | Lunch Break | | |
| | 02:30 to 5:00 pm | Demonstration | Practical | |
| 05.04.2022 Tuesday | 10:00 to 01:30 pm | Resume/Placement/ Mock Test | | Mr. Subodh Thakur *Analyst* *Mob. : 7000660259* |
| | 01:30 to 02:30 pm | Lunch Break | | |
| | 02:30 to 5:00 pm | Valedictory | | |

Dr. Aparna Gandhe
Dr. M. K. Dwivedi
Co-Convener

Dr. Anamika Jain
HOD, Chemistry
Convener

Dr. Suresh T. Silawat
Patron & Principal

GOVT. HOLKAR SCIENCE COLLEGE
INDORE

# INTERNSHIP REPORT

SUBMITTED TO :- DR. APARNA GANDHE MAM

SUBMITTED BY :- ANAMIKA SINGH

CLASS :- M.SC. FINAL YEAR 2021-2022

ENROLL. NO. :- DS1718510

DATE :- 18 APRIL 2022

On 7th April, the department of chemistry of Govt. Holkar Science College Had organized the session on instrumentation training for 10 days.

The session or training was open to the students in approximately 60 students were in session. The 1st day was interesting, we all were excited at the same time very curious.

Our trainer Mr. Subodh Thakur had very impressive and positive attention. He began with his introduction and shared his experience about instrument which are very useful in any pharma industry. The interaction between student and sir was very good. Sir informed us name of the different instruments which we learned during this training period.

Here is the list of what we learned during this training,

1. PH meter
2. Analytical balance
3. UV visible spectroscopy
4. HPLC (High Performance Liquid Chromatography)
5. FTIR (Fourier Transform Infrared Spectroscopy)
6. AAS (Atomic Absorption Spectroscopy)
7. Gas chromatography
8. Dissolution apparatus
9. GMP and GXP
10. Interview preparation

On the 8th April which was the 2nd day of our training. Again, with same enthusiasm we were waiting for our trainer.

The day or instrumentation training session was started with the introduction of 1st important instruments which is very useful in any industry that is PH meter.

We all were familiar with these word PH meter but the basic knowledge and whole working was explained by our trainer. The session was started with introduction of PH meter basic principle which basically depend on glass electrode in a given solution. Basically, it is a important in any industry which is use to major PH of any solution. He discussed about the electrodes in PH determination, it working mechanism, applications and advantages and disadvantages. Most importantly he explained about calibration technique. This is very important for every instrument by calibration we know about the accuracy of any instrument.

The 2nd instrument which he discussed about was analytical balance which is use to give an accurate measurement. They measure the force(weight) that acts downward on the balance pan. Sir informed us basic principle of analytical balance and what is the importance of exact weight of any chemical from least count to maximum count and also explained about different types of analytical balance used in pharma industry.

This is how our 2nd day of training ended with some technical knowledge of two instruments.

On 9th April which was the 3rd day of our training. On this day we learn about the UV visible spectroscopy. We learn the working principle of spectrometer. Its principle is based on beer's lambert law.

$$A = ECL$$

It is used to know the concentration of any solute in solution. After lunch sir informed us how to operate spectrophotometers and also sir informed us how calibration process is done in industries.

Many students make their samples in laboratory and perform practically on spectrophotometers they know the concentration of their sample.

He explained about how UV play a major role in pharmaceutical industries. At last sir tell as what type of spectrophotometer in industries and working mechanism of it. This is how our 3rd day of training ended with technical knowledge of instruments.

On 11th April which was the 4th day our training on instrumentation. In today's lecture we know about the HPLC method.

HPLC is high performance liquid chromatography it is a chromatographic technique used to separate components of mixture for the purpose to identify quantity purify. The individual components of the mixture.

Sir is informed us how to use of this technique in any pharma industry and also its use in various types of other industries.

In this lecture we know about the instrumentation and working of HPLC. HPLC instrument consists solvents, pumps, mixer, injector, column, detector.

The training will provide exposure to the advance in the field of HPLC to the experienced analyst and both basics and practical aspects to bigness.

Wide coverage is given to fundamental concepts of laboratory operation.

At last sir discussed about advantages & disadvantages of HPLC and its applications in various fields.

On 12th April 5th day of our internship training we understand each and every rules and regulations necessary to operate HPLC.

On this day firstly some of the student give their presentation on HPLC and they explain very well.

After that many students brings different types of samples to perform HPLC then we all prepare our sample by specific sample preparation methods. After the preparation of our sample we go for the further process.

Under the guidance of our trainer we performed the HPLC method and we all got our results of different samples like Aciloc and tomato ketch up, paracetamol.

Sir informed about the role of accuracy and calibration in HPLC and he also explained about the applications of HPLC on various fields and major role in pharma industry.

At last, we all learn about the working principle and uses of HPLC.

On 13th April 6th day of our internship training. We learned about FTIR (Fourier Transform Infrared Spectroscopy) instrumentation and what is all about the FTIR.

In the first session sir tell us about the working, principle and instrumentation of FTIR. It is a technique used to obtain an infrared spectrum of absorption or emission of a solid, liquid, gas. An FTIR spectrometer simultaneously collects high resolution spectral data over a vide spectral range.

After lecture we took a break then we move towards the lab for the practical.

There we collects sample and placed over the FTIR for a while after few minutes the detector collects the data and as per the data the spectrum was plotted on the computer screen with the help of software.

On 14th April 7th day of our internship training. Today we learn about the atomic absorption spectrometer.

Atomic absorption spectrometer is used to analyse element in solution.

1st we attended the theory about the AAS after that we took a lunch break 30 min then we went for the practical.

WORKING :-

Absorption spectroscopy works by determining what wavelengths get absorbed by a material. All wavelengths not absorbed by a material will pass through and be measured by a sensor. Every specific molecule or chemical will absorbed only specific wavelengths.

The instrument was quite big it has a light source, burner, monochromator, detector, computer and a gas tank connected to the burner.

As per hour sample we place cathode in light source then we ignite the burner then sample is transferred to the burner through solution pipe for atomization the light source started the light is pass through the flame to the monochromator where we already set the wavelength as per our sample and the detector the electromagnetic wave and send to the computer and as per the signals the computer plots the diagram.

On 15th April 8th day of our internship training.

Today we learn about gas-chromatography

It is a process of separating components from the given sample by using a gaseous mobile phase.

After attending the theory session over gas-chromatography we want for practical session.

Where we first check all the required instruments (carrier gas, sample, syringe, gas-flow controller, gas-chromatography, detector, computer).

After ensuring energy thing is available with proper safety we performed the practical. Where we first collect the sample in the syringe and set the temperature of gas-chromatography the gas value open and the sample is inserted into the injection port and after the injecting time is noted and some time the detector detect the signal and graph is plotted on the computer screen.

On 16th April 9th day of our internship training on instrumentation.

In todays lecture we learned about the dissolution apparatus method. It is a very important instrument which is use for dissolution test an apparatus with specific test condition in combination with acceptance of criteria to evaluate the performance of the product.

Dissolution include for standard apparatus basket, paddle, reciprocating cylinder and flow through cell.

Sir informed us the use of this technique in pharma industry.

The started with introduction of dissolution apparatus its principle, working mechanism, advantages.

At last we actually saw the apparatus working in our lab the training has provided exposure to the advance in the filled of dissolution apparatus and both the basic and practical aspects to begin.

On 16th April 9th day of our internship training.

On this day we learn about GNP (Good Manufacturing Practices).

Good manufacturing practice are a group of guidelines those are regulated by WHO. Since 1975 through out the world the aim of GMP to ensure the quality of the pharmaceutical products. Therefor the GMP is considered as a quality seal for the pharmaceutical products. The guidelines ensure the good production condition in the production area and good testing of the product passes all the specified tests produced in GMP violating manufacturing area that should not be reached in the market. The basic GMP facility requirements that have to be followed by pharmaceutical manufactures are :-

- Manufacturing process should be properly defined and controlled.
- All critical processes should be validated to insure the consisting of the process.
- Result of the validation of the process should comply with specification.
- Batch manufacturing records should be controlled and any changes to the process should be validated.
- Changes that can have any impact on the quality of the product must be validated.
- Procedure and any instructions should be written in dear language to understand properly.
- Personnel should be trained for production, quality control and to carry out the documentation.
- Every process need to be documented from testing to the final production.
- Complete history of a batch should be retained till the expiry of the batch.
- Well defined procedure should be available for recalling any batch from the market.
- Appropriate prevention action should be taken to prevent recurrence of the defect.

On 18th April which was the last day of our training and very important day of our entire training session. on this day we all were taught about interview process in any pharma industry.

The perfect training was given by Mr. Subodh Thakur sir for each round of interview and their purpose was explained by sir in details.

Sir also taught us how to make a prefect and impactful resume. After all this we were allowed to present our knowledge on any instrument as a presentation, we all were sharing knowledge with each other.

Finally, we were ready to perform the practical which was given by our coordinator for our project report. In which we learn about how to prepare sample and how to operate an instrument.

This was our 10 days experience as I said very first day Mr. Subodh Thakur Sir as a trainer had very impressive and positive attention of attenders. He boosted our confidence and knowledge, also make familiar to the instruments used in QC department.

Sir taught us very frankly about the both theoretical and technical knowledge of each and every instrument.

For this wonderful training we would like to thanks to our principal Mr. Suresh T Silawat Sir and also thanks to Dr. Anamika Jain mam(HOD) department of chemistry for infinite support and giving this wonderful training opportunity which will definitely beneficial for our future job work.

We would like to express our deepest gratitude and special thanks to Mr Subodh Thakur Sir analyst for providing us a platform to enhance our knowledge and confidence.

Pharma Chemistry Department
M.SC III Sem.

| | | |
|---|---|---|
| 1 | AMAR BIRLA | |
| 2 | BHARTI SAHU | |
| 3 | BINDU | |
| 4 | DHANRAJ PRAJAPATI | |
| 5 | DILIP | |
| 6 | EKTA RATHI | |
| 7 | KAVITA SITOLE | |
| 8 | MAHIMA NEEMA | |
| 9 | MONA KHEDEKAR | |
| 10 | PALLAVI SANKHLA | |
| 11 | POOJA | |
| 12 | PRACHI SACHDEVA | |
| 13 | PRADEEP | |
| 14 | PRADEEP NARWE | |
| 15 | PRADIP | |
| 16 | PRITAM DHAKAD | |
| 17 | When you | |
| 18 | RAHUL MUVEL | |
| 19 | RAJNANDANI RATHORE | |
| 20 | RITESH GANGLE | |
| 21 | RONALI RANSING | |
| 22 | RUCHI | |
| 23 | SACHIN | |
| 24 | SHAMSHUR RAB | |
| 25 | SHIVANEE NEGI | |
| 26 | SHIVANI SOLANKI | |
| 27 | SHUBHAM D PATEL | |
| 28 | SHYAM AHIRWAR | |
| 29 | SUDAMA | |
| 30 | SUKHDEEP SINGH TUTEJA | |
| 31 | SUMIT | |
| 32 | SURBHI GUPTA | |
| 33 | SUSHIL | |
| 34 | YASHIKA BHAWSAR | |

प्रति,

विभागाध्यक्ष महोदया

रसायनशास्त्र विभाग, शासकीय होलकर विज्ञान महाविद्यालय, इन्दौर (म.प्र.)

विषय– इंटर्नशिप आयोजित करने हेतु आवेदन पत्र।

महोदय,

सविनय निवेदन है कि हम सभी एम.एस–सी चतुर्थ सेमेस्टर के विद्यार्थी है। जैसा की आपको विदित है कि हम सभी विद्यार्थियों के लिए एम.एस–सी चतुर्थ सेमेस्टर मे इंटर्नशिप आवश्यक है परन्तु सभी विद्यार्थियों के लिए विभिन्न कंपनियों मे इंटर्नशिप के अवसर प्राप्त नहीं हो रहे है और विद्यार्थियों के लिए फीस की राशि भी ज्यादा है।

इसलिए महोदयजी से निवेदन है कि विद्यार्थियों के हित में रसायनशास्त्र विभाग मे ही इंटर्नशिप आयोजित कराये जाने की कृपा करें।

धन्यवाद्

दिनांक– 02/03/2022

प्रार्थी
समस्त विद्यार्थी
एम.एस–सी. चतुर्थ सेमेस्टर
विषय– रसायनशास्त्र
(2021–22)

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| 4. | Bhavika Pandagre | Bhavika |
| | Sushmita Chouhan | Chouhan. |
| | Archana Meena | Archana |
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| | Pooja Panwar | Pooja |
| | Nisha sen | Sen |
| | Saurabh Nizam | Nizam |
| | Shital Chatergji | Shital |
| | Sunita Malviya | Sunita |
| | Sawash Aukhore | Aukhore |
| | DIKSHA NAMDEV | Namdev |
| | Dileep Kumar Diwedi | Diwedi. |
| | Sonam Jat | Sonam |
| | Prithmi Pandit | Pandit |
| | Neha Jat | Neha Jat |
| | Sakshi Singh | Sakshi |
| | Shivani Sindal | Shivani. |
| | Jaya Diwedi | Jaya |
| | Garima Pawar | Garima |
| | Sheetal Gurjar | Sheetal |
| | Hemlata. | Hemlata |
| | Rajkumari kag | Rkag |
| | Saloni patoa | Saloni |
| | Pooja Maurya | Pooja |
| | Ayushi Yadav | Ayushi |
| | Nikita yadav | Nikita |
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| | Damini Tiwari | Damini |
| | Divya Singh | Divya |

Teacher's Signature :

Rahul Pawar

Sonam Chakrawarti

Nisha Meena

Sonika Jangra

Pravin Jangid

Kala Tadwal

Pooja Dawar

Dayaram More

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Tejashwari Ajmera

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Date

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| Name of Student | Signature |
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| Shilpa Tembhare | Shilpa |
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| Prachin Pandey | |
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| Mahesh Mk | |
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| Harsh Gujar | |
| Divya Singh | |
| Gitika Patidar | |
| Tejashwini Mulewa | |
| Nayan Pandey | |
| Vardana Patidar | |
| Vaishali Hataniya | |
| Vandana chouhan | |
| Saurav Kumar Tripathi | |
| Dipalee Mandloi | |
| Priagya Tomar | |
| Diksha Sad | |
| Pooja Babram Marvel | |
| Shivani Vishwakarma | |
| ASHISH RATHORE | |
| AMUL CHOUHAN | |
| ALOK PATIDAR | |
| Ku. Shivani | |
| Shivanee Dhariwal | |
| Shraddha patidar | |

Teacher's Signature :

Parvez pathan

Manali Kushwah

Simran kushwah

manavendra prabhat

Arati Katare

Kajal Pandey

Nidhi Yadav

Anjali Gangwal

Neha Sharde

Rajesh Pitole

Anjali kushwah

Avlesh Shirke

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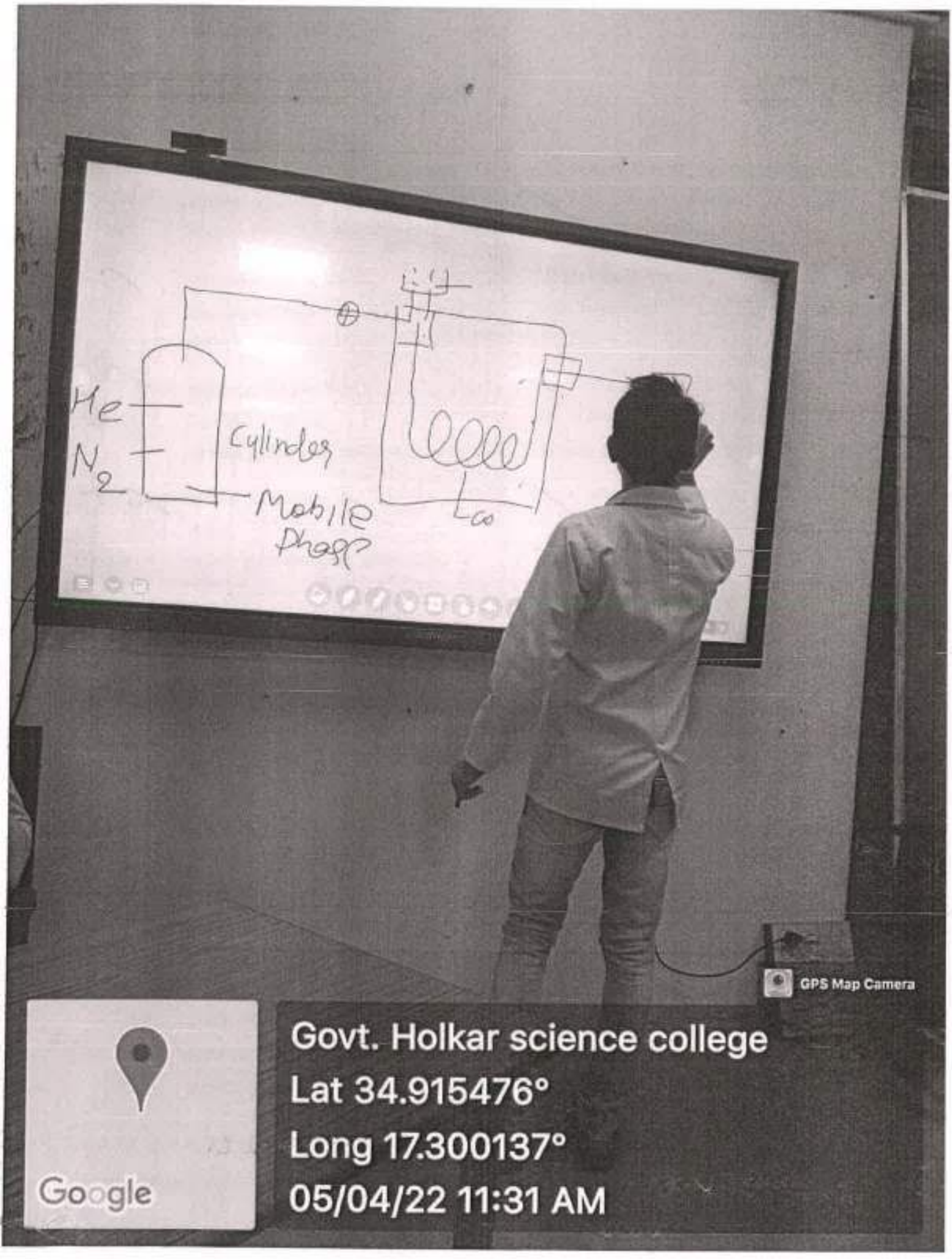
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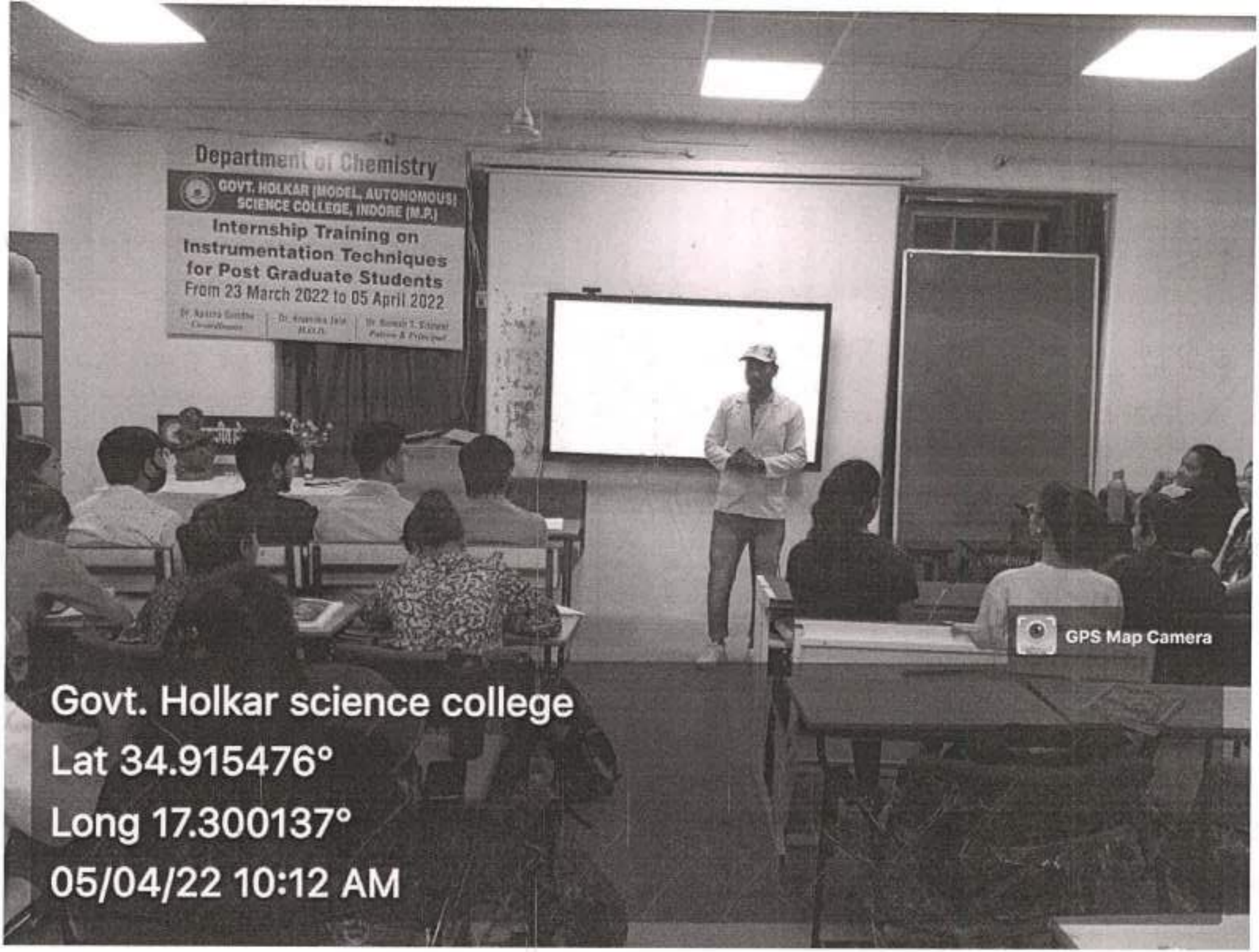

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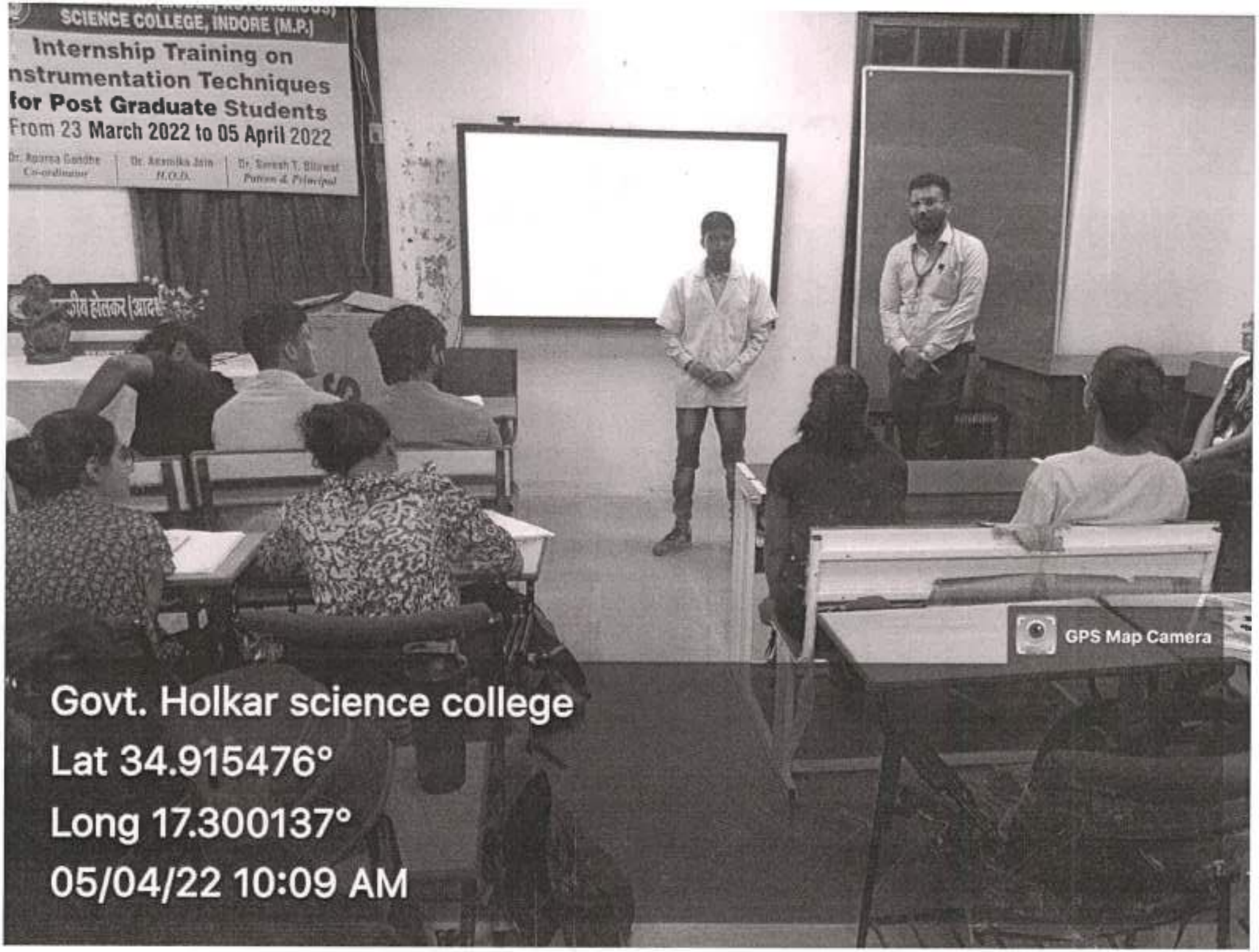

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Dr. Anamika Jain

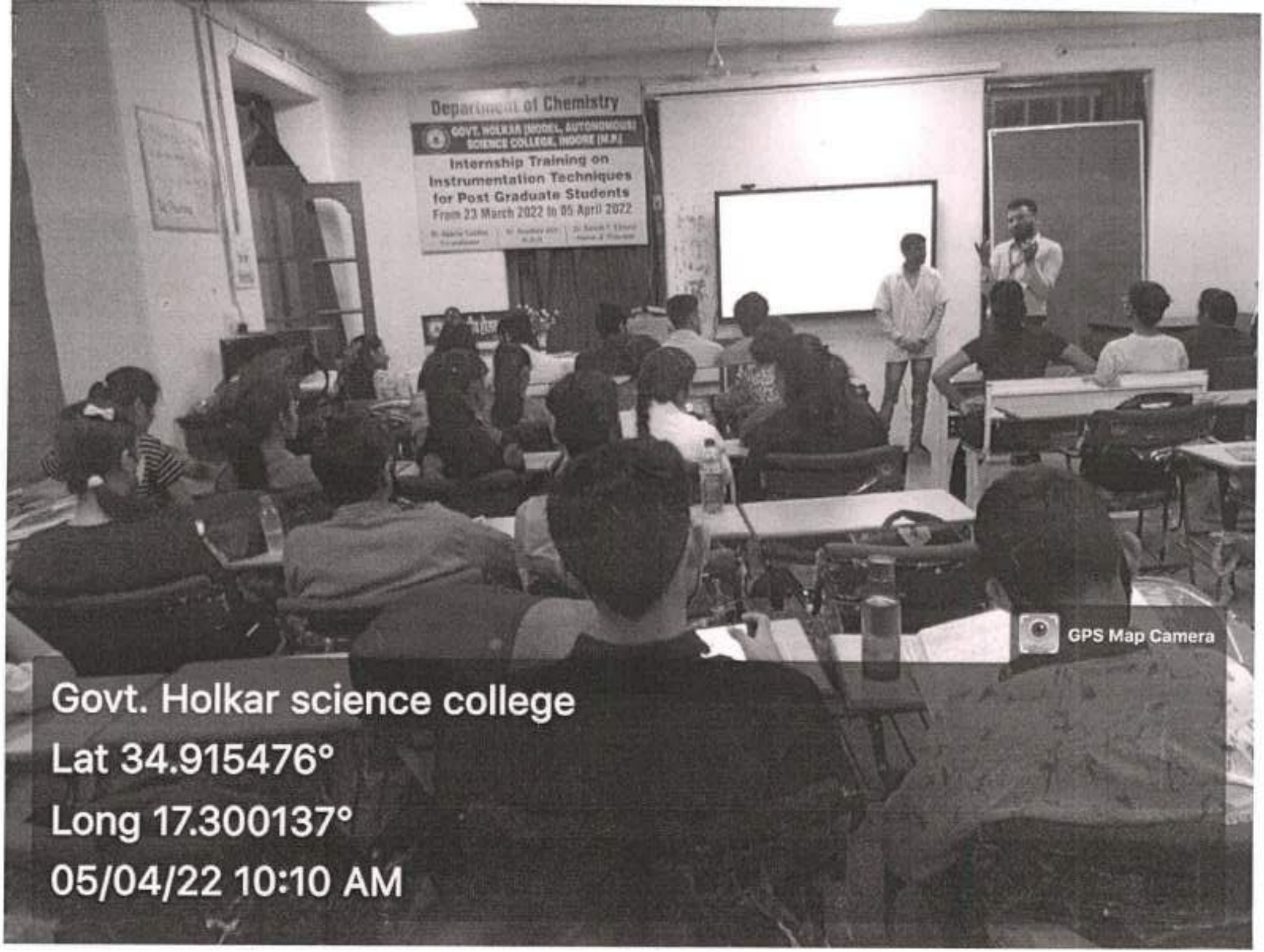



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Department of Chemistry
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Internship Training on
Instrumentation Techniques
for Post Graduate Students
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Department of Chemistry
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Internship Training on
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for Post Graduate Students
From 23 March 2022 to 05 April 2022
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# SSR DOCUMENT

2022

## CRITERION –3

## MoUs/Linkages/Collaborations

Department of Geography, MLSU,Udaipur, Rajasthan

**Document Title:**

Various objectives undertaken for the year 2022 in the Electoral Information System for Governance and Developmental Planning: A G-Governance Initiative

# मोहनलाल सुखाड़िया विश्वविद्यालय, उदयपुर
## MOHANLAL SUKHADIA UNIVERSITY: UDAIPUR

NAAC ACCREDITED 'A' GRADE STATE UNIVERSITY

No.F./RUSA/Gen/MLSU/2020/ 6067

Dated : 25-06-2020
6/07

ORDER

With reference to request submitted by Nodal Officer RUSA, MLSU, Udaipur in reference to letter No. F30(16)SPD/RUSA/2016/178 dated 31 March, 2020 of SPD, I am directed to convey administrative sanction for Research and Innovation project under component 10 or RUSA 2.0 of MHRD as per details given below:

| S.No. | Department | Principal Investigator | Co-Investigator | Project Title | TOTAL Amount Sanctioned | Ist Instalment |
|---|---|---|---|---|---|---|
| 1 | Geography | Prof. Seema Jalan | Dr. Shailesh Chaure, Dr. Urmi Sharma | Electoral Information System for Governance and Developmental Planning: A G-Governance Initiative | 5725000 | 2862500 |

Yours faithfully,

REGISTRAR

Copy to :

1. The Dean/Director, _____
2. The Comptroller, MLSU, Udaipur
3. The Head, Department of _____
4. The Nodal Officer, RUSA-MLSU, Udaipur
5. Person Concerned
6. Guard file

DY. REGISTRAR

# Progress Report for RUSA 2.0 Projects

*Report 2022*

## Name of Department

Department of Geography, Faculty of Earth Sciences, Mohanlal Sukhadia University

## Project Title

Electoral Information System for Governance and Developmental Planning: A G-Governance Initiative

## Date of Commencement of Project

**Administrative Sanction:** No. F./RUSA/Gen/MLSU/2020/6367 dated: 06-07-2020

**Financial Sanction:** PD/OS/SPD-(RUSA-Phase-II/CSA-1-(3)/2020-21/243 dated: 20/ 21-08-2020

## Name of PI and /or Co-PI


**Principal Investigator (PI)** : Prof. Seema Jalan
Department of Geography, MLSU, Udaipur

**Co-PI** :

1. Dr. Shailesh Chaure,
   Associate Professor of Geology
   Govt. Holkar Science College, Indore
2. Ms. Urmi Sharma
   Assistant Professor
   Department of Geography, MLSU, Udaipur

# 1. Approved objectives/work plan of project

This project aims to develop and provide a rich geo-spatial information system for various governing bodies, elected representatives of respective constituencies, and state election system which has data including election statistics, socio-economic, ethnic, political issues, census, infrastructure, and developmental information about a particular area on a single platform.

This information will serve as a spatially enabled informed decision-making tool for policy-makers in effective governance and citizen-centric developmental planning.

The main objective of this project is to develop an application for G-governance entitled 'Electoral Information System for Governance and Developmental Planning (EIS-GDP)' - a web mapping application which will enable dynamic and interactive mapping of selected attributes at two levels:

- Assembly and Parliamentary constituencies of Rajasthan
- Tonk Assembly constituency

Comprehensive electoral statistics at Assembly Constituency level for the entire state.

In the first phase database will be created only for post-delimitation assembly elections. The work may be extended to pre-delimitation assembly elections and Lok Sabha elections in subsequent phases.

Comprehensive database with selected attributes relevant to governance and developmental planning at various administrative levels.

# 2. Objectives achieved

The first phase of the project is about to get completed with all the pages/tabs working as per the functionality given in the wireframe. The second and the final phase of the development work is yet to be started.

Following are the objectives achieved-

- Research for various election statistics
- GIS layers digitization and updation

- Identification of statistical data
- Database creation in GIS format
- Training and workshop for project staff
- Identifying tools and functionalities to be integrated into the portal
- Designing of wireframe of the portal
- Identifying technology architecture for the portal
- Development of a prototype of the portal
- Master database creation and sorting for the final development
- Understanding UI and UX of the portal and implementing updation
- Development of various tabs in the portal for different kinds of GIS Visualizations
- Designing of wireframe of the portal
- Field survey for phase 2 primary database generation.

## 3. Brief description of methodology/techniques/approach adopted

Various technologies and frameworks were discussed at the beginning of the project.

Both perpetual and open-source technologies were looked into and finally following open-source technologies were used both for development and GIS Analysis.

- GIS Software – QGIS
- Database Solution – PostgreSQL and PostGIS
- Front-End technologies – HTML, CSS, JavaScript
- Back-End Server – Geo Server
- Frameworks – Open layers, Chart.JS

## 4. Summary of work done so far and analysis of the result

Since the inception of this study, the project has been going on in a structured manner and all the team members have been assigned designated tasks to carry out as per their respective skillset, domain expertise, and experience.

Team members are regularly having meetings and discussions with their project PI and Co-PIs and under their guidance, the project has been pacing very well as per the mentioned timeline (mentioned under the point – project progress).

Below mentioned are the targets completed so far.

- Collected various datasets from different sources that can be arranged in a geospatial format.
- Digitizing and rectifying datasets (shapefile of Rajasthan Assemblies) so that they can be used to join other attributes with shapefiles.
- Prepared election boundaries of all 200 assembly constituencies of Rajasthan.
- Prepared boundaries of all 33 districts of Rajasthan.
- Preparation of election boundaries for all 25 Parliamentary constituencies of Rajasthan.
- Prepared election statistics for all 3 assembly elections of Rajasthan (Post-delimitation) i.e., 2008, 2013, and 2018 in a spatial format.
- Prepared election statistics for all 3 parliamentary elections of Rajasthan (Post-delimitation) i.e., 2009, 2014, and 2019 in a spatial format.
- Also checked the authenticity of population datasets calculated spatially concerning ground data.
- Collection of statistical datasets from sources such as election statistics reports, ADR reports, and various other forms of information.
- Arranging non-spatial datasets into a set template and finally converting it into spatial data for further analysis.
- Carried out various GIS-based analyses using both open source and perpetual licensed-based software.
- Setting up a development environment using various technologies available in open source and licensed-based technologies.
- Identified pros and cons of both sides of technologies.
- Understanding technical aspects and various frameworks available for portal development.
- Developed a wireframe of the final portal to be developed along with required functionalities and tabs.
- Explored all possible and available technologies that can be used for a Web-GIS mapping application and accordingly started with the development framework
- Understood hierarchy of Web-GIS architecture (Desktop, Middleware, Server, and Mobile) and how to link this using one common method as guided by the expert in a 3-day Web-GIS training (mentioned in the report below).
- Developed a fully functional prototype portal GUI using a rich mapping interface library.

- Added basic functionalities needed in a web mapping application with map panel and legend panel.
- Added an advanced attribute query tool with attribute selector and viewer.
- Added various layers of the base map to support better viewing capability for the user.
- Added an important tool to get information out of a basic map to the user in a very simple grid format.
- Finally, as per the project proposal released a limited tender for Web-based Geo-Portal development.
- After taking inputs from the prototype and discussing with PIs, have designed a wireframe in a phased manner for the portal which will be shared with the developer.
- Finalised all functionalities and tools to be integrated into the geoportal.
- Worked on database needed in a sorted approach which would be needed for the portal features and functionalities in a phased manner.
- Designed Wireframe for all the pages of Portal along with its User Interface Design.
- Any necessary changes or inputs if required, were made.
- Currently in 1st phase of portal development, all the main pages have been developed completely along with the integration of the database.
- These pages include Home Tab, State-GIS Tab, Trends Tab, and Compare Tab which is focused on State level GIS Data visualization.
- In Home Tab, on click year-wise dynamic visualizations for the state have been shown like No. of Polling booths, Year of Election, Political Parties, Elected Party, Voter Turnout, Total Electorate, and Total Candidates have been shown for previous three elections.
- Also, dynamic visualizations for all assembly and parliamentary constituencies have been shown like the winning candidate's name, winner candidate's party, voter turnout, per cent of votes received by the winner, and vote share of the top five parties have been shown in a form of a pie-chart.
- In the State-GIS tab, Dynamic visualization is displayed as per the user's attribute query for different sorts of spatial analysis.
- In the Trends tab, a user will be able to compare different attributes in the form of statistical diagrams like scatterplots, bar graphs, line graphs, and histograms.
- In Compare Tab, users will be able to compare attributes of different years in the form of synchronised maps. For example, users will be able to view maps of winning parties

overstate assembly and parliamentary elections of different years for a better comparison of elections trends.

- User will also be able to print or save the displayed statistical diagram in a pdf format.
- One more Tab (About Us) is still under the development phase as content for the same is yet to be finalized.
- Updated the latest SH and NH network of Rajasthan along with its symbology.
- As part of the project's second phase, completed Land use (Master Plan) and Land cover maps of the Tonk assembly constituency.
- Updated secondary level amenities/point of interest database for complete Tonk assembly constituency.
- Updated village-level GIS data.
- A field survey was carried out for 36 Gram Panchayats and Tonk Municipal areas in which GPS-based information like polling booths and various other amenities was gathered.
- A questionnaire-based survey was also done for Panchayat Sarpanch regarding various issues and developmental challenges faced by them. Inputs from localities were also taken.
- All this information has been sorted out in GIS format and will be mapped finally on the portal with necessary attributes.
- As per the project proposal, released a limited tender for the second phase of web-based Geo-Portal development.
- Wireframe has been designed for the second phase of the development which includes only a single page or tab which will be having all sorts of functionality required for visualization as mentioned under the project proposal.
- The Second phase of the portal will be focused on the Tonk assembly constituency ward wise election results and developmental issues, Panchayat wise election results and developmental issues along with booth level election data for the past three elections of the Assembly, Parliamentary, and Municipal Elections.
- Database and GIS layers for the second phase are completed with minor changes and corrections to be made.
- Layers for the second phase include amenities (points of interest), administrative boundaries, election boundaries, road network, and thematic layers.
- Once the database and GIS layers are completed, they will be integrated into the portal.

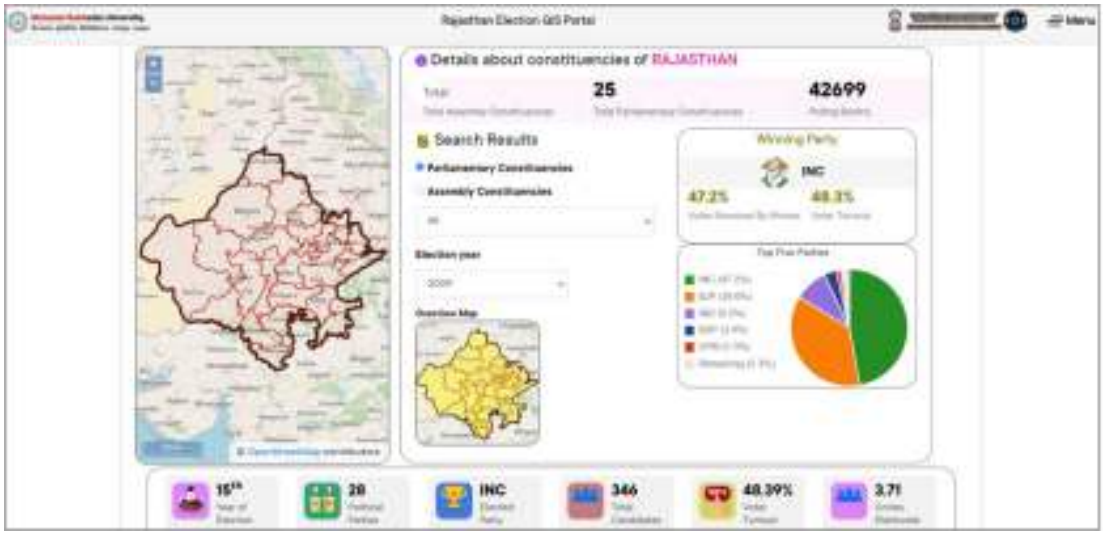



Figure 1: Home page of the portal

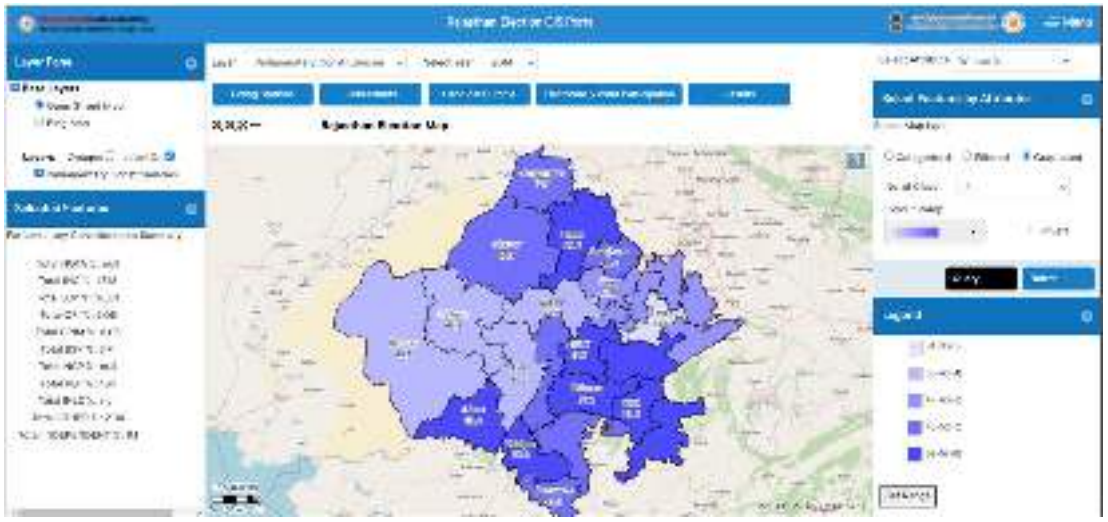



Figure 2: State-GIS page of the portal




Figure 3: Trends page of the portal

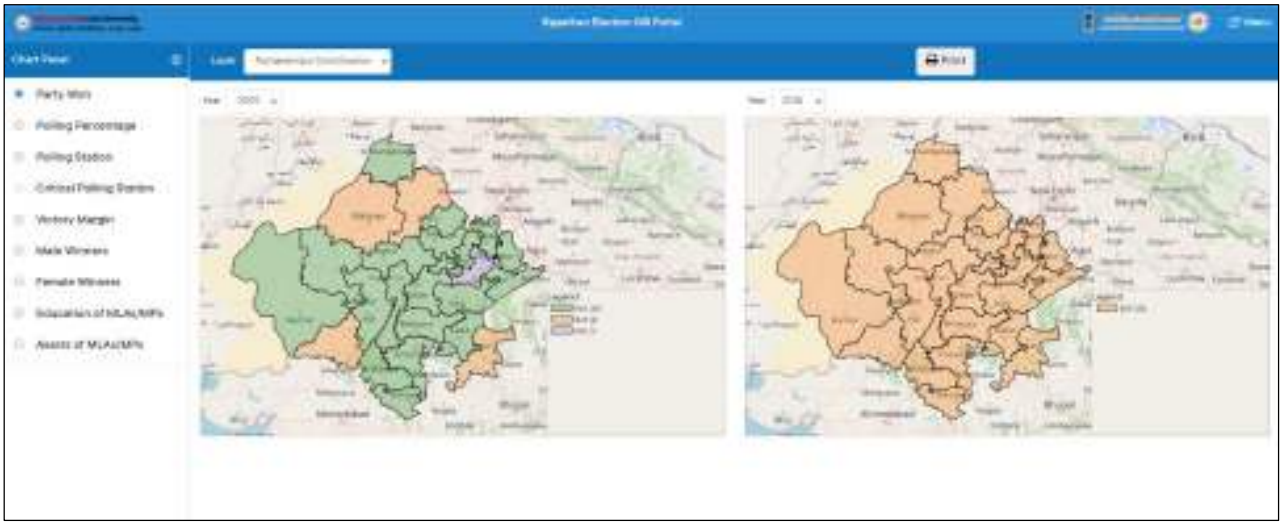


Figure 4: Compare page of the portal

## 5. Challenges being faced

- Access to Election Statistical data for the second phase (Panchayat election data and ULB election data) has been a major challenge.
- Access to the old municipal ward boundary of Tonk AC was also a challenge.
- New ward boundary of Tonk AC is also not identical with ground data.
- However, both the ward boundaries now have been digitized and corrected.
- We have been continuously pursuing with related government authorities for various datasets but delay in obtaining these datasets is posing a big challenge. As this data is also not available on public portals.
- Two project fellows have left the project mid-way due to frequent delays in the release of salaries because of COVID lockdown and other procedural delays. The positions have been re-advertised. The permission for an extension of the project period and early release of the second instalment is awaited for completing the selection process.
- One project fellow has been hired for the position of Research Assistant in the month of March.
- As per directions of RUSA major part of the released fund has already been utilized (expenditure made or booked). Timely release of the second instalment and permission for re-appropriation of the sanctioned fund is required to carry on the project work as per the expected timeline and uninterrupted progress of project work.

- Field survey has also been a major challenge as while collecting points of interest data, project staff had to be dependent on local people and resources and due to this sometimes information loss also happens. However, the project staff was very much active in collecting all the necessary information required.

## 6. Online or Offline Seminar/Conference/Workshop/Training organized

### Web-GIS Training Workshop

- A 3-Day training on Web-GIS was also carried out at the GIS lab of the Department of Geography, MLSU, Udaipur by an expert from the Regional Space Application Centre, Indian Space Research Organization, Jodhpur, Rajasthan ($7^{th}$-$9^{th}$ January 2021)
- Project fellows got exposure to current trends and technologies in open-source web-GIS.
- The training was mostly focused on technological aspects such as-

a) Web-GIS architecture
b) Front-end technologies
c) Back-end technologies
d) Middleware technologies
e) Server-side technologies
f) Mobile GIS
g) Desktop GIS



Figure 5: Participants during Web-GIS training workshop

## Hand-Held GPS Training and Total Station Training Workshop

- A 3-Day combined training on Hand-held Android-based GPS Data collection instrument procured under the R&I project and Motorized Total Station was carried out at the Department of Geography, MLSU, Udaipur by the industry experts from Alltera Geospatial Solutions, Gurugram ($19^{th}$ – $21^{st}$ January 2022)
- In this workshop, project staff and other faculty members got to learn how latest industry equipment functions for GPS based data collection and exporting of data for further GIS Mapping.
- Project staff also got to learn about Motorized Total Station equipment, its functioning and applications in various applications of Topographic survey.
- Various Real-time applications were also explained based on the queries of project staff.

## ArcGIS Pro Essential Workflows Training

- A 3-Day training workshop was organized in collaboration with ESRI India with respect to the EIGAP Solution (GIS Software) purchased under RUSA R&I Project.
- Workshop was conducted via online mode from $2^{nd}$-$4^{th}$ February 2022 by industry experts from ESRI India.
- In this workshop, project staff and other faculty members got to know about the latest industry-standard GIS software being practiced worldwide. The training was also very beneficial for participants who are already using old versions of ESRI's ArcMap and want to migrate towards ArcGIS Pro.
- Along with theoretical understanding, hands-on sessions were also taken by the host for all the participants.
- Participants got the chance to get used to the new interface of the latest ESRI's GIS software and were able to perform various GIS and Remote sensing analyses during live hands-on sessions.
- All relevant doubts and queries of the participants were also solved by the industry experts.



Figure 6: Participants during the theoretical session of Total Station and hand-held GPS workshop



Figure 7: Participant during the training of Total Station



Figure 8: Participants during training of Hand-held GPS

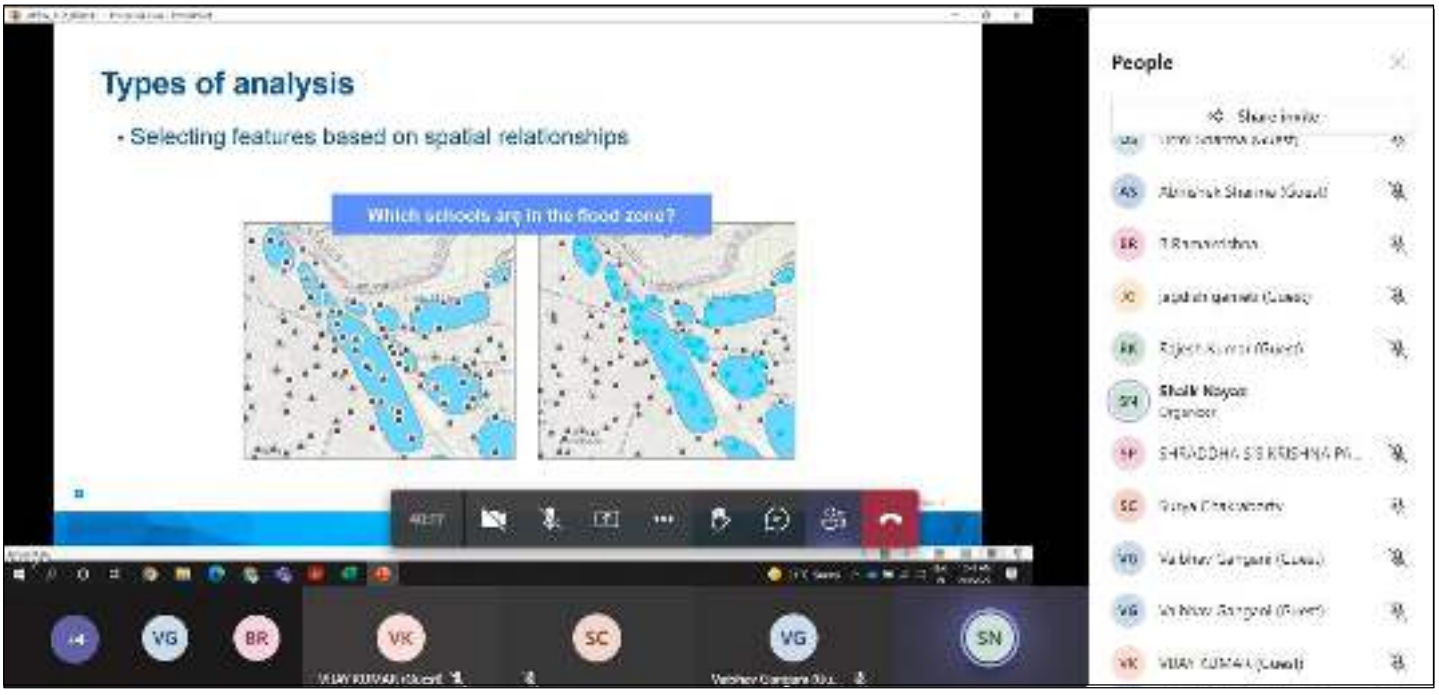



Figure 9: Screenshot of session during training of ArcGIS Pro

# 7. Brief Report of Field Survey

## First Field Survey (March 2021)

A GPS based Field survey was conducted for the second phase of the project in the Tonk Assembly constituency during the last week of March 2021. The survey was conducted by the project team and two field assistants. Hand-held GPS devices were used to collect field level information. This survey focused on collecting geo-tagged information and pictures of the municipal Tonk area and Arniya Kedar panchayat.

The interaction was held with local leaders and politicians of the Tonk Assembly constituency for identifying relevant aspects for designing the survey schedule.

Below mentioned is the information collected from the field survey.

- Point of interest data from Ward no. 10 and Arniya Kedar panchayat were collected such as major landmarks, government offices, primary health centers, schools, Anganwadi centers, and polling stations (GPS survey).
    - Ground control points were collected using GPS from various parts of Tonk assembly in order to Geo-reference map of the municipal area with respect to ground-level information.
    - Polling station location information was collected from all wards of municipal Tonk (GPS survey).
    - Hard copies of polling catchment area maps (hand-drawn) were gathered.
    - Municipal map of Tonk has been collected.
    - Gathered location of all police stations and police HQ for Tonk district.
    - Map showing the location of police stations along with their catchment area for Tonk district was gathered from the Police department.

All this information was rectified, corrected, and put in GIS format (in actual scale) and various analyses were done which will be incorporated into the portal.

With this mock survey, the project team also got an idea of how to proceed with the main survey and what all necessary information has to be collected from secondary sources which will be helpful in the primary survey.



Figure 10: Project Staff during GPS based field survey



Figure 11: A snapshot of from sarpanch office during the field survey

## Second Field Survey (December 2021)

A GPS based Field survey was conducted for the second phase of the project in the Tonk Assembly constituency from 1st December to 9th December 2021. The survey has been conducted by project staff and one field assistant. Hand-held GPS devices were used to collect field GPS locations of amenities in the area. This survey focused on collecting geo-tagged information and pictures of 25 Gram panchayats of the Tonk assembly constituency which included Arniyamal, Bamor, Baroni, Bharni, Chandlai, Chhan, Dakhiya, Darda Hind, Deoli, Deopura, Ghas, Harchandera, Hatauna, Kabra, Lamba, Lawadar, Mandawar, Mehandawas, Palra, Parana, Sankhana, Sonwa, Soran, Takholi, Morbhatiyan. Schedule based primary survey has been conducted to gather

information about the socio-economic ethnic composition of the villages, developmental issues and problems having bearing on the voting decisions in the study area.

Survey planning included mapping of day-wise routes and generation of maps for individual field maps of Panchayats.

Project staff interacted with local leaders and common people of the surveyed area.

A summary of the information collected from the field survey has been given below:

- Amenities data such as School, Anganwadi, Local health facilities, Panchayat office, Veterinary hospital, Patwar office, Polling booths, Police stations, Banks and other government buildings were collected.
- Each Amenity was verified on the field if operational or not and the number of staff working was also recorded.
- GPS information collected daily was synchronized with the GIS software and was saved daily so that no data is lost.
- Questionnaire was also given to every Sarpanch for non-spatial information regarding local election and developmental issues and challenges faced by them.
- Similar inputs were also taken from localities for another point of view.



Figure 12: A snapshot from one of the Upper Primary schools during the field survey

## Third Field Survey (March 2022)

A GPS based Field survey was conducted for the second phase of the project in the Tonk Assembly constituency from 24th March to 29th March 2022. The survey has been conducted by project staff along with PI and Co-PI. Latest Hand-held android-based GPS devices were used to collect field GPS locations of amenities in the area. This survey focused on collecting geo-tagged information and pictures of polling booths from the remaining 10 Gram panchayats of the Tonk assembly constituency which included Aliyari, Hameerpur, Indokiya, Barwas, Baori, Lamba Kalan, Gopalpura, Ganeti, Khareda, and Chhan Bassorya.

The survey team was also collecting questionnaire-based information from every sarpanch of the respective Gram Panchayats which included questions related to development, issues and challenges faced by governance in their area.

One more team was working in the municipal area of Tonk assembly for collecting GPS based amenities and similar inputs from Ward Councillor.

All this was a part of a similar previous exercise done in the second field survey where the socio-economic ethnic composition of the villages, ward areas, developmental issues and problems having bearing on the voting decisions were collected in the study area. The project team also identified 70 plus polling booths which were present in the previous year's election but the location of which was missing from our master database. Hence project team also collected GPS points of such Polling booths and mapped them.

Project staff interacted with local leaders, sarpanch, councillors and common people of the surveyed area.

A summary of the information collected from the field survey has been given below:

- Amenities data such as School, Anganwadi, Local health facilities, Panchayat office, Veterinary hospital, Patwar office, Polling booths, Police stations, Banks, recreational facilities, and other government buildings were collected.
- Each Amenity was verified on the field if operational or not and the number of staff working was also recorded.
- GPS information collected daily was synchronized with the GIS software and was saved daily so that no data is lost.
- Questionnaire was also given to every Sarpanch and Ward Councilor for non-spatial information regarding local election and developmental issues and challenges faced by them.

- Similar inputs were also taken from localities for another point of view.
- Old polling booth points were also collected in the municipal area whose locations were missing from the database.

## Outcome

- All the spatial information recorded using GPS was verified with secondary data and has been mapped in GIS format
- Non-spatial information gathered has been sorted out in GIS format and will be mapped further and visualized in the portal.
- Once all the GIS layers are completed, data collected will be joined with the shapefiles and further integration and visualization will be done on the portal.
- Maps are generated based on GPS points of polling booths and amenities collected during the field survey.
- Surveyed data has been cleaned, categorized and final shapefiles have been generated with necessary attributes.

## 8. Work remaining

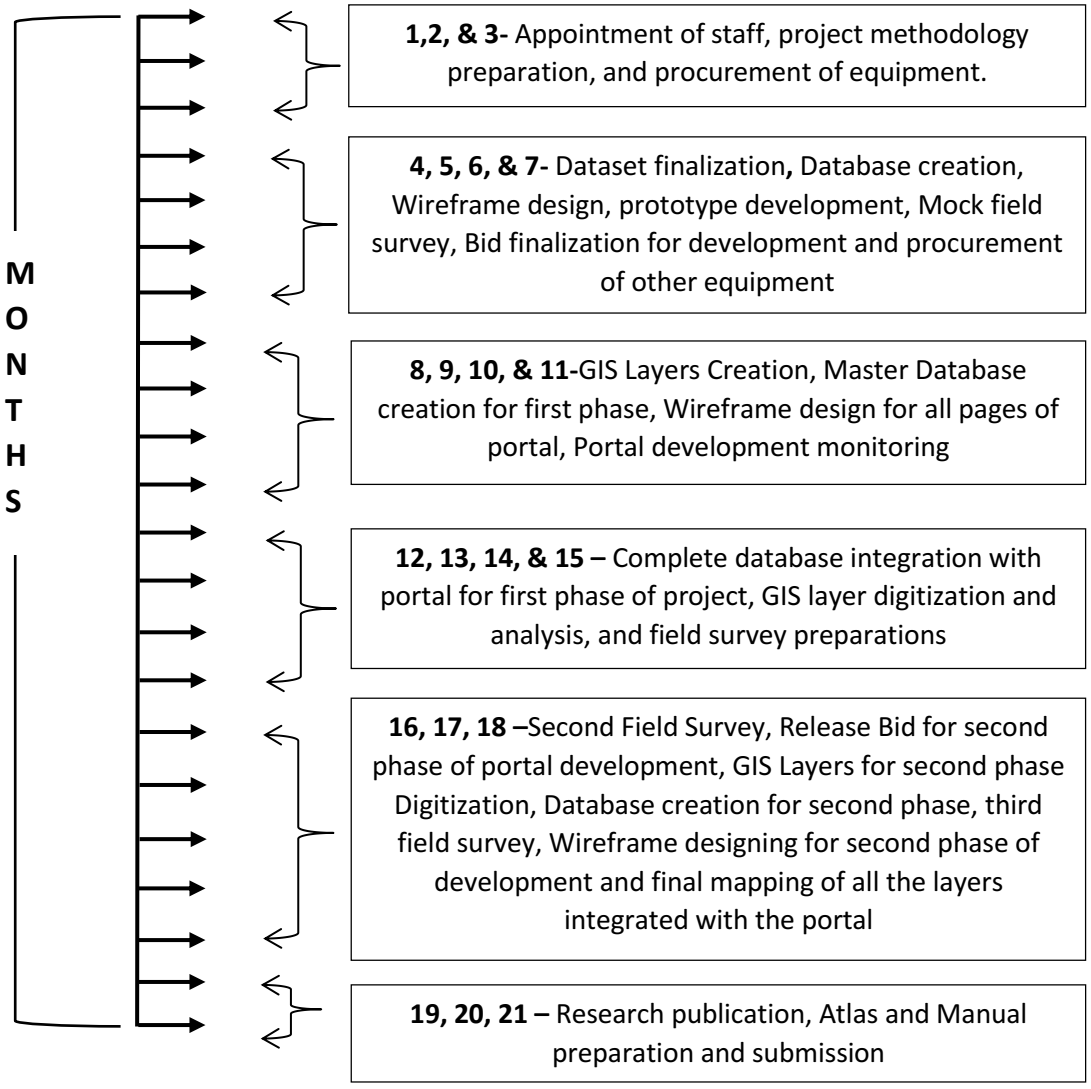
Phase 1.0 of the project is under development and is scheduled to be completed very soon as only some minor development work is remaining. Phase 2.0 of the project is mainly focused on the Tonk Assembly constituency and its booth level information and comprehensive election statistics. The Project staff has already completed the majority of the database part along with the creation and updating of GIS-based layers.

Following is the work remaining for the rest of the project.

- Remaining procurement.
- Finalization of the first phase of portal development
- Final field survey (if required) for filling the gaps in the information recorded.
- Finalization of database and GIS layers for the second phase of the project.
- Final styling of the portal such as finalizing colour combinations and main logo for the portal.
- GIS layers digitization and updation for the second phase

- Second phase of portal development and integrating data prepared by the project team.
- GIS Analysis and final mapping of deprived villages
- SLD finalization for layers created in phase 2
- Publication of output as research papers
- Atlas and Manual creation
- Final report submission.

## 9. Project Timeline (Considering the date of financial sanction as date of commencement – w.e.f. 21.08.2020)



## 10. Details of staff recruited

**Advertisement No. for various posts under the project:**

**F. No./MLSU/Geog./RUSA 2.0/2020/SJ/429**

| S. No. | Designation | Name | Date of Joining | Office order no. |
|---|---|---|---|---|
| 1 | GIS Analyst | Mr. Vaibhav Kumar Gangani | 6th Nov 2020 | MLSU/Geog./RUSA 2.0/2020/SJ/458 |
| 2 | Research Associate | Mr. Sandeep P | 3rd Dec 2020 | MLSU/Geog./RUSA 2.0/2020/SJ/461 |
| 3 | Research Assistant | Mr. Parvaze Ahmed Khan | 21st Nov 2020 | MLSU/Geog./RUSA 2.0/2020/SJ/460 |

## 11. Pictures of facility created




Figure 12: A2 Colour Printer Installed in project room



Figure 13: A4 printer procured in project




Figure 14: Hand-held GPS Device procured in project




Figure 15: Wabcom DTH Writing pad procured in project




Figure 16: GPS based phablet procured in project



Figure 17: Air-conditioner procured in project



Figure 18: Power backup system and UPS procured in project




Figure 19: Books procured in project




Figure 20: Snapshot of GIS Software procured in project



Figure 21: CCTV System procured in project



Figure 22: Furniture procured in project

## 12. Total till date expenditure (Budget head wise) (As per original proposal – request for re-appropriation is under consideration)

| S. No. | Head | Expenditure (Payments made) in Lakhs) | Booked expenditure (In lakhs) * |
|---|---|---|---|
| **Hard Components** | | | |
| 1 | Equipment | | |
| | High-end hand-held GPS | | |
| | A2 Printer | | |
| | A4 Printer | 1.44 | 2.63 |
| 2 | Furniture | 0.09 | |
| 3 | Air Conditioners | 0.91 | |
| 4 | Power Backup System (UPS) | 0.35 | |
| 5 | Other Infrastructural setup | 0.22 | |
| **Soft Components** | | | |
| 1 | Computers, laptops | 1.44 | 1.20 |
| 2 | Software | 3.47 | 11.49 |
| 3 | Books and data | 0.69 | |
| 4 | Travel | 1.33 | |
| 5 | Consultancy | 0.02 | 2.45 |
| 6 | Remuneration | 11.91 | |
| 7 | Contingency, Miscellaneous | 1.22 | |
| **Total expenditure (including booked expenditure) till date** | | | |
| | In figures (Rs. in lakhs) | 40.85 | |
| | In words (Rs. in lakhs) | Forty Lakh Eighty-Five Thousand only | |
| | As percentage of the first installment | 142.74 | |

*Booked Expenditure excluding salary of Project staff. It includes items for which Bids/Tender have been done but payment had not been done.

# SSR DOCUMENT

2022

## CRITERION –3

## MoUs/Linkages/Collaborations

Department of Geography, MLSU,Udaipur, Rajasthan

**Document Title:**

Database creation, validation for next phase from both primary and secondary data of Dungarpur and Banswara district

# मोहनलाल सुखाड़िया विश्वविद्यालय, उदयपुर
## MOHANLAL SUKHADIA UNIVERSITY: UDAIPUR
NAAC ACCREDITED 'A' GRADE STATE UNIVERSITY

No.F./RUSA/Gen/MLSU/2020/ 6366

Dated : 25-06-2020
6/07

ORDER

With reference to request submitted by Nodal Officer RUSA, MLSU, Udaipur in reference to letter No. F30(16)SPD/RUSA/2016/178 dated 31 March, 2020 of SPD, I am directed to convey administrative sanction for Research and Innovation project under component 10 or RUSA 2.0 of MHRD as per details given below:

| S.No. | Department | Principal Investigator | Co-Investigator | Project Title | TOTAL Amount Sanctioned | Ist Instalment |
|---|---|---|---|---|---|---|
| 1 | Geography | Dr. D.S. Chouhan | Prof. Seema Jalan, Dr. Shailesh Chaure | Impact of Water Quality on Health in Vagad Region of Rajasthan: An Application in Web-GIS | 3004000 | 1502000 |

Yours faithfully,

REGISTRAR

Copy to :
1. The Dean/Director, _____
2. The Comptroller, MLSU, Udaipur
3. The Head, Department of _____
4. The Nodal Officer, RUSA-MLSU, Udaipur
5. Person Concerned
6. Guard file

DY. REGISTRAR

# Project Progress Report

# January, 2023

## *Impact of Water Quality on Health in Vagad Region of Rajasthan: An Application in Web-GIS*

**Date of Issue of Order by the University - 20-08-2020**

**Date of Issue of Financial Sanction by the University - 21-08-2020**


**Professor Seema Jalan**
**Head and Co-Principal Investigator**

**Dr. D. S. Chouhan**
**Principal Investigator**
**And Assistant Professor**

**Dr. Shailesh Chaure**
**Co-Principal Investigator**
**Government Holkar Science College, Indore (M.P)**

**Department of Geography**
**Faculty of Earth Science**
**Mohanlal Sukhadia University**
**Udaipur, Rajasthan, India, 313001**

# Project Staff

| S. No. | Status | Name | Designation |
|---|---|---|---|
| 1 | PI | Dr. D. S. Chouhan | Assistant Professor<br>Department of Geography<br>MLS University, Udaipur, Raj. |
| 2 | Co-PI | Prof. Seema Jalan | Professor<br>Department of Geography<br>MLS University, Udaipur, Raj. |
| 3 | Co- PI | Dr. Shailesh Chaure | Associate Professor<br>Govt. Holkar Science College<br>Indore, Madhya Pradesh |

# CONTENT


| S. No. | Topic | Page No. |
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| 2 | Introduction | 4 |
| 3 | Approved Objectives of the Project | 5 |
| 4 | Work Accomplished and Objectives Achieved | 5 |
| 5 | Brief Description of the Methodology | 7 |
| 6 | Outcomes of the Work Done So Far | 8 |
| 7 | Publications | 9 |
| 8 | Conference, Workshop and Training Organized | 9 |
| 9 | Work Remaining, Future Work Plan and Timeline | 9 |

1. **TITLE:** Impact of Water Quality on Health in Vagad Region of Rajasthan: An Application in Web-GIS

## 2. INTRODUCTION

### Study Area

The study area comprises of the two districts of Dungarpur and Banswara. Also the project will be covering all the tehsils and villages present in Dungarpur and Banswara districts based on Census 2011.

This project proposal is being submitted under the discipline of 'Geography' (specifically Resource Geography) but in approach, relevance and content it is interdisciplinary in nature spanning across Geography, Environment Science, Geology, Geo-Chemistry. Water quality is a major issue of the world in current scenario. A good water quality is essential to a healthy life and whole ecosystem because water quality issues influence living beings and natural environment. The proposed research will be a significant contribution to research and designing various policies related to drinking water, health and sanitation.

Water quality and health bear close inter-relationship to each other. Water quality is fundamental to human development, well-being and health. Providing access to safe water is one of the most effective instruments in promoting health. Water is not only essential to life but intimately interwoven with quality of life across the world. Access to enough clean water is crucial in everyday life for every person in the world. Changes in the quality, quantity, natural cycles of water and water systems have far-reaching impacts on all aspects of human life. As the human population continues to grow and the global clean water supply is reduced by consumption, contamination and climate change, water issues will only increase in complexity and importance.

Presently all Government organizations like Ministry of Water Resources India, World Health Organization (WHO) and various State Ground Water Departments are doing efforts to asses quality of water and monitor both surface and ground water resources. Also the causes and transmission of waterborne disease are under assessment because the quality of water, whether used for drinking, domestic purposes, food production or recreational purposes has an important impact on health. Contaminated or poor quality can cause epidemics and it can contribute to high rates of microbial infestation of water sources on large scale. Initiatives to manage and improve water quality not only supports general public health, but often promote Field survey development of the citizens. This document aims at demonstrating an approach for the assessment of water quality and its impact on health of the people living and consuming

water from sources present in the vicinity of citizens living in an area and will sets out a probable strategy adopted by Government of India and Rajasthan to manage water quality with a view to protecting and promoting human health in Vagad Region of Rajasthan.

## 3. APPROVED OBJECTIVES OF THE PROJECT

Detailed objectives of the project are as under:

(i) To assess the ground and surface water quality of Vagad Region in context of geographical and demographic characteristics of the region.

(ii) To understand the difference between ground and surface water quality in Vagad Region.

(iii) To identify the general sources of contaminants of groundwater in Vagad Region.

(iv) To identify poor water quality buffer zones using Geo-Statistical Interpolation methods in Vagad Region.

(v) To understand the impact of water quality on human health in Vagad Region.

(vi) To identify the causes and magnitude of dwindling quantity and deteriorating quality of water resource in the Vagad Region.

(vii) Conduct a Pilot Study and Survey in Dungarpur Tehsil with all the objectives related to the major project.

(viii) To generate detailed and enhanced spatio-temporal database readily accessible to common man and decision makers in form of an interactive Web-GIS based application in a user-friendly interface.

(ix) To examine the water management policy currently being followed in the Vagad Region.

(x) To suggest water harvesting and other solutions for a sustainable water supply in the Vagad Region.

(xi) To create awareness among the people of Vagad Region regarding problems related to water quality and measures of prevention.

## 4. WORK ACCOMPLISHED AND OBJECTIVES ACHIEVED

The following work was accomplished and results achieved since the beginning of the project:

- Geo Referencing of the Census 2011 Atlas Census Maps of the Vagad Region i.e. the districts of Dungarpur and Banswara.

- Geo Referencing of the Census 2011 Atlas Census Maps of all 9 individual tehsils of the districts of Dungarpur and Banswara with all the census village boundaries.
- Digitization of the Vector Boundaries of all the villages of all 9 tehsils of the districts of Dungarpur and Banswara using the above mentioned geo-referenced Census 2011 Atlas Maps into ESRI Shapefile format.
- Attribution of the above digitized approximately 2500 villages' vector polygon features of the districts of Dungarpur and Banswara with attributes viz. Village Name, Village Census Location Code, District Name, District Census Location Code, Tehsil Name, Town Name, Town Census Location Code, Village Population Census 2011 etc.
- Preparation of the vector format data of Geological Structure Layer for the Dungarpur and Banswara districts using the Geology data provided by the Geological Survey India, Bhukosh Portal.
- Preparation of the vector format data of Geomorphological Structure Layer for the Dungarpur and Banswara districts using the Geomorphology data provided by the Geological Survey India, Bhukosh Portal.
- Preparation of the vector format data of Lineament Form Layer for the Dungarpur and Banswara districts using the Lineament Form data provided by the Geological Survey India, Bhukosh Portal.
- Preparation of the vector format data of Lithology Layer for the Dungarpur and Banswara districts using the Lithology data provided by the Geological Survey India, Bhukosh Portal.
- Preparation of Dungarpur Tehsil GWD Sites point feature vector format shapefile representing the location of the GWD water quality report data sites by quarrying the "GWD Assets" GIS Layer on the Rajasthan Government Ground Water "Rajdharaa" GIS Portal and comparing the GWD Water Quality Asset Location Names written in GWD Ground Water Quality Report for Grid Analysis and identification of zones and villages in Dungarpur Tehsil with no water quality monitoring by the Ground Water Department (GWD) or water quality data is not available.
- Attribution of the above mentioned GWD Sites point feature vector shapefile with water quality attributes taken from GWD Water Quality Report, 2014 of Dungarpur.
- Preparation of vector format grid shapefile for the Vagad region consisting of individual grid cells of dimensions of 5 Km. length and 5 Km. breadth for Grid analysis to select

villages for approximately spatially even distribution of villages for Water Quality Sample Collection and Field survey under the Pilot Project Study of Dungarpur Tehsil.

- Preparation of Pilot Project Sampling Sites point feature vector format shapefile representing the location of the villages selected for the Water Quality Sample Collection and Field survey under Pilot Project Study of Dungarpur Tehsil.
- Attribution of the above prepared Pilot Project Sampling Location Site shapefile with attributes viz. Village Name, Village Census Location Code, Sample No., Sample Name, Water Testing Lab Results viz. Sample Registration No., pH, Taste, Odour, Turbidity, TDS, Hardness, Alkalinity, Chloride, Fluoride, Sulphate, Nitrate, Iron, Faecal Coliform, E. Coli level etc.
- Performing Kriging Interpolation Operation over the parameters and attribute values in the GWD Site Layer for assessment of correct interpolation method to be used for the pilot study as well as main project, also for preparation of a research paper on Comparative Study of Better Interpolation Method for Water Quality Monitoring and Prediction.
- Preparation of Survey Schedule or Questionnaire for the Pilot Project of Dungarpur Tehsil completed.
- Conducted Pilot Study Field survey and Water Sample Collection at 21 selected locations in Dungarpur Tehsil.
- Conducted Field survey and Water Sample Collection Survey in 200 villages in Banswara district.
- Organization of results of field survey data collected in field survey and results of the physico-chemical testing of water samples collected in the field by the laboratory is under progress.

## 5. BRIEF DESCRIPTION OF THE METHODOLOGY

The following points describe briefly about the methodology adopted for the project:

- Georeferencing of Census Maps 2011 for the digitization of the study area boundaries in GIS vector data format.
- Attribution of the study area vector data boundaries and village vector data boundaries with Census 2011 population and census location codes.

- Preparation of Geology, Lithology and Geomorphology vector data
- Preparation of 5km by 5km spatial grid polygon layer for the selection of the villages for conducting the field survey and field water sample collection drive in Banswara and Dungarpur districts.
- Preparation of field survey schedules for the field survey and preparation of label for the water sample bottles to be used in field.
- Recording and compilation of data collected in field survey and lab testing results of 14 water quality parameters from each surveyed location in the study area.
- Preparation of GIS point feature vector data of surveyed location in the field survey containing data from field survey and lab test results of the water samples.
- Geo-Statistical and Interpolation Analysis on the above prepared GIS point feature vector data layer of surveyed location in the field survey containing data from field survey and lab test results of the water samples.
- Compilation of the results of the analysis done.
- Preparation of Web-GIS Application with all the required functionalities and reporting tools integrated.
- Preparation of Maps Layouts and Final Project Report.

## 6. OUTCOME OF THE WORK DONE SO FAR

The following points illustrate the outcomes of the work done so far in the project:

- Geo-referencing and digitization of all the study area GIS vector data boundaries of Vagad region - Dungarpur and Banswara districts done based upon the Census 2011.
- Attribution of the digitized GIS vector data boundaries of Vagad region - Dungarpur and Banswara districts done up to the village level based upon the Census 2011.
- Preparation of the GIS vector data boundaries of the Geology, Lithology, Waterbodies and Geomorphology of the entire study area was completed.
- Preparation of the field survey Schedules and Water Samples Labels was completed.
- Conduction of the pilot survey of 21 villages of tehsil Dungarpur was completed.
- Approximately 400 water sample collected from Banswara & Dungarpur districts.
- Field survey of approximately 800 families have been completed.

## 7. PUBLICATIONS

- Research Paper Title: "Spatial Variability of Groundwater Quality Parameters With Geo-Statistical Interpolation Method Using Ordinary Kriging and GIS (Case Study: Dungarpur Tehsil, Rajasthan, India)" based on the State Ground Water Department Rajasthan Pre-Monsoon 2014 data was published in Journal of Geomatics, Vol. 16, No. 2, Oct. 2022 by Indian Society of Geomatics.

## 8. CONFERENCE, WORKSHOP AND TRAINING ORGANISED

- A three day Web-GIS Training was conducted in the Department of Geography, Mohanlal Sukhadia University, Udaipur, Rajasthan from 7$^{th}$ to 9$^{th}$ January, 2021 under RUSA 2.0 Project by Prof. Seema Jalan, Co-PI & Head of Department. Mr. Mohammed Ali S., was the resource person from Rajasthan State Remote Sensing Centre, Jodhpur (Rajasthan). Details of the training are mentioned with photographs in a separate annexure (Annexure I) with this report.

## 9. PROJECT WORK STATUS, WORK REMAINING, FUTURE WORK PLAN AND TIMELINE

| **Months (after issue of FS on 20.8.2020)** | **Targets** | **Status** | **Remarks** |
|---|---|---|---|
| November, 2020 | • Procurement of equipment, software, furniture, books, data etc.<br>• Appointment of Staff | • Completed as per priority. Will be procured as required with the progress of the project.<br>• Completed in November, 2020. | |

| | | | |
|---|---|---|---|
| March, 2021 | • Preparation of questionnaire<br>• Data collection ,compilation and preparation<br>• Field data collection and primary survey | • Completed in March, 2021<br>• Completed<br>• Pilot survey of the same has been completed in March,2021 | |
| July, 2021 | • Generation of Geospatial database<br>• Web application development | Completed | |
| Mar. 2022 | • Layer finalization, attribution and analysis as per the next phase of the project.<br>• Database creation, validation for next phase from both primary and secondary data of Dungarpur and Banswara district.<br>• Field Survey and Water Sample Collection of Banswara District. | Field Survey and Water Sample Collection of Banswara & Dungarpur District Completed.<br>Database schema creation completed.<br>Compilation of data collected in survey and water sample lab testing results. | |
| Dec. 2023 | • Preparation of GIS Vector Data Layers of Compilation of Survey and Water Quality Lab Test Results of Both Dungarpur and Banswara districts. | Remaining | Time Required 2 Month |
| Dec. 2023 | • Geo-Statistical Analysis and Project Report Preparation | Remaining | Time Required 2 Months |

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2022

## CRITERION –3

## MoUs/Linkages/Collaborations

National Dong Hwa University, Hualien, Taiwan

**Document Title:**

Thematic webinar on the International Year of Basic Sciences for Sustainable Development: Inaugural Note by Prof. Y. K. Kuo, National Dong Hwa University, Hualien, Taiwan

# MEMORANDUM OF UNDERSTANDING
# BETWEEN
# GOVERNMENT HOLKAR SCIENCE COLLEGE INDORE, INDIA
# AND
# NATIONAL DONG HWA UNIVERSITY, TAIWAN, R.O.C.

In the spirit of international understanding, Govt. Holkar Science College Indore, India, and National Dong Hwa University, Taiwan, R.O.C., agree to examine the possibility of establishing a framework for educational and research cooperation for our students, faculty and staff.

In preparation for establishing a formal framework for future activities, the parties hereto agree as follows:

1. Explore possibilities for faculty and staff exchanges for research, lectures, and discussions that mutually benefit both institutions;
2. Explore the feasibility of student exchanges and study programs;
3. Seek support for projects determined to be mutually beneficial to both institutions;
4. The terms of joint activities and arrangements for specific visit, exchanges, and other forms of cooperation will be agreed upon in writing prior to the initiation of any activity. Any commitment of resources, financial or otherwise, in support of these activities must be contained in subsequent specific agreements;
5. While no binding commitments have been made, we sign this Memorandum of Understanding in recognition of our common interests and agree to consult periodically concerning the status of our collaboration;
6. This understanding is done in two identical copies, both in English, by authorized representatives of each institute, and both parties will retain one copy of the memorandum.

**For Govt. Holkar Science College Indore, India**

10/04/19

Dr. Suresh Silawat

Principal

Date: 10 April 2019

**For National Dong Hwa University, Hualien County, Taiwan, R.O.C.**

Dr. Han-Chieh Chao

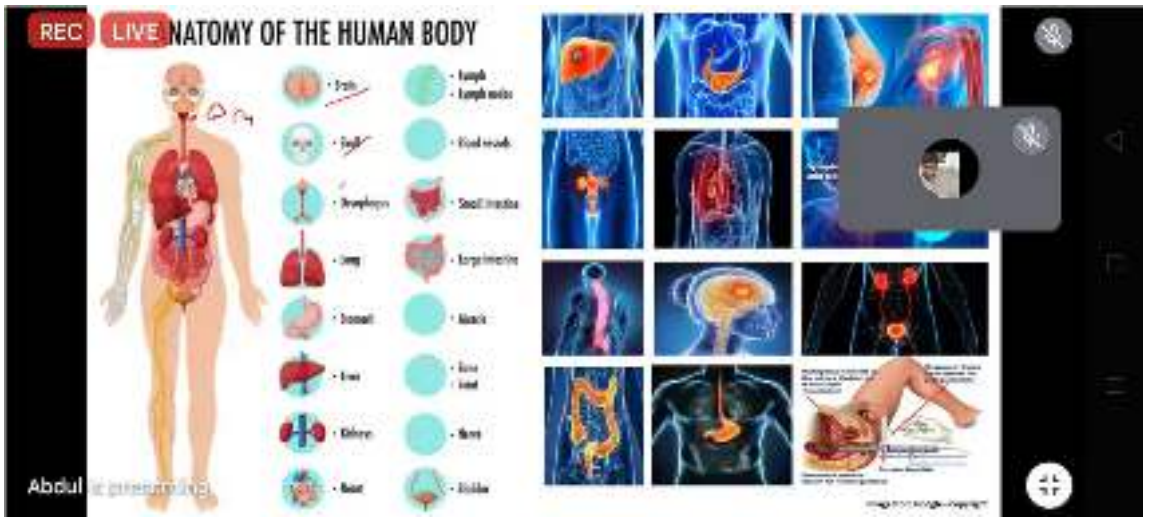
President

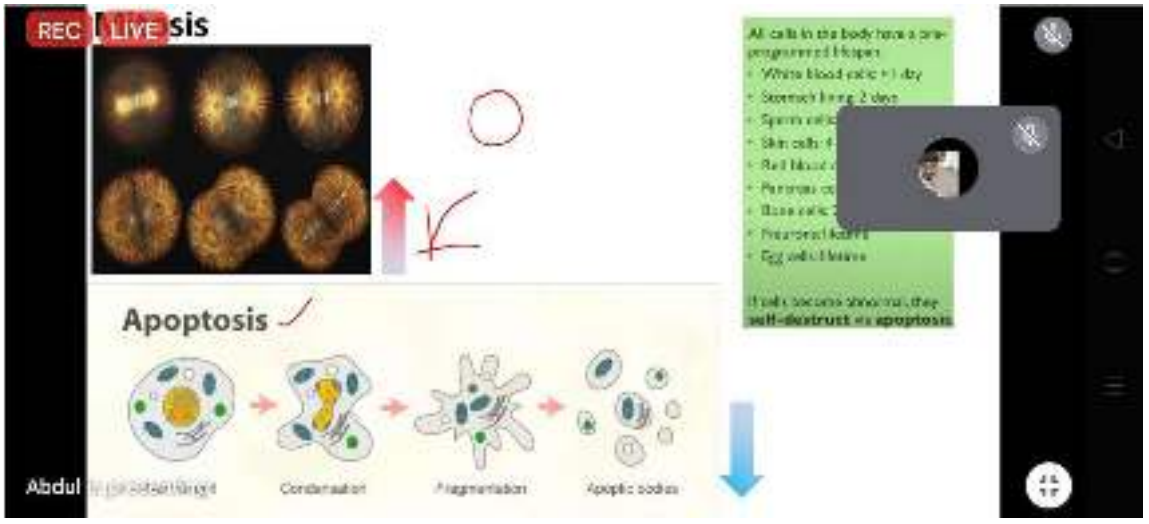
Date: 10 April 2019

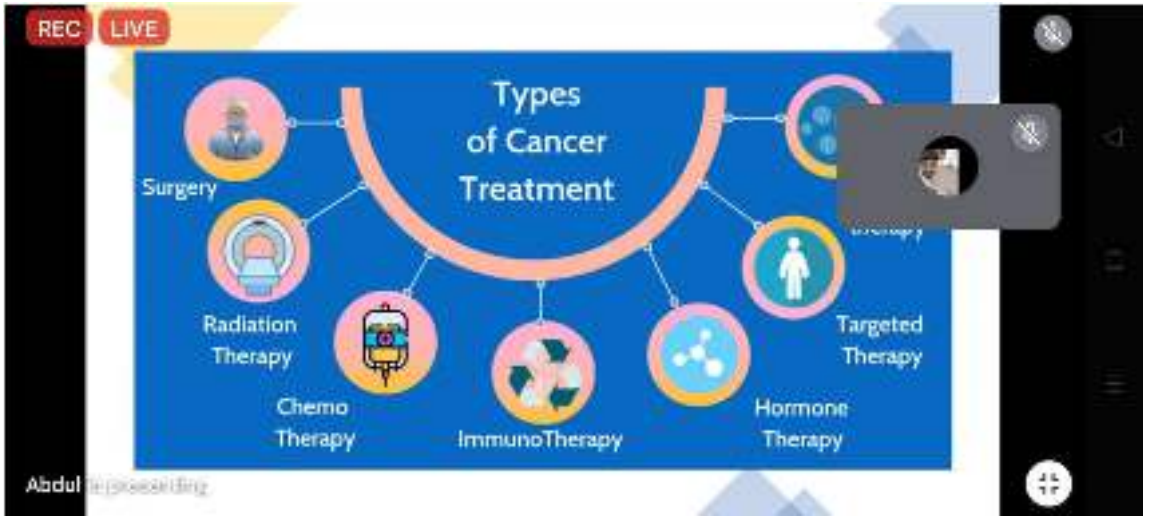
SKILL DEVELOPMENT PROGRAM
2022-23

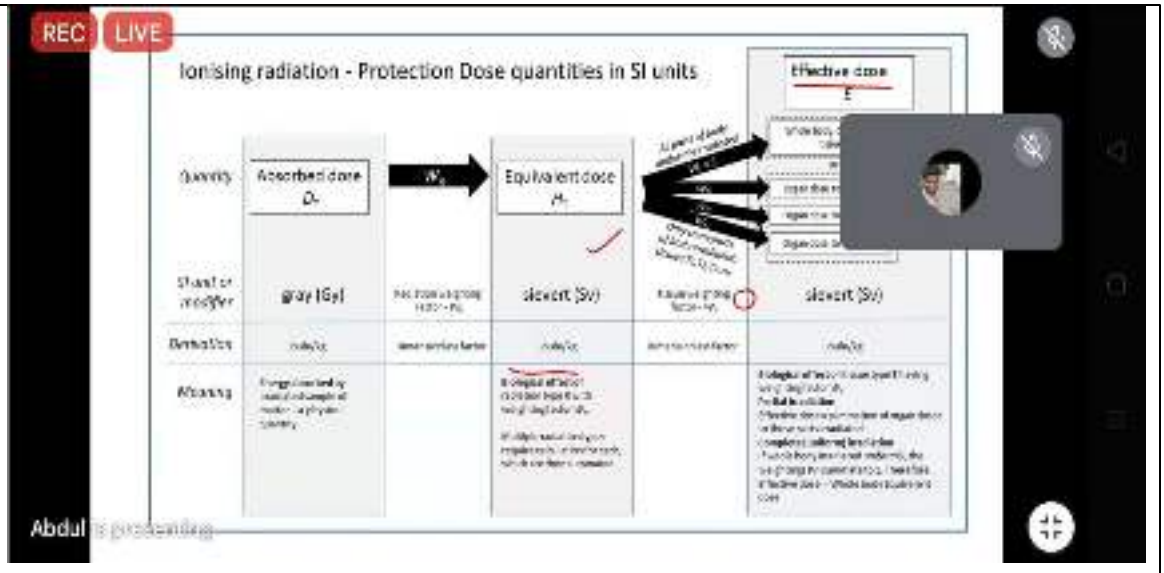
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<tr><th>S. No</th><th>Component/Activities</th><th>Details</th></tr>
<tr><td>1</td><td>Name of the Department / Unit / Agency:</td><td>Department of Physics</td></tr>
<tr><td>2</td><td>Name of the Activity:</td><td>Thematic Webinar on the International Year of Basic Sciences for Sustainable Development</td></tr>
<tr><td>3</td><td>Name of the Scheme:</td><td>Online Webinar</td></tr>
<tr><td>4</td><td>Date and Year of the Activity:</td><td>09/08/2022</td></tr>
<tr><td>5</td><td>Number of Students Participated in the activity:</td><td>121</td></tr>
<tr><td>6</td><td>Report of the Activity (in 100 words):</td><td>Department of Physics & IQAC, Govt. Holkar (Model, Autonomous) Science College Indore was organized an online webinar on “Thematic Webinar on the International Year of Basic Sciences for Sustainable Development”. The agenda for Sustainable Development is the ambitious agenda adopted by United Nations member states to ensure the planet's balanced, sustainable, and inclusive development. The contributions of basic, curiosity-driven sciences are undervalued. Nonetheless, they constitute the foundation of key technological developments that promote innovation and are essential for teaching future workforce and strengthening the capacity of communities to participate in future-determining decisions. Therefore, the focus of this webinar is to bring links between basic sciences and the Sustainable Development Goals.<br>The Inauguration of this webinar was given by Dr. Suresh T. Silawat, Additional Director, Indore Division and Principal, Govt. Holkar (Model, Autonomous) Science College. Following members were worked as :
<table>
<tr><th>S.No</th><th>Name</th><th>Worked as</th></tr>
<tr><td>1.</td><td>Dr. Suresh T. Silawat</td><td>Chief Patron</td></tr>
<tr><td>2.</td><td>Dr. G.D. Gupta</td><td>Patron</td></tr>
<tr><td>3.</td><td>Dr. R.C. Dixit</td><td>A.O.</td></tr>
<tr><td>4.</td><td>Dr. Bijendra Rai</td><td>NAAC Coordinator</td></tr>
<tr><td>5.</td><td>Dr.Nagesh Dagaonkar</td><td>IQAC Coordinator</td></tr>
<tr><td>6.</td><td>Dr. Swagata Gupta</td><td>Advisor</td></tr>
<tr><td>7.</td><td>Dr. Pramila Kori</td><td>NAAC Facilitator</td></tr>
<tr><td>8.</td><td>Dr. Netram Kaurav</td><td>Organizing Secretary</td></tr>
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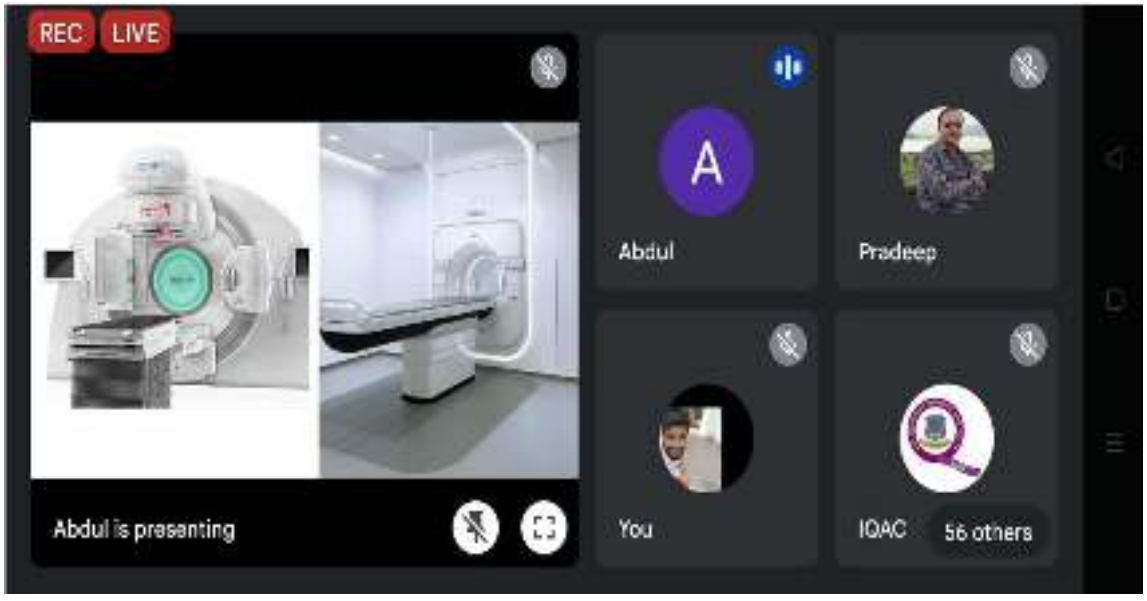
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| 7 | Photo of Activity: | Enclosed |

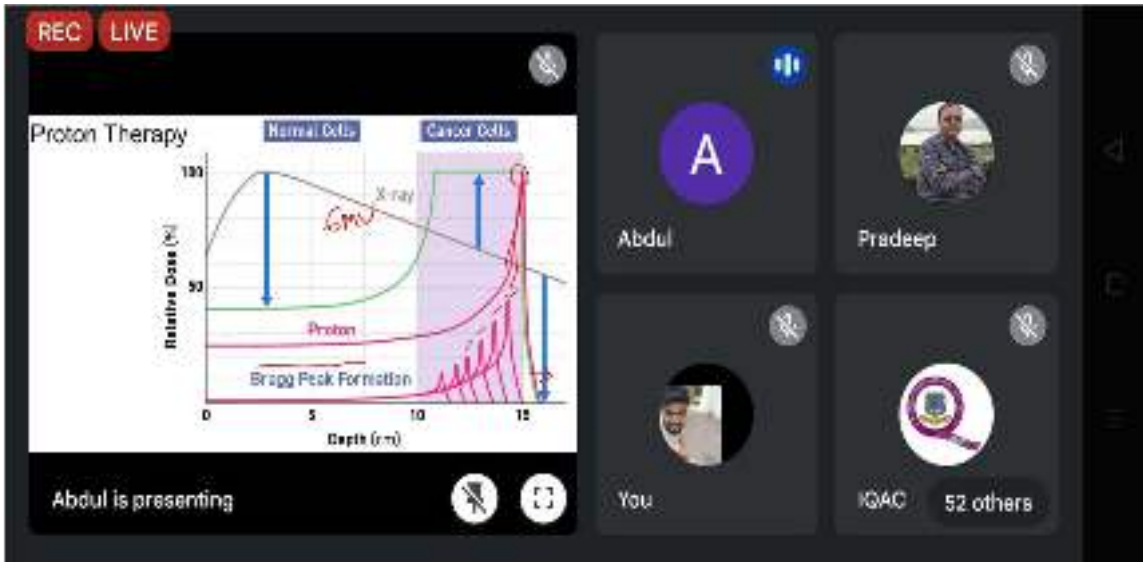





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| 8. | Poster of Activity |

# आमंत्रण

## THEMATIC WEBINAR ON THE INTERNATIONAL YEAR OF BASIC SCIENCES FOR SUSTAINABLE DEVELOPMENT

## मुख्य अतिथि



डॉ सुरेश टी. सिलावट
अतिरिक्त संचालक, उच्च शिक्षा विभाग, इंदौर संभाग
एवं
प्राचार्य, शासकीय होलकर (आदर्श, स्वशासी) विज्ञान महाविद्यालय इंदौर ( म.प्र.)

09 अगस्त, 2022

समय प्रातः 09.15 बजे से 10.30 बजे तक

आयोजक: भौतिकी विभाग, आईक्यूएसी

# Invitation

## THEMATIC WEBINAR ON THE INTERNATIONAL YEAR OF BASIC SCIENCES FOR SUSTAINABLE DEVELOPMENT

## Inaugural Note



Prof. Yung-Kang Kuo
Professor & Provost
National Dong Hwa University,
Hualien, Taiwan

09 August, 2022

Time: 09.15 AM to 10.30 AM

Organizers: Department of Physics & IQAC

# Invitation

## THEMATIC WEBINAR ON THE INTERNATIONAL YEAR OF BASIC SCIENCES FOR SUSTAINABLE DEVELOPMENT



## Lecture

DR. ABDUL K. PARCHUR
Medical Physics Resident
Radiation Oncology, Medical College of Wisconsin, USA

09 August, 2022

Time: 09.15 AM to 10.30 AM

Organizers: Department of Physics & IQAC




| Timestamp | Event Details | Speaker |
|---|---|---|
| 9.20 AM | Joining of participant at online platform Google Meet | Join online at<br>**Google Meet joining info**<br>https://meet.google.com/jge-uyfn-uhj<br><br>**Live Stream**<br>https://stream.meet.google.com/stream/5178a806-ef29-4c63-8ebf-0062f54ec505<br><br>https://youtu.be/PSlOYp6lGk0 |
| 9.30AM to 9.32AM | Starting of event, Introduction of event, Inviting Principal Sir for his inaugural address | Dr. Nagesh Dagaonkar |
| 9.32AM to 9.35AM | Inaugural Address | Dr. Suresh T. Silawat |
| 9.35AM to 9.36AM | Inviting Vice Principal Sir for his Inaugural Address | Dr. Nagesh Dagaonkar |
| 9.36AM to 9.38AM | Inaugural Address | Dr. G. D. Gupta |
| 9.38AM to 9.39AM | Inviting Dr. Bhawana Chourasia to Introduce Prof. Y. K. Kuo, Professor and Dean, Department of Physics, National Dong Hwa University, Hualien, Taiwan | Dr. Nagesh Dagaonkar |
| 9.39 AM to 9.42 AM | Introduction of Prof. Kuo | Dr. Bhawana Chourasia |
| 9.42 AM to 9.46 AM | Inaugural Note By Prof. Kuo | Prof. Y. K. Kuo, |
| 9.46 AM to 9.47 AM | Inviting Dr. V.V.S. Murthy to Introduce DR. ABDUL K. PARCHUR, Medical Physics Resident, Radiation Oncology, Medical College of Wisconsin, USA | Dr. Nagesh Dagaonkar |
| 9.47 AM to 9.50 AM | Introduction of Dr. PARCHUR | Dr. V.V.S. Murthy |
| 9.50 AM to 10.30 AM | Lecture: Introduction to medical physics and nanomedicine for cancer treatment. | DR. ABDUL K. PARCHUR |
| 10.30 AM to 10.35 AM | Q & A Session | Moderated by Dr. R. C. Dixit/ Dr. Nagesh Dagaonkar |
| 10.35 AM to 10.36 AM | Inviting Dr. Netram Kaurav for Vote of Thanks to the Guests, speaker and audience | Dr. Nagesh Dagaonkar |
| 10.36 AM to 10.40 AM | Vote of Thanks and Concluding Remarks | Dr. Netram Kaurav |

**Department of Physics**

Government Holkar (Model Autonomous) Science College, Indore

**IQAC Cell**

Government Holkar (Model Autonomous) Science College, Indore

# Department of Physics, Govt. Holkar (Model, Autonomous) Science College, Indore (MP)

# THEMATIC WEBINAR ON THE INTERNATIONAL YEAR OF BASIC SCIENCES FOR SUSTAINABLE DEVELOPMENT







The focus of this webinar is to bring links between basic sciences and the Sustainable Development Goals.

## AUGUST 9, 9.30 AM TO 10.30 AM ONLINE MODE



Chief Patron:

**Dr. Suresh T. Silawat,**
Additional Director, Indore Division
Principal, Govt. Holkar [Model, Autonomous] Science College, Indore (MP)-INDIA



**Prof. Y-K Kuo**
Professor & Dean,
Department of Physics,
National Dong Hwa University,
Hualien, Taiwan






Webinar Homepage for Details and Registration:
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Dr. Riya Neema

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M.Sc. II & III SEM, 2021-22

## MOU Representation

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National Dong Hwa University,
Hualien, Taiwan

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Dr. Anupam Sharma
Dr. Rekha Sharma
Shri Manoj Gobrele

## Non Teaching Staff

All Administrative Office Staff

# Yung-Kang Kuo



Department of Physics, National Dong Hwa University, Hualien 97401, Taiwan
Email: ykkuo@gms.ndhu.edu.tw
Tel: +886-3-8903697 Fax:+886-3-8900166

Yung-Kang Kuo's received his Ph. D. degree in 1995. He joined the Department of Physics, National Dong Hwa University, Taiwan, in 1998. He has been the Dean of the College of Science and Engineering from 2016 to 2022, and he is now the provost. His expertise is in experimental condensed matter physics. His experimental techniques include designing and operating high precision calorimetric measurements on extremely small crystals, thermal expansion measurements using a capacitance dilatometer, Seebeck coefficient and thermal conductivity measurements by direct-pulse technique, and high precision electrical transport measurements. His main research interest is studying phase transitions in strongly correlated electron systems, such as charge-density-wave transition, order-disorder transition, superconducting transition, magnetic transition, etc. Besides, he is also interested in functional materials, such as thermoelectric materials, metal silicides, Heusler compounds, and shape memory alloys. He has published about 190 SCI papers.

# Abdul K. Parchur, PhD

Medical Physics Resident
Radiation Oncology, Medical College of Wisconsin, Milwaukee, WI 53226
Email: aparchur@outlook.com | Phone: +1 (414) 930 6437 | www.linkedin.com/in/aparchur/


**SUMMARY**

- Developing Machine Learning-based tools to improve therapeutic outcomes in magnetic resonance image-guided adaptive radiation therapy and integrate them into the clinical workflow.
- Participate in testing radiation beam characteristics, image quality, radiation safety, dose delivery/calculation accuracy, and clinical/QA workflow procedures.
- Perform patient specific quality assurance using ArcCHECK (Sun Nuclear) to evaluate intensity modulated radiation therapy (IMRT) plans in the clinic.
- Practice Radiation Therapy, *in vivo* animal real time dynamic imaging (MR, CEST, X-ray - CT, NIR, SWIR fluorescence imaging) followed remote-triggered therapies (Ultrasound, X-ray, RF, NIR light triggering), Interpret, analyze results and administer statistical methods.
- Dynamic contrast enhancement Magnetic Resonance Imaging guided cancer therapy, perfusion model analysis and radiation induced lung damage using CT imaging.
- Expertise in designing and developing novel colloidal nanomaterials, liposomes, optical, magnetic, and plasmonic properties, and surface functional modification, chemical synthesis to develop new nanomedicine applications with a strict GLP protocol.
- To collaborate with a team of experts, medical physicists, MD's, dosimetrist, radiation therapists to define new approaches to clinical problems, willing to learn clinical workflows, leadership, and effective communicator.

**SKILLS**

Radiation Therapy, Dosimetry, Treatment Planning, T1/T2-Weighted MR imaging, DCE MR Imaging, CT imaging, CEST Imaging, Photothermal Therapy, Cancer therapy - Breast Tumors, Liver Tumors, Gd(III) Electron paramagnetic resonance, NMR, Electron Microscopy, Nanomaterials, X-ray Structural Analysis, etc.

**THERAPEUTIC INSTRUMENTS**

***Machines***: Siemens Artiste, Elekta Infinity, Accuray Radixact
***QA Equipment***: Sun Nuclear ArcCheck, ScandiDos Delta4 Phantom+ with Hexamotion, CIRS 1D, Motion Platform and 4D Motion Phantom, Exradin A1SL Ion Chamber, Farmers Ion Chamber, Multichannel Electrometer, IC Profiler, Gafchromic and EDR2 Film, Sun Nuclear Daily QA3
***TPS***: Accuray Precision, Elekta Monaco, MIM
***Record and Verify***: Elekta Mosaiq

**Training**

Radiation Safety, MR Level II Safety, General Laboratory Safety and Protocols

**Computational Resources**

MATLAB, Python, MIM, Amira 6.2, VivoQuant, OriginPro, Material Studio, Rietveld, ImageJ, MS Office

**CLINICAL EXPERIENCE**

**Medical Physics Certificate Program | Froedtert & the Medical College of Wisconsin**

**Patient QA –** Froedtert Hospital, Milwaukee WI **May 2021 – June 2022**

- IMRT (Siemens Artiste, Elekta Infinity) and Tomotherapy (Accuray Radixact) QA using ArcCheck
- Synchrony QA (Accuray Radixact with Synchrony) for fiducial targets and fiducial-free targets using ArcCheck and Delta4 Phantom+

**Monthly QA–** Froedtert Hospital, Milwaukee WI **November 2020 – June 2021**

- QA duties include mechanical, dosimetry, electron and photon beam characteristics, kV and MV imaging, safety on Elekta Infinity™ linear accelerator

**Annual QA–** Froedtert Hospital, Milwaukee WI **January 2021 – June 2021**

- Participated in annual performance of TG-142 and TG-51 on Elekta Infinity and Siemens Artiste
- Post-service QA including after MLC, Jaw replacement, imaging panel replacement

**WORK EXPERIENCE**

**Medical College of Wisconsin, Radiation Oncology, Milwaukee, WI**
**Clinical Medical Physics Resident**
07/2022- Expected in June 2025

**Medical College of Wisconsin, Radiation Oncology, Milwaukee, WI**
**CAMPEP Medical Physics Researcher**
07/2020-06/2022

- Development of novel machine learning techniques fully account for interfractional anatomical changes in MR-Linac image-guided adaptive radiotherapy for the effective tumor targeting during radiation therapy delivery.
- Quick assessment of MR-guided online adaptive radiation therapy workflow on MR-Linac: Adapt to Position-ATP or Adapt to Shape-ATS

**Medical College of Wisconsin, Radiology, Milwaukee, WI**
**Research Scientist**
04/2015-06/2020

- Perform 3D image rendering and analysis of different organs in lamb, mice, and rats using micro-computed tomography (micro-CT) imaging and Magnetic Resonance (MR) Imaging after contrast perfusion (microfil, Iodine, and Gadolinium(III) based contrast)
- Design and develop novel nanomaterials and characterize through various analytical methods and establish procedures using Good Laboratory Practice (GLP)
- Conduct effective *In vivo* animal research on Computed Tomography imaging, Dynamic Near-Infrared (NIR) imaging, Short-wave infrared (SWIR) imaging, Magnetic Resonance (MR) Imaging, CEST Imaging, and Cancer Therapy

**Utah State University, Biomedical Engineering, Logan, UT**
**Postdoctoral Researcher**
09/2013-03/2015

- Engineering multifunctional magnetic nanostructures for the selective targeting of HER2-expressing breast cancer cells and SERS-fluorescence bimodal nanoprobes for *in vitro* imaging of fatty acid responsive receptor GPR120 and single cell Raman imaging
- Exploring biomechanical properties of human lung adenocarcinoma epithelial cells pre- and post uptake of designed nanocontrast materials
- Standardization Atomic force microscopy and enhanced Raman spectroscopy for nanoscale molecular imaging and developing analytical methods for the detection of heavy metal ions in water in Utah State

**Bhabha Atomic Research Centre, BARC, Mumbai | Banaras Hindu University, India**
**Young Scientist**
08/2010-08/2013

- Developed a new method using wet chemistry to make temperature sensing nanomaterials and it's characterization.
- X-ray diffraction crystal refinement of nanostructures using different regression models and spectroscopy techniques.
- Communicating with team and other groups to develop and implement safety standards while performing test procedures as well as recommending realistic quality goals and objectives

**Dr. H S Gour Central University, India**
**Research Scholar - PhD**
2006 - 2010

- Dissertation: "Performance analysis of modern processors used in computers"
- SPEC Benchmark workload performance analysis on advanced intel and AMD processors
- Finite element method analysis of Cu metal attached to a Si substrate above a height of 1.2 μm using different low-k values and voltages

**SELECTED PUBLICATIONS | Citations 2060, H-index 24, i10-index 33**


1. Ahunbay E, **Parchur A. K.**, Paulson E, Chen X, Omari E, Li XA. Development and implementation of an automatic air delineation technique for MRI-guided adaptive radiation therapy. *Phys Med Biol.* **2022**;67(14).
2. Ansari, A. A.; **Parchur, A. K.**; Chen, G., Surface modified lanthanide upconversion nanoparticles for drug delivery, cellular uptake mechanism, and current challenges in NIR-driven therapies. *Coordination Chemistry Reviews* **2022**, *457*, 214423.
3. Ansari, A. A.; **Parchur, A. K**.; Labis, J. P.; Shar, M. A., Physiochemical characterization of highly biocompatible, and colloidal LaF3:Yb/Er upconversion nanoparticles. Photochem Photobiol Sci **2021**, *20(9)*, 1195.

4. Sharma, M.; Rana, U.; Joshi, C.; Michalkiewicz, T.; Afolayan, A.; **Parchur, A. K.**; Joshi, A.; Teng, R. J.; Konduri, G. G., Decreased Cyclic GMP-protein Kinase G signaling impairs Angiogenesis in a Lamb Model of Persistent Pulmonary Hypertension of Newborn. Am J Respir Cell Mol Biol **2021**, *65(5)*,555.
5. Thorat, N.; Pricl, S.; **Parchur, A. K.**; Somvanshi, S. B.; Li, Q.; Umrao, S.; Townley, H., Safeguarding COVID-19 and cancer management: drug design and therapeutic approach; DOI: 10.12688/openreseurope.13841.1.
6. Ansari, A. A.; **Parchur, A. K.**; Nazeeruddin, M. K.; Tavakoli, M. M., Luminescent lanthanide nanocomposites in thermometry: Chemistry of dopant ions and host matrices. *Coordination Chemistry Reviews* **2021,** *444*, 214040.
7. Ansari, A. A.; **Parchur, A. K.**; Thorat, N. D.; Chen, G., New advances in pre-clinical diagnostic imaging perspectives of functionalized upconversion nanoparticle-based nanomedicine. *Coordination Chemistry Reviews* **2021,** *440*, 213971.
8. Ansari, A. A.; **Parchur, A. K.**; Labis, J. P.; Shar, M. A.; Khan, A., Highly hydrophilic CaF2:Yb/Er upconversion nanoparticles: Structural, morphological, and optical properties. *Journal of Fluorine Chemistry* **2021,** *247*, 109820.
9. **Parchur, A. K.**; Fang, Z.; Jagtap, J. M.; Sharma, G.; Hansen, C.; Shafiee, S.; Hu, W.; Miao, Q. R.; Joshi, A., NIR-II window tracking of hyperglycemia induced intracerebral hemorrhage in cerebral cavernous malformation deficient mice. *Biomaterials Science* **2020**, 8 (18), 5133-5144.
10. **Parchur, A. K.**; Sharma, G.; Jagtap, J. M.; Gogineni, V. R.; LaViolette, P. S.; Flister, M. J.; White, S. B.; Joshi, A. Vascular Interventional Radiology-Guided Photothermal Therapy of Colorectal Cancer Liver Metastasis with Theranostic Gold Nanorods. *ACS Nano* **2018,** *12* (7), 6597.
11. Gogineni, V. R.; Maddirela, D.; Ram, W.; Jagtap, J. M.; Sharma, G.; **Parchur, A. K.**; Joshi, A.; Kim D. H.; Larson, A. C.; White, S. B. Localized and triggered release of oxaliplatin for the treatment of colorectal liver metastasis. *Journal of Vascular and Interventional Radiology* **2020,** 11(23), 6982.
12. Sharma, G.; **Parchur, A. K.‡**; Jagtap, J. M.**‡**; Gogineni, V. R.; Bergom, C.; White, S. B.; Flister, M. J.; Joshi, A. Heritable Modifiers of Tumor Micro-environment Heterogeneity Influence Nanoparticle Uptake, Distribution and Response to Photo-thermal Therapy". *Theranostics* **2020,** 10(12):5368-5383.

***‡Authors contributed equally***

13. Jagtap, J. M.; Fish, B.; Hancen, C.; Gao, F.; Sharma, G.; **Parchur, A. K.**; Narayan, C.; Audi, S.; Joshi, A. A rapid dynamic *in vivo* near-infrared fluorescence imaging assay to track lung vascular permeability after acute radiation injury. *Am J Physiol Lung Cell Mol Physiol* **2021,** *320(3)*, L436-L450.
14. Zimmerman, K. C.; Sharma, G.; **Parchur, A. K.**; Joshi, A.; Schmidt, T. G. Experimental investigation of neural network estimator and transfer learning techniques for K-edge spectral CT imaging. *Medical Physics* **2020**, 47 (2), 541.
15. Rana, U.; Callan, E.; Entringer, B.; Michalkiewicz, T.; Joshi, A.; **Parchur, A. K.**; Teng, R.-J.; Konduri, G. G. AMP-Kinase Dysfunction Alters Notch Ligands to Impair Angiogenesis in Neonatal Pulmonary Hypertension. *American Journal of Respiratory Cell and Molecular Biology* **2020,** PubMed: 32048878.
16. Ansari, A. A.; Khan, S.; Aldalbahi, A.; **Parchur, A. K**.; Kumar, B.; Kumar, A.; Raish, M.; Rai, S. B. In-vitro cytotoxicity evaluation of surface design luminescent lanthanide core/shell nanocrystals. *Arab. J Chem.,* **2020,** *13* (1), 1259.
17. Thorat, N. D.; Townely, H.; Brennan, G.; **Parchur, A. K.**; Silien, C.; Bauer, J.; Tofail, S. A. M. Progress in Remotely Triggered Hybrid Nanostructures for Next-Generation Brain Cancer Theranostics. *ACS Biomaterials Science & Engineering* **2019,** *5* (6), 2669.
18. Gogineni, V.; Park, W.; Maddirela, D.; Jagtap, J.; **Parchur, A. K**.; Sharma, G.; Joshi, A.; Kim, D.; Larson, A. Targeted and stimulated release of oxaliplatin for the treatment of colorectal liver metastasis. *Journal of Vascular and Interventional Radiology* **2019,** *30* (3), S100.
19. Xiao, L.; **Parchur, A. K.**; Gilbertson, T. A.; Zhou, A. SERS-fluorescence bimodal nanoprobes for in vitro imaging of the fatty acid responsive receptor GPR120. *Analytical Methods* **2018,** *10*, 22.
20. Jaidip, J.; Gayatri, S.; **Parchur, A. K.**; Venkateswara, G.; Carmen, B. S. W.; Flister, M. J.; and Amit, J. Methods for detecting host genetic modifiers of tumor vascular function using dynamic near-infrared fluorescence imaging. *Biomedical Optics Express* **2018,** *9* (2), 543.
21. Jagtap, J.; Patil, N.; **Parchur, A. K.**; Pantola, C.; Agarwal, A.; Pandey, K.; Pradhan, A. Effective screening and classification of cervical precancer biopsy imagery. *IEEE transactions on Nanobioscience* **2017,** *16* (8), 687.
22. Flister, M. J.; Tsaih, S.-W.; Stoddard, A.; Plasterer, C.; Jagtap, J.; **Parchur, A. K.**; Sharma, G.; Prisco, A. R.; Lemke, A.; Murphy, D. Host genetic modifiers of nonproductive angiogenesis inhibit breast cancer. *Breast Cancer Research and Treatment* **2017,** *165* (1), 53.
23. Belkhir, N. H.; Toncelli, A.; **Parchur, A. K.‡**; Alves, E.; Maalej, R. Efficient temperature sensing using photoluminescence of Er/Yb implanted GaN thin films. *Sensors and Actuators B: Chemical* **2017,** *248*, 769.

***‡Corresponding Author***

24. **Parchur, A. K.**; Li, Q.; Zhou, A. Near-infrared photothermal therapy of Prussian-blue-functionalized lanthanide-iondoped inorganic/plasmonic multifunctional nanostructures for the selective targeting of HER2-expressing breast cancer cells. *Biomaterials Science* **2016,** *4*, 1781.
25. Li, Q.**‡**; **Parchur, A. K.‡**; Zhou, A. In-vitro biomechanical properties, fluorescence imaging, surface-enhanced Raman spectroscopy, and photothermal therapy evaluation of luminescent functionalized CaMoO4:Eu@Au hybrid nanorods on human lung adenocarcinoma epithelial cells. *Science and Technology of Advanced Materials* **2016,** *17* (1), 346.

***‡Both authors contributed equally***

26. Ansari, A. A.; **Parchur, A. K.**; Kumar, B.; Rai, S. B. Highly aqueous soluble CaF2:Ce/Tb nanocrystals: effect of surface functionalization on structural, optical band gap, and photoluminescence properties. *J Mater Sci Mater Med* **2016,** *27* (12), 178.
27. Ansari, A. A.; **Parchur, A. K**.; Kumar, B.; Rai, S. B. Influence of Shell Formation on Morphological Structure, Optical and Emission Intensity on Aqueous Dispersible NaYF4:Ce/Tb Nanoparticles. *J Fluorescence* **2016,** *26* (4), 1151.
28. Gogineni, V. R.; Jagtap, J. M.; **Parchur, A. K.**; Sharma, G.; Joshi, A.; White, S. B. Photothermal Ablation: A Perspective on Technique. *Intervent Oncol 360. 2015;3(12)* **2015,** *3* (12), E141.
29. Singh, B. P.; **Parchur, A. K.‡**; Ningthoujam, R. S.; Ramakrishna, P. V.; Singh, S.; Singh, P.; Rai, S. B.; Maalej, R. Enhanced up-conversion and temperature-sensing behaviour of Er3+ and Yb3+ co-doped Y2Ti2O7 by incorporation of Li+ ions. *Physical Chemistry Chemical Physics* **2014,** *16* (41), 22665.

***‡Corresponding Author***

30. Singh, B. P.; **Parchur, A. K.‡**; Ningthoujam, R. S.; Ansari, A. A.; Singh, P.; Rai, S. B. Enhanced photoluminescence in CaMoO4:Eu3+ by Gd3+ co-doping. *Dalton Transactions* **2014,** *43* (12), 4779.

***‡Corresponding Author***

31. Singh, B. P.; **Parchur, A. K.‡**; Ningthoujam, R. S.; Ansari, A. A.; Singh, P.; Rai, S. B. Influence of Gd3+ co-doping on structural property of CaMoO4:Eu nanoparticles. *Dalton Transactions* **2014,** *43* (12), 4770.

***‡Corresponding Author***

32. **Parchur, A. K.**; Ansari, A. A.; Singh, B. P.; Hasan, T. N.; Syed, N. A.; Rai, S. B.; Ningthoujam, R. S. Enhanced luminescence of CaMoO4:Eu by core@shell formation and its hyperthermia study after hybrid formation with Fe3O4:cytotoxicity assessment on human liver cancer cells and mesenchymal stem cells. *Integrative Biology* **2014,** *6* (1), 53.
33. Ansari, A. A.; **Parchur, A. K.**; Alam, M.; Labis, J.; Azzeer, A. Influence of Surface Coating on Structural and Photoluminescent Properties of CaMoO4:Pr Nanoparticles. *Journal of Fluorescence* **2014,** *24* (4), 1253.
34. Ansari, A. A.; **Parchur, A. K.**; Alam, M.; Azzeer, A. Effect of surface coating on optical properties of Eu3+-doped CaMoO4 nanoparticles. *Spectrochimica Acta Part a-Molecular and Biomolecular Spectroscopy* **2014,** *131*, 30.
35. Ansari, A. A.; **Parchur, A. K.**; Alam, M.; Azzeer, A. Structural and photoluminescence properties of Tb-doped CaMoO4 nanoparticles with sequential surface coatings. *Materials Chemistry and Physics* **2014,** *147* (3), 715.
36. Ansari, A. A.; Alam, M.; **Parchur, A. K**. Nd-doped calcium molybdate core and particles: synthesis, optical and photoluminescence studies. *Applied Physics a-Materials Science & Processing* **2014,** *116* (4), 1719.
37. Singh, B. P.; **Parchur, A. K.‡**; Singh, R. K.; Ansari, A. A.; Singh, P.; Rai, S. B. Structural and up-conversion properties of Er3+ and Yb3+ co-doped Y2Ti2O7 phosphors. *Physical Chemistry Chemical Physics* **2013,** *15* (10), 3480.

***‡Corresponding Author***

38. Prasad, A. I.; **Parchur, A. K.**; Juluri, R. R.; Jadhav, N.; Pandey, B. N.; Ningthoujam, R. S.; Vatsa, R. K. Bi-functional properties of Fe3O4@YPO4:Eu hybrid nanoparticles: hyperthermia application. *Dalton Trans* **2013,** *42* (14), 4885.
39. Ansari, A. A.; Hasan, T. N.; Syed, N. A.; Labis, J. P.; **Parchur, A. K.**; Shafi, G.; Alshatwi, A. A. In-vitro cyto-toxicity, geno-toxicity, and bio-imaging evaluation of one-pot synthesized luminescent functionalized mesoporous SiO2@Eu(OH)(3) core-shell microspheres. *Nanomedicine-Nanotechnology Biology and Medicine* **2013,** *9* (8), 1328.
40. **Parchur, A. K.**; Prasad, A. I.; Rai, S. B.; Tewari, R.; Sahu, R. K.; Okram, G. S.; Singh, R. A.; Ningthoujam, R. S. Observation of intermediate bands in Eu3+ doped YPO4 host: Li+ ion effect and blue to pink light emitter. *AIP Advances* **2012,** *2*, 032119.
41. **Parchur, A. K.**; Prasad, A. I.; Rai, S. B.; Ningthoujam, R. S. Improvement of blue, white and NIR emissions in YPO4:Dy3+ nanoparticles on co-doping of Li+ ions. *Dalton Trans* **2012,** *41* (45), 13810.
42. **Parchur, A. K.**; Prasad, A. I.; Ansari, A. A.; Rai, S. B.; Ningthoujam, R. S. Luminescence properties of Tb3+-doped CaMoO4 nanoparticles: annealing effect, polar medium dispersible, polymer film and core-shell formation. *Dalton Transactions* **2012,** *41* (36), 11032.
43. **Parchur, A. K.**; Ningthoujam, R. S. Behaviour of electric and magnetic dipole transitions of Eu3+, 5D0→7F0 and Eu-O charge transfer band in Li+ co-doped YPO4: Eu3+. *RSC Advances* **2012,** *2* (29), 10859.
44. **Parchur, A. K.**; Ningthoujam, R. S. Preparation, microstructure and crystal structure studies of Li+ co-doped YPO4:Eu3+. *RSC Advances* **2012,** *2* (29), 10854.
45. **Parchur, A. K.**; Ningthoujam, R. S.; Rai, S. B.; Okram, G. S.; Singh, R. A.; Tyagi, M.; Gadkari, S. C.; Tewari, R.; Vatsa, R. K. Luminescence properties of Eu3+ doped CaMoO4 nanoparticles. *Dalton Trans* **2011,** *40* (29), 7595.
46. **Parchur, A. K.**; Ningthoujam, R. S. Preparation and structure refinement of Eu3+ doped CaMoO4 nanoparticles. *Dalton Transactions* **2011,** *40* (29), 7590.

**PUBLICATIONS UNDER PREPARATION**

1. **Parchur, A. K.**; Lim, S.; Nasief, H.; Omari, E.; Zhang, Y.; X. Allen Li, Auto-detection of structural similarity index map from daily MRI as an indicator for MR-guided online adaptation replanning, *Medical Physics, 2021* (***under preparation***).
2. Omari, E.; Nasief, H.; Zhang, Y.; **Parchur, A. K.;** Paulson, E.; Chen, X.; Ahunbay, E.; Hall, W.; Erickson,B.; X. Allen Li, Should Daily Online Adaptive Replanning be Utilized for Every Treatment in MRI-guided Radiotherapy for

Pancreatic Cancer? Annual Meeting Scientific Program Committee of the American Society for Radiation Oncology (ASTRO). (***under preparation***).

3. Nasief, H.; Omari, E.; Zhang, Y.; **Parchur, A. K.;** Paulson, E.; Hall, W.; Erickson,B.; X. Allen Li, Automatically determining necessity of online adaptive replanning based on MRI wavelet multiscale texture features for MRI-guided adaptive radiation therapy. Annual Meeting Scientific Program Committee of the American Society for Radiation Oncology (ASTRO) (***under preparation***).

**PROCEEDINGS PUBLICATIONS**

1. Gogineni, V. R.; Park, W. R.; Jagtap, J.; **Parchur, A. K.**.; Sharma, G.; Joshi, A.; Kim, D.-H.; Larson, A. C.; White, S. B. Localized and triggered release of oxaliplatin for the treatment of colorectal liver metastasis. In *Cancer Res*; Proceedings of the AACR Annual Meeting 2018, **2018**; Vol. 78.
2. Singh, B. P.; **Parchur, A. K.**; Rai, S. B.; Singh, P. Luminescence and electrical behavior of lead molybdate nanoparticles. *AIP Conf. Proc.* **2013,** *1512* (1), 248.
3. **Parchur, A. K.**; Kaurav, N.; Ansari, A. A.; Prasad, A. I.; Ningthoujam, R. S.; Rai, S. B. CaMoO4:Tb@Fe3O4 hybrid nanoparticles for luminescence and hyperthermia applications. *AIP Conf. Proc.* **2013,** *1512* (1), 184.
4. **Parchur A. K.**, G. S. O., R. A. Singh, R. Tewari, L. Pradhan, R. K. Vatsa, and R. S. Ningthoujam. Effect Of EDTA On Luminescence Property Of Eu3+ Doped YPO4 Nanoparticles. *AIP Conf. Proc.* **2010,** *1313*, 391.
5. Singh, B. P.; **Parchur, A. K**.; Rai, S. B.; Singh, P.;Luminescence and electrical behavior of lead molybdate nanoparticles, *AIP Conf. Proc.* **2013,** *1512*, 248.
6. Sharma, G.; **Parchur, A. K.**; Jagtap, J.; Fish, B.; Carmen, B.; Medhora, M.; Flister, M.; Joshi, A. Image-guided radiotherapy with novel trimodal optical/MR/x-ray contrast nanoconstructs enhance the radiation response of head and neck tumor xenografts, *Abstracts of Papers of the ACS*, **2017**, *254*, Abstract 88.
7. Lodhi, P. D.; Kaurav, N.; **Parchur, A. K**.; Choudhary, K. K.; Interpretation of thermal conductivity in LaFeAsO at low temperatures. *AIP Conf. Proc.* **2015,** *1665*, 900025 .

**BOOK CHAPTERS**

1. Jagtap, J. M.; **Parchur, A. K.**; Sharma, G., Smart Nanomaterials for Hyperthermia Therapy Tumor Targeted Nanomaterials", In *Intelligent Nanomaterials for Drug Delivery Applications*, Elsevier Inc., **2020**, *Ch* 3, 43-59.
2. Jagtap, J. M.; Sharma, G.; **Parchur, A. K.**,Functional Nanostructures for drug resistance breast cancer theranostics", In *Micro and Nano Technologies, 1st Edition*, Elsevier Inc., **2020**, *Ch* 7, 131-152.
3. **Parchur, A. K.**; Jagtap, J. M.; Sharma, G.; Hansen, C. P. Radiation and ultrasound stimulated breast cancer nanomedicine, In *External Field and Radiation Stimulated Breast Cancer Nanotheranostics*; IOP Publishing Ltd, **2019**, *Ch* 6, 1-6.
4. **Parchur, A. K.**; Jagtap, J. M.; Sharma, G.; Gogineni, V.; White, S. B.; Joshi, A. Remotely Triggered Nanotheranostics. In *Nanotheranostics for Cancer Applications*; Springer Inc., **2019**, *Ch 17*, 429-460.
5. **Parchur, A. K.**; Jagtap, J. M.; Sharma, G.; Gogineni, V.; Hansen, C. P.; White, S. B.; Joshi, A. Nanostructures for Externally Triggered Chemo/Thermal Therapies, In *Hybrid Nanostructures for Cancer Theranostics*; Elsevier Inc., **2019**, *Ch* 6, 105-124.
6. Sharma, G.; **Parchur, A. K.**; Jagtap, J. M.; Hansen, C. P.; Joshi, A. Hybrid Nanostructures in Targeted Drug Delivery. In *Hybrid Nanostructures for Cancer Theranostics*; Elsevier, **2019**, Ch 8, 139-158.
7. Sharma, G.; Jagtap, J. M.; **Parchur, A. K.**; Hansen, C. P. Ionizing radiation stimulated breast cancer nanomedicine. In *External Field and Radiation Stimulated Breast Cancer Nanotheranostics*; IOP Publishing Ltd, **2019,** Ch 8, 1-21.

**CONFERENCES**

1. **Parchur A. K.**, Nasief H., Lim S., Omari E., Zhang Y., Li X, Improving Structural Similarity Based Indication for MR-Guided Online Adaptation Replanning, *Medical Physics* 49 (6), E203-E203.
2. Nasief H., Omari E., **Parchur A. K.**, Zhang Y., Chen X., Paulson E., Hall W, et. al., MRI Wavelet-Based Machine Learning Classifier to Automatically Determine OLAR Necessity During MRgART, *Medical Physics* 49 (6), E612-E612.
3. Nasief H., **Parchur A. K.**, Omari E., Zhang Y., Chen X., Paulson E., Li X, Hall W,Implementation of Primary and Secondary Methods for Automatically Determining Necessity of Online Adaptive Replanning During MRI-Guided Adaptive Radiation Therapy, *Medical Physics* 49 (6), E245-E245
4. Amjad A., Moreau M., **Parchur A. K.**, Ahunbay E., Cooper D., LiX, A Fast 3D Contour Editing Tool with 3D paintbrush and Edge Detection for MRI-Guided Adaptive Radiation Therapy *Medical Physics* 49 (6), E761-E761
5. Ahunbay E., Xu J., **Parchur A. K.**, Thill D., Paulson E., Chen X., Omari E., Li X, A Two-Step Deep Learning Method for Accurate Synthetic CT From Abdominal MRI, Medical Physics 49 (6), E755-E755
6. **Parchur, A. K.**; Lim, S.; Nasief, H.; Omari, E.; Zhang, Y.; X. Allen Li, Auto-detection of structural similarity index map from daily MRI as an indicator for MR-guided online adaptation replanning, *AAPM 63rd Annual Meeting & Exhibition, 2021*. **ORAL**

7. Omari, E.; Nasief, H.; Zhang, Y.; **Parchur, A. K.;** Paulson, E.; Chen, X.; Ahunbay, E.; Hall, W.; Erickson,B.; X. Allen Li, Should Daily Online Adaptive Replanning be Utilized for Every Treatment in MRI-guided Radiotherapy for Pancreatic Cancer? *ASTRO* Annual Meeting, Oct 24-27th 2021, Chicago. **POSTER**
8. Nasief, H.; Omari, E.; Zhang, Y.; **Parchur, A. K.;** Paulson, E.; Hall, W.; Erickson,B.; X. Allen Li, Automatically determining necessity of online adaptive replanning based on MRI wavelet multiscale texture features for MRI-guided adaptive radiation therapy. *ASTRO* Annual Meeting, Oct 24-27th 2021, Chicago. **ORAL**
9. Sharma G.; **Parchur, A. K.**; Jagtap, J. P.; Fish B.; Carmen, B.; Flister, M.; Medhora,M. M.; and Joshi, A.; Magnetic Resonance Image guided radiation therapy with nanoparticles improves radiation response of Oral Tumor Xenograft, ISMRM & SMRT, 2020, (Poster).
10. C. Hansen, J. M. Jagtap, G. Sharma, **Parchur, A. K.**, K. Allen, R. K. Woods, V. Hraska, A. Joshi; Near Infrared Fluorescence Image Guidance System for Thoracic Duct Visualization During Pediatric Cardiac Surgery, Biomedical Engineering Society Annual Meeting, Oct 17-20, 2018, Atlanta, GA. (Poster)
11. J. M. Jagtap, G. Sharma, **Parchur, A. K.**, B. Fish, M. Medhora, A. Joshi; Near-infrared dynamic fluorescence imaging to characterize radiation-induced cardiovascular changes in Invivo in rats, 64th Annual Meeting of the Radiation Research Society, Sep 23-26, 2018, Chicago, IL (Poster)
12. Stephen Mazurchuk, J. M. Jagtap, G. Sharma, **Parchur, A. K**., B. Fish, M. Medhora, A. Joshi; Machine Learning Framework for Dynamic NIR Fluorescence Based Classification of Congenic Mapping in Rats; 2018 WMIC, Sep 12–15th, 2018, Seattle, WA. (Poster)
13. J. M. Jagtap, G. Sharma, **Parchur, A. K.**, B. Fish, M. Medhora, A. Joshi; Assessing radiation induced acute vascular injury in rats with near-infrared dynamic fluorescence imaging; 2018 WMIC, Sep 12–15th, 2018, Seattle, WA. (Poster)
14. **Parchur, A. K**., J. M. Jagtap, G. Sharma, S. M. Holzhauer, W. Jing, B. D. Johnson, M. Riese, A. Joshi; Tracking T-Cell Based Therapies with Short-Wave-Infrared Emitting Quantum Dots; 2018 WMIC, Sep 12–15th, 2018, Seattle, WA. (Oral)
15. J. M. Jagtap, G. Sharma, **Parchur, A. K.**, V. Gogineni, S. B. White, M. Flister, A. Joshi; Imaging the Effect of Germline Tumor Microenvironment Variation on Triple Negative Breast Cancer, 2017 BMES Annual Meeting, Oct 11–14th, 2017, Phoenix, AZ. (Poster)
16. J. M. Jagtap, G. Sharma, **Parchur, A. K.**;, V. Gogineni, S. B. White, C. Bergom, M. Flister, A. Joshi; Imaging lymphatic function in a rat model of hypertension and the impact on breast cancer metastasis, 2017BMES Annual Meeting, Oct 11–14th, 2017, Phoenix, AZ. (Poster)
17. **Parchur, A. K.**, J. M. Jagtap, V. Gogineni, G. Sharma, S. B. White, M. Flister, A. Joshi; Efficient Hepatic Site-Selective Delivery of Novel Trimodal Optical/MR/X-ray Contrast Nanoconstructs for Colorectal Cancer Liver Metastasis Therapy, 2017 BMES Annual Meeting, Oct 11–14th, 2017, Phoenix, AZ. (Oral)
18. G. Sharma, **Parchur, A. K.**, J. M. Jagtap, B. Fish, B. Carmen, M. M. Medhora, M. Flister, A. Joshi; Enhanced Radiation Response of Head and Neck Tumor Xenografts Using Novel Trimodal Optical/MR/Xray Contrast Nanoconstructs, 2017 BMES Annual Meeting, Oct 11–14th, 2017, Phoenix, AZ. (Oral)
19. **Parchur, A. K**., J. M. Jagtap, V. Gogineni, G. Sharma, S. B. White, M. Flister, A. Joshi; Image Guided Site-Selective Delivery of Novel Trimodal Optical/MR/X-ray Contrast Nanoconstructs for Colorectal Cancer Liver Metastasis Therapy, 2017 WMIC, Sep 13–16th, 2017, Philadelphia, PA. (Oral)
20. J. M. Jagtap, G. Sharma, **Parchur, A. K**., V. Gogineni, C. Bergom, S. B. White, M. Flister, A. Joshi; Genetic variation in vascular morphology affects plasmonic nanoparticle uptake, temperature distribution, and efficacy of photothermal ablation of breast cancer, 2017 WCIO; Jun 8–11th 2017, Boston, MA. (Poster)
21. **Parchur, A. K**;, J. M. Jagtap, G. Sharma, V. Gogineni, M. Flister, S. B. White, A. Joshi; Site-Selective Delivery of Novel Trimodal Optical/MR/X-ray Contrast Bearing Photothermal Nanoconstructs Increases Uptake in Colorectal Liver Metastasis Tumors, 2017 WCIO; June 8–11th 2017, Boston, MA. (Oral)
22. **Parchur, A. K.**, J. M. Jagtap, V. Gogineni, G. Sharma, S. B. White, M. Flister, A. Joshi; Theranostic Nanoparticles with Native Short Wave IR and MR Contrast for Plasmonic Photothermal Therapy of Breast Cancer in a Rat Model, 2016 WMIC, Sep 7–10th, 2016, New York, NY. (Poster)
23. J. M. Jagtap, **Parchur, A. K.**, V. Gogineni, G. Sharma, A. L. Kaczmarowski, P. S. LaViolette, C. Bergom, S.B. White, M. Flister, A. Joshi; Imaging the Impact of Germline Tumor Micro-environment Variation on Triple Negative Breast Cancer, 2016 WMIC, Sep 7–10th, 2016, New York, NY. (Oral)
24. V. Gogineni, **Parchur, A. K.**, J. M. Jagtap, G. Sharma, M. Flister, S. B. White, M. Flister, A. Joshi; DynaCT and Short wave-IR Optical Image Guided Interventional Photothermal therapy of Colorectal Liver Metastasis, 2016 WMIC, Sep 7–10th, 2016, New York, NY. (Poster)
25. **Parchur, A. K.**, J. M. Jagtap, G. Sharma, V. Gogineni, M. Flister, S. B. White, A. Joshi; A Novel Tri-Modal Gold Nanocomplex for Image-Guided Thermal Ablation of Liver Tumors, 2016 WCIO; June 9–12th 2016, Boston, MA. (Oral)
26. J. M. Jagtap, **Parchur, A. K.**, G. Sharma, V. Gogineni, M. Flister, S. B. White, A. Joshi; Impact of Germline Tumor Microenvironment Variation on Plasmonic Photothermal Ablation of Breast Cancer, 2016 WCIO; June 9–12th 2016, Boston, MA. (Oral)

27. J. M. Jagtap, **Parchur, A. K.**, V. Gogineni, G. Sharma, A. Kaczmarowski, M. Flister, S. B. White, A. Joshi; A Novel Tri-Modal Gold Nanocomplex for Image-Guided Thermal Ablation of Liver Tumors, 2016 Midwest Preclinical Imaging Consortium, May 15–17th, 2016, Madison, WI. (Poster)
28. **Parchur, A. K.**, J. M. Jagtap, G. Sharma, V. Gogineni, M. Flister, S. B. White, A. Joshi; A Novel Tri-Modal Gold Nanocomplex for Image-Guided Thermal Ablation of Liver Tumors, 2016 Midwest Preclinical Imaging Consortium, May 15–17th, 2016, Madison, WI. (Poster)
29. **Parchur, A. K.**, J. M. Jagtap, G. Sharma, V. Gogineni, M. Flister, S. B. White, A. Joshi; Theranostic Nanoparticles for the Noninvasive Diagnosis and Photothermal Therapy of Breast Cancer, 2016 Cancer Center Scientific Retreat, the Medical College of Wisconsin Cancer Center, April 29, 2016, Milwaukee, WI. (Poster)

**HONORS AND AWARDS**

- Guest Editor, Nanomaterials (ISSN 2079-4991), July 2022.
- AAPM Oral presentation at 2021 AAPM Virtual 63rd Annual Meeting
- ASTRO Oral presentation (co-author) at 2021 ASTRO's 63rd Annual Meeting
- Guest Editor, IEEE Transactions on NanoBioscience, Dec 2017.
- Best Scientific Abstract: Site-Selective Delivery of Novel Trimodal Optical/MR/X-Ray Contrast Bearing Photothermal Nanoconstructs Increases Uptake in Colorectal Liver Metastasis Tumors, World Conference on Interventional Oncology, Boston, 2017.
- Best Scientific Abstract: Impact of Germline Tumor Micro-environment Variation on Plasmonic Photothermal Ablation of Breast Cancer, World Conference on Interventional Oncology, Boston, 2016.
- Travel Grants: Talk Title: Tracking T-Cell Based Therapies with Short-Wave-Infrared Emitting Quantum Dots,World Molecular Imaging Society, 2018
- Travel Grants: Talk Title: Image Guided Site-Selective Delivery of Novel Trimodal Optical/MR/X-ray Contrast Nanoconstructs for Colorectal Cancer Liver Metastasis Therapy, World Molecular Imaging Society, 2017
- Travel Grants: Talk Title: Imaging the Impact of Germline Tumor Micro-environment Variation on Triple Negative Breast Cancer, World Molecular Imaging Society, 2015

**PEER REVIEWS | Verified reviews at Publons >250 (https://publons.com/a/1324077)**

Reviewed manuscripts for: Applied Physics Reviews, Journal of Applied Physics, Applied Physics A, Applied Physics Letters, AIP Advances, Advanced Materials, Physical Chemistry Chemical Physics, Acta Biomaterialia, IEEE Transactions on NanoBioscience, Langmuir, Crystal Growth & Design, Nanoscale, Analyst, Nanomedicine: Nanotechnology, Biology, and Medicine, Dalton Transactions, Journal of Material Chemistry C, RSC Advances, ACS Biomaterials Science & Engineering, etc.

**PROFESSIONAL MEMBERSHIP**

| | |
|---|---|
| Junior member of American Association of Physicists in Medicine - AAPM | **July 2020 – Present** |
| Radiological Society of North America - RSNA | **August 2016 – Present** |
| World Molecular Imaging Society - WMIS | **2016 – 2018** |

**EDUCATION**

**Clinical Medical Physics Resident**
Froedtert Hospital & Medical College of Wisconsin, Milwaukee WI
2022 - Expected June 2025

**CAMPEP Medical Physics Certificate**
Medical College of Wisconsin, Milwaukee WI
2020 - 2022

**Ph.D. in Physics**
Dr. H. S. Gour Central University, India
2006 - 2010

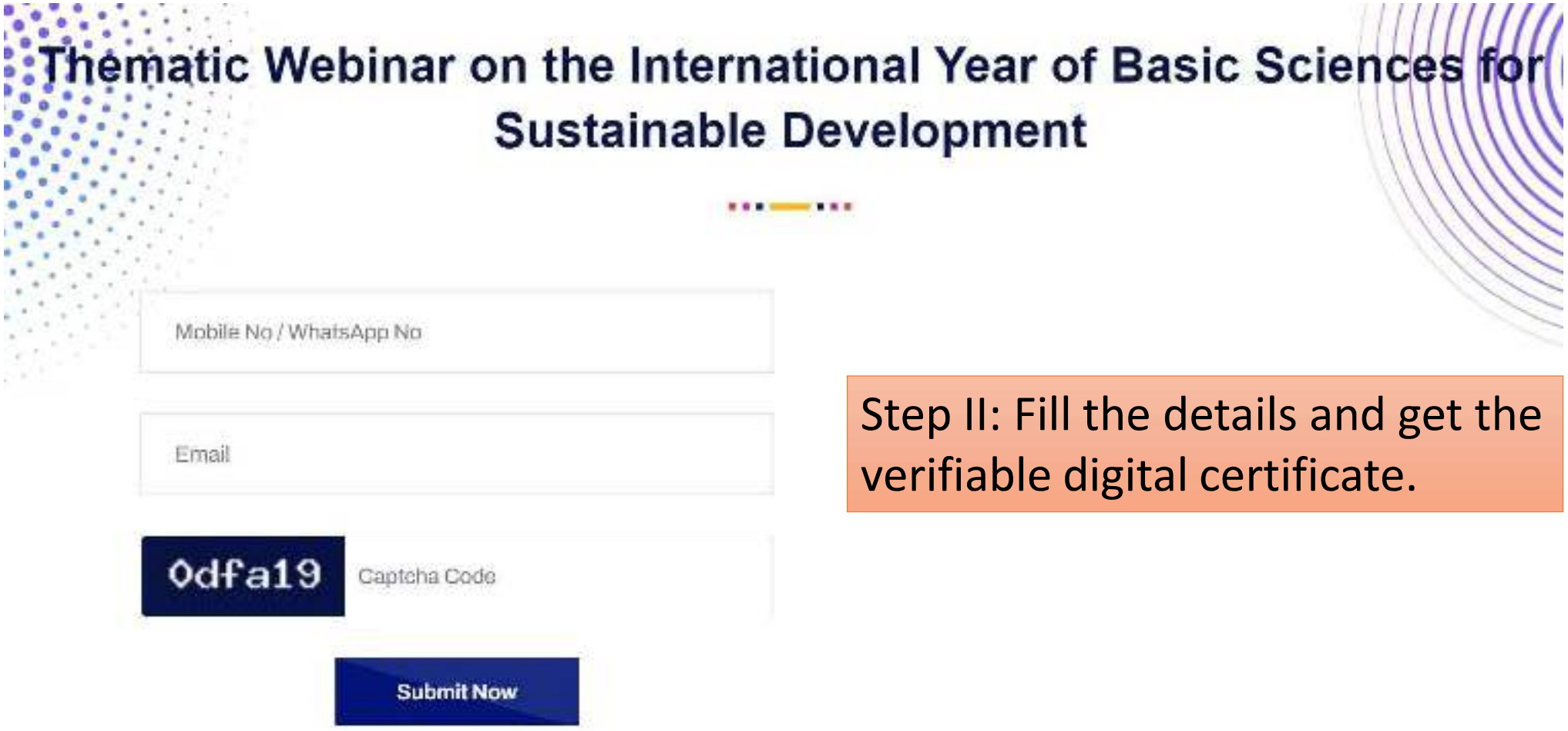
**M.Sc. in Physics | Laser Spectroscopy** Percentage: 70%
Dr. H. S. Gour Central University, India
2003 - 2005

**B.Sc. in Physics** Percentage: 80%
Acharya Nagarjuna University, India
2000 - 2003

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# SSR DOCUMENT

2022

## CRITERION -3

## MoUs/Linkages/Collaborations

**Document Title:**

**Academic student exchange for internship**



तमसो मा ज्योतिर्गमय

# Mata Jija Bai Govt. Girls P.G. College
Moti Tabela ,Indore

E-mail : ggpgcind@gmail.com, hegpgcmtind@mp.gov.in


दिनांक : 04.04.2022

प्रति

विभागाध्यक्ष
शासकीय होलकर विज्ञान महाविद्यालय,
इन्दौर म.प्र.

विषय – एम.ओ.यू. के अंतर्गत शैक्षणिक आदान–प्रदान के लिये हमारे महाविद्यालय के स्नातकोत्तर रसायनशास्त्र विषय के विद्यार्थियों को इंर्टनशिप में सम्मिलित करने बाबद्।

महोदय,

उपरोक्त विषयांतर्गत लेख है कि शासकीय होलकर विज्ञान, इन्दौर एवं माता जीजाबाई शासकीय कन्या महाविद्यालय, मोतीतबेला, इन्दौर के मध्य हुए एम.ओ.यू. के अंतर्गत शैक्षणिक आदान–प्रदान के लिये हमारे महाविद्यालय के स्नातकोत्तर रसायनशास्त्र विषय के विद्यार्थियों को आपके महाविद्यालय के रसायनशास्त्र विभाग द्वारा दिनांक 07.04.2022 से 18.04.2022 तक आयोजित इंर्टनशिप में सम्मिलित करने का कष्ट करें।

सधन्यवाद्।

Head of the
Chemistry Deptt.
Govt. Girls P.G. College, Indore

विभागाध्यक्ष
रसायनशास्त्र विभाग
माता जीजाबाई शासकीय कन्या महाविद्यालय, मोतीतबेला,
इन्दौर म.प्र.

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# SSR DOCUMENT

2022

## CRITERION –3

## MoUs/Linkages/Collaborations

Dr. G. S. Okram, UGC-DAE CSR, Indore

**Document Title:**

**Research activity and joint publication with Dr. G. S. Okram, UGC-DAE CSR, Indore, as Principal Collaborator from the CSR side**

# UGC-DAE Consortium for Scientific Research

*(Formerly: Inter University Consortium for DAE Facilities; IUC-DAEF)*
(An Autonomous institution under University Grants Commission, New Delhi)
University Campus, Khandwa Road, Indore-452001, MP, India
Phone (+91)0731-2463913/2762267/2463913 Fax: 0731-2462294/2465437

Dr. Gunadhor S. Okram
Scientist G/ Engineer G
Website http://www.csr.ernet.in/csr/indore/facilities/ltl/profile.html
Email: okramgs@gmail.com, okram@csr.ernet.in


28 July 2022

**Collaboration certificate**

This is to certify that Dr. Netram Kaurav of Government Holkar (Model, Autonomous) Science College (GHSC), A. B. Road, Indore is a Principal Investigator for the three-year Collaborative Research Scheme project (but extended for another year due to COVID19 lockdown) entitled "*Synthesis and characterization of monodisperse nickel nanoparticles-assisted carbon membranes and their application in gas separation*" of this institute with sanction order No. CSR-IC-MSRSR-02/CRS-210/2017-18/1291, dated 31st March, 2018 under my collaboration with him as the Principal Collaborator of CSR Indore-Centre. This is being issued for the **year 2021-2022** as per the requirements of GHSC of a collaboration certificate.



G. S. Okram

**UGC-DAE Consortium for Scientific Research**
*(Formerly: Inter University Consortium for DAE Facilities, IUC-DAEF(An Autonomous* institution under University Grants Commission, New Delhi)( **A Society Registered Under M.P. Society RegistrikaranAdhiniyam, 1973)***Registered Office and Head Office : UGC-DAE Consortium*, University Campus, Khandwa Road, Indore-452 017,Phone 0731-2463913/2762267/2463913 Fax: 0731-2462594/2465437

**Ref: CSR-CSR-IC/MSRSR-02/CRS-210/2021-22/** 629 **Date :16/12/2021**

To,
Dr. NetramKaurav,
Assistant Professor,
Holkar Science College,
Indore.

Sub :- Your proposal entitled "Synthesis characterization of monodisperse nickel nanoparticles assisted carbon membranes and their application in gas sepration".

Dear Dr.Kaurav,

We are happy to inform you that your CRS proposal has been renewed for one more year for the period 1st April, 2021 to 31st March, 2022, subject to compliance of other procedures.

The financial allocation for this year will be:

| | | |
|---|---|---|
| Project Fellow (@31000/-pm+HRA | Rs.3,72,000/- + HRA | |
| Contingency | | Rs. 15,000/- |
| Consumables | | Rs. 30,000/- |

1. Dr. G S Okram will coordinate the activities of the project from CSR side.
2. The CSR will reimburse the travel expenses to investigators as well as student under the project as per CSR guidelines for visiting CSR, Indore Centre on project work.
3. The PI and the Co-ordinator from CSR side are requested to make every effort to complete the project in time that may enable the research scholar working in the project to complete his/her Ph.D. degree within this year. As the project is already on extension, further extension may not be possible.
4. This is a Collaborative Research Scheme. In view of the complex and involved nature of the experiments, any publication emerging under the project must be of collaborative in nature with due consents from the participating institutions / persons, and in consultation with the CRS coordinator. The publication should also acknowledge the UGC-DAE CSR, Indore for the project support.
5. Money for the year 2021-22 will be transferred to the Registrar of your University under intimation to you by our Accounts Section after adjusting the unspent balance of the grant released earlier, if any upto financial year ending on 31.3.2021, upon receiving the following: (a) Statement of Account for the period upto31.3.2021 signed by the Registrar and (b) Certificate of Utilization of money spent till 31.3.2021, signed by the Registrar.
6. UC/SE in the prescribed format for Financial Year 2021-22 has to be submitted by 30th April 2022.

Thanking you.

Yours sincerely,

(Dr. Vasant Sathe)
Centre-Director

Copy to the following for information and necessary action:-

2. The Administrative Officer-I (Account), UGC-DAE CSR, Indore Centre
3. The Principal, Holkar Science College, Indore.
4. The Centre-Director, CSR Indore Centre for project file.

# UGC-DAE Consortium for Scientific Research
## (UGC-DAE CSR)

(Formerly Inter University Consortium for DAE Facilities, IUC-DAEF)
(An Autonomous institution under University Grants Commission, New Delhi)
(A Society Registered Under M.P. Society Registrikaran Adhiniyam, 1973)
Registered Office and Head Office : UGC-DAE Consortium, University Campus, Khandwa Road,
Indore-452 017
Phone 0731-2463913/2462287 Fax 0731-2462294/2465437


No. CSR-Accts/2021-22/

Date 24.12.2021

To,

Speed Post / Courier / By Hand

The Principal
Holkar Science College,
A.B Road,
Indore

**Sub : Collaborative research titled** "Synthesis characterization of monodisperse nickel nanoparticles assisted carbon membranes and their applications in gas separation" Sanctioned to Dr. Netram Kaurav, Department of Physics, Holkar Science College, A.B Road, Indore.

Ref : Our sanctioned letter No. CSR-IC-210/2021-22/629 dated 16.12.2021.

Sir/Madam,

An amount of Rs. 482100/- has been deposited on 22.12.2021 in your account towards grant sanctioned for the year 2021-22 to CSR Project mentioned above. Details of sanction as follows:

| S.No. | Particulars | | Amount (Rs.) |
|---|---|---|---|
| 01 | Project Fellow @ Rs.31000x12 + HRA | | 437100.00 |
| 02 | Contingency | | 15000.00 |
| 03 | Consumables | | |
| 04 | Unspent Money | (-) | 30000.00 |
| | **Total Amount Deposited** | | **482100.00** |

Money has been transfetred in State Bank of India S/B Account No. 53015687345 through PFMS Portal vide **Trn.ID No. 12234285968 on 22.12.2021.**

The next instalment of money, if any sanctioned, will be released only on production of a statement of account and a utilization certificate from your Institution/University.

Please acknowledge receipt of this letter and send us a stamped receipt by return of post.

Yours sincerely,

Administrative Officer-I (Accts.)

Encl: As above

Copy to : (1) Dr. Netram Kaurav, Department of Physics, Holkar Science College, A.B Road, Indore.
(2) The Center Director UGC-DAE CSR Indore

## PROGRESS REPORT

## Project Title: Synthesis and characterization of monodisperse nickel nanoparticles assisted carbon membranes and their application in gas separation

| Title of paper | Name of the author/s | Department of the teacher | Name of journal | Year of publication | ISSN number | Link to the recognition in UGC enlistment of the Journal | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Link to website of the Journal | Link to article/paper /abstract of the article | Is it listed in UGC Care list |
| Gas permeation properties of nickel nanoparticle-embedded PPO/PVP polymers based carbon membrane | Disha Harinkhere,Netram Kaurav | Physics | Materials Today: Proceedings | 2022 | 2214-7853 | https://www.sciencedirect.com/journal/materials-today-proceedings | https://doi.org/10.1016/j.matpr.2022.07.195 | Scopus Indexed |
| Structural and optical properties of PPO/PVP blended polymer film | Disha Harinkhere, Nikita Karma, K.K. Choudhary, Netram Kaurav | Physics | Materials Today: Proceedings | 2021 | 2214-7853 | https://www.sciencedirect.com/journal/materials-today-proceedings | https://doi.org/10.1016/j.matpr.2021.10.206 | Scopus Indexed |
| Preparation and Characterization of Membranes Supports for Filteration Application | Disha Harinkhere, Netram Kaurav | Physics | Materials Today: Proceedings | 2021 | 2214-7853 | https://www.sciencedirect.com/journal/materials-today-proceedings | https://doi.org/10.1016/j.matpr.2021.10.508 | Scopus Indexed |
| Temperature-dependent transport properties of a FeTe compound | Pavitra Devi Lodhi, Netram Kaurav, K K Choudhary, Y K Kuo | Physics | Bulletin of Materials Science (Springer) | 2019 | 0973-7669 | https://www.springer.com/journal/12034 | https://doi.org/10.1007/s12034-019-1953-7 | Scopus Indexed |
| High pressure structural phase transition and elastic properties of ZnSexTe1-x semiconducting compounds | Saligram Verma, Arvind Jain, K. K. Choudhary and Netram Kaurav | Physics | International Journal of Modern Physics B | 2019 | 0217-9792 | https://www.worldscientific.com/worldscinet/ijmpb | https://doi.org/10.1142/S0217979219502503 | Scopus Indexed |
| Measurement and Analysis of Normal-State Transport Properties of FeSe Superconductor | Pavitra Devi Lodhi, Netram Kaurav, K. K. Choudhary, Y. K. Kuo | Physics | Journal of Low Temperature Physics (Springer) | 2019 | 1573-7357 | https://www.springer.com/journal/10909 | https://doi.org/10.1007/s10909-019-02198-3 | Scopus Indexed |
| Synthesis and characterization of ZnO nanoparticles by thermal decomposition method | Rathore R.; Harinkhere D.; Kaurav N. | Physics | AIP Conference Proceedings | 2019 | 0094-243X | https://pubs.aip.org/aip/acp | https://doi.org/10.1063/1.5098752 | Scopus Indexed |
| Effect of sintering temperature on the dielectric properties of non-stoichiometric nickel oxide | Dubey P.; Choudhary K.K.; Singh K.; Kaurav N. | Physics | AIP Conference Proceedings | 2019 | 0094-243X | https://pubs.aip.org/aip/acp | https://doi.org/10.1063/1.5098725 | Scopus Indexed |
| Structural and Raman analysis of double perovskite La2CoTi0.7Ni0.3O6 | Solanki N.; Lodhi P.D.; Kaurav N. | Physics | AIP Conference Proceedings | 2019 | 0094-243X | https://pubs.aip.org/aip/acp | https://doi.org/10.1063/1.5098715 | Scopus Indexed |

# SSR DOCUMENT

2022

## CRITERION – 3

## MoUs/Linkages/Collaborations

Manganese Ore (India) Limited, Balaghat

**Document Title:**

Internship of students with MOIL, Balaghat.

DEPARTMENT OF GEOLOGY
GOVT. HOLKAR [Model, Autonomous] SCIENCE COLLEGE,
INDORE – 452001 [M.P.]

No. 1350 / Geology/UG Internship

Indore: October 19, 2022

To,
**Mines Manager,**
**Balaghat Manganese Mines,**
**Manganese Ore India Ltd (MOIL)**
**Balaghat (Madhya Pradesh)**

**Sub : Internship of UG students (B.Sc. Part - III) of Geology Department.**

**Ref. : Commissioner Higher Education, Govt. of M.P. Order No. Bhopal dated 16\7\2010**

Sir,

We always appreciate your cooperation and help for considering our request and providing Internship training to UG students of Geology department of our institution. In this regard this is to state that as per the curriculum, the UG students of B.Sc. Part – III 2022-23 are required to complete Internship of one week during first week of November 2022 with concerned department/organization. In this connection, you are requested to accommodate and guide 10 students of B.Sc. Part - III Geology in your Department/Office/Field, so they will be able to carry out the work to fulfill the requirement of Internship. In this regard, you are also requested to assess their performance after completion of Internship as per norms given. Kindly provide a certificate regarding Internship to those students who are present during full course of Internship at your organization. List of participating students is enclosed herewith.

Thanking you for extending help.

Yours sincerely

Head, Department of Geology,
Govt. Holkar Science College Indore
Mobile No. : 09425384421
Email Id : geology_hsc@rediffmail.com

Head
Department of Geology
(Model, Autonomous) Holkar Science College
Indore (M.P.)

**List of students is annexed with letter**

List of B.Sc. Part – III Geology Students:

| S. No. | Students Name | Gender | Mobile No. |
|---|---|---|---|
| 1 | Om Patle | M | 9165719891 |
| 2 | Bhumika Patle | F | 9302938127 |
| 3 | Ankush Funde | F | 8349499173 |
| 4 | Amit Patle | M | 9302938127 |
| 5 | Shubham Khobrgade | M | 9301459230 |
| 6 | Geetali Banskar | F | 7869434134 |
| 7 | Aastha Hanwat | F | 7354636436 |
| 8 | Utkarsh Jhariya | F | 9685832460 |
| 9 | Subhangi Pancheswar | F | 7067816622 |
| 10 | Urvashi Chunne | F | 7224051286 |

Head, Department of Geology,
Govt. Holkar Science College Indore

Head
Department of Geology
Govt. (Model, Autonomous) Holkar Science College
Indore (M.P.)

Shri Vinay Kumar Rahengdale
Chief Manager (Geology)
Manganese Ore India Ltd (MOIL)
Balaghat Mines
Mine Office Bharveli, Balaghat (Madhya Pradesh)

DEPARTMENT OF GEOLOGY
GOVT. HOLKAR [Model, Autonomous] SCIENCE COLLEGE,
INDORE – 452001 [M.P.]

No. 1351 /Geology/UG Internship

Indore: October 19, 2022

To,
**Mines Manager,**
**Balaghat Manganese Mines,**
**Manganese Ore India Ltd (MOIL)**
**Balaghat (Madhya Pradesh)**

**Sub : Internship of UG students (B.Sc. Part - III) of Geology Department.**

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Thanking you for extending help.

Yours sincerely

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Govt. Holkar Science College Indore
Mobile No. : 09425384421
Email Id : geology_hsc@rediffmail.com

Head
Department of Geology
(Model, Autonomous) Holkar Science College
Indore (M.P.)

**List of students is annexed with letter**

List of B.Sc. Part – III Geology Students:

| S. No. | Students Name | Gender | Mobile No. |
|---|---|---|---|
| 1 | Shivam Sharnagat | M | 8224078288 |
| 2 | Jayesh Sharnagat | M | 7247042224 |
| 3 | Sneha Jain | F | 7747832777 |
| 4 | Raj Murchule | M | 9301312348 |
| 5 | Shrey Kumar Patel | M | 9630617185 |
| 6 | Abhinay Patel | M | 9993977185 |
| 7 | Amrata Patel | F | 9993977185 |
| 8 | Jaya Sonkeshriya | F | 6232767744 |
| 9 | Diskha Bisen | F | 9302747538 |
| 10 | Trapti Bhairam | F | 8085784700 |

Head, Department of Geology,
Govt. Holkar Science College Indore

Head
Department of Geology
Govt. (Model, Autonomous) Holkar Science College
Indore (M.P.)

Shri Vinay Kumar Rahengdale
Chief Manager (Geology)
Manganese Ore India Ltd (MOIL)
Balaghat Mines
Mine Office Bharveli, Balaghat (Madhya Pradesh)

# GOVT. HOLKAR SCIENCE COLLEGE,

# INDORE (MP)

## INTERNSHIP REPORT ON

## MANGANESE ORE INDIA LIMITED

**MANGANESE MINES OF BHARVELI,**

**BALAGHAT, MADHYA PRADESH**

**From - 18th March to 24th March 2021**


**SUBMITTED BY:**

**SHIVANI THAKUR**

**M.Sc. IV Sem**

**(EN.NO.- DS19OO505)**

**SUBMITTED TO:**

**DR. VISHNU GADGIL SIR**

**HEAD OF THE DEPARTMENT:**

**GEOLOGY**

# MANGANESE ORE INDIA LIMITED




## BHARVELI, BALAGHAT, MADHYA PRADESH

**VISITED BY: Students of M.Sc. IV Sem**

1. **Shivani Thakur (DS1900505)**
2. **Shruti Jain ( DS1900506)**
3. **Shaifali Pal ( DS1612094)**
4. **Jaya Pandey (DS1900499)**
5. **Saina Rawat ( DS1603903)**
6. **Komal Dawar ( DS1612014)**
7. **Aashi Maroo ( DS1611548)**
8. **Ranjana Mujalda (DS1611772)**
9. **Sonam Chouhan (DS1618736)**

# Acknowledgement

First and foremost, we are grateful to Mr. Vinay kumar Rahangdale Sir, chief geologist for providing an opportunity to kindly attend seven days mine training.

We express our deep sense of gratitude to MOIL (Manganese Ore India Limited) Bharweli, Balaghat, and Madhya Pradesh for approving our letter, dated on 18th of march 2021.

We are also thankful to Mr. Keshavrao Patle sir ( Diamond drill supervisor), Mr. Prashant Thaware (trannie geologist) and Mr. Rajesh Daharwar sir, Moil Bharveli, Balaghat,(Madhya Pradesh) for knowledgeable lecture session and also for guiding us and helping us through out the training.

Our sincere thanks are also to mine operators, labors, villagers for their corporation, and valuable guidance within field days. Our heartfelt thanks are for our parents for giving us financial support to carry out the field training and motivation.

Finally, we would like to express our gratitude to all colleagues who directly and indirectly helped us to make this short training success and joyful.

Date:18 to 24 march 2021

College – Govt. Holkar Science College, Indore (Madhya Pradesh)

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- Introduction: General Geology of the area and stratigraphy
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- Spot 5: Preparing Of Borehole Section And Ore Reserve Estimation.
- Spot 6: Visit To Borehole Drilling Site Near ShankarTemple.
- Spot 7: Conclusion

# GENERAL GEOLOGY OF THE AREA AND STRATIGRAPHY

The rocks in this area belong to Sausar group of rocks. Sausar group is a part of Sausar Mobile Belt (SMB) along with Tirodi biotite gneiss and Meta pelites and Mafic granulites. Sausar group of rocks comprises of multiply deformed and polymetamorphosed sequence of calc silicate gneiss, marble, politic to psammopelitic schist, quartzites and Mn oxide silicate. This group is economically rich because the Mn ore deposits are associated with Sausar group of metasediments. Metamorphic grade of Sausar group of rocks increases from south to north and also towards west. Low grade green schist to green schist-amphibolites facies transition zone metamorphism have been recognized all along the southern periphery of Sausar Group starting from Ukwa in the east to Mansar-Kandri-Satak-Lohdongri areas in the southwestern corner of the basin. In the Tirodi area sillimanite has appeared through the transformation of fibrolite (formed at lower temperature than sillimanite).

Lithologically Sausar group represents an outright supracrustal cratonic assemblage of metamorphosed quartzite, pelites and carbonate (QPC assemblage of Condie 1989). The richest manganese ore deposits of India occur in the mica schist (Mansar formation) and to a lesser extent, in the carbonate (Lohangi formation) horizons of SSG. SSFB is known to extend from Ramakona (Chhindwara, M.P.) in the west to Baihar (Balaghat, M.P.) in the east for a strike length of more than 200km.

Sausar group of rocks are deformed into isoclinal folds along E-W, ENE-WSW, AND NE-SW axes. These are overturned towards north. Sausar Mn ore are identified as synsedimentary low phosphorous type deposited in shelf environment, there are many ores having high phosphorus content. The Mn ore of Balaghat are derived mainly from hydrothermal exhalative and partly from continental sources.

Earlier Narayanswami et al (1963) had given a stratigraphic succession for the Sausar Group of rocks. Recently A. Chattopadhyay, B.K. Bandopadhyay and A.S.Khan (2001) has proposed a stratigraphic succession of Sausar Group and associated gneiss-migmatites which is given as follows:

| | Stratigraphic name | Rock type |
|---|---|---|
| SAUSAR GROUP | Sitapur formation | Hornblende-schists and amphibolites |
| | Intrusives Massive | potassic granite, pegmatite, aplite and quartz |
| | Bichua Formation | Pure and impure dolomitic marble with subordinate |
| | Junewani formation | muscovite-biotite schists and Granulites |
| | Chorbaoli formation | Garnetiferrous quartz-mica-schist with local development of magnetite and staurolite. |
| | Mansar Formation | Biotite (±fibrolite)-muscovite-quartz schist, Dolomitic marble and quartzite with manganese and gondite |
| | Lohangi Formation | Calc-silicate rocks, calc-gneiss and calcitic with or without manganese ore |
| | kadbikhera formation | Granulitic rocks with biotite and magnetite |
| | Sitasaongi formation | Gritty quartzite and associated pebbly quartz-mica schist |
| TBG | Tirodi-biotite gneiss migmatite, | Multi component gneiss, Biotite gneiss, Tonalite gneiss, cordierite gneiss etc |

## DESCRIPTION OF BALAGHAT MINE:

Balaghat Mine is located in Balaghat District, Madhya Pradesh and is 223 Km from Nagpur. It can be approached by all weathered road. The Balaghat Manganese Mine is 6 Km away from Balaghat railway station. The Mine area falls on toposheet No 64 C/1 and is situated at 21° 50' North Latitude and 80° 14' East Longitude. Mining was started in the year 1903 in this mine. Balaghat Mine is deepest and largest underground Manganese Mine in Asia. The lease hold area is located over rolling plain, near the foot

of Baihar plateau. The area comprises of ridge trending in NNE-SSW direction. This ridge forms the southern part of a spur jutting out from the scarp of main Baihar plateau. The average elevation of the plateau is about 610 m above sea level. Ore is mainly silicate in origin (Braunite).

At Balaghat, the litho formations identified are-

Recent alluvium

---

Quartz vein/ pegmatite

---

Mansar formation

---

Manganese Horizon

---

Sitasaongi formation

## MINE AT A GLANCE

- Strike length : 2.8 km
- Strike direction : N25°E- S25°W.
- Dip : 15°- 80° due West
- No. of level of operations : 7th to 12th level.
- No. of level proved : 23rd level.
- Thickness of ore body : 3 -30 m
- Hanging Wall rock : Sericitic schist

  (Mansar formation)
- Foot wall rock : Felapathic Quartzite & quartz schist

  (Siatasaongi)

## Details of Main Entry-

| | | |
|---|---|---|
| Holmes Shaft | : | 6.60 m X 2.70 m<br>Depth upto 15th level 383.50 m & proposed depth upto 16.5 level i.e. 428.50 m |
| Production Shaft | : | 4.50 m dia.<br>Depth 370.26 m |
| Edward Shaft | : | 4.55 m X 1.80m<br>Depth 62 m |
| Haulage Road | : | 3.6 m X 2.4 m (North)<br>3.0 m X 2.4 m (South) |
| Ore Drive | : | 2.4 m X 2.1 m |
| Cross Cut | : | 3.0 m X 2.4 m (North)<br>2.4 m X 2.1 m (South) |
| Winze | : | 2.4 m X 1.8 m |



**HOLMES SHAFT, MOIL, BALAGHAT**

# METHOD OF MINING:

**UNDERGROUND MINE:**

At Balaghat, mining commenced in the year 1901. Over a period 100 years, the activities have reached to the depth of 300 m, through underground mining The development of drives in the underground is done in the ore horizon of dimension of 2.4 m x 2.1m. For proper ventilation in the underground winzes of dimension 2.1 m x 1.8 m are developed in the ore horizon. Winzes generally connect one level to the other; it can also be used for transportation of material from one level to other.

The method of mining in the underground is horizontal cut and fill method by hydraulic sand stowing. In a stope block a slice of 3 m is mined out first, the excavated area is filled with sand (hydraulic sand stowing) for 2 m leaving behind one meter gap. Again another slice of 2 m is mined out, this process continues till we reach the crown pillar. Ore is generally extracted from drives, winzes and stopes.

- Method of Stoping : Cut and Fill Overhand with Hydraulic Sand Stoping.
- No. of Levels worked : $7^{th}$ to $12^{th}$ level
- Level Interval : 30 Mtrs.
- Size of the stope block :60 mtr X 15 mtr X 30 mtr
- Percentage Recovery of Ore from stope: 78%

## SALIENT DESCRIPTION OF PRESENT MINING METHOD:

Currently Balaghat Mine is being worked by underground cut & fill mining method with pre mining supports like rock bolts and cable bolts. Voids created are filled by sand.

## SEQUENCE OF MINING OPERATION:

- **DRILLING:** Drilling is done by jack hammer machine (32 mm dia). It can drill horizontal as well as inclined hole.
- **CHARGING:** The blast holes are charged with explosive, then blast out to open the drive or to get the ore.
- **BLASTING:** For blasting electric detonators are used.
- **DRESSING:** After blasting drives and stopes are dressed to remove the loose and weak portion.
- **MUCKING & TRANSPORTATION:** By SDL (side discharge loader) & hopper loader, material sent to ore pass or ore chute. Ore loaded from chute into GB car and tub. There after ore is dropped into main ore pass.

## VISIT TO UNDERGROUND MINES (LEVEL 13.5):



A visit to underground mines level 13.5 which is below **420 m** from MSL was done. The traverse was done along the haulage road which was made

on the country rock. The haulage road connects the ore by a road called as ore drive.

An exposure was studied of the country rock. The country rock was having fine bands of light and dark colour in which the dark coloured minerals were flaky in nature thus we say that the country rock is micaceous schist which is by stratigraphy the hanging wall. There also patches and veins of quarts seen.

After observing the country rock we went to see the Mn ore. The rock was blackish in colour with lusture and having higher density than the country rock. Strikes and dip were taken ,

- Strike of ore body- N25E – S25W
- Dip- 65˚W

**MINE SUPPORT SYSTEM:**

MINE SUPPORT: a) Crown Pillar

b) Rib Pillar

c) Post Pillar



***(LEVEL 13.5 VISIT)***

# DIAMOND DRILLING

Drilling is an important method of prospecting subsurface rocks and ore deposits. In drilling data are collected by direct penetration of sub surface rocks by drill hole. The sample of rocks are obtained in the form of cylindrical cores of rocks fragments.

It has been employed in mining and geological work. they are

1. Prospecting
2. Exploration
3. Blasting
4. During exploitation for development shaft ,sinking, rescue work etc.

## TYPES OF DRILLING :

1. **Percussion**
2. **Rotary : Diamond drilling**
3. **Miscellaneous**

### DIAMOND DRILLING

Diamond drilling is a form of core drilling which uses a rotary drill with a diamond drill bit attached in order to create precisely measured holes. As diamond is the hardest naturally occurring material in the world, it is ideal for crating openings in a range of materials including concrete, metal and glass.

The main part in diamond drilling methods are;

1. Drill rods
2. Core Bit
3. Barrel
4. Casing(Borehole)
5. Diamond Bit
6. Tungston core bit
7. Stone per carat
8. Impregnated Bit
9. Hosting Plug

Two types of core bit are;

- NQWL
- BQWL

NQWL and BQWL core bits are used with NQWL reaming shell and BQWL reaming shell respectively, where NQ and BQ are series and WL means Wire Line Drilling.

**Reaming shell;**

The outer shell in NQWL bit which has 2mm larger diameter that of bit, used for making the hole wider so as to decrease friction caused by rubbing of the tools and drill rods, against the drill hole walls.

**Barrel;**

A hollow cylinder attached to a specially designed bit and which is used to obtain and to preserve a continuous section or core of the rocks penetrated in drilling.

1. Outer Barrel
2. Inner Barrel

**CORE BARREL**;

It is a tube inside a drill pipe and supported by a bit to receive the core in core drilling, it is a tube usually of iron on which a foundry loam core is formed. All bits are fitted in the core barrel.

There are two types of core barrel;

1. Single Tube
2. Double Tube

**CASING;**

It is a large diameter pipe that assembled and inverted into a recently drilled section of boreholes.

1. HW Casing
2. NW Casing

**DIAMOND BIT;**

Diamond bits are tools for drilling rock that works by scrapping industrial grade diamonds against bottom of hole. The diamonds are embedded into the metal surface during manufacturing of bit.

There are various sizes of diamond bit they are;

1. HW Bit
2. NW Bit
3. NQ Bit




# CORE LOGGING

Core logging is the systematic recording and measuring of as much information as possible required to determine the lithology, mineralogy, potential, geological history, structure and alteration zone through a tiny piece of cylindrical rock drilled and removed from a potential mineral deposit.

## Vocabulary of Core Logging;

- Core Length
- Core Recovery
- Recovery Percentage
- RQD( Rock Quality Designation)
- RQD Percentage

1. **Core length:**
   Length of core is core length a core has a core length 3m.
2. **Core Recovery:**
   In full 3m length which we get is called total core length and reduce is called Recovery.
3. **Core Recovery Percentage:**
   The ratio of the length of the recovered to the length drilling ranges from 0% to 100%.

**Core Recovery % = Total length of core recovery.100 /core run length**

4. **RQD:**
   RQD is modified core recovery percentage in which the length of all round rocks core pieces over 100mm in length are summed and divided by the length of the core run, pieces of core length are not hard and round should not be included in the RQD evaluation even if they are at least 100mm or 10cm in length.

| Range | Length | Recovery | Recovery% | RQD | RQD% | Formation |
|---|---|---|---|---|---|---|
| o-3 | 3m | 3m | 100% | 2.80m | 93.33% | Mica ceresite schist+quartzite |
| 0-3 | 3m | 3m | 100% | 2.87m | 96% | Mica ceresite schist+ quartzite |



(Our team with our mentors at diamond drill)

# VISIT TO FERRO MANGANESE PLANT

## INTRODUCTION:

As a part of diversification, the company has set up a 5 MVA capacity Ferro Managanese Plant with installed capacity 10000 TPA. The plant was commissioned on 1.10.1998. The submerged arc furnace of 5 MVA capacity is able to produce about 10000 TPA of Ferro Managanese or 6800 TPA of Silico Manganese or any combination of these two products depending on the market scenario. The capital costof the plant is about Rs. 5.00 crores.

High Carbon Ferro Manganese is through smelting of charge burden consisting of manganese ore, coke, steam coal, dolomite, iron ore, etc., in the furnace. The High Carbon Ferro Manganese produced in the plant is of the best quality in India having 78% Mn, 0.35% Phosphorous and 6 to 8 % Carbon.

A)



B)



A). Heat Furnace B). Molten ferro manganese aloy flow

The plant has been awarded with ISO 9001-2000 Quality Certificate during the year 2004-05. As production of Ferro alloy is power intensive, the company is considering to set up a captive power plant of 50 MW capacity to meet its power requirements. The company is also planning to expanding the capacity of ferro manganese plant and setting up a new 16.5 MVA Silico Manganese Plant to meet the ever increasing demand of the ferro alloys globally.

## WORKING OF THE PLANT IN BRIEF:

Firstly the raw materials i.e. Mn ore (2.5 to 2.6 MT), pearl coke (0.55 to 0.600 MT), dolomite(0.360 MT), Fe ore (0.070 MT), Carbon paste (0.016 MT) and silica gel (0.200 MT) are taken seperately into 6 bunkers which are then mixed together in a single bunker. The mixture is then taken to the furnace by a carrier. The furnace is an submerged arc furnace which has three electrodes which are formed of carbon paste and forms a delta structure. The electodes have contact rings which ae used to supply current to it coming from the transformer situated above the furnace. There is also pressure ring around the furnace which is used as a support to the furnace.

The current generates heat in the furnace which melts the raw material. The temperature in the furnace is around 1200˚C. In the furnace, electric arc is produced underneath the charge to generate necessary heat for reactions for smelting of the Ferro Manganese. During the process oxides of manganese and iron are reduced by carbon content in coke and goes to metal and gang material su--ch as alumina and silica react with the calcium oxide and magnesium oxide available in the dolomite to form complex silicates in the form of slag. The tapping is done four times a day in which the smelted material is taken out of the furnace and then cooled. First the slag comes out of the furnace followed by the metal as it is less denser than the metal.

## USES OF HIGH CARBON FERRO MANGANESE:

High Carbon Ferro Mn is a vital constituent for the production of steel. It is used as deoxidiser in steel making and also finds strategic importance in as alloying element when additional or specific properties are required in the special steel such as stainless steel, alloy steel, etc.




## VISIT TO INTEGRATED MANGANESE BENEFICIATION PLANT (IMB PLANT)

**Date :21/03/2021**

**Latitude : 21.850$^0$ N**

**Longitude : 80.2280E**

As a part of mechanization of ore handling and beneficiation of manganese ore, the Company has set up an integrated Manganese Ore Beneficiation Plant comprising of crushing, handling, wet screening, drying and magnetic separation operations in one complex at a capital cost of Rs.4 crores, in 2001.

The plant is utilized for bulk handling of ROM and to improve the productivity of the mine and also the grade of ores. This will help in sustaining production and market requirements in future. The plant is first of its kind in the country to be set up for manganese ore beneficiation.

**The following operations are carried out during operation of plant**:

1. **Crushing:** In this process manganese rock particles got crushed in fine particles through the crushers having fastly moving cutting plates in it. It does Crushing of +75 mm material to -75 mm by means of jaw crusher.





2. **Screening**: There are 3 sizes of screens (seives) being used for separation by mechanical vibrations.

| Screen sizes | Product grade |
|---|---|
| 75mm- 25mm | Lumphy |
| 25mm- 6mm | Coarse |
| <=6mm | Fine |

3. **Washing:** After screening ROM separated into 3 size and washing is done with water to remove soil from the manganese ore**.**
4. **Hand picking** : The workers pick out the waste material through hand by weighing their specific gravity (as manganese ore mineral, braunite have high specific gravity 4.7-4.8).

5. **Jigging:** Jigging is a method of gravitational preparation of natural resoures based on separation of mineral mixture on density in vertically oscillating water stream of variable direction. The formed layer different density are separately removed as a concentrate, waste and intermediate product. It is done manually as well as mechanically.




**(IMB PLANT MAP AND SAMPLES)**

# CONCLUSION

It was a really nice experience for us to work here under the great guidance of our guide. we learn from the very beginning of how the ore is extracted to how it is processed in various plants like Ferro Manganese Plant and Integrated Manganese Beneficiation Plant. we also learn how to prepare the borehole sections to estimate the ore reserve and also how the borehole is drilled i.e. its methodology. The underground mine visit was really a thrilling experience as it was our first time that too in Asia's biggest and deepest underground mines. we practically learnt all the methodologies and principles applied here. Overall it was a very good learning experience.

The most important reason that we extract any ore is because of its wide applications in our lives so the applications of Mn are as follows:

1. Oxidizing agent in steel industry
2. Dry Battery as Depolarizer
3. Used in the manufacture of
   - Ferro Manganese (70-74% Mn.)
   - Silico Manganese (60-65% Mn.)
   - Chrome Manganese (20- 25% Mn.)
4. Preparation of Organic and Inorganic Chemicals.
5. In Paints, Pigments, Ceramics and Ferrites.
6. As Micro-nutrients in Fertilizer and animal.
7. Electronics - High purity manganese oxides are designed specifically for component manufacture
8. Fuel Additives - Manganese containing octane improvers provide refiners a highly efficient alternative to MTBE. They reduce pollution

## LOCATION AND ACCESSIBILITY:-

Balaghat Mine is located in village Bharveli, Tawejhari, Aowlajhari Hirapur & Manjhara of Balaghat District, Madhya Pradesh, It is about 223 km from Nagpur . It falls under 21° 50' North Latitude and 80° 14' East Longitude and comes under Topo-sheet no. 64 C/1. It is well connected by road, State Highway No. 26 passes through it and connects Baihar. The nearest railway station is in Balaghat which is connected to Gondia & Jabalpur.

## LOCAL GEOLOGY:

The manganese ore belt in Sausar extends from North-East of Balaghat, Madhya Pradesh to south-west of Nagpur, Maharashtra. It is for about 215km covering Balaghat, Bhandara & Nagpur districts. In Balaghat Mine the surface outcrop of manganese ore is for about 2.8km along the strike. It has a trend NE-SW direction and is dipping towards W direction. The general strike length is N25°E and the dip amount varies from 15° to 85° at various sections.

Genetically, the Manganese deposit in Balaghat mine is Sedimentary in nature, where pure and impure sediments were deposited in the form of higher oxides. These sediments were converted to lower oxide during metamorphism. Since the deposit was admixture of both pure and impure sediments, the zoning of grade is absent. By and large the central part is higher in grade; the quality depletes towards hangwall and footwall. Towards footwall the impure sedimentation is present as manganiferous Quartzite. Therefore in every stope the Manganese varies from 25 – 48 %. The Phos. Distribution within ore zone is prominent. The central portion i.e. between ch.11 & ch.60, the Phos. is less than 0.1 % whereas it is greater than 0.1 % on either *side.* Stratigraphically ore horizon of Balaghat Mine underlies the rocks of Munsar stage & overlies the Sitasaongi stage of Sausar series.

The manganese ore deposit of Balaghat mine is the richest deposit in India occurring in association with the formations of "Sausar Series" as lenticular mass and stretched over a distance of about 8000 ft (2.80 Km). The ore body striking NE-SW with a swing to N-S beyond chainage 'O' and to E-W beyod ch.100, where it thins out both along strike as well as depth.As stated earlier, the Manganese ore of the Bharveli area is the richest one in Central region's Manganese deposit. Out of the total reserve estimated, about 52% is having manganese value more than 40% and remaining 48% is having the Manganese value less than 40%. The

phosphorous value is high (0.2%) from Ch. No.0 to 5 and between Ch. . 60 & 90 on the surface. However this value gradually tapers down between Chainages 11 & 63 respectively at 8th Level underground. Thereafter it follows downwards vertically as evident from the drilling data. The ore horizon consists of manganese ore, manganiferous quartzite and jasperiod quartzite. The width of the ore body varies from 3 mtrs. (at the extremities) to 30 meters at the central part. The maximum true width of the ore body is observed between Chainage 2100 to 1500. The dip of the ore body is towards NW and varies from 20 degree to 80 degree. The steep dip is observed between Chainage 5200-7000.

**STRUCTURE OF ORE BED:**

The Ore bed of the Bharveli mine strikes N 25º E dipping about 50º to 85º towards N 65º W. In the Northern section dip becomes flat (25º to 30º) and in Southern Section it is very steep (70º to 80º). The variation in dip is due to low deformation of the strata.

**FOLDS:**

There are two generations of folds encountered here:-

(I)`The older (F-1) generation fold, in which recumbent fold is existing, is found in between Ch. 800 and Ch.4200. The plunge of this fold is 15 degree towards NW, which causes local flatness of dip in various levels.

(II)The younger generation of fold (F-2) is drag folds, which occur all along the strike, but they have very little effect on the strata. The fold system is displayed on vertical plain, as a result reversal dip is noticed in course of stoping.

**FAULTS** :

Presently there are no faults traceable due to exploitation activities, at opencast as well as in underground levels. They were minor dislocations and had no influence in any direction on the strata.

**JOINTS**:

The Ore bed of this mine is highly jointed. Different sets of joints are developed in section of mines; this may be due to local structural disturbances. In the North Section where the ore body is influenced of recumbent fold (Ch: 800 to Ch: 4200). Four sets of joints along with the random joints are present. The dip of major sets of joint is 78(towards North 130). .But the trend of the joint changes according to local dip direction. The South Section is found to be less disturbed. Here two sets of joints were seen along with the random joints. The dip of the major set of

joint is 70(towards North 298°. The Ore bed of this mine is stretching about 2.8 Kms. In length is continuous along the dip & The Balaghat manganese deposit is a stratiform type deposit; it is also good example for meta-sedimentary deposit. Low grade metamorphism of sedimentary rocks like shale, sandstone and Mn bearing silicate rocks altered to Phyllite, Quartzite & Mn ore horizon. The alternate bands of quartzite and Mn ore clearly indicate sedimentation before metamorphism.

**STRATIGRAPHY:**

The major rock types found in Balaghat are Phyllite, Mica schist, Mn ore and Felspathic/ Quartzite schist. The above series of the rocks are of Mansar formation in sausar group.

**Bichua formation:** Dolomitic Marble, Calc gneiss and Schist.

**Junewani formation:** Mica schist, Quartzite, Biotite gneiss

**Charbaoli formation:** Quartzite, Felspathic schist gneiss, autoclastic Quartz Conglomerate

**Mansar formation:** Mica schist gneiss, graphic schist, phyllite and Quartzite with Manganese deposit including Gondite

**Lohangi formation:** Pink white Calcitic and Dolomitic Marble, calc-silicate gneiss, Quartzite and Manganese deposits, Quartz-Biotite schist and gneiss.

**Sitasongi formation:** Quartz mica schist, Felspathic schist and gneiss, Quartzite and conglomerate

----------unconformity----------

**Tirodi gneiss/older metamorphic group**

**Sitasaongi formation** consist of white to pink jaspery quartzite, followed by a thick zone of conglomerate & grit. The quartzite beds thin out towards North. These rocks form the bottommost member of the sausar series & are in contact with underlying granitic gneiss.

**Manganese bed** in this area occupies a stratigrahic horizon between phyllite & sericite schist of Munsar formation.

**Munsar formation**- overlying the ore bed is a great thickness of sericite schist, which is thrown in to rolling folds. They are medium to fine grained soft, sometimes garnetifeous in nature. Munsar stage comprises of muscovite schist, muscovite, biotite-sillimanite schist and sericite schist in

the low-grade metamorphic zone. At places, these schist are feldspathic and grade into muscovite gneiss. Phyllitic rocks in the Eastern part of the Balaghat District represent this stage.

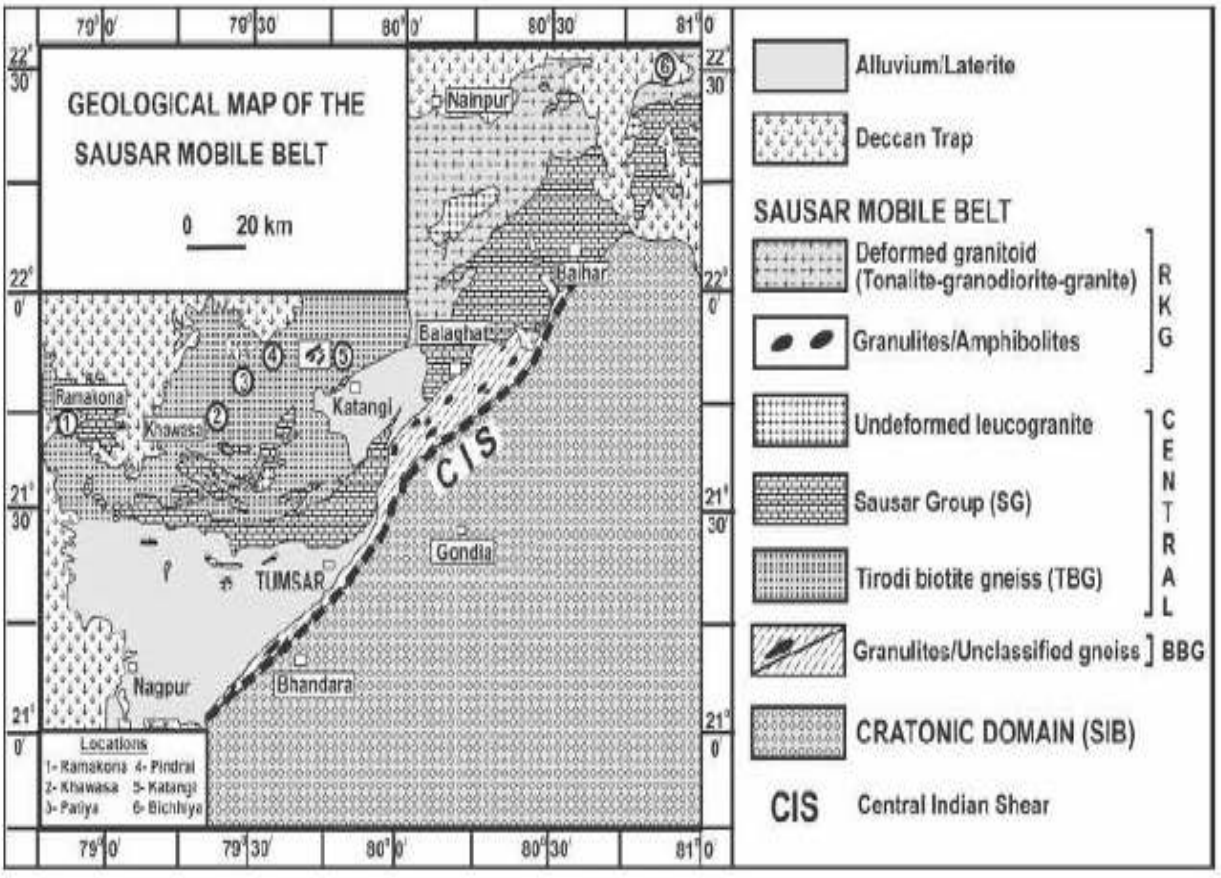



**Fig. 2.** Geological map of the Sausar Mobile Belt in central India, showing the different lithotectonic domains (after Bhowmik & Pal, 2000).

**The contact of ore horizon with hanging wall and Footwall rocks is sharp. The sequence could be represent as below-**

**H/W,- SCHISTOSE ROCK - ORE HORIZON**

**F/ W. - FELDSPATHIC QUARTZITE**

# ORE MINERALS OF MANGANESE

| NAME | BRAUNITE | PYROLUCITE | HAUSMANITE |
|---|---|---|---|
| **Colour** | Brownish black | Steelgrey ,bluish grey | Brownish black |
| **System** | Tetragonal | Tetragonal | Tetragonal |
| **Hardness** | 6-6.5 (Moh's scale) | 6-6.5 (Moh's scale) | 5.5 (Moh's scale) |
| **Formula** | $Mn^{2+}Mn^{3+}SiO_4O_8$ | $MnO_2$ | $MnMn_2O_4$ |
| **Lustre** | Sub-metallic | Sub-metallic | Sub-metallic |
| **Streak** | Black | Black | Dark brown |
| **Diaphaneity** | Opaque | Opaque | Opaque |
| **Tenacity** | Brittle | Brittle | Brittle |
| **Cleavage** | Perfect | Perfect | Perfect |
| **Fracture** | Irregular /concoidal | Concoidal to uneven | Uneven-flat |
| **Density** | 4.8 $g/cm^3$ | 4.4-5.06 $g/cm^3$ | 4.8-4.83$g/cm^3$ |
| **Mode of formation** | Braunite is formed due to metamorphism of manganese silicates and weathering products. | Occurs as Sedimentary, hydrothermal and secondary. | A primary mineral in hydrothermal veins. Also produced by metamorphism of manganiferrous rocks. |

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2022

## CRITERION – 3

## MoUs/Linkages/Collaborations

Medilux Laboratories Pvt. Ltd. Pithampur

**Document Title:**

Industrial visit to Medilux Laboratories Pvt. Ltd., Pithampur

Office of the Principal
**Govt. (Model Autonomous) Holkar Science College**
**Indore (M.P.)**
✆ 0731-2464074(O), 2446806, 2764027 (Exam)
e-mail : principalhsc@rediffmail.com, Web Address: www.collegeholkar.org
(Re-accredited 'A' Grade by NAAC)

D.No./1414/22 Date:- 28/03/2022

**Memorandum of Understanding for Academic and Industrial Cooperation**
**Between**
**Department of Pharmaceutical Chemistry, Govt. Holkar (Model, Autonomous) Science College Indore (M.P.) INDIA**
**And**
**Medilux Laboratories Pvt. Ltd., Sector-1, Pithampur, Indore (M.P.), INDIA**

The purpose of this agreement is to promote cooperation in educational, technical, and industrial environment between the Department of Pharmaceutical Chemistry, Govt. Holkar (Model, Autonomous) Science College, Indore (M.P.), India and Medilux Laboratories Pvt. Ltd., Sector-1, Pithampur, Indore (M.P.), INDIA

The Memorandum of Understanding (MOU) establishes the following:

**PURPOSE OF THE AGREEMENT**

1. The MOU has been signed with the primary purpose to strengthen the research and development in the field of Pharma sector.
2. To conduct/deliver the lectures on relevant technologies, trends, and upgradation of analytical Knowledge to support students.
3. To conduct collaborative research project.
4. To design curriculum for students as per industry requirement.
5. To conduct placement drive for UG and PG students.
6. To facilitate industry visit for students and faculties.
7. Other activities as mutually agreed.

**ROLE OF PARTIES**

The Government Holkar (Model, Autonomous) Science College , Indore, will assign a Faculty member from the department and the cooperative side, the director will designate a faculty/staff member.

**COMPLETION PERIOD OF MOU**

This MOU will be signed between Government Holkar (Model, Autonomous) Science College,Indore and Medilux Laboratories Pvt.Ltd., Sector-1, Pithampur, Indore. It will be effective for ten years from the date of agreement, with the possibility of extension based on mutual agreement.

**FINANCIAL LIABILITIES**

The Medilux Laboratories Pvt. Ltd. Pithampur, Indore will provide Instruments like HPLC as per their norms to promote the research activities in the department of Pharmaceutical Chemistry.

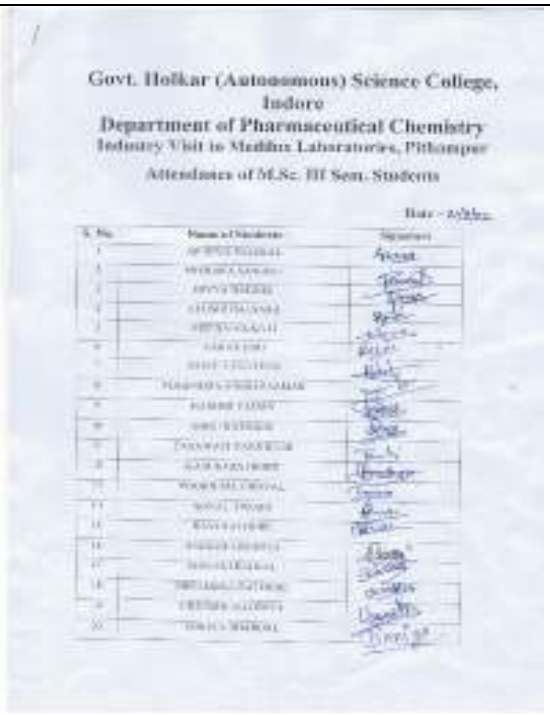
**Date of Implementation:- 28 March-2022**

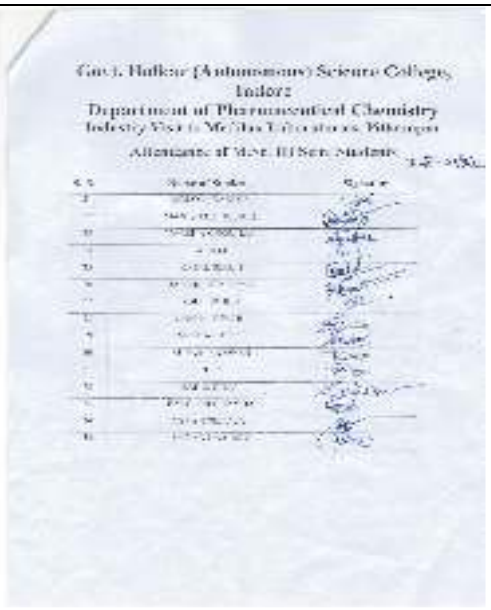
This MOU is signed by

| | | |
|---|---|---|
| **Dr. M.K. Dwivedi** | **Dr. Suresh T. Shawat** | **Mr. Sanjay Kewalramani** |
| **HOD** | **Principal** | **Director** |
| Department of Pharmaceutical Chemistry Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.) | Govt. Holkar (Model, Autonomous) Science College, Indore (M.P.) | Medilux Laboratories Pvt. Ltd. Sector-1 Pithampur, Indore (M.P.) |

| | | | |
|---|---|---|---|
| 02 | Medilux Laboratories Pvt. Ltd., Pithampur | Industry Visit of Students | 21-09-2022 |

| S. No | Component/Activities | Details of event |
|---|---|---|
| 1 | Name of the Department / Unit / Agency: | **Pharmaceutical Chemistry** |
| 2 | Name of the Activity: | Industry Visit to Medilux Laboratories |
| 3 | Date and Year of the Activity: | 21-09-2022 |
| 4 | Number of Students Participated in the activity: | 35 |
| 5 | Report of the Activity (in 100 words): | **Industry Visit to Medilux Laboratories (Activity under MOU)**<br><br>Department of Pharmaceutical Chemistry has organized industry visit on 21-09-2022 to medilux laboratories Pvt. Ltd. Pithampur. Student of M.Sc. Final has participated in this visit accompanied by Head of the Department Dr. M.K.Dwivedi, Dr. Rashmi Agrawal, Prof. Hema Kochar, Prof. Anjali Yadav. As it is a part of curriculum medilux laboratories is recognised manufacturer of fine chemical, intermediates and APIs they are committed to protected the environment by customised effluent treatment plant. Students learned about APIs like baclofen, hydroquinone etc. they got exposure to QMS, R&D and EHS. They had huge ware house for storing row material. The visit was very informative and beneficial for our students and it will help them in near future for getting placement in Pharma Industries. |

| | | |
|---|---|---|
| 6 | Photo of Activity: |  |
| 7 | List of Participants |  |

| | | |
|---|---|---|
| | |  |

Govt. Holkar (Autonomous) Science College, Indore
Department of Pharmaceutical Chemistry
Industry Visit to Medisa Laboratories, Pithampur
Attendance of M.Pharm. III Sem. Students

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2022

## CRITERION – 3

## MoUs/Linkages/Collaborations

Govt. Mata Jija Bai Girls P.G. College, Indore

**Document Title:**

Lecture delivered by Dr. M. K. Dwivedi, Title: UV Spectroscopy under MoU activity

**Memorandum of Understanding**
**Between**
**Deptt. Of Chemistry M.J.B.Govt P.G. Girls P.G. College ,Indore(M.P.)**
**And**
**Deptt. Of Chemistry Holkar Science College, Indore (M.P.)**

Deptt. of Chemistry M.J.B.P.G.Govt.Girls College Motitabela Indore and Deptt. of Chemistry Holkar Science College Indore desiring to support the cooperation between two departments in education and training programs .
Both the departments agreed to implement cooperation programs including-

1)The exchange of academic materials .
2) Conducting Lectures
3) Curriculum development
4) Participating in Seminars ,Symposium & other Type of academic discussions.
5) internship for P.G. Students

**Implementation of MOU-**

To-implement this MOU Head of both the chemistry deptt are authorized .Any cooperation under this MOU is Subject to the availability of funding, sources and approval by relevant authority .

**Entry into force, duration & termination -**

This MOU shall enter into force on the date of signing and sha l be valid for an unlimited period from that date .

The agreement may be terminated by either Deptt. by providing 180 days written notice to the Head of Department .

18/10/18

**Signature**

Head of Chemistry Department

M.J.B.P.G.Govt.Girls College Indore

Head of Department
Chemistry Dept.
Mata Jijabai Govt. P.G Girls College
Moti Tabela, INDORE

18/10/18

**Signature**

Head of Chemistry Department

Holkar science College Indore

23.10.18

Principal
Holkar Science Coll
INDORE

# Report of Activities under MoU between Department of Chemistry, MJB Govt. P G Girls College, Indore, M.P., and Department of Chemistry, Govt. Holkar science College, Indore.

## Sessions : 2017-2018. 2018-2019 & 2021-2022

The Department of Chemistry at MJB Govt. P G Girls College, Indore, M.P., and the Department of Chemistry at Govt. Holkar Science College, Indore, collaborated under an MoU with the following activities:

1. **On 2nd and 3rd March 2018, Dr. Rajshree Somani gave a lecture on "Pericyclic Reactions."**
   Dr. Rajshree Somani, a renowned expert, delivered an enlightening lecture on "Pericyclic Reactions" on 2nd and 3rd March 2018. The lecture was jointly organized by the Department of Chemistry at Govt. Holkar Science College, Indore, and MJB Govt. P G Girls College, Indore. Dr. Somani's presentation delved into the intricacies of pericyclic reactions, elucidating their mechanisms and significance in organic chemistry. The audience, comprising students and faculty from both institutions, greatly benefited from the comprehensive and insightful content. The lecture fostered an atmosphere of knowledge sharing and academic collaboration, enhancing the participants' understanding and interest in this specialized field of chemistry.

2. **On 6th and 7th March 2019, Dr. Meenal Shrivastava delivered a lecture on "Electronic Spectral Studies."**
   Dr. Meenal Shrivastava, a distinguished expert, delivered a captivating lecture on "Electronic Spectral Studies" on 6th and 7th March 2019. The lecture was organized by the Department of Chemistry at Govt. Holkar Science College, Indore, in collaboration with MJB Govt. P G Girls College, Indore. Dr. Shrivastava's presentation provided in-depth insights into the principles and applications of electronic spectral studies in the field of chemistry. Her expertise and engaging delivery captivated the audience, comprising students, faculty, and researchers. The lecture enriched the participants' understanding and sparked interest in the subject, fostering academic collaboration and promoting knowledge exchange between the two institutions.

3. **On 3rd December 2022, Dr. M K Dwivedi conducted a lecture on "UV Spectroscopy."** On 3rd December 2022, Dr. M K Dwivedi delivered an insightful lecture on "UV Spectroscopy." The lecture, organized collaboratively by the Department of Chemistry at Govt. Holkar Science College, Indore, and MJB Govt. P G Girls College, Indore, provided an in-depth understanding of UV spectroscopy's principles and applications. Dr. Dwivedi's expertise and engaging presentation captivated the audience, which comprised students and faculty members from both institutions. The lecture not only enhanced the participants' knowledge of UV spectroscopy but also encouraged academic collaboration and knowledge exchange between the two colleges. It proved to be a valuable and enriching experience for all attendees.

***These lectures provided valuable insights and knowledge exchange between the two institutions, fostering academic collaboration and enhancing the learning experiences of students and faculty.***

Professor And Head
Department of Chemistry
Govt. Holkar Sc. College,INDOR

Dr. Anamika Jain
**Professor & Head**
**Department of Chemistry**
**Govt. Holkar Science College, Indore**

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2022

## CRITERION – 3

## MoUs/Linkages/Collaborations

**Research Institute of Organic Agriculture Switzerland (FiBL) and the bioRe Association (India)**

**Document Title:**

**National Scientific Board Meeting under active collaboration with the Research Institute of Organic Agriculture Switzerland (FiBL) and the BioRe Association (India)**

Office of the Principal
Govt. (Model Autonomous) Holkar Science College
Indore (M.P.)
0731-2464074(O), 2446806, 2764027 (Exam)
e-mail : principalhsc@rediffmail.com, Web Address: www.collegeholkar.org
(Re-accredited 'A' Grade by NAAC)

Date:-

# Memorandum of Agreement

between the

Research Institute of Organic Agriculture, Switzerland (FiBL)

and the

Government Model Autonomous Holkar Science College Indore (India)

As well as the

Remei India Limited and bioRe Association (India)

concerning the doctoral project entitled

**"Developing socio-economically and ecologically resilient cotton rotational farming systems"**

And concerning

**Scientific exchange between the four institutions**

The Research Institute of Organic Agriculture (hereafter called "FiBL"), the Government Model Autonomous Holkar Science College Indore (hereafter called "Holkar College"), the Remei India Limited and the bioRe Association (hereafter called "bioRe") wishing to strengthen their collaboration in international agricultural research agree to engage in a doctoral research project.

## Article 1: Objectives

1.1 The collaboration shall provide international doctoral research experience to a "research fellow". The research fellow shall be assigned to the project entitled "Developing socio-economically and ecologically resilient cotton rotational farming systems" (hereby called "the project").

1.2 The research to be conducted and a timetable for the project are set out in the project proposal.

1.3 The overall objective is to strengthen the established institutional collaboration between FiBL, Holkar College, Remie India Limited and bioRe (hereby called "collaborating partners") by conducting the project of the research fellow as described below.

1.4 The collaboration further aims to strengthen the socio-ecological research exchange between the collaborating institutes. For this purpose two interdisciplinary workshops will be organised at Holkar college.

## Article 2: Period and Place of Assignment

2.1 The research fellow shall be assigned for a time period of three years (January 2023 – December 2026).

2.2 The place of assignment will principally be at the bioRe research station, located at the 5th Km Milestone, Kasrawad Mandleshwar road, Tehsil Kasrawad, District – Khargon, Madhya

## Article 3: Infrastructure, Budget and Payment to the Research Fellow

3.1 A consolidated fellowship amounting to twenty-eight thousand Indian rupees (28,000 INR) per month will be provided to the research fellow, by the bioRe Association, corresponding to the respective head in the FiBL SysCom Project.

3.2 The infrastructure and staff resources necessary to conduct the project field activities are either available at the research station or these will be arranged by the research staff together with the research fellow.

3.3 Basic analysis of the samples could be carried out at the field lab at bioRe research station.

3.4 For more advanced analysis Holkar College will make arrangement with the specialised labs in other institutes as needed.

3.5 The research project will support four internship projects of four PG students to support the assigned research fellow. The research project will support these master students for food and accommodation at the research station. The project will also support the students for basic analysis needed and for their travel required (one travel per month) to the bioRe research station.

## Article 4: Supervision, Backstopping and Publication

4.1 The PhD project of the research fellow will be jointly supervised by a supervising committee comprising Dr. Sanjeeda Iqbal (Holkar College) and Dr. Akanksha Singh (FiBL). Dr. Iqbal - being the main supervisor - will ensure the punctuality of planned research activities, along with sound quality of data and appropriate publication of results.

4.2 The research fellow will work in close collaboration with the researchers responsible for the long-term trial at bioRe, lab technician of bioRe and dissemination specialist of bioRe. The research staff at bioRe will provide the support and basic information required to carry out field activities.

4.3 The results obtained from this project will be published in international peer reviewed journals. The research fellow supported by the main supervisor will be responsible for sound data analysis and preparation of first draft of the manuscript(s). Both members of the supervising committee will support and contribute towards the publication process.

4.4 As a general rule, the data obtained from the field trials and surveys of FiBL is owned by FiBL and therefore all the publication rights are reserved by FiBL. No part of the data obtained from this project could be published or presented in any form without the approval of FiBL. Upon approval by FiBL, the results could be presented in national and international conferences.

4.5 The research fellow and both members of the supervising committee (depending upon their contribution), will gain authorship on the publication originating from the project. The order of authorship and corresponding authorship will be jointly decided by the supervising committee. In general, Dr. Singh will serve as a last author on these publications.

4.6 Plagiarism is a serious offence in scientific publication. Therefore, the research fellow and the main supervisor will ensure that the manuscripts produced from the project are free from Plagiarism.

4.7 In addition to the scientific publications, the fellow will compile a doctoral thesis and submit to his affiliating university (Devi Ahilya Vishwavidyalaya, Indore) as per the requirements and regulations set forth by the doctoral programme.

4.8 Considering the political nature of the project, the research fellow is instructed not to discuss or present anything related to this project in print or electronic media.

4.9 The envisaged internships of the four PG students will be conceptualised and supervised jointly by the research fellow and the supervising committee.

Signed at Frick, Switzerland on 10 August, 2022
For the Research Institute of Organic Agriculture (FiBL), Frick, Switzerland

FiBL Switzerland

Dr. Akanksha Singh (SysCom India – Country Leader)

Signed at Indore, India on 10 August, 2022
For the Government Model Autonomous Holkar Science College

Dr. Suresh T. Siwant (Principal, Holkar Science College)

Signed at Frick, Switzerland on 27 August, 2022
For Remei India

Vivek Kumar Rawal (Director Remei India Limited, General Secretary, biotic Association India)

Signed at Indore, India on 27 August, 2022

Dr. Sanjay Vyas (Head of Department of Botany, Holkar Science College)

Signed at Indore, India on 27 August, 2022

Dr. Sanyeeda Iqbal (Main Supervisor, Department of Botany, Holkar Science College)

**Dr. Sanjeeda Iqbal**

## Certificate of attendance

### SysCom India "National Scientific Advisory Board (NSAB)" Meeting 2022

Hereby it is certified that, **Dr. Sanjeeda Iqbal** – Professor, Holkar Science college, Indore and member of NSAB committee 2022-23 attended the NSAB meeting was held on 4th November 2022 at bioRe Association, Kasarwad, Dist. Khargone, 451228 M.P. India

The main objective of the meeting was to gather inputs from the national experts for the next phase of the **"Farming system comparison trials in tropics (SysCom India)"** project and, to further reflect on the results of the past phases.

Country Leader
(SysCom-India)

FiBL Switzerland

Dr. Akanksha Singh
(Dr. rer. nat.)
Department of International Cooperation

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2022

## CRITERION – 3

## MoUs/Linkages/Collaborations

Electronics & Electriclas, 18a, Electronic Complex, Pardeshipura, Pardeshipura, Indore, Madhya Pradesh

**Document Title:**

One Day Visit/Training on Electronic Equipment Manufacture Unit of Electronics and Electrical, Indore

कार्यालय प्राचार्य
शासकीय होलकर विज्ञान महाविद्यालय, इन्दौर
☎ 0731-2464074 ● फैक्स : 0731-2446806, 2764027
Email : principalhsc@rediffmail.com ● Web Site: www.collegeholkar.org

**Memorandum of Understanding for Academic and Industrial Cooperation**
**Between**
**Department of Electronics, Govt. Holkar (Model, Autonomous) Science College Indore (M.P.)**
**INDIA**
**And**
**Electronics & Electricals, 18-A Electronics Complex, Pardesipura, Indore (M.P.), INDIA**

The purpose of this agreement is to promote cooperation in educational, technical, and industrial environments/behavior between the Department of Electronics, Govt. Holkar (Model, Autonomous) Science College, Indore (M.P.), India and Electronics & Electricals, 18-A Electronics Complex, Pardesipura, Indore (M.P.), India.

The Memorandum of Understanding (MOU) establishes the following:

**PURPOSE OF THE AGREEMENT**

1. The industry would guide on internship/Major projects/minor projects/summer projects/projects to students.
2. Recommend/deliver the lectures on relevant technologies, trends, and tools to support students.
3. To understand the culture of tech product development, industry facilitating to allow visits for students and faculties.
4. In response to academic demand, the industry will give training on current technologies.
5. Other activities as mutually agreed.

**ROLE OF PARTIES**

The Government Holkar (Model, Autonomous) Science College in Indore, will assign a Faculty member from the department and the cooperative side, the director will designate a faculty/staff member.

**COMPLETION PERIOD OF MOU**

This MOU will be signed by the institutes and the industry, and it will be in effect for 5 years, with the possibility of extension based on mutual agreement.

**FINANCIAL LIABILITIES**

There are no financial liabilities for either participant in implementing the MOU.

This MOU is signed by,

Head of the Department
ELECTRONICS
Govt. Holkar Science College
INDORE

**Dr. Netram Kaurav, HOD**, Department of Electronics,
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

**Dr. Suresh T. Silawat, Principal**
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

**Mr. Shailesh Kasliwal, Partner**
Electronics & Electricals, 18-A Electronics Complex, Pardeshipura, Indore (M.P.)

**Date of Implementation 27/Nov/2019**

E&E

**ELECTRONICS & ELECTRICALS**
18-A, Electronic Complex, Pardeshipura,
INDORE - 452 010 (M.P.) INDIA

**Memorandum of Understanding for Academic and Industrial Cooperation**
**Between**
**Department of Electronics, Govt. Holkar (Model, Autonomous) Science College Indore (M.P.)**
**INDIA**
**And**
**Electronics & Electricals, 18-A Electronics Complex, Pardesipura, Indore (M.P.), INDIA**

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Govt. Holkar Science College

**Dr. Netram Kaurav, HOD** Department of Electronics,
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

**Dr. Suresh T. Silawat, Principal**
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

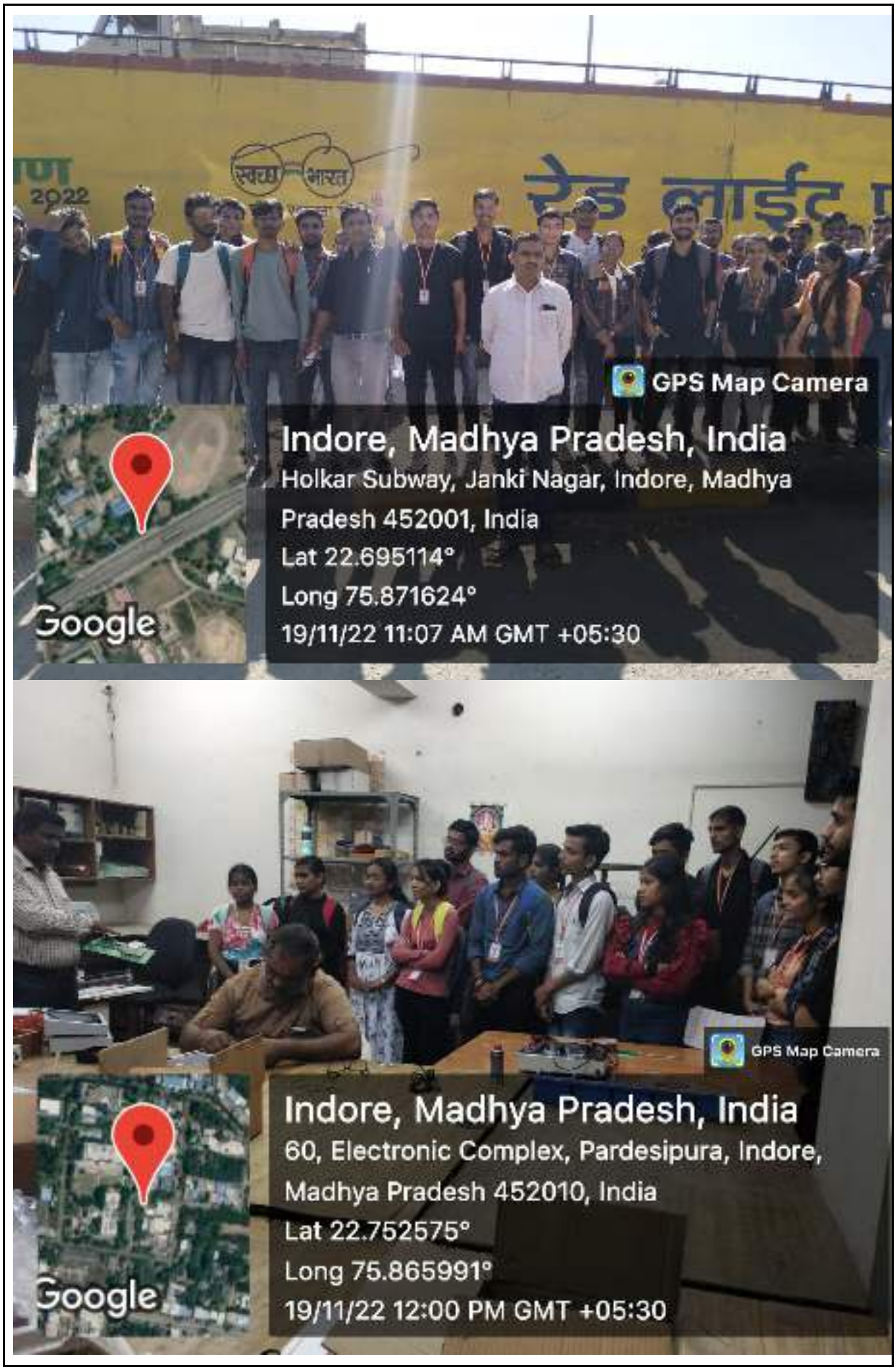
**Mr. Shailesh Kasliwal, Partner**
Electronics & Electricals, 18-A Electronics Complex, Pardeshipura, Indore (M.P.)

**Date of Implementation 27/Nov/2019**

# SKILL DEVELOPMENT PROGRAM

## 2022-23

| S. No | Component/Activities | Details |
|---|---|---|
| 1 | Name of the Department /Unit / Agency: | Department of Electronics |
| 2 | Name of the Activity: | Industrial Visit/Training on Electronic Apparatus Manufacture Unit |
| 3 | Name of the Scheme: | Hands on Training & Industrial Experience |
| 4 | Date and Year of the Activity: | 19/11/2022 |
| 5 | Number of Students Participated in the activity: | 35 |
| 6 | Report of the Activity (in 100 words): | A one-day industrial training on 19/11/2022 at Electronics and Electrical was organized by the Electronics Department, Government Holkar (Model, Autonomous) Science College, Indore as part of an agreement between the company and the college. The manufacturing of electronic equipment was covered in this industrial visit for the students. Additionally, students learned how to design equipment. Ten students from the department benefited from this training. After completing this training, the students practiced in the department lab and, with the assistance of the department's instructors and staff, created basic kits of laboratory equipment. The Principal, Dr. Suresh T. Silawat, and the Department Head, Dr. Netram Kaurav, had approved this visit. |


GPS Map Camera
Indore, Madhya Pradesh, India
Holkar Subway, Janki Nagar, Indore, Madhya Pradesh 452001, India
Lat 22.695114°
Long 75.871624°
19/11/22 11:07 AM GMT +05:30
Google
GPS Map Camera
Indore, Madhya Pradesh, India
60, Electronic Complex, Pardesipura, Indore, Madhya Pradesh 452010, India
Lat 22.752575°
Long 75.865991°
19/11/22 12:00 PM GMT +05:30
Google


GPS Map Camera
Indore, Madhya Pradesh, India
2-A, opp. Vodafone Idea Ltd, Electronic Complex,
Pardesipura, Indore, Madhya Pradesh 452010, India
Lat 22.753771°
Long 75.866083°
19/11/22 01:19 PM GMT +05:30
Google


GPS Map Camera
Indore, Madhya Pradesh, India
2-A, opp. Vodafone Idea Ltd, Electronic Complex, Pardesipura, Indore, Madhya Pradesh 452010, India
Lat 22.753776°
Long 75.865986°
19/11/22 01:16 PM GMT +05:30
Google


GPS Map Camer
Indore, Madhya Pradesh, India
18-A, Electronic Complex, Pardesipura, Indore,
Madhya Pradesh 452010, India
Lat 22.752684°
Long 75.865972°
19/11/22 12:57 PM GMT +05:30
Google

# शासकीय होलकर (आर्दश, स्वशासी) विज्ञान महाविद्यालय, इन्दौर

## इलेक्ट्रॉनिक्स विभाग

प्रति,

दिनांक:– 16.11.2022

प्राचार्य,

शासकीय होलकर विज्ञान महाविद्यालय,

इन्दौर

विषयः– Industrial Visit हेतु अनुमति बाबत्।

महोदय,

निवेदन है कि उच्च शिक्षा गुणवत्ता उन्नयन परियोजना (MPHEQIP) के अन्तर्गत B.Sc. III Year के विद्यार्थियों को Industrial Visit हेतु Electronics & Electrical, Electronics Complex, Pardeshipura Indore (M.P.) दिनांक 19/11/2022 को ले जाना है।

अतः इस हेतु बस द्वारा आने जाने की अनुमति (आनुमानित लागत 8,000/–) प्रदान करने की कृपा करें।

Industrial Visit विद्यार्थियों के पाठ्यक्रम में समावेशित है।

धन्यवाद।

Yes

डॉ. नेतराम कौरव
विभागाध्यक्ष
इलेक्ट्रॉनिक्स विभाग

विभागाध्यक्ष
इलेक्ट्रॉनिक्स विभाग
शा. होलकर विज्ञान महाविद्यालय
इन्दौर

**Govt. Holkar (Model, Autonomous) Science College, Indore**

**Department Of Electronics**

Date:- 16/11/2022

To,

Director,
Electronics And Electricals,
18 A Electronic Complex
Pardeshipura, Indore

Subject: -Proposal/Permission Letter for One-Day Visit/Training in Industry under collobrative proposal.

Respected Sir,

The purpose of this letter is to request permission for a one-day visit/training on 19/11/2022, with Reference MOU. For the students of B.Sc. III Year Employment/Learning Purpose, I request you to Kindly Provide some practical education to the students about industrial procedures, Products and facilities. The 47 students will be part of the trip accompanied by two teacher. Your kind consideration of our request will help.

I request you to kindly confirm our students the visit/Training.

Thanks for your kind corperation

Dr. Netram Kaurav
HOD
Department of Electronics
Head of the Department
ELECTRONICS
Govt. Holkar Science College
INDORE

E&E

ELECTRONICS & ELECTRICALS
18-A, Electronic Complex, Pardeshipura,
INDORE - 452 010 (M.P.) INDIA

# CERTIFICATE

This is to Certify that we had arranged one day visit/training program for the B.Sc. Electronics 35 Students from Government Holkar Science College, Indore on 19.11.2022. Students found the visit/training very informative and helpful in their future endeavours.

Thanking you

For **ELECTRONICS & ELECTRICALS**

**SHAILESH KASLIWAL**
Partner

Date : 20-11-2022

e-mail : info@eeindia.in • Website : www.eeindia.in • Phone : (0731) 2556811 • Mobile : 98270-23868

| | | |
|---|---|---|
| 8 | List of Participants | Enclosed |

**Government Holkar (Model Autonomous) Science College, Indore (M.P.), India**

**B.Sc. III Year Student List 19/12/2022**

**Industrial Visit, Electronics Complex, Pardeshipura, Indore (M.P.)**

| S.No. | Name of the voter | Mobile No |
|---|---|---|
| 1 | Deepanshu Bhisikar | 9340803388 |
| 2 | Praveen Singh Parmar | 6267339756 |
| 3 | Kuldeep Panchal | 8959874780 |
| 4 | Jatin mujalda | 8269457179 |
| 5 | Arshita Pandey | 8080475834 |
| 6 | Yash rathore | 8839326386 |
| 7 | RAJIT TOMAR | 9589256747 |
| 8 | Nilesh Patil | 9691216328 |
| 9 | Sahil gupta | 7225800550 |
| 10 | Ajay Kumar Pandey | 9752125658 |
| 11 | Bhumika Agrawal | 9406555701 |
| 12 | Ayush | 9406557056 |
| 13 | Samprita Pandey | 9171988968 |
| 14 | Baghel Sohan Bhagwan | 7972391534 |
| 15 | Shreya pagare | 7724939286 |
| 16 | Deeksha pandey | 7770886820 |
| 17 | Vikash Tripathi | 7067245861 |
| 18 | Arpita Dwivedi | 8839845312 |
| 19 | Yashasvi kamde | 9630654857 |
| 20 | Roshni Rane | 8319753768 |
| 21 | Shivam Pandey | 7566200290 |
| 22 | Yashi pateriya | 9589705755 |
| 23 | Rishabh Bhuriya | 6265064683 |
| 24 | Shalabh dixit | 7974037013 |
| 25 | Gaurav Choudhary | 7974301351 |
| 26 | Vimod kumar chauhan | 9630964940 |
| 27 | Satyam hisen | 9516252771 |
| 28 | Abhishek kumar mahobiya | 7224897034 |
| 29 | Khushi Mansoori | 9165741886 |
| 30 | Yash Ramje | 6263077119 |
| 31 | Radheshyam dangi | 8516910300 |
| 32 | Hansraj Muzzalda | 9630887611 |
| 33 | Kratika yadav | 8319284756 |
| 34 | Satyam Shivhare | 7470969466 |
| 35 | Sakshi Verma | 7470582876 |

# SSR DOCUMENT

2022

## CRITERION – 3

## MoUs/Linkages/Collaborations

### Mine Instruments Private Limited, Indore (MP)

**Document Title:**

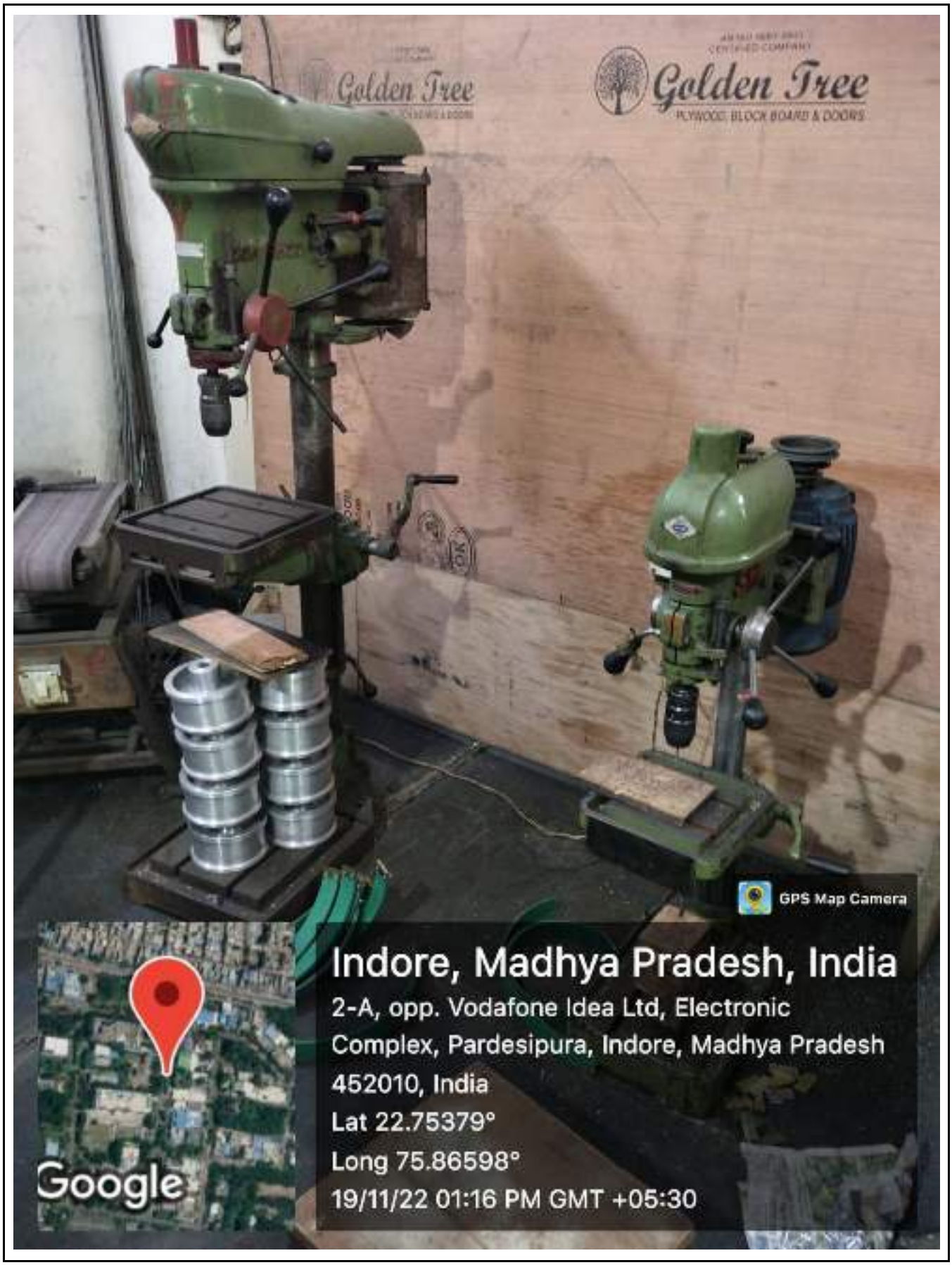
**One-Day Visit/Training On Electronics Laboratory Equipment at Mine Instruments Private Limited, Indore, under collaboration**

SKILL DEVELOPMENT PROGRAM
2022-23

| S. No | Component/Activities | Details |
|---|---|---|
| 1 | Name of the Department /Unit / Agency: | Department of Electronics |
| 2 | Name of the Activity: | One Day Visit/Training On Electronic Laboratory Equipments |
| 3 | Name of the Scheme: | Hands on Training & Industrial Experience |
| 4 | Date and Year of the Activity: | 19/11/2022 |
| 5 | Number of Students Participated in the activity: | 35 |
| 6 | Report of the Activity (in 100 words): | A one-day industrial training on 19/11/2022 at Mine Instruments Private Limited was organized by the Electronics Department, Government Holkar (Model, Autonomous) Science College, Indore as part of an agreement between the company and the college. The manufacturing of electronic equipment was covered in this industrial visit for the students. Additionally, students learned how to design equipment. Ten students from the department benefited from this training. After completing this training, the students practiced in the department lab and, with the assistance of the department's instructors and staff, created basic kits of laboratory equipment. The Principal, Dr. Suresh T. Silawat, and the Department Head, Dr. Netram Kaurav, had approved this visit. |


2022
GPS Map Camera
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Long 75.866083°
19/11/22 01:19 PM GMT +05:30
Google


Golden Tree
Golden Tree
PLYWOOD, BLOCK BOARD & DOORS
GPS Map Camera
Indore, Madhya Pradesh, India
2-A, opp. Vodafone Idea Ltd, Electronic Complex, Pardesipura, Indore, Madhya Pradesh 452010, India
Lat 22.75379°
Long 75.86598°
19/11/22 01:16 PM GMT +05:30
Google

| | |
|---|---|
| 7 | Poster Activity |

## शासकीय होलकर (आर्दश, स्वशासी) विज्ञान महाविद्यालय, इन्दौर

### इलेक्ट्रॉनिक्स विभाग

प्रति,

दिनांकः– 16.11.2022

प्राचार्य,

शासकीय होलकर विज्ञान महाविद्यालय,

इन्दौर

विषयः– Industrial Visit हेतु अनुमति बाबत्।

महोदय,

निवेदन है कि उच्च शिक्षा गुणवत्ता उन्नयन परियोजना (MPHEQIP) के अन्तर्गत B.Sc. III Year के विद्यार्थियों को Industrial Visit हेतु Electronics & Electrical, Electronics Complex, Pardeshipura Indore (M.P.) दिनांक 19/11/2022 को ले जाना है।

अतः इस हेतु बस द्वारा आने जाने की अनुमति (आनुमानित लागत 8,000/–) प्रदान करने की कृपा करें।

Industrial Visit विद्यार्थियों के पाठ्यक्रम में समावेशित है।

धन्यवाद।

Yes

डॉ. नेतराम कौरव
विभागाध्यक्ष
इलेक्ट्रॉनिक्स विभाग

विभागाध्यक्ष
इलेक्ट्रॉनिक्स विभाग
शा. होलकर विज्ञान महाविद्यालय
इन्दौर

**Govt. Holkar (Model, Autonomous) Science College, Indore**

**Department Of Electronics**

Date:- 16/11/2022

To,

Director,
Mine Instruments Private Limited
68 A Electronic Complex
Indore

Subject: -Proposal/Permission Letter for One-Day Visit/Training in Industry under collobrative proposal.

Respected Sir,

The purpose of this letter is to request permission for a one-day visit/training on 19/11/2022. For the students of B.Sc. III Year Employment/Learning Purpose, I request you to Kindly Provide some practical education to the students about industrial procedures, Products and facilities. The 47 students will be part of the trip accompanied by two teacher. Your kind consideration of our request will help.

I request you to kindly confirm our students the visit/Training.

Thanks for your kind corporation

Dr. Netram Kashav
HOD
Department of Electronics

Head of the Department
ELECTRONICS
Govt. Holkar Science College
INDORE

MINE®
You Think, We will make it.

Date. 23.11.2022

## Certificate

It is certified that Mine Instruments Private Limited has arrange the one day Visit/training program for the B.Sc. Electronics 35 Students from Govt Holkar science college, Indore on 19.11.2022 students were learn skills and satisfy with us

**For Mine Instruments Pvt. Ltd.**

Authorized Signatory


**Mine Instruments Pvt. Ltd.**

G7-B, First Floor, Electronic Complex,
Pardeshipura, Indore-452010 (M.P.) India

info@mineinstruments.in
sales@mineinstruments.in

+91-731-4246503
+91-6262608000

mineinstruments.com
mineinstruments.in


ISO 9001:2015

एन एस आई सी
NSIC

GeM

#startupindia

MAKE IN INDIA

| | | |
|---|---|---|
| 8 | List of Participants | Enclosed |

**Government Holkar (Model Autonomous) Science College, Indore (M.P.), India**

**B.Sc. III Year Student List 19/12/2022**

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| 2 | Praveen Singh Parmar | 6267339756 |
| 3 | Kuldeep Panchal | 8959874780 |
| 4 | Jatin mujalda | 8269457179 |
| 5 | Arshita Pandey | 8080475834 |
| 6 | Yash rathore | 8839326386 |
| 7 | RAJIT TOMAR | 9589256747 |
| 8 | Nilesh Patil | 9691216328 |
| 9 | Sahil gupta | 7225800550 |
| 10 | Ajay Kumar Pandey | 9752125658 |
| 11 | Bhumika Agrawal | 9406555701 |
| 12 | Ayush | 9406557056 |
| 13 | Samprita Pandey | 9171988968 |
| 14 | Baghel Sohan Bhagwan | 7972391534 |
| 15 | Shreya pagare | 7724939286 |
| 16 | Deeksha pandey | 7770886820 |
| 17 | Vikash Tripathi | 7067245861 |
| 18 | Arpita Dwivedi | 8839845312 |
| 19 | Yashasvi kamde | 9630654857 |
| 20 | Roshni Rane | 8319753768 |
| 21 | Shivam Pandey | 7566200290 |
| 22 | Yashi pateriya | 9589705755 |
| 23 | Rishabh Bhuriya | 6265064683 |
| 24 | Shalabh dixit | 7974037013 |
| 25 | Gaurav Choudhary | 7974301351 |
| 26 | Vinod kumar chauhan | 9630964940 |
| 27 | Satyam bisen | 9516252771 |
| 28 | Abhishek kumar mahobiya | 7224897034 |
| 29 | Khushi Mansoori | 9165741886 |
| 30 | Yash Ramje | 6263077119 |
| 31 | Radheshyam dangi | 8516910300 |
| 32 | Hansraj Muzzalda | 9630887611 |
| 33 | Kratika yadav | 8319284756 |
| 34 | Satyam Shivhare | 7470969466 |
| 35 | Sakshi Verma | 7470582876 |

Dr. Nitin Gaur

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2022

## CRITERION – 3

## MoUs/Linkages/Collaborations

Dr. Hari Singh Gour University, Sagar (M.P.)

**Document Title:**

Faculties Exchange:Guest Lecture delivered by: 1) Dr. Navjot Kaur Kanwal on June 3, 2022; 2) Dr. Devasish Bose on August 29, 2022 under the MoU with Dr. Hari Singh Gour University, Sagar

अपराधशास्त्र एव न्यायिक विज्ञान विभाग
**DEPARTMENT OF CRIMINOLOGY & FORENSIC SCIENCE**
डॉ. हरीसिंह गौर विश्वविद्यालय, सागर (म.प्र.) 470003
**Dr. Harisingh Gour Vishwavidyalaya, Sagar (M.P.) 470003**
(Formerly University of Saugor)

डॉ. देवाशीष बोस
विभागाध्यक्ष
टेली : (07582)-264122
फेक्स: (07582)-264163
www.dhsgsu.ac.in

( A Central University )

**Dr. Devasish Bose**
**Head**
Tel : (07582) - 264122
Fax : (07582) - 264163
Email – crimforensic@gmail.com

**Department of Criminology and Forensic Science**
**Dr. Harisingh Gour Vishwavidyalaya (A Central University),**
**Sagar (M.P)**
**&**
**Department of Forensic Science**
**Govt. Holkar (Autonomous) Science College**
**(Affiliated to Devi Ahilya Vishvavidhhyalaya, Indore)**

## Collaboration Certificate
## (Mutually Beneficial Relationship)

The signing departments agree to provide opportunity, as appropriate to establish a mutually beneficial relationship built on academic, scientific exchange of books, scientific publication, course information, seminars, conferences, student's project or dissertation and any other data and information of common interest.

Devasish Bose
27-11-2015

HOD
Dr. Devashish Bose
Department of Criminology
and Forensic Science
Dr. Hari Singh Gour Central
University, Sagar (M.P)

VRchourey

HOD
Dr. Vijay R Chourey
Department of Forensic Science
Govt. Holkar (Autonomous)
Science College, Indore (M.P)

PRINCIPAL
Dr. K.N Chaturvedi
Govt. Holkar (Autonomous) Science College,
Indore (M.P)

Govt. Holkar (Model, Autonomous) Science College, Indore
(M.P.) Pin - 452017
Department of Forensic Science

Memorandum of Understanding
Between
Dr. Harisingh Gour Vishwavidhyalaya, Sagar (M.P.)
And
Department of Forensic Science, Govt. Holkar (Model, Autonomous) Science College, Indore

We jointly enter into a MOU for the Expertise sharing, training, collaborative research, promote projects/ internship programs, organization of moot courts, workshop etc for learning and training purpose of students, faculties and other associated personnel's.

Following Activities have been conducted under this:

1. **Faculty Exchange/ Guest Lecture**
   Invited Resource Person- Dr. Navjot Kaur Kanwal
   Faculty Development Program on "Emerging Paradigm in Forensic Science: A Multi-disciplinary Approach"
   Date: 03/06/2022

2. **Faculty Exchange/ Guest Lecture**
   Invited Resource Person- Dr. Devasish Bose
   One Day National Webinar on "Challenging Aspects of Environmental Forensics"
   Date: 29/08/2022

# GOVT. HOLKAR [MODEL, AUTONOMOUS] SCIENCE COLLEGE, INDORE, (M. P.)

('NAAC' Accredited 'A' Grade College)

One Day National Webinar on "Challenging Aspects of Environmental Forensics"

Organized by

Department of Forensic Science

under IQAC and WB-MPHEQIP

(Session: 2021-22)

IYBSSD2022

## *Certificate of Appreciation*

This certificate is awarded to

**Dr. Devasish Bose**

Professor & Head, Department of Criminology and Forensic Science, Dr. Hari Singh Gour Central University, Sagar (M. P.) for his dedicated contribution as **'Resource Person'** in One Day National Webinar on **"Challenging Aspects of Environmental Forensics"** organized by **'Department of Forensic Science'** on 29/08/2022.

| | | |
|---|---|---|
| Dr. Geetha Sarasan<br>Head<br>Department of Forensic Science | Prof. Ritu Bharti<br>Ass. Professor<br>(Convenor) | Dr. Suresh T. Sikawat<br>Principal & Additional Director<br>(Patron) |

# Educational visit of participants of the virtual workshop at UGC-DAE CSR, Indore, under the MoU between both institutes-2022

**GOVERNMENT HOLKAR (MODEL, AUTONOMOUS) SCIENCE COLLEGE INDORE (M.P.), INDIA**
**Department of Forensic Science**
**(NAAC Accredited "A" Grade College)**
**(Request Letter)**

Date: - 02/10/2022

To,

The Central Director,
UGC-DAE Consortium for Scientific Research,
Indore (M.P.)

**Subject:** Request for the Visit of Participants of Virtual Workshop to UGC-DAE Consortium for Scientific Research, Indore

Respected Sir,

This is to state that the participants of Virtual Workshop on Instrumental techniques organizing by Department of Forensic Science, Govt. Holkar (Model, Autonomous) Science College, Indore (M.P.) from 3/10/22 to 10/10/22 want to visit your Centre for attending the **Offline Demonstration of Various Instruments** available in your Centre. So, I Request you to kindly grant the permission for the proposed visit on 10th October 2022.

Thanking You!

**Dr. Geetha Sarasan**
HOD
Department of Forensic Science
Govt. Holkar Science College, Indore (M. P.)





GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2021

## CRITERION –3

## MoUs/Linkages/Collaborations

Research Institute of Organic Agriculture FiBL, Switzerland

**Document Title:**

National Scientific Advisory Board (NSAB) Meeting

FiBL Research Institute of Organic Agriculture FiBL

SysCom

## Dr. Sanjeeda Iqbal

### Certificate of attendance

### SysCom India "National Scientific Advisory Board (NSAB)" Meeting 2021

Hereby it is certified that, **Dr. Sanjeeda Iqbal** – Professor, Holkar Science college, Indore and member of NSAB committee 2021-22 attended the NSAB meeting was held on 25 September 2021 at bioRe Association, Kasarwad, Dist. Khargone, 451228 M.P. India

The main objective of the meeting was to gather inputs from the national experts for the next phase of the **"Farming system comparison trials in tropics (SysCom India)"** project and, to further reflect on the results of the past phases.

Country Leader
(SysCom-India)

Dr. Akanksha Singh
(Dr. rer. nat.)
Department of International Cooperation

FiBL Switzerland

Research Institute of Organic Agriculture FiBL | Ackerstrasse 113 | P.O. box 219
5070 Frick | Switzerland | +41 62 865 72 72 | info.suisse@fibl.org | www.fibl.org

# SSR DOCUMENT

2021

## CRITERION –3

## MoUs/Linkages/Collaborations

Sak Bioenzyme T.V. Station Road, Shanker Naga, Raipur, Chattisgarh

**Document Title:**

Research Activity: A Novel Approach: Stimulatory Effect of Bioenzyme Supplementation on Quality of Mung Bean, jointly conducted with Sak Bioenzyme T.V. Station Road, Shanker Naga, Raipur, Chattisgarh

Office of the Principal

**Govt. (Model Autonomous) Holkar Science College**
**Indore (M.P.)**

) 0731-2464074(O), 2446806, 2764027 (Exam)
e-mail : principalhsc@rediffmail.com, Web Address: www.collegeholkar.org
(Re-accredited 'A' Grade by NAAC)

# MEMORANDUM OF UNDERSTANDING FOR ACADEMIC AND SCIENTIFIC COOPERATION

**BETWEEN**

**SAK BIOENZ T.V. STATION ROAD, SHANKER NAGAR, RAIPUR, CHATTISGARH**
**AND**
**GOVT. HOLKAR (MODEL, AUTONOMOUS) SCIENCE COLLEGE INDORE (M.P.)**

The representatives of **Sak Bioenz T.V. Station Road, Shanker Nagar, Raipur, Chattisgarh** and **Department Of Biochemistry, Govt. Holkar (Model, Autonomous) Science College Indore (M.P.)** agree to this Memorandum of Understanding.

The Memorandum of Understanding (MOU) establishes the following:

## 1. OBJECTIVE OF THE AGREEMENT

To establish a mutually beneficial relationship built on academic and scientific cooperation. Areas of cooperation between the **Sak Bioenz T.V. Station Road, Shanker Nagar, Raipur, Chattisgarh** and **Department of Biochemistry, Govt. Holkar (Model, Autonomous) Science College Indore (M.P.)** include the exchange of researchers, students, publications, academic programs and research projects.

## 2. GOALS AND FORMS OF COOPERATION

The signing institutions agree to provide opportunity, as appropriate, for the following activities towards the completion of the objective of this MOU.

1. Exchange of students and/or researchers with the objective of offering courses and realizing research projects in areas mutually agreed upon by both institutes through prior invitation and in accordance with the procedures and expectations established by each institute and specific department.
2. Exchange of books, scientific publications, study programs, academic projects, course information, seminars, conferences and other data and information of common interest.
3. Develop joint research projects and joint publications.
4. All joint activities will be realized through the mutual agreement and clearly established conditions and mutual obligations of the appropriate institute entity.

SAK BIOENZ
PROPRIETOR

प्राचार्य
शासकीय आदर्श स्वशासी
होलकर विज्ञान महाविद्यालय,
इन्दौर (म.प्र.)

Office of the Principal

**Govt. (Model Autonomous) Holkar Science College**
**Indore (M.P.)**

) 0731-2464074(O), 2446806, 2764027 (Exam)
e-mail : principalhsc@rediffmail.com, Web Address: www.collegeholkar.org
(Re-accredited 'A' Grade by NAAC)

### 3. IMPLEMENTATIOION OF THE MEMORANDUM OF UNDERSTANDING

The objectives of the MOU will be implemented and regulated in the following manner.

i. Student Exchange

a. Student and research scholars may visit the corresponding departments of these institutes after finalizing a mutually acceptable schedule.

b. All the expenses shall be the direct responsibility of the student concerned (subject to any agreements on payment arrangements made by either institution with its own students). These expenses include.

1. Travel expenses
2. Reprographic and Internet Usage Expenses
3. Required student services fees at the host institution
4. Books and academic supplies
5. Administrative fees, if any.

ii. Exchange of researchers

With the objective of strengthening ties through joint projects and research activities of both institutes, the MOU allows for the creation of researcher exchange. The following conditions will apply.

a. The researchers will maintain their status as research scholars at their home institution for the duration of the exchange.

b. The researchers will be allowed to make use of the instruments and other research facilities available in various departments of these institutes after prior approval of the visiting schedule.

c. The appropriate departments and administrative offices will assist in securing housing and other necessary arrangements for living in the host institutions city.

iii. Research and resources

**Sak Bioenz T.V. Station Road, Shanker Nagar, Raipur, Chattisgarh** and **Department of Biochemistry, Govt. Holkar (Model, Autonomous) Science College Indore(M.P.)** remote research and realize collaborative projects, giving priority to interdisciplinary works.

SAK BIOENZ
PROPRIETOR

प्राचार्य
शासकीय आदर्श स्वशासी
होलकर विज्ञान महाविद्यालय,
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e-mail : principalhscrediffmail.com, Web Address: www.collegeholkar.org
(Re-accredited 'A' Grade by NAAC)

4. DURATION AND RECINDENCE OF MOU

a. The agreement shall come into effect on 10-02-21 Changes to this agreement shall be made by mutual consent between both institutions. In cases of disagreement, the Institute wishing to depart from the agreement shall, wherever possible, give two months' notice of its intention to do so. The agreement shall be reviewed after a period of five years.

b. This MOU is being signed purely with the intention of academic and scientific cooperation

This MOU is signed by,

SAK BIOENZ
Founder
(Sak Bio[illegible] Road, Shanker Nagar, [illegible]attisgarh)

&

Head
Department of Biochemistry
Govt. Holkar (Model, Autonomous) Science College Indore (M.P.)

Principal
Govt. Holkar (Model, Autonomous) Science College Indore (M.P.)

In presence of the following witnesses:

1. .....

2. .....

# Government Holkar Science College, Indore (MP)

## Department of Biochemistry

### Certificate of Collaboration

This is to certify that the **Department of Biochemistry, Govt. Holkar Science College, Indore, and Sak Bioenz, T.V. Station Road, Shanker Nagar, Raipur, Chhattisgarh** have signed MOU for Mutual collaborative work. Under this collaboration, a research paper entitled "**A Novel Approach: Stimulatory Effect of Bioenzyme Supplementation on Quality of Mung Bean"** has been successfully published in the year 2023.



**Head**

Department of Biochemistry

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# A Novel Approach: Stimulatory Effect of Bioenzyme supplementation on quality of Mung bean

**S. Patidar[1], A. Bafna[1], T. Rangwala[1], N. Vyas[2] and R. Gupta[2]**

***[1]Department of Biochemistry, Govt. Holkar Science College, Indore 452 017, M.P., India***
***[2]Noble Alchem Pvt. Ltd., Sanwer Road, Indore (M.P.), India***

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**ABSTRACT**

Organic farming nowadays is a major area of interest for research. It is the best way to restore disturbed ecological balance due to excessive use of chemicals in agriculture like fertilizers, pesticides, insecticides, etc. The present study was designed to evaluate the potential of eco- friendly product bioenzyme on biochemical and oxidative stress parameters of mung (*Vigna radiata*). A field experiment was conducted at Loharpipliya village, district Dewas (M.P.) during March-May 2022. Various dilutions of Bioenzyme were sprayed at the interval of 15 days after the two leaves stage of the plant. Four treatments were designed – Control (without any treatment), T1 (1ml bioenzyme/L water), T2 (2 ml bioenzyme/L water), and T3 (3 ml bioenzyme/L water). Photosynthetic pigments were significantly increased in all the treatments involving bioenzyme collated to control. A highly significant increment in carbohydrate and protein content in leaves of mung was reported with T2 treatment. Oxidative stress assessed in terms of MDA and proline was observed to decrease significantly with all treatments. Among all the three concentrations of bioenzyme used in the present study, the best results were obtained with the spraying of 2ml bioenzyme/l water (T2). Bioenzyme can be a good alternative for farmers to improve the quality of mung without the use of harmful chemicals to avoid adverse effects on soil and crop quality. Though further research is required for use of bioenzyme with other crops too.

***Key words:*** *Carbohydrate, MDA, Proline, Protein, Vigna radiata.*

## Introduction

Agriculture is one of the most significant economic activities across all parts of the world. India has the second largest area of arable land in the world and is a major producer of a number of agricultural products. Farmers are facing many problems due to the volatile climate which results in poor quality and reduced yield of the crops. Although chemical fertilizers and supplements used to enhance production accomplish the plants or crop needs but they have drawbacks like adversely affects the pH of soil and ground water, kills eco-friendly microflora and also very harmful for human health etc. The above problem can be resolved by use of eco-friendly nontoxic soil supplement and growth stimulant "Bioenzyme".

In many countries kitchen waste is currently landfilled together with other municipal wastes (FAO). Due to its nutrient rich composition, can be utilized as an enzyme resource. Such conversion of Kitchen waste is potentially more profitable for Indian Farmers. Bioenzyme is also known as garbage enzyme which was invented byDr. Rosukon in Thailand from residues such as vegetables, fruits or its peels which are abundantly available in supermarket of Malaysia (Lim *et al.,* 2016).

Bioenzyme is known fertilizer having essential

nutrient (NPK) content as well as metabolites similar to plant growth regulators. Bioenzyme influences the plant physiological systems at low concentration. It can act as natural pesticide, insecticide, herbicide and fertilizer, induce the uptake of nutrients in seedlings of chick pea (Moloto *et al.*, 2018).

Application of bioenzyme accelerate activity of enzymes involved in physiological processes which in turn hydrolyse starch and helps in the metabolic activity during the change of available starch into sugar content (Jain, 2006). It contains nutrients in a naturally chelated form which helps to improve cell division and cell enlargement resulting into better chlorophyll content and increased production. (Manna *et al.*, 2015).

Mung bean (*Vigna radiata)* is a third economically most important crop in India grown in nearly 16% of the total pulse area. It has great value as food and is a cheap source of protein for direct human consumption (Mubarak, 2005). Mung bean is not only rich in protein but also enrich content of nitrogen in soil.

## Materials and Methods

Mung bean (*Vigna radiata*) seeds MI731-3 variety was purchased from Indian Agriculture Research Institute (IARI) Indore, Madhya Pradesh.

Three different concentrations of bioenzyme were supplied at the interval of every fifteen days after sowing.

C- Without any treatment

T1 – (1 ml bioenzyme/L water)

T2- (2 ml bioenzyme/L water)

T3- (3 ml bioenzyme/L water)

Photosynthetic pigments, biochemical and oxidative stress parameters were studied in leaves of *Vigna radiata* at the interval of 15 days after each spray.

**Determination of Chlorophyll and Carotenoid content:** Fresh leaf samples were extracted with 80% acetone. For spectrophotometric determination of chlorophyll, a, chlorophyll b and carotenoid contents, the absorbance of the extracts were measured at 645 and 663 nm and 470 nm following the method by Lichtenthaler and Wellburn (1983) and calculated using the following formula:

Chlorophyll (a) in (mg/g) = 12.7(A663) – 2.69(A645) × V/1000 × W

Chlorophyll (b) in (mg/g) = 22.9(A645) – 4.68(A663) × V/1000 × W

Carotenoid (mg/g) = [1000(A470)-3.27 (Chl a)-104 (Chl b)]/229

**Determination of Protein Content**: The estimation




**Fig. 1.** Stimulatory effect of Bioenzyme on growth of mung bean

of protein was determined as per standard procedure given by Lowry *et al.* (1951). Protein content was estimated using a standard curve prepared with 40-200 µg of BSA at 660nm.

**Determination of Carbohydrate Content:** It was determined by the method as given Hedge *et al.* (1962). Carbohydrates are dehydrated by conc. $H_2SO_4$ to form furfural which condenses with anthrone to form a blue-green coloredcomplex which is measured colorimetrically at 630 nm.

**Determination of Malondialdehyde Content:** The level of lipid peroxidation as an indicator of oxidative stress was measured by using malondialdehyde (MDA), a decomposition product of the polyunsaturated fatty acid present in membrane lipids. It was estimated using thiobarbituric acid (TBA) as the reactive material and measuring absorbance spectrophotometrically at 532 nm.

The extinction coefficient of 155 $mM^{-1}$ $cm^{-1}$was used following the method of Heath and Packer, (1968).

**Determination of Proline:** Proline was extracted using sulphosalysilic acid and measured using acid ninhydrin. Leaf tissues were homogenized in 3% sulfosalicylic acid and the homogenate was centrifuged at 3,000×g for 20min. The supernatant was treated with acid ninhydrin, boiled for 1 h, and then the absorbance was determined at 520 nm by Bates *et al.* (1973).

## Results and Discussion

**Photosynthetic pigments:** Nitrogen deficiency adversely affects the chlorophyll concentration and photosynthetic activity which automatically results in the reduced growth of the plant. In the present study significant increase in chlorophyll a and b content were reported with supplementation of all the dilutions with 2 ml/L water bioenzyme giving best results (Table 1). Though no effect has been reported on carotenoid content in leaves after spraying bioenzyme at any of the concentration used in the study. Similar findings showed positive effect of bioenzyme spraying on photosynthetic pigments (Wahyudi *et al.,* 2009, Wulandavi and Susanti *et al.* 2012). Application of bioenzyme as biofertilizer also showed faster growth and better content of photosynthetic pigments in chick pea seedlings (Singh *et al.,* 2020). Positive effect of garbage enzyme was reported on chlorophyll a, b and carotene content of cowpea seedlings by Christopher and Ehijivwo

**Table 1.** Effect of foliar spray with bioenzyme on photosynthetic pigments

| Treatments | Chlorophyll a (mg/g) | | | Chlorophyll b (mg/g) | | | Carotenoid (mg/g) | | |
|---|---|---|---|---|---|---|---|---|---|
| | After 15 days of first spray | After 15 days of second spray | After 15 days of third spray | After 15 days of first spray | After 15 days of second spray | After 15 days of third spray | After 15 days of first spray | After 15 days of second spray | After 15 days of third spray |
| C(Without spray) | 0.01 ± .001 | 0.025±.001 | 0.045±.004 | 0.018 ± .01 | 0.047±.001 | 0.046±.001 | 0.032 ± .002 | 0.017±.005 | 0.018±.001 $^{ns}$ |
| T1 (1 ml/L water) | 0.023 ±.001** | 0.028±.001** | 0.057±.004** | 0.022 ±.005*** | 0.064±.002*** | 0.082±.001*** | 0.034 ±.001$^{ns}$ | 0.018±.005$^{ns}$ | 0.018±.005 $^{ns}$ |
| | (130%) | (12%) | (27%) | (22%) | (36%) | (78%) | (6%) | (5%) | (0%) |
| T2 (2 ml/L water) | 0.027± .001*** | 0.032±.002*** | 0.070±.001** | 0.029± .002*** | 0.068±.002*** | 0.087±.002*** | 0.040± .002 $^{ns}$ | 0.017±.005 $^{ns}$ | 0.021±.001 $^{ns}$ |
| | (170%) | (28%) | (55%) | (61%) | (45%) | (89%) | (25%) | (0%) | (16%) |
| T3 (3 ml/L water) | 0.018 ± .001** | 0.030±.001** | 0.054±.002** | 0.025 ± .003*** | 0.055±.003*** | 0.071±.002*** | 0.033 ± .002$^{ns}$ | 0.017±.001$^{ns}$ | 0.019±.005 $^{ns}$ |
| | (80%) | (20%) | (20%) | (39%) | (17%) | (54%) | (31%) | (0%) | (5%) |

* Indicates p value < 0.05 and is significant, ** indicates p value < 0.01 and is highly significant, *** indicates p value< 0.001 and is extremely significant.

2021. The treatment of rice with ecoenzyme resulted in enhanced absorption of nitrogen from soil leading to increased chlorophyll content, better growth and improved yield (Barman *et al.*, 2022)

**Biochemical parameters:** Carbohydrate content determined after each spray of bioenzyme showed highly significant increase in all the treatment as compared to control (Table 2). Increase in photosynthetic pigments may have resulted in increased photosynthesis leading to enhanced carbohydrate content. Tazuke and Sakiyama (1991) in study on pepper fruit reported an increase in carbohydrate content after spraying of bioenzyme. The possible reason for increase in carbohydrate content may be enhancement in respiration capacity, subsequently there would be increase in metabolic activity and growth. Sethi *et al.* (2021) reported in a case study that use of ecoenzyme resulted in improved photosynthesis, nutrient and water uptake leading to improved quality and quantity of fruits and vegetables.

Significant increase was reported in protein content in leaves of mung bean after each spray as mentioned in Table 2. White *et al.* (2005) highlighted, that bioenzyme contains essential elements like zinc, iron, manganese, magnesium, sulfur and boron. Probably these elements involved in the activity of enzymes plays role in the protein biosynthesis. Higher amount of nitrogenous compound in the bioenzyme, accelerate the rate of biosynthesis of amino acids (Leegod *et al.*, 2000). Increase in protein content was reported in wheat with the application of garbage enzyme (Sethi *et al.*, 2021).

**Oxidative stress parameters:** In the open field plants are exposed to adverse environmental conditions produce free radicals in an excessive amount, can lead to increased production of ROS which can cause cell death by enhancing peroxidation of lipid, oxidation of protein, damage to nucleic acid, inhibition of important enzymes and initiation of pro-

**Table 2.** Effect of foliar spray with bioenzyme on biochemical parameters

| Treatments | Carbohydrate (%mg) | | | Protein (mg/g) | | |
|---|---|---|---|---|---|---|
| | After 15 days of first spray | After 15 days of first spray | After 15 days of first spray | After 15 days of first spray | After 15 days of second spray | After 15 days of third spray |
| C(Without spray) | 2.0 ±0.4 | 2.0 ±0.4 | 2.0 ±0.4 | 2.59 ±0.05 | 3.22± 0.19 | 3.99± 0.12 |
| T1 (1 ml/L water) | 5.9 ±0.8** (195%) | 5.9 ±0.8** (195%) | 5.9 ±0.8** (195%) | 2.93 ±0.1 (13.12%) | 3.95± 0.26 (22.67%) | 4.49± 0.12** (12.53%) |
| T2 (2 ml/L water) | 7.46±0.7*** (273%) | 7.46±0.7*** (273%) | 7.46±0.7*** (273%) | 3.95±0.2** (52.50%) | 4.08± 0.28** (26%) | 4.98± 0.1** (25%) |
| T3 (3 ml/L water) | 4.73 ±1.1*** (136%) | 4.73 ± 1.1*** (136%) | 4.73 ±1.1*** (136%) | 2.79 ± 0.06** (8%) | 3.41± 0.43** (5.90%) | 4.51± 0.12** (13.03%) |

* Indicates p value < 0.05 and is significant, ** indicates p value < 0.01 and is highly significant, *** indicates p value< 0.001 and is extremely significant.

**Table 3.** Effect of foliar spray with bioenzyme on oxidative stress parameters

| Treatments | MDA (nmoles/g) | | | Proline (µmoles/g) | | |
|---|---|---|---|---|---|---|
| | After 15 days of first spray | After 15 days of first spray | After 15 days of first spray | After 15 days of first spray | After 15 days of second spray | After 15 days of third spray |
| C | 0.063±.005 | 0.020±.003 | 0.024±.01 | 0.027 ± .001 | 0.021 ± .002 | 0.027±.001 |
| T1 (1 ml/L water) | 0.066 ±.005$^{ns}$ (5%) | 0.024±.005$^{ns}$ (20%) | 0.024±.009$^{ns}$ (0%) | 0.011 ± .0005*** (-59.25%) | 0.013 ± .003* (-38.09%) | 0.023 ± .003$^{ns}$ (-14.81%) |
| T2 (2 ml/L water) | 0.066± .005$^{ns}$ (5%) | 0.006±.002*** (-.028%) | 0.026±.006* (8.33%) | 0.011 ±.0005*** (-59.25%) | 0.009 ± .001*** (-57.14%) | 0.052 ± .004*** (92.59%) |
| T3 (3 ml/L water) | 0.073 ± .005$^{ns}$ (16%) | 0.018±.001$^{ns}$ (-10%) | 0.021±.003$^{ns}$ (-12.5%) | 0.016 ± .001*** (-40.74%) | 0.024 ± .001$^{ns}$ (14.28%) | 0.063 ± .011*** (133.33%) |

* Indicates p value < 0.05 and is significant, ** indicates p value < 0.01 and is highly significant, *** indicates p value< 0.001 and is extremely significant.

**Table 4.** ANOVA between three different dilutions of bioenzyme

| Parameters | F value between T1, T2, T3 After 15 days of first spray | F value between T1, T2, T3 After 15 days second spray | F value between T1,T2,T3 After 15 days third spray |
|---|---|---|---|
| Chlorophyll a | 32.17*** | 3.79 | 27.87*** |
| Chlorophyll b | 7.4* | 14** | 67*** |
| Carotenoid | 9.6* | 0.8 | 4.72 |
| Carbohydrate | 8.35* | 15.8* | 175.21*** |
| Protein | 42*** | 3.33 | 16.74*** |
| MDA | 1.33 | 94.04*** | 0.39 |
| Proline | 40*** | 36*** | 23** |

Tabulated F value for 2,6 degree of freedom is 5.14. * Indicates p value < 0.05 and is significant, ** indicates p value < 0.01 and is highly significant, *** indicates p value< 0.001 and is extremely significant.

grammed cell death (Hasanuzzaman *et al.,* 2014). In the control may be the limiting amount of the nutrients in the soil create nutrient deficiency resulting in increased production of ROS. As mentioned in Table 3, MDA content was insignificantly affected in all the treatments after first foliar spray. Though significant decrease was observed after second spray only with 2 ml/L (T2) as compared to control. Decrease in lipid peroxidation measured by MDA content indicates increased tolerance of plant to changing environmental condition. Supplementation of bioenzyme fulfil the requirement of the limiting nutrients overcoming the nutrients deficiency stress hence reducing the ROS production and MDA content.

As shown in Table 3, highly significant decrease in proline content were observed after first spray of all the three dilutions of bioenzyme, however after third spray proline content was increased significantly corresponding to increased concentration of bioenzyme. Consistence with the present findings, in a review application of many biostimulants resulted in the improved antioxidative system as compared to control (Calvo *et al.,* 2014). Furthermore, Aydin *et al.,* (2012) observed that humic substance application under saline conditions increased proline content, and reduced membrane leakage and reactive oxygen species (ROS) generation in the common bean (*Phaseolus vulgaris* L.), reflecting better adaptability to saline conditions. Probable reasons for that may be humic acid content present in bioenzyme has increased leaf hydration under dry soil conditions as well as root growth, shoot growth, and antioxidant capacity (Zhang *et al.,* 2002 and 2008). Bioenzyme through its positive effect on proline content, reduces ROS level and maintains cellular homeostasis (Garcia *et al.*, 2012).

## Conclusion

The study highlights the positive effect of bioenzyme application on photosynthetic pigments, biochemical and oxidative stress parameters. This research concludes that the ecofriendly product bioenzyme can be a good alternative for chemical fertilizers to protect soil and our ecosystem. Bio-enzymes helps to reduce some waste & turn into a useful substance to the society which is economical and cheaply available and the end product can be completely useful.

## Acknowledgement

We express our sincere thanks to Dr. Suresh T. Silawat, Principal, Govt. Holkar Science College, Indore (M.P.) for providing necessary laboratory facilities and encouragement. We acknowledge MPCST for its funding in conducting this research.

### Conflict of Interest

All the authors hereby declare that there is no conflict of interest regarding the publication of this article.

## References

Aydin, A., Kant, C. and Turan, M. 2012. Humic acid application alleviates salinity stress of bean (*Phaseolus vulgaris* L.) plants decreasing membrane leakage. *Afr. J. Agric. Res.* 7: 1073–1086.

Calvo, P., Nelson, L. and Kloepper, J. W. 2014. Agricultural uses of plant biostimulants. *Plant and Soil*. 383: 3–41.

Christopher, M. and Ehijivwo, O.P. 2021. Effect of Garbage Enzyme on the Chlorophyll A & B and Carotene Content of fifteen Days Old Cowpea Seedlings. *In-*

*ternational Journal of Research Publication and Reviews*. 2(9): 1199-1201.

García, A.C., Santos, L.A., Izquierdo, F.G., Sperandio, M.V.L., Castro, R.N. and Berbara, R.L.L. 2012. Vermicomposthumic acids as an ecological pathway to protect rice plant against oxidative stress. *Ecological Engineering*. 47: 203-208.

Hasanuzzaman, M., Nahar, K., Gill, S.S. and Fujita, M. 2014. Drought stress responses in plants, oxidative stress, and antioxidant defense. In *Climate Change and Plant Abiotic Stress Tolerance*; Tuteja, N., Gill, S.S., Eds.; Wiley: Weinheim, Germany, 209–250.

Heath, R.L. and Packer, L. 1968. Photoperoxidation in isolated chloroplast. I. Kinetics and stoichiometry of fatty acid peroxidation. *Archives of Biochemistry and Biophysics.* 125: 189-198.

Hedge, J.E. and Hofreiter, B.T. 1962. In: *Carbohydrates chemistry*. 17. (eds. Whisteler R. L. and Bemiller J.N.), AcademicPress, New York.

Jain, P. K. 2006. Fruit drop, yield and quality of mango as influenced by biozyme and urea sprays. *Indian J. Hort.* 63(4): 453-454.

Lichtenthaler, H. K. and Wellburn, A.R. 1983. Determinations of total carotenoids and chlorophylls a and b of leaf extracts in different solvent. *Biochem. Soc. Trans.* 11: 591-592.

Lim, W. J., Chin, N. L., Yusof, A. Y., Yahya, A. and Tee, T. P. 2016. Mini review food waste handling in Malaysia and comparison with other Asian countries. *International Food Research Journal* (IFRJ). 23: 1-6.

Manna, M. Islam, T., Kaul, T.A., Reddy, C.S., Fartyal, D., James, D. and Reddy M.K. 2015. Comparative study of effects of increasing concentrations of phosphate and phosphite on rice seedlings. *Acta. Physiol. Plant.* 37: 258.

Moloto, R.M., Lengwati, M.D, Soundy, P., Dakora, F.D. and Maseko, S.T. 2018. Effect of soil type and bio stimulants on growth parameters of chickpea. *South African Journal of Botany.* 115: 300.

Mubarak, A.E. 2005. Nutritional Composition and Anti-Nutritional Factors of Mung Bean Seeds (*Phaseolus aureus*) as Affected by Some Traditional Process. *Food Chemistry.* 89: 489-495.

Sethi, S.K., Soni, K., Dhingra, N. and Narula, G.B. 2021. Bringing Lab to Our Home: Bio-Enzyme and its Multiutility in Everyday Life. *International Research Journal of Engineering and Technology* (IRJET) 8(3): 1461- 1476.

Singh, K., Dhar, V. and Dhasmana, A. 2020. Study the Synergistic Effect of Agro-Waste Compost and Bio-Enzymes on Seed Germination and Plant Growth. *East African Scholars J Agri Life Sci.* 3(6): 196- 201.

Susanti, E., Budi Utomo, S., Syukri, Y. and Redjeki, T. 2012. Phytochemical screening and analysis polyphenolic antioxidant activity of methanolic extract of white dragon fruit (*Hylocereus undatus*) *Indones. J. Pharm*. 23 (1): 60-64.

White, P.J., Broadley, M.R.,Greenwood, D.J. and Hammond, J.P. 2005. *Proceedings of the International Fertiliser Society 568. Genetic modifications to improve phosphorus acquisition by roots.* IFS : York, UK. ISBN 0853102058.

Zhang, X. and Ervin, E.H. 2008. Impact of seaweed extract-based cytokinins and zeatinriboside on creeping bentgrass heat tolerance. *Crop Sci.* 48(1): 364–70.

Zhang, X., Schmidt, R.E., Ervin, E.H. and Doak, S. 2002. Creeping bentgrass physiological responses to natural plant growth regulators and iron under two regimes. *Hort. Science*. 37(6): 898–902.

# SSR DOCUMENT

2021

## CRITERION – 3

## MoUs/Linkages/Collaborations

Azim Premji University, Bengaluru, India

**Document Title:**

**Online meeting organized for Translation work of Physics books from English to Hindi in association with Azim Premji University, Bengaluru, India**

# MEMORANDUM OF UNDERSTANDING

This Memorandum of Understanding (MOU) is entered into on this **24th day of May, 2021** by and between:

**Azim Premji University**, a private university established under the Azim Premji University Act, 2010 (Karnataka Act No. 14 of 2010) with its principal place of operations at Survey No. 66, Burugunte Village, Bikkanahalli Main Road, Sarjapura Bengaluru- 562125; and a division of Azim Premji Foundation for Development, a section 25 company registered under the Companies act, 1956 and having its registered office at #134, Doddakannelli, Next to Wipro Corporate Office, Sarjapur Road, Bangalore- 560035, hereinafter referred to as "**University**" (which expression shall, unless repugnant to the context, include its successors in interest, administrators and assigns)of the **One Part**;

**AND**

**Government Holkar Science College**, with its principal place of operations at A.B. Road, Near Bhawarkua, Indore, Madhya Pradesh – 452 017, hereinafter referred to as "**Institute**" (which expression shall, unless repugnant to the context, include its successors in interest, administrators and assigns) of the **Other Part**.

University and Institute shall be referred to individually as "**Party**" and jointly as "**Parties**".

**WHEREAS**

A. University is a not-for-profit university established in Karnataka by the Azim Premji University Act, 2010 offering undergraduate and postgraduate programmes in education and development domains.

B. Institute is an autonomous institution established in Indore with NAAC 'A' grade accreditation and is a leading science college in the State of Madhya Pradesh.

C. University is interested in generating Science, Mathematics, Economics, and other subjects' education resources in Indian languages. Institute is interested in expansion of sciences, mathematics, and their education in general. Both Parties admit students to their respective undergraduate science programs many of whom are making a transition from education in their own languages to English as a medium of instruction. These interests provide a common ground for collaboration.

D. Both Parties welcome collaboration between their members including faculty and students on projects related to resource generation for science and mathematics pedagogy and are therefore executing this MOU. Parties will respectively provide the required resources to facilitate the collaborative projects from time to time.

(c) *Applicable Law.* This MOU shall be governed by the Laws in India and each of the Parties submit to the jurisdiction of the courts of Bangalore.

**IN WITNESS WHEREOF the Parties hereto have duly caused these presents to the executed on the day, month and year first above written.**

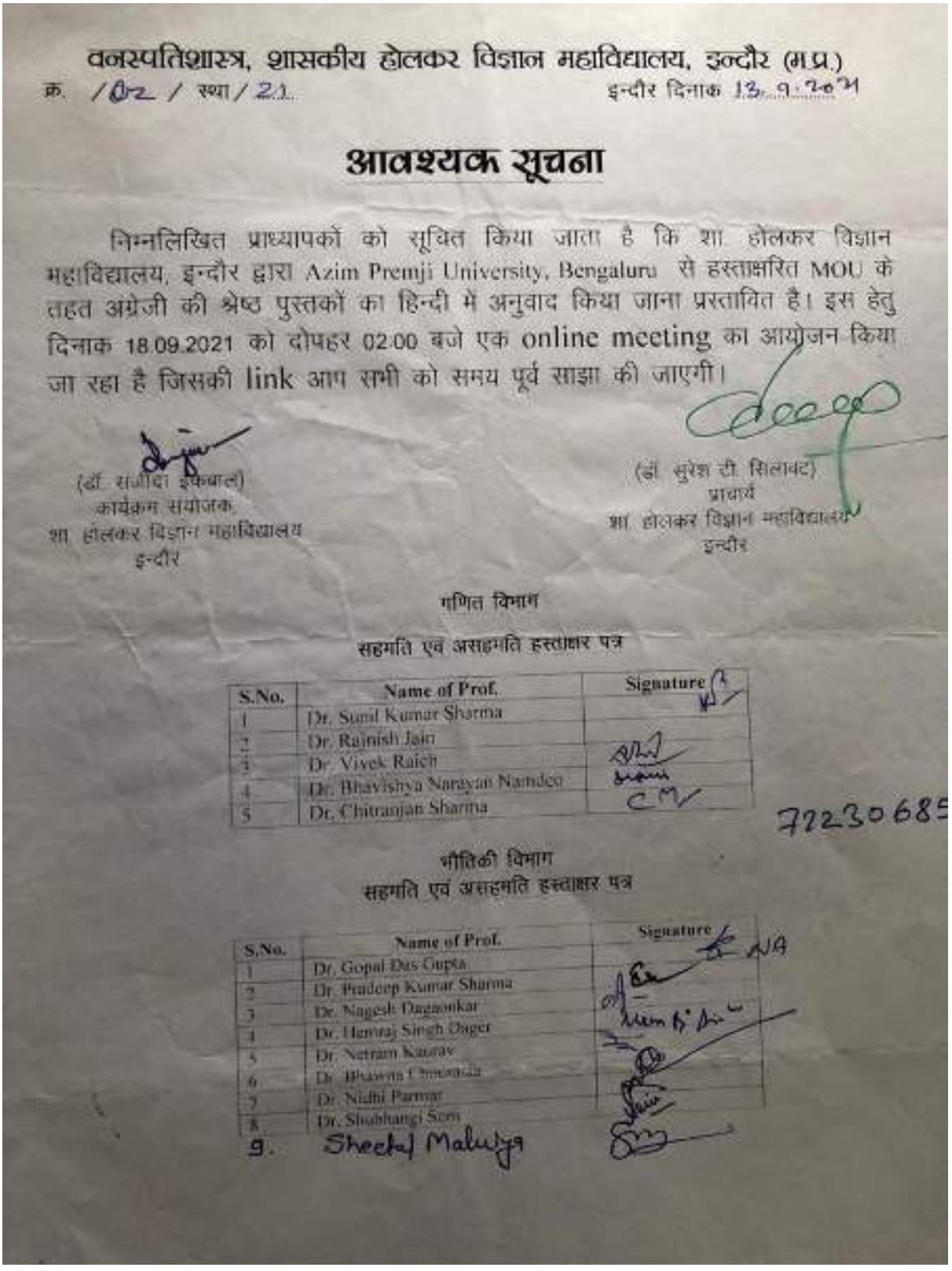
By:

Name: Manoj P
Registrar
Azim Premji University
Date:

By:

Name:
Principal,
Government Holkar Science College
Date:

# Azim Premji University, Bengaluru, India (Online meeting organized for Translation work of Physics books from English to Hindi)



वनस्पतिशास्त्र, शासकीय होलकर विज्ञान महाविद्यालय, इन्दौर (म.प्र.)

क्र. /02 / स्था / 21 इन्दौर दिनांक 13.9.2021

## आवश्यक सूचना

निम्नलिखित प्राध्यापकों को सूचित किया जाता है कि शा. होलकर विज्ञान महाविद्यालय, इन्दौर द्वारा Azim Premji University, Bengaluru से हस्ताक्षरित MOU के तहत अंग्रेजी की श्रेष्ठ पुस्तकों का हिन्दी में अनुवाद किया जाना प्रस्तावित है। इस हेतु दिनांक 18.09.2021 को दोपहर 02:00 बजे एक online meeting का आयोजन किया जा रहा है जिसकी link आप सभी को समय पूर्व साझा की जाएगी।

(डॉ. साजीदा इकबाल)
कार्यक्रम संयोजक
शा. होलकर विज्ञान महाविद्यालय
इन्दौर

(डॉ. सुरेश टी. सिलावट)
प्राचार्य
शा. होलकर विज्ञान महाविद्यालय
इन्दौर

गणित विभाग

सहमति एवं असहमति हस्ताक्षर पत्र

| S.No. | Name of Prof. | Signature |
|---|---|---|
| 1 | Dr. Sunil Kumar Sharma | |
| 2 | Dr. Rajnish Jain | |
| 3 | Dr. Vivek Raich | |
| 4 | Dr. Bhavishya Narayan Namdeo | |
| 5 | Dr. Chitranjan Sharma | |

7223068

भौतिकी विभाग

सहमति एवं असहमति हस्ताक्षर पत्र

| S.No. | Name of Prof. | Signature |
|---|---|---|
| 1 | Dr. Gopal Das Gupta | NA |
| 2 | Dr. Pradeep Kumar Sharma | |
| 3 | Dr. Nagesh Dagaonkar | |
| 4 | Dr. Hemraj Singh Dager | |
| 5 | Dr. Netram Kaurav | |
| 6 | Dr. Bhawna Chouhan | |
| 7 | Dr. Nidhi Parmar | |
| 8 | Dr. Shubhangi Soni | |
| 9. | Sheetal Malviya | |

# Azim Premji University, Bengaluru, India (Meeting for translation work by Team of translation initiative)







GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2021

## CRITERION –3

## MoUs/Linkages/Collaborations

Faculty of Sciences & IT, Madhyanchal Professional University, Bhopal,M.P., India

**Document Title:**

Lecture delivered by Dr. Sugandha Singh on Opportunities in Microbiology under an MoU with the Faculty of Sciences and IT, Madhyanchal Professional University, Bhopal,M.P., India

DRAFT

# MEMORANDUM OF UNDERSTANDING BETWEEN DEPARTMENT OF MICROBIOLOGY, GOVERNMENT HOLKAR SCIENCE COLLEGE INDORE, INDIA AND FACULTY OF SCIENCES & IT, MADHYANCHAL PROFESSIONAL UNIVERSITY, BHOPAL.

In the spirit of Mutual understanding, Dept. of Microbiology, Govt. Holkar Science College Indore, India, and Faculty of Sciences & IT, Madhyanchal Professional University, Bhopal, M.P., India agrees to examine the possibility of establishing a framework for educational cooperation for our students, faculty and staff.

In preparation for establishing a formal framework for future activities, the parties hereto agree as follows:

1. *Explore possibilities for faculty and staff exchanges for research, lectures, and discussions that mutually benefit both institutions.*
2. *Explore the feasibility of student exchanges and study programs.*
3. *Seek support for projects determined to be mutually beneficial to both institutions.*
4. *The terms of joint activities and arrangements for specific visit exchanges, and other forms of cooperation will be agreed upon in writing prior to the initiation of any activity. Any commitment of resources, financial or otherwise, in support of these activities must be contained in subsequent specific agreements.*
5. *While no binding commitments have been made, we sign this Memorandum of Understanding in recognition of our common interests and agree to consult periodically concerning the status of our collaboration.*
6. *This understanding is done in two identical copies, both in English, by authorized representatives of each institute, and both parties will retain one copy of the memorandum.*

For Department of Microbiology, Govt. Holkar Science College, Indore, India

Dr. (Name): DR. SANJAY VYAS

Title: PROF. & HEAD, DEPT. OF MICRO. GOVT. HOLKAR SCIENCE COLLEGE

Date: 27.12.2021

For , Faculty of Sciences & IT Madhyanchal Professional University, Bhopal, Madhya Pradesh, India

Dr. (Name): SUGANDHA SINGH

Title: DEAN, FACULTY OF SCIENCES & IT MPU, BHOPAL

Date: 24.12.2021



Lecture by Dr. Sugandha Singh on “Opportunities in Microbiology” 27 December, 2021 in Dept. of Microbiology, Govt. Holkar Science College, Indore (M.P.)

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2021

## CRITERION –3

## MoUs/Linkages/Collaborations

**Infutech Health Care Pvt. Ltd., Indore**

**Document Title:**

**Internship training is provided to microbiology students by Infutech Health Care Pvt. Ltd., Indore, under active collaboration.**

DRAFT

# MEMORANDUM OF UNDERSTANDING
# BETWEEN
# DEPARTMENT OF MICROBIOLGY, GOVERNMENT HOLKAR SCIENCE COLLEGE INDORE, INDIA
# AND
# INFUTECH HEALTH CARE PVT. LTD. INDORE, INDIA

In the spirit of National understanding, Dept. of Microbiology, Govt. Holkar Science College, Indore, India and Infutech Health Care Pvt. Ltd., Indore agree to examine the possibility of establishing a framework for educational and research cooperation for our students, faculty and staff.

In preparation for establishing a formal framework for future activities, the parties hereto agree as follows:

1. Explore possibilities for faculty and staff exchanges for research, lectures, and discussions that mutually benefit both institutions.

2. Explore the feasibility of student exchanges and study programs.

3. Seek support for projects determined to be mutually beneficial to both institutions.

4. The nature of such activities and arrangements for specific visits, exchanges, and other forms of cooperation will be agreed upon in writing prior to the initiation of any activity. Any concurrent of resources, financial or otherwise, in support of these activities must be contained in subsequent, specific agreements.

5. While no binding commitments have been made, we sign this Memorandum of Understanding in recognition of our common interests and agree to consult periodically concerning the status of our collaboration.

6. This understanding is done in two identical copies, both in English, by authorized representatives of each institution, and both parties shall retain one copy of the understanding.

For Department of Microbiology, Govt. Holkar Science College Indore, India

Dr. (Name): SANJAY VYAS

Title: Head, Dept. of Microbiology, Govt. Holkar Science College

Date: 01/03/2021

For Infutech Health Care Pvt. Ltd., Indore, India

Dr. (Name): C. K. NAIR

Title:

Date: 01/03/2021

To,

Date: 01/02/2021

The Director
InSitech Health Care Pvt. Ltd.,
Indore (M.P.)

**Sub: Regarding Internship for B.Sc. Students of Microbiology.**

Respected Sir,

This is to request you for allowing eight of our B.Sc. Microbiology students for the internship in your Institute for fulfilling the norms stated in the MOU signed by our respective Institute. The list of students is attached with this letter.

Thanking You,

Dr. Sanjay Vyas
Professor & Head
Dept. of Microbiology
Govt. Holkar College, Indore (M.P.)
Indore (M.P.)

GOVT. HOLKAR SCIENCE COLLEGE, INDORE
DEPARTMENT OF MICROBIOLOGY

INTERNSHIP/PROJECT INFORMATION -2021
MICRO B.Sc. FINAL YEAR [B.S]

| S.N. | NAME OF STUDENT | SURNAME | CLASS SECTION | NAME OF COLLEGE GUIDE | NAME OF PLACE | DATE OF TRAINING | INTERNSHIP SUBJECT |
|---|---|---|---|---|---|---|---|
| 1 | JYOTI | SHRIVAS | B.Sc. III rd Year B-S | DR. D.C.P.T. SHARMA | INTAS PHARMACEUTICALS PVT. LTD. | 12.10.2020 TO 12.11.2021 | QC |
| 2 | KIRAN CHOUHAN | | B.Sc. III rd Year B-S | DR. D.C.P.T. SHARMA | INTAS PHARMACEUTICALS PVT. LTD. | 12.10.2020 TO 12.11.2021 | QC |
| 3 | PANKAJ KUMAR | | B.Sc. III rd Year B-S | DR. D.C.P.T. SHARMA | INTAS PHARMACEUTICALS PVT. LTD. | 12.10.2020 TO 12.11.2021 | QC |
| 4 | RAJESH NAGAR | | B.Sc. III rd Year B-S | DR. D.C.P.T. SHARMA | INTAS PHARMACEUTICALS PVT. LTD. | 12.10.2020 TO 12.11.2021 | QC |
| 5 | SHIVANI | KUSHWAHA | B.Sc. III rd Year B-S | PROF. ANJU SHARMA | INTAS PHARMACEUTICALS PVT. LTD. | 12.10.2020 TO 12.11.2021 | QC |
| 6 | SHUBHAM | SATAVA | B.Sc. III rd Year B-S | PROF. ANJU SHARMA | INTAS PHARMACEUTICALS PVT. LTD. | 12.10.2020 TO 12.11.2021 | QC |
| 7 | URJA BANGI | | B.Sc. III rd Year B-S | PROF. ANJU SHARMA | INTAS PHARMACEUTICALS PVT. LTD. | 12.10.2020 TO 12.11.2021 | QC |
| 8 | YOGITA | THAKUR | B.Sc. III rd Year B-S | PROF. ANJU SHARMA | INTAS PHARMACEUTICALS PVT. LTD. | 12.10.2020 TO 12.11.2021 | QC |

Kindly above students for Internship in your Institute

Professor & Head
Dept. of Microbiology
Govt. Holkar College, Indore (M.P.)

# SSR DOCUMENT

2021

## CRITERION – 3

## MoUs/Linkages/Collaborations

**Parenteral Drugs Pharmaceuticals Pvt. Ltd. Indore**

**Document Title:**

**Parenteral Drugs Pharmaceuticals Pvt. Ltd., Indore, provided an industrial internship to microbiology students as per the MoU between both institutes.**

DRAFT

# MEMORANDUM OF UNDERSTANDING BETWEEN DEPARTMENT OF MICROBIOLGY, GOVERNMENT HOLKAR SCIENCE COLLEGE INDORE, INDIA AND PARENTERAL DRUGS PHARMACEUTICALS LIMITED, INDORE, INDIA

In the spirit of National understanding, Dept. of Microbiology, Govt. Holkar Science College Indore, India, and Parenteral Drugs Pharmaceuticals Limited, Indore, India agree to examine the possibility of establishing a framework for educational and research cooperation for our students, faculty and staff.

In preparation for establishing a formal framework for future activities, the parties hereto agree as follows:

1. Explore possibilities for faculty and staff exchanges for research, lectures, and discussions that mutually benefit both institutions;
2. Explore the feasibility of student exchanges and study programs;
3. Seek support for projects determined to be mutualy beneficial to both institutions;
4. The terms of joint activities and arrangements for specific visit, exchanges, and other forms of cooperation will be agreed upon in writing prior to the initiation of any activity. Any commitment of resources, financial or otherwise, in support of these activities must be contained in subsequent specific agreements;
5. While no binding commitments have been made, we sign this Memorandum of Understanding in recognition of our common interests and agree to consult periodically concerning the status of our collaboration;
6. This understanding is done in two identical copies, both in English, by authorized representatives of each institute, and both parties will retain one copy of the memorandum.

**For Department of Microbiology, Govt. Holkar Science College, Indore, India**

Dr. (Name) SANJAY VYAS

Title: Head, Dept. of Microbiology, Govt. Holkar Sci. College Indore

Date: 01/03/2021

**For Parenteral Drugs Pharmaceuticals Limited, Indore, India**

Dr. (Name) C.K. NAIR

Title

Date: 01/03/2021

# Parenteral Drug Private Limited, Indore

## CERTIFICATE

This is to certify that **Ms. Akanksha Swamy** has done her internship in **Parenteral Drug Private Limited, Indore** from 01/02/2021 to 09/02/2021. She has worked on a project titled **"Drinking Water Analysis of Govt. Holkar Science College, Indore".** This project was completed as per the internship programme mentioned in the academic syllabus of M.Sc. Final year. During her internship she has demonstrated her skills with self-motivation to learn new skills. Her performance exceeded our expectations and she was able to complete the project on time.

We wish her all the best for her upcoming career.

**Mr. Vinod Gupta**
Director
Parenteral Drug Private Limited,
Indore, (M.P.)

# Parenteral Drug Private Limited, Indore

## CERTIFICATE

This is to certify that **Ms. Arzoo Rathore** has done her internship in **Parenteral Drug Private Limited, Indore** from 01/02/2021 to 09/02/2021. She has worked on a project titled **"Drinking Water Analysis of Govt. Holkar Science College, Indore".** This project was completed as per the internship programme mentioned in the academic syllabus of M.Sc. Final year. During her internship she has demonstrated her skills with self-motivation to learn new skills. Her performance exceeded our expectations and she was able to complete the project on time.

We wish her all the best for her upcoming career.

**Mr. Vinod Gupta**
Director
Parenteral Drug Private Limited,
Indore, (M.P.)

# Parenteral Drug Private Limited, Indore

## CERTIFICATE

This is to certify that **Ms. Ashwani Shah** has done her internship in **Parenteral Drug Private Limited, Indore** from 01/02/2021 to 09/02/2021. She has worked on a project titled **"Drinking Water Analysis of Govt. Holkar Science College, Indore".** This project was completed as per the internship programme mentioned in the academic syllabus of M.Sc. Final year. During her internship she has demonstrated her skills with self-motivation to learn new skills. Her performance exceeded our expectations and she was able to complete the project on time.

We wish her all the best for her upcoming career.

**Mr. Vinod Gupta**
Director
Parenteral Drug Private Limited,
Indore, (M.P.)

# Parenteral Drug Private Limited, Indore

## CERTIFICATE

This is to certify that **Ms. Ayushi Joshi** has done her internship in **Parenteral Drug Private Limited, Indore** from 01/02/2021 to 09/02/2021. She has worked on a project titled **"Drinking Water Analysis of Govt. Holkar Science College, Indore".** This project was completed as per the internship programme mentioned in the academic syllabus of M.Sc. Final year. During her internship she has demonstrated her skills with self-motivation to learn new skills. Her performance exceeded our expectations and she was able to complete the project on time.

We wish her all the best for her upcoming career.

**Mr. Vinod Gupta**
Director
Parenteral Drug Private Limited,
Indore, (M.P.)

# Parenteral Drug Private Limited, Indore

## CERTIFICATE

This is to certify that **Ms. Deepmala Devda** has done her internship in **Parenteral Drug Private Limited, Indore** from 01/02/2021 to 09/02/2021. She has worked on a project titled **"Drinking Water Analysis of Govt. Holkar Science College, Indore".** This project was completed as per the internship programme mentioned in the academic syllabus of M.Sc. Final year. During her internship she has demonstrated her skills with self-motivation to learn new skills. Her performance exceeded our expectations and she was able to complete the project on time.

We wish her all the best for her upcoming career.

**Mr. Vinod Gupta**
Director
Parenteral Drug Private Limited,
Indore, (M.P.)

# Parenteral Drug Private Limited, Indore

## CERTIFICATE

This is to certify that **Ms. Esha Vijayvargiy** has done her internship in **Parenteral Drug Private Limited, Indore** from 01/02/2021 to 09/02/2021. She has worked on a project titled **"Drinking Water Analysis of Govt. Holkar Science College, Indore".** This project was completed as per the internship programme mentioned in the academic syllabus of M.Sc. Final year. During her internship she has demonstrated her skills with self-motivation to learn new skills. Her performance exceeded our expectations and she was able to complete the project on time.

We wish her all the best for her upcoming career.

**Mr. Vinod Gupta**
Director
Parenteral Drug Private Limited,
Indore, (M.P.)

# Parenteral Drug Private Limited, Indore

## CERTIFICATE

This is to certify that **Ms. Harshita Sharma** has done her internship in **Parenteral Drug Private Limited, Indore** from 01/02/2021 to 09/02/2021. She has worked on a project titled **"Drinking Water Analysis of Govt. Holkar Science College, Indore".** This project was completed as per the internship programme mentioned in the academic syllabus of M.Sc. Final year. During her internship she has demonstrated her skills with self-motivation to learn new skills. Her performance exceeded our expectations and she was able to complete the project on time.

We wish her all the best for her upcoming career.

**Mr. Vinod Gupta**
Director
Parenteral Drug Private Limited,
Indore, (M.P.)

# Parenteral Drug Private Limited, Indore

## CERTIFICATE

This is to certify that **Ms. Lonare Anushka Devanand** has done her internship in **Parenteral Drug Private Limited, Indore** from 01/02/2021 to 09/02/2021. She has worked on a project titled **"Drinking Water Analysis of Govt. Holkar Science College, Indore".** This project was completed as per the internship programme mentioned in the academic syllabus of M.Sc. Final year. During her internship she has demonstrated her skills with self-motivation to learn new skills. Her performance exceeded our expectations and she was able to complete the project on time.

We wish her all the best for her upcoming career.

**Mr. Vinod Gupta**
Director
Parenteral Drug Private Limited,
Indore, (M.P.)

# Parenteral Drug Private Limited, Indore

## CERTIFICATE

This is to certify that **Ms. Muskan Goyal** has done her internship in **Parenteral Drug Private Limited, Indore** from 01/02/2021 to 09/02/2021. She has worked on a project titled **"Drinking Water Analysis of Govt. Holkar Science College, Indore".** This project was completed as per the internship programme mentioned in the academic syllabus of M.Sc. Final year. During her internship she has demonstrated her skills with self-motivation to learn new skills. Her performance exceeded our expectations and she was able to complete the project on time.

We wish her all the best for her upcoming career.

**Mr. Vinod Gupta**
Director
Parenteral Drug Private Limited,
Indore, (M.P.)

# Parenteral Drug Private Limited, Indore

## CERTIFICATE

This is to certify that **Ms. Muskan Sen** has done her internship in **Parenteral Drug Private Limited, Indore** from 01/02/2021 to 09/02/2021. She has worked on a project titled **"Drinking Water Analysis of Govt. Holkar Science College, Indore".** This project was completed as per the internship programme mentioned in the academic syllabus of M.Sc. Final year. During her internship she has demonstrated her skills with self-motivation to learn new skills. Her performance exceeded our expectations and she was able to complete the project on time.

We wish her all the best for her upcoming career.

**Mr. Vinod Gupta**
Director
Parenteral Drug Private Limited,
Indore, (M.P.)

# Parenteral Drug Private Limited, Indore

## CERTIFICATE

This is to certify that **Ms. Nikita Raikwar** has done her internship in **Parenteral Drug Private Limited, Indore** from 01/02/2021 to 09/02/2021. She has worked on a project titled **"Drinking Water Analysis of Govt. Holkar Science College, Indore".** This project was completed as per the internship programme mentioned in the academic syllabus of M.Sc. Final year. During her internship she has demonstrated her skills with self-motivation to learn new skills. Her performance exceeded our expectations and she was able to complete the project on time.

We wish her all the best for her upcoming career.

**Mr. Vinod Gupta**
Director
Parenteral Drug Private Limited,
Indore, (M.P.)

# Parenteral Drug Private Limited, Indore

## CERTIFICATE

This is to certify that **Ms. Nikita Raikwar** has done her internship in **Parenteral Drug Private Limited, Indore** from 01/02/2021 to 09/02/2021. She has worked on a project titled **"Drinking Water Analysis of Govt. Holkar Science College, Indore".** This project was completed as per the internship programme mentioned in the academic syllabus of M.Sc. Final year. During her internship she has demonstrated her skills with self-motivation to learn new skills. Her performance exceeded our expectations and she was able to complete the project on time.

We wish her all the best for her upcoming career.

**Mr. Vinod Gupta**
Director
Parenteral Drug Private Limited,
Indore, (M.P.)

# Parenteral Drug Private Limited, Indore

## CERTIFICATE

This is to certify that **Ms. Pooja Pariyar** has done her internship in **Parenteral Drug Private Limited, Indore** from 01/02/2021 to 09/02/2021. She has worked on a project titled **"Drinking Water Analysis of Govt. Holkar Science College, Indore".** This project was completed as per the internship programme mentioned in the academic syllabus of M.Sc. Final year. During her internship she has demonstrated her skills with self-motivation to learn new skills. Her performance exceeded our expectations and she was able to complete the project on time.

We wish her all the best for her upcoming career.

**Mr. Vinod Gupta**
Director
Parenteral Drug Private Limited,
Indore, (M.P.)

# Parenteral Drug Private Limited, Indore

## CERTIFICATE

This is to certify that **Ms. Rishika Vishopiya** has done her internship in **Parenteral Drug Private Limited, Indore** from 01/02/2021 to 09/02/2021. She has worked on a project titled **"Drinking Water Analysis of Govt. Holkar Science College, Indore".** This project was completed as per the internship programme mentioned in the academic syllabus of M.Sc. Final year. During her internship she has demonstrated her skills with self-motivation to learn new skills. Her performance exceeded our expectations and she was able to complete the project on time.

We wish her all the best for her upcoming career.

**Mr. Vinod Gupta**
Director
Parenteral Drug Private Limited,
Indore, (M.P.)

# Parenteral Drug Private Limited, Indore

## CERTIFICATE

This is to certify that **Ms. Ritu Dhaked** has done her internship in **Parenteral Drug Private Limited, Indore** from 01/02/2021 to 09/02/2021. She has worked on a project titled **"Drinking Water Analysis of Govt. Holkar Science College, Indore".** This project was completed as per the internship programme mentioned in the academic syllabus of M.Sc. Final year. During her internship she has demonstrated her skills with self-motivation to learn new skills. Her performance exceeded our expectations and she was able to complete the project on time.

We wish her all the best for her upcoming career.

**Mr. Vinod Gupta**
Director
Parenteral Drug Private Limited,
Indore, (M.P.)

# Parenteral Drug Private Limited, Indore

## CERTIFICATE

This is to certify that **Ms. Shivani Kulhare** has done her internship in **Parenteral Drug Private Limited, Indore** from 01/02/2021 to 09/02/2021. She has worked on a project titled **"Drinking Water Analysis of Govt. Holkar Science College, Indore"**. This project was completed as per the internship programme mentioned in the academic syllabus of M.Sc. Final year. During her internship she has demonstrated her skills with self-motivation to learn new skills. Her performance exceeded our expectations and she was able to complete the project on time.

We wish her all the best for her upcoming career.

**Mr. Vinod Gupta**
Director
Parenteral Drug Private Limited,
Indore, (M.P.)

# Parenteral Drug Private Limited, Indore

## CERTIFICATE

This is to certify that **Ms. Swati Kapil** has done her internship in **Parenteral Drug Private Limited, Indore** from 01/02/2021 to 09/02/2021. She has worked on a project titled **"Drinking Water Analysis of Govt. Holkar Science College, Indore".** This project was completed as per the internship programme mentioned in the academic syllabus of M.Sc. Final year. During her internship she has demonstrated her skills with self-motivation to learn new skills. Her performance exceeded our expectations and she was able to complete the project on time.

We wish her all the best for her upcoming career.

**Mr. Vinod Gupta**
Director
Parenteral Drug Private Limited,
Indore, (M.P.)

# Parenteral Drug Private Limited, Indore

## CERTIFICATE

This is to certify that **Ms. Tarannum Mansuri** has done her internship in **Parenteral Drug Private Limited, Indore** from 01/02/2021 to 09/02/2021. She has worked on a project titled **"Drinking Water Analysis of Govt. Holkar Science College, Indore".** This project was completed as per the internship programme mentioned in the academic syllabus of M.Sc. Final year. During her internship she has demonstrated her skills with self-motivation to learn new skills. Her performance exceeded our expectations and she was able to complete the project on time.

We wish her all the best for her upcoming career.

**Mr. Vinod Gupta**
Director
Parenteral Drug Private Limited,
Indore, (M.P.)

# Parenteral Drug Private Limited, Indore

## CERTIFICATE

This is to certify that **Ms. Vinita Choursiya** has done her internship in **Parenteral Drug Private Limited, Indore** from 01/02/2021 to 09/02/2021. She has worked on a project titled **"Drinking Water Analysis of Govt. Holkar Science College, Indore".** This project was completed as per the internship programme mentioned in the academic syllabus of M.Sc. Final year. During her internship she has demonstrated her skills with self-motivation to learn new skills. Her performance exceeded our expectations and she was able to complete the project on time.

We wish her all the best for her upcoming career.

**Mr. Vinod Gupta**
Director
Parenteral Drug Private Limited,
Indore, (M.P.)

# Parenteral Drug Private Limited, Indore

## CERTIFICATE

This is to certify that **Mr. Harsh Vardhan Singh** has done his internship in **Parenteral Drug Private Limited, Indore** from 01/02/2021 to 09/02/2021. He has worked on a project titled **"Drinking Water Analysis of Govt. Holkar Science College, Indore".** This project was completed as per the internship programme mentioned in the academic syllabus of M.Sc. Final year. During his internship he has demonstrated his skills with self-motivation to learn new skills. His performance exceeded our expectations and he was able to complete the project on time.

We wish him all the best for his upcoming career.

**Mr. Vinod Gupta**
Director
Parenteral Drug Private Limited,
Indore, (M.P.)

# Parenteral Drug Private Limited, Indore

## CERTIFICATE

This is to certify that **Mr. Krishn Mohan Baghel** has done his internship in **Parenteral Drug Private Limited, Indore** from 01/02/2021 to 09/02/2021. He has worked on a project titled **"Drinking Water Analysis of Govt. Holkar Science College, Indore".** This project was completed as per the internship programme mentioned in the academic syllabus of M.Sc. Final year. During his internship he has demonstrated his skills with self-motivation to learn new skills. His performance exceeded our expectations and he was able to complete the project on time.

We wish him all the best for his upcoming career.

**Mr. Vinod Gupta**
Director
Parenteral Drug Private Limited,
Indore, (M.P.)

# Parenteral Drug Private Limited, Indore

## CERTIFICATE

This is to certify that **Mr. Shikhar Dungarwal** has done his internship in **Parenteral Drug Private Limited, Indore** from 01/02/2021 to 09/02/2021. He has worked on a project titled **"Drinking Water Analysis of Govt. Holkar Science College, Indore".** This project was completed as per the internship programme mentioned in the academic syllabus of M.Sc. Final year. During his internship he has demonstrated his skills with self-motivation to learn new skills. His performance exceeded our expectations and he was able to complete the project on time.

We wish him all the best for his upcoming career.

**Mr. Vinod Gupta**
Director
Parenteral Drug Private Limited,
Indore, (M.P.)

# Parenteral Drug Private Limited, Indore

## CERTIFICATE

This is to certify that **Mr. Shivanshu Chaturvedi** has done his internship in **Parenteral Drug Private Limited, Indore** from 01/02/2021 to 09/02/2021. He has worked on a project titled **"Drinking Water Analysis of Govt. Holkar Science College, Indore"**. This project was completed as per the internship programme mentioned in the academic syllabus of M.Sc. Final year. During his internship he has demonstrated his skills with self-motivation to learn new skills. His performance exceeded our expectations and he was able to complete the project on time.

We wish him all the best for his upcoming career.

**Mr. Vinod Gupta**
Director
Parenteral Drug Private Limited,
Indore, (M.P.)

# Parenteral Drug Private Limited, Indore

## CERTIFICATE

This is to certify that **Mr. Shubham Baghel** has done his internship in **Parenteral Drug Private Limited, Indore** from 01/02/2021 to 09/02/2021. He has worked on a project titled **"Drinking Water Analysis of Govt. Holkar Science College, Indore"**. This project was completed as per the internship programme mentioned in the academic syllabus of M.Sc. Final year. During his internship he has demonstrated his skills with self-motivation to learn new skills. His performance exceeded our expectations and he was able to complete the project on time.

We wish him all the best for his upcoming career.

**Mr. Vinod Gupta**
Director
Parenteral Drug Private Limited,
Indore, (M.P.)

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2021

## CRITERION – 3

## MoUs/Linkages/Collaborations

**Environmental and Science Institute UDYAM, Indore**

**Document Title:**

**The Department of Zoology organized a lecture by Dr. Jayshree, Plant Tissue Culture Specialist, at the MP Forest Extension Circle, Indore, on Organic Farming and Kitchen Gardening, an initiative under the MoU.**

**Office of the Principal**

**Govt. Model Autonomous Holkar Science College, Indore (M.P.)**

**0731-2464074 (O), 2446806 (Fax)**

**Email: principal@collegeholkar.org Web Address: www.collegeholkar.org**

**S.No ...../2021** **Indore, Date: 25.3.21**

**To,**

**The Director**
**Environmental and Science Institute**
**UDYAM**
**Jayshree Sukhwani Plant tissue**
**Training consultant culture and environmental technology**
**Under training Ad JRF Forest department.**
**754/3/3838-12, jsukhwaani88@gmail.com**

**Subject: - Regarding MOU with your prestigious institute.**
**Respected Sir,**

**Holkar Science College Indore is the oldest, most renowned and pioneer NAAC accredited Autonomous Govt. Science College of Madhya Pradesh. It is heartening to inform you that the students of this institution have got outstanding caliber, the right aptitude and postitive attitude to peruse a carrier in scientific research. Udyam, Indore being distinguished production & research center maintains a vast infrastructure required for scientific investigation, Plant tissue culture, Specialized working for forest department. It can be instrumental in exploitation and grooming up of the raw (research) potential of UG and PG, Students of Govt. Holkar Science College, Keeping these facts in view we wish to sign a MOU with your institution for the upgrading and development of research in this area. The draft of MOU will be like that-**

**1) Both the instituations will make an effort to identify the areas of common interest in which research can be pursues.**
**2) Your Organization will provide research facilities and technical know-how to the outstanding students of our college belonging to various UG and PG disciplines.**
**3) In order to develop interest in research both the institutions will jointly organize seminar for faculty and students every year.**
**4) Both the institutions will discuss the curriculum of some of the subjects for giving final branches of science.**
**Your suggestions are welcomed.**
**This draft is open for any change.**
**I Shall be highly obliged if you consier our proposal.**

**Principal**
**Dr. Suresh T. Silawat**

RSharma

SAGAR AQUATICS PVT. LTD.
63, Sector G, Jankipuram Extension, Lucknow (U.P.)

| S. No | Component/Activities | Details of event |
|---|---|---|
| 1 | Name of the Department / Unit / Agency: | Environmental and Science Institute (UDYAM) |
| 2 | Name of the Activity: | Lecture on Organic Farming Kitchen Gardening |
| 3 | Name of the Scheme: | MOU related lecture |
| 4 | Date and Year of the Activity: | 23.12.2021 |
| 5 | Number of Students Participated in the activity: | 54 |
| 6 | Report of the Activity (in 100 words): | Department of Zoology organized lecture of Dr Jayshree (Plant Tissue Culture Specialist at MP Forest extension circle, Indore) on Organic Farming Kitchen Gardening. She explained about vermicompost used in organic farming and its importance and also explained about kitchen gardening by vemicompost. |
| 7 | Photo of Activity: |   |
| 8 | List of Participants | 54 |

(32) kaushal shakya
(33) omprakash panwar
(34) Himanshee suthakar
(35) Rohan patidar
(36) Savitree
(37) Priyanka
(38) Deepak kumar

(39) Gritanshu
(40) jhenda Barde
(41) Sumeet Narke
(42) Pekha Ramre
(43) rathal pawar
(44) Madhvi Ahirwar
(45) Ayushi Ramgade
(46) Ritika Mandlai
(47) Pritti Rawat
(48) Anita Billore
(49) Atul Kr. Patel
(50) KAMALNIMA SINGH RAGHEL
(51) SHIVANGHI UJJAINI
(52) MINAKSHI VERMA
(53) Damikala Tiwari
(54) Aruna Devi Singh

| | | |
|---|---|---|
| 1 | Sunil Lodhi | |
| 2 | Jetan Wasker | Priyanka |
| 3 | Jayshree Solanki | Bamne |
| 4 | Rekha - Bamne | Mure |
| 5 | Shirakshi Verma | Sumaiya |
| 6 | Sumana Narke | Dilip |
| 7 | Dilip Bhumne | Sansin |
| 8 | Sansing Chauhan | |
| 9 | Nisha | Javid |
| 10 | Naveen Rathore | Kamal |
| 11 | Mangesh Rawat | Singh |
| 12 | Amit Singh. | |
| 13 | Jabbar Singh Shinde. | Abillee |
| 14 | Anita Billore | Solanki |
| 15 | Mansing Solanki | Jamre |
| 16 | Pawan Jamre | Jamre |
| 17 | Nirad Jamre | Powar |
| 18 | Sonelal Pawar | |
| 19 | Mukesh Verma | Barde |
| 20 | Jeevdali Barde | Mendhe |
| 21 | Monika Amble | Shukla |
| 22 | Dilkhus Thakur | Rawat |
| 23 | Pramod panwar, | Swati |
| 24 | Jyoti verma | Jatee |
| 25 | Jyoti Lankhande | Sonk |
| 26 | Tekchandsing Semle | |
| 27 | Sunil Dangi | Rawat |
| 28 | Jyoti Panche | Rawat |
| 29 | Yogeshi Jamalkar | |
| | Kannata | Rawat |

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2021

## CRITERION –3

## MoUs/Linkages/Collaborations

Sagore Aquatics Pvt. Ltd., Indore

**Document Title:**

Department of Zoology organized lecture of Deepak Soniya, Sagore Aquatics Pvt. Ltd.

Office of the Principal

Govt. Model Autonomous Holkar Science College, Indore (M.P.)

0731-2464074 (O), 2446806 (Fax)

Email: principal@collegeholkar.org Web Address: www.collegeholkar.org

S.No ...../2021

Indore, Date: 25.2.21

To,

The Director
Deepak Soniya, Vinayak Sagore
Sagore Aquatics Pvt. Ltd., Bioflock Technology
290 Gopur extensions near gopur square, Indore
CIN: U05000MP2020PTC051966
Registration No. – 51966
info@sagareaquatics.com

Subject: - Regarding MOU with your prestigious institute.

Respected Sir,

Holkar Science College Indore is the oldest, most renowned and pioneer NAAC accredited Autonomous Govt. Science College of Madhya Pradesh. It is heartening to inform you that the students of this institution have got outstanding caliber, the right aptitude and postitive attitude to peruse a carrier in scientific research. student would like to get knowledge of traning for Fish Culture, Modern Techniquese for technology Fish Farming by Bioflock Technology It can be instrumental in exploitation and grooming up of the raw (research) potential of UG, PG & M.Phil. Students of Govt. Holkar Science College, Keeping these facts in view we wish to sign a MOU with your institution for the upgrading and development of research in this area. The draft of MOU will be like that-

1) Both the instituations will make an effort to identify the areas of common interest in which research can be pursues.
2) Your Organization will provide research facilities and technical knowledge to the outstanding students of our college belonging to various UG, PG disciplines.
3) In order to develop interest in research both the institutions will jointly organize seminar for faculty and students every year.
4) Both the institutions will discuss the curriculum of some of the subjects for giving final branches of science.

Your suggestions are welcomed.
This draft is open for any change.
I Shall be highly obliged if you consier our proposal.

Principal
Dr. Suresh T. Silawat

RSharma

SAGARE AQUATICS PVT. LTD.
63, [illegible] (M.P.)

## EXTENSION AND OUTREACH PROGRAMME

| S. No | Component/Activities | Details of event |
|---|---|---|
| 1 | Name of the Department / Unit / Agency: | Sagore Aquatics Pvt. Ltd, Bioflock Technology, Indore |
| 2 | Name of the Activity: | Lecture on Bioflock Culture |
| 3 | Name of the Scheme: | MOU Activity |
| 4 | Date and Year of the Activity: | 27.11.2021 |
| 5 | Number of Students Participated in the activity: | 54 |
| 6 | Report of the Activity (in 100 words): | Department of Zoology organized lecture of Deepak Soniya, Sagore Aquatics Pvt. Ltd. He delivered lecture on Bioflock culture. He explained the modern techniques of fish farming by bioflock fish farming. Biofloc is a heterogeneous aggregate of suspended particles and variety of microorganisms associated with extracellular polymeric substances. It is composed of microorganisms such as bacteria, algae, fungi, invertebrates and detritus, etc. Bottom-dwelling species like shrimp and tilapia are best suited to biofloc production. |
| 7 | Photo of Activity: |  |

| | | |
|---|---|---|
| | |  |
| 8 | Media Report of Activity: | NA |
| 9. | Poster of Activity | NA |
| 10 | List of Participants | 54 |

Signature of Activity In charge

Note: 1). Please use Time New Roman font with 12 font sizes.

2). Delete extra rows if data is not available.

3). Preserve the word file in your computer.

(32) Kaushal Shakya
(33) Omprakash Panwar
(34) Himanshu Sutradhar
(35) Rohan Pathak
(36) Savitree
(37) Priyanka
(38) Deepak Kumar

(39) Lalitanshu
(40) Jhenkali Barde
(41) Sumeet Nerkar
(42) Pekha Barua
(43) Motilal Panwar
(44) Madhvi Ahirwar
(45) Ayushi Rangade
(46) Ritika Mandlai
(47) Priti Rawat
(48) Anita Billore
(49) Atul Kr. Patel
(50) KAMALNIMA SINGH BAGHEL
(51) SHIVANGHI UJJAINI
(52) MINAKSHI VERMA
(53) Danikshu Tiwari
(54) Aruna Devi Singh

1 Sunil Lodhi
2 Jetan Wasked
3 Priyanka Solanki
4 Rekha - Bamne
5 Srinakshi Verma
6 Sumana Narke
7 Dilip Bhumne
8 Sansing Chauhan
9 Nisha
10 Naveen Rathore
11 Mangesh Rawat
12 Amit Singh.
13 Jabbar singh Shinde.
14 Anita Billore
15 Mansing Solanki
16 Sawan Jamre
17 Vikas Jamre
18 Sonelal Pawar
19 Mukesh Verma
20 Sandali Barde
21 Rekha Ardle
22 Shikha Thakur
23 Anand panwar
24 Jyoti verma
25 Jyoti Lankhande
26 Jabbarsingh Semle
27 Rahul Dangi
28 Jyoti Panche
29 Kaveri Jamalkar
30 Laxman Kanoje

Priyanka
Bamne
Mukesh
Sumana
Dilip
Sansing
Naveen
Mangesh
Singh
Billore
Solanki
Jamre
Jamre
Pawar
Barde
Shikha
Anand
Swati
Jyoti
Rahul
Jyoti
Kaveri
Laxman

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2021

## CRITERION – 3

## MoUs/Linkages/Collaborations

Codeberry Software Solution, Indore

**Document Title:**

Internship Training was provided by Codeberry Software Solution, Indore, under collaborative understanding.

कार्यालय प्राचार्य, शासकीय होलकर विज्ञान महाविद्यालय, इन्दौर (म.प्र.)

क्रमांक /2022-23 इंदौर, दिनांक

प्रति,

Loddberry Software Solution

.....

.....

विषय:- प्रोजेक्ट/इंटर्नशिप विद्यार्थियों का कार्यस्थल प्रशिक्षण एवं मूल्यांकन विषयक

महोदय,

एम.एस-सी. अंतिम वर्ष के विद्यार्थियों को पाठ्यक्रम पूर्ण करने के लिये 60 घंटे का कार्यस्थल प्रशिक्षण करना अनिवार्य है। कृपया विद्यार्थी को प्रशिक्षण उपलब्ध करा कर सहयोग प्रदान करें।

आपके संस्थान में होलकर विज्ञान महाविद्यालय इंदौर के .....से संबंधित जो विद्यार्थी 60 घंटे की इंटर्नी कर रहे है, उनका कार्य प्रशिक्षण पूर्ण होने पर 50 अंकों में से मूल्यांगज भी आपको ही करना है तथा प्राप्त अर्को की सूची सील बन्द लिफा में उपस्थिति के साथ प्राचार्य को भेजने का कष्ट करें।

इंटर्नशिप हेतु अनुशंसित विद्यार्थी की जानकारी

विद्यार्थी का नाम : Chandan Bagwan

पिता का नाम : .....

कक्षा : M.Sc. IV

मार्गदर्शक का नाम एवं हस्ताक्षर : Jaya Sharma

HEAD
Computer Science Department
Govt. Holkar Science College, INDORE

विभागाध्यक्ष



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कार्यालय प्राचार्य, शासकीय होलकर विज्ञान महाविद्यालय, इन्दौर (म.प्र.)

क्रमांक /2022-23 इंदौर, दिनांक

प्रति,

Coldberry S/w Solution

.....

.....

विषय:- प्रोजेक्ट इंटर्नशिप विद्यार्थियों का कार्यस्थल प्रशिक्षण एवं मूल्यांकन विषयका

महोदय,

एम.एस-सी. अंतिम वर्ष के विद्यार्थियों को पाठ्यक्रम पूर्ण करने के लिये 60 घंटे का कार्यस्थल प्रशिक्षण करना अनिवार्य है। कृपया विद्यार्थी को प्रशिक्षण उपलब्ध करा कर सहयोग प्रदान करें।

आपके संस्थान में होलकर विज्ञान महाविद्यालय इंदौर के .....से संबंधित जो विद्यार्थी 60 घंटे की इंटनी कर रहे है, उनका कार्य प्रशिक्षण पूर्ण होने पर 50 अंकों में से मूल्यांगज भी आपको ही करना है तथा प्राप्त अर्को की सूची सील बन्द लिफा में उपस्थिति के साथ प्राचार्य को भेजने का कष्ट करें।

इंटर्नशिप हेतु अनुशंसित विद्यार्थी की जानकारी

विद्यार्थी का नाम : Manish Brahmwanshi

पिता का नाम : .....

कक्षा : M.Sc. IV

मार्गदर्शक का नाम एवं हस्ताक्षर : Jaya Sharma

विभागाध्यक्ष HEAD
Computer Science Department
Govt. Holkar Science College, INDORE



Scanned by CamScanner

कार्यालय प्राचार्य, शासकीय होलकर विज्ञान महाविद्यालय, इन्दौर (म.प्र.)

क्रमांक /2022-23 इंदौर, दिनांक

प्रति.

Coddherry Softwore Solution

.....

.....

विषय:- प्रोजेक्ट/इंटर्नशिप विद्यार्थियों का कार्यस्थल प्रशिक्षण एवं मूल्यांकन विषयका

महोदय,

एम.एस-सी. अंतिम वर्ष के विद्यार्थियों को पाठ्यक्रम पूर्ण करने के लिये 60 घंटे का कार्यस्थल प्रशिक्षण करना अनिवार्य है। कृपया विद्यार्थी को प्रशिक्षण उपलब्ध करा कर सहयोग प्रदान करें।

आपके संस्थान में होलकर विज्ञान महाविद्यालय इंदौर के .....से संबंधित जो विद्यार्थी 60 घंटे की इंटर्नी कर रहे है, उनका कार्य प्रशिक्षण पूर्ण होने पर 50 अंकों में से मूल्यांगज भी आपको ही करना है तथा प्राप्त अर्को की सूची सील बन्द लिफा में उपस्थिति के साथ प्राचार्य को भेजने का कष्ट करें।

इंटर्नशिप हेतु अनुशंसित विद्यार्थी की जानकारी

विद्यार्थी का नाम : Barat Raj

पिता का नाम : .....

कक्षा : M.Sc. IV

मार्गदर्शक का नाम एवं हस्ताक्षर : Jaya Sharma

विभागाध्यक HEAD
Computer Science Department
Govt. Holkar Science College, INDORE



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कार्यालय प्राचार्य, शासकीय होलकर विज्ञान महाविद्यालय, इन्दौर (म.प्र.)

इंदौर, दिनांक

क्रमांक /2022-23

प्रति,

Coddherry Software Solution

विषय:- प्रोजेक्ट/इंटर्नशिप विद्यार्थियों का कार्यस्थल प्रशिक्षण एवं मूल्यांकन विषयक।

महोदय,

एम.एस-सी. अंतिम वर्ष के विद्यार्थियों को पाठ्यक्रम पूर्ण करने के लिये 60 घंटे का कार्यस्थल पशिक्षण करना अनिवार्य है। कृपया विद्यार्थी को प्रशिक्षण उपलब्ध करा कर सहयोग प्रदान करें।

आपके संस्थान में होलकर विज्ञान महाविद्यालय इंदौर के .....से संबंधित जो विद्यार्थी 60 घंटे की इंटर्नी कर रहे है, उनका कार्य प्रशिक्षण पूर्ण होने पर 50 अंकों में से मूल्यांगज भी आपको ही करना है तथा प्राप्त अर्को की सूची सील बन्द लिफा में उपस्थिति के साथ प्राचार्य को भेजने का कष्ट करें।

इंटर्नशिप हेतु अनुशंसित विद्यार्थी की जानकारी

विद्यार्थी का नाम : Saurabh Mowar

पिता का नाम : .....

कक्षा : M.Sc. IV

मार्गदर्शक का नाम एवं हस्ताक्षर : Jaya Sharma

विभागाध्यक HEAD
Computer Science Department
Govt. Holkar Science College, INDORE



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कार्यालय प्राचार्य, शासकीय होलकर विज्ञान महाविद्यालय, इन्दौर (म.प्र.)

क्रमांक /2022-23

इंदौर, दिनांक

प्रति,

Coddbeezy S/w Solution

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विषय:- प्रोजेक्ट/इंटर्नशिप विद्यार्थियों का कार्यस्थल प्रशिक्षण एवं मूल्यांकन विषयका

महोदय,

एम.एस-सी. अंतिम वर्ष के विद्यार्थियों को पाठ्यक्रम पूर्ण करने के लिये 60 घंटे का कार्यस्थल प्रशिक्षण करना अनिवार्य है। कृपया विद्यार्थी को प्रशिक्षण उपलब्ध करा कर सहयोग प्रदान करें।

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इंटर्नशिप हेतु अनुशंसित विद्यार्थी की जानकारी

विद्यार्थी का नाम : Deepika Gupta

पिता का नाम : .....

कक्षा : M.Sc. IV

मार्गदर्शक का नाम एवं हस्ताक्षर : Jayesh Sharma

विभागाध्यक्ष

READ
Computer Science Department
Govt. Holkar Science College, INDORE



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कार्यालय प्राचार्य, शासकीय होलकर विज्ञान महाविद्यालय, इन्दौर म.प्र.

इंदौर, दिनांक

क्रमांक /2022-23

प्रति.

coddberry software solution

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विषय:- प्रोजेक्ट इंटर्नशिप विद्यार्थियों का कार्यस्थल प्रशिक्षण एवं मूल्यांकन विषयका

महोदय,

एम.एस-सी. अंतिम वर्ष के विद्यार्थियों को पाठ्यक्रम पूर्ण करने के लिये 60 घंटे का कार्यस्थल प्रशिक्षण करना अनिवार्य है। कृपया विद्यार्थी को प्रशिक्षण उपलब्ध करा कर सहयोग प्रदान करे।

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इंटर्नशिप हेतु अनुशंसित विद्यार्थी की जानकारी

विद्यार्थी का नाम : Chelsi S.axena

पिता का नाम : .....

कक्षा : M.Sc. IV

मार्गदर्शक का नाम एवं हस्ताक्षर : Jaya Sharma

विभागाध्यक्ष HEAD
Computer Science Department
Govt. Holkar Science College, INDORE



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कार्यालय प्राचार्य, शासकीय होलकर विज्ञान महाविद्यालय, इन्दौर (म.प्र.)

क्रमांक /2022-23 इंदौर, दिनांक

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विषय:- प्रोजेक्ट इंटर्नशिप विद्यार्थियों का कार्यस्थल प्रशिक्षण एवं मूल्यांकन विषयक

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इंटर्नशिप हेतु अनुशंसित विद्यार्थी की जानकारी

विद्यार्थी का नाम : Neelika hayaran

पिता का नाम : .....

कक्षा : M.Sc. IV

मार्गदर्शक का नाम एवं हस्ताक्षर : Jaya Sharma

विभागाध्यक्ष HEAD
Computer Science Department
Govt. Holkar Science College, INDORE



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CodeBerrys

**CB/202106/10**

# To Whom So Ever It May Concern

**This is to certify that** Mr./Ms. Chelsi Saxena **student of** Msc 4th semester **from** Government Holkar Science College, Indore **has completed industrial training and project in our organization from** 10th March 2021 to 8th June 2021.

**During the time period his/her performance was found excellent. We wish him/her best of luck for future.**

**For Codeberry Software Solution**




**Mohit Verma**

**Director**

**CODEBERRY SOFTWARE SOLUTION**

**85-B Shree, Krishna Ave phase 2, Limbodi Indore, Madhya Pradesh- 452001**

**Tel : 9907805876 | Website : www.codeberrys.com | Email : info@codeberrys.com**

CodeBerrys

**CB/202106/10**

# To Whom So Ever It May Concern

**This is to certify that** Mr./Ms. Deepika Gupta **student of** Msc 4th semester **from** Government Holkar Science College, Indore **has completed industrial training and project in our organization from** 10th March 2021 to 8th June 2021.

**During the time period his/her performance was found excellent. We wish him/her best of luck for future.**

**For Codeberry Software Solution**




**Mohit Verma**

**Director**

**CODEBERRY SOFTWARE SOLUTION**

**85-B Shree, Krishna Ave phase 2, Limbodi Indore, Madhya Pradesh- 452001**

**Tel : 9907805876 | Website : www.codeberrys.com | Email : info@codeberrys.com**

CodeBerrys

**CB/202106/10**

# To Whom So Ever It May Concern

**This is to certify that** Mr./Ms. Manisha Brahmwanshi **student of** Msc 4th semester **from** Government Holkar Science College, Indore **has completed industrial training and project in our organization from** 10th March 2021 to 8th June 2021.

**During the time period his/her performance was found excellent. We wish him/her best of luck for future.**

**For Codeberry Software Solution**



**Mohit Verma**

**Director**

**CODEBERRY SOFTWARE SOLUTION**

**85-B Shree, Krishna Ave phase 2, Limbodi Indore, Madhya Pradesh- 452001**

**Tel : 9907805876 | Website : www.codeberrys.com | Email : info@codeberrys.com**

CodeBerrys

**CB/202106/10**

# To Whom So Ever It May Concern

**This is to certify that** Mr./Ms. Saurabh Mourya **student of** Msc 4th semester **from** Government Holkar Science College, Indore **has completed industrial training and project in our organization from** 10th March 2021 to 8th June 2021.

**During the time period his/her performance was found excellent. We wish him/her best of luck for future.**

**For Codeberry Software Solution**




**Mohit Verma**

**Director**

**CODEBERRY SOFTWARE SOLUTION**

**85-B Shree, Krishna Ave phase 2, Limbodi Indore, Madhya Pradesh- 452001**

**Tel : 9907805876 | Website : www.codeberrys.com | Email : info@codeberrys.com**

CodeBerrys

**CB/202106/10**

# To Whom So Ever It May Concern

**This is to certify that** Mr./Ms. Chandan Bagwan **student of** Msc 4th semester **from** Government Holkar Science College, Indore **has completed industrial training and project in our organization from** 10th March 2021 to 8th June 2021.

**During the time period his/her performance was found excellent. We wish him/her best of luck for future.**

**For Codeberry Software Solution**




**Mohit Verma**

**Director**

**CODEBERRY SOFTWARE SOLUTION**
**85-B Shree, Krishna Ave phase 2, Limbodi Indore, Madhya Pradesh- 452001**
**Tel : 9907805876 | Website : www.codeberrys.com | Email : info@codeberrys.com**

CodeBerrys

**CB/202106/10**

# To Whom So Ever It May Concern

**This is to certify that** Mr./Ms. Bharat Raj **student of** Msc 4th semester **from** Government Holkar Science College, Indore **has completed industrial training and project in our organization from** 10th March 2021 to 8th June 2021.

**During the time period his/her performance was found excellent. We wish him/her best of luck for future.**

**For Codeberry Software Solution**




**Mohit Verma**

**Director**

**CODEBERRY SOFTWARE SOLUTION**

**85-B Shree, Krishna Ave phase 2, Limbodi Indore, Madhya Pradesh- 452001**

**Tel : 9907805876 | Website : www.codeberrys.com | Email : info@codeberrys.com**

CodeBerrys

**CB/202106/10**

# To Whom So Ever It May Concern

**This is to certify that** Mr./Ms. Neetika Hayaran **student of** Msc 4th semester **from** Government Holkar Science College, Indore **has completed industrial training and project in our organization from** 10th March 2021 to 8th June 2021. **During the training period He/she worked on projet** "ProShare" **for our client using** Core Java, Andriod & Project Development Technologies.

**During the time period his/her performance was found excellent. We wish him/her best of luck for future.**

**For Codeberry Software Solution**



**Mohit Verma**

**Director**

**CODEBERRY SOFTWARE SOLUTION**
**85-B Shree, Krishna Ave phase 2, Limbodi Indore, Madhya Pradesh- 452001**
**Tel : 9907805876 | Website : www.codeberrys.com | Email : info@codeberrys.com**

# SSR DOCUMENT

2021

## CRITERION – 3

## MoUs/Linkages/Collaborations

The Spark Foundation, Indore

**Document Title:**

The Spark Foundation, Indore, agreed to provide internship training to Anup Rai for active collaboration between both institutions.

कार्यालय प्राचार्य, शासकीय होलकर विज्ञान महाविद्यालय, इन्दौर (म.प्र.)

क्रमांक /2021/22 इंदौर, दिनांक

प्रति

The Spark Foundation

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विषय:- प्रोजेक्ट इटर्नशिप विद्यार्थियों का कार्यस्थल प्रशिक्षण एवं मूल्यांकन विषयक

महोदय,

एम.एस-सी. अंतिम वर्ष के विद्यार्थियों को पाठ्यक्रम पूर्ण करने के लिये 60 घंटे का कार्यस्थल प्रशिक्षण करना अनिवार्य है। कृपया विद्यार्थी को प्रशिक्षण उपलब्ध करा कर सहयोग प्रदान करें।

आपके संस्थान में होलकर विज्ञान महाविद्यालय इंदौर के .....से संबंधित जो विद्यार्थी 60 घंटे की इंटर्नी कर रहे है, उनका कार्य प्रशिक्षण पूर्ण होने पर 50 अंकों में से मूल्यांकन भी आपको ही करना है तथा प्राप्त अंकों की सूची सील बन्द लिफाफे में उपस्थिति के साथ प्राचार्य को भेजने का कष्ट करें।

इंटर्नशिप हेतु अनुशंसित विद्यार्थी की जानकारी

विद्यार्थी का नाम : Anup Rai

पिता का नाम : .....

कक्षा : M.Sc.

मार्गदर्शक का नाम एवं हस्ताक्षर : Jaya Sharma

विभागाध्यक्ष HEAD
Computer Science Department
Govt. Holkar Science College, INDORE



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# THE SPARKS FOUNDATION

INSPIRE, INNOVATE, INTEGRATE

## CERTIFICATE OF COMPLETION

*This Certificate is presented to*

*Anup Rai*

*for an outstanding contribution during the session (Jul 2021 - Aug 2021) of Graduate Rotational Internship Program at The Sparks Foundation on 05-Aug-2021.*



Certificate Number: U25SFDUF56

Verification at:
https://truecertificates.com/verification/

PRANAV DUBEY

MANAGING DIRECTOR

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2021

## CRITERION –3

## MoUs/Linkages/Collaborations

Mantic Technologies, Indore

**Document Title:**

Internship Training for Computer Science Students by Mantic Technologies, Indore

कार्यालय प्राचार्य, शासकीय होलकर विज्ञान महाविद्यालय, इन्दौर (म.प्र.)

इंदौर, दिनांक

क्रमांक /2022-23

प्रति,

Mauti's Technologies

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विषय:- प्रोजेक्ट इंटर्नशिप विद्यार्थियों का कार्यस्थल प्रशिक्षण एवं मूल्यांकन विषयक।

महोदय,

एम.एस.सी. अंतिम वर्ष के विद्यार्थियों को पाठ्यक्रम पूर्ण करने के लिये 60 घंटे का कार्यस्थल प्रशिक्षण करना अनिवार्य है। कृपया विद्यार्थी को प्रशिक्षण उपलब्ध करा कर सहयोग प्रदान करें।

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इंटर्नशिप हेतु अनुशंसित विद्यार्थी की जानकारी

विद्यार्थी का नाम : Akshat Panchal

पिता का नाम : .....

कक्षा : M.Sc IV

मार्गदर्शक का नाम एवं हस्ताक्षर : Jaya Sharma

विभागाध्यक्ष HEAD
Computer Science Department
Govt. Holkar Science College, INDORE



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कार्यालय प्राचार्य, शासकीय होलकर विज्ञान महाविद्यालय, इन्दौर म.प्र.

क्रमांक /2022-23 इंदौर, दिनांक

प्रति,

Mantis Technologies

विषय :- प्रोजेक्ट/इंटर्नशिप विद्यार्थियों का कार्यस्थल प्रशिक्षण एवं मूल्यांकन विषयक

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इंटर्नशिप हेतु अनुशंसित विद्यार्थी की जानकारी

विद्यार्थी का नाम : Kartikey Gupta

पिता का नाम : .....

कक्षा : MSc IV

मार्गदर्शक का नाम एवं हस्ताक्षर : Divya Sharma

HEAD
Computer Science Department
Govt. Holkar Science College, INDORE

विभागाध्यक्ष



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कार्यालय प्राचार्य, शासकीय होलकर विज्ञान महाविद्यालय, इन्दौर (म.प्र.)

क्रमांक /2022-23 इंदौर, दिनांक

प्रति

Mantic Technologies

विषय:- प्रोजेक्ट इंटर्नशिप विद्यार्थियों का कार्यस्थल प्रशिक्षण एवं मूल्यांकन विषयक

महोदय,

एम.एस-सी. अंतिम वर्ष के विद्यार्थियों को पाठ्यक्रम पूर्ण करने के लिये 60 घंटे का कार्यस्थल प्रशिक्षण करना अनिवार्य है। कृपया विद्यार्थी को प्रशिक्षण उपलब्ध करा कर सहयोग प्रदान करें।

आपके संस्थान में होलकर विज्ञान महाविद्यालय इंदौर के ..... से संबंधित जो विद्यार्थी 60 घंटे की इंटर्नी कर रहे है, उनका कार्य प्रशिक्षण पूर्ण होने पर 50 अंकों में से मूल्यांकन भी आपको ही करना है तथा प्राप्त अंकों की सूची सील बन्द लिफाफे में उपस्थिति के साथ प्राचार्य को भेजने का कष्ट करें।

इंटर्नशिप हेतु अनुशंसित विद्यार्थी की जानकारी

विद्यार्थी का नाम : Manisha Mishra

पिता का नाम : .....

कक्षा : MSc IV

मार्गदर्शक का नाम एवं हस्ताक्षर : Jaya Sharma

विभागाध्यक्ष

HEAD
Computer Science Department
Govt. Holkar Science College, INDORE



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कार्यालय प्राचार्य, शासकीय होलकर विज्ञान महाविद्यालय, इन्दौर (म.प्र.)

क्रमांक /2022-23 इंदौर, दिनांक

प्रति

Mountic Technologies

.....

.....

विषय:- प्रोजेक्ट इंटर्नशिप विद्यार्थियों का कार्यस्थल प्रशिक्षण एवं मूल्यांकन विषयक

महोदय,

एम.एस-सी. अंतिम वर्ष के विद्यार्थियों को पाठ्यक्रम पूर्ण करने के लिये 60 घंटे का कार्यस्थल प्रशिक्षण करना अनिवार्य है। कृपया विद्यार्थी को प्रशिक्षण उपलब्ध करा कर सहयोग प्रदान करें।

आपके संस्थान में होलकर विज्ञान महाविद्यालय इंदौर के ..... से संबंधित जो विद्यार्थी 60 घंटे की इंटर्नी कर रहे है, उनका कार्य प्रशिक्षण पूर्ण होने पर 50 अंकों में से मूल्यांकन भी आपको ही करना है तथा प्राप्त अंकों की सूची सील बन्द लिफाफे में उपस्थिति के साथ प्राचार्य को भेजने का कष्ट करें।

इंटर्नशिप हेतु अनुशंसित विद्यार्थी की जानकारी

विद्यार्थी का नाम : Sachin Sathe

पिता का नाम : .....

कक्षा : M.Sc. IV

मार्गदर्शक का नाम एवं हस्ताक्षर : Jaya Sharma

विभागाध्यक्ष HEAD
Computer Science Department
Govt. Holkar Science College, INDORE



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कार्यालय प्राचार्य, शासकीय होलकर विज्ञान महाविद्यालय, इन्दौर (म.प्र.)

इंदौर, दिनांक

क्रमांक /2022-23

प्रति

Mountic Technologies

विषय:- प्रोजक्ट इंटर्नशिप विद्यार्थियों का कार्यस्थल प्रशिक्षण एवं मूल्यांकन विषयक

महोदय,

एम.एस-सी. अंतिम वर्ष के विद्यार्थियों को पाठ्यक्रम पूर्ण करने के लिये 60 घंटे का कार्यस्थल प्रशिक्षण करना अनिवार्य है। कृपया विद्यार्थी को प्रशिक्षण उपलब्ध करा कर सहयोग प्रदान करें।

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इंटर्नशिप हेतु अनुशंसित विद्यार्थी की जानकारी

विद्यार्थी का नाम : Anshu Purohit

पिता का नाम : .....

कक्षा : M.Sc. IV

मार्गदर्शक का नाम एवं हस्ताक्षर : Jaya Sharma

विभागाध्यक्ष HEAD
Computer Science Department
Govt. Holkar Science College, INDORE



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MANTIC
Technologies

**Date: 11 Jun, 2021**

To
Anshu Purohit
Holkar science College indore

Certificate of completion of Internship

This is to certify that Mr.Anshu Purohit, student of MSc has completed his internship withus, from **03-Mar-2021** to **04-Jun-2021**

During the tenure with us, we found him sincere and result oriented.We wish Mr.

Anshu Purohit all the best for his future endeavours.

Mantic Technologies

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20/1, Modern Mansion,
Great Balaji House, Palasia Square,
Indore Ph: 91 731 4091658, 4268656
www.mantic.in

MANTIC
Technologies

**Date: 11 Jun, 2021**

To
Kartikey Gupta
Holkar science College indore

Certificate of completion of Internship

This is to certify that Mr. Kartikey Gupta, student of MSc has completed his internship with us, from **03-Mar-2021** to **04-Jun-2021**

During the tenure with us, we found him sincere and result oriented.
We wish Mr. Kartikey Gupta all the best for his future endeavours.

Mantic Technologies

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www.mantic.in

MANTIC
Technologies

**Date: 11 Jun, 2021**

To
Akshat Panchal
Holkar science College indore

Certificate of completion of Internship

This is to certify that Mr. Akshat Panchal, student of MSc has completed his internship with us, from **03-Mar-2021** to **04-Jun-2021**

During the tenure with us, we found him sincere and result oriented.
We wish Mr. Akshat Panchal all the best for his future endeavours.

Mantic Technologies

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Great Balaji House, Palasia Square,
Indore Ph: 91 731 4091658, 4268656
www.mantic.in

MANTIC Technologies

**Date: 11 Jun, 2021**

To
Sachin Sathe
Holkar science College indore

Certificate of completion of Internship

This is to certify that Mr. Sachin Sathe, student of MSc has completed his internship withus, from **03-Mar-2021** to **04-Jun-2021**

During the tenure with us, we found him sincere and result oriented.
We wish Mr. Sachin Sathe all the best for his future endeavours.

Mantic Technologies

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Great Balaji House, Palasia Square,
Indore Ph: 91 731 4091658, 4268656
www.mantic.in

MANTIC
Technologies

**Date: 11 Jun, 2021**

To
Manisha Mishra
Holkar science College indore

Certificate of completion of Internship

This is to certify that Ms. Manisha Mishra, student of MSc has completed her internship with us, from **03-Mar-2021** to **04-Jun-2021**

As part of Internship she has done a project **"ONLINE EXAMINATION SYSTEM"** as a Trainee Software Developer using PHP & MySql.

During the tenure with us, we found Ms.Manisha Mishra**,** sincere and result oriented.

We wish Ms.Manisha Mishra all the best for her future endeavours.

Mantic Technologies

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20/1, Modern Mansion,
Great Balaji House, Palasia Square,
Indore Ph: 91 731 4091658, 4268656
www.mantic.in

# SSR DOCUMENT

2021

## CRITERION – 3

## MoUs/Linkages/Collaborations

Elite Informatics, Indore

**Document Title:**

Internship training was conducted by Elite Informatics, Indroe, for M.Sc. Chemistry students.

ELITE ANALYTICS INC.

*All that your lab Needs...*

**ELITE ANALYTICS INC,INDIA**

310 , KALANI NAGAR,AIRPORT ROAD, INDORE

# CERTIFICATE

**Issued To : GOVERNMENT HOLKER SCIENCE COLLEGE, INDORE**

This is to confirm that we Elite Analytics Inc, INDIA, has a MOU with Govt. HOLKER SCIENCE COLLEGE,Indore (under document number: 24 Chem ).

We are organising Technical Trainings over Analytical Instrumentation and Analysis Techniques every Year since 2020 for M.Sc / B.Sc final year in the Institute and in Our labs.

We are conducting this training based on Industrial requirment and with our speakers from Varios PHARMA companies in M.P. Also we provide below activity during every year training :

1. ANALYTICAL INSTRUMENT HAND ON TRAINING.
2. ANALYTICAL ANALYSIS OF VARIOUS DRUGS IN FOOD AND PHARMA.
3. CROSS AREA TRAINING IN OUR LABS AND TO PHARMA COPANIES.
4. PROVIDING ANALYTICAL PROCUDURE DOCUMENTATION FROM VARIOUS GUIDELINES.
5. HELPING STUDENTS FOR THEIR P.hd RESEARCH WORK, PROVIDING PAPERS & BOOKS.

We are bide to provided our technical knowledge and experties to help improve students knowledge and hands on experiance over analytical instruemntation, Globel document process training, method development on instruemntation, and research work.

We are thankfull to Dr.Anamika Jain HOD Chemsitry department for their help during trainings, and to all the staff helping us for conducting trainngs sucessfully.

With Best Regards:
Elite Analaytics Inc, India.
Subodh Thakur.
info@eliteanalytics.in
+917000660259

Digitally signed by subodh thakur
DN: cn=subodh thakur, o=ELITE ANALYTICS INC, ou=Admin, email=info@eliteanalytics.in, c=IN
Date: 2021.06.21 15:12:28 +05'30'

SUBODH THAKUR

**MEMORANDUM OF UNDERSTANDING FOR ACADEMIC AND SCIENTIFIC COOPERATION**

**BETWEEN**

Govt. [Model, Autonomous] Holkar Science College, Indore, M. P.

&

Elite Analytics Inc, Indore

The representatives of Govt. [Model, Autonomous] Holkar Science College, Indore and Elite Analytics Inc, Indore agree to this Memorandum of Understanding.

The Memorandum of Understanding (MOU) establishes the following:

**1. OBJECTIVE OF THE AGREEMENT**

To establish a mutually beneficial relationship built on academic and scientific cooperation. Areas of cooperation between the Govt. [Model, Autonomous] Holkar Science College, Indore, M. P. and *Elite Analytics Inc. Indore* include the exchange of researchers, students, publications, academic programs and research projects.

**2. GOALS AND FORMS OF COOPERATION**

The signing institutions agree to provide opportunity, as appropriate, for the following activities towards the completion of the objective of this MOU.

1. Exchange of students and/or researchers with the objective of offering courses and realizing research projects in areas mutually agreed upon by both institutes through prior invitation and in accordance with the procedures and expectations established by each institute and specific department.
2. Exchange of books, scientific publications, study programs, academic projects, course information, seminars, conferences and any other data and information of common interest.
3. Develop joint research projects and joint publications.
4. All joint activities will be realized through the mutual agreement and clearly established conditions and mutual obligations of the appropriate institute entity.

## 3. IMPLEMENTATION OF THE MEMORANDUM OF UNDERSTANDING

The objectives of the MOU will be implemented and regulated in the following manner:

### *i. Student Exchange*

a. Students and research scholars may visit the corresponding departments of these institutes after finalizing a mutually acceptable schedule.

b. All the expenses shall be the direct responsibility of the student concerned (subject to any agreements on payment arrangements made by either institution with its own students). These expenses include:

1. Travel expenses
2. Reprographic and Internet Usage Expenses
3. Required student services fees at the host institution
4. Books and academic supplies
5. Administrative fees, if any.

### *ii. Exchange of researchers*

With the objective of strengthening ties through joint projects and research activities of both institutes, the MOU allows for the creation of researcher exchange. The following conditions will apply:

a. The researchers will maintain their status as research scholars at their home institution for the duration of the exchange.
b. The researchers will be allowed to make use of the instruments and other research facilities available in various departments of these institutes after prior approval of the visiting schedule.
c. The appropriate academic departments and administrative offices will assist in securing housing and other necessary arrangements for living in the host institution's city.

### *iii. Research and Resources*

Govt. [Model, Autonomous] Holkar Science College, Indore and Elite Analytics Inc, Indore promote research and realize collaborative projects, giving priority to interdisciplinary works.

## 4. DURATION AND RECINDENCE OF MOU

a. The agreement shall come into effect on 10.10.20. Changes to this agreement shall be made by mutual consent between both institutions. In cases of disagreement, the Institute wishing to depart from the agreement shall, wherever possible, give two months' notice of its intention to do so. The agreement shall be reviewed after a period of one year.

b. This MOU is being signed purely with the intention of academic and scientific cooperation without any financial liabilities.

This MOU is signed by,

**Dr. Suresh T. Silawat**
Principal,
Govt. Holkar Science College,
Indore [M.P.]

Principal
M. Holkar Science College
INDORE

And

Shri Subodh Thakur
DIRECTOR, *Elite Analytics Inc. Indore* Madhya Pradesh -

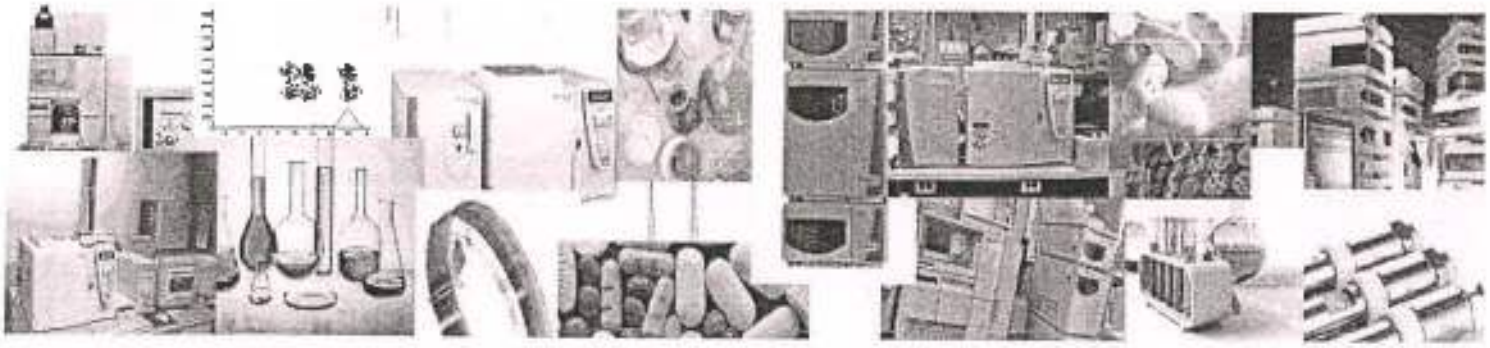
In presence of the following witnesses:

1. Dr. Vijayshri Nilosey
2. Dr. Rajshri somani

Govt. Holkar Science College

# ELITE INSTITUTE

OF ADVANCE ANALYTICAL & RESEARCH TRAINING



## About Us

We are one of the most recognized Industrial training institute in Central India & M.P. Since last few years, our institute retain the strengths of a small organization - quick decision and cajole structures. But we have grown by leaps and bounds in our confidence that we can be the best Chromatography training institute in India. This is our quest that steers us to perform better and better. Our institute is a leader in the use of environment friendly technologies.

## Mission & Goals

The Elite institute of Advance Analytical Research & Training Institute was founded on the belief that both laboratories and instrument suppliers could be better served through an independent organization whose desire is to improve the flow of factual information concerning chromatography instrumentation, theory and operation. We are committed to providing the services in the best, most effective and reasonably priced structure.

# ELITE INSTITUTE

OF ADVANCE ANALYTICAL & RESEARCH TRAINING

## Understanding of Pharmacy Equipment

Duration: 15 Days x 2.5Hrs.
Eligibility: Fresher's / Experience with B.Sc./M.Sc./B.Pharm/M.Pharm/P.hd

- Basic principal of instrument and it'sworking .
- Identification of instruments
  - pH meter
  - Analytical balance
  - GC
  - HPLC
  - FTIR
  - GC with headspace and auto sampler
  - UV visible spectrophotometer
  - Atomic Absorbance Spectrophotometer
  - Dissolution

* We will provide practical training on the avilable instruments in the college premises.
* Also will discuss about hte various pharmacopia and GMP GXP modules.
* Regulatory affairs and their guidelines.
* Local Lab Compliance and procedures of reading SOP and other documentation procedures.
* Interview Questations asked in pharma sector.
* advice on intrest of students to choose thier stream like QC/QA/ Stability/ Microbiology etc.

# ELITE INSTITUTE

OF ADVANCE ANALYTICAL & RESEARCH TRAINING

One of the most frequently heard comments at our courses are "This course has exceeded my expectations!" Course after course, they tell as how much better our courses are.

How understandable, concise, enjoyable, practical, and helpful they are. The material we provide is sound in the fundamentals, and clear in its presentation. Our courses are also personal. Class size is manageable (usually about 7-8), allowing the instructor to customize the presentation according to the applications and needs of the participants. Questions are encouraged and answered simply and practically.

For Any Further Query Regarding above stated course or content of the document please contact us at given contact number or email ID. We will be happy to assist you for any query or enquiry.

With Best Regards:

Subodh Thakur | Elite Institute (EI-Art) | Elite Analytics Inc. |

+91.7000660259, +91.9584992661 | Info@eliteanalytics.in | Subodh_thakur@outlook.com |

2021

# *Internship Training on Instrumentation*

Total Hours: 60

| Date | Time | Topic | Guest Lecture |
|---|---|---|---|
| 03.03.2021 | 12:00 to 1: 30 pm | **INAUGURATION**<br>Registration & Introduction of Course<br>**(Venue- Bhagwat Lab)** | **Prof. Amiya Pahare**<br>Professor, Botany<br>Holkar Science College, Indore |
| | 1:30 to 2:30 pm | **U-V Visible Spectrophotometry**<br>**(Venue- Bhagwat Lab)** | **Dr. Rajshri Somani**<br>Professor, Govt. Holkar Science College, Indore |
| | 2:30 to 3: 00 pm | **Lunch Break** | |
| | 3:00 to 4:00 pm | **Demonstration** | |
| | 4:00 to 5:00 pm | **Library / Project Preparation** | |
| 04.03.2021 | 12:00 to 1: 00 pm | **Lecture on XRD**<br>**(Venue- Bhagwat Lab)** | **Dr. Netram Kaurav**<br>H.O.D., Electronics Dept<br>Govt. Holkar Science College, Indore |
| | 1:00 to 2:00 pm | **Practical session** | |
| | 2:00 to 2:30 pm | **Lunch Break** | |
| | 2:30 to 4: 00 pm | **Lab Visit** | |
| | 4:00 to 5:00 pm | **Library / Project Preparation** | |
| 05.03.2021 | 12:00 to 1: 00 pm | **Lecture on HPLC**<br>**(Venue- Bhagwat Lab)** | **Dr. M.K. Dwivedi**<br>H.O.D., Pharma Dept<br>Govt. Holkar Science College, Indore |
| | 1:00 to 2:00 pm | **Lunch Break** | |
| | 2:00 to 4:00 pm | **Demonstration** | |
| | 4:00 to 5:00 pm | **Library / Project Preparation** | |
| 06.03.2021 | 12:00 to 1: 00 pm | **Lecture on Atomic Absorption Spectrophotometer**<br>**(Venue- Bhagwat Lab)** | **Dr.Dhananjay Dwivedi**<br>Assistant Professor<br>P.M.B. Gujarati Science College, Indore |
| | 1:00 to 1:30 pm | **Lunch Break** | |
| | 1:30 to 4:00 pm | **Demonstration** | |
| | 4:00 to 5:00 pm | **Library / Project Preparation** | |
| 08.03.2021 | 12:00 to 1: 00 pm | **Lecture on FTIR**<br>**(Venue- Bhagwat Lab)** | **Dr. Geetha Sarasan**<br>Professor<br>Govt. Holkar Science College, Indore |
| | 1:00 to 1:30 pm | **Lunch Break** | |
| | 1:30 to 4:00 pm | **Demonstration** | |
| | 4:00 to 5:00 pm | **Library / Project Preparation** | |

| | | | |
|---|---|---|---|
| **09.03.2021** | 12:00 to 2: 00 pm | **IR Spectrophotometery and Applications (Venue- Bhagwat Lab)** | **Dr. Pramila Kori**<br>Assistant Professor<br>Govt. Holkar Science College, Indore |
| | 2:00 to 2:30 pm | **Lunch Break** | |
| | 2:30 to 4:00 pm | **Chromatography** | **Dr. Sandeep Gohar**<br>Assistant Professor<br>Govt. Holkar Science College, Indore |
| | 4:00 to 5:00 pm | **Library / Project Preparation** | |
| **10.03.2021** | 12:00 to 2: 00 pm | **Lecture on Colorimetric measurements & NET/ SLET preparation** | **L1 – Dr. N. Pathak**<br>Professor<br>Govt. Holkar Science College, Indore<br><br>**L2- Prof. Sadhna Notwani** |
| | 2:00 to 2:30 pm | **Lunch Break** | |
| | 2:30 to 4:00 pm | | |
| | 4:00 to 5:00 pm | **Library / Project Preparation** | |
| **12.03.2021** | 12:00 to 2: 00 pm | **Conductivity measurements** | **L1- Dr. Rachna Dubey**<br>Assistant Professor<br>Govt. Holkar Science College, Indore |
| | 2:00 to 2:30 pm | **Lunch Break** | |
| | 2:30 to 4:00 pm | **pH metery** | **L2 – Dr. Namita Bende**<br>Assistant Professor<br>Govt. Holkar Science College, Indore |
| | 4:00 to 5:00 pm | **Library / Project Preparation** | |
| **13.03.2021** | 12:00 to 1: 00 pm | **Clinical Studies** | **Dr. Pushpa Makwane**<br>Assistant Professor<br>Govt. Holkar Science College, Indore |
| | 1:00 to 1:30 pm | **Lunch Break** | |
| | 1:30 to 4:00 pm | **Lab Visit** | |
| | 4:00 to 5:00 pm | **Valedictory Function** | |

**Convener of Training/ Internship Programme:**

**Dr. Aparna Gandhe**
Co-ordinator

**Dr. Anamika Jain**
HOD

**Dr. Suresh T. Silawat**
Patron & Principal

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2021

## CRITERION – 3

## MoUs/Linkages/Collaborations

MACLEC Technical Project Laboratory Pvt. Ltd. New Delhi

**Document Title:**

Online lecture deleivered by Mr. Balram Bhardwaj, MD, MACLEC Technical Project Laboratory Pvt. Ltd. New Delhi

**MEMORANDUM OF UNDERSTANDING FOR ACADEMIC AND SCIENTIFIC COOPERATION**

**BETWEEN**

Govt. [Model, Autonomous] Holkar Science College, Indore, M. P.

&

MACLEC Technical Project Laboratory Pvt. Ltd., New Delhi

The representatives of Govt. [Model, Autonomous] Holkar Science College, Indore and MACLEC Technical Project Laboratory Pvt. Ltd., New Delhi agree to this Memorandum of Understanding.

The Memorandum of Understanding (MOU) establishes the following:

**1. OBJECTIVE OF THE AGREEMENT**

To establish a mutually beneficial relationship built on academic and scientific cooperation. Areas of cooperation between the Govt. [Model, Autonomous] Holkar Science College, Indore, M. P. and MACLEC Technical Project Laboratory Pvt. Ltd., New Delhi include the exchange of researchers, students, publications, academic programs and research projects.

**2. GOALS AND FORMS OF COOPERATION**

The signing institutions agree to provide opportunity, as appropriate, for the following activities towards the completion of the objective of this MOU.

1. Exchange of students and/or researchers with the objective of offering courses and realizing research projects in areas mutually agreed upon by both institutes through prior invitation and in accordance with the procedures and expectations established by each institute and specific department.
2. Exchange of books, scientific publications, study programs, academic projects, course information, seminars, conferences and any other data and information of common interest.
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3. Required student services fees at the host institution
4. Books and academic supplies
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With the objective of strengthening ties through joint projects and research activities of both institutes, the MOU allows for the creation of researcher exchange. The following conditions will apply:

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b. The researchers will be allowed to make use of the instruments and other research facilities available in various departments of these institutes after prior approval of the visiting schedule.
c. The appropriate academic departments and administrative offices will assist in securing housing and other necessary arrangements for living in the host institution's city.

***iii. Research and Resources:***

Govt. [Model, Autonomous] Holkar Science College, Indore and MACLEC Technical Project Laboratory Pvt. Ltd., New Delhi promote research and realize collaborative projects, giving priority to interdisciplinary works.

## 4. DURATION AND RECINDENCE OF MOU

a. The agreement shall come into effect on 15-2-2020. Changes to this agreement shall be made by mutual consent between both institutions. In cases of disagreement, the Institute wishing to depart from the agreement shall, wherever possible, give two months' notice of its intention to do so. The agreement shall be reviewed after a period of one year.

b. **This MOU is being signed purely with the intention of academic and scientific cooperation** without **any financial liabilities.**

**This MOU is signed by,**

**Dr. Suresh T. Silawat**
**Principal,**
**Govt. Holkar Science College,**
**Indore [M.P.]**
**Holkar Science College**
**INDORE**

MACLEC Technical Project Laboratory Pvt. Ltd.

**MACLEC** Technical Project Laboratory Pvt. Ltd.,
New Delhi

**In presence of the following witnesses:**

1. Dr. Vijayshri Nilosey
2. Dr. Rajshri Semwal



MACLEC Technical Project Laboratory Pvt. Ltd.

# BALRAM BHARDWAJ

MD

M-11, Sainik nagar, Nawada, NEW DELHI, 110059, India

+918285948337

bhardwajtheboss.1990@gmail.com



## + ABOUT ME

For his extraordinary innovations, Mr. Bhardwaj is awarded by several institutions. His main achievements are as follows -

1. Recognised as X Factor Innovation of earth by NASA (USA) 2020

2. Social Alpha Energy Challenge National Award by TATA Power, Mission Innovation & Social Alpha 2020

3. Winner of International Climate Launchpad Global Green Business Idea Competition by Climate Launchpad and European Union , 2019

4. Winner of Swaccha Bhaarat Grand Program National Award by DIPP, Ministry of Commerce and Industry and Startup India, 2019

5. Winner of Brands of India Award by Union Ministry of MSME and Yourstory, 2019

## + WORK EXPERIENCE

- MACLEC TECHNICAL PROJECT LABORATORTY PVT. LTD. DEC 2014
  NEW DELHI
  MD

Mr. BalRam is the Co-founders of MACLEC Laboratory with a vision to innovate the present technology scenario. He possess 10+ years of experience in Technology Development in Environment Management sector. He also acting as R&D guide for many Government and private institutes, individuals and students.

Mr. BalRam has filed many patents and published many research papers in Research journals.

His research spanning over 10+ years has been on engineering behavior of non-conventional energy technologies particularly in hydrokinetics, Microbial Fuel Cell, Solar PV Technology, Robotics, etc. An established technical troubleshooters, researchers and active consultants, Mr. Bhardwaj has supervised 50+ Bachelors, Masters annd PhD Researchers and remain instrumental in over 23000 engineering projects and Industrial Projects and currently working with various IITs, CSIR Labs, Ministries, DRDO Labs, State Renewable Energy Nodal Agencies, many more MNCs.

As prolific writer, Mr. Bhardwaj published many technical papers in national and international journals and conferences. They have been the Associate investigators of many sponsored research projects and carried out more than 1300 consultancies in the areas of green energy, robotics, kinematics, solar incinerator and Embedded Technologies.

Mr. Bhardwaj traveled extensively and has collaborative research with American, Canadian, Kuwaiti, Australian, African and European Universities. he delivered several workshops and special lectures in India and abroad on various emerging technologies such as Multi-rotor Drones, Non-Conventional Energies, Hydrokinetics and were remain a guest Editor for many magazines as well as Online/print Media Group.

As per His view "Innovators are not born they are developed by good guidance, encouragement and more importantly a good mentor."With the vision of "Redefine Engineering-Reinventing Technologies" Mr. Bhardwaj and his research oriented company is working hard to make this world a better place to live.

6. FINALIST OF UBM RENEWABLE ENERGY INDIA AWARDS-2018 by UBM INDIA 2018

7. TOP 20 ICT Startup Award 2018 by ASSOCHEM-ERRICSSON with Union Ministry ICT, 2018

8. NRDC Budding Innovator Award by National Research Development Corporation, 2014

9. Best Young Innovator of India Award, India Innovation Initiative, National Fair - October 2016, New Delhi By CII, DST, AICTE, 2016

10. Best Paper Presentation Award, International Conference on Emerging technologies in SEM by K. N. Modi Institute of Technology, Modinagar (U.P.) 2016

11. CLEAN-TECH 2015. Shortlisted for Funding by INDIA ANGEL NETWORK & Johnson Matthey UK, 2015

12. Best Innovation Award, Central University Punjab, Bathinda, 2015

13. India Innovation Initiative-I3. National fair "Innovator of the Year" Award, AICTE, CII, DST, I4C, 2014

## + EDUCATION

- Govt. Arts & Science College — 2009
  Ratlam, Madhya Pradesh
  **BACHELOR**

  Bachelor of Science with Specialization in Microbiology

  - BEST SD ARMY NCC Cadet Award Recipient from DG NCC During RDC 2008
  - Represented India as Youth Ambessador in Youth Exchange program to Vietnam During YEP 2008

- Govt Autonomous Holkar Science College — 2011
  Indore
  **MASTER OF SCIENCE**

  M. Sc. in Microbiology

  - Dissertation: 3 Months Special Training in Criminal DNA Fingerprinting State Forensic Science Laboratory, FSL, Saugor (M.P.)

- Ambala College of Engineering & Applied Research — 2016
  Ambala (Haryana)
  **MASTER OF TECHNOLOGY**

  Master of Technology in Biotechnology

  - Dissertation: Microbial Fuel Cell

- University School of Environment management, Guru Gobind Singh Indraprasth University — 2016
  New Delhi
  **PH.D.**

  Pursuing PhD in Environment Management (Part Time)

  - Thesis: Bioprocess Optimization and Development of Digester to Produce Methane Enriched Biogas and Fertiliser from Waste Biomass

## + LINKS

**Company**
http://maclec.com/

**Linkedin**
https://www.linkedin.com/in/balram-bhardwaj-5b3b00184

**twitter**
http://@Bhardwajbalram1

## + DRIVING LICENSE

**Driving license category**
LMV

## + PERSONAL DETAILS

**Date of birth**
15th May 1990

**Nationality**
Indian

**Visa status**
USA (10 years)

## + LANGUAGES

Hindi

English

## + SKILLS

IP Protection And Patent Writing

Environment Engineering

Biotechnology

Idea Pitching & Presentations

Renewable Energy Technologies

Industrial Prototyping

Business Development & Technology Commercialization

## + PUBLICATIONS

- IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) MAY 2015
  **DESIGN ANALYSIS OF ROCKER BOGIE SUSPENSION SYSTEM AND ACCESS THE POSSIBILITY TO IMPLEMENT IN FRONT LOADING VEHICLES**

- e-ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 12, Issue 3 Ver. III (May. - Jun. 2015), PP 72-75
  **DESIGN ANALYSIS & SIMULATION BASED TECHNO-FEASIBILITY TESTING OF CENTRE MOUNTED SUSPENSION SYSTEM**

- International Journal of Advances in Engineering & Scientific Research, Vol.3, Issue 2, Apr-Jun - 2016, pp 01-17 ISSN: 2349 -3607 (Online), ISSN: 2349 -4824 JUN 2016
  **MODELLING & FINITE ELEMENT ANALYSIS (FEA) OF ATV CHASSIS TO ENHANCE EFFICIENCY**

- International Journal of Advances in Engineering & Scientific Research, Vol.3, Issue 2, Apr-Jun - 2016, pp 18-31 ISSN: 2349 -3607 (Online), ISSN: 2349 -4824 APR 20

## + HOBBIES

- Writing, Tracking, Reading, Keep innovating

## + REFERENCES

- **Prof. R. P. Saini**
  Department of Hydro & Renewable Energy, Indian Institute of Technology Roorkee
  **Phone Number:** +91-1332-285841
  **Email:** rp.saini@hre.iitr.ac.in

- **S. K. Goyal**
  Senior Scientist & Head, CSIR-NEERI, Delhi
  **Phone Number:** 011 2589 2749
  **Email:** sk_goyal@neeri.res.in

SMART CLOUD WITH DOCUMENT CLUSTERING

- International Journal of Advances in Engineering & Scientific Research, Vol.3, Issue 2, Apr-Jun - 2016, JUN 2016
  IMPLEMENTATION OF ENERGY EFFICIENT CLUSTERED CHAIN BASED POWER TRACKING ROUTING PROTOCOL (EECCPTR) IN WSN

## + INTERNSHIP

- Ranbaxy Pharmaceuticals Limited AUG 2010 - JAN 2011
  Indore
  **ASSISTANT FORMULATOR**

  For partial fulfilment of Masters Degree in Microbiology

## + EXTRA-CURRICULAR ACTIVITIES

- Indian Army JUL 2004 - JUN 2009
  NCC DIRECTORATE OF MP&CG
  **NATIONAL CADET CORPS**

  Earn A, B and C certificate with "A" Grading

**Department of Chemistry, Govt. Holkar (Model, Autonomous) Science College, Indore (M.P.)**
Email: chem09_hsc@rediffmail.com

Date:16.08.2021

Online lecture delivered by **Mr. Balram Bhardwaj (MD)** MACLEC Technical Project Laboratory Pt. Ltd. New Delhi

Today, I stand before you to discuss one of the most pressing topics of our time – alternative renewable energy solutions: theory versus reality. Our quest to transition from fossil fuels to cleaner and sustainable energy sources has been fueled by the promise of a greener and healthier future for our planet. We have envisioned a world where renewable energy technologies power our homes, industries, and transportation systems while reducing carbon emissions and mitigating climate change. However, the journey from theory to reality has been both inspiring and challenging.

The theoretical aspects of alternative renewable energy solutions have been captivating. Scientists and engineers have envisioned an array of energy sources harnessing the power of nature - solar panels that convert sunlight into electricity, wind turbines that capture the kinetic energy of the wind, hydroelectric dams that generate power from flowing water, and geothermal systems that tap into the Earth's natural heat. These theoretical concepts have excited us with their potential to revolutionize our energy landscape.

In theory, renewable energy seems limitless, offering the promise of energy independence and reducing our reliance on finite fossil fuels. Moreover, it presents an opportunity to create millions of green jobs and stimulate economic growth while preserving our environment for future generations. We have seen projections that paint a picture of an energy sector powered entirely by renewables, with clean air, reduced greenhouse gas emissions, and a stable climate.

However, as we delve into the reality of implementing alternative renewable energy solutions, we are faced with a myriad of challenges. One of the most significant hurdles is the intermittency of renewable sources. Solar power generation is dependent on daylight hours and weather conditions, while wind energy relies on unpredictable wind patterns. This intermittency makes it challenging to maintain a consistent energy supply and requires careful integration with energy storage and grid management systems.

Furthermore, the transition to renewable energy necessitates extensive infrastructure development and substantial investment. Upgrading existing grids to accommodate renewable energy flow and building new facilities can be a complex and expensive

process. The challenge of securing financial support and political will to facilitate these changes is a reality we must confront.

Additionally, renewable energy projects often encounter opposition from local communities, environmental concerns, and land-use conflicts. Balancing the need for renewable energy development with preserving sensitive ecosystems and respecting the rights of indigenous communities requires thoughtful planning and collaboration.

Despite these challenges, we have witnessed remarkable progress in the adoption of renewable energy sources in recent years. Countries around the world have set ambitious targets and made substantial investments in renewable energy technologies. Innovations in battery storage, smart grids, and efficiency improvements have helped address some of the challenges associated with intermittency.

In conclusion, the transition to alternative renewable energy solutions is an imperative task that requires a delicate balance between theory and reality. While the theoretical potential of renewable energy sources is awe-inspiring, the road to implementation is marked with challenges that demand careful consideration and collective efforts. We must recognize that achieving a sustainable future goes beyond the realms of science and engineering – it demands societal, political, and economic transformation.

As advocates of clean energy, let us continue to bridge the gap between theory and reality. Let us work together to overcome the challenges and seize the opportunities presented by renewable energy. By doing so, we can pave the way for a cleaner, healthier, and more sustainable planet for generations to come. Thank you.


11:08
53%
About this call
People
Information
Activities
Rajshree Bad...
Ranu Mori
Ravi Upadhy...
Ravindra Ma...
Rohit Baghel
Rohit Solanki
ROSHNI MA...
Rudrakshi Ra...
Rupali yadav
sachin gothi
Sakshi Gupta
Sakshi Patel
Sakshi Turkar
You
M
Meen
+91

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2021

## CRITERION –3

## MoUs/Linkages/Collaborations

Answer Foundation, BM 70 Near Bapat Square, Indore

**Document Title:**

Instrumental experience on Robotics a collaborative learning under the MOU Answer Foundation, Indore

कार्यालय प्राचार्य
शासकीय होलकर विज्ञान महाविद्यालय, इन्दौर
☎ 0731-2464074 ● फैक्स : 0731-2446806, 2764027
Email : principalhsc@rediffmail.com ● Web Site: www.collegeholkar.org

**Memorandum of Understanding for Academic and Industrial/academic Cooperation**
**Between**
**Department of Electronics, Government Holkar (Model, Autonomous) Science College Indore (M.P.) INDIA**
**And**
**Answer Foundation, BM-70 Near Bapat Square Shukliya Indore (M.P.), INDIA**

Department of Electronics, Government Holkar (Model, Autonomous) Science College, Indore (M.P.), India has inked a Memorandum of Understanding (MOU) with Answer Foundation, Indore to bridge the gap between the academic deliveries and industry needs and thereby improve technical and employability skills of the students.
The Memorandum of Understanding (MOU) establishes the following:

**RESPONSIBILITIES IN THE AGREEMENT**

1. To connive technological collaboration, training on advanced techniques/tools of the stream would be endowed by industry faculty/staff.
2. Industry will confer pilotage for major or minor projects/summer projects/projects/internships for students.
3. The industry would give stream-oriented lectures/lecture series, on academic needs.
4. Supportort in Incubation Center.
5. Students will be allowed to visit the firm to gain working skills and the culture of the firm.
6. Other activities as mutually agreed.

**ROLE OF THE MOU:**

The Department of Electronics would be implemented a nodal department from Government Holkar (Model Autonomous) Science College, Indore side, and a faculty/staff would be assigned by the chief executive officer from the firm side.

**TERM OF THE MOU:**

This MOU shall be effective upon signature by the institute and the firm, shall remain in force for 1 year, and will be extended further on mutual understanding.

**FINANCIAL LIABILITIES**

There are no financial liabilities for either participant in implementing the MOU.
This MOU is signed by,

Head of the Department
ELECTRONICS
Govt. Holkar Science College
INDORE

**Dr. Netram Kakrat, HOD, Department of Electronics,**
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

**Dr. Suresh T. Silawat, Principal**
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

PRINCIPAL
Govt. Model Autonomous
Holkar Science College
Indore (M.P.)

ANSWER FOUNDATION SOCIETY
President / Treasurer / Secretary

**Mr. Mudit Thakkar, Founder And President**
Answer Foundation, BM-70 Near Bapat Square Shukliya Indore

**Date of Implementation 09/Dec/2020**

**Memorandum of Understanding for Academic and Industrial/academic Cooperation**
**Between**
**Department of Electronics, Government Holkar (Model, Autonomous) Science College Indore (M.P.) INDIA**
**And**
**Answer Foundation, BM-70 Near Bapat Square Shukliya Indore (M.P.), INDIA**

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**FINANCIAL LIABILITIES**

There are no financial liabilities for either participant in implementing the MOU.
This MOU is signed by,

Head of the Department
ELECTRONICS
Govt. Holkar Science College
Indore

**Dr. Nehaa Kataria, HOD, Department of Electronics,**
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

**Dr. Suresh J. Sharma, Principal**
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

Govt. Model Science College
Holkar Science College
Indore (M.P.)

ANSWER FOUNDATION SOCIETY
President / Treasurer / Secretary

**Mr. Mudit Thakkar, Founder and President**
Answer Foundation, BM-70 Near Bapat Square Shukliya Indore

**Date of Implementation 09/Dec/2020**

SKILL DEVELOPMENT PROGRAM
2020-21

| S. No | Component/Activities | Details |
|---|---|---|
| 1 | Name of the Department / Unit / Agency: | Department of Electronics |
| 2 | Name of the Activity: | Instrumental experience on Robotics |
| 3 | Name of the Scheme: | Collaborative learning under the MOU |
| 4 | Date and Year of the Activity: | 12/01/2021 |
| 5 | Number of Students Participated in the activity: | 10 |
| 6 | Report of the Activity (in 100 words): | In accordance with the Memorandum of Understanding that the industry and the college signed, Electronics Department, Government Holkar (Model, Autonomous) Science College, Indore organized a Instrumental experience related to Robotics on 12/01/2021 at Answer Foundation. The goal of the tour was to educate fundamentals of robotics, Students were informed about the embedded system and the Arduino board during this Training Program, they also worked on them. Ten departmental students benefited from this training. Dr. Suresh T. Silawat, the principal, and Dr. Netram Kaurav, the department head, have approved of this visit. Mr. Mudit Thakkar has approved this visit from industry side. |

शासकीय होल्कर विज्ञान महाविद्यालय
इन्दौर (म.प्र.) भारत – 452 017
फोन नं. : 0731-2464074, 244049
ईलेक्ट्रॉनिकी विभाग

Date:- 04/01/2021

To,

Director,
Answer Foundation,
BM-70 Near Bapat Square Shukliya,
Indore (M.P.), INDIA

Subject: -Proposal/Permission Letter for One-Day Visit/Training in Industry

Respected Sir,

The purpose of this letter is to request permission for a one-day visit/training. For the students of B.Sc. Electronics Students Employment/Learning Purpose, I request you to Kindly Provide some practical education to the students about industrial procedures, Products, and facilities. The 10 students will be part of the trip accompanied by one teacher. Your kind consideration of our request will help.

I request you to kindly confirm our student's visit/Training.

**Students List**

| S.No | Students Name | S.No | Students Name |
|---|---|---|---|
| 1 | ROHAN YADAV | 6 | PAWAN SAHU |
| 2 | SAHIL CHOUKSEY | 7 | PINKI SHUKLA |
| 3 | SAKSHI PANWAR | 8 | RAHUL EVANE |
| 4 | SATYAM BAMALIYA | 9 | RAHUL JAT |
| 5 | SHIVAM | 10 | SHALINI PARIHAR |

Thanks for your kind corporation

Received

O/C

Dr. Netram Kaurav
HOD
Department of Electronics
ईलेक्ट्रॉनिकी विभाग
शा. होल्कर विज्ञान महाविद्यालय,
इन्दौर

ANSWER
FOUNDATION

To,

Head,

Department of Electronics,

Govt. Holkar Science College,

Indore (M.P.)

Subject: -Acceptance of your Proposal.

Dear Sir,

This is with your request, this instituted is agreed to provide one-day Training on 12/01/2021 to your college students as mentioned in the list in your request letter.

with regards
Director

Answer Foundation | 7447047016 | mail.answerfoundation@gmail.com

| | | |
|---|---|---|
| 7 | List of Participants | Enclosed |

**Students List**

| S.No | Students Name | S.No | Students Name |
|---|---|---|---|
| 1 | ROHAN YADAV | 6 | PAWAN SAHU |
| 2 | SAHIL CHOUKSEY | 7 | PINKI SHUKLA |
| 3 | SAKSHI PANWAR | 8 | RAHUL EVANE |
| 4 | SATYAM BAMALIYA | 9 | RAHUL JAT |
| 5 | SHIVAM | 10 | SHALINI PARIHAR |

# SSR DOCUMENT

2021

## CRITERION –3

## MoUs/Linkages/Collaborations

Department of Geography, MLSU,Udaipur, Rajasthan

**Document Title:**

Various objectives undertaken for the year 2021 in the Electoral Information System for Governance and Developmental Planning: A G-Governance Initiative

# मोहनलाल सुखाड़िया विश्वविद्यालय, उदयपुर
## MOHANLAL SUKHADIA UNIVERSITY: UDAIPUR

NAAC ACCREDITED 'A' GRADE STATE UNIVERSITY

No.F./RUSA/Gen/MLSU/2020/ 6067

Dated : 25-06-2020
6/07

ORDER

With reference to request submitted by Nodal Officer RUSA, MLSU, Udaipur in reference to letter No. F30(16)SPD/RUSA/2016/178 dated 31 March, 2020 of SPD, I am directed to convey administrative sanction for Research and Innovation project under component 10 or RUSA 2.0 of MHRD as per details given below:

| S.No. | Department | Principal Investigator | Co-Investigator | Project Title | TOTAL Amount Sanctioned | Ist Instalment |
|---|---|---|---|---|---|---|
| 1 | Geography | Prof. Seema Jalan | Dr. Shailesh Chaure, Dr. Urmi Sharma | Electoral Information System for Governance and Developmental Planning: A G-Governance Initiative | 5725000 | 2862500 |

Yours faithfully,

REGISTRAR

Copy to :

1. The Dean/Director, _____
2. The Comptroller, MLSU, Udaipur
3. The Head, Department of _____
4. The Nodal Officer, RUSA-MLSU, Udaipur
5. Person Concerned
6. Guard file

DY. REGISTRAR

# Progress Report for RUSA 2.0 Projects

*Report 2021*

## Name of Department

Department of Geography, Faculty of Earth Sciences, Mohanlal Sukhadia University

## Project Title

Electoral Information System for Governance and Developmental Planning: A G-Governance Initiative

## Date of Commencement of Project

**Administrative Sanction:** No. F./RUSA/Gen/MLSU/2020/6367 dated: 06-07-2020

**Financial Sanction:** PD/OS/SPD-(RUSA-Phase-II/CSA-1-(3)/2020-21/243 dated: 20/ 21-08-2020

## Name of PI and /or Co-PI


| | | |
|---|---|---|
| **Principal Investigator (PI)** | : | Prof. Seema Jalan<br>Department of Geography, MLSU, Udaipur |
| **Co-PI** | : | 1. Dr. Shailesh Chaure,<br>Associate Professor of Geology<br>Govt. Holkar Science College, Indore<br>2. Ms. Urmi Sharma<br>Assistant Professor<br>Department of Geography, MLSU, Udaipur |

## Purpose

This project aims to develop and provide a rich geospatial information system for various governing bodies, elected representatives of respective constituencies, and state election system which has data including election statistics, socio-economic, ethnic, political issues, census, infrastructure, and developmental information about a particular area on a single platform.

This information will serve as a spatially enabled informed decision-making tool for policy-makers in effective governance and citizen-centric developmental planning.

## Brief objective of the project

To develop an application for G-governance entitled 'Electoral Information System for Governance and Developmental Planning (EIS-GDP)' - a web mapping application which will enable dynamic and interactive mapping of selected attributes at two levels:

- Assembly and Parliamentary constituencies of Rajasthan
- Tonk Assembly constituency

Comprehensive electoral statistics at Assembly Constituency level for the entire state.

In the first phase database will be created only for post-delimitation assembly elections. The work may be extended to pre-delimitation assembly elections and Lok Sabha elections in subsequent phases.

Comprehensive database with selected attributes relevant to governance and developmental planning at various administrative levels.

## Work done so far and results achieved

Since the inception of this study, the project has been going on in a structured manner and all the team members have been assigned designated tasks to carry out as per respective skillset, domain expertise, and experience.

Team members are regularly having weekly meetings and discussions with their project PI and Co-PIs and under their guidance the project has been pacing very well as per the mentioned timeline (mentioned under the point – project progress).

Below mentioned are the targets completed so far.

- Collected various datasets from different sources that can be arranged in a geo-spatial format.
- Digitizing and rectifying datasets (shapefile of Rajasthan assemblies) so that it can be used to join other attributes with shape files.
- Prepared election boundaries of all 200 assembly constituencies of Rajasthan.
- Prepared boundaries of all 33 districts of Rajasthan.
- Preparation of election boundaries for all 25 Parliamentary constituencies of Rajasthan.
- Prepared election statistics for all 3 assembly elections of Rajasthan (Post-delimitation) i.e., 2008, 2013, and 2018 in a spatial format.
- Prepared election statistics for all 3 parliamentary elections of Rajasthan (Post-delimitation) i.e., 2009, 2014, and 2019 in a spatial format.
- Also checked the authenticity of population datasets calculated spatially with reference to ground data.
- Collection of statistical datasets from sources such as election statistics reports, ADR reports, and various other forms of information.
- Arranging non-spatial datasets into a set template and finally converting it into spatial data for further analysis.
- Carried out various GIS-based analysis using both open source and perpetual licensed based software.
- Setting up a development environment using various technologies available in open source and licensed based technologies.
- Identified pros and cons of both sides of technologies.
- Understanding technical aspect and various libraries available for portal development.
- Developed a wireframe of the final portal to be developed along with required functionalities and tabs.
- Explored all possible and available technologies that can be used for a Web-GIS mapping application and accordingly started with the development framework

- Understood hierarchy of Web-GIS architecture (Desktop, Middleware, Server, and Mobile) and how to link this using one common method as guided by the expert in a 3-day Web-GIS training (mentioned in the report below).
- Developed a prototype portal GUI using a rich mapping interface library.
- Added basic functionalities needed in a web mapping application with map tree panel and legend panel.
- Added an advance spatial query tool with attribute selector and viewer.
- Added various layers of base map to support better viewing capability to the user.
- Added an important tool to get information out of a basic map to the user in a very simple grid format.
- Finally, as per project proposal released a limited tender for a Web based Geo-Portal development.
- After taking inputs from prototype and discussing with PIs, have designed wireframe in phased manner for the portal which will be shared to the developer.
- Finalised all functionalities and tools to be integrated in the geoportal.
- Worked on database needed in a sorted approach which would be needed for the portal features and functionalities in a phased manner.
- Any necessary change or inputs if required, were made.
- Currently phase 2 of portal is being developed which includes detailed GIS visualizations of ACs and PCs of Rajasthan.
- Advance query panel has been added for better visualization and interpretation of election statistics.
- Along with statistical data, major road network of Rajasthan will also be displayed.
- Wireframe for further pages (yet to be developed) for trend analysis has also been designed on an initial level.

## Workshop/Training Organized

- A 3-Day training on Web-GIS was also carried out at the GIS lab of Department of Geography, MLSU, Udaipur by the expert from the Regional Space Application Centre, Indian Space Research Organization, Jodhpur, Rajasthan ($7^{th}$-$9^{th}$ January, 2021)
- Project fellows got exposure to current trends and technologies in open-source web-GIS.

- The training was mostly focused on technological aspects such as-
    a) Web-GIS architecture
    b) Front-end technologies
    c) Back-end technologies
    d) Middleware technologies
    e) Server-side technologies
    f) Mobile GIS
    g) Desktop GIS



Figure 1: Participants during Web-GIS training workshop

## Field work Report

A mock GPS based Field survey was conducted for second phase of the project in Tonk Assembly constituency during last week of March, 2021. In this survey project Staff was volunteered with two other field surveyors. Latest Hand-held GPS devices were used to collect field level information. This survey focused on collecting geo-tagged information and pictures of municipal Tonk area and Arniya Kedar panchayat.

Project staff was also closely cooperated with local leaders and politicians of the Tonk Assembly.

Below mentioned is the information collected from field survey.

- Point of interest data from Ward no. 10 and Arniya Kedar panchayat were collected such as major landmarks, government offices, primary health centres, schools, Anganwadi centres, and polling stations (GPS survey).

- Ground control points were collected using GPS from various parts of Tonk assembly in order to Geo-reference map of municipal area with respect to ground level information.
- Polling station location information was collected from all wards of municipal Tonk (GPS survey).
- Hard copies of polling catchment area maps (hand drawn) were gathered.
- Municipal map of Tonk has been collected.
- Gathered location of all police station and police HQ for Tonk district.
- Map showing location of police stations along with their catchment area for Tonk district was gathered from Police department.

All this information was rectified, corrected, and was put in GIS format (in actual scale) and various analysis were done which will be incorporated on the portal.

With this mock survey, project team also got an idea on how to proceed for the main survey and what all necessary information has to be collected from secondary sources which will be helpful in primary survey.



Figure 2: Project Staff during GPS based field survey



Figure 3: A snapshot of from sarpanch office during field survey

## Project Progress according to original plan

As per the original plan of the project, there have been many hurdles during the project in view of the following circumstances:

1. Acquisition of the College and the Department building for State Assembly elections at initial stage of the project delayed the work of establishment of basic infrastructure
2. Complete closure of the University and concerned Government Departments consequent upon COVID induced lockdown.
3. Travel restrictions have severely affected timeline for data collection and field work.

Updated tentative project timeline of the project is as shown in the figure below:

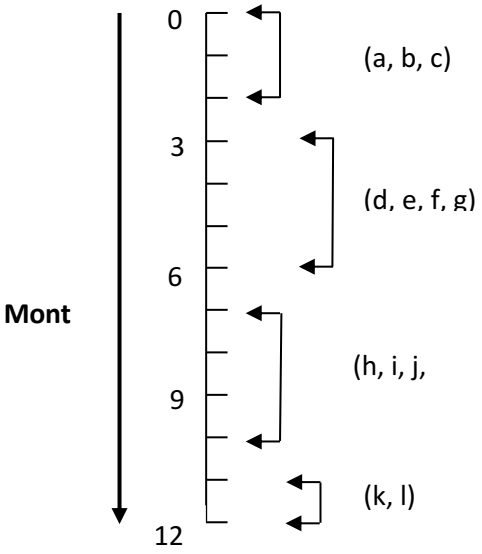



Figure 4: Project timeline hierarchy

a) Procurement of equipment, software and study material and Appointment of staff.
b) Data collection & compilation.
c) Prototype development and procurement of survey instruments.
d) Field data collection and primary mock survey.
e) Wireframe finalization and outsourcing for portal development.
f) Generation of geospatial database for 1st phase of development and its validation.
g) Generation of geospatial database for 1st phase of development and its validation.
h) Layer finalization and analysis as per next phase of project.
i) Field survey for phase 2.
j) Database creation, validation for phase 2 from both primary and secondary data.
k) GIS based Analysis for Phase 2 and any other pending work from both the phases.
l) Report preparation.

## Approximate timing for project completion

Major part of the project work involves data collection (field survey) and the progress of the project has been severely compromised due to COVID-19 pandemic. The circumstances are extremely uncertain in the view of possible third wave of the pandemic.

Request for extension of project period has already been submitted vide letter No. MLSU/Geog./ RUSA 2.0/ 2021/ SJ/ 571 dated April 17, 2021 for extension till May, 2022 (*Annexure 1 (i)*). However due to COVID situation and consequential effects, it is likely that further extension of 06 months will be essentially required. **Likely timeline for completion of project amidst COVID situation is November, 2022.**

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SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2021

## CRITERION –3

## MoUs/Linkages/Collaborations

Department of Geography, MLSU,Udaipur, Rajasthan

**Document Title:**

Preparation of questionnaire, Data collection ,compilation and preparation; Field data collection and primary survey in the collobrative research project

# मोहनलाल सुखाड़िया विश्वविद्यालय, उदयपुर
## MOHANLAL SUKHADIA UNIVERSITY: UDAIPUR
NAAC ACCREDITED 'A' GRADE STATE UNIVERSITY

No.F./RUSA/Gen/MLSU/2020/ 6366

Dated : 25-06-2020
6/07

## ORDER

With reference to request submitted by Nodal Officer RUSA, MLSU, Udaipur in reference to letter No. F30(16)SPD/RUSA/2016/178 dated 31 March, 2020 of SPD, I am directed to convey administrative sanction for Research and Innovation project under component 10 or RUSA 2.0 of MHRD as per details given below:

| S.No. | Department | Principal Investigator | Co-Investigator | Project Title | TOTAL Amount Sanctioned | Ist Instalment |
|---|---|---|---|---|---|---|
| 1 | Geography | Dr. D.S. Chouhan | Prof. Seema Jalan, Dr. Shailesh Chaure | Impact of Water Quality on Health in Vagad Region of Rajasthan: An Application in Web-GIS | 3004000 | 1502000 |

Yours faithfully,

REGISTRAR

Copy to :
1. The Dean/Director, _____
2. The Comptroller, MLSU, Udaipur
3. The Head, Department of _____
4. The Nodal Officer, RUSA-MLSU, Udaipur
5. Person Concerned
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DY. REGISTRAR

# Project Progress Report

# January, 2023

## *Impact of Water Quality on Health in Vagad Region of Rajasthan: An Application in Web-GIS*

**Date of Issue of Order by the University - 20-08-2020**

**Date of Issue of Financial Sanction by the University - 21-08-2020**


**Professor Seema Jalan**
**Head and Co-Principal Investigator**

**Dr. D. S. Chouhan**
**Principal Investigator**
**And Assistant Professor**

**Dr. Shailesh Chaure**
**Co-Principal Investigator**
**Government Holkar Science College, Indore (M.P)**

**Department of Geography**
**Faculty of Earth Science**
**Mohanlal Sukhadia University**
**Udaipur, Rajasthan, India, 313001**

# Project Staff

| S. No. | Status | Name | Designation |
|---|---|---|---|
| 1 | PI | Dr. D. S. Chouhan | Assistant Professor<br>Department of Geography<br>MLS University, Udaipur, Raj. |
| 2 | Co-PI | Prof. Seema Jalan | Professor<br>Department of Geography<br>MLS University, Udaipur, Raj. |
| 3 | Co- PI | Dr. Shailesh Chaure | Associate Professor<br>Govt. Holkar Science College<br>Indore, Madhya Pradesh |

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1. **TITLE:** Impact of Water Quality on Health in Vagad Region of Rajasthan: An Application in Web-GIS

## 2. INTRODUCTION

### Study Area

The study area comprises of the two districts of Dungarpur and Banswara. Also the project will be covering all the tehsils and villages present in Dungarpur and Banswara districts based on Census 2011.

This project proposal is being submitted under the discipline of 'Geography' (specifically Resource Geography) but in approach, relevance and content it is interdisciplinary in nature spanning across Geography, Environment Science, Geology, Geo-Chemistry. Water quality is a major issue of the world in current scenario. A good water quality is essential to a healthy life and whole ecosystem because water quality issues influence living beings and natural environment. The proposed research will be a significant contribution to research and designing various policies related to drinking water, health and sanitation.

Water quality and health bear close inter-relationship to each other. Water quality is fundamental to human development, well-being and health. Providing access to safe water is one of the most effective instruments in promoting health. Water is not only essential to life but intimately interwoven with quality of life across the world. Access to enough clean water is crucial in everyday life for every person in the world. Changes in the quality, quantity, natural cycles of water and water systems have far-reaching impacts on all aspects of human life. As the human population continues to grow and the global clean water supply is reduced by consumption, contamination and climate change, water issues will only increase in complexity and importance.

Presently all Government organizations like Ministry of Water Resources India, World Health Organization (WHO) and various State Ground Water Departments are doing efforts to asses quality of water and monitor both surface and ground water resources. Also the causes and transmission of waterborne disease are under assessment because the quality of water, whether used for drinking, domestic purposes, food production or recreational purposes has an important impact on health. Contaminated or poor quality can cause epidemics and it can contribute to high rates of microbial infestation of water sources on large scale. Initiatives to manage and improve water quality not only supports general public health, but often promote Field survey development of the citizens. This document aims at demonstrating an approach for the assessment of water quality and its impact on health of the people living and consuming

water from sources present in the vicinity of citizens living in an area and will sets out a probable strategy adopted by Government of India and Rajasthan to manage water quality with a view to protecting and promoting human health in Vagad Region of Rajasthan.

## 3. APPROVED OBJECTIVES OF THE PROJECT

Detailed objectives of the project are as under:

(i) To assess the ground and surface water quality of Vagad Region in context of geographical and demographic characteristics of the region.

(ii) To understand the difference between ground and surface water quality in Vagad Region.

(iii) To identify the general sources of contaminants of groundwater in Vagad Region.

(iv) To identify poor water quality buffer zones using Geo-Statistical Interpolation methods in Vagad Region.

(v) To understand the impact of water quality on human health in Vagad Region.

(vi) To identify the causes and magnitude of dwindling quantity and deteriorating quality of water resource in the Vagad Region.

(vii) Conduct a Pilot Study and Survey in Dungarpur Tehsil with all the objectives related to the major project.

(viii) To generate detailed and enhanced spatio-temporal database readily accessible to common man and decision makers in form of an interactive Web-GIS based application in a user-friendly interface.

(ix) To examine the water management policy currently being followed in the Vagad Region.

(x) To suggest water harvesting and other solutions for a sustainable water supply in the Vagad Region.

(xi) To create awareness among the people of Vagad Region regarding problems related to water quality and measures of prevention.

## 4. WORK ACCOMPLISHED AND OBJECTIVES ACHIEVED

The following work was accomplished and results achieved since the beginning of the project:

- Geo Referencing of the Census 2011 Atlas Census Maps of the Vagad Region i.e. the districts of Dungarpur and Banswara.

- Geo Referencing of the Census 2011 Atlas Census Maps of all 9 individual tehsils of the districts of Dungarpur and Banswara with all the census village boundaries.
- Digitization of the Vector Boundaries of all the villages of all 9 tehsils of the districts of Dungarpur and Banswara using the above mentioned geo-referenced Census 2011 Atlas Maps into ESRI Shapefile format.
- Attribution of the above digitized approximately 2500 villages' vector polygon features of the districts of Dungarpur and Banswara with attributes viz. Village Name, Village Census Location Code, District Name, District Census Location Code, Tehsil Name, Town Name, Town Census Location Code, Village Population Census 2011 etc.
- Preparation of the vector format data of Geological Structure Layer for the Dungarpur and Banswara districts using the Geology data provided by the Geological Survey India, Bhukosh Portal.
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- Preparation of the vector format data of Lineament Form Layer for the Dungarpur and Banswara districts using the Lineament Form data provided by the Geological Survey India, Bhukosh Portal.
- Preparation of the vector format data of Lithology Layer for the Dungarpur and Banswara districts using the Lithology data provided by the Geological Survey India, Bhukosh Portal.
- Preparation of Dungarpur Tehsil GWD Sites point feature vector format shapefile representing the location of the GWD water quality report data sites by quarrying the "GWD Assets" GIS Layer on the Rajasthan Government Ground Water "Rajdharaa" GIS Portal and comparing the GWD Water Quality Asset Location Names written in GWD Ground Water Quality Report for Grid Analysis and identification of zones and villages in Dungarpur Tehsil with no water quality monitoring by the Ground Water Department (GWD) or water quality data is not available.
- Attribution of the above mentioned GWD Sites point feature vector shapefile with water quality attributes taken from GWD Water Quality Report, 2014 of Dungarpur.
- Preparation of vector format grid shapefile for the Vagad region consisting of individual grid cells of dimensions of 5 Km. length and 5 Km. breadth for Grid analysis to select

villages for approximately spatially even distribution of villages for Water Quality Sample Collection and Field survey under the Pilot Project Study of Dungarpur Tehsil.

- Preparation of Pilot Project Sampling Sites point feature vector format shapefile representing the location of the villages selected for the Water Quality Sample Collection and Field survey under Pilot Project Study of Dungarpur Tehsil.
- Attribution of the above prepared Pilot Project Sampling Location Site shapefile with attributes viz. Village Name, Village Census Location Code, Sample No., Sample Name, Water Testing Lab Results viz. Sample Registration No., pH, Taste, Odour, Turbidity, TDS, Hardness, Alkalinity, Chloride, Fluoride, Sulphate, Nitrate, Iron, Faecal Coliform, E. Coli level etc.
- Performing Kriging Interpolation Operation over the parameters and attribute values in the GWD Site Layer for assessment of correct interpolation method to be used for the pilot study as well as main project, also for preparation of a research paper on Comparative Study of Better Interpolation Method for Water Quality Monitoring and Prediction.
- Preparation of Survey Schedule or Questionnaire for the Pilot Project of Dungarpur Tehsil completed.
- Conducted Pilot Study Field survey and Water Sample Collection at 21 selected locations in Dungarpur Tehsil.
- Conducted Field survey and Water Sample Collection Survey in 200 villages in Banswara district.
- Organization of results of field survey data collected in field survey and results of the physico-chemical testing of water samples collected in the field by the laboratory is under progress.

## 5. BRIEF DESCRIPTION OF THE METHODOLOGY

The following points describe briefly about the methodology adopted for the project:

- Georeferencing of Census Maps 2011 for the digitization of the study area boundaries in GIS vector data format.
- Attribution of the study area vector data boundaries and village vector data boundaries with Census 2011 population and census location codes.

- Preparation of Geology, Lithology and Geomorphology vector data
- Preparation of 5km by 5km spatial grid polygon layer for the selection of the villages for conducting the field survey and field water sample collection drive in Banswara and Dungarpur districts.
- Preparation of field survey schedules for the field survey and preparation of label for the water sample bottles to be used in field.
- Recording and compilation of data collected in field survey and lab testing results of 14 water quality parameters from each surveyed location in the study area.
- Preparation of GIS point feature vector data of surveyed location in the field survey containing data from field survey and lab test results of the water samples.
- Geo-Statistical and Interpolation Analysis on the above prepared GIS point feature vector data layer of surveyed location in the field survey containing data from field survey and lab test results of the water samples.
- Compilation of the results of the analysis done.
- Preparation of Web-GIS Application with all the required functionalities and reporting tools integrated.
- Preparation of Maps Layouts and Final Project Report.

## 6. OUTCOME OF THE WORK DONE SO FAR

The following points illustrate the outcomes of the work done so far in the project:

- Geo-referencing and digitization of all the study area GIS vector data boundaries of Vagad region - Dungarpur and Banswara districts done based upon the Census 2011.
- Attribution of the digitized GIS vector data boundaries of Vagad region - Dungarpur and Banswara districts done up to the village level based upon the Census 2011.
- Preparation of the GIS vector data boundaries of the Geology, Lithology, Waterbodies and Geomorphology of the entire study area was completed.
- Preparation of the field survey Schedules and Water Samples Labels was completed.
- Conduction of the pilot survey of 21 villages of tehsil Dungarpur was completed.
- Approximately 400 water sample collected from Banswara & Dungarpur districts.
- Field survey of approximately 800 families have been completed.

## 7. PUBLICATIONS

- Research Paper Title: "Spatial Variability of Groundwater Quality Parameters With Geo-Statistical Interpolation Method Using Ordinary Kriging and GIS (Case Study: Dungarpur Tehsil, Rajasthan, India)" based on the State Ground Water Department Rajasthan Pre-Monsoon 2014 data was published in Journal of Geomatics, Vol. 16, No. 2, Oct. 2022 by Indian Society of Geomatics.

## 8. CONFERENCE, WORKSHOP AND TRAINING ORGANISED

- A three day Web-GIS Training was conducted in the Department of Geography, Mohanlal Sukhadia University, Udaipur, Rajasthan from 7$^{th}$ to 9$^{th}$ January, 2021 under RUSA 2.0 Project by Prof. Seema Jalan, Co-PI & Head of Department. Mr. Mohammed Ali S., was the resource person from Rajasthan State Remote Sensing Centre, Jodhpur (Rajasthan). Details of the training are mentioned with photographs in a separate annexure (Annexure I) with this report.

## 9. PROJECT WORK STATUS, WORK REMAINING, FUTURE WORK PLAN AND TIMELINE

| **Months (after issue of FS on 20.8.2020)** | **Targets** | **Status** | **Remarks** |
|---|---|---|---|
| November, 2020 | • Procurement of equipment, software, furniture, books, data etc.<br>• Appointment of Staff | • Completed as per priority. Will be procured as required with the progress of the project.<br>• Completed in November, 2020. | |

| | | | |
|---|---|---|---|
| March, 2021 | • Preparation of questionnaire<br>• Data collection ,compilation and preparation<br>• Field data collection and primary survey | • Completed in March, 2021<br>• Completed<br>• Pilot survey of the same has been completed in March,2021 | |
| July, 2021 | • Generation of Geospatial database<br>• Web application development | Completed | |
| Mar. 2022 | • Layer finalization, attribution and analysis as per the next phase of the project.<br>• Database creation, validation for next phase from both primary and secondary data of Dungarpur and Banswara district.<br>• Field Survey and Water Sample Collection of Banswara District. | Field Survey and Water Sample Collection of Banswara & Dungarpur District Completed.<br>Database schema creation completed.<br>Compilation of data collected in survey and water sample lab testing results. | |
| Dec. 2023 | • Preparation of GIS Vector Data Layers of Compilation of Survey and Water Quality Lab Test Results of Both Dungarpur and Banswara districts. | Remaining | Time Required 2 Month |
| Dec. 2023 | • Geo-Statistical Analysis and Project Report Preparation | Remaining | Time Required 2 Months |

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2021

## CRITERION –3

## MoUs/Linkages/Collaborations

Department of Geography, MLSU,Udaipur, Rajasthan

**Document Title:**

Generation of Geospatial database; Web application development in the collobrative research project

# मोहनलाल सुखाड़िया विश्वविद्यालय, उदयपुर
## MOHANLAL SUKHADIA UNIVERSITY: UDAIPUR
NAAC ACCREDITED 'A' GRADE STATE UNIVERSITY

No.F./RUSA/Gen/MLSU/2020/ 6366

Dated : 25-06-2020
6/07

## ORDER

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|---|---|---|---|---|---|---|
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Yours faithfully,

REGISTRAR

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DY. REGISTRAR

# Project Progress Report

# January, 2023

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- Preparation of Survey Schedule or Questionnaire for the Pilot Project of Dungarpur Tehsil completed.
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- Compilation of the results of the analysis done.
- Preparation of Web-GIS Application with all the required functionalities and reporting tools integrated.
- Preparation of Maps Layouts and Final Project Report.

## 6. OUTCOME OF THE WORK DONE SO FAR

The following points illustrate the outcomes of the work done so far in the project:

- Geo-referencing and digitization of all the study area GIS vector data boundaries of Vagad region - Dungarpur and Banswara districts done based upon the Census 2011.
- Attribution of the digitized GIS vector data boundaries of Vagad region - Dungarpur and Banswara districts done up to the village level based upon the Census 2011.
- Preparation of the GIS vector data boundaries of the Geology, Lithology, Waterbodies and Geomorphology of the entire study area was completed.
- Preparation of the field survey Schedules and Water Samples Labels was completed.
- Conduction of the pilot survey of 21 villages of tehsil Dungarpur was completed.
- Approximately 400 water sample collected from Banswara & Dungarpur districts.
- Field survey of approximately 800 families have been completed.

## 7. PUBLICATIONS

- Research Paper Title: "Spatial Variability of Groundwater Quality Parameters With Geo-Statistical Interpolation Method Using Ordinary Kriging and GIS (Case Study: Dungarpur Tehsil, Rajasthan, India)" based on the State Ground Water Department Rajasthan Pre-Monsoon 2014 data was published in Journal of Geomatics, Vol. 16, No. 2, Oct. 2022 by Indian Society of Geomatics.

## 8. CONFERENCE, WORKSHOP AND TRAINING ORGANISED

- A three day Web-GIS Training was conducted in the Department of Geography, Mohanlal Sukhadia University, Udaipur, Rajasthan from 7$^{th}$ to 9$^{th}$ January, 2021 under RUSA 2.0 Project by Prof. Seema Jalan, Co-PI & Head of Department. Mr. Mohammed Ali S., was the resource person from Rajasthan State Remote Sensing Centre, Jodhpur (Rajasthan). Details of the training are mentioned with photographs in a separate annexure (Annexure I) with this report.

## 9. PROJECT WORK STATUS, WORK REMAINING, FUTURE WORK PLAN AND TIMELINE

| **Months (after issue of FS on 20.8.2020)** | **Targets** | **Status** | **Remarks** |
|---|---|---|---|
| November, 2020 | • Procurement of equipment, software, furniture, books, data etc.<br>• Appointment of Staff | • Completed as per priority. Will be procured as required with the progress of the project.<br>• Completed in November, 2020. | |

| | | | |
|---|---|---|---|
| March, 2021 | • Preparation of questionnaire<br>• Data collection ,compilation and preparation<br>• Field data collection and primary survey | • Completed in March, 2021<br>• Completed<br>• Pilot survey of the same has been completed in March,2021 | |
| July, 2021 | • Generation of Geospatial database<br>• Web application development | Completed | |
| Mar. 2022 | • Layer finalization, attribution and analysis as per the next phase of the project.<br>• Database creation, validation for next phase from both primary and secondary data of Dungarpur and Banswara district.<br>• Field Survey and Water Sample Collection of Banswara District. | Field Survey and Water Sample Collection of Banswara & Dungarpur District Completed.<br>Database schema creation completed.<br>Compilation of data collected in survey and water sample lab testing results. | |
| Dec. 2023 | • Preparation of GIS Vector Data Layers of Compilation of Survey and Water Quality Lab Test Results of Both Dungarpur and Banswara districts. | Remaining | Time Required 2 Month |
| Dec. 2023 | • Geo-Statistical Analysis and Project Report Preparation | Remaining | Time Required 2 Months |

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2021

## CRITERION – 3

## MoUs/Linkages/Collaborations

Electronics & Electriclas, 18a, Electronic Complex, Pardeshipura, Pardeshipura, Indore, Madhya Pradesh

**Document Title:**

One-Day Visit and Training on Industrial Electronic Instrumentation at Electronics and Electrical, Indore

कार्यालय प्राचार्य
शासकीय होलकर विज्ञान महाविद्यालय, इन्दौर
☎ 0731-2464074 ● फैक्स : 0731-2446806, 2764027
Email : principalhsc@rediffmail.com ● Web Site: www.collegeholkar.org

**Memorandum of Understanding for Academic and Industrial Cooperation**
**Between**
**Department of Electronics, Govt. Holkar (Model, Autonomous) Science College Indore (M.P.)**
**INDIA**
**And**
**Electronics & Electricals, 18-A Electronics Complex, Pardesipura, Indore (M.P.), INDIA**

The purpose of this agreement is to promote cooperation in educational, technical, and industrial environments/behavior between the Department of Electronics, Govt. Holkar (Model, Autonomous) Science College, Indore (M.P.), India and Electronics & Electricals, 18-A Electronics Complex, Pardesipura, Indore (M.P.), India.

The Memorandum of Understanding (MOU) establishes the following:

**PURPOSE OF THE AGREEMENT**

1. The industry would guide on internship/Major projects/minor projects/summer projects/projects to students.
2. Recommend/deliver the lectures on relevant technologies, trends, and tools to support students.
3. To understand the culture of tech product development, industry facilitating to allow visits for students and faculties.
4. In response to academic demand, the industry will give training on current technologies.
5. Other activities as mutually agreed.

**ROLE OF PARTIES**

The Government Holkar (Model, Autonomous) Science College in Indore, will assign a Faculty member from the department and the cooperative side, the director will designate a faculty/staff member.

**COMPLETION PERIOD OF MOU**

This MOU will be signed by the institutes and the industry, and it will be in effect for 5 years, with the possibility of extension based on mutual agreement.

**FINANCIAL LIABILITIES**

There are no financial liabilities for either participant in implementing the MOU.

This MOU is signed by,

Head of the Department
ELECTRONICS
Govt. Holkar Science College
INDORE

**Dr. Netram Kaurav, HOD**, Department of Electronics,
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

Principal
शासकीय होलकर विज्ञान महाविद्यालय
इन्दौर (म.प्र.)

**Dr. Suresh T. Silawat, Principal**
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

**Mr. Shailesh Kasliwal, Partner**
Electronics & Electricals, 18-A Electronics Complex, Pardeshipura, Indore (M.P.)

**Date of Implementation 27/Nov/2019**

E&E
ELECTRONICS & ELECTRICALS
18-A, Electronic Complex, Pardeshipura,
INDORE - 452 010 (M.P.) INDIA

**Memorandum of Understanding for Academic and Industrial Cooperation**
**Between**
**Department of Electronics, Govt. Holkar (Model, Autonomous) Science College Indore (M.P.)**
**INDIA**
**And**
**Electronics & Electricals, 18-A Electronics Complex, Pardesipura, Indore (M.P.), INDIA**

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The Government Holkar (Model, Autonomous) Science College in Indore, will assign a Faculty member from the department and the cooperative side, the director will designate a faculty/staff member.

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Head of the Department
ELECTRONICS
Govt. Holkar Science College
INDORE

**Dr. Netram Kaurav, HOD** of Electronics,
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

प्राचार्य

**Dr. Suresh T. Silawat, Principal**
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

**Mr. Shailesh Kasliwal, Partner**
Electronics & Electricals, 18-A Electronics Complex, Pardeshipura, Indore (M.P.)

**Date of Implementation 27/Nov/2019**

SKILL DEVELOPMENT PROGRAM
2020-21

| S. No | Component/Activities | Details |
|---|---|---|
| 1 | Name of the Department / Unit / Agency: | Department of Electronics |
| 2 | Name of the Activity: | One Day Visit/Training on Industrial Electronic Instrumentation |
| 3 | Name of the Scheme: | Hands-On Training under the MOU |
| 4 | Date and Year of the Activity: | 05/02/2021 |
| 5 | Number of Students Participated in the activity: | 10 |
| 6 | Report of the Activity (in 100 words): | In accordance with a contract between the company and the college, Electronics Department, Government Holkar (Model, Autonomous) Science College, Indore, organized a one-day industrial training course on 05/02/2021 at Electronics and Electrical. This industrial excursion for the students addressed about industrial electronic equipment. Students also learned how to operate this kind of equipment. This demonstration helped ten departmental students. This visit has been authorized by the department head, Dr. Netram Kaurav, and the principal, Dr. Suresh T. Silawat. Mr. S. Kasliwal authorized this visit from the company. |

# शासकीय होल्कर विज्ञान महाविद्यालय
## इन्दौर (म.प्र.) भारत – 452 017

फोन नं. : 0731–2464074, 244049

**इलेक्ट्रॉनिकी विभाग**

Date:- 28/01/2021

To,

Director,
Electronics And Electricals,
18 A Electronic Complex
Pardeshipura, Indore

Subject: -Proposal/Permission Letter for One-Day Visit/Training in Industry

Respected Sir,

The purpose of this letter is to request permission for a one-day visit/training. For the students of B.Sc. III Year Employment/Learning Purpose. I request you to Kindly Provide some practical education to the students about industrial procedures, Products, and facilities. The 10 students will be part of the trip accompanied by one teacher. Your kind consideration of our request will help.

I request you to kindly confirm our students the visit/Training.

**Students List**

| S.No | Students Name | S.No | Students Name |
|---|---|---|---|
| 1 | Amardeep Jhala | 6 | Prachi Jain |
| 2 | Divyansh Shukla | 7 | Pranjali Gupta |
| 3 | Himanshu Jain | 8 | Simran Khan |
| 4 | Neha Sharma | 9 | Surbhi Gupta |
| 5 | Nilansh Jain | 10 | Tarun Chaudhary |

Thanks for your kind corporation

28/1/21

Dr. Netram Kaurav
HOD
Department of Electronics

विभागाध्यक्ष
इलेक्ट्रॉनिकी विभाग
शा. होल्कर विज्ञान महाविद्यालय,
इन्दौर

E&E

ELECTRONICS & ELECTRICALS
18-A, Electronic Complex, Pardeshipura,
INDORE - 452 010 (M.P.) INDIA

No Dated 30-01-2021

The Prof & Head
Deptt of Electronics,
Government Holkar Science College,
AB Road, **INDORE**

Dear Sir,

Sub.:- Your letter dated 28-01-2021 regarding Industrial visit of the students.

With reference to your above mentioned letter, we hereby confirm the date of visit on 05-02-2021 at around 10.30 AM.

We look forward to the visit of 10 students of BSc III year along with the faculty member.

Thanking you,

Yours faithfully,
For **ELECTRONICS & ELECTRICALS**

**SHAILESH KASLIWAL**

e-mail : info@eeindia.in • Website : www.eeindia.in • Phone : (0731) 2558811 • Mobile : 98270-23898

| | | |
|---|---|---|
| 7 | List of Participants | Enclosed |

**Students List**

| S.No | Students Name | S.No | Students Name |
|---|---|---|---|
| 1 | Amardeep Jhala | 6 | Prachi Jain |
| 2 | Divyansh Shukla | 7 | Pranjali Gupta |
| 3 | Himanshu Jain | 8 | Simran Khan |
| 4 | Neha Sharma | 9 | Surbhi Gupta |
| 5 | Nilansh Jain | 10 | Tarun Chaudhary |

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2021

## CRITERION –3

## MoUs/Linkages/Collaborations

Index Medical College and Research Centre, Indore

**Document Title:**

Esteem Guest Speaker Dr. Mustafa Johar, Senior Professor from Index Medical College, Indore, gave his valuable lecture on The Future of Biotechnology in Medical Sciences.

Office of the Principal
**Govt. (Model Autonomous) Holkar Science College**
**Indore (M.P.)**
0731-2464074(O), 2446806, 2764027 (Exam)
e-mail : principalhsc@rediffmail.com, Web Address: www.collegeholkar.org
(Re-accredited 'A' Grade by NAAC)

Date:- 11.01.19

To,

The Director,
Index Medical College & Research Center,
Indore (M.P.)

Subject – Consent letter for the renewal of MOU.

Most humbly we wish to inform you with reference to the Letter No/1212 Dated 30-08-2014 regarding MOU that, we are glad to sign the renewal of the same with your institute for three years (2018-2021) from the date of signing authorities.

24/1/2019

Index Medical College Hospital & Research Center
Medical Superintendent
Indore (M.P.)

With regards

Principal

Office of the Principal
**Govt. Model Autonomous Holkar Science College**
**Indore (M.P.)**
✆ 0731 - 2464074 (O), 2446806 (Fax)
e-mail : principal@collegeholkar.org • Web Address : www.collegeholkar.org

क्र 1212 Date : 30/08/2014

**MEMORANDUM OF UNDERSTANDING**

**FOR**

**M.Sc., M. Phil and Ph.D.**

**RESEARCH WORK**

This Memorandum of Understanding is made on 30 August 2014 between Index Medical College and Research Centre Indore and Govt. Holkar Science College, Indore so as to jointly enter into an agreement for post graduate research work leading to the degree of M.Sc., M. Phil and Ph.D. Terms and conditions are as follows:

(1) Both the institutions Index Medical College and Research Centre, Indore & Govt. Holkar Science College will make an effort to identify the areas of common interest in which research can be pursued.

(2) Both the institution will provide research facilities and technical knowledge to the outstanding students of both the institutions.

(3) In order to develop interest in research both the institutions will jointly organize seminars regularly.

(4) Both the institutions will discuss the curriculum of some of the subjects for giving final shape if required.

(5) Both the institutions would jointly work for the promotion of research in basic and advanced branches of science using their infrastructure including laboratory ~~etc.~~ library via required formats.

(6) The nature of research work undertaken by the students will be within the research mended by both of the institutions.

(7) The authorship issue of the publication /research paper and other agreed programme will be decided on the basis of contribution of the student/research guide/co-guide.

(8) The students while working in both the institutions has to maintain a high degree of discipline and moral character.

2 August 2023 12:17 pm

Office of the Principal
**Govt. Model Autonomous Holkar Science College**
**Indore (M.P.)**
✆ 0731 - 2464074 (O), 2446806 (Fax)
e-mail : principal@collegeholkar.org • Web Address : www.collegeholkar.org

(9) For the students fee will be decided by coordinator per annum per students will be chargeable in advance at the time of reporting at the centre.

(10) Copies of Dissertation/ Thesis carried out in both the institutions will be exchanged and shall be kept in institutes library.

(11) Any additional substitution of by laws can be done by mutual consent between Index Medical College and Research Centre and Govt. Holkar Science College at any time.

(12) The students form Govt. Holkar Science College will be given a letter for their work at Index Medical College and Research Centre and duly signed by head of the Department of Biological sciences and vice versa, candidate from Index Medical College and Research Centre and shall come with a letter duly signed by medical Director/Dean/Academic head.

The present memorandum shall be valid for one year period agreed upon by both the partner institute. Either partner/institute can terminate this agreement with prior notice in writing to the other for 30 days. This agreement may be amended/deleted/modified by means of exchange of letters between the two institutions. Once approved by the two institutions, such amendment shall become part of this Memorandum of Understanding.

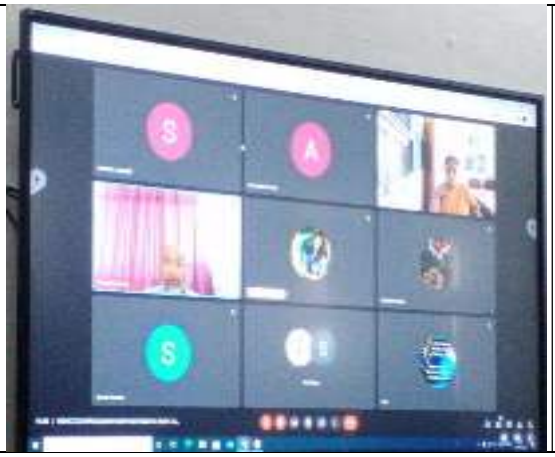
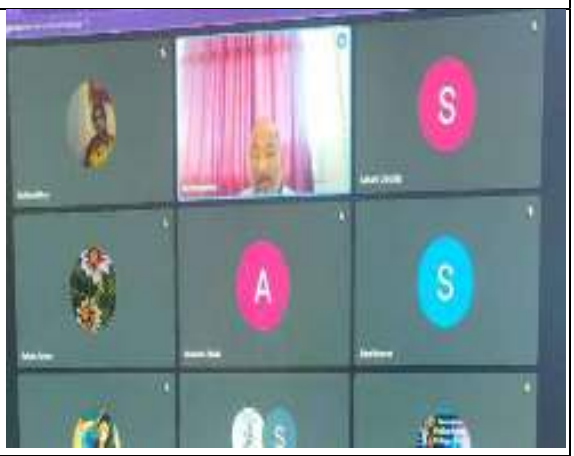
**Principal**
Govt. Holkar Science College,
Indore
***Principal,***
Govt. Holkar Science College
INDORE (M. P.)

**Director**
Index Medical Complex
and Research Centre,
Indore (M.P.)

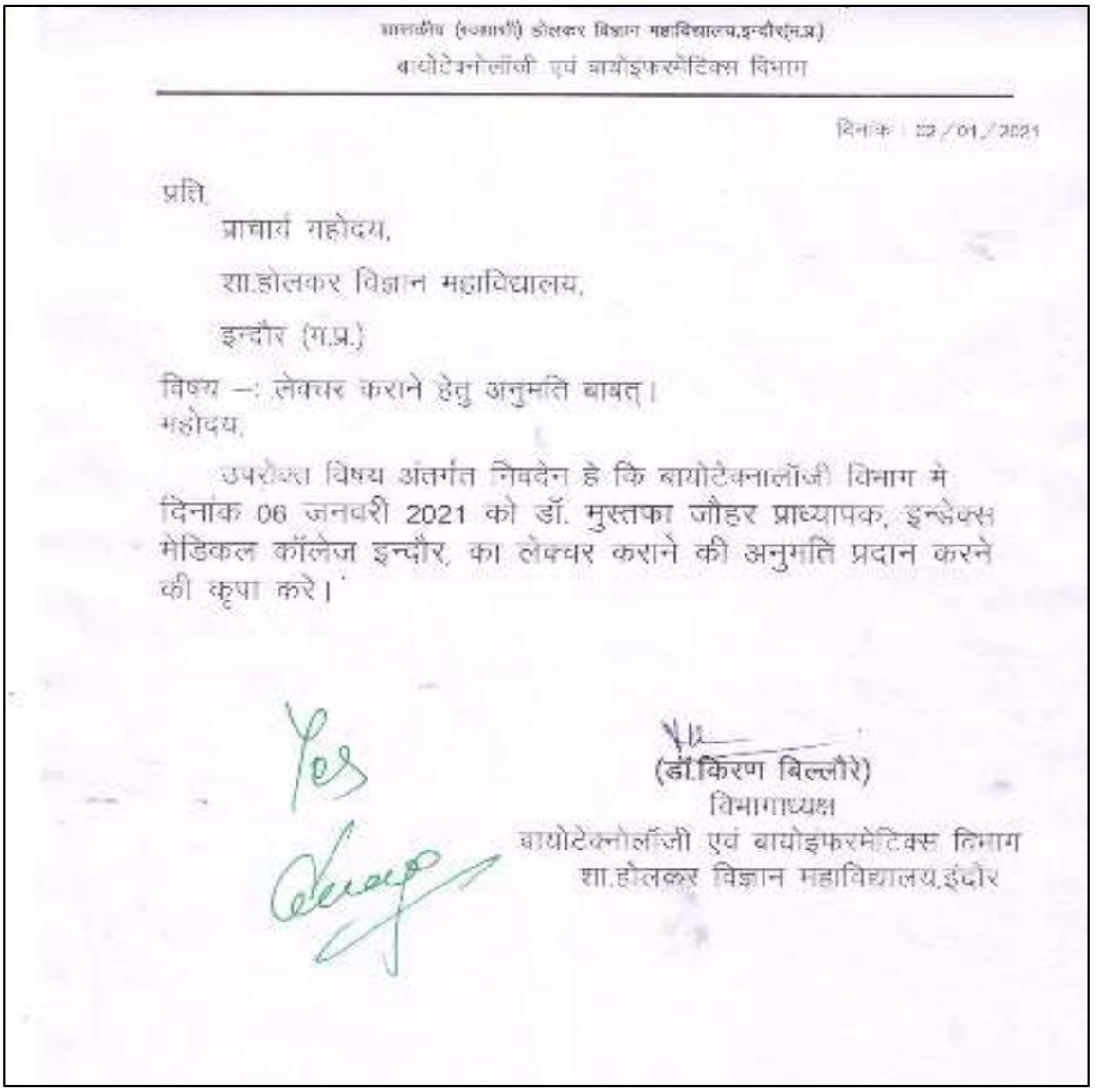
2 August 2023 12:17 pm

**Online Lecture**

**2020-2021**

| S. No | Component/Activities | Details |
|---|---|---|
| 1. | Name of the Department / Unit / Agency: | Department of Biotechnology & Bioinformatics |
| 2. | Name of the Activity: | Online Lecture |
| 3. | Name of the Scheme: | Under the MOU with Index Medical College, Indore |
| 4. | Date and Year of the Activity: | 06/01/2021 |
| 5. | Number of Students Participated in the activity: | 60 |
| 6. | **Activity Photographs** | |
| |  |  |
| 7. | **Report of the Activity (in 100 words):** | |
| | On 6th January 2021 an online lecture conducted by the Department of Biotechnology under the collaboration of MOU with Index Medical College, Indore. In this program Dr Kiran Billore HOD of Biotechnology Department welcome honourable guests, speaker and students. Dr Suresh T. Silawat, Principal of Holkar Science College, Indore extended his best wishes and blessings to the students. Esteem guest speaker Dr Mustafa Johar, Senior Professor at Index Medical College, Indore given his valuable lecture on **"Future of Biotechnology in Medical Sciences"**. At the end vote of thanks was given by faculty member. | |

## Permission Letter



शासकीय (स्वशासी) होलकर विज्ञान महाविद्यालय,इन्दौर(म.प्र.)
बायोटेक्नोलॉजी एवं बायोइंफरमेटिक्स विभाग

दिनांक : 02/01/2021

प्रति,
प्राचार्य महोदय,
शा.होलकर विज्ञान महाविद्यालय,
इन्दौर (म.प्र.)

विषय –: लेक्चर कराने हेतु अनुमति बाबत्।
महोदय,

उपरोक्त विषय अंतर्गत निवदेन है कि बायोटेक्नालॉजी विभाग में दिनांक 06 जनवरी 2021 को डॉ. मुस्तका जौहर प्राध्यापक, इन्डेक्स मेडिकल कॉलेज इन्दौर, का लेक्चर कराने की अनुमति प्रदान करने की कृपा करे।

Yes

(डॉ.किरण बिल्लौरे)
विभागाध्यक्ष
बायोटेक्नोलॉजी एवं बायोइंफरमेटिक्स विभाग
शा.होलकर विज्ञान महाविद्यालय,इंदौर

## Participants List

| S. No. | Name | Class |
|---|---|---|
| 1. | Anushka vardiya | B.Sc 3rd year |
| 2. | Bablu Waskale | B.Sc 2nd year |
| 3. | Sandeep parmar | B.Sc 2nd year |
| 4. | Mahak meena | B.Sc. 4th sem |
| 5. | Anshika Carpenter | B.Sc. 3rd year |
| 6. | Nitin | B.Sc. 3rd year |
| 7. | Nandini Mandloi | Bsc 2nd year |
| 8. | Khushi Yashwant Joshi | Bsc 4th sem |
| 9. | Manish jatav | Bsc 2nd sem. |
| 10. | Pari Jain | B.Sc. 3rd year |
| 11. | Hansa Tamoliya | B.Sc 2nd year |
| 12. | Hareesh Kumar Singh Sotiya | Bsc 3rd year |
| 13. | Raj Baroniya | Bsc 3 year |
| 14. | Husaina Najmi | B.sc 2nd year |
| 15. | Anjali Kewat | Bioinformatics |
| 16. | Harsh Dangi | Bsc |

| | | |
|---|---|---|
| 17. | Sanwali Jain | Bsc |
| 18. | Shrayanshi Goswami | Bsc |
| 19. | Deeksha jain | Bsc. 3rd year |
| 20. | Nayan | BSC |
| 21. | Kashish ninama | Bsc 1st year |
| 22. | Deeksha Ahirwar | Bsc 4th sem |
| 23. | Sakshi Verma | biotechnology |
| 24. | Shreya Nagpure | 4th sem |
| 25. | chirag khare | BSc 3rd year |
| 26. | Bhavana patel | bsc bioinformatics |
| 27. | Gajendra Jamra | BSC 3rd year |
| 28. | sadiya khan | BSc |
| 29. | Mansi raikwar | B.sc.1st year 2nd semester |
| 30. | Pratima Yadav | Bsc 1st year (2nd sem) |
| 31. | Ragini paraste | B.sc (4sem) |
| 32. | Ruchika Nagle | bsc 3rd year |
| 33. | Khushboo kirade | B.sc 1st year |
| 34. | Ayushi Singh | Bsc 3 year |
| 35. | Janhavi Lalge | B.sc III |
| 36. | Ranjana | Bsc |
| 37. | Ashish Kumar Namdeo | Bsc 2 yr |
| 38. | Shalini rajput | 4th semester |
| 39. | Aditi Vishwakarma | BSc 2bd year |
| 40. | Manish | Bsc (IV)SEM |
| 41. | Aditi joshi | Bsc 3rd year |
| 42. | PIYUSH PANDAGRE | BSc first year bioinformatics |
| 43. | Anand Kumar | Bsc 3rd year |
| 44. | DEEPAk | Bsc 3rd year |
| 45. | Vinita | BSC 1st year |
| 46. | Kaushalya | Bas 3rd year |
| 47. | Sujal Damor | 2 year |
| 48. | Arvind rathore | Bsc 2nd sem |
| 49. | UDRABHRANT TIWARI | B.sc 2nd year 4th sem |
| 50. | Nancy Majhi | Biotechnology |
| 51. | Indra kumar rajak | 2nd year (4th semester) |
| 52. | Abhishek Sagar Shrivastava | Bsc 4th semester |
| 53. | Nisha Patel | B.sc 4 sem |
| 54. | Karan Alawe | B.sc.4th semester |
| 55. | Pratibha Rajak | B.Sc. |
| 56. | shweta mishra | Faculty |
| 57. | Vivek Rai | Bsc 1 year |
| 58. | Dr.Navita Khosla | B.Sc 2nd sem |
| 59. | Gouri royal | 2nd year 3rd sem |
| 60. | Mokshita patel | B.sc 2 semester 1st year |

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2021

## CRITERION – 3

## MoUs/Linkages/Collaborations

Dr. G. S. Okram, UGC-DAE CSR, Indore

**Document Title:**

**Research activity and joint publication with Dr. G. S. Okram, UGC-DAE CSR, Indore, as Principal Collaborator from the CSR side**

# UGC-DAE Consortium for Scientific Research

*(Formerly: Inter University Consortium for DAE Facilities; IUC-DAEF)*
(An Autonomous institution under University Grants Commission, New Delhi)
University Campus, Khandwa Road, Indore-452001, MP, India
Phone (+91)0731-2463913/2762267/2463913 Fax: 0731-2462294/2465437

Dr. Gunadhor S. Okram
Scientist G/ Engineer G
Website http://www.csr.ernet.in/csr/indore/facilities/ltl/profile.html
Email: okramgs@gmail.com, okram@csr.ernet.in


16 July 2021

## Collaboration certificate

This is to certify that Dr. Netram Kaurav of Government Holkar (Model, Autonomous) Science College (GHSC), A. B. Road, Indore is a Principal Investigator for the three-year Collaborative Research Scheme project (but extended for another year due to COVID19 lockdown) entitled "*Synthesis and characterization of monodisperse nickel nanoparticles-assisted carbon membranes and their application in gas separation*" of this institute with sanction order No. CSR-IC-MSRSR-02/CRS-210/2017-18/1291, dated 31st March, 2018 under my collaboration with him as the Principal Collaborator of CSR Indore-Centre. This is being issued for the **year 2020-2021** as per the requirements of GHSC of a collaboration certificate.



G. S. Okram

**UGC-DAE Consortium for Scientific Research**
*(Formerly: Inter University Consortium for DAE Facilities; IUC-DAEF*
*An Autonomous Institution under University Grants Commission, New Delhi)*
***(A Society Registered under M.P. Society Registrikaran Adhiniyam, 1973)***
***Registered Office and Head Office:*** *UGC-DAE Consortium, University Campus, Khandwa Road, Indore – 452 001.*
*Phone 0731-2463913/2762267 Fax: 0731-2462294/2465437*

No. CSR/Acctts/2020-21/ 339

October 23, 2020

The Registrar/Principal,
Holkar Science College,
Indore.

Sub:- Your CRS entitled "Synthesis and characterization.....in gas separation".
Ref:- Our Sanction Letter No: CSR-IC-MSRSR-02/CRS-210/2020-21/288, dated October 13, 2020.

Dear Sir,

An amount of Rs. 2,38,260 has been deposited on 23.10.2020 in your CRS Account No.53015687345 towards grants sanctioned for year 2020-21 (April, 2020 to September, 2020) to CRS project mentioned above. Details of sanction as follows:

| S.No. | Particulars | Amount (Rs.) |
|---|---|---|
| 1 | Project Associate-1 @ (Rs.31,000x6) +16% HRA | 2,15,760 |
| 2 | Contingency | 7,500 |
| 3 | Consumables | 15,000 |
| | TOTAL | 2,38,260 |
| | Less: Unspent balance | nil |
| | **Balance deposited Amount** | 2,38,260 |

Money has been transferred through PFMS Portal vide **Trn.ID. C102023792091** on **23-10-2020**.

The remaining six months funds (i.e., from October 2020 to March, 2021) will be released as soon as the funds from UGC, New Delhi received.

The conditions for the award of the grant in aid have been set out in our earlier letter cited above.

Please acknowledge the receipt of this letter and send us a stamped receipt by return of post.

Yours sincerely,

Upadhyay

Administrative Officer-I (Accounts)

Copy to the following for information and necessary action:-
1. Dr. Netram Kaurav, Holkar Science College, Indore.
2. Centre-Director, CSR, Indore Centre.

**UGC-DAE Consortium for Scientific Research**
*(Formerly: Inter University Consortium for DAE Facilities, IUC-DAEF*
*An Autonomous Institution under University Grants Commission, New Delhi)*
***(A Society Registered under M.P. Society Registrikaran Adhiniyam, 1973)***
***Registered Office and Head Office:*** *UGC-DAE Consortium, University Campus, Khandwa Road, Indore – 452 001.*
*Phone 0731-2463913/2762267 Fax: 0731-2462294/2465437*

No. CSR/Acctts/2020-21/832 11 March 2021

The Registrar/Principal,
Holkar Science College,
Indore .

Sub:- Your CRS entitled "Synthesis and characterization.....in gas separation".
Ref:- Our Sanction Letter No. CSR-IC-MSRSR-02/CRS-210/2020-21/288, dated October 13, 2020.

Dear Sir,

An amount of Rs. 2,38,260 has been deposited on 09-03-2021 in your CRS Account No.53015687345 towards grants sanctioned for year 2020-21 (October 2020 to March, 2021) to CRS project mentioned above. Details of sanction as follows:

| S.No. | Particulars | Amount (Rs.) |
|---|---|---|
| 1 | Project Associate-1 @ (Rs.31,000x6) +16% HRA | 2,15,760 |
| 2 | Contingency | 7,500 |
| 3 | Consumables | 15,000 |
| | TOTAL | 2,38,260 |

Money has been transferred through PFMS Portal vide **Trn.ID. C032121269858** on **09-03-2021**.

The conditions for the award of the grant in aid have been set out in our earlier letter cited above.

Please acknowledge the receipt of this letter and send us a stamped receipt by return of post.

Yours sincerely,

Upadhyaya
Administrative Officer-I (Accounts)

Copy to the following for information and necessary action:-
1. Dr. Netram Kaurav, Holkar Science College, Indore.
2. Centre-Director, CSR,Indore Centre.

Dr. D.M. Phase
Centre-Director (Offc.),
CSR, Indore Centre.

**UGC-DAE Consortium for Scientific Research**
*(Formerly: Inter University Consortium for DAE Facilities; IUC-DAEF*
*An Autonomous Institution under University Grants Commission, New Delhi)*
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***Registered Office and Head Office:*** *UGC-DAE Consortium, University Campus, Khandwa Road, Indore – 452 001.*
*Phone 0731-2463913/2762267 Fax: 0731-2462294/2465437*

Ref: CSR-IC-MSRSR-02/CRS-210/2020-2021/288 October 13, 2020

3 years

Dr. NetramKaurav
Holkar Science College,
Indore,

Sub:- Your proposal entitled "Synthesis and characterization of monodisperse nickel nanoparticles assisted carbon membranes and their application in gas separation".

Dear Dr. NetramKaurav,

We are happy to inform you that your CRS proposal has been renewed for one more year for the period 1st April, 2020 to 31st March, 2021, subject to compliance of other procedures:

| | |
|---|---|
| Project Associate 1 (@ Rs.31,000/- pm) + HRA | Rs. 3,72,000/- + HRA |
| Contingency | Rs.15,000/- |
| Consumables | Rs.30,000/- |

1. Dr. G.S. Okram will coordinate the activities of the project from CSR side.
2. **The funds for six months will be released at present, the remaining funds will be released as soon as the grants from UGC, New Delhi have been received.**
3. The Project will be reviewed at the end of each year and a decision will be taken on the financial allocation for the succeeding year.
4. The CSR will be able to reimburse the travel expenses to investigators as well as student under the project as per CSR guidelines for visiting CSR, Indore Centre on project work.
5. The PI and the co-ordinator from CSR side are requested to make every effort to complete the project in time that may enable the research scholar working in the project to complete his/her Ph.D. degree well within the stipulated time limit.
6. This is a Collaborative Research Scheme. In view of the complex and involved nature of the experiments, any publication emerging under the project must be of collaborative in nature with due consents from the participating institutions / persons, and in consultation with the CRS coordinator. The publication should also acknowledge the UGC-DAE CSR, Indore for the project support.
7. Money for the year 2020-21 will be transferred to the Registrar of your University under intimation to you by our Accounts Section after adjusting the unspent balance of the grant released earlier, if any, upto financial year ending on 31.3.2020, upon receiving the following: (a) Statement of Account for the period upto 31.3.2020 signed by the Registrar and (b) Certificate of Utilisation of money spent till 31.3.2020, signed by the Registrar.

Yours sincerely,

(Dr. D.M. Phase)

Copy to the following for information and necessary action:-
1. The Administrative Officer-I (Accounts), UGC-DAE CSR, Indore Centre.
2. The Principal, Holkar Science College, Indore.
3. The PS to Centre-Director, CSR, Indore Centre for project file.

## PROGRESS REPORT

## Project Title: Synthesis and characterization of monodisperse nickel nanoparticles assisted carbon membranes and their application in gas separation

| Title of paper | Name of the author/s | Department of the teacher | Name of journal | Year of publication | ISSN number | Link to the recognition in UGC enlistment of the Journal | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Link to website of the Journal | Link to article/paper /abstract of the article | Is it listed in UGC Care list |
| Gas permeation properties of nickel nanoparticle-embedded PPO/PVP polymers based carbon membrane | Disha Harinkhere,Netram Kaurav | Physics | Materials Today: Proceedings | 2022 | 2214-7853 | https://www.sciencedirect.com/journal/materials-today-proceedings | https://doi.org/10.1016/j.matpr.2022.07.195 | Scopus Indexed |
| Structural and optical properties of PPO/PVP blended polymer film | Disha Harinkhere, Nikita Karma, K.K. Choudhary, Netram Kaurav | Physics | Materials Today: Proceedings | 2021 | 2214-7853 | https://www.sciencedirect.com/journal/materials-today-proceedings | https://doi.org/10.1016/j.matpr.2021.10.206 | Scopus Indexed |
| Preparation and Characterization of Membranes Supports for Filteration Application | Disha Harinkhere, Netram Kaurav | Physics | Materials Today: Proceedings | 2021 | 2214-7853 | https://www.sciencedirect.com/journal/materials-today-proceedings | https://doi.org/10.1016/j.matpr.2021.10.508 | Scopus Indexed |
| Temperature-dependent transport properties of a FeTe compound | Pavitra Devi Lodhi, Netram Kaurav, K K Choudhary, Y K Kuo | Physics | Bulletin of Materials Science (Springer) | 2019 | 0973-7669 | https://www.springer.com/journal/12034 | https://doi.org/10.1007/s12034-019-1953-7 | Scopus Indexed |
| High pressure structural phase transition and elastic properties of ZnSexTe1-x semiconducting compounds | Saligram Verma, Arvind Jain, K. K. Choudhary and Netram Kaurav | Physics | International Journal of Modern Physics B | 2019 | 0217-9792 | https://www.worldscientific.com/worldscinet/ijmpb | https://doi.org/10.1142/S0217979219502503 | Scopus Indexed |
| Measurement and Analysis of Normal-State Transport Properties of FeSe Superconductor | Pavitra Devi Lodhi, Netram Kaurav, K. K. Choudhary, Y. K. Kuo | Physics | Journal of Low Temperature Physics (Springer) | 2019 | 1573-7357 | https://www.springer.com/journal/10909 | https://doi.org/10.1007/s10909-019-02198-3 | Scopus Indexed |
| Synthesis and characterization of ZnO nanoparticles by thermal decomposition method | Rathore R.; Harinkhere D.; Kaurav N. | Physics | AIP Conference Proceedings | 2019 | 0094-243X | https://pubs.aip.org/aip/acp | https://doi.org/10.1063/1.5098752 | Scopus Indexed |
| Effect of sintering temperature on the dielectric properties of non-stoichiometric nickel oxide | Dubey P.; Choudhary K.K.; Singh K.; Kaurav N. | Physics | AIP Conference Proceedings | 2019 | 0094-243X | https://pubs.aip.org/aip/acp | https://doi.org/10.1063/1.5098725 | Scopus Indexed |
| Structural and Raman analysis of double perovskite La2CoTi0.7Ni0.3O6 | Solanki N.; Lodhi P.D.; Kaurav N. | Physics | AIP Conference Proceedings | 2019 | 0094-243X | https://pubs.aip.org/aip/acp | https://doi.org/10.1063/1.5098715 | Scopus Indexed |

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2021

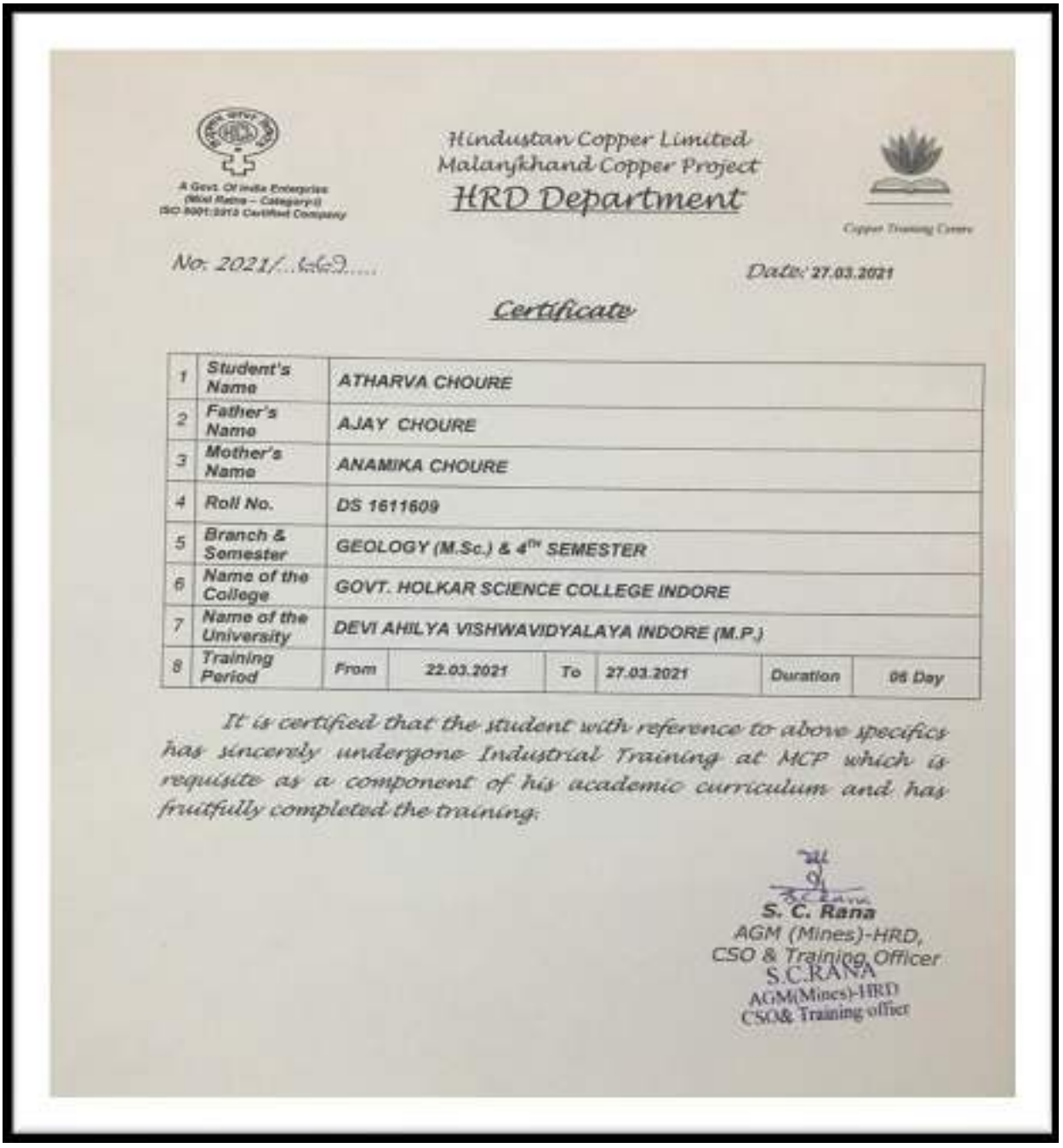
## CRITERION –3

## MoUs/Linkages/Collaborations

Malanjkhand Copper Mines, Hindustan Copper Limited

**Document Title:**

Vocational Practical Training at Malanjkhand Copper Mines, Hindustan Copper Limited



A Govt. Of India Enterprise
(Mini Ratna – Category-I)
ISO 9001:2015 Certified Company

Hindustan Copper Limited
Malanjkhand Copper Project
HRD Department

Copper Training Centre

No: 2021/...162.....

Date: 27.03.2021

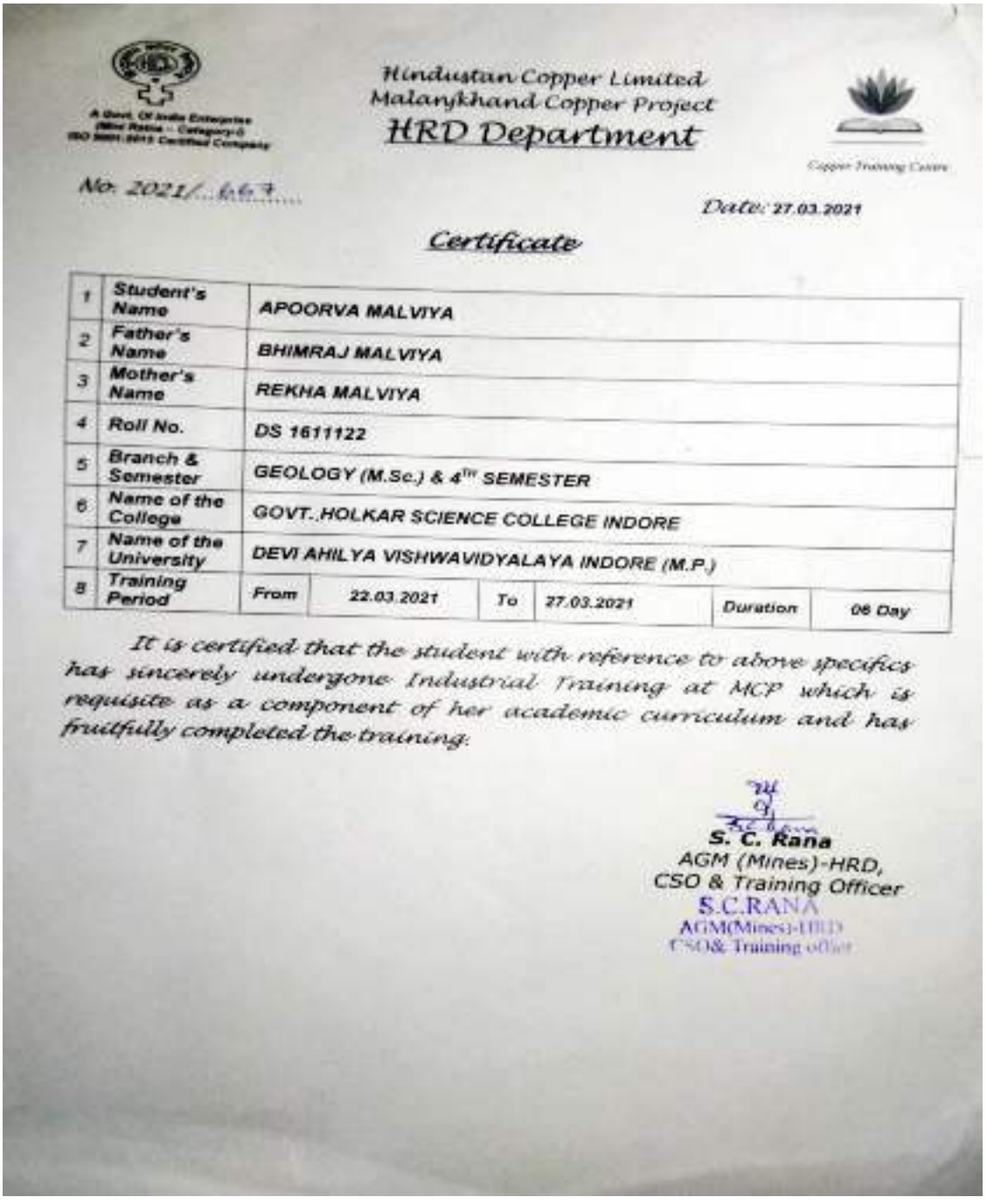
## Certificate

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Student's Name | ATHARVA CHOURE | | | | | |
| 2 | Father's Name | AJAY CHOURE | | | | | |
| 3 | Mother's Name | ANAMIKA CHOURE | | | | | |
| 4 | Roll No. | DS 1611609 | | | | | |
| 5 | Branch & Semester | GEOLOGY (M.Sc.) & 4TH SEMESTER | | | | | |
| 6 | Name of the College | GOVT. HOLKAR SCIENCE COLLEGE INDORE | | | | | |
| 7 | Name of the University | DEVI AHILYA VISHWAVIDYALAYA INDORE (M.P.) | | | | | |
| 8 | Training Period | From | 22.03.2021 | To | 27.03.2021 | Duration | 06 Day |

It is certified that the student with reference to above specifics has sincerely undergone Industrial Training at MCP which is requisite as a component of his academic curriculum and has fruitfully completed the training.

S. C. Rana
AGM (Mines)-HRD,
CSO & Training Officer

S.C.RANA
AGM(Mines)-HRD
CSO& Training officer



Hindustan Copper Limited
Malanykhand Copper Project
HRD Department

Copper Training Centre

No. 2021/...667...

Date: 27.03.2021

## Certificate

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Student's Name | APOORVA MALVIYA | | | | | |
| 2 | Father's Name | BHIMRAJ MALVIYA | | | | | |
| 3 | Mother's Name | REKHA MALVIYA | | | | | |
| 4 | Roll No. | DS 1611122 | | | | | |
| 5 | Branch & Semester | GEOLOGY (M.Sc.) & 4TH SEMESTER | | | | | |
| 6 | Name of the College | GOVT. HOLKAR SCIENCE COLLEGE INDORE | | | | | |
| 7 | Name of the University | DEVI AHILYA VISHWAVIDYALAYA INDORE (M.P.) | | | | | |
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S. C. Rana
AGM (Mines)-HRD,
CSO & Training Officer

S.C.RANA
AGM(Mines)-HRD
CSO& Training officer

# A Report on Vocational Practical Training at Malanjkhand Copper Mines Hindustan Copper Limited







*Submitted to*

Department of Geology, Govt. Holkar Science College Indore, MP

*Submitted by*

**Atharva Choure**

**M.Sc. IV Semester**

# Certificate



A Govt. Of India Enterprise
(Mini Ratna – Category-I)
ISO 9001:2015 Certified Company

Hindustan Copper Limited
Malanjkhand Copper Project
HRD Department

Copper Training Centre

No: 2021/..663....

Date: 27.03.2021

## Certificate

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Student's Name | ATHARVA CHOURE | | | | | |
| 2 | Father's Name | AJAY CHOURE | | | | | |
| 3 | Mother's Name | ANAMIKA CHOURE | | | | | |
| 4 | Roll No. | DS 1611609 | | | | | |
| 5 | Branch & Semester | GEOLOGY (M.Sc.) & 4TH SEMESTER | | | | | |
| 6 | Name of the College | GOVT. HOLKAR SCIENCE COLLEGE INDORE | | | | | |
| 7 | Name of the University | DEVI AHILYA VISHWAVIDYALAYA INDORE (M.P.) | | | | | |
| 8 | Training Period | From | 22.03.2021 | To | 27.03.2021 | Duration | 06 Day |

It is certified that the student with reference to above specifics has sincerely undergone Industrial Training at MCP which is requisite as a component of his academic curriculum and has fruitfully completed the training.

S. C. Rana
AGM (Mines)-HRD,
CSO & Training Officer

S.C.RANA
AGM(Mines)-HRD
CSO& Training officer

# Acknowledgement

I would like to express my gratitude to **Dr Suresh T. Silawat,** the Principal of Govt. Holkar Science College for creating this opportunity**.** My sincere thanks to **Dr Vishnu Gadgil,** Professor and Head of Department of Geology for the support and guidance provided to me in the pursuit of this project. Our Special thanks to **Mr N. S. Jangde** (AGM Training) Malanjkhand Copper Mines, Hindustan Copper Limited for organizing the summer internship program.

I would like to express my deep sense of gratitude and sincere thanks to (HOD, Geology and Research Development Department) for granting permission to undergo vocational practical training and **Mr Sunish Raj**, **Mr Ashish Singh** and **Mr Vivek Mishra** for their expert guidance.

At last, but not least gratitude goes to my parents and my fellow mate for their kind cooperation and encouragement. I deeply regret if any name missed out on the list and would also like to express my sincere gratitude to them.

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1. Introduction
2. Study Region
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   3.3 Mineralization and Mode of Occurrence
4. Ore Reserve Estimation
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5. Sampling and Ore Demarcation
6. Ore Beneficiation and Quality Control
7. Classification of Ore Reserves
8. Environment Management tailing dessert
9. Conclusion

## 1. Introduction

Hindustan Copper limited is the one of the leading producer of copper in India. In that Malanjkhand Copper Project is the Asia's largest open pit copper mine. The annual production of the mine is around two million tones. The mine is highly mechanized open pit type. Malanjkhand copper deposit is single largest copper deposit in India, constituting nearly 70 % of country's reserve and currently contributes to around 80.5 of the HCL's copper production. It is located 90 km NE of Balaghat city in Madhya Pradesh at an altitude of 575 MRL.

The concentrated copper from the concentration plant is sent to HCL's own smelting plant located in Ghatsila and Khethri for smelting. This deposit constitutes possibly the most important representatives of epigenetic sulphide mineralization associated with acid magmatism in India. Rock types occurring around Malanjkhand belongs to middle proterozoic to upper proterozoic age and can be broadly divided into 2 groups, namely Basement complex (older formation (Granitoids, Quartz Reef etc)) and Chilpi Ghat Series (younger formation).

## 2. Study Region

The current study focuses on mine planning, mineral processing, and environment management at Malanjkhand Copper Project HCL, Malanjkhand. The Malanjkhand hill stands out in isolated majesty, above the undulating terrain that form the part of the Baihar plateau. It is made up of 7 hillocks forming an acute shape of 2.6 km length having convexity and inclination towards east. The highest point of this hill range is 652 n above mean sea level, while the general ground level of the surrounding area is above 580m above msl.

MCP is bounded between latitude 29°00'O5" to 22°01'18.5" N and longitude 80°12'33" to 80°43'07"E. It falls in the toposheet number 61B/12. It is located in Karamsara Village of Malanjkhand Township in Balaghat district of Madhya Pradesh. It is 90 km away from Balaghat by road, 130 km from Gondia and 150km from Durg. The famous wild life sanctuary Kanha Tiger Reserve is about 69 km from Malanjkhand by road.




Fig.1. Location map of Hindustan Copper Limited, indicating Malanjkhand Copper Mines.



Fig. 2. Malanjkhand Open Pit Mine (view 1)



Fig. 3. Malanjkhand Open Pit Mine (view 2)

## 2.1 General Information about Study Region

| **Location** | |
|---|---|
| Latitude | 22°00'5'' - 22°01'48" |
| Longitude | 80°42'33" - 80°43'07" |
| Latitude highest level | 625 m above MSI |
| Latitude ground level | 580m above MSI |
| Toposheet No. | 64 B/12 |

| **Climate** | |
|---|---|
| Average rain fall | 1200 |
| Average Rel.Humid | 60% |
| Average Temperature | 25°C |
| Maximum Temperature | 45°C minimum 0.4°C |
| Maximum rain fall in a day | 280mm |

| **Installed capacity / year** | |
|---|---|
| Excavation | 13.45 million tonne |
| Ore production | 200 million tonne |
| Ore mining | 200 million tonne |
| Metal in concentration | 22,000 tonne |
| Project commissioned on | 12 Nov. 1982 |
| Man power (ason 01/05/2012) | 876 |

| **Geological features** | |
|---|---|
| Host rock | Quartz reef and Granite |
| Copper ore body | Chalcopyrite, Chalcocite, malachite |
| Strike length of ore body | 2600 MTS |
| Av. Width of ore body | 75 MTS |
| Balance reserves (as on 01/05/2012) within MCP pit up to | 340nRL at 0.45 % Cu cut off grade 11.45 MT× 1.06 % Cu. |
| Balance lift pit | 2.0 MT/ year |
| **Geological ore reserves HCL MCP Estimate** | |
| At | 0.45 % Cu cutoff -141.66 MT x 137 % Cu |
| At | 0.80 % Cu cutoff - 96.206 MT x 1.89 % Cu |
| At | 1.00 % Cu cutoff - 76.310 MT x 2.09 % Cu |

| **Salient feature of mine** | |
|---|---|
| Total area of the project | 2010 (ha) |
| Area under mining lease | 408 (ha) proposed area 256 (ha) |
| Mining method | Mechanized / open pit |

| | |
|---|---|
| Proposed length and width of pit | 2200 mts , 600 mts |
| Depth of pit present | 190 mts (390 mRL) |
| Ultimate | 240 mts (340 mRL) |
| Pit slope | $37^{o}$ - $52^{o}$ |
| Bench hight | 12 mts |
| No. of benches present | 21 |
| Ultimate | 26 |
| Haul road gradient | 8-10% |
| Width of inpit ramps | 22 mts |
| Total material in the pit | 122 million $m^3$ |
| Dump area proposed hight | 60 mts |
| Present hight | 50 mts |

| **Production statistics** | |
|---|---|
| Excavation (million m3) | 121,346 million m3 |
| Ore production (mt. x Gr) | 57.11 mt x 1.17 Gr Cu % |
| Ore milled (mt x grode Cu %) | 58.09 mt x 1.16 Cu % |
| Concentration producted | |
| (mt x grade % Cu) | 2149742 mt x 27.118 Cu % |
| Metal in concentration (tonne) | 601667 metric tone |

| **Afforestation** | |
|---|---|
| Total area afforestation | 119.86 (ha) |
| With mining lease | |
| No. of plants | 296510 |
| Survival % (with mining lease area) | 69.20 % |
| Afforestation outside mining | 161.754 (ha) |
| (Lease township) | |
| No. of plants | 504142 |
| Survival % | 57.14 % |
| No of plants per (ha) | 1752 |
| Waste dump plantation | 279000 $m^2$ |
| Top soil store | 2458000 $m^3$ |

| **Project** | |
|---|---|
| Start of exploration | 1969 |
| Detailed project report | 1975 |
| Government sanction | 1978 |
| Start of construction | 1978 |
| Start of production | July 1982 |
| Area aquired | 2016 Ha |
| Mining lease | 480 Ha |

## 2.2 Climate Pattern and Drainage System

The Indian Summer Monsoon brings the main precipitation to the study region. The average annual rainfall of the area varies from 1200 mm/y to 1500 mm/y, maximum recorded is 2600 mm/y. And the temperature ranges from 1°C in winter to 36°C in summer the average being 25°C with Average Relative Humidity being 60%.

The main drainage system in the area is the Banjar River, flowing through all seasons of the year. The river channel is around 2.2 km away from Malanjkhand town. It flows in a North Westerly direction and debouches on the Narmada River, Mandla. This river is fed by a number of small nalas.

# 3. Geology of the Area

## 3.1 General Geology

The rocks of Malanjkhand area are of Proterozoic age and can be broadly grouped into two divisions, each with distinct characters, separated by an unconformity. The older group consists of basement granitoids and the younger less meta-sedimentary rocks of chilpi-ghat series.

The Geological succession is as follows:

| | |
|---|---|
| | Laterite |
| Chilpi Ghat Series | Quartz vain |
| | Phyllite with quartzite |
| | Arkosic grit |
| | Conglomerate |
| ----------Unconformity---------- | |
| | Metadolarite |
| Basement complex | Quartz reef |
| | Granite rocks |

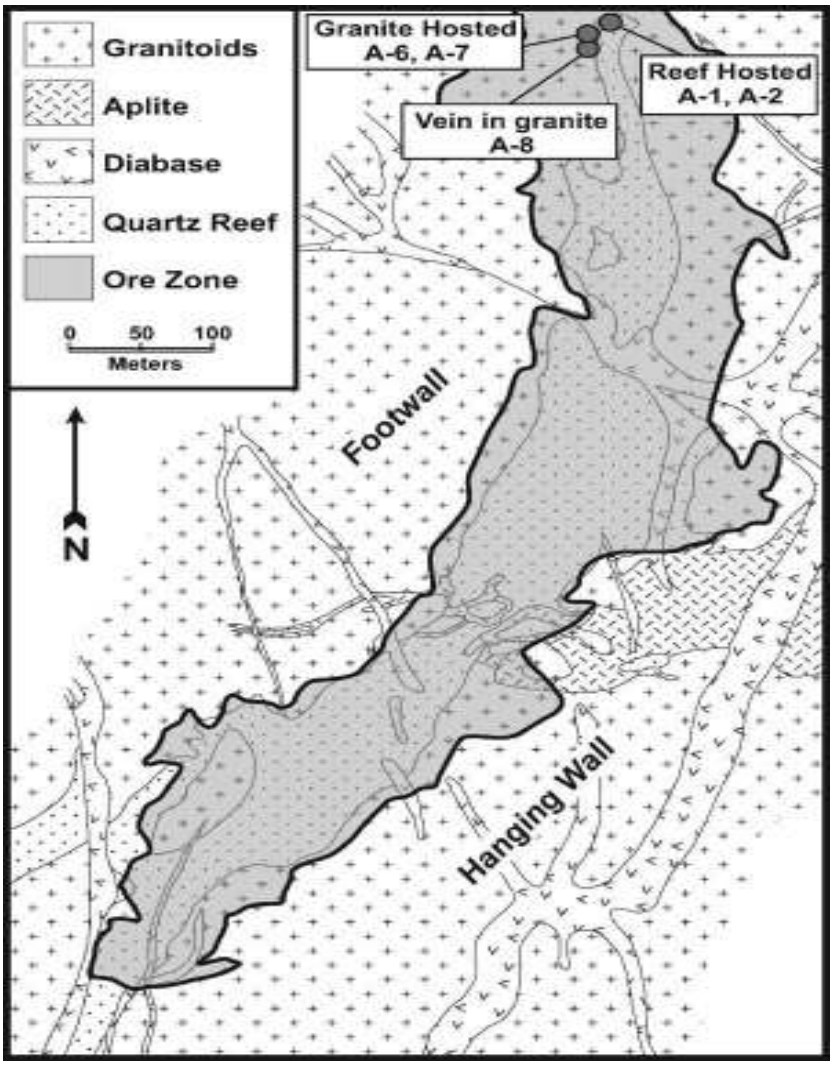



Fig. 4. Highly Simplified Geological map of Malanjkhand.

## 3.2 *Lithology*

The lithology of the area consists of various types of rocks and igneous intrusion. The lithology descriptions of different rocks ore as follows:

**Granitic rocks:**

The area around Malanjkhand and their major parts are occupied by granitic rocks which consist mainly biotite granite to quartz diorite through intermediate adamellite, tonalite and granodiorite. These rocks show wind variety in color, texture and composition. The color ranges from light gray to medium gray with occasional buff to pink shades.

The texture is some cases towards micro perthitic to porphyritic, incipient foliation and gneissic bonding are also observed. They are generally hard compact and massive. They are

invariably seen or detached outcrops in the Flat soil covered counting hardly rising a few numbers above the ground level.



Fig. 5,6. Copper ore bearing Granitic rocks, found in Malanjkhand.

**Quartz reef and vein:**

The quartz reef is the principal host rock of mineralization and varies in composition from pure quartz to quartz-felspathic rock. The quartz reef is sheared and fractured. The reef is traversed by aplite and basic rocks.

There are mainly two generations of quartz vein out of that first generation is represented by main Malanjkhand reed which forms the backbone of the hill where as the second generation of vain quartz is in the post Chilpi period. However the identification of the two generation of quartz vein is rather difficult.

The first generation quartz veins ore more fractured and are slightly darker in color as compared to that of second generation the reef has a steep easterly dip of about $70^{o}$ and it shows variation in color from light gray, white, pink to brown.



Fig. 7. Copper ore bearing Quartz sample from Malanjkhand Copper Mines.

**Metadolerite:**

The granitic rocks and granitoids of the basement complex of ore transferred by a large number of metadolerite dyke. There are two types of metadolerite dykes are seen in the area. One is partially altered but quite massive, crystalline, dark yellowish green in color, equigranular with the thickness upto 50 m. it shows hilled margin. Another dyke is fine grained with the thickness varies from few cm. to about one or two meter.

**Chilpi ghat Series:**

The younger sedimentary formation lying unconformity over the granitoids belongs to the Chilpi ghat series. These are of post mineralization age. The rock of Chilpi ghat series observed here comprises conglomerate, arkose, grit, quartzite, phyllite and shales. They occur as isolated patches resting unconformity over the rock of the basement complex. The conglomerate from the basal bed of the series and rest area is the product surface of the granitic rocks.

The conglomerate grades upwards into grits which ore arkosic, medium to coarse grained, light gray in color. It is usually felspathic in nature with feldspar altered to sericite or kinoite. The rock of this group series have been instructed by quartz veins.

## *3.3 Mineralization*

Chalcopyrite, the main primary copper mineral is associated with secondary and oxidized minerals. The quartz reef is the main host of sulphide mineralization.

Beside the main mineralization in quartz reef considerable amount of sulphide mineralization also occurs in the silicified altered granite rock.

The intensity of mineralization within granitoids was mostly controlled by the intensity of potassic alteration and silicification. The far away areas occupied by granodiorite (known at grey granite) with no potassic alteration are generally devoid of mineralization.

The quartz reef is the main host of sulphide mineralization. Beside the main mineralization in quartz reef considerable amount of sulphide mineralization also occur in the silicified altered granitic rock.

**Nature of mineralization:**

The mineralization in Malanjkhand is restricted to highly fractured and brecciate quartz veins. Malachite and rarely Azurite shows sporadic appearance at various places. Occasionally specks of pyrite and chalcopyrite have been observed.

Here the mineralization associated with quartz and it is essentially confined to the reef quartz as fracture fill type. Also the mineralization is associated with veins of quartz and can be classifies as stringer type. Mineralization is also occurred in the form of disseminated are within the granites in the interstices of constituent grains.

**Control of mineralization:**

The intensity of mineralization within granitoids mostly controlled by the intensity of potassic alteration and silicification. Here the ore mineralization is predominately of fracture filling type. Therefore the lithological control is of secondary importance. Although the sulphides are found both in vain quartz and adjoining granitic rocks. The concentration is more prominent in the reef quartz.

**Mineralogy:**

The major ore which occur in quartz reef and granitoids are

| | |
|---|---|
| 1) Primary | Chalcopyrite ($CuFeS_2$, 34.5% Cu), pyrite ($FeS_2$), molybdenite, magnetite and sphalerite (ZnS). |
| 2) Secondary | Chalcocite ($Cu_2S$, 79.8% Cu), bornite ($Cu_5FeS$) and covellite. |
| 3) Oxidized | Malachite ($CuCO_3.Cu(OH)_2$, 57.3% Cu), azurite ($2CuCO_3.(OH)_2$, 55.1% Cu), Cuprite ($Cu_2O$, 88.8% Cu) and native copper (Cu, 100% Cu). |

*The secondary and oxidized ore minerals are confined to the upper part of the deposit.*

Oxides: Magnetite, goethite and other hydrated oxides of Fe, Cuprite.

Sulfide: Chalcopyrite, pyrite, molybdenite, chalcocite, covellite and bornite.

Gangue minerals: Quartz, feldspar, mica, epidote, chlorite, amphibole, calcite.



Fig. 8. Chalcopyrite sample from Malanjkhand Copper Mines.

**Zone of oxidation:**

In the Malanjkhand copper deposit the zone of oxidation extends all along the strike of vein quartz. However the maximum zone of oxidation is noticed the central part of the deposit. In general the depth of the zone of oxidation is 40 to 110 m from the hill profile. It extends up to 550 mRL in the southern part of the deposit while in the central part and northern part it in restricted to around 570 mRL. There is no well defined horizon of native copper except sporadic occurrences both in the oxidized as well as primary ore zone as noticed in the mine.

**Zone of secondary enrichment:**

The zone of secondary enrichment is practically absent but still the zone of oxidation to under lain by fairly central and southern part of the deposit. The primary sulphide mineral makes their appearance abruptly below the zone of oxidation pockets of massive chalcocite with minor covellite ore however seen in transition zone these pockets are rather sporadic and do not from a well defined horizon.

**Mode of Occurrence:**

Three conspicuous modes of occurrence of mineralization have been observed.

Mineralization solely associated with quartz which are essentially confined to the reef quartz as fracture fill type and can be classified as quartz ore.

mineralization associated with veins/ vein lets of quartz and can be classified as stringer type. The stringer type ore occurs mostly within the granites.

Disseminated ore within the granites occur in the interstices of constituent grains of the associated rocks.

Other Minerals: Miner amount of Gold, Silver are associated with copper mineralization with the belt. The Malanjkhand Copper mine is having about 2gm/T of Gold and 60 gm/T of Silver. This amount of Gold and Silver is non-economical for extraction from ore bodies.

## 4. Ore Reserve Estimation

The reserves have been divided in to the categories namely, *Proved, Probable* and *Possible.* Where proved reserves can be demarcated by the intersection of ore body which is from 0 -25 m, probable reserves can be demarcated by the ore of up & down dip from 25 - 50m and possible reserve is the ore body above 50 m. Thus on the profile Section map offer plotting the ore body of different grade with cut off grade 0.45 % of Cu the rock containing ore body between the two bore holes of different grade is being cut into exactly half the distance and the line is drawn. This line is called as 'borehole influence line". Thus we will get two grades of above and below the borehole influence. Now from the intersection of the ore body i.e. from the bore hole towards borehole influence 0-25 m is proved ore, 25 -50 m is demarcated as probable ore and above 50 m is considered as possible ore.

## 4.1 Cross Section Method

| Block | Area | Grade |
|---|---|---|
| 1 | A1 | G1 |
| 2 | A2 | G2 |
| 3 | A3 | G3 |
| 4 | A4 | G4 |
| . | . | . |
| . | . | . |
| . | . | . |
| N | An | Gn |

$$\text{Grade} = \frac{(A1G1 + A2G2 + A3G3 + A4G + \cdots\ldots\ldots + AnGn)}{\sum A}$$

**Calculation of Volume:**

Volume= Area× Height

**Calculation of Tonnage:**

Tonnage = Volume × Specific Gravity

∵ *Specific Gravity of Cu= 2.69*

∴Tonnage = Volume × 2.69

## 4.2 Leveling (Level Plan) Method

To prepare a geological level plan first of all, one should trace the grade as well as boreholes of two sections from contour plan of the mine. Then plot the lithology of 500 MRL on the relative section lines in reference to the boreholes, from the year vice prepared section plans. After this, correlate the lithology as well as ore body and then like bore hole influence, plot the "strike influence" between two section lines and likewise, calculate the area, average grade, volume, tonnage and grade of the ore body. Thus ore reserve is estimated by leveling method.

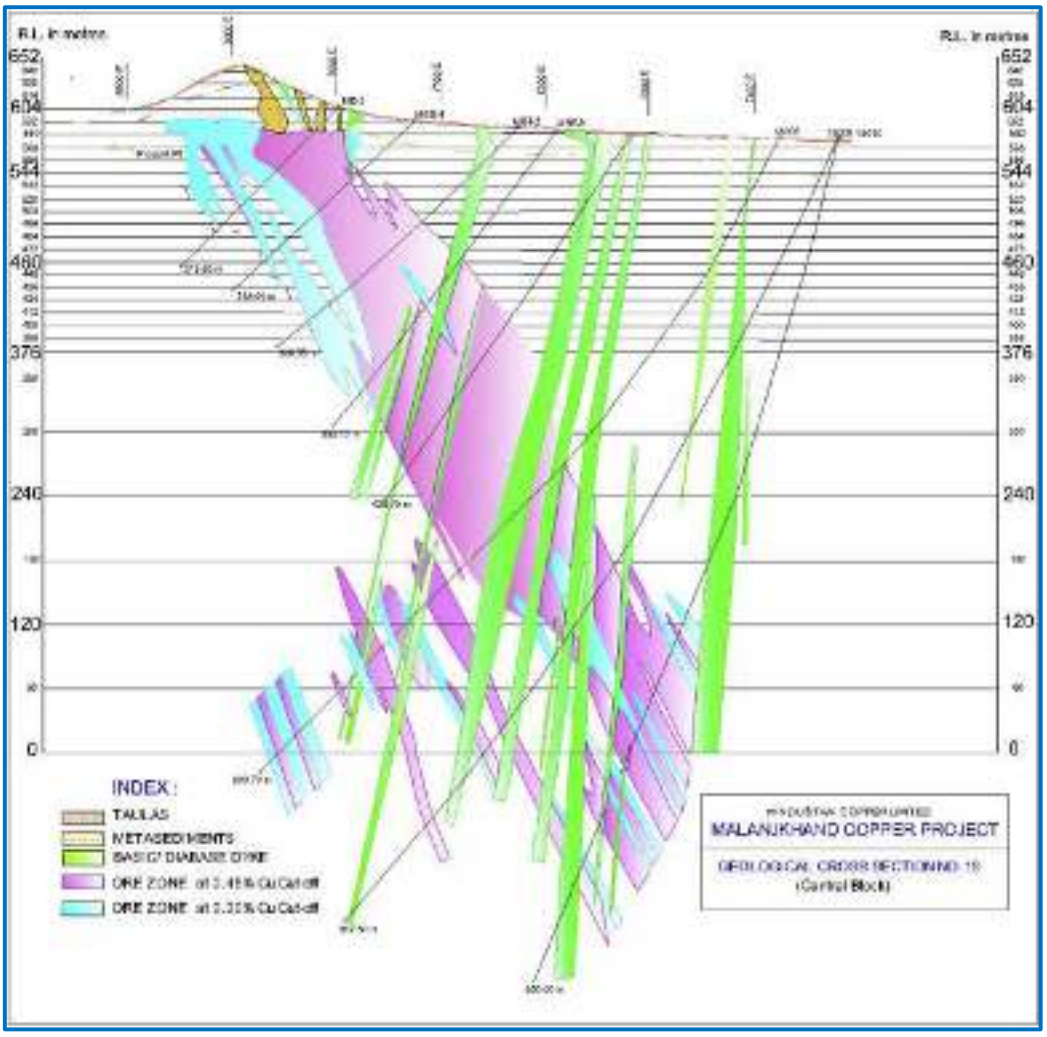



Fig. 9. An example of Geological Cross Section map of Malanjkhand Copper Project.

## 5. Sampling and Ore Demarcation

### *5.1 Sampling*

Sampling is an art of collecting small fraction of the material, so as to represent the whole mass. It is done to ascertain the grade of mineral and metal values that vary in proportion from one place to another.

Sampling serves the purpose of:

- Knowing the grade of ore.
- Pattern of mineralization within the ore body.
- Demarcation of richer and leaner ore portions

- Limits of mineralization towards both the hanging wall and foot wall contacts can also be predefined by carefully sampling.
- Sampling is necessary to determine the pressing and extra stability characterization of the ore.

**A) Infill Drilling Sampling**

Infill drilling holes are done to know approximate quality of ore in different section. From this, one can know the grade tonnage, quality and quantity i.e. advance information about the ore. In this case the drill holes are done up to 2 to 4 benches depth i.e. 36 to 48 meters. The infill drill holes are placed at 30 x 15 m interval in strike and dip direction of the ore body.

***Sampling Procedure***

Samples of Infill drilled holes are collected in barrels at 4 m intervals for each bench i.e. three samples are being collected for 12 m bench height. Then weighing of the sample is done for recovery of the chips; got through infill drilling. After weighing, representative samples are prepared by coning and quartering method. 5 KGs of representative sample is collected, and then small quantity of representative sample is washed for assessing the rock types and visual grades in the representative sample. 250 grams of representative sample is prepared in sample processing section after reduction by coning and quartering method. Then the samples are sent to Chemical Laboratory for assessing value of copper content in terms of percentages.

***Tonnage calculation (MT)***

Spacing × Burden × depth × Sp. Gravity

= 30 × 15 ×12 × 2.69

= 14526 MT

***Average grade calculation***: Total value of three samples divided by Number of three samples which resulted average grade (Cu %) for each bench.

Value of each hole are plotted on Infill drilled plans and operating rock matrix plans for future planning of mine development activities.

**B) Blast hole sampling**

The Blast holes are drilled up to 12 m depth for blasting of rock mass by diesel & electrically operated drill machines. The accumulated material around the collar of drill holes are being taken for preparation of representative samples through coning and quartering method. A Ring has been prepared around the collar of the blast hole for making a representative sample of this material through coning and quartering method. Around 5 Kg representation sample is collected in Cotton or Plastic bag for each hole of a block location of bench and number of hole

is marked on sample bag and same thing is also marked in a paper slip and this slip is put into the sample bag. Further, this 5 kg sample is reduced up to 250 grams by coning and quartering method for grinding of sample into powder form up to 250 mesh size particles. This powder sample is sent to the chemical Laboratory for its analysis. The blast holes are placed in grid pattern or staggered pattern. There after the chemical results of Cu content (n %) is plotted in each blast holes on Blast Hole Disposition plan. The Tonnage & Average grade are being calculated for each Blast Hole Disposition Plan. The Tonnage and Average Grade are being calculated for each Blast Hole Blocks before blasting of rock mass.

***Tonnage Calculation*** = Spacing × Burden × depth of each Holes × Sp. Gravity × No. of Holes

= 6 × 3 × 12 × 2.69 × 15

= 8715.6 MT

***Average Grade Calculation*** = Total values of Blast Holes/ Total no. of Holes

| | | |
|---|---|---|
| High Grade Ore | 17/15 | 1.13% Cu |
| Low Grade Ore | 8/12 | 0.67% Cu |
| Lean Grade Ore | 4/10 | 0.4% Cu |
| Waste Material | 1/6 | 0.17% Cu |

## *5.2 Ore Demarcation*

In the Malanjkhand Copper Mine the blasted muck of each block are being demarcated by using different colors of flags. These flags are used depending upon the percentage of copper content found in the blast hole blocks in each bench of the mine. The demarcation is based on visual interpretation. Following types of color flags are being used in Malanjkhand Copper Mines:

| ***Color of Flag*** | ***Type of Ore*** | ***Average Grade of Ore*** |
|---|---|---|
| Yellow | High Grade | Above> 1% Cu |
| White | Low Grade | >0.45-0.99 % Cu |
| Blue | Lean Ore | <0.20-0.44% i.e. < 0.45% Cu |
| Maroon | Waste | <0.20% Cu |

# 6. Ore Beneficiation & Quality Control

## *6.1 Ore Beneficiation*

Ore dressing or beneficiation is the process by which ore is improved in grade, so that the product can be used in metallurgical industry. Method adopted in mineral beneficiation are essentially physical, as no change in the inherent physical or chemical identity of mineral is involved. It reduced the freight and handling cost per unit weight of value, minimized, the cost of extraction and in many cases it economically and technically feasible to exploit low grade ore deposit which would not otherwise be workable. Mineral beneficiation techniques can be broadly divided into two phases of operation:

1) Liberation of wanted particles (by means of size prod)
2) Concentration of the valuable point (concentration & reduction of gangue stalling)

**The Concentration**

The concentration plant has been designed to treat 2 million tons of copper ore annually to produce around 99200 tons of copper concentration containing 25 % copper at its full capacity. The plant consists of the following sanctions:

1) Crushing sections
2) Grinding section
3) Flotation section
4) Thickening & filtration
5) tailing disposal and water recirculation

The basic design of the plant was done at Mekhanobre institute, Leningrad based on the pilot plant studies conducted at the National Metallurgical laboratory, Jamshedpur and also Mekhanobre institute.

## *6.2 Quality Control*

Whatever may be the scale of mining operation, the mined ore should be of a specific grade and hence grade control operations are necessary. Under Indian standards; grade control has two objectives viz., (1) to maintain constant ore quality & (2) to maintain constant ore size.

**Cut off grade**

Cut off grade is defined as the minimum grade of ore which meet the direct operational coast. Cut off grade is highly variable in quantity, depending on too many external factors. Such as market conditions, transport facilities, and ultimately the cost of operation. A block of ore

about to be mined normally consists of a variety of ore materials which can be recognized in following categories:

i. Ore above cut off grade.
ii. Ore below cut off grade.
iii. Waste rock.

High grade crusher ore contains copper percentage above 1. At Malanjkhand copper mines the quality control is achieved by two wags

A) By studying the grade of ore in the field by simply examining the ore megascopically
B) By chemical analysis of ore.

## 7. Ore Reserve Classification

The ore reserves have been classified under proved, probable and possible categories following the report of commission of standardization of ore and mineral reserves-GSI. The strike influence is all the 3 categories is assumed to be the same and is taken as half the distance between the adjoining cross-sections whenever parallel, otherwise calculated by taking convergence principle.

**A) Proved Category-**

***Ore reserves***: The continuity of ore zones has been established between the bore holes spaced up to a maximum of 75m, along dip direction, quality for the category and the area of influence of each ore zone ex tends up to half the distance between two bore holes.

Where the distance between two boreholes is more than 75m and the continuity of ore zones is established, a maximum influence of 25m down dip and up dip only was considered for this category.

**B) Portable Category-**

Ore projections beyond 25m of proved category in down dip and up dip have been classified as probable category.

In case of single intersections 25m up dip and down dip influence has been considered under this group.

**C) Possible Category-**

Ore projections modes beyond 25m of probable category have been grouped under possible category.

## 8. Environment Management

As far as we have observed, MCP is really striving hard to protect the environment. Major environmental issues concerned generally with a mine are as follows:

- Air Pollution
- Water Pollution
- Land Degradation
- Noise and Vibration
- Hazardous Waste Disposal
- Solid Waste Management

**Air Pollution**

From the last analysis, it is found that the air quality is good and the pollutants are within permissible limits.

- Dust suppression through consistent water sprinkling on haul roads, conveyors and crushing area.
- Dust collectors installed in blast hole drill machines and also wet drilling is carried out by water injection methods.
- Arresting dust storms in tailing dam by Turfing the slopes.
- Turfing on 17,500 $km^2$ till 2010 on tailing dam slopes for slope stability.
- Suppression of dust by dust collectors, exhaust fans and ventilation fans with filter.

**Water Pollution**

- No discharge from tailing dam to cause pollution. Everyday around 4000 $m^3$ of water is reclaimed from tailing dam for plant operation.
- Everyday 2418 m" of water is sent for limestone treatment to be used in concentrator plant operation.
- 243 $m^3$ of domestic sewage is sent to oxidation pond for bio degradation.
- An effluent water treatment plant with limestone dozing is installed near reclamation ponds of concentrator plant.
- Tailing dam, mine and industrial workshop effluents are being treated with lime dozing and recycled regularly to concentrator plant for reuse in process.
- Garland drains with site arrestors are made around dumps and tailng dam to collect seepage water.
- Stone barriers in the drains to check water current and hence to arrest solids wash off.
- Toe bunds with sand filters are constructed at tailing dam t0 arrest outflow of suspended solids in seepage.
- Settling pits and drains are cleaned and maintained periodically for their proper function.

- Mine water discharge is stopped outside the premises and it is diverted fully to plant use.
- It is ensured that quality of drinking water is hygiene and good sanitation system is available.
- The domestic seepage generated from colony is discharged in oxidation ponds for bio-degradation.
- Regular water monitoring is being done so as to ascertain the quality of water.
- Water level measurements are being carried out on monthly and quarterly basis in and around 3- 5 km radius of MCP to find out any changes in ground water table behavior due to mining and tailing dam disposal activities.
- Oil skimmer is installed for separation of oil and grease from workshop effluents.

**Land Degradation**

***Erosion and Sediment***

Due to hard strata there will be insignificant erosion. No surface water course exists in the area and hence sedimentation is not anticipated.

**Top Soil**

- 2.085 $mm^3$ top soil, generated from mines pit had been stored in top soil dump.
- Top soil dumps have been terraced and have been planted on their slopes.
- Generated top soil will be stored in top soil dumps and it will be spread over completed waste dumps, mining areas for plantation and also for Turfing of tailing dam slopes for green belt development.

**Noise and vibration**

- Green belt around the mining lease area.
- Rubber liners at the chutes and ball mills.
- Controlled blasting is practiced for vibration control.

**Hazardous Waste Management**

Waste oil and scrap lead acid batteries are the hazardous wastes to be concerned about. They are safely sold to authorized re-processor by CPCB.

**Solid Waste Management**

- During mining operation, generated solid waste is stacked into well designed waste dumps, on hanging wall side of mine.

- Top surface and slopes of waste dumps are covered with top soil. Extensive tree plantation has been done on slope of waste dumps to restore aesthetic beauty.
- Garland drains are made in the all along the toe of dump along with silt arrestors.

**Details of Water Dump**

Total area of waste dump: 236 Hectare

Ultimate height - 60m (3 lifts of 20 m height)

Present area occupied - 160 Hectare

Capacity of dump – 103 $mm^3$

## 9. Conclusion

This internship was a great experience for me. As a student of Geology, I learnt a lot about Mining operations in the mines. It was a real pleasure for me to get trained in **Hindustan Copper Limited Malanjkhand Copper Project** which was full of knowledge and thrilling experience. I gained a lot of insight regarding section mapping, mine planning, sampling, chemical analysis of samples, etc. The friendly welcome from all the employees is appreciating, sharing their experience and giving their piece of wisdom which, they have gained in the long journey of work. I hope this experience will surely help me in my future and also in shaping my career.

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2021

## CRITERION –3

## MoUs/Linkages/Collaborations

Govt. Nirbhay Singh Patel Science College, Indore

**Document Title:**

**Institutional Educational Visit of Students to Govt. Nirbhay Singh Patel Science College, Indore**




मध्य प्रदेश MADHYA PRADESH AX 032479

**Memorandum of Understanding**
**(For education and social purposes only, Without any legal binding)**

A memorandum of understanding is being signed and accepted today on 6.12.17 between Department of Microbiology Holkar science college, Indore and Department of Botany Govt. Nirbhay Singh Patel Science college, Indore with agreement on following points.

1. Faculties of both colleges can use libraries of each other's college with prior permission of the Principal.
2. Faculties of both colleges can visit other institute for guest lecture with prior approval of the Principal.
3. If a placement company arrives in any of the institutions, the students of both colleges will be included in the drive.
4. Selected students of both colleges will be permitted to attend the classes of other college twice a year with prior permission of the Principal.
5. Both the institutes will provide guidance for Ph.D And allied research work.
6. Both the institutes will exchange the experiences regarding accreditation from NAAC and will cooperate with each other.
7. There will be cooperation and guidance for NSS activities of both the colleges.
8. Cultural programmes can be organized with the mutual consent of both the colleges.

Both of the institutes further declare that this memorandum will not be used in any way for legal/juridical purposes. It will be used only for mutual cooperation, educational and social development of both the college with prior permission and convenience of both the colleges.

Principal,
Holkar Science college Indore

Principal
Govt. Nirbhay Singh Patel
Govt. Nirbhay Singh Patel Science College
INDORE

HOD Bot.

To,

Date: 19/08/2021

The Principal
Govt. Nehnay Singh Patel Science College,
Indore (M.P.)

Sub: Regarding **Institute Visit for B.Sc. Students of Microbiology 23/08/2021.**

Respected Sir/Madam,

This is to request you for allowing two of our B.Sc. Microbiology students- Mr. Hakkemuddin Bohra & Mr. Sumesh Agrawal for the visit to your Institute for fulfilling the norms stated in the MOU signed by our respective Institute. This visit is initiated for helping the students to explore the educational environment of near by institute inspiring them to learn social and academic surroundings.

Kindly revert back as soon as possible.

Thanking You,

Dr. Sanjay Vyas
Prof. & Head
Dept. of Microbiology
Govt. Holkar College, Indore (M.P.)

Professor & Head
Dept.of Microbiology
Govt. Holkar College, Indore (M.P.)

# *3.7.1 MoU Report on Collaborative activities between*

## (Between Govt. Holkar (Autonomous Model) Science College, Indore)

## &

## (Bherulal Patidar Govt. P. G. college, MHOW)

**REPORT OF ACTIVITY :**

**Empowering Diversity in Science: IUPAC Global Women's Breakfast - A Transformative Event as an MoU partner.**

**Date: 16.02.2022**

Bheru Lal Patidar Government PG College MHOW orchestrated a momentous International webinar in collaboration with the International Union of Pure and Applied Chemistry (IUPAC) on February 16, 2022. This global event, aptly titled "IUPAC Global Women's Breakfast: Empowering Diversity in Science," marked a significant stride towards celebrating the achievements of women in the realm of science and inspiring future generations to embrace science careers.

**Collaborative Efforts and Coordinated Event:**

The event was masterfully coordinated by the Association of Chemistry Teachers (ACT), in partnership with the Homi Bhabha Centre for Science Education, Mumbai, India.

This extraordinary initiative was steered by the Chemical Association and the Department of Chemistry, operating under the umbrella of the Internal Quality Assurance Cell (IQAC) and the World Bank's MPHEQIP's academic excellence initiative.

**Global Women's Breakfast: A Unifying Endeavor:** The Global Women's Breakfast, an annual event held in conjunction with the UN Day of Women and Girls in Science, occurred on a single day in February.

Its overarching goal was to recognize and celebrate the contributions of women in science while igniting a passion for scientific pursuits among the younger generation.

**The 2022 theme, "Empowering Diversity in Science," aimed to address gender imbalances in the field.**

Participants from diverse science organizations globally, irrespective of their field of specialization, united to share breakfast experiences either virtually or in-person.

**Fostering Gender Equality:** Beyond celebration, the event had a profound mission - to build a robust network of both men and women devoted to dismantling gender disparities in science. A key focus was to establish

connections at local, regional, and international levels, facilitating the exchange of ideas and strategies to drive progress.

**Influence of Advisory Partners:** The Department of Chemistry, Government Holkar Science College, Indore, played a pivotal role in the event as part of the advisory board.

This involvement was a testament to the effective execution of an initiative stemming from an MOU, contributing to the broader vision of equality in science.

**Positive Reception and Lasting Impact:**The event's profound impact was palpable, resonating with participants across the board.

**Dr. Anamika Jain, Professor and Head, Govt. Holkar (Model Autonomous) Science College, Indore, emerged as a key member of the advisory committee, exemplifying the commitment of MOU partners.**

The event not only ignited meaningful conversations but also provided a fresh perspective on advancing gender equality in science.

**Impact:**

The IUPAC Global Women's Breakfast marked a significant stride towards fostering diversity and gender equality in the realm of science. By uniting minds, sharing experiences, and championing an inclusive vision, the event heralded a brighter and more equitable future for the scientific community. The collective efforts will undoubtedly leave an indelible mark on the pursuit of gender equality in science.

***RENEWAL OF***

***MEMORANDUM OF UNDERSTANDING FOR ACADEMIC AND SCIENTIFIC COOPERATION***

***BETWEEN***

## BHERULAL PATIDAR GOVT. P.G. COLLEGE, MHOW, M.P.

## AND

## GOVT. AUTONOMOUS HOLKAR SCIENCE COLLEGE, INDORE

The representatives of ***GOVT. AUTONOMOUS HOLKAR SCIENCE COLLEGE, INDORE*** and ***BHERULAL PATIDAR GOVT. P.G. COLLEGE, MHOW, M.P.***, agree to this Memorandum of Understanding.

The Memorandum of Understanding (MOU) establishes the following:

### 1. OBJECTIVE OF THE AGREEMENT

To establish a mutually beneficial relationship built on academic and scientific cooperation.

Areas of cooperation between ***GOVT. AUTONOMOUS HOLKAR SCIENCE COLLEGE, INDORE*** and ***BHERULAL PATIDAR GOVT. P.G. COLLEGE, MHOW, M.P.*** include the exchange of researchers, students, publications, academic programs and research projects.

### 2. GOALS AND FORMS OF COOPERATION

The signing institutions agree to provide opportunity, as appropriate, for the following activities towards the completion of the objective of this MOU.

1. Exchange of students and / or researchers with the objective of offering courses and realizing research projects in area mutually agreed upon by both institutes through prior invitation and in accordance with the procedures and expectation established by each institute and specific department.
2. Exchange of books, scientific publication, study programs, academic projects, course information, seminars, conferences and any other data and information of common interest.
3. Develop joint research projects and joint publications.
4. All joint activities will be realized through the mutual agreement and clearly established conditions and mutual obligation of the appropriate institute entity.

### 3. IMPLEMENTATION OF THE MEMORANDUM OF UNDERSTANDING

The objectives of the MOU will be implemented and regulated in the following manner:

#### i. Student Exchange

a. Student and research scholars may visit the corresponding department of these institute after finalizing a mutually acceptable schedule.

b. All the expenses shall be the direct responsibility of the student concerned (subject to any agreements on payment arrangements made by either institution with its own student). These expenses include:

1. Travel expenses
2. Reprographic and internet Usage Expenses
3. Required student services fees at the host institution
4. Books and academic supplies
5. Administrative fees, if any.

#### ii. Exchange of researchers

With the objective of strengthening ties through joint projects and research activities of both institutes, the MOU allows for the creation of researcher exchange. The following conditions will apply:

c. The researchers will maintain their status as research scholars at their home institution for the duration of the exchange.
d. The researchers will be allowed to make use of the instruments and other research facilities available in various departments of these institutes after prior approval of the visiting schedule.
e. The appropriate academic department and administrative offices will assist in securing housing and other necessary arrangements for living in the host institution's city.

**iii. Research and Resources**

**BHERULAL PATIDAR GOVT. P.G. COLLEGE, MHOW, M.P.** and ***GOVT. AUTONOMOUS HOLKAR SCIENCE COLLEGE, INDORE*** promote research and realize collaborative projects, giving priority to interdisciplinary works.

**4. DURATION AND RECINDENCE OF MOU**

a. The agreement shall come into effect on 24-01-2020 Changes to this agreement shall be made by mutual consent between both institutions. In case of disagreement, the Institute wishing to depart from the agreement shall, wherever possible, give two months notice of its intention to do so. The agreement shall be reviewed after a period of five year.
b. This MOU is being signed purely with the intention of academic and scientific cooperation without any financial liabilities.

This MOU is signed by,

**Dr. SHOBHA JAIN**
**PRINCIPAL**
**B.L.P. GOVT. P.G. College, MHOW**

PRINCIPAL
B.L.P.Govt.P.G.College
MHOW

**Dr. SURESH T. SILAWAT**
**PRINCIPAL**
***GOVT. AUTONOMOUS HOLKAR SCIENCE COLLEGE, INDORE***

Principal
Govt. Model Autonomous
Holkar Science College
Indore (M.P.) Ph. 246874

In presence of the following witnesses:

1. **DR. P.K. SHARMA ,**
2. **DR. R.C. DIXIT**
   ***GOVT. AUTONOMOUS HOLKAR SCIENCE COLLEGE, INDORE***

1. **DR. PRAVEEN OJHA**
2. **DR. SANJAY SOHANI**
   **B.L.P. GOVT. P.G. College, MHOW**

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2020

## CRITERION – 3

## MoUs/Linkages/Collaborations

Techritzy Pvt. Ltd., 236 ,Clerk Colony, Indore

**Document Title:**

Students educational Visit (2020)



तमसो मा ज्योतिर्गमय

SKILL DEVELOPMENT PROGRAM
2020-21

| S. No | Component/Activities | Details |
|---|---|---|
| 1 | Name of the Department / Unit / Agency: | Department of Electronics |
| 2 | Name of the Activity: | One Day Visit/Hands-On Training on Python Technology |
| 3 | Name of the Scheme: | Hands-On Training |
| 4 | Date and Year of the Activity: | 17/12/2020 |
| 5 | Number of Students Participated in the activity: | 10 |
| 6 | Report of the Activity (in 100 words): | Python is one of the most popular programming languages in use today. To give future scope in the field of Python, the Electronics Department, Government Holkar (Model, Autonomous) Science College, Indore has organized a Hands-on Training on Python Technology at Techritzy Pvt. Ltd. Students developed some applications in Python during this activity. The industry has allowed ten students for this visit, and this visit/hands-on training is held on 17/12/2020. Mr. Sunny Raikwar has approved this event on the industry side; Dr. Suresh T. Silawat, the principal, and Dr. Netram Kaurav, have approved this event from the institution side. |

# शासकीय होल्कर विज्ञान महाविद्यालय
## इन्दौर (म.प्र.) भारत – 452 017
फोन नं. : 0731-2464074, 244049

ईलेक्ट्रॉनिकी विभाग


Date:- 03/12/2020

To,

Director,
Techritzy Pvt. Ltd.,
236 Clerk Colony,
Indore (M.P.), India

Subject: -Proposal/Permission Letter for One-Day Visit/Training in Company

Respected Sir,

The intention of this letter is to seek permission for a one-day visit/training for the students of B.Sc. Electronics request you to kindly Provide some practical education with the hands-on training session. 10 students will be part of the visit accompanied by one teacher your kind consideration regarding the same will help.

I request you to kindly confirm our student's visit/Training.

**Students List**

| S.No | Students Name | S.No | Students Name |
|---|---|---|---|
| 1 | Varsha Pandey | 6 | Pankaj Panwar |
| 2 | Vibhuti | 7 | Payal Tomar |
| 3 | Vidhi Sonavane | 8 | Piyush Jat |
| 4 | Vijay Mourya | 9 | Pradeep Patel |
| 5 | Vikram | 10 | Praveen |

Thanks for your kind corporation

Dr. Netram Kaurav
HOD
Department of Electronics
Head of the Department
ELECTRONICS
Govt. Holkar Science College
INDORE

TECHRITZY

**TechRitzy Private Limited**
Address : 236 Clerk Colony Indore
Contact : (+91)99264-90045
Website : www.techritzy.com
TAN - BPLT02776E

To,

Head,

Department of Electronics,

Govt. Holkar Science College, Indore

Subject: -Consent Letter for One-Day Industrial Visit/Training of your Students.

Dear Sir,

This is to inform you that we have cordially accepted your request for a one-day visit for a hands-on training session we are drafting a Module with the Practical session included in it.

You are requested to arrange a visit on 17/12/2020 date

Thanking you

Director

TECHRITZY PRIVATE LIMITED

| | | |
|---|---|---|
| 7 | List of Participants | Endcolsed |

**Students List**

| S.No | Students Name | S.No | Students Name |
|---|---|---|---|
| 1 | Varsha Pandey | 6 | Pankaj Panwar |
| 2 | Vibhuti | 7 | Payal Tomar |
| 3 | Vidhi Sonavane | 8 | Piyush Jat |
| 4 | Vijay Mourya | 9 | Pradeep Patel |
| 5 | Vikram | 10 | Praveen |

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2020

## CRITERION – 3

## MoUs/Linkages/Collaborations

Jawahar lal Nehru Institute of Corporate Social Responsibilities

**Document Title:**

Lecture by Mr. Nikhil Kumar Sarojaz on "Career in Corporate Social Responsibility and Sustainability" in the One-Day Webinar on "Placements in Pharmaceutical Industries"

Office of the Principal
**Govt. (Model Autonomous) Holkar Science College**
**Indore (M.P.)**
✆ 0731-2464074(O), 2446806, 2764027 (Exam)
e-mail : principalhsc@rediffmail.com, Web Address: www.collegeholkar.org
(Re-accredited 'A' Grade by NAAC)

# Memorandum of Understanding

Date:-

for Academic Cooperation

Between

Jawaharlal Nehru Institute of Corporate Social Responsibility

**(JNICSR)**

(JNICSR FOUNDATION)

Office no: 322, Vardhman Sunrise Plaza, Vasundhara Enclave, Delhi – 110096

and

**Government Holkar Science College, Indore**

(State University, Government of MP, established under the Act 2015 (2 of 2016)A B. Road, near Bhawarkua Square, Indore, Madhya Pradesh 452001

## Memorandum of Understanding (MoU)

Jawaharlal Nehru Institute of Corporate Social Responsibility (JNICSR)(herein aftercalled the 'MoU') is made on this 24th August 2020

Office of the Principal

**Govt. (Model Autonomous) Holkar Science College**
**Indore (M.P.)**

✆ 0731-2464074(O), 2446806, 2764027 (Exam)

e-mail : principalhsc@rediffmail.com, Web Address: www.collegeholkar.org

(Re-accredited 'A' Grade by NAAC)

BETWEEN

Date:

Jawaharlal Nehru Institute of Corporate Social Responsibility (JNICSR), a statutory body under JNICSR FOUNDATION, having its headquarters at Office no: 322 Vardhman Sunrise Plaza, Vasundhara Enclave, Delhi - 110096 represented through its Founder/President,Prof.NIKHIL KUMAR, hereinafter referred to as"JNICSR" (which expression shall, unless excluded by or repugnant to the context be deemed to include its successors in office, representative, administrators, and assigns) of the ONE PART

AND

Government Holkar Science College, Indore, A.B Road, near Bhawarkua Square,Indore, Madhya Pradesh 452001, (which expression shall, unless excluded by orrepugnant to the context be deemed to include its successors in office, representative, administrators, and assigns) of the SECOND PART

Whereas both the Institutions (JNICSR & Government Holkar Science College, Indore) haveidentified the following areas of mutual co-operations:

(i)Introducing 2 Week Online Certificate Programme (Course) in Corporate Social Responsibility (CSR).

(ii)Duration will be 2 Week.

(iii)Extending co-operation in developing curriculum and jointly conducting 2week Online Certificate Programme in Corporate Social Responsibility (CSR).

(iv)Extending co-operation in jointly conducting 2 week Online CertificateProgramme in Corporate Social Responsibility (CSR) for the benefit of the membersand students.

(v)For promoting and conducting for 2 week Online Certificate Programme inCorporate Social Responsibility (CSR) (Courses) at College level (Graduation level)designed by JNICSR for enhancing employable skills of the students

(vi)JNICSR will conduct 2 hrs classes twice a week.

(vii)Zoom Classes or any other live classes platform will be use by JNICSR forvirtual classroom.

(viii)JNICSR will be allowed to sign MOU with Institutions and organisations forpropagation of CSR.

(ix)Our services will be available for all.

(x)Government Holkar Science College will always be a priority ofJNICSR.

(xi)Government Holkar Science College and JNICSR will always work jointly for the research for the sector of CSR. And allow student to participate into it. So that our students will get more exposure.

**Renewal, Review, Revenue Sharing, Termination etc.:**

(i)This MoU shall be valid initially for a period of five years and may be extendedfurther on mutually agreed terms and conditions.

(ii)This MoU shall be subjected to review each year by both the Institutions jointly.

ii) This MoU may be terminated upon mutual understanding serving a notice of 90

Office of the Principal

**Govt. (Model Autonomous) Holkar Science College**
**Indore (M.P.)**

✆ 0731-2464074(O), 2446806, 2764027 (Exam)
e-mail : principalhsc@rediffmail.com, Web Address: www.collegeholkar.org
(Re-accredited 'A' Grade by NAAC)

Date:-

**Eligibility:** The Students who have passed/appearing 12th (10+2) examination are eligible to take admission in Foundation (Entry Level) of CAT Course.

**Mode of Examination:** Multiple choice question (MCQ) to be answered on-line.

**IN WITNESS WHEREOF** reading understanding terms and conditions we agreed on this agreement with sound body and mind without instigation of any one.

Signed on behalf of-
Jawaharlal Nehru Institute of Corporate Social Responsibility (JNICSR)

Nikhil Kumar
Founder/President

Signed on behalf of-
Government Holkar Science College, Indore, A.B. Road, near Bhawarkua Square, Indore, Madhya Pradesh 452001

Dr. Suresh T Silawat
Director

In the presence of witnesses as under:

1. Dr. Mahender Kumar
(Retd. Under Secretery, UGC, New Delhi) Chairman, JNICSR

In the presence of witnesses as under:

Capt. Prof. Dr. Sanjay Vyas
Professor, and Incharge Placement Cell
Government Holkar Science College

Office of the Principal

**Govt. (Model Autonomous) Holkar Science College**
**Indore (M.P.)**

✆ 0731-2464074(O), 2446806, 2764027 (Exam)
e-mail : principalhsc@rediffmail.com, Web Address: www.collegeholkar.org
(Re-accredited 'A' Grade by NAAC)

ANNEXURE

Date:-

**(A) Deliverables by JNICSR:**

- Awarding the 2 Week Online CSR Course
- Designing Curriculum
- Developing and providing Study Materials
- Providing Webinars, PPTs, Lecture notes
- Conducting Online Mock Test
- Model question Bank
- Conducting Examination Online
- Joint Certification
- Providing PPT, Lecture Notes to the students
- Providing Webinars to the students
- Branding / Marketing of the Course
- Publicity of the Course through JNICSR Website, Journals, Bulletins, flyers, various events/ programmes organized by JNICSR
- JNICSR will also Promote Holkar Science College in our all the social and local platforms.

(B) **Expectations from Government Holkar Science College, Indore, A.B. Road, near Bhawarkua Square, Indore, Madhya Pradesh 452001:**

- Promotion of Course
- Online Ads Printing and exhibitions of Banner / Hoardings.
- Online and offline Branding / Marketing of the Courses
- Must announce **JNICSR** Association on **Holkar Science College, Indore** official website and other social network as Notification.
- Administrative Support, if required

**ABOUT THE COURSES**

**CSR Course**
**Objective:**
To meet the huge demand for entry level CSR Executives in India, JNICSR has launched ashort term Exclusive Course - Certificate in Corporate Social Responsibility (2 Week CCSR)for 12th (10+2) passed, Under Graduates, Post Graduates and for the budding professionals.
CSR Act has been introduced by Ministry of Corporates Affairs, Government of India in2013. CSR equip students become well versed and create understanding for the sector ofCSR. Where if any student will pursue their career in future, he or she will get en less opportunities.

# GOVERNMENT HOLKAR (MODEL, AUTONOMOUS) SCIENCE COLLEGE
Indore (M.P.) INDIA
(NAAC Accredited "A" Grade College)





## One Day Webinar on
## "Placements in pharmaceutical industries and corporate responsibilities"
By Placement Cell

**Date: 18 August, 2020 and Time: 5:00 to 6:00 PM**

**Director**
**Dr. Suresh T Silawat**
Additional Director,
Higher education and
Principal, Govt
Holkar Science
College, Indore

**Co-ordinator**
**Capt Dr. Sanjay Vyas**
Professor & Incharge
Placement Cell

**Organising Secretaries:**
Dr. Kanta Mulchandani
Dr. Swarna Tanwani
Dr. Netram Kaurav

**Organising Committee:**
Dr. Deepti Khare
Prof. Anuja Sharma
Mrs. Ranjeeta Prajapati
Ms. Neha Sharma
Mr. Dileep Jacob



**Mr. Satish Yadav**
Director
Head Site Quality Control,
Cipla Pharmaceuticals,
Limited, Pithampur.
**Topic: "Career in pharmaceutical industry : biggest hope"**



**Mr. Nikhil Kumar Sarojaz**
Chairman Founder,
Editor, Researcher,
Educationist, Entrepreneur,
Philanthropist. New Delhi
**Topic: "Career in corporate social responsibility and sustainability"**

**E- certificate will be issued**

**Registration : FREE**

**Online Platform : Zoom Meeting Application**

**Last date of Registration: 17 Aug, 2020 up to 5 pm.**

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2020

## CRITERION – 3

## MoUs/Linkages/Collaborations

Department of Geography, MLSU,Udaipur, Rajasthan

**Document Title:**

Procurement of equipment, software, furniture, books, data etc., Appointment of Staff in the collobrative research project

# मोहनलाल सुखाड़िया विश्वविद्यालय, उदयपुर
## MOHANLAL SUKHADIA UNIVERSITY: UDAIPUR
NAAC ACCREDITED 'A' GRADE STATE UNIVERSITY

No.F./RUSA/Gen/MLSU/2020/ 6366

Dated : 25-06-2020
6/07

## ORDER

With reference to request submitted by Nodal Officer RUSA, MLSU, Udaipur in reference to letter No. F30(16)SPD/RUSA/2016/178 dated 31 March, 2020 of SPD, I am directed to convey administrative sanction for Research and Innovation project under component 10 or RUSA 2.0 of MHRD as per details given below:

| S.No. | Department | Principal Investigator | Co-Investigator | Project Title | TOTAL Amount Sanctioned | Ist Instalment |
|---|---|---|---|---|---|---|
| 1 | Geography | Dr. D.S. Chouhan | Prof. Seema Jalan, Dr. Shailesh Chaure | Impact of Water Quality on Health in Vagad Region of Rajasthan: An Application in Web-GIS | 3004000 | 1502000 |

Yours faithfully,

REGISTRAR

Copy to :
1. The Dean/Director, _____
2. The Comptroller, MLSU, Udaipur
3. The Head, Department of _____
4. The Nodal Officer, RUSA-MLSU, Udaipur
5. Person Concerned
6. Guard file

DY. REGISTRAR

# Project Progress Report

# January, 2023

## *Impact of Water Quality on Health in Vagad Region of Rajasthan: An Application in Web-GIS*

**Date of Issue of Order by the University - 20-08-2020**

**Date of Issue of Financial Sanction by the University - 21-08-2020**


**Professor Seema Jalan**
**Head and Co-Principal Investigator**

**Dr. D. S. Chouhan**
**Principal Investigator**
**And Assistant Professor**

**Dr. Shailesh Chaure**
**Co-Principal Investigator**
**Government Holkar Science College, Indore (M.P)**

**Department of Geography**
**Faculty of Earth Science**
**Mohanlal Sukhadia University**
**Udaipur, Rajasthan, India, 313001**




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# Project Staff

| S. No. | Status | Name | Designation |
|---|---|---|---|
| 1 | PI | Dr. D. S. Chouhan | Assistant Professor<br>Department of Geography<br>MLS University, Udaipur, Raj. |
| 2 | Co-PI | Prof. Seema Jalan | Professor<br>Department of Geography<br>MLS University, Udaipur, Raj. |
| 3 | Co- PI | Dr. Shailesh Chaure | Associate Professor<br>Govt. Holkar Science College<br>Indore, Madhya Pradesh |

# CONTENT


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| 4 | Work Accomplished and Objectives Achieved | 5 |
| 5 | Brief Description of the Methodology | 7 |
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1. **TITLE:** Impact of Water Quality on Health in Vagad Region of Rajasthan: An Application in Web-GIS

## 2. INTRODUCTION

### Study Area

The study area comprises of the two districts of Dungarpur and Banswara. Also the project will be covering all the tehsils and villages present in Dungarpur and Banswara districts based on Census 2011.

This project proposal is being submitted under the discipline of 'Geography' (specifically Resource Geography) but in approach, relevance and content it is interdisciplinary in nature spanning across Geography, Environment Science, Geology, Geo-Chemistry. Water quality is a major issue of the world in current scenario. A good water quality is essential to a healthy life and whole ecosystem because water quality issues influence living beings and natural environment. The proposed research will be a significant contribution to research and designing various policies related to drinking water, health and sanitation.

Water quality and health bear close inter-relationship to each other. Water quality is fundamental to human development, well-being and health. Providing access to safe water is one of the most effective instruments in promoting health. Water is not only essential to life but intimately interwoven with quality of life across the world. Access to enough clean water is crucial in everyday life for every person in the world. Changes in the quality, quantity, natural cycles of water and water systems have far-reaching impacts on all aspects of human life. As the human population continues to grow and the global clean water supply is reduced by consumption, contamination and climate change, water issues will only increase in complexity and importance.

Presently all Government organizations like Ministry of Water Resources India, World Health Organization (WHO) and various State Ground Water Departments are doing efforts to asses quality of water and monitor both surface and ground water resources. Also the causes and transmission of waterborne disease are under assessment because the quality of water, whether used for drinking, domestic purposes, food production or recreational purposes has an important impact on health. Contaminated or poor quality can cause epidemics and it can contribute to high rates of microbial infestation of water sources on large scale. Initiatives to manage and improve water quality not only supports general public health, but often promote Field survey development of the citizens. This document aims at demonstrating an approach for the assessment of water quality and its impact on health of the people living and consuming

water from sources present in the vicinity of citizens living in an area and will sets out a probable strategy adopted by Government of India and Rajasthan to manage water quality with a view to protecting and promoting human health in Vagad Region of Rajasthan.

## 3. APPROVED OBJECTIVES OF THE PROJECT

Detailed objectives of the project are as under:

(i) To assess the ground and surface water quality of Vagad Region in context of geographical and demographic characteristics of the region.

(ii) To understand the difference between ground and surface water quality in Vagad Region.

(iii) To identify the general sources of contaminants of groundwater in Vagad Region.

(iv) To identify poor water quality buffer zones using Geo-Statistical Interpolation methods in Vagad Region.

(v) To understand the impact of water quality on human health in Vagad Region.

(vi) To identify the causes and magnitude of dwindling quantity and deteriorating quality of water resource in the Vagad Region.

(vii) Conduct a Pilot Study and Survey in Dungarpur Tehsil with all the objectives related to the major project.

(viii) To generate detailed and enhanced spatio-temporal database readily accessible to common man and decision makers in form of an interactive Web-GIS based application in a user-friendly interface.

(ix) To examine the water management policy currently being followed in the Vagad Region.

(x) To suggest water harvesting and other solutions for a sustainable water supply in the Vagad Region.

(xi) To create awareness among the people of Vagad Region regarding problems related to water quality and measures of prevention.

## 4. WORK ACCOMPLISHED AND OBJECTIVES ACHIEVED

The following work was accomplished and results achieved since the beginning of the project:

- Geo Referencing of the Census 2011 Atlas Census Maps of the Vagad Region i.e. the districts of Dungarpur and Banswara.

- Geo Referencing of the Census 2011 Atlas Census Maps of all 9 individual tehsils of the districts of Dungarpur and Banswara with all the census village boundaries.
- Digitization of the Vector Boundaries of all the villages of all 9 tehsils of the districts of Dungarpur and Banswara using the above mentioned geo-referenced Census 2011 Atlas Maps into ESRI Shapefile format.
- Attribution of the above digitized approximately 2500 villages' vector polygon features of the districts of Dungarpur and Banswara with attributes viz. Village Name, Village Census Location Code, District Name, District Census Location Code, Tehsil Name, Town Name, Town Census Location Code, Village Population Census 2011 etc.
- Preparation of the vector format data of Geological Structure Layer for the Dungarpur and Banswara districts using the Geology data provided by the Geological Survey India, Bhukosh Portal.
- Preparation of the vector format data of Geomorphological Structure Layer for the Dungarpur and Banswara districts using the Geomorphology data provided by the Geological Survey India, Bhukosh Portal.
- Preparation of the vector format data of Lineament Form Layer for the Dungarpur and Banswara districts using the Lineament Form data provided by the Geological Survey India, Bhukosh Portal.
- Preparation of the vector format data of Lithology Layer for the Dungarpur and Banswara districts using the Lithology data provided by the Geological Survey India, Bhukosh Portal.
- Preparation of Dungarpur Tehsil GWD Sites point feature vector format shapefile representing the location of the GWD water quality report data sites by quarrying the "GWD Assets" GIS Layer on the Rajasthan Government Ground Water "Rajdharaa" GIS Portal and comparing the GWD Water Quality Asset Location Names written in GWD Ground Water Quality Report for Grid Analysis and identification of zones and villages in Dungarpur Tehsil with no water quality monitoring by the Ground Water Department (GWD) or water quality data is not available.
- Attribution of the above mentioned GWD Sites point feature vector shapefile with water quality attributes taken from GWD Water Quality Report, 2014 of Dungarpur.
- Preparation of vector format grid shapefile for the Vagad region consisting of individual grid cells of dimensions of 5 Km. length and 5 Km. breadth for Grid analysis to select

villages for approximately spatially even distribution of villages for Water Quality Sample Collection and Field survey under the Pilot Project Study of Dungarpur Tehsil.

- Preparation of Pilot Project Sampling Sites point feature vector format shapefile representing the location of the villages selected for the Water Quality Sample Collection and Field survey under Pilot Project Study of Dungarpur Tehsil.
- Attribution of the above prepared Pilot Project Sampling Location Site shapefile with attributes viz. Village Name, Village Census Location Code, Sample No., Sample Name, Water Testing Lab Results viz. Sample Registration No., pH, Taste, Odour, Turbidity, TDS, Hardness, Alkalinity, Chloride, Fluoride, Sulphate, Nitrate, Iron, Faecal Coliform, E. Coli level etc.
- Performing Kriging Interpolation Operation over the parameters and attribute values in the GWD Site Layer for assessment of correct interpolation method to be used for the pilot study as well as main project, also for preparation of a research paper on Comparative Study of Better Interpolation Method for Water Quality Monitoring and Prediction.
- Preparation of Survey Schedule or Questionnaire for the Pilot Project of Dungarpur Tehsil completed.
- Conducted Pilot Study Field survey and Water Sample Collection at 21 selected locations in Dungarpur Tehsil.
- Conducted Field survey and Water Sample Collection Survey in 200 villages in Banswara district.
- Organization of results of field survey data collected in field survey and results of the physico-chemical testing of water samples collected in the field by the laboratory is under progress.

## 5. BRIEF DESCRIPTION OF THE METHODOLOGY

The following points describe briefly about the methodology adopted for the project:

- Georeferencing of Census Maps 2011 for the digitization of the study area boundaries in GIS vector data format.
- Attribution of the study area vector data boundaries and village vector data boundaries with Census 2011 population and census location codes.

- Preparation of Geology, Lithology and Geomorphology vector data
- Preparation of 5km by 5km spatial grid polygon layer for the selection of the villages for conducting the field survey and field water sample collection drive in Banswara and Dungarpur districts.
- Preparation of field survey schedules for the field survey and preparation of label for the water sample bottles to be used in field.
- Recording and compilation of data collected in field survey and lab testing results of 14 water quality parameters from each surveyed location in the study area.
- Preparation of GIS point feature vector data of surveyed location in the field survey containing data from field survey and lab test results of the water samples.
- Geo-Statistical and Interpolation Analysis on the above prepared GIS point feature vector data layer of surveyed location in the field survey containing data from field survey and lab test results of the water samples.
- Compilation of the results of the analysis done.
- Preparation of Web-GIS Application with all the required functionalities and reporting tools integrated.
- Preparation of Maps Layouts and Final Project Report.

## 6. OUTCOME OF THE WORK DONE SO FAR

The following points illustrate the outcomes of the work done so far in the project:

- Geo-referencing and digitization of all the study area GIS vector data boundaries of Vagad region - Dungarpur and Banswara districts done based upon the Census 2011.
- Attribution of the digitized GIS vector data boundaries of Vagad region - Dungarpur and Banswara districts done up to the village level based upon the Census 2011.
- Preparation of the GIS vector data boundaries of the Geology, Lithology, Waterbodies and Geomorphology of the entire study area was completed.
- Preparation of the field survey Schedules and Water Samples Labels was completed.
- Conduction of the pilot survey of 21 villages of tehsil Dungarpur was completed.
- Approximately 400 water sample collected from Banswara & Dungarpur districts.
- Field survey of approximately 800 families have been completed.

## 7. PUBLICATIONS

- Research Paper Title: "Spatial Variability of Groundwater Quality Parameters With Geo-Statistical Interpolation Method Using Ordinary Kriging and GIS (Case Study: Dungarpur Tehsil, Rajasthan, India)" based on the State Ground Water Department Rajasthan Pre-Monsoon 2014 data was published in Journal of Geomatics, Vol. 16, No. 2, Oct. 2022 by Indian Society of Geomatics.

## 8. CONFERENCE, WORKSHOP AND TRAINING ORGANISED

- A three day Web-GIS Training was conducted in the Department of Geography, Mohanlal Sukhadia University, Udaipur, Rajasthan from 7$^{th}$ to 9$^{th}$ January, 2021 under RUSA 2.0 Project by Prof. Seema Jalan, Co-PI & Head of Department. Mr. Mohammed Ali S., was the resource person from Rajasthan State Remote Sensing Centre, Jodhpur (Rajasthan). Details of the training are mentioned with photographs in a separate annexure (Annexure I) with this report.

## 9. PROJECT WORK STATUS, WORK REMAINING, FUTURE WORK PLAN AND TIMELINE

| **Months (after issue of FS on 20.8.2020)** | **Targets** | **Status** | **Remarks** |
|---|---|---|---|
| November, 2020 | • Procurement of equipment, software, furniture, books, data etc.<br>• Appointment of Staff | • Completed as per priority. Will be procured as required with the progress of the project.<br>• Completed in November, 2020. | |

| | | | |
|---|---|---|---|
| March, 2021 | • Preparation of questionnaire<br>• Data collection ,compilation and preparation<br>• Field data collection and primary survey | • Completed in March, 2021<br>• Completed<br>• Pilot survey of the same has been completed in March,2021 | |
| July, 2021 | • Generation of Geospatial database<br>• Web application development | Completed | |
| Mar. 2022 | • Layer finalization, attribution and analysis as per the next phase of the project.<br>• Database creation, validation for next phase from both primary and secondary data of Dungarpur and Banswara district.<br>• Field Survey and Water Sample Collection of Banswara District. | Field Survey and Water Sample Collection of Banswara & Dungarpur District Completed.<br>Database schema creation completed.<br>Compilation of data collected in survey and water sample lab testing results. | |
| Dec. 2023 | • Preparation of GIS Vector Data Layers of Compilation of Survey and Water Quality Lab Test Results of Both Dungarpur and Banswara districts. | Remaining | Time Required 2 Month |
| Dec. 2023 | • Geo-Statistical Analysis and Project Report Preparation | Remaining | Time Required 2 Months |

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2020

## CRITERION – 3

## MoUs/Linkages/Collaborations

Govt. Mata Jijabai Girls PG College, Indore

**Document Title:**

**Two students from Govt. Mata Jijabai Girls PG College, Indore participated in Internship exchange program organized by Department of Biochemistry**



तमसो मा ज्योतिर्गमय

# MEMORANDUM OF UNDERSTANDING FOR ACADEMIC AND SCIENTIFIC COOPERATION

BETWEEN

GOVT. HOLKAR (MODEL, AUTONOMOUS) SCIENCE COLLEGE INDORE (M. P.)
AND
MATA JIJA BAI GOVT. GIRLS PG COLLEGE, MOTI TABELA , INDORE (M. P.)

The representatives of **Department Of Biochemistry, Govt. Holkar (Model, Autonomous) Science College Indore (M.P.)** and **Department Of Biochemistry, Mata Jija Bai Govt. Girls PG College, Moti Tabela , Indore (M. P.)** agree to this Memorandum of Understanding.

The Memorandum of Understanding (MOU) establishes the following:

## 1. OBJECTIVE OF THE AGREEMENT

(A) To establish a mutually beneficial relationship built on academic and scientific cooperation.

(B) Areas of cooperation between the **Department of Biochemistry, Govt. Holkar (Model, Autonomous) Science College Indore (M.P.)** and **Department Of Biochemistry, Mata Jija Bai Govt. Girls PG College, Moti Tabela , Indore (M. P.)** include the exchange of researchers, students, publications, academic programs and research projects.

(C) To conduct study tour, a mutually agreed in writing between the both departments prior commencement of this activity.

## 2. GOALS AND FORMS OF COOPERATION

The signing institutions agree to provide opportunity, as appropriate, for the following activities towards the completion of the objective of this MOU.

1. Exchange of students and/or researchers with the objective of offering courses and realizing research projects in areas mutually agreed upon by both institutes through prior invitation and in accordance with the procedures and expectations established by each institute and specific department.
2. Exchange of books, scientific publications, study programs, academic projects, course information, seminars, conferences and other data and information of common interest.
3. Develop joint research projects and joint publications.
4. All joint activities will be realized through the mutual agreement and clearly established conditions and mutual obligations of the appropriate institute entity.

विभागाध्यक्ष
जीव रसायन विभाग

Head
Department of Biochemistry
Govt. Holkar Science College, Indore

## 3. IMPLEMENTATION OF THE MEMORANDUM OF UNDERSTANDING

The objectives of the MOU will be implemented and regulated in the following manner:

i. Student Exchange
   a. Student and research scholars may visit the corresponding departments of these institutes after finalizing a mutually acceptable schedule.
   b. All the expenses shall be the direct responsibility of the student concerned (subject to any agreements on payment arrangements made by either institution with its own students). These expenses include.
      1. Travel expenses
      2. Reprographic and Internet Usage Expenses
      3. Required student services fees at the host institution
      4. Books and academic supplies
      5. Administrative fees, if any.

ii. Exchange of researchers

With the objective of strengthening ties through joint projects and research activities of both institutes, the MOU allows for the creation of researcher exchange. The following conditions will apply.

   a. The researchers will maintain their status as research scholars at their home institution for the duration of the exchange.
   b. The researchers will be allowed to make use of the instruments and other research facilities available in various department of these institutes after prior approval of the visiting schedule.
   c. The appropriate departments and administrative offices will assist in securing housing and other necessary arrangements for living in the host institutions city.

iii. Research and resources

**Department of Biochemistry, Govt. Holkar (Model, Autonomous) Science College Indore (M.P.)** and **Department Of Biochemistry, Mata Jija Bai Govt. Girls Pg College, Moti Tabela , Indore (M. P.)** remote research and realize collaborative projects, giving priority to interdisciplinary works.

## 4. DURATION AND RECINDENCE OF MOU

a. The agreement will take effect from the date of its signing and changes to this agreement shall be made by mutual consent between both institutions. In cases of disagreement, the Institute wishing to depart from the agreement shall, wherever possible, give two months' notice of its intention to do so. The agreement shall be reviewed after a period of three years.

b. This MOU is being signed purely with the intention of academic and scientific cooperation

This MOU is signed by,

HEAD
Department of Biochemistry
Govt. Holkar Science College Indore

HEAD
Department of Biochemistry
Holkar Science College, Indore

Head
Department of Biochemistry
**Govt. Holkar (Model, Autonomous) Science College Indore (M.P.)**

Principal
**Govt. Holkar (Model, Autonomous) Science College Indore (M.P.)**

&

Head
Department of Biochemistry
**Mata Jija Bai Govt. Girls PG College, Moti Tabela , Indore (M. P.)**

Principal
**Mata Jija Bai Govt. Girls PG College, Moti Tabela , Indore (M. P.)**

**In presence of the following witnesses:**

1. .....
2. .....

GOVT. HOLKAR SCIENCE COLLEGE, INDORE

DEPARTMENT OF BIOCHEMISTRY

# CERTIFICATE

The certificate is issued to **Miss Neetu Vishwakarma** of M. Sc. IV Semester, Biochemistry Department, Mata Jija Bai Govt. Girls P.G. College Indore. She has completed the internship training on "The effect of salt stress on wheat and mung seedlings" from 25/1/2020 to 12/3/2020 in Department of Biochemistry, Govt. Holkar Science College, Indore (M.P).

The certificate is issued on 9 September 2020.

Head
Department of Biochemistry
Govt. Holkar Science College,
Indore (M.P.)

HEAD
Department of Biochemistry
Holkar Science College, Indore

GOVT. HOLKAR SCIENCE COLLEGE, INDORE

**DEPARTMENT OF BIOCHEMISTRY**

# CERTIFICATE

The certificate is issued to **Miss Arwa Captan** of M. Sc. IV Semester, Biochemistry Department, Mata Jija Bai Govt. Girls P.G. College Indore. She has completed the internship training on "The effect of salt stress on wheat and mung seedlings" from 25/1/2020 to 12/3/2020 in Department of Biochemistry, Govt. Holkar Science College, Indore (M.P).

The certificate is issued on 9 September 2020.

Head
Department of Biochemistry
Govt. Holkar Science College,
Indore (M.P.)

HEAD
Department of Biochemistry
Holkar Science College, Indore

LS

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2020

## CRITERION – 3

## MoUs/Linkages/Collaborations

**Tuteja's Forensic Document Examination and Research Centre, Indore (M.P.)**

**Document Title:**

**Guest Lecture by Mr. H. S. Tuteja from Tuteja's Forensic Document Examination and Research Centre, Indore, under active collaboration between both institutes**

**H. S. TUTEJA** M.Sc.
Retd. Dy. Govt. EXAMINER OF
QUESTIONED DOCUMENTS, Kolkata
EXPERIENCE OF 48 YEARS

**S. TUTEJA** B.Sc. (Cal.)
QUESTIONED DOCUMENTS
EXAMINER 92002 40222

TUTEJA'S
FORENSIC DOCUMENTS
EXAMINATION & RESEARCH CENTRE
INDORE - Ph. 98277-77733

**FORMER**
Asstt. Central Intelligence officer, grade-I
Asstt. govt. Examiner of Questioned Documents, Dy Govt. Examiner of Questioned Documents Kolkata till 31 May 1996

**CRIME EXHIBIT EXAMINATION**
Examined about 3000 cases containing many lacs of documents forwarded by CBI, CID of various state Govt.,Public Sector undertakings, Nationalised Banks, Autonomous bodies courts of law, Armed forces including [redacted]URULIA ARMS DROP Case involvement of Peter Blench (Danger to National Security) for Supreme Court Bail Cases.

**EVIDENCES**
About 700 times in court of India, Court Martial, Departmental Inquiries. With reference to opinion furnished.

**RESEARCH AND PUBLISHED WORK.**
Author of many Research Papers on important topics of Forensic Documents which were published in Journal of Bureau of Police Research and development CBI Bulletin and in the journal of Indian Academy of Forensic Sciences

**TRAINING**
Course Director for imparting training to Vigilance Officers of E. Rly., N.Rly., undertaking of Govt. of India ( Nationalised Banks) and Trainees of Diploma Course in Document Examination conducted by NICFS & Police Officer Trainees of various states undergoing training in Central Detective training School, Kolkata

**MEMBER.**
Indian Academy of Forensic Sciences. (IAFSc.) Asst. Editor-Journal of Indian Academy of Forensic Sciences.

**PRIVATE CASES EXAMINED**
Appox. 3000 cases examined & evidence given in 700 cases after retirement. From 1999-2015

**OUTSTANDING CASES**
Cases of Royal Family of Holkar State, Sailana, Agar,(Malwa) etc. S.B.I.,S.B.of Indore,Union Bank of India, Central Bank of India, Premier Bank, Brahmin Sahakari Bank, IDBI, LIC, MPSEB, Forest Dept., Panchayat, Cooperatives, Housing Colonies etc.

**SPECIALLY TRAINED**
In determining age of documents, signatures, writings, type writings, INK ANALYSIS etc

**BOOK UNDER PROSSESS**
1. "ABC" of Handwriting.
2. Your Forgery Proof Signature.

[redacted]

30.03.2019

## MEMORANDUM OF UNDERSTANDING

between

**TUTEJA'S FORENSIC DOCUMENT EXAMINATION AND RESEARCH CENTRE, INDORE (M.P.)**

and

**DEPARTMENT OF FORENSIC SCIENCE**
**GOVT. HOLKAR (MODEL, AUTONOMOUS) SCIENCE COLLEGE, INDORE (M.P.)**
**AFFILIATED TO DEVI AHILYA VISHWAVIDYALAYA**

Whereas the above named institutions recognize that the academic collaboration would be of mutual benefit and would provide strength in research and education. We jointly enter into a Memorandum of Understanding for the expertise sharing, training, collaborative research, promote projects/internship programs, organization of moot court, visit to court, workshops etc. for learning and training purposes of students, faculties and other associated personnel's.

This memorandum of agreement will become effective from the date of signing and will have duration of 5 years.

Mr. H.S. Tuteja
(Director)
Tuteja's Forensic Document
Examination and Research Centre,
Indore (M.P.)

Dr. Vijay R Chourey
(Professor and Head)
Department of Forensic Science
Govt. Holkar (Model, Autonomous) Science
College, Indore (M.P.)

Forensic Science Department
Govt. Holkar Science College
Indore (M.P.)

Dr. Suresh T. Silawat
(Principal)
Govt. Holkar (Model, Autonomous) Science
College, Indore (M.P.)

प्राचार्य
शासकीय आदर्श स्वशासी
होलकर विज्ञान महाविद्यालय,
इन्दौर (म.प्र.)

**H. S. TUTEJA** M Sc
Retd. Dy. Govt. EXAMINER OF
QUESTIONED DOCUMENTS, Kolkata
EXPERIENCE OF 48 YEARS

**S. TUTEJA** B.Sc. (Cal.)
QUESTIONED DOCUMENTS
EXAMINER 92002 40222



TUTEJA'S
FORENSIC DOCUMENTS
EXAMINATION & RESEARCH CENTRE
INDORE - Ph 98277-77733

**FORMER**
Asstt. Central Intelligence officer, grade-I
Asstt. govt. Examiner of Questioned Documents, Dy Govt. Examiner of Questioned Documents, Kolkata till 31 May 1996

**CRIME EXHIBIT EXAMINATION**
Examined about 3000 cases containing many lacs of documents forwarded by CBI, CID of various state Govt., Public Sector undertakings, Nationalised Banks, Autonomous bodies courts of law, Armed forces including [redacted]RULIA ARMS DROP Case [redacted]olvement of Peter Blench (Danger to National Security) for Supreme Court Bail Cases.

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Author of many Research Papers on important topics of Forensic Documents which were published in Journal of Bureau of Police Research and development CBI Bulletin and in the journal of Indian Academy of Forensic Sciences.

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Course Director for imparting training to Vigilance Officers of E Rly., N Rly., undertaking of Govt. of India ( Nationalised Banks) and Trainees of Diploma Course in Document Examination [redacted]nducted by NICFS & Police [redacted]cer Trainees of various states undergoing training in Central Detective training School, Kolkata.

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**SPECIALLY TRAINED**
In determining age of documents, signatures, writings, type writings, INK ANALYSIS etc.

**BOOK UNDER PROSSESS**
1. "ABC" of Handwriting
2. Your Forgery Proof Signature

[redacted]

## MEMORANDUM OF UNDERSTANDING

between

**TUTEJA'S FORENSIC DOCUMENT EXAMINATION AND RESEARCH CENTRE, INDORE (M.P.)**

and

**DEPARTMENT OF FORENSIC SCIENCE**
**GOVT. HOLKAR (MODEL, AUTONOMOUS) SCIENCE COLLEGE, INDORE (M.P.)**
**AFFILIATED TO DEVI AHILYA VISHWAVIDYALAYA**

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This memorandum of agreement will become effective from the date of signing and wi' have duration of 5 years.

Mr. H.S. Tuteja
(Director)
Tuteja's Forensic Document
Examination and Research Centre,
Indore (M.P.)

Dr. Vijay R Chourey
(Professor and Head)
Department of Forensic Science
Govt. Holkar (Model, Autonomous) Science
College, Indore (M.P.)

Dr. Rooplekha Vyas
(Principal)
Govt. Holkar (Model, Autonomous) Science
College, Indore (M.P.)

"Chamber No. 8-9, 1st Floor Guru Govind Sing Market, Behind, Top Khana Gurudwara
M.G. Road, INDORE - 452004

Govt. Holkar (Model, Autonomous) Science College, Indore
(M.P.) Pin - 452017
Department of Forensic Science

Memorandum of Understanding
Between
Tuteja's Forensic Document Examination and Research Centre, Indore (M.P.)
And
Department of Forensic Science, Govt. Holkar (Model, Autonomous) Science College, Indore

We jointly enter into a MOU for the Expertise sharing, training, collaborative research, promote projects/ internship programs, organization of moot courts, workshop etc for learning and training purpose of students, faculties and other associated personnel's.

Following Activity has been conducted under this:

- **Faculty Exchange/ Guest Lecture**
  Invited Resource Person:- Mr. H.S. Tuteja
  Seminar on "Job opportunities in Questioned Documents"
  Date: 15/01/2020

Govt. Holkar (Model, Autonomous) Science College, Indore
(M.P.) Pin - 452017
Department of Forensic Science

Date: - 14/01/2020

To,
Mr. H.S. Tuteja,
Document Expert,
Forensic Documents Examination & Research Centre,
Indore, (M.P.)

Subject: - Invitation letter for Expert Lecture in Questioned Document in **"Job Opportunities in Questioned Documents".**

Dear Sir,

Department of Forensic Science, Govt. Holkar (Model, Autonomous) Science College, Indore (M.P.) Pin - 452017 is going to organize an Seminar on " **Job Opportunities in Questioned Documents ".** on 15/01/2020.
We are pleased to inform you that we are inviting you as a resource person on 15/01/2020 in our Programme. We would be delighted with their presence in the Programme.

Vchourey

Dr. V.R. Chourey
HOD
Department of Forensic Science
Govt. Holkar (Autonomous, Model) Science

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2020

## CRITERION – 3

## MoUs/Linkages/Collaborations

Sai Electronics, 1508-E, Sai Vihar Colony, Rau, Indore

**Document Title:**

One-Day Visit/Training on Internship and Employment-Based Project at Sai Electronics, Indore.

कार्यालय प्राचार्य
शासकीय होलकर विज्ञान महाविद्यालय, इन्दौर
☎ 0731-2464074 ● फैक्स : 0731-2446806, 2764027
Email : principalhsc@rediffmail.com ● Web Site: www.collegeholkar.org

**Memorandum of Understanding for Academic and Industrial/academic Cooperation**
**Between**
**Department of Electronics, Government Holkar (Model Autonomous) Science College Indore (M.P.) INDIA**
**And**
**SaiElectronics, Rau, Indore**

This Memorandum of Understanding made between the department of electronics, Government Holkar (Model, Autonomous) Science College, Indore (M.P.), India and SaiElectronics, Rau, Indore (M.P.), India, agree to explore the possibilities of providing a framework for educational, technical, and industrial cooperation for students and teachers of the Department of Electronics at Government Holkar (Model, Autonomous) Science College in Indore.

The Memorandum of Understanding (MOU) establishes the following:

**SCOPE OF THE AGREEMENT**

1. To encourage academic and technological collaboration, training on advanced technologies/tools would be provided by industry faculty/staff.
2. Industry will provide pilotage for internship/major or minor projects/summer projects/projects for students.
3. In response to academic demand, the industry will give specific stream-oriented lectures.
4. Students will be permitted to tour the industry to gain a better understanding of the instrument development process.

**EXECUTION OF THE MOU:**

The Department of Electronics will be implementing a nodal department from Government Holkar (Model Autonomous) Science College, Indore side. A faculty/staff will be assigned by the proprietor from the cooperation side.

**TERM OF THE MOU:**

This MOU shall be effective upon signature by the two institutes and shall remain in force for 5 years and will be extended further on mutual understanding.

**FINANCIAL LIABILITIES**

There are no financial liabilities for either participant in implementing the MOU.

This MOU is signed by

Head of the Department
ELECTRONICS
Govt. Holkar Science College
INDORE

**Dr. Netram Kaltray, HOD,** Department of Electronics,
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

**Dr. Suresh T. Silawat, Principal**
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

प्राचार्य
शासकीय होलकर विज्ञान महाविद्यालय
इन्दौर (म.प्र.)

SAI ELECTRONICS RAU, INDORE

**Mr. S. K. Sahu, Proprietor**
SaiElectronics, Rau, Indore

**Date of Implementation**

18/09/2019

Tin. No. : 23069083942

Sai Electronics

Scientific Laboratory Instruments
(Physics, Electronic, Chemistry & Biology)
Dealers & Suppliers

**Memorandum of Understanding for Academic and Industrial/academic Cooperation**
**Between**
**Department of Electronics, Government Holkar (Model Autonomous) Science College Indore (M.P.) INDIA**
**And**
**SaiElectronics, Rau, Indore**

This Memorandum of Understanding made between the department of electronics, Government Holkar (Model, Autonomous) Science College, Indore (M.P.), India and SaiElectronics, Rau, Indore (M.P.), India, agree to explore the possibilities of providing a framework for educational, technical, and industrial cooperation for students and teachers of the Department of Electronics at Government Holkar (Model, Autonomous) Science College in Indore.

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2. Industry will provide pilotage for internship/major or minor projects/summer projects/projects for students.
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4. Students will be permitted to tour the industry to gain a better understanding of the instrument development process.

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The Department of Electronics will be implementing a nodal department from Government Holkar (Model Autonomous) Science College, Indore side. A faculty/staff will be assigned by the proprietor from the cooperation side.

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This MOU shall be effective upon signature by the two institutes and shall remain in force for 5 years and will be extended further on mutual understanding.

**FINANCIAL LIABILITIES**

There are no financial liabilities for either participant in implementing the MOU.

This MOU is signed by

Head of the Department
ELECTRONICS
Govt. Holkar Science College
INDORE

**Dr. Netram Kaurav, HOD,** Department of Electronics,
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

**Dr. Suresh T. Sikarwar, Principal**
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

प्राचार्य
शा. आदर्श उत्कृष्ट
होल्कर विज्ञान महाविद्यालय,
INDORE (M.P.)

SAI ELECTRONICS
RAU, INDORE

**Mr. S. K. Sahu, Proprietor**
SaiElectronics, Rau, Indore

**Date of Implementation**
18/09/2019

# SKILL DEVELOPMENT PROGRAM
2020-21

| S. No | Component/Activities | Details |
|---|---|---|
| 1 | Name of the Department / Unit / Agency: | Department of Electronics |
| 2 | Name of the Activity: | One-Day Visit/Training on Internship & Employment-Based Project |
| 3 | Name of the Scheme: | Visit/Training under the MOU |
| 4 | Date and Year of the Activity: | 26/11/2020 |
| 5 | Number of Students Participated in the activity: | 08 |
| 6 | Report of the Activity (in 100 words): | Government Holkar (Model, Autonomous) Science College, Indore's Electronics Department held a one-day industrial visit/training on 26/11/2020 at Sai Electronics in accordance with the Memorandum of Understanding that the firm and the college signed. The tour's objective was to help students learn employability skills and future prospects for the electronics industry. This training helped eight departmental students. The department head, Dr. Netram Kaurav, and the principal, Dr. Suresh T. Silawat, have given their approval for this visit. This visit has been approved by Mr. S.K. Sahu on behalf of company. |

शासकीय होल्कर विज्ञान महाविद्यालय
इन्दौर (म.प्र.) भारत – 452 017
फोन नं. : 0731-2464074, 244049
ईलेक्ट्रॉनिकी विभाग

Date:- 10/11/2020

To,

Director,
Sai Electronics,
1508 – E, SaiVihar Colony,
Rau, Indore,

Subject: -Proposal/Permission Letter for One-Day Visit/Training in Industry

Respected Sir,

The purpose of this letter is to request permission for a one-day visit/training. For the students of B.Sc. Electronics Employment/Learning Purpose, I request you to Kindly Provide some practical education to the students about industrial procedures, Products, and facilities. The 8 students will be part of the trip accompanied by one teacher. Your kind consideration of our request will help.

I request you to kindly confirm our student's visit/Training.

**Students List**

| S.No. | Students Name | S.No. | Students Name |
|---|---|---|---|
| 1 | Atanu Pal | 5 | Tulshi Hattel |
| 2 | Kripanshu Nagle | 6 | Vibhuti Bhagat |
| 3 | Sakshi Panwar | 7 | Rahul Nagle |
| 4 | Rupali Thakre | 8 | Abhishek Rai |

Thanks for your kind corporation

Received

SAI ELECTRONICS RAU INDORE

O/C

Dr. Netram Kaurav
HOD
Department of Electronics

विभागाध्यक्ष
इलेक्ट्रानिकी विभाग
शा. होलकर विज्ञान महाविद्या.
इन्दौर

Tin. No. : 230690839

Sai Electronics

Scientific Laboratory Instrumen
(Physics, Electronic, Chemistry & Biolog
Dealers & Supplie

To,

Head,

Department of Electronics,

Govt. Holkar Science College, Indore

Subject: -Consent Letter for One-Day Visit of your Students.

Dear Sir,

As per your request regarding the one-day visit training to fill the bridge between technical concepts taught in curriculum and industry applied concepts. Also, preparing for a good industrial experience.

You're requested to arrange a visit on 26/11/2020 date

Thanking you

SAI ELECTRONICS RAU, INDORE

1508 - E, Sai Vihar Colony, Rau, Indore - 453 331 (M.P.) Mob.: 9993936902
E-Mail : saielectronics83@gmail.com

| | | |
|---|---|---|
| 7 | List of Participants | Enclosed |

**Students List**

| S.No. | Students Name | S.No. | Students Name |
|---|---|---|---|
| 1 | Atanu Pal | 5 | Tulshi Hattel |
| 2 | Kripanshu Nagle | 6 | Vibhuti Bhagat |
| 3 | Sakshi Panwar | 7 | Rahul Nagle |
| 4 | Rupali Thakre | 8 | Abhishek Rai |

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2020

## CRITERION – 3

## MoUs/Linkages/Collaborations

National Dong Hwa University, Hualien, Taiwan

**Document Title:**

National Conference on Physics and Chemistry of Materials: Keynote Speaker: Prof. Y-R Ma, National Dong Hwa University, Hualien, Taiwan

# MEMORANDUM OF UNDERSTANDING
# BETWEEN
# GOVERNMENT HOLKAR SCIENCE COLLEGE INDORE, INDIA
# AND
# NATIONAL DONG HWA UNIVERSITY, TAIWAN, R.O.C.

In the spirit of international understanding, Govt. Holkar Science College Indore, India, and National Dong Hwa University, Taiwan, R.O.C., agree to examine the possibility of establishing a framework for educational and research cooperation for our students, faculty and staff.

In preparation for establishing a formal framework for future activities, the parties hereto agree as follows:

1. Explore possibilities for faculty and staff exchanges for research, lectures, and discussions that mutually benefit both institutions;
2. Explore the feasibility of student exchanges and study programs;
3. Seek support for projects determined to be mutually beneficial to both institutions;
4. The terms of joint activities and arrangements for specific visit, exchanges, and other forms of cooperation will be agreed upon in writing prior to the initiation of any activity. Any commitment of resources, financial or otherwise, in support of these activities must be contained in subsequent specific agreements;
5. While no binding commitments have been made, we sign this Memorandum of Understanding in recognition of our common interests and agree to consult periodically concerning the status of our collaboration;
6. This understanding is done in two identical copies, both in English, by authorized representatives of each institute, and both parties will retain one copy of the memorandum.

**For Govt. Holkar Science College Indore, India**

10/04/19

Dr. Suresh Silawat

Principal

Date: 10 April 2019

**For National Dong Hwa University, Hualien County, Taiwan, R.O.C.**

Dr. Han-Chich Chao

President

Date: 10 April 2019

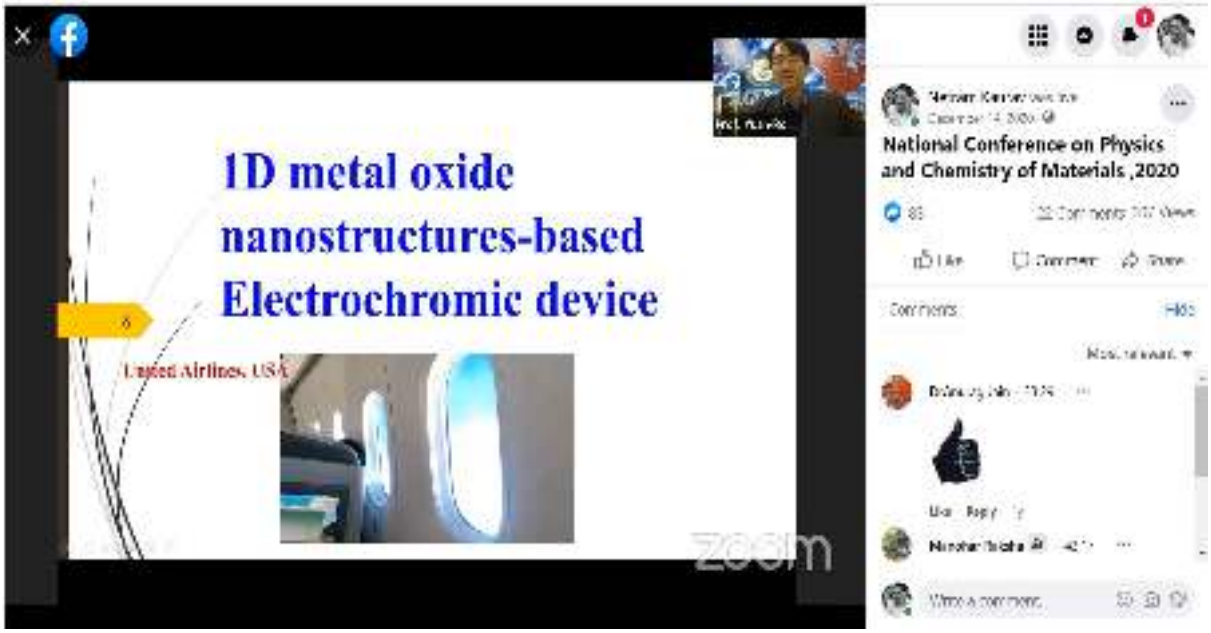
# RESEARCH METHODOLOGY/ SKILL DEVELOPMENT PROGRAM
# 2020-21

| S. No | Component/Activities | Details |
|---|---|---|
| 1 | Name of the Department / Unit / Agency: | Department of Physics |
| 2 | Name of the Activity: | National Conference on Physics and Chemistry of Materials |
| 3 | Name of the Scheme: | Under the MOU with National Dong Hwa University, Hualien, Taiwan |
| 4 | Date and Year of the Activity: | 14/12/2020 to 16/12/2020 |
| 5 | Number of Students Participated in the activity: | 219 |
| 6 | Report of the Activity (in 100 words): | The Government Holkar (Model, Autonomous) Science College in Indore's department of physics hosted a three-day national conference on the physics and chemistry of materials. This conference was run entirely online. This conference has given us the perfect forum and chance to discuss research ideas with distinguished academics, businesspeople, scientists, and policymakers working in the various branches of science and technology. The conference's focus has included advances in both basic and applied science and technology. This conference included a wide range of topics in the physics and chemistry of materials, including computational physics, thin-film technology, solar energy, nanomaterials, condensed matter physics, and materials chemistry, among others.<br>Dr. Suresh T. Silawat, Additional Director and Principal of Govt. Holkar Science College in Indore, opened the conference. Prof. Yuan-Ron Ma of National Dong Hwa University in Hualien, Taiwan, led the first session. The Conference's chairman, conveners, and organising secretaries were Dr. G.D. Gupta (HOD, Department of Physics), Dr. RC Dixit, Dr. Netram Kaurav (HOD, Department of Electronics), and Dr. Kmal Kumar Choudhary, IMA Dehardun. |

| 7 | Photo of Activity: |
|---|---|

https://www.facebook.com/1095451055/videos/10219732949969658/



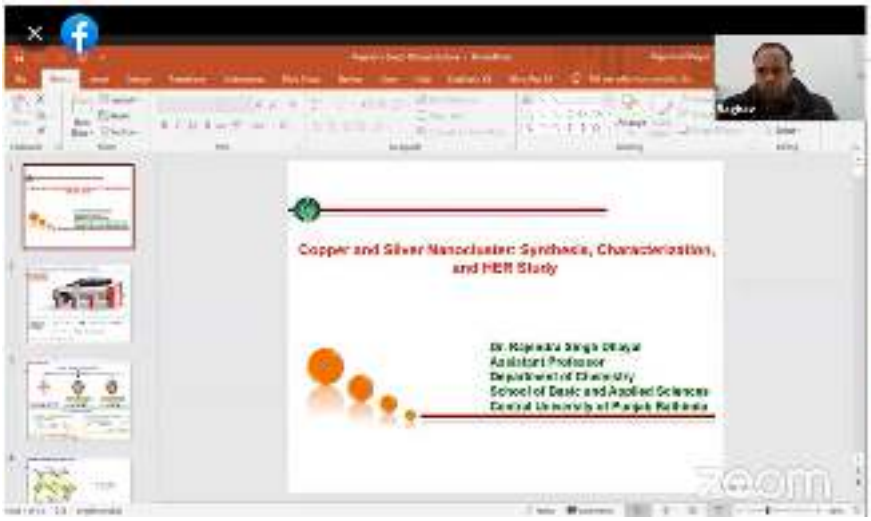



https://www.facebook.com/1095451055/videos/10219740710403664/



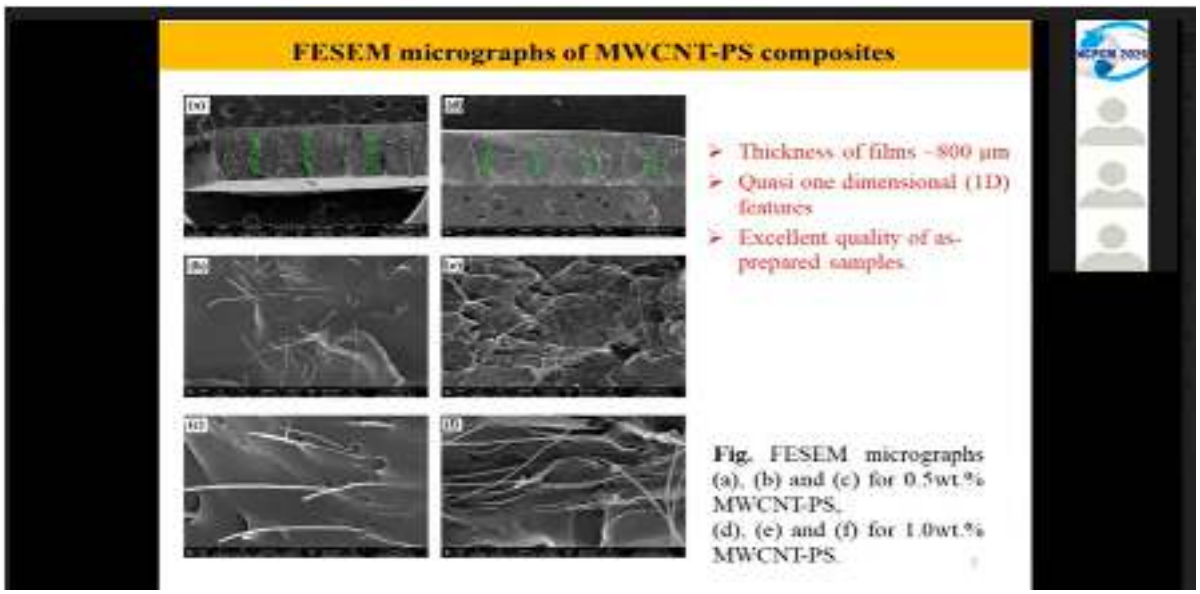













| | |
|---|---|
| 8 | Poster of Activity |




# ONLINE MODE!






Chief Patron
Dr. Suresh T. Silawat,
Additional Director, Indore Division
Principal, Govt. Holkar [Model, Autonomous]
Science College, Indore (MP)-INDIA

AIP
American Institute of Physics

## National Conference on Physics and Chemistry of Materials

14th - 16th December, 2020, Indore - India

Department of Physics, Govt. Holkar Science College, Indore

Important Dates

Registration Deadline
15st Nov., 2020

Paper Submission Deadline
20th Oct., 2020

## CONFERENCE WILL COVER FOLLOWING TRACKS :-

- Track#1: Nano Materials and Thin Film Technology
- Track#2: Phase Transition and Mechanical Properties of Materials
- Track#3: Semiconductor & Dielectric Material
- Track#4: Plasma Physics, Photonic materials & Plasmonics
- Track#5: Physics and Chemistry of Noval Materials
- Track#6: Organic, Inorganic & Biomaterials and their Chemistry
- Track#7: Electronic Structure & Phonons
- Track#8: Superconductivity, Magnetism & Spintronics
- Track#9: Computational methods in Physics and Chemistry
- Track#10: Glasses & Ceramics, Composites Materials




via link click here

Click here to visit
646 NCPCM2020

via link click here

| Session | Time Slot | Presenter Guest/ Chair/ Speaker/ Oral | Zoom Meeting |
|---|---|---|---|
| **14th Dec. 2020 Monday** | | | |
| Inaugural | 10:30 am to 11:00 am | **Chief Guest:**<br>Chief Patron: **Dr. Suresh T. Silawat**,<br>Additional Director Higher Education, Indore Division<br>Principal, Govt. Holkar Science College, Indore<br>Conf. Chairman: **Dr. G. D. Gupta**, Govt. Holkar Science College, Indore<br>Conf. Convener: **Dr. R. C. Dixit**, Govt. Holkar Science College, Indore<br>Organizing Secretaries:<br>**Dr. Netram Kaurav**, Govt. Holkar Science College, Indore<br>**Dr. Kmal Kumar Choudhary**, IMA Dehardun<br>Technical Co-ordinator:<br>**Prof. Sagar Sen**, Maharaja Bhoj Government PG College, Dhar | Join Zoom Meeting<br>https://us02web.zoom.us<br><br>Meeting ID: 895 5269 0090<br>Passcode: 043266 |
| Invited Talk | 11:00 am to 11:40 am<br>11:40 am to 12:20 pm | Session Chair: **Dr. Rupesh Devan**, Indian Institute of Technology, Indore.<br>Co-chair: **Dr. Pradeep Sharma**, Govt. Holkar Sci. College, Indore<br>Keynote Speaker: **Prof. Yuan-Ron Ma**, National Dong Hwa University, Hualien, Taiwan<br>Invited Speaker: **Dr. Sanjay Singh**, School of Mat. Sci. & Tech., IIT (BHU)<br>Technical Co-ordinators:<br>(1) **Dr. Bhawna Chourasia**, Govt. Holkar Sci. College, Indore<br>(2) **Prof. Vinod Rathore**, Govt. Holkar Sci. College, Indore | Join Zoom Meeting<br>https://us02web.zoom.us<br><br>Meeting ID: 895 5269 0090<br>Passcode: 043266 |
| Parallel Session I | 01:00 pm to 03:00 pm | Session Chair: **Dr. V. V. S. Muthy**, Science College, Dewas<br>Judge I: **Dr. Vandana Rathore**, School of Engineering & Technology, Jagran Lakecity University Bhopal<br>Judge II: **Dr. Ravindra Kinge**, Smt G G Khadse College Muktainagar Dist Jalgaon Maharashtra.<br>Technical Co-ordinators:<br>(1) **Prof. Sagar Sen**, Maharaja Bhoj Government PG College, Dhar<br>(2) **Dr. Prasad Deshpande**, Govt. Holkar Sci. College, Indore<br>Track#1: Nano Materials and Thin Film Technology<br>List of Oral Presentations: NCPCM-1011, 1018, 1027, 1034, 1041, 1044, 1045, 1051, 1061, 1064, 1068, 1073, 1078 | Join Zoom Meeting<br>https://us02web.zoom.us<br><br>Meeting ID: 895 5269 0090<br>Passcode: 043266 |
| Parallel Session II | 01:00 pm to 03:00 pm | Session Chair: **Dr. Jitendra Tripathi**, IPS Academy, Indore<br>Judge I: **Dr. Swati Goyal**, Girls PG College, Indore<br>Judge II: **Dr. Ravi Vanspal**, SVVV, Indore<br>Technical Co-ordinators:<br>(1) **Dr. Jaiveer Singh**, IPS Academy, Indore<br>(2) **Dr. Vinay Dashore**, Govt. Holkar Sci. College, Indore<br>Track#2: Phase Transition and Mechanical Properties of Materials<br>List of Oral Presentations: NCPCM-1025, 1037, 1055, 1059, 1186, 1222, 1226, 1233, 1261<br>Track#3: Semiconductor & Dielectric Material<br>List of Oral Presentations: NCPCM-1012, 1040, 1049, 1050 | Join Zoom Meeting<br>https://us02web.zoom.us<br><br>Meeting ID: 865 1170 9510<br>Passcode: 600093 |
| Parallel Session III | 01:00 pm to 03:00 pm | Session Chair: **Dr. Venkat Raman**, PMB Gujrati Science College, Indore<br>Judge I: **Dr. Srimathy B**, Indian Institute of Handloom Technology, Salem<br>Judge II: **Dr. Supragan Thakur**, SVVV, Indore<br>Technical Co-ordinators:<br>(1) **Prof. Aadish Jain**, Swami Vivekanand Government College, Susner<br>(2) **Dr. Saleem Malla**, Govt. Holkar Sci. College, Indore<br>Track#5: Physics and Chemistry of Noval Materials<br>List of Oral Presentations: 1007, 1014, 1020, 1023, 1024, 1031, 1047, 1065, 1075, 1083, 1098, 1107 | Join Zoom Meeting<br>https://us02web.zoom.us<br><br>Meeting ID: 856 5017 4365<br>Passcode: 028125 |
| Parallel Session IV | 03:30 pm to 05:30 pm | Session Chair: **Dr. Uttam Sharma**, SVVV, Indore<br>Judge I: **Dr. Rajesh Thakur**, Jawahar lal Nehru College, Bhopal<br>Judge II: **Dr. Rajesh Kumar**, Indira Gandhi National Tribal University, Amarkantak<br>Technical Co-ordinators:<br>(1) **Prof. Ravi Rathore**, Govt JNS PG College Shujalpur<br>(2) **Mrs. Poornima Karil**, Govt. Holkar Sci. College, Indore<br>Track#1: Nano Materials and Thin Film Technology<br>List of Oral Presentations: NCPCM-1081, 1086, 1090, 1092, 1097, 1099, 1106, 1108, 1114, 1115, 1116, 1119, 1165 | Join Zoom Meeting<br>https://us02web.zoom.us<br><br>Meeting ID: 895 5269 0090<br>Passcode: 043266 |
| Parallel Session V | 03:30 pm to 05:30 pm | Session Chair: **Dr. Nishchhal Yadav**, Vikram University, Ujjain<br>Judge I: **Dr. Shweta Mishra**, SVVV, Indore<br>Judge II: **Dr. Prasant Thapliyal**, IMA Deharadun<br>Technical Co-ordinators:<br>(1) **Dr. Paras Dubey**, SAGE University, Indore<br>(2) **Prof. Suraj Parwani**, Govt. Holkar Sci. College, Indore<br>Track#3: Semiconductor & Dielectric Material<br>List of Oral Presentations: NCPCM-1079, 1084, 1101, 1103, 1123, 1128, 1149, 1206, 1209, 1214, 1215, 1269 | Join Zoom Meeting<br>https://us02web.zoom.us<br><br>Meeting ID: 865 1170 9510<br>Passcode: 600093 |
| Parallel Session VI | 03:30 pm to 05:30 pm | Session Chair: **Dr. P. Murlidhar Reddy**, Osmania University, Hedrabad<br>Judge I: **Dr. Sheetal Shrimal**, Govt. PG College, Mandsaur<br>Judge II: **Dr. Pooja Singh**, College of Technology and Engineering, Udaipur<br>Technical Co-ordinators:<br>(1) **Dr. Jitendera Solanki**, Government College, Manawar<br>(2) **Prof. Vishal Tandan**, Govt. Holkar Sci. College, Indore<br>Track#6: Organic, Inorganic & Biomaterials and their Chemistry<br>List of Oral Presentations: NCPCM-1015, 1052, 1057, 1062, 1076, 1089, 1110, 1126, 1127, 1133, 1141, 1145, 1249 | Join Zoom Meeting<br>https://us02web.zoom.us<br><br>Meeting ID: 856 5017 4365<br>Passcode: 028125 |
| ***Note: All the papers will be presented orally for 7 minutes and 3 minutes for discussions. Increasing order of manuscript will be followed for presentation. Join the Zoom meeting before 15 minutes. Please follow all the instructions of online presentation etiquette.*** | | | |

| 15th Dec. 2020 Tuesday | | | |
|---|---|---|---|
| Invited Talk | 11:00 am to 11:40 am<br>11:40 am to 12:20 pm | Session Chair: **Dr. Susheel Kalia**, IMA Dehradun<br>Co-chair: **Dr. Nagesh Dagaonkar**, Govt. Holkar Science College, Indore<br>Invited Speaker: **Dr. Pradip Paik**, School of Biomedical Engineering IIT BHU<br>Invited Speaker: **Dr. Rajendra Singh Dhayal**, Central University of Punjab, Bathinda<br>Technical Co-ordinators:<br>(1) **Dr. Shubhangi Soni**, Govt. Holkar Sci. College, Indore<br>(2) **Dr. Saligram Verma**, Govt. Holkar Sci. College, Indore+D15 | Join Zoom Meeting<br>https://us02web.zoom.us<br><br>Meeting ID: 841 5487 2078<br>Passcode: 604403 |
| Parallel Session I | 01:00 pm to 3:00 pm | Session Chair: **Dr. Manoj Rathore,** MPCST, Bhopal<br>Judge I: **Dr. Neetu Parsai**, Govt. College, Badwah<br>Judge II: **Dr. Tanmoy Chakrabarty,** National Institute of Chemical Physics and Biophysics (NICPB), Tallinn<br>Technical Co-ordinators:<br>(1) **Prof. Pyush Joshi**, Govt. Holkar Sci. College, Indore<br>(2) **Dr. Prasad Deshpande**, Govt. Holkar Sci. College, Indore<br>Track#1: Nano Materials and Thin Film Technology<br>List of Oral Presentations: NCPCM-1121, 1124, 1125, 1139, 1140, 1142, 1146, 1151, 1153, 1164, 1166, 1167, 1291 | Join Zoom Meeting<br>https://us02web.zoom.us<br><br>Meeting ID: 841 5487 2078<br>Passcode: 604403 |
| Parallel Session II | 01:00 pm to 03:00 pm | Session Chair: **Dr. Prerana Sharma**, UEC, Ujjain<br>Judge I: **Dr. Apramita Chand**, National Institute of Science Education and Research, Bhubaneswar<br>Judge II: **Dr. Aparna Agrawal**, Govt Shri Nilkantheshwar PG College, Khandwa<br>Technical Co-ordinators:<br>(1) **Dr. Jitendra Solanki**, Government College, Manawar<br>(2) **Dr. Vinay Dashore**, Govt. Holkar Science College, Indore<br>Track#3: Semiconductor & Dielectric Material<br>List of Oral Presentations: 1272, 1280<br>Track#8: Superconductivity, Magnetism & Spintronics<br>List of Oral Presentations: NCPCM-1063, 1087, 1104, 1111, 1131, 1161, 1173, 1179, 1228, 1239, 1277, 1289 | Join Zoom Meeting<br>https://us02web.zoom.us<br><br>Meeting ID: 875 0138 1674<br>Passcode: 080061 |
| Parallel Session III | 01:00 pm to 03:00 pm | Session Chair: **Dr. B. D. Shrivastava**, Maharaja Bhoj Government PG College, Dhar<br>Judge I: **Dr. Nisha Pandey**, St. Aloysius College (autonomous) , Jabalpur<br>Judge II: **Dr. Gireesh Soni**, SGSITS, Indore<br>Technical Co-ordinators:<br>(1) **Prof. Ravi Rathore**, Govt JNS PG College Shujalpur<br>(2) **Dr. Saleem Malla**, Govt. Holkar Science College, Indore<br>Track#5: Physics and Chemistry of Noval Materials<br>List of Oral Presentations: 1113, 1130, 1157, 1174, 1176, 1183, 1212, 1216, 1240, 1244, 1268, 1275, 1284 | Join Zoom Meeting<br>https://us02web.zoom.us<br><br>Meeting ID: 891 1763 3110<br>Passcode: 645297 |
| Parallel Session IV | 03:30 pm to 05:30 pm | Session Chair: **Dr. Griraj Sharma,** Govt. PG College, Neemach<br>Judge I: **Dr. Sachin Kumar Mahajan**, Samrat Ashok Technological Institute, Vidisha<br>Judge II: **Dr. Irfan Mansuri**, Indore institute of science and technology, Indore<br>Technical Co-ordinators:<br>(1) **Ms. Disha Harinkhere**, Govt. Holkar Science College, Indore<br>(2) **Dr. Kapil Kumar Kushwaha**, Govt. Holkar Science College, Indore<br>Track#1: Nano Materials and Thin Film Technology<br>List of Oral Presentations: NCPCM-1109, 1168, 1169, 1171, 1172, 1177, 1178, 1184, 1200, 1210, 1213, 1217, 1225, 1227 | Join Zoom Meeting<br>https://us02web.zoom.us<br><br>Meeting ID: 841 5487 2078<br>Passcode: 604403 |
| Parallel Session V | 3:30 pm to 5:30 pm | Session Chair: **Dr. Rakesh Sharma**, NDA Pune<br>Judge I: **Dr. Atul Gour**, Government Kusum PG college Seoni malwa Hoshangabad, Hoshangabad<br>Judge II: **Dr. Dinesh Choudhary**, Govt. PG College, Khargone.<br>Technical Co-ordinators:<br>(1) **Dr. Mona Gupta**, Maharaja Bhoj Government PG College, Dhar<br>(2) **Dr. Ashish Mamgain**, Govt. Holkar Science College, Indore<br>Track#4: Plasma Physics, Photonic materials & Plasmonics<br>List of Oral Presentations: NCPCM-1004, 1046, 1054, 1132, 1160, 1223, 1257<br>Track#6: Organic, Inorganic & Biomaterials and their Chemistry<br>List of Oral Presentations: NCPCM- 1148, 1163, 1189, 1193, 1245, 1252, 1259, 1265, 1287 | Join Zoom Meeting<br>https://us02web.zoom.us<br><br>Meeting ID: 875 0138 1674<br>Passcode: 080061 |
| Parallel Session VI | 03:30 pm to 05:30 pm | Session Chair: **Dr. Meenu Varshney**, DAVV, Indore<br>Judge I: **Dr. Deepi Jain**, IPS Academy, Indore<br>Judge II: **Dr ANIL VITHALRAO RAUT**, Department of physics, Vivekanand Art's and Sardar Dalipsing Commerce and Science College, Aurangabad, Maharashtra INDIA<br>Technical Co-ordinators:<br>(1) **Ms. Nikita Karma**, Govt. Holkar Sci. College, Indore<br>(2) **Prof. Jaiprakash Yadav**, Govt. Holkar Sci. College, Indore<br>Track#9: Computational methods in Physics and Chemistry<br>List of Oral Presentations: NCPCM-1019, 1030, 1060, 1067, 1070, 1093, 1095, 1102, 1122, 1154, 1175, 1181 | Join Zoom Meeting<br>https://us02web.zoom.us<br><br>Meeting ID: 891 1763 3110<br>Passcode: 645297 |
| ***Note: All the papers will be presented orally for 7 minutes and 3 minutes for discussions. Increasing order of manuscript will be followed for presentation. Join the Zoom meeting before 15 minutes. Please follow all the instructions of online presentation etiquette.*** | | | |

| Session | Time Slot | Presenter Guest/ Chair/ Speaker/ Oral | Zoom Meeting |
|---|---|---|---|
| **16th Dec. 2020 Wednesday** | | | |
| Invited Talk | 11:00 am to 11:40 am<br>11:40 am to 12:30 pm | Session Chair: **Dr. J. T. Andrews**, SGSITS, Indore<br>Co-chair: **Dr. H. S. Dagar**, Govt. Holkar Science College, Indore<br>Invited Speaker: **Dr. Arvind Yogi,** UGC-DAE CSR, Indore<br>Invited Speaker: **Prof. S. I. Patil**, University of Pune, Pune<br>Technical Co-ordinators:<br>(1) **Prof. Sheetal Malviya**, Govt. Holkar Sci. College, Indore<br>(2) **Dr. Nidhi Parmar**, Govt. Holkar Sci. College, Indore | Join Zoom Meeting<br>https://us02web.zoom.us<br><br>Meeting ID: 863 6112 0283<br>Passcode: 008095 |
| Parallel Session I | 01:00 pm to 03:30 pm | Session Chair: **Dr. Ashwani Kumar**, NDA Pune<br>Judge I: **Dr. Visakha Vibute**, Sahid Chandra Shekhar Azad Govt PG College Jhabua<br>Judge II: **Dr. Sachin Kaothekar**, Mahakal Institute of Technology & Management , Ujjain<br>Technical Co-ordinators:<br>(1) **Prof. Sagar Sen**, Maharaja Bhoj Government PG College, Dhar<br>(2) **Prof. Trun Garg**, Govt. Holkar Sci. College, Indore<br>(3) **Prof. Dermendra Mewada**, Govt. Holkar Sci. College, Indore<br>Track#1: Nano Materials and Thin Film Technology<br>List of Oral Presentations: NCPCM-1234, 1235, 1242, 1247, 1253, 1254, 1258, 1260, 1263, 1264, 1266, 1276, 1278, 1281, 1286 | Join Zoom Meeting<br>https://us02web.zoom.us<br><br>Meeting ID: 863 6112 0283<br>Passcode: 008095 |
| Parallel Session II | 01:00 pm to 03:30 pm | Session Chair: **Dr. Swati Dubey,** Vikram University, Ujjain<br>Judge I: **Dr. Kirti Sahu**, SN PG College, Khandwa<br>Judge II: **Dr. Vashim Shekh,** Govt. Swami Vivekanand College, Sarangpur, Rajgarh (M.P.)<br>Technical Co-ordinators:<br>(1) **Prof. Taruna Verma**, Govt. Holkar Science College, Indore<br>(2) **Prof. Kritika Shukla**, Govt. Holkar Science College, Indore<br>(3) **Dr. Muni Prasad Mishra**, Govt. Holkar Science College, Indore<br>Track#6: Organic, Inorganic & Biomaterials and their Chemistry<br>List of Oral Presentations: NCPCM-1270, 1270, 1285<br>Track#10: Glasses & Ceramics, Composites Materials<br>List of Oral Presentations: NCPCM-1017, 1048, 1077, 1082, 1105, 1117, 1118, 1137, 1150, 1152, 1170, 1202, 1204, 1248, 1262 | Join Zoom Meeting<br>https://us02web.zoom.us<br><br>Meeting ID: 854 2679 7470<br>Passcode: 860157 |
| Parallel Session III | 01:00 pm to 03:30 pm | Session Chair: **Dr. N. P. Rajpoot**, Govt. College, Rau<br>Judge I: **Dr. Arvind Jain**, St. Paul Institute of Professional Studies, Indore<br>Judge II: **Dr. Manoj Nagar**, BLP Govt PG College, Mahow<br>Technical Co-ordinators:<br>(1) **Prof. Ashish Mamgain**, Govt. Holkar Sci. College, Indore<br>(2) **Dr. Pavitra Lodhi**, Govt. Holkar Sci. College, Indore<br>Track#7: Electronic Structure & Phonons<br>List of Oral Presentations: 1088, 1156, 1159, 1185, 1194, 1219, 1224, 1232, 1243<br>Track#9: Computational methods in Physics and Chemistry<br>List of Oral Presentations: NCPCM-1191, 1203, 1208, 1220, 1221, 1250 | Join Zoom Meeting<br>https://us02web.zoom.us<br><br>Meeting ID: 834 7844 9185<br>Passcode: 936309 |
| Valedictory | 04:00 pm to 04:30 pm | Chief Guest:<br>Chief Patron: **Dr. Suresh T. Silawat,**<br>Additional Director Higher Education, Indore Division<br>Principal, Govt. Holkar Science College, Indore<br>Conf. Chairman: **Dr. G. D. Gupta**, Govt. Holkar Science College, Indore<br>Conf. Convener: **Dr. R. C. Dixit**, Govt. Holkar Science College, Indore<br>Organizing Secretaries:<br>**Dr. Netram Kaurav**, Govt. Holkar Science College, Indore<br>**Dr. Kamal Kumar Choudhary**, IMA Dehardun | Join Zoom Meeting<br>https://us02web.zoom.us<br><br>Meeting ID: 863 6112 0283<br>Passcode: 008095 |
| ***Note: All the papers will be presented orally for 7 minutes and 3 minutes for discussions. Increasing order of manuscript will be followed for presentation. Join the Zoom meeting before 15 minutes. Please follow all the instructions of online presentation etiquette.*** | | | |

# List of Speakers

| Keynote Speaker | | |
|---|---|---|
| **Name & Designation** | | **Area of Interest** |
|  | **Prof. Yuan-Ron Ma**<br>Professor & Head Department of Physics National Dong Hwa University<br>Associate Dean Office of International Affairs National Dong Hwa University | Surface Science, Nanotechnique |
| **Invited Speakers** | | |
|  | **Dr. Sanjay Singh,**<br>Assistant Professor,<br>School of Mat. Sci. & Tech., IIT (BHU) | Heusler Compounds, Spintronics, Topological and Quantum Materials, X-ray and neutron diffraction, Magnetism, Multiferroic Device, Shape Memory Alloys, Solid State Cooling, Phase Transition. |
|  | **Dr. Rajendra Singh Dhayal**<br>Assistant Professor<br>Center for Chemical Science,<br>School of Basic and Applied Sciences, Central University of Punjab, Bathinda. | Properties of Boranes and Metallaboranes Chemistry, higher nuclearity copper polyhydride nanoclusters, super atom of silver nanoclusters and their applications in H 2 evolution. |
|  | **Dr. Pradip Paik**<br>Associate Professor<br>School of Biomedical Engineering<br>IIT BHU<br>paik.bme@iitbhu.ac.in<br>8500109932<br>8500109932 | Materials for Health Care and Therapeutic Applications: New designing and synthesis of Polymers, Ceramic, Composites, other Nanoscale Materials of Health care and Nanomedicine, in-plantable materials, Drug Delivery, Cancer Therapy, Nano vaccination, in-vitro and in-vivo studies |
|  | Dr. Arvind Yogi,<br>Scientist D,<br>UGC-DAE CSR, Indore (MP). | Strongly correlated electron systems, Superconductivity, Crystal Growth. |

| 9 | List of Participants | | |
|---|---|---|---|
| S.No | Rec. No | Email ID | Name |
| 1 | ncpcm2020/01 | kamakshi14.gehlot@gmail.com | Ms. Kamakshi Gehlot |
| 2 | ncpcm2020/02 | patelnidhin34@gmail.com | Ms. Nidhi N.Patel |
| 3 | ncpcm2020/03 | sanjaypanjabi_27@yahoo.co.in | Dr. SANJAYKUMAR H PANJABI |
| 4 | ncpcm2020/04 | alokeverma1785@gmail.com | Mr. Aloke Verma |
| 5 | ncpcm2020/05 | pppadghan5@gmail.com | Dr. Prafull Panjabrao Padghan |
| 6 | ncpcm2020/06 | sachinmgioo7@gmail.com | Dr. Sachin Kaothekar |
| 7 | ncpcm2020/07 | sammitadurga@gmail.com | Ms. S Durga Bhavani |
| 8 | ncpcm2020/08 | poojajain0425@gmail.com | Ms. Pooja jain |
| 9 | ncpcm2020/09 | mrinmoy.rs@presiuniv.ac.in | Mr. MRINMOY CHAKRABORTY |
| 10 | ncpcm2020/10 | sharmaabhishek43701@gmail.com | Mr. Abhishek Kumar |
| 11 | ncpcm2020/100 | biswajitdutta93@gmail.com | Mr. BISWAJIT DUTTA |
| 12 | ncpcm2020/101 | satyendranirvan15@gmail.com | Mr. SATYENDRA SINGH |
| 13 | ncpcm2020/102 | nidhinayakjain@gmail.com | Ms. Nidhi |
| 14 | ncpcm2020/103 | sushilnain001@gmail.com | Mr. Sushil Kumar |
| 15 | ncpcm2020/104 | fasate2sandip@gmail.com | Mr. Sandip Kadubal Fasate |
| 16 | ncpcm2020/105 | ridhorkarsd@gmail.com | Dr. B. D. RIDHORKAR |
| 17 | ncpcm2020/106 | sanjaybagade8@gmail.com | Dr. SANJAY H BAGADE |
| 18 | ncpcm2020/107 | ssukhjot01@gmail.com | Mr. Sukhjot Singh |
| 19 | ncpcm2020/108 | daspunyatoya012@gmail.com | Ms. Punyatoya Das |
| 20 | ncpcm2020/109 | monika.saxena2308@gmail.com | Ms. Monika Saxena |
| 21 | ncpcm2020/11 | nairreshma1721997@gmail.com | Ms. Reshma Ramesh Nair |
| 22 | ncpcm2020/110 | vibha220391@gmail.com | Mrs VIBHA MALVIYA |
| 23 | ncpcm2020/111 | meenalchouhan92@gmail.com | Mrs Meenal |
| 24 | ncpcm2020/112 | khushbu.gupta30691@gmail.com | Mrs Khushbu Gupta |
| 25 | ncpcm2020/113 | manvendrasingh@iitg.ac.in | Mr. Manvendra Singh Gangwar |
| 26 | ncpcm2020/114 | indmallesh@gmail.com | Mr. Rachanagouda F. Chinnappagoudra |
| 27 | ncpcm2020/115 | rahulrajthuruthi@gmail.com | Mr. Rahulraj M |
| 28 | ncpcm2020/116 | b.pilik@iitg.ac.in | Mr. Pilik Basumatary |
| 29 | ncpcm2020/117 | megha16@iiserb.ac.in | Ms. Megha Shrivastava |
| 30 | ncpcm2020/118 | pravarati18@iiserb.ac.in | Ms. Pravrati Taank |
| 31 | ncpcm2020/119 | reenapunia03@gmail.com | Mrs REENA RANI |
| 32 | ncpcm2020/12 | nupurvora94@gmail.com | Ms. Nupur P. Vora |
| 33 | ncpcm2020/120 | meena.kashyap3@gmail.com | Mrs Meena Kashyap |
| 34 | ncpcm2020/121 | soniaarora198820@gmail.com | Mrs sonia arora |
| 35 | ncpcm2020/122 | richaverma@jssaten.ac.in | Dr. Richa Verma |
| 36 | ncpcm2020/123 | sanaidu@rgukt.in | Dr. S ASIRI NAIDU |
| 37 | ncpcm2020/124 | koshal_anil@yahoo.com | Mr. Anil Kumar Koshal |
| 38 | ncpcm2020/125 | adibaeshaal@gmail.com | Ms. Adiba |
| 39 | ncpcm2020/126 | Nidhiparashar93@gmail.com | Dr. Nidhi Sharma |
| 40 | ncpcm2020/127 | nitish.nidhi75@gmail.com | Dr. Nitish Gupta |
| 41 | ncpcm2020/128 | physics.tushar@hmail.com | Mr. Tushar Kanti Bhowmik |
| 42 | ncpcm2020/129 | vidhyacbose@gmail.com | Ms. Vidhya C |
| 43 | ncpcm2020/13 | jawaher1984m@gmail.com | Mrs JAWAHER QASEM ABDULGALEEL GHALEB |
| 44 | ncpcm2020/130 | sayaribiswas@gmail.com | Ms. SAYARI BISWAS |
| 45 | ncpcm2020/131 | physics.kb@gmail.com | Mr. Konark Bisht |
| 46 | ncpcm2020/132 | nikhil.phy@ddugu.ac.in | Dr. Nikhil Kumar |
| 47 | ncpcm2020/133 | nasima.khatunf7@gmail.com | Dr. Nasima Khatun |

| | | | |
|---|---|---|---|
| 48 | ncpcm2020/134 | sahoobibhuti93@gmail.com | Mr. BIBHUTI BHUSAN SAHOO |
| 49 | ncpcm2020/135 | mukunddhikale9@gmail.com | Mr. Mukund Dnyaneshwar Dhikale |
| 50 | ncpcm2020/136 | agnel.josewilfred@gmail.com | Ms. MARY AGNEL |
| 51 | ncpcm2020/137 | anju.varun15@gmail.com | Dr. Anjali Jain Deotale |
| 52 | ncpcm2020/138 | puneet.phy@gmail.com | Ms. PUNEET KAUR |
| 53 | ncpcm2020/139 | daisysardana3@gmail.com | Ms. Deji |
| 54 | ncpcm2020/14 | ehetasamulkadir1@gmail.com | Mr. Eheta Samul Kadir |
| 55 | ncpcm2020/140 | parvathy88.nancy@gmail.com | Mrs Parvathy N |
| 56 | ncpcm2020/141 | payalnchauhan64@gmail.com | Ms. Payal Chauhan |
| 57 | ncpcm2020/142 | patelalkesh51@yahoo.co.in | Mr. Alkesh B. Patel |
| 58 | ncpcm2020/143 | amanjotk251@gmail.com | Ms. Amanjot Kaur |
| 59 | ncpcm2020/144 | santanujuphys91@gmail.com | Mr. Santanu De |
| 60 | ncpcm2020/145 | manokamna12333@gmail.com | Mrs Manokamna |
| 61 | ncpcm2020/146 | sutapadey1992@gmail.com | Ms. Sutapa Dey |
| 62 | ncpcm2020/147 | jyotishukla12@yahoo.com | Ms. Jyoti Shukla |
| 63 | ncpcm2020/148 | krishanuroy2010@gmail.com | Dr. KRISHANU ROY |
| 64 | ncpcm2020/149 | singla.anju5@gmail.com | Ms. Anju Rani |
| 65 | ncpcm2020/15 | sunilnits18@gmail.com | Mr. Sunil Kumar |
| 66 | ncpcm2020/150 | ruchikaith1204@gmail.com | Mrs Ruchi |
| 67 | ncpcm2020/151 | kaliprasannam25@gmail.com | Mr. Kali Prasanna Mondal |
| 68 | ncpcm2020/152 | p.sreedevi@ymail.com | Mrs SREEDEVI.P.D |
| 69 | ncpcm2020/153 | joshiakshay6@gmail.com | Mr. Akshay Joshi |
| 70 | ncpcm2020/154 | sanehlata0802@gmail.com | Mrs saneh lata |
| 71 | ncpcm2020/155 | sucheta.suchi@yahoo.com | Ms. Sucheta M |
| 72 | ncpcm2020/156 | ploharkar@gmail.com | Mr. Praveen Kumar Loharkar |
| 73 | ncpcm2020/157 | grk.physics@gmail.com | Dr. RAMAKRISHNA.G |
| 74 | ncpcm2020/159 | jsharma628@gmail.com | Dr. Jyoti Sharma |
| 75 | ncpcm2020/16 | bsrimathy@gmail.com | Dr. SRIMATHY. B |
| 76 | ncpcm2020/161 | vishwasacharya59@gmail.com | Mr. Vishwas Acharya |
| 77 | ncpcm2020/163 | renubub@gmail.com | Dr. Renuka C G |
| 78 | ncpcm2020/164 | p.gpcsendhwa@gmail.com | Mr. PANKAJ |
| 79 | ncpcm2020/165 | kkverma19@gmail.com | Dr. KAMAL KISHOR VERMA |
| 80 | ncpcm2020/166 | sibimku2014@gmail.com | Mr. SIBI ABRAHAM |
| 81 | ncpcm2020/167 | poojapatel18593@gmail.com | Ms. Pooja D Patel |
| 82 | ncpcm2020/168 | rumman.zaidi11@gmail.com | Ms. Rumman Zaidi |
| 83 | ncpcm2020/169 | prashantahuja1986@gmail.com | Mrs Shakti N. Bajaj |
| 84 | ncpcm2020/17 | a.lingaraju@gmail.com | Dr. Lingaraju |
| 85 | ncpcm2020/170 | acharyaphysics2011@gmail.com | Mr. Sagar Bisoyi |
| 86 | ncpcm2020/171 | shekhar.hbad@gmail.com | Mr. Shekhar Yadav |
| 87 | ncpcm2020/172 | ashapkind@gmail.com | Dr. Asha P K |
| 88 | ncpcm2020/173 | ravikiran.alange@gmail.com | Dr. Ravindra Chanabasappa Alange |
| 89 | ncpcm2020/174 | hemantk1331@gmail.com | Dr. Hemant Kumar |
| 90 | ncpcm2020/175 | nisha1602pandey@gmail.com | Dr. Nisha Pandey |
| 91 | ncpcm2020/176 | rohinib82@gamil.com | Dr. ROHINI |
| 92 | ncpcm2020/177 | gdkulkarniagc@gmail.com | Mr. Govind D. Kulkarni |
| 93 | ncpcm2020/18 | soumyadevanss@gmail.com | Mrs Soumya S S |
| 94 | ncpcm2020/182 | sachin_k_mahajan@rediffmail.com | Dr. Sachin Kumar Mahajan |
| 95 | ncpcm2020/183 | amritadwivedi63@gmail.com | Dr. Dr Amrita Dwivedi |
| 96 | ncpcm2020/184 | pratimarajput@jssaten.ac.in | Ms. Pratima |
| 97 | ncpcm2020/185 | ranidudhal027@gmail.com | Mrs Rani D. Dudhal |

| | | | |
|---|---|---|---|
| 98 | ncpcm2020/186 | deepak.tonpe@gmail.com | Mr. Dipak Amrut Tonpe |
| 99 | ncpcm2020/187 | gouratul80@gmail.com | Dr. Atul Gour |
| 100 | ncpcm2020/188 | niki13oct@gmail.com | Mrs Niketa Bajpai |
| 101 | ncpcm2020/189 | rishikaravi@gmail.com | Ms. Narmada Vallakeerthi |
| 102 | ncpcm2020/19 | dashoralpa@gmail.com | Dr. Alpa Dashora |
| 103 | ncpcm2020/190 | dpunnareddy@gmail.com | Mr. D Punna Reddy |
| 104 | ncpcm2020/191 | prashant.197104@gmail.com | Dr. Prashant Thapliyal |
| 105 | ncpcm2020/192 | poojamishra1125@gmail.com | Ms. Pooja Mishra |
| 106 | ncpcm2020/193 | sandhya.phy@vvce.ac.in | Dr. N SANDHYA RANI |
| 107 | ncpcm2020/194 | sanjayvchavan48@gmail.com | Mr. Sanjay V. Chavan |
| 108 | ncpcm2020/195 | dharmendramewada466@gmail.com | Mr. Dharmendra Mewada |
| 109 | ncpcm2020/196 | supriyavyas2012@gmail.com | Mrs Supriya Vyas |
| 110 | ncpcm2020/197 | athiraaadi1@gmail.com | Ms. Athira K. M. |
| 111 | ncpcm2020/198 | prateek0519@gmail.com | Mr. PRATEEK DEOMAN MALWE |
| 112 | ncpcm2020/199 | kumarsachin3160@gmail.com | Mr. Sachin Kumar Yadav |
| 113 | ncpcm2020/20 | mmanu@gehu.ac.in | Dr. Mehul Manu |
| 114 | ncpcm2020/200 | llsaravanan90@gmail.com | Dr. Saravanan |
| 115 | ncpcm2020/201 | upendra.kumar@ikst.res.in | Dr. Upendra Kumar |
| 116 | ncpcm2020/202 | patelarunendra@gmail.com | Dr. Arunendra Kumar Patel |
| 117 | ncpcm2020/203 | sajalbarman623@gmail.com | Mr. Sajal Barman |
| 118 | ncpcm2020/204 | amreenhussain8888@gmail.com | Dr. Amreen Ara Hussain |
| 119 | ncpcm2020/205 | hiteshrajpute@gmail.com | Mr. Hitesh Viththalsing Rajput |
| 120 | ncpcm2020/206 | psvindhya93@gmail.com | Ms. Vindhya P S |
| 121 | ncpcm2020/207 | mdsharma.phy@gmail.com | Dr. M. D. Sharma |
| 122 | ncpcm2020/208 | remyaud90@gmail.com | Ms. Remya. U.D |
| 123 | ncpcm2020/209 | meenuv13@rediffmail.com | Dr. Meenu Asthana Varshney |
| 124 | ncpcm2020/21 | rajanibhoyar1@gmail.com | Ms. Rajani Bhoyar |
| 125 | ncpcm2020/210 | swastisaxenaa@gmail.com | Dr. SWASTI SAXENA |
| 126 | ncpcm2020/211 | piyushi.nautiyal@gmail.com | Dr. Piyushi Nautiyal |
| 127 | ncpcm2020/212 | ravikumarborade@gmail.com | Mr. Ravikumar Marotrao Borade |
| 128 | ncpcm2020/213 | dr.1710r@gmail.com | Mr. Rishi Pal |
| 129 | ncpcm2020/214 | priyanka191189@gmail.com | Mrs Priyanka Shrivastava |
| 130 | ncpcm2020/215 | kekachkrbrty@gmail.com | Dr. Keka Chakraborty |
| 131 | ncpcm2020/216 | linda.xavier.p@gmail.com | Ms. Puravathan Linda Xavier |
| 132 | ncpcm2020/217 | drpaalvi@gmail.com | Mr. Mohd. Imran Khan |
| 133 | ncpcm2020/218 | eswarhbk05@gmail.com | Mr. H. Bhoomeeswaran |
| 134 | ncpcm2020/219 | anuraggeete.21@gmail.com | Dr. Anurag geete |
| 135 | ncpcm2020/22 | naseemfatima030@gmail.com | Mrs Naseem Fathima |
| 136 | ncpcm2020/220 | drfakruddin786@gmail.com | Dr. SHAIK FAKRUDDIN BABAVALI |
| 137 | ncpcm2020/221 | rrparlikar2015@gmail.com | Mrs Rekha R Parlikar |
| 138 | ncpcm2020/222 | kumars@kuk.ac.in | Dr. Suresh Kumar |
| 139 | ncpcm2020/223 | akumars@kuk.ac.in | Dr. Suresh Kumar |
| 140 | ncpcm2020/224 | crystal_lab457@yahoo.com | Dr. Dmytro Bletskan |
| 141 | ncpcm2020/225 | anishre21@gmail.com | Prof. Vinod Rathore |
| 142 | ncpcm2020/226 | pg6880@gmail.com | Prof. Pankaj Gupta |
| 143 | ncpcm2020/23 | write2joymukherjee@gmail.com | Mr. Joy Mukherjee |
| 144 | ncpcm2020/24 | sharmadip63@gmail.com | Mr. DEEP SHARMA |
| 145 | ncpcm2020/25 | anandwalki@gmail.com | Mr. Shashikant Walki |
| 146 | ncpcm2020/26 | marymolmoothedan@gmail.com | Dr. Marymol Moothedan |
| 147 | ncpcm2020/27 | faruquekist@gmail.com | Dr. Sk. Faruque Ahmed |

| | | | |
|---|---|---|---|
| 148 | ncpcm2020/28 | yadavrenu1993@gmail.com | Ms. RENU |
| 149 | ncpcm2020/29 | anilkumar650982@gmail.com | Dr. Dr. ANIL KUMAR |
| 150 | ncpcm2020/30 | lekshmisunil536@gmail.com | Mrs LEKSHMI O. |
| 151 | ncpcm2020/31 | nidhivijayverma@gmail.com | Mrs Nidhi Verma |
| 152 | ncpcm2020/32 | rishigeshwari9@gmail.com | Ms. Revathy Sundara Moorthy |
| 153 | ncpcm2020/33 | lokeswar.nits@gmail.com | Mr. Lokeswar Patnaik |
| 154 | ncpcm2020/34 | reenujacob12@gmail.com | Dr. Reenu Jacob |
| 155 | ncpcm2020/35 | seethusreerangan@gmail.com | Ms. Seethu V S |
| 156 | ncpcm2020/36 | essreelakshmi98@gmail.com | Ms. E S Sreelakshmi |
| 157 | ncpcm2020/37 | shesstarwellkharbani@gmail.com | Mr. Shesstarwell K. Bani |
| 158 | ncpcm2020/38 | pooja7503@gmail.com | Dr. Pooja Singh |
| 159 | ncpcm2020/39 | mdbalal421@gmail.com | Mr. Mohammad Balal |
| 160 | ncpcm2020/40 | dr.sunilpanwar66@gmail.com | Dr. Sunil Panwar |
| 161 | ncpcm2020/41 | rgvn89@gmail.com | Mr. Sonu Raghvan |
| 162 | ncpcm2020/42 | prasannakumarjb39@gmail.com | Dr. PRASANNAKUMAR J B |
| 163 | ncpcm2020/43 | jmallesh.phy@gmail.com | Dr. J.Malleshappa |
| 164 | ncpcm2020/44 | dchoudhary17@gmail.com | Dr. Dinesh Choudhary |
| 165 | ncpcm2020/45 | jayalakshmiprasad712@gmail.com | Mr. T V S ADINARAYANA |
| 166 | ncpcm2020/46 | shujalaprvn141@gmail.com | Ms. Shujala Parveen Sheikh |
| 167 | ncpcm2020/47 | vbssuryawanshi@gmail.com | Dr. Vilas Bhagawat Suryawanshi |
| 168 | ncpcm2020/48 | imtan90@gmail.com | Dr. Tanmoy Chakrabarty |
| 169 | ncpcm2020/49 | dravinash03@gmail.com | Dr. Avinash Avadhutrao Ramteke |
| 170 | ncpcm2020/50 | saktis1978@gmail.com | Mrs SAKTI PADA SHIT |
| 171 | ncpcm2020/51 | pushpankit@gmail.com | Dr. ANKIT KUMAR SRIVASTAVA |
| 172 | ncpcm2020/52 | dikshakharkwal151994@gmail.com | Ms. Deeksha Kharkwal |
| 173 | ncpcm2020/53 | rajubkn@gmail.com | Dr. Rajpal Singh |
| 174 | ncpcm2020/54 | bhargav92alavani@gmail.com | Dr. Bhargav Krishnanath Alavani |
| 175 | ncpcm2020/55 | vishnusudarsanv@gmail.com | Mr. VISHNU SUDARSANAN |
| 176 | ncpcm2020/56 | pinkyyadav06@gmail.com | Mrs Pinky Yadav |
| 177 | ncpcm2020/57 | riyanka16@iiserb.ac.in | Ms. Riyanka Karmakar |
| 178 | ncpcm2020/58 | santu16@iiserb.ac.in | Mr. Santu Kumar Bera |
| 179 | ncpcm2020/59 | vishaldhingra@andc.du.ac.in | Mr. Vishal Dhingra |
| 180 | ncpcm2020/60 | jyotiyogi1222@gmail.com | Ms. without prefix |
| 181 | ncpcm2020/61 | jerrysaji46@gmail.com | Mr. Jerry Saji |
| 182 | ncpcm2020/62 | kirteshkhare01@gmail.com | Mr. Kirtesh Pratap Khare |
| 183 | ncpcm2020/63 | bharatn042@gmail.com | Mr. Bharat Nayak |
| 184 | ncpcm2020/64 | aditin706@gmail.com | Ms. Aditi Nag |
| 185 | ncpcm2020/65 | apramita.chand@gmail.com | Dr. Apramita Chand |
| 186 | ncpcm2020/66 | vaisakhedpl@gmail.com | Mr. Vaisakh R Kumar |
| 187 | ncpcm2020/67 | p20170007@pilani.bits-pilani.ac.in | Mr. Shivaraja S J |
| 188 | ncpcm2020/68 | soniakaushik1996@gmail.com | Ms. SONIA KAUSHIK |
| 189 | ncpcm2020/69 | p20170412@pilani.bits-pilani.ac.in | Ms. Mishra Shweta Ravindra |
| 190 | ncpcm2020/70 | lavkush.pehl@gmail.com | Prof. LAVKUSH KUMAR |
| 191 | ncpcm2020/71 | rupali.thete@raisoni.net | Prof. Rupali Jayant Thete |
| 192 | ncpcm2020/72 | ajaykumar.pgcs@gmail.com | Mr. Bondada Ajay Kumar |
| 193 | ncpcm2020/73 | elxnkits@yahoo.co.in | Dr. E Laxminarayana |
| 194 | ncpcm2020/74 | chumkitarafder@gmail.com | Ms. CHUMKI TARAFDAR |
| 195 | ncpcm2020/75 | tvba64@gmail.com | Prof. T V BANUMATHI |
| 196 | ncpcm2020/76 | tripathi.csp@bhu.ac.in | Mr. Chandra Shekhar Pati Tripathi |
| 197 | ncpcm2020/77 | nareshp6@rediffmail.com | Dr. Naresh Padamati |

| | | | |
|---|---|---|---|
| 198 | ncpcm2020/78 | tneemuch@gmail.com | Mr. Tarun Kumar Joshi |
| 199 | ncpcm2020/79 | prameshbabu8687@gmail.com | Dr. P. RAMESH BABU |
| 200 | ncpcm2020/80 | jasminmmmd@gmail.com | Mrs JASMIN.M |
| 201 | ncpcm2020/81 | gourigangasri89@gmail.com | Ms. Gouri Sreekumar |
| 202 | ncpcm2020/82 | hiralpateltm@yahoo.com | Dr. HIRAL PATEL |
| 203 | ncpcm2020/83 | ashuphys@gmail.com | Dr. Ashwani Kumar |
| 204 | ncpcm2020/84 | rakesh_sharma_ujn@yahoo.co.in | Dr. RAKESH SHARMA |
| 205 | ncpcm2020/85 | aelxnkits@yahoo.co.in | Dr. E Laxminarayana |
| 206 | ncpcm2020/86 | ramappaskuri@gmail.com | Prof. Ramappa S Kuri |
| 207 | ncpcm2020/87 | shivaleelab17@gmail.com | Ms. Shivaleela Basavaraj |
| 208 | ncpcm2020/88 | sbera@amity.edu | Dr. Sambhunath Bera |
| 209 | ncpcm2020/89 | kn_venkatachalaiah@blr.amrita.edu | Dr. venkatachalaiah |
| 210 | ncpcm2020/90 | ipsitamohanty8895@gmail.com | Ms. IPSITA MOHANTY |
| 211 | ncpcm2020/91 | prabirshit.phx@gmail.com | Mr. PRABIR KUMAR SHIT |
| 212 | ncpcm2020/92 | amityaul1983@gmail.com | Dr. AMIT RAMDASJI YAUL |
| 213 | ncpcm2020/93 | pjain2308@gmail.com | Ms. PAYAL JAIN |
| 214 | ncpcm2020/94 | kratika.shukla14@gmail.com | Ms. Kritika Shukla |
| 215 | ncpcm2020/95 | satishayila@rguktn.ac.in | Dr. A Satish Kumar |
| 216 | ncpcm2020/96 | prajina.ok@saintgits.org | Dr. PRAJINA O K |
| 217 | ncpcm2020/97 | rustam_abirov@mail.ru | Dr. Rustam Abiropv |
| 218 | ncpcm2020/98 | bharatinpatil@gmail.com | Dr. Bharati N. Patil |
| 219 | ncpcm2020/99 | kalirampatil0201@gmail.com | Mr. KALIRAM PATIL |

कार्यालय प्राचार्य, शासकीय होलकर विज्ञान महाविद्यालय, इन्दौर

# प्रेस नोट

दिनांक :– 10.04.2019

## ताईवान के विश्वविद्यालय से होलकर कॉलेज का शैक्षणिक गतिविधियों के लिए हुआ अनुबंध (एम.ओ.यू.)

दिनांक 10 अप्रैल 2019 को शासकीय स्वशासी होलकर विज्ञान महाविद्यालय, इन्दौर का ताईवान के नेशनल डोंग हवा विश्वविद्यालय, हावालियन से साईंस एवं टेक्नोलॉजी के क्षेत्र में शोधकार्य, अध्ययन, अध्यापन एवं विद्यार्थियों के एक्सचेंज प्रोग्राम जैसी शैक्षणिक गतिविधियों के लिए अनुबंध (एम.ओ.यू.) हस्ताक्षर किया गया जिससे महाविद्यालय के शिक्षकों, विद्यार्थियों तथा शोधार्थियों को रिसर्च के क्षेत्र में नए–नए शोध कार्य के लिए प्रोत्साहन मिल सके। एम.ओ.यू. पर ताईवान विश्वविद्यालय के इंटरनेशनल अफेयर्स के डीन – प्रो. यान रोन मा तथा कॉलेज के प्राचार्य डॉ. सुरेश टी. सिलवाट द्वारा हस्ताक्षर किए। साथ ही इंटरनेशनल अफेयर्स के डीन – प्रो. यान रोन मा ने महाविद्यालय के गौरवशाली इतिहास की सराहना करते हुए महाविद्यालय के विद्यार्थियों को शोधकार्य हेतु स्टूडेंट प्रोग्राम के तहत विशेष स्कॉलरशिप देने का प्रस्ताव रखा। एम.ओ.यू. के हस्ताक्षर कार्यक्रम का संचालन डॉ. नेतराम कौरव ने किया तथा अध्यक्षता प्रशासनिक अधिकारी डॉ. आर. सी. दीक्षित ने की। कार्यक्रम में अन्य वरिष्ट प्राध्यापक विशेष रूप से उपस्थित रहे। प्रो. यान रोन मा ने महाविद्यालय को स्मृति चिन्ह प्रदान किया।

प्रति,

संपादक महोदय,

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कृपया उक्त समाचार अपने लोकप्रिय समाचार में निशुल्क प्रकाशित करने का कष्ट करें।

प्राचार्य

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**Noble Alchem Pvt. Ltd. (Agribooster), Sanwer Road, Indore, M.P.**

**Document Title:**

**collaborative research work on "Effect of pre-sowing seed treatment with silica and fungicide on growth, photosynthetic pigments, and oxidative stress parameters of mung bean (Vigna radiata) with Noble Alchem Pvt. Ltd., Indore**

# Government Holkar Science College, Indore (MP)

## Department of Biochemistry

### Certificate of Collaboration

This is to certify that the **Department of Biochemistry, Govt. Holkar Science College, Indore, and Noble Alchem Pvt. Ltd. (Agribooster), Sanwer Road, Indore, M.P.** with the mutual collaborative work have successfully published a Research Paper entitled **"Effect of pre-sowing seed treatment with silica and fungicide on growth, photosynthetic pigments and oxidative stress parameters of mung *bean (vigna radiata)*"** in the session 2020-21.



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5555Original Article

# EFFECT OF PRE-SOWING SEED TREATMENT WITH SILICA AND FUNGICIDE ON GROWTH, PHOTOSYNTHETIC PIGMENTS AND OXIDATIVE STRESS PARAMETERS OF MUNG BEAN *(VIGNA RADIATA)*

**ANGURBALA BAFNA[1], SHANTI PATIDAR[2], TASNEEM RANGWALA[3], NAGESH VYAS[4] & ROHAN GUPTA[5]**

[1,2,3]*Department of Biochemistry, Govt. Holkar Science College, Indore, Madhya Pradesh, India*

[4,5]*Noble AlchemPvt.Ltd.,Sanwer Road, Indore, Madhya Pradesh, India*

***ABSTRACT***

***In the present scenario, farmers deal with increasingly volatile weather and their productivity and quality are affected by it.With the growth of new techniques in farming,a large number of methods are there to solve the above problem but the outcomes are not always positive because each field is having different conditions. Seed pretreatment is one of the good findings for them. The present study was carried out to investigate the efficacy of soluble silica and fungicide in the pretreatment of seed before sowing.A highly significant increase inheight of plants, photosynthetic pigments and a highly significant decrease in duration of germination, MDA content and peroxidase activitywere observed in the leaves of mung bean seedlings when seeds were pretreatedwith silica powder.Although a combination of silica powder pretreatment and foliar spray of soluble silica resulted in better growth and reduced oxidative stress. Insignificant changes in studied parameters were observed with fungicide pretreatment. However, liquid soluble silica application through foliar spray along with fungicide pretreatment showed significant changes in improving growth and reducing oxidative stress. It can be concluded from the present study that pretreatment of mung bean seeds with solublesilica powder resulted in enhanced growth and photosynthetic pigments concentration along with the reduction in oxidative stress. Foliar spray of soluble silica applied after the emergence of seedlings gives more pronounced results.***

***KEYWORD: Agribooster®, Germination, Malondialdehyde, Peroxidase Activity & Soluble Silica Powder***

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## 1. INTRODUCTION

Germination and emergence of seedlings are the deciding processes for plant growth. Any abnormalities during the emergence of the seedling can restrain the yield and production of a crop (Singh et.al, 2015). Owing to ever-changing climatic and soil conditions, the yield of crops reduces as they are important factors for determining crop production (Mwale et.al. 2003). Several studies have been carried out for reducing time after sowing to the emergence of a seedling. The seed priming technique is one of the important developmental tools related to this field (Heydecker 1973). Seed priming techniques include different treatments that have an impact on metabolic,biochemical and enzymatic activities of seed, thus preparing it to better play their biological functions, such as early germination and seedling establishment (Demir &Mavi 2004).

Seed pretreatment is the process in which some physical, chemical and biological agents are applied before planting to provide effective protection against many seeds and soil-borne plant pathogens (Forsberg *et al.*, 2003). It can be a boon for the farmers having poor resources as it is easy to use and is also economical (Harries 1996).

Different insecticides and fungicides are often used for seed pretreatment to reduce damage caused by many pathogens ( Lakhani).Seed pretreatment with different agents that are more environmental and crop friendly compared to commercial treatment in improving the early stages of seedling growth is in great demand (Sehwinn et al;1994). In the present scenario, seed pretreatment has a significant economic impact on markets as it is cost-effective in enhancing productivity (Research and Market, 2013).

Over the last few decades, several authors have observed the significant role of silicon (Si) to induce tolerance against biotic and abiotic stresses, including salinity, high temperature, chilling, drought, etc. It is accelerating seed germination and enhances plant growth and crop yield. It acts as a plant protectant and biostimulant under a range of stress conditions( Zhu& Gong 2014). It also improves the water status and water use efficiency of plants and reduces lipid peroxidation under drought stress (Hasanuzzaman et al; 2018, Liu et al;2019). It could regulate osmolyte accumulation and readjust osmotic potential under water-deficit conditions. It redirects the primary metabolism by acting as a signaling factor under unstressed conditions (Pang et al., 2019; Mohanty et al., 2020). Si is an imperative non-essential plant nutrient that can boost plant resistance against abiotic stresses (Ahmed et al., 2011).

Mung bean (Vigna radiata L. Wilkzek) is a pulse crop with a short duration (70-90 days) and high nutritive value. The seeds contain 22-28% protein, 60-65% carbohydrates, 1-1.5% fat, 3.5-4.5% fibers and 4.5-5.5% ash. (Mohamed and Karamany 2005). It is a cheap protein source for direct human consumption (Mubarak 2005).

Keeping the above facts in mind, the present experiment was designed to evaluate the potential of silica as a seed pretreatment agent to improve seed emergence, photosynthetic pigments and reduce oxidative stress parameters of mung bean seedlings.

## 2. MATERIALS AND METHODS

Mung bean (*Vigna radiata*) seeds MI731-3 variety was purchased from Indian Agriculture Research Institute (IARI) Indore, Madhya Pradesh. Fungicide (Vitavax) @ 2 gm/kg and silica in powdered form (Agribooster® Soluble Silicon Powder) @ 5 gm/kg were used as priming agents. For seedbed preparation and better germination of the crop, the soil was cultivated 2 times with a tractor-mounted cultivator followed by planking each time. Pre-sowing irrigation was applied. Fungicide and soluble silica powderwere mixed with seeds separately and kept for 15 minutes After pretreatment seeds were sowed in a block of area 2m × 2m(4 sq.m) in the field located in the village Loharpipliya, District Dewas. A randomized block design was used and each block represented a single treatment. Foliar spray of liquid silica (10ml/L)in the form of potassium silicate under the trade name Agribooster®was applied twice at the interval of 15 days after sowing.

Following treatments were designed for the study:-

| | | |
|---|---|---|
| 1 | T1 | Without any pretreatment |
| 2 | T2 | Fungicide pretreated |
| 3 | T3 | Fungicide pretreated + Foliar spray of Liquid silica (10ml/L) |
| 4 | T4 | Soluble silica Powdered pretreated |
| 5 | T5 | Soluble silica Powdered pretreated + Foliar spray of Liquid silica (10ml/L) |

Vegetative, Biochemical and oxidative stress parameters were estimated in leaves of *Vigna radiata* at an interval of 15 days after each treatment. After 15 days of sowing only samples from T1, T2 and T4 were collected.

### 2.1 Vegetative Parameters Studied in *Vigna radiata*

- **Duration of Germination:** It was noted onthe day when seedlings emerge above the ground.
- **Height of plant:** It was recorded using a standard centimeter scale.

### 2.2 Biochemical and Oxidative stress parameters studied in leaves of *Vigna radiata* seedlings

- **Chlorophyll and Carotenoid content:** Fresh leaf samples were extracted with 80% acetone. For spectrophotometric determination of chlorophyll a, chlorophyll b and carotenoid contents, the absorbance of the extracts were measured at 645 and 663 nm and 470nmfollowing the method by Lichtenthaler and Wellburn 1983 and calculated using the following formula:

  Chlorophyll (a) in (mg/g) = 12.7(A663) – 2.69(A645) × V/1000 × W

  Chlorophyll (b) in (mg/g) = 22.9(A645) – 4.68(A663) × V/1000 × W

  Carotenoid (mg/g) = [1000(A470)-3.27 (Chl a)- 104 (Chl b)]/229

- **Malondialdehyde content:** The level of lipid peroxidation as an indicator of oxidative stress was measured by using malondialdehyde (MDA), a decomposition product of the polyunsaturated fatty acid present in membrane lipids. It was estimated using thiobarbituric acid (TBA) as the reactive material and measuring absorbance spectrophotometrically at 532 nm.

  Using an extinction coefficient of 155 mM-1 cm-1 following the method of Heath and Packer, (1968).

- **Peroxidase activity**: The enzyme activity was assayed using o-dianisidine as hydrogen donor and $H_2O_2$ as electron acceptor. The rate of formation of yellow orange colored dianisidine dehydrogenation product was used as a measure of peroxidase activity and assayed spectrophotometrically at 430nm in units/min/g according to Summer and Gjessing, (1943).

## 3. RESULTS

**Table 1: Effect of seed Pretreatment on Parameters Collected after 15 days of sowing**

| Treatment | Height of plant (cm) | Durationof germination (day) | Chlorophyll a(mg/g) | Chlorophyll b(mg/g) | Carotenoid(mg/g) | MDA(nmoles/gm) | Peroxidase (units/min/g) |
|---|---|---|---|---|---|---|---|
| **T1** | 6.4 ± .1 | 4.3±.5 | .20±.005 | .09±.01 | 7.90±.02 | 0.06 ± 0 | 2.80 ± .05 |
| **T2** | 6.43±.05a$^{ns}$ (.46%) | 3.3±.5a$^{ns}$ (23.25%) | .21±.02a$^{ns}$ (5%) | .13±.02a$^{ns}$ (44.44%) | 7.96±.45a$^{ns}$ (.75%) | 0.07±.01a$^{ns}$ (16.66%) | 0.93±.04a** (-84%) |
| **T4** | 8.3±.1a**b *(29.68%) | 2± 0a**b** (-53.48%) | .22 ± 0a** b$^{ns}$ (10%) | .15±.01a** b$^{ns}$ (66.66%) | 8.32±.005a**b ** (92.30%) | 0.04±.005a** b** (33.33%) | 0.81±.02a** b* (-86.15%) |

* Indicates p value < 0.05 and is significant.** indicates p value < 0.01 and is highlysignificant.*** indicates p value < 0.001 and is extremely significant.a indicates comparison to T1. b indicates comparison to T2.Parenthesis indicates percent increase or decrease

As shown in table 1, the height of the plant and content of photosynthetic pigments as observed after 15 days of pretreatment showed an insignificant change in fungicide pretreatment. Silica powder pretreatment resulted in a highly significant increase in height of mung bean seedlings and photosynthetic pigments concentration. With the application of silica powder during pretreatment highly significant decrease was resulted in MDA and peroxidase activity as compared to control and fungicide pretreatment. No significant change was observed in the duration of germination on pretreatment with fungicide but a highly exceptional decrease was found in silica pretreatment.

**Table 2: Effect of Pretreatment along with Foliar Spray of Soluble Silica on Plant height**

| Treatment | Height of Plant (cm) | |
|---|---|---|
| | After 15 days of first foliar spray | After15 days of second foliar spray |
| **T1** | 11.6 ± .65 | 21.11± .32 |
| **T2** | 12.06 ± .81a$^{ns}$(3.95%) | 23.43 ± 1.28a$^{ns}$(10.99%) |
| **T3** | 15.23 ± .56 a** b**(31.29%) | 25.86 ± .81a***b*(22.50%) |
| **T4** | 16.17 ± .35a*** b**(39.39%) | 26.93 ± .51a***b**(27.56%) |
| **T5** | 19.46 ± 1.05a*** b**(67.75%) | 27.33 ± 1.15a***b**(29.46%) |
| * Indicates p value < 0.05 and is significant.** indicates p value < 0.01 and is highly significant.*** indicates p value < 0.001 and is extremely significant.a indicates comparison to T1. b indicates comparison to T2.Parenthesis indicatespercent increase or decrease | | |

As shown in table 2, the height of theplant as observed after 15 days of first and second foliar spray showed no significant change in T2(pretreated with fungicide). However, the application of soluble silica through the foliar spray in fungicide pretreated seedlings (T3) showed a significant increment in height of the plant. Silica powder pretreatment(T4) alone and along withfoliar spray of silica also resulted in a remarkable increase in plant height as compared to control (T1) and only fungicide pretreatment (T2).

**Table 3: Effect of Pretreatment along with Foliar spray ofSoluble silica on Photosynthetic Parameters**

| Treatment | Chlorophyll a (mg/g) | | Chlorophyll b (mg/g) | | Carotenoid (mg/g) | |
|---|---|---|---|---|---|---|
| | After 15 days of first foliar spray | After15 days of second foliar spray | After 15 days of first foliar spray | After15 days of second foliar spray | After 15 days of first foliar spray | After15 days of second foliar spray |
| **T1** | 0.22±.005 | 0.15± .015 | 0.13±.005 | 0.07± .005 | 7.46±.35 | 5.53±.28 |
| **T2** | 0.24±.01 (9.09%) a$^{ns}$ | 0.17±.0 (13.33%) a$^{ns}$ | 0.15±.01 (15.38%) a$^{ns}$ | .072±.005 (2.8%) a$^{ns}$ | 8.26±.35 (10.72%) a$^{*}$ | 5.33±.13(-3.61%) a$^{ns}$ |
| **T3** | 0.26±.02 (18.18%) a*** b* | 0.18± .01 (20%) a* b$^{ns}$ | 0.21±.01 (61.53%) a** b** | 0.08 ± 0 (14.28%) a** b* | 8.15± .04 (9.24%) a$^{**}$ b$^{ns}$ | 6.25±.03 (13.01%) a** b** |
| **T4** | 0.26±.01 (18.18%) a*** b** | 0.19± .0 (26.66%) a** b** | 0.25±.005 (92.30%) a** b** | 0.13±.02 (85.71%) a** b** | 8.26± .01 (10.72%) a** b$^{ns}$ | 6.31± 04 (14.10%) a*** b*** |
| **T5** | 0.27±.0 (5%) a*** b** | 0.20± .01 (33.33%) a*** b** | 0.31±.005 (138.4%) a***b*** | 0.16±.005 (128.5%) a***b** | 9.75± .10 (30.69%) a*** b$^{*}$ | 6.77± .07 (22.42%) a***b*** |
| * Indicates p value < 0.05 and is significant.** indicates p value < 0.01 and is highly significant.*** indicates p value < 0.001 and is extremely significant.a indicates comparison to T1. b indicates comparison to T2.Parenthesis indicates percentincrease or decrease | | | | | | |

Photosynthetic pigments as observed after foliar spray with soluble silica at the interval of 15 days showed insignificant change in the leaves of T2 (pretreated with fungicide only). As shown in table 3, a highly significant increase in chlorophyll a, chlorophyll b and carotenoid concentration was found in T3 (pretreated with fungicide along with foliar spray), T4 (Pretreated with solublesilica powder alone) and T5 (pretreated with solublesilica powder along with foliar spray).

**Table 4:Effect of seed Pretreatment along with Foliar Spray ofsoluble silica on Oxidative Stress Parameters**

| Treatment | MDA (nmoles/gm) | | Peroxidase (units/min/g) | |
|---|---|---|---|---|
| | After 15 days of first foliar spray | After 15 days of second foliar spray | After 15 days of first foliar spray | After 15 days of second foliar spray |
| **T1** | .05 ± .02 | 0.03 ± .006 | 5.45 ± .27 | 6.22 ± .06 |
| **T2** | .03 ± .02 $a^{ns}$ (- 40%) | 0.019± .01 $a^{ns}$ (-36%) | 2.61 ±.01 a*** (-76.07%) | 2.84 ±.23a***(-65.49%) |
| **T3** | .018±.004 a* $b^{ns}$ (-64%) | 0.012± .004 $a^{*}$ $b^{**}$ (-60%) | 2.53 ±.12 a*** $b^{**}$ (-76.81%) | 2.48 ± .026 a*** $b^{**}$ (-69.86%) |
| **T4** | .017± .002 a** $b^{ns}$ (-66%) | 0.013± .004 a** $b^{ns}$ (-56%) | 1.92 ± .04 a*** $b^{**}$ (-82.40%) | 1.54 ±.07 a*** $b^{**}$ (-81.28%) |
| **T5** | .009± .0005 a*** $b^{*}$ (-82%) | 0.007± .001 $a^{**}$ $b^{***}$ (-76%) | 1.89 ± .07 a*** $b^{**}$ (-82.62%) | 1.29 ± .05 a*** $b^{**}$ (-84.32%) |
| * Indicates p value < 0.05 and is significant.** indicates p value < 0.01 and is highly significant.*** indicates p value < 0.001 and is extremely significant.a indicates comparison to T1. b indicates comparison to T2.Parenthesis indicates percentincrease or decrease | | | | |

As shown in table 4, application of silica through the foliar spray twice at the interval of 15 days showed an insignificant reduction in MDA content and activity of peroxidase enzyme in the leaves of mung bean seedlings obtained from T2 (fungicide pretreated) and a highly significant decrease was observed in T3 (pretreated with fungicide along with foliar spray), T4 (Pretreated with solublesilica powder alone) and in T5 (pretreated with solublesilica powder along with foliar spray).




**Figure 1: Effect of Pretreatment with Fungicide and Silica along with Foliar Spray of Silica on Plant height og Mung Bean.**

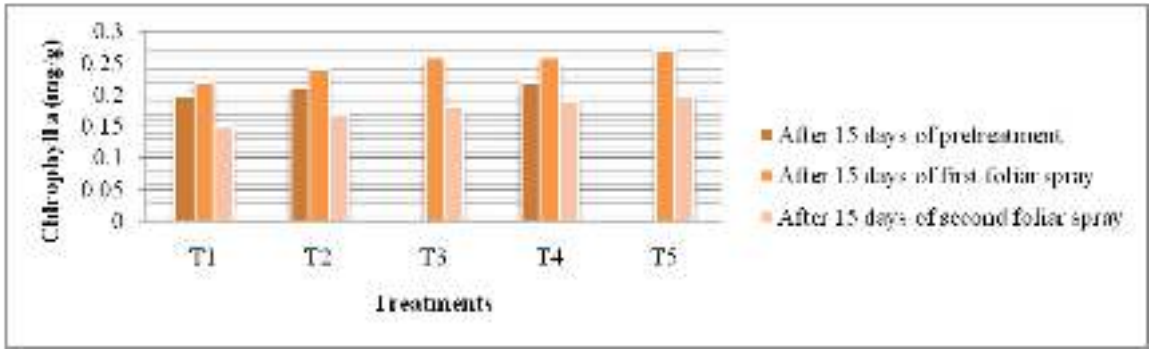



**Figure 2: Effect of Pretreatment with Fungicide and Silica along with Foliar Spray of Silica on Chlorophyll 'a' Content in Leaves of Mung Bean.**

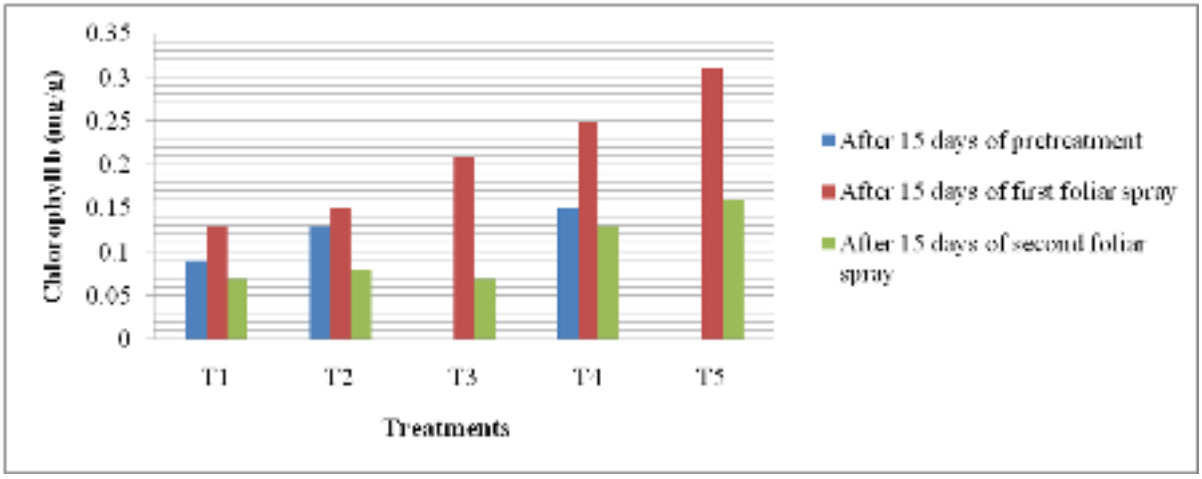



**Figure 3: Effect of Pretreatment with Fungicide and silica along with Foliar Spray of Silica on Chlorophyll 'b' Content in Leaves of Mung Bean.**

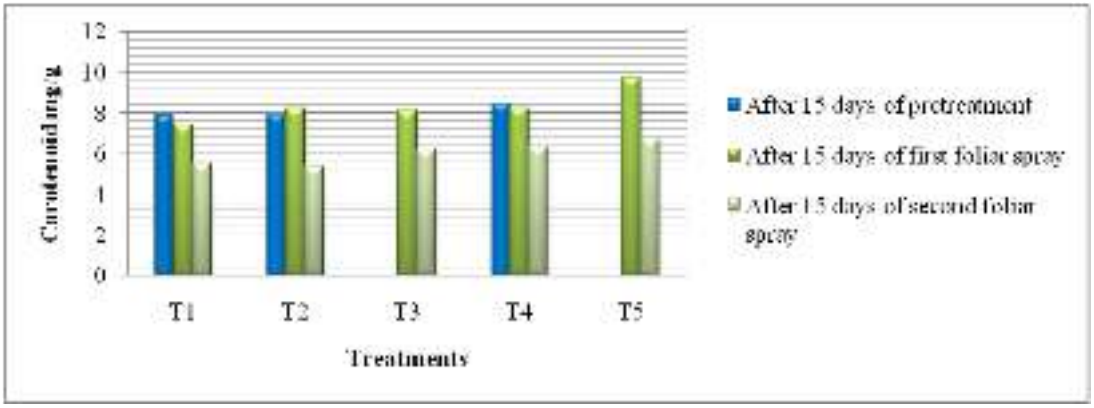



**Figure 4: Effect of Pretreatment with Fungicide and Silica along with Foliar Spray of Silica on Carotenoid Content in Leaves of Mung Bean.**

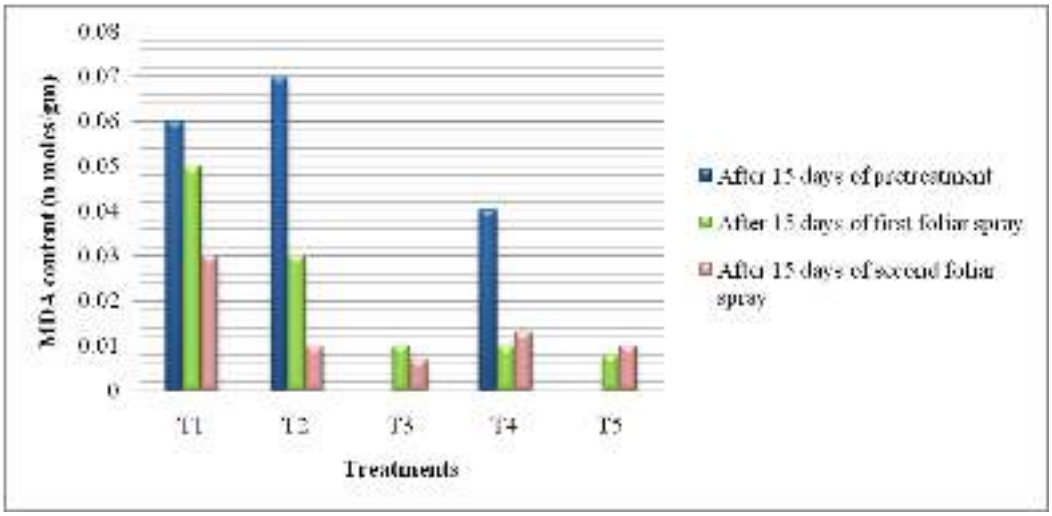



**Figure 5: Effect of Pretreatment with Fungicide and Silica along with Foliar Spray of Silica on MDA Content in Leaves of Mung Bean.**

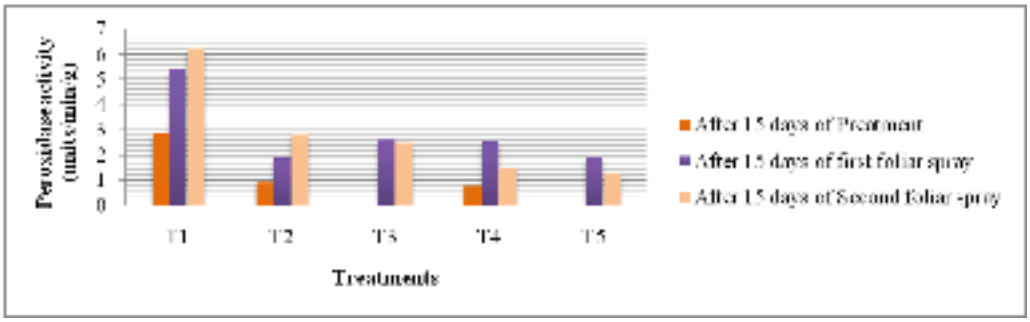



**Figure 6: Effect of Pretreatment with Fungicide and (Soluble) Silica along with Foliar Spray of Silica on Peroxidase Activity in Leaves of Mung Bean.**

## 4. DISCUSSIONS

### 4.1 Vegetative Parameters

Proper germination is very essential for the continued growth and yield of the crop. From the result obtained, solublesilica supplementation in pretreatment significantly enhanced the germination of mung beans. Siddiqui, etal., 2014 &Foltete et al., 2011 also reported increased seed germination, mean germination time, germination index and seed vigor index in tomato with the application of silicon. In water deficit conditions increased germination of seed was observed with the supplementation of calcium silicate (Zarger et al. 2013). Reasons behind this elevation as reported by (Lei et al 2008) is improved ability of seed for absorbing and utilizing water and fertilizer in presence of silicon which promotes seed antioxidant system, reduces stress by reducing superoxide radicals and increasing activity of some enzymes such as superoxide dismutase, ascorbate peroxidase, guaiacol peroxidase, and catalase in spinach.

The application of soluble silica powder as a pretreatment agent before sowing significantly increased the height of the plants of *Vigna radiata*in comparison to control (Figure 1). Likewise, THE results shownby Janmohammadi et al., 2015 on the pre-hydration treatment of seed with the colloid solution of silica nanoparticles before germination significantly improvedheight parameters insunflower (*Helianthus annuus L.*).

### 4.2 Photosynthetic Pigments

The role of chlorophyll and carotenoids in photosynthesis stabilization of membranes and energy transformation has been studied widely (Zang 2003,Jiang et al., 2017). The chlorophyll production is mainly dependent on the penetration of sunlight and it is the main component for photosynthesis (Srichaikul et al; 2011). It is influenced by different stress factors.Silicon provides rigidity and strength, enables erectness of leaves, which results in enhanced light absorption and improved photosynthesis, photo assimilation, growth and final yield of the plant (Saud et al. 2014).

Reduced chlorophyll content of tomato leaves due to drought stress was significantly increased by the addition of silicon which resulted in enhanced activity (Song et al., 2014). Underwater stress, silicon-mediated improvement in chlorophyll content may be due to reduced production of ROS in presence of silicon leading to improved antioxidant defense (Shi et al.2016).Results similar to the present study were observed in coriander leaves supplemented with silicon under water-deficient stress. Silicon supplementation led to the elevated growth rate of photosynthesis, yield and water using capacity of plants grown under reduced water availability(Gao et al., 2005). Silicon is likewise recognized to improve the resistance of plants towards drought through enhancing photosynthetic performance, maintaining plant water equilibrium and straightness of leaves (Yin et al.2013). Silicon increased expression of genes which encodes for enzymes involved in the synthesis of precursors for chlorophyll (protoporphyrin IX, Mg-protoporphyrin IX and protochlorophyllide) under nitrate stress may be the reason for the improvement in chlorophyll content is the presence of silica. (Candan&Tarhan2003; Taiz & Zeiger 2009). Our study results also showed improvement in content of chlorophyll a, chlorophyll b and carotenoid in the leaves of mung seedlings pretreated with soluble silica powderbefore sowing along with foliar spray of soluble silica twice at the interval of 15 days after sowing (Figure 2, 3,4).

### 4.3 Oxidative Stress

In open field everchanging climatic conditions exposes plants to stress factors which lead to the production of many ROS in the course of photosynthesis and respiration (Milttler 2002, Arbona et al., 2003).For maintenance of homeostasis in plants, two mechanisms for detoxification are observed which include enzymatic and non enzymatic antioxidants(Sytar et al., 2013, Wuet et al., 2017). In stress caused due to salinity, significant reduction in the content of peroxidase, catalase activity was also observed by (Tarabi et al.2015, Kim et al.,2016 and Tripathi et al., 2017). Oxidative stress marker in terms of MDA was reduced and peroxidase activity was increased with pretreatment of mung seeds with soluble silica powder before sowing. Application of soluble silica through foliar spray after sowing further reduced content of MDA and enhanced activity of peroxidase indicating decrement in oxidative stress (Figure 5, 6). Similar results with supplementation of silicon indicating a decrease in MDA content in salt-stressed Barley, maize and grapevine rootstock was reported which maintained integrity of membrane and reduced permeability.

## 5. CONCLUSIONS

Seed pretreatment with silica is an environmentally safe and new wave that can be easily adopted by resource-poor farmers and benefited the farmers in various ways. It may indeed be considered as a valuable strategy to improve stand establishment under adverse agro-climatic conditions (rainfed, dry farming and dryland farming regions) with enhanced yield, increased tolerance to stress situations, increased resistance against diseases, enhanced crop competitiveness against weeds and increased water use efficiency. The pretreatment with Soluble silica powder was more beneficial in improving vegetative growth and photosynthetic pigment than fungicide. The farmers are advised to use Soluble silica powder for the

pretreatment of seeds as it results in better germination and growth of the seed. Thepretreatment with soluble silica powder along with foliar spray with soluble silica can further enhance quality by enhancing growth and reducing oxidative stress. Thus in addition to silica pretreatment, foliar spray with soluble silica is also suggested to the farmers to increase their productivity.

## 6. ACKNOWLEDGEMENT

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### *7. REFERENCES*

1. *Ahmad S.T., Haddad R. (2011).Study of silicon effects on antioxidant enzyme activities and osmotic adjustment of wheat under drought stress. Czech Journal of Genetics and Plant Breeding, 47:17–27.*
2. *Al-aghabaryK., ZhuZ.,and ShiQ.,(2004).“Influence of silicon supply on chlorophyll content, chlorophyll fluorescence, and antiox-idative enzyme activities in tomato plants under salt stress", Journal of Plant Nutrition,.27,.12,2101–2115..*
3. *Arbona V.,Flors V.,Jacas J.,García A.,Pilar And Gomezcadenas A.(2003) Enzimatic and non-enzimatic antioxidant responses of carrizo citrange, a salt-sensitive citrus roostoock, to different levels of salinity. Plant Cell Physiology, 44( 4): 388-394.*
4. *Candan N., Tarhan L. (2003). Relationship among chlorophyll-carotenoid content, antioxidant enzyme activities and lipid peroxidationlevelsby$Mg^{2+}$deficiencyinthe Menthapulegiumleaves. Plant Physiol Biochem. 41:35-40.*
5. *Demir, İ. and Mavi, K. (2004). The effect of priming on seedling emergence of differentially matured watermelon (Citrullus lanatus (Thunb.) Matsum and Nakai) seeds. Scientia Horticulturae, 102(4), 467-473.*
6. *FolteteAS., Masfaraud JF., Bigorgne E., Nahmani J., Chaurand P., Botta C.,(2011). Environmentalimpactof sunscreen nanomaterials: Ecotoxicity and genotoxicity of altered TiO2 nanocomposites on Vicia Faba. Environ Poll. 159:2515-2522.*
7. *Forsberg, G. Kristensen, L., Eibel, P., Titone, P. and Haiti, W. (2003). Sensitivity of cereal seeds to short duration treatment with hot, humid air. Journal of Plant Disease and Protection, 110 (1): 1-16.*
8. *Gao, X. P., Zou, C. Q., Wang, L. J., and Zhang, F. S. (2004). Silicon emproves water use efficiency in maize plants. J. Plant Nutr. 27, 1457–1470. doi: 10.1081/PLN-200025865*
9. *Harris, D. and Jones, M. (1996). On-farm seed priming to accelerate germination in rainfed, dry-seeded rice. InternationalRice: Research Note 22: 30.*
10. *Hasanuzzaman, M., Nahar, K., Anee, T., Khan, M., and Fujita, M. (2018). Silicon-mediated regulation of antioxidant defense and glyoxalase systems confers drought stress tolerance in Brassica napus L. S. Afr. J. Bot. 115, 50–57.*
11. *Heath R.L., Packer L. Photoperoxidation in isolated chloroplast. I.(1968). Kinetics and stoichiometry of fatty acid peroxidation. Archives of Biochemistry and Biophysics, 125, pp. 189-198.*
12. *Heath, R. L., and Packer, L.(1968). Photoperoxidation in isolated chloroplasts: I. kinetics and stoichiometry of fatty acid peroxidation. Arch. Biochem. Biophys. 125, 189–198.*
13. *Heydecker, W. (1973). Accelerated germination by osmotic seed treatment. Nature.* ***246****: 42-44.*
14. *Janmohammadi M., Sabaghnia N. (2015). Effect Of Pre-Sowing Seed Treatments With SiliconNanoparticles On Germinability Of Sunflower (Helianthus Annuus).University Of Maragheh, Agriculture College, Department Of Agronomy And Plant Breeding, Maragheh, P.O.Box 55181-83111, Iran, 21(1): 13–21.*

15. Jiang Y. Ding X. Zhang D. Deng Q. Yu C.-L. Zhou S. Hui, D. (2017) Soil salinity increases the tolerance of excessive sulfur fumigation stress in tomato plants. Environ. Exp. Bot.,133, 70–77.

16. Kim Y. H., Khan A. L., Waqas M., Shahzad R., Lee I. J. (2016). Silicon-mediated mitigation of wounding stress acts by up-regulating the rice antioxidant system. Cereal Res. Commun. 44, 111–121.

17. Liang Y., Chen Q., Liu Q., Zhang W., Ding R. (2003). Exogenous silicon (Si) increases antioxidant enzyme activity and reduces lipid peroxidation in roots of salt-stressed barley (Hordeum vulgare L.). J. Plant Physiol. 160, 1157–1164.

18. Lichtenthaler, H. K. and Wellburn, A. R.(1983) Determinations oftotal carotenoids and chlorophylls a and b of leaf extracts indifferent solvents, Biochem. Soc. Trans.; 11, 591–592.

19. Liang, Y., Sun, W., Zhu, Y.-G., and Christie, P. (2007). Mechanisms of silicon-mediated alleviation of abiotic stresses in higher plants: a review. Environ. Pollut. 147, 422–428.

20. Mittler R. (2002). Oxidative stress, antioxidants and stress tolerance. Trends Plant Sci 7:405–410.

21. Mohanty, S., Nayak, A. K., Swain, C. K., Dhal, B., Kumar, A., Tripathi, R., et al. (2020). Silicon enhances yield and nitrogen use efficiency of tropical low land rice. Agron.J. 112, 758–771.

22. Mwale, S. S., Hamusimbi, C. and Mwansa, K. (2003). Germination, emergence and growth of sunflower (Helianthus annuus L.) in response to osmotic seed priming. Seed Sci Tech. **31**: 199-206.

23. Pang, Z., Tayyab, M., Islam, W., Tarin, M. W. K., Sarfraz, R., Naveed, H., et al. (2019). Silicon mediated improvement in tolerance of economically important crops under drought stress. Appl. Ecol. Environ. Res.17, 6151–6170.

24. Sabale, A. and Kale, P.B. (2007). Response and recovery of Coriandrum sativum(L.) variety Indori exposed to soil moisture stress. Indian J. Plantphysiol., 12 (3): 266-270.

25. Saud S, Li X, Chen Y, Zhang L, Fahad S, Hussain S, Sadiq A, Chen Y. 2014. Silicon application increases drought tolerance of Kentucky bluegrass by improving plant water relations and morpho physiological functions. The Sci World J.:10.

26. Schwinn, F. (1994). Seed treatment – a panacea for plantprotection? Seed Treatment: Progress and Prospects. BCPC Publications. Monograph 57, 3. Retrieved: September9, 2014 from http://www.amazon.com/gp/search?

27. Shao, S., Meyer, C.J., Ma, F., Peterson, C.A. and Bernards,M.A. (2007). The outermost cuticle of soybean seeds: A chemical composition and function during imbibitions.Journal of Experimental Botany, 58(5): 1071–1082.

28. ShiY., Zhang Y., Han W.,Feng R., HuY., Guo J., Gong H (2016). Silicon enhances water stress tolerance by improving root hydraulic conductance in **S**olanum lycopersicum **L** Frontiers in Plant Science, 7, 196.

29. Siddiqui M.H.,Al-Whaibi M.H.,(2014). Role of nano-SiO2 in germination of tomato (Lycopersicum esculentum seeds Mill.) Saudi Journal of Biological Sciences, 21(1): 13–17.

30. Singh, P. K., Pandita, V. K., Tomar, B. S., and Seth, R. (2015). Standardisation of priming treatments for enhancement of seed germination and field emergence in carrot. Indian J. Hortic. 72: 306-309.

31. Song A., Li P., Fan F., Li Z., Liang Y. (2014).The effect of silicon on photosynthesis and expression of its relevant genes in rice (Oryza sativa L.) under high-zinc stress. PLoS One;9(11):e113782.

32. Srichaikul B., Bunsang R., Samappito S., Butkhup L., Bakker G.(2011). Comparative study of chlorophyll content in leaves of Thai Morus alba Linn. Species.Plant science research 3(2):17-20.

33. Summer, J.B. and Gjessing, E.C.( 1943)Archives of Biochemistry, **2**:291.

34. *Sytar O, Kumar A, Latowski D, Kuczynska P, Strzalka K, Prasad MNV. Heavy metal-induced oxidative damage, defense reactions, and detoxification mechanisms in plants. Acta Physiol Plant. 2013;35:985–99.*
35. *Taiz L., Zeiger E.( 2009). Plant physiology, 4th edn. Massachusetts, Sinauer Associates.*
36. *Torabi F., Majd A., Enteshari S. (2015). The effect of silicon on alleviation of salt stress in borage (Borago officinalis L.). Soil Sci. Plant Nut. 61, 788–798.*
37. *Tripathi, D. K., Singh, S., Singh, V. P., Prasad, S. M., Dubey, N. K., and Chauhan, D. K. (2017). Silicon nanoparticles more effectively alleviated UV-B stress than silicon in wheat (Triticum aestivum) seedlings. Plant Physiol. Biochem. 110, 70–81.*
38. *Umair, A.; Ali, S.; Bashir, K. and Hussain, S.(2010).Evaluation of different seed priming techniques in mung bean (Vigna radiata). Soil & Environ. 29(2): 181-186.*
39. *Wu Z., Liu S., Zhao J., Wang F., Du Y., Zou S. (2017). Comparative responses to silicon and selenium in relation to antioxidant enzyme system and the glutathione-ascorbate cycle in flowering Chinese cabbage (Brassica campestris L. ssp. chinensis var. utilis) under cadmium stress. Environ. Exp. Bot. 133, 1–11.*
40. *Yin, L. N., Wang, S. W., Li, J. Y., Tanaka, K., and Oka, M. (2013). Application of silicon improves salt tolerance through ameliorating osmotic and ionic stresses in the seedling of Sorghum bicolor. Acta Physiol. Plant. 35, 3099–3107.*
41. *Zargar SM., Agnihotri A. Impact of silicon on various agromorphological and physiological parameters in maize and revealing its role in enhancing water stress tolerance. Emir J Food Agric. 2013;25:138–141.*
42. *Zhang S. Ma K. Chen, L.(2003). Response of photosynthetic plasticity of paeonia suffruticosa to changed light environments. Environ. Exp. Bot., 49, 121–133.*
43. *Zhu Z., WeiG., LiJ., QianQ. andYuJ.(2004) "Silicon alleviates salt stress and increases antioxidant enzymes activity in leaves of salt-stressed cucumber (Cucumis sativusL.)", Plant Science, vol.167, no. 3, 527–533.*
44. *Sukhanova, M. V., and V. P. Zabrodin. "DAMAGE TO SEEDS BY T HE WORKING BODIES OF CONTINUOUS MACHINES." International Journal of Mechanical and Production Engineering Research and Development 8.5 (2019): 373-380.*
45. *Khopkar, R. R., et al. "Studies on seed germination of Pummelo (Citrus grandis L. Osbeck)." Int. J. Agric. Sci. and Res 7 (2017): 257-264.*
46. *Surendhiran, M., et al. "Nano Emulsion Seed Invigouration for Improved Germination and Seedling Vigour in Maize." Int. J. Agric. Sci. Res 9 (2019): 333-340.*
47. *Gautam, Akta, and Jitin Rahul. "Seed Germination and Growth of Chitrak (Plumbago zeylanica L.)." International Journal of Botany and Research (IJBR) 3.4 (2013): 29-38.*

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2020

## CRITERION – 3

## MoUs/Linkages/Collaborations

Dr. G. S. Okram, UGC-DAE CSR, Indore

**Document Title:**

**Research activity and joint publication with Dr. G. S. Okram, UGC-DAE CSR, Indore, as Principal Collaborator from the CSR side**

# UGC-DAE Consortium for Scientific Research

*(Formerly: Inter University Consortium for DAE Facilities; IUC-DAEF)*
(An Autonomous institution under University Grants Commission, New Delhi)
University Campus, Khandwa Road, Indore-452001, MP, India
Phone (+91)0731-2463913/2762267/2463913 Fax: 0731-2462294/2465437

Dr. Gunadhor S. Okram
Scientist G/ Engineer G
Website http://www.csr.ernet.in/csr/indore/facilities/ltl/profile.html
Email: okramgs@gmail.com, okram@csr.ernet.in


16 July 2020

**Collaboration certificate**

This is to certify that Dr. Netram Kaurav of Government Holkar (Model, Autonomous) Science College (GHSC), A. B. Road, Indore is a Principal Investigator for the three-year Collaborative Research Scheme project (but extended for another year due to COVID19 lockdown) entitled "*Synthesis and characterization of monodisperse nickel nanoparticles-assisted carbon membranes and their application in gas separation*" of this institute with sanction order No. CSR-IC-MSRSR-02/CRS-210/2017-18/1291, dated 31st March, 2018 under my collaboration with him as the Principal Collaborator of CSR Indore-Centre. This is being issued for the **year 2019-2020** as per the requirements of GHSC of a collaboration certificate.



G. S. Okram

**UGC-DAE Consortium for Scientific Research**
*(Formerly: Inter University Consortium for DAE Facilities; IUC-DAEF)*An Autonomous Institution under University Grants Commission, New Delhi)**( A Society Registered Under M.P. Society RegistrikaranAdhiniyam, 1973)***Registered Office and Head Office : UGC-DAE Consortium,* University Campus, Khandwa Road, Indore-452 017.Phone 0731 2463913/2762267/2463913 Fax 0731-2462294/2465437

**No. CSR/Acctts/2019-20/1022** **09 Jan 2020**

**Speed Post**

To
The Principal,
Holkar Science College,
Indore – 452001.

Sub. : Collaborative research titled "**Synthesis and characterization....their application in gas separation**" sanctioned to Dr. Netram Kaurav, Holkar Science College, Indore – 452001.

Ref: Our letter No. **CSR-IC-MSRSR-02/CRS-210/2019-20/** dated **24 May 2019**

Dear Sir,

An amount of **Rs. 4,53,999/-** has been deposited on **08-01-2020** in your Account No. **53015687345** in State Bank of India towards grants sanctioned for year 2019-20 to CRS project mentioned above. Detail of sanction is as follows:

| S. No. | Particulars | Amount (Rs.) |
|---|---|---|
| 1. | Project Fellow @ Rs.14000/-pm + 16% HRA | 1,94,880.00 |
| 2. | Contingency | 15,000.00 |
| 3. | Consumables | 30,000.00 |
| | Total | 2,39,880.00 |
| | Less: Unspent Balance (-) | 81,681.00 |
| | Total | 1,58,199.00 |
| | Fellowship Arrears (31000-14000)*15+16% (1-1-2019 to 31-3-2020) | 2,95,800.00 |
| | **Balance Deposited Amount** | **4,53,999.00** |

Money has been transferred through PFMS Portal vide **Trn. ID. C012009186564** on 08-01-2020.

The next instalment of money, if any sanctioned, will be released only on production of a statement of account and a utilization certificate from your institution.

The conditions for the award of the grant in aid have been set out in our earlier letter cited above.

Please acknowledge receipt of this letter and send us a stamped receipt by return of post.

Yours sincerely,

Administrative Officer-I (Accounts)

Encl. as above.

Copy to : 1. Dr. Netram Kaurav, Holkar Science College, Indore – 452001.
2. Centre-Director, UGC-DAE CSR, Indore Centre

# UGC-DAE Consortium for Scientific Research

विश्वविद्यालय अनुदान आयोग – परमाणु ऊर्जा विभाग वैज्ञानिक अनुसंधान संकुल

(An autonomous institution of UGC, New Delhi)

(विश्वविद्यालय अनुदान आयोग, नई दिल्ली द्वारा स्थापित स्वशासी संस्थान)

(Formerly : Inter University Consortium for DAE Facilities; IUC-DAEF)

Indore Centre
केन्द्र-निदेशक

*Dr. V. Ganesan*
*Centre-Director*


Ref: CSR-IC-MSRSR-02/CRS-210/2019-20/ May 24, 2019

Dr. Netram Kaurav
Holkar Science College, Indore.

Sub:- Your proposal entitled "Synthesis and characterization of monodisperse nickel nanoparticles assisted carbon membranes and their application in gas separation".

Dear Dr. Netram Kaurav,

We are happy to inform you that your CRS proposal has been renewed for one more year for the period 1st April, 2019 to 31st March, 2020, subject to compliance of other procedures:

The financial allocation for this year will be:

| | |
|---|---|
| Project Fellow (@ Rs.14,000/- pm) + HRA | Rs. 1,68,000/- + HRA |
| Contingency | Rs.15,000/- |
| Consumables | Rs.30,000/- |

1. Dr. G.S. Okram will coordinate the activities of the project from CSR side.
2. The Project will be reviewed at the end of each year and a decision will be taken on the financial allocation for the succeeding year.
3. The CSR will be able to reimburse the travel expenses to investigators as well as student under the project as per CSR guidelines for visiting CSR, Indore Centre on project work.
4. After 2 years as Project Fellow, if the research work is found satisfactory on assessment by a Committee with atleast one research paper in a reputed journal, the Project Fellow may be upgraded to Project Fellow-II with the fellowship of Rs.16,000/- pm + HRA.
5. The PI and the co-ordinator from CSR side are requested to make every effort to complete the project in time that may enable the research scholar working in the project to complete his/her Ph.D. degree well within the stipulated time limit.
6. This is a Collaborative Research Scheme. In view of the complex and involved nature of the experiments, any publication emerging under the project must be of collaborative in nature with due consents from the participating institutions / persons, and in consultation with the CRS coordinator. The publication should also acknowledge the UGC-DAE CSR, Indore for the project support.
7. Money for the year 2019-20 will be transferred to the Registrar of your University under intimation to you by our Accounts Section after adjusting the unspent balance of the grant released earlier, if any, upto financial year ending on 31.3.2019, upon receiving the following: (a) Statement of Account for the period upto 31.3.2019 signed by the Registrar and (b) Certificate of Utilisation of money spent till 31.3.2019, signed by the Registrar.
8. **It may be noted that the funds will be released after receiving grants from UGC.**

Yours sincerely,

V. Ganesan

(V. Ganesan)

Copy to the following for information and necessary action:-

1. The Administrative Officer-I (Accounts), UGC-DAE CSR, Indore Centre.
2. The Principal, Holkar Science College, Indore.
3. The PS to Centre-Director, CSR, Indore Centre for project file.


विश्वविद्यालय परिसर, खण्डवा रोड, इन्दौर-452 001 (म.प्र.)
University Campus, Khandwa Road, INDORE - 452 001 (M.P.) INDIA
Phone : +91-731-2472200, 2908150 - Direct, PBX- 2463913,2762267, 2472201 Exnt 192 311
Fax : +91-731- 2465437 , e-mail vganesan@csr.res.in; cd.indore@csr.res.in
www.csr.res.in

# PROGRESS REPORT

## Project Title: Synthesis and characterization of monodisperse nickel nanoparticles assisted carbon membranes and their application in gas separation

| Title of paper | Name of the author/s | Department of the teacher | Name of journal | Year of publication | ISSN number | Link to the recognition in UGC enlistment of the Journal | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Link to website of the Journal | Link to article/paper /abstract of the article | Is it listed in UGC Care list |
| Gas permeation properties of nickel nanoparticle-embedded PPO/PVP polymers based carbon membrane | Disha Harinkhere,Netram Kaurav | Physics | Materials Today: Proceedings | 2022 | 2214-7853 | https://www.sciencedirect.com/journal/materials-today-proceedings | https://doi.org/10.1016/j.matpr.2022.07.195 | Scopus Indexed |
| Structural and optical properties of PPO/PVP blended polymer film | Disha Harinkhere, Nikita Karma, K.K. Choudhary, Netram Kaurav | Physics | Materials Today: Proceedings | 2021 | 2214-7853 | https://www.sciencedirect.com/journal/materials-today-proceedings | https://doi.org/10.1016/j.matpr.2021.10.206 | Scopus Indexed |
| Preparation and Characterization of Membranes Supports for Filteration Application | Disha Harinkhere, Netram Kaurav | Physics | Materials Today: Proceedings | 2021 | 2214-7853 | https://www.sciencedirect.com/journal/materials-today-proceedings | https://doi.org/10.1016/j.matpr.2021.10.508 | Scopus Indexed |
| Temperature-dependent transport properties of a FeTe compound | Pavitra Devi Lodhi, Netram Kaurav, K K Choudhary, Y K Kuo | Physics | Bulletin of Materials Science (Springer) | 2019 | 0973-7669 | https://www.springer.com/journal/12034 | https://doi.org/10.1007/s12034-019-1953-7 | Scopus Indexed |
| High pressure structural phase transition and elastic properties of ZnSexTe1-x semiconducting compounds | Saligram Verma, Arvind Jain, K. K. Choudhary and Netram Kaurav | Physics | International Journal of Modern Physics B | 2019 | 0217-9792 | https://www.worldscientific.com/worldscinet/ijmpb | https://doi.org/10.1142/S0217979219502503 | Scopus Indexed |
| Measurement and Analysis of Normal-State Transport Properties of FeSe Superconductor | Pavitra Devi Lodhi, Netram Kaurav, K. K. Choudhary, Y. K. Kuo | Physics | Journal of Low Temperature Physics (Springer) | 2019 | 1573-7357 | https://www.springer.com/journal/10909 | https://doi.org/10.1007/s10909-019-02198-3 | Scopus Indexed |
| Synthesis and characterization of ZnO nanoparticles by thermal decomposition method | Rathore R.; Harinkhere D.; Kaurav N. | Physics | AIP Conference Proceedings | 2019 | 0094-243X | https://pubs.aip.org/aip/acp | https://doi.org/10.1063/1.5098752 | Scopus Indexed |
| Effect of sintering temperature on the dielectric properties of non-stoichiometric nickel oxide | Dubey P.; Choudhary K.K.; Singh K.; Kaurav N. | Physics | AIP Conference Proceedings | 2019 | 0094-243X | https://pubs.aip.org/aip/acp | https://doi.org/10.1063/1.5098725 | Scopus Indexed |
| Structural and Raman analysis of double perovskite La2CoTi0.7Ni0.3O6 | Solanki N.; Lodhi P.D.; Kaurav N. | Physics | AIP Conference Proceedings | 2019 | 0094-243X | https://pubs.aip.org/aip/acp | https://doi.org/10.1063/1.5098715 | Scopus Indexed |

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2020

## CRITERION –3

## MoUs/Linkages/Collaborations

Dr. Kamal Kumar Choudhary, Army Cadet College (ACC), Indian Military Academy, Dehradun, Uttrakhand

**Document Title:**

Collaborative Research activity and joint publication

# Army Cadet College
## Indian Military Academy
Dehradun, Uttarakhand -248007; Phone: 0135-2775769

**Dr. K. K. Choudhary**

**Professor and Head,**
**Faculty of Science**


No.

Date: 04 Jul 2020

## RESEARCH COLLABORATION

Prof. R. C. Dixit, Dr. H. S. Dager and Dr. Netram Kaurav, Department of Physics, Govt. Holkar Science College, Indore are engaged in collaborative research with Dr. Kamal Kumar Choudhary, Professor, Army Cadet College, Indian Military Academy, Dehradun.

This research collaboration is focused on research activities in the fields of Thermuelectric properties of nanomaterials, superconducting materials, research at high pressure and related topics.

By the virtue of this collaboration, the research groups at both institutions will be able to share the expertise and research facilities at each other's institutes and will be able to guide the research scholars. However, there will be no financial implication on any of the institution due to this research collaboration.

This research collaboration will be effective for the academic session 2020-2021 and will be carried forward based on the need and agreement of both the research groups.

(Dr.K. K. Choudhary)

Dr K K Choudhary
Professor (Physics)
Army Cadet College Wing
Indian Military Academy
Dehradun-248007

RESEARCH ARTICLE | SEPTEMBER 13 2021

# Analysis of size dependent electrical resistivity of $Bi_2Te_3$ nanoparticles

Vinod Rathore; R. C. Dixit; Ravindra R. Kinge; K. K. Choudhary

Check for updates

+ Author & Article Information

*AIP Conference Proceedings* 2369, 020225 (2021)
https://doi.org/10.1063/5.0062273

The size-dependent electrical resistivity ρ(T) of $Bi_2Te_3$ nanoparticles is theoretically analyzed. Temperature-dependent resistivity of $Bi_2Te_3$ nanoparticles is very sensitive to particle size, it shows clearly semiconducting phase for 22nm particle size, whereas, for 150nm particle size, it shows metallic behaviour dominated by electron-phonon interaction. The resistivity in metallic phase is estimated considering electron-phonon scattering mechanism using Bloch-Gruneisen [BG] model of resistivity. Whereas, resistivity in Semiconducting phase has been estimated by small polaron conduction (SPC) mechanism. The theoretically calculated resistivity for various particle sizes in semiconducting and metallic phase of $Bi_2Te_3$ nanoparticles shows good agreement with experimental results in wide temperature range.

Topics
Electrical resistivity, Polarons, Nanoparticle, Elementary particle interactions, Phonon scattering, Public policy and governance

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Squadcast Inc
Faster time to recovery

RESEARCH ARTICLE | SEPTEMBER 13 2021

# Investigation of structural and optical properties of $Fe^{3+}$ ion substituted molybdenum oxide

Pankaj Gupta ; M. Saleem; K. K. Choudhary; Netram Kaurav; R. C. Dixit

Check for updates

+ Author & Article Information

*AIP Conference Proceedings* 2369, 020226 (2021)
https://doi.org/10.1063/5.0061432

Transition metal oxides of the type $Mo_{1-x}Fe_xO_3$ ($x$ = 0.01, 0.02, 0.05) are reported in this work. These metal oxides were synthesized by the solid state reaction method. The as synthesized metal oxides were studied for structural properties using X-ray diffraction characterization. The data collected in the angular range of 20° ≤ θ ≤ 60° was analyzed and it was found that all the synthesized oxides have acquired orthorhombic (Pbnm) crystal structure. It was witnessed that all sample were single phased inferred from the identical diffractogram of these oxides. To verify the results of XRD analysis further, we refined the XRD data and the various structural parameters obtained established the structure and space group of the prepared oxide materials. To obtain the crystallite size acquired as a result of high temperature firing, we approached with classical Debye-Scherer formula and Williamson-Hall approach and the calculated crystallite size in both approaches agree with each other. Further, Williamson-Hall approach helped us in the determination of the strain induced as a result of severe mechanical grinding and high temperature treatment. The optical bandgap estimated exploiting UV-Vis spectroscopic technique was found 3.34eV, 3.5eVand 3.3eV for $Mo_{0.99}Fe_{0.01}O_3$, $Mo_{0.98}Fe_{0.02}O_3$ and $Mo_{0.95}Fe_{0.05}O_3$ oxides respectively.

Topics

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RESEARCH ARTICLE | SEPTEMBER 13 2021

# Preparation and optical properties of nickel nanoparticles implanted carbon membranes

Disha Harinkhere ; K. K. Choudhary; Netram Kaurav

Check for updates

+ Author & Article Information

*AIP Conference Proceedings* 2369, 020201 (2021)

https://doi.org/10.1063/5.0061269

Through dip coating method monodisperse nickel nanoparticles assisted carbon membrane was prepared on porous alumina disc support. The coating solution was prepared by blending of thermally stable polymer polyphenylene oxide (PPO) and thermally labile polymer polyvinylpyrrolidone (PVP) followed by addition of nickel nanoparticles. Size of nanoparticles, surface porosity, average pore size, element composition and optical properties of the membrane were investigated by means of different techniques such as XRD, FE-SEM, EDS and UV-Visible spectrometer Incorporation of nano-sized nickel in polymer matrix causes increase in pore size from 0.022 μm to 0.076 μm as well as porosity and decrease in optical band gap from 5.44 eV to 5.09 eV of membrane.

Topics

Band gap, Materials synthesis and processing, Optical properties, Polymers, Porous media, Visible spectroscopy, Nanoparticle, Transition metals, Chemical elements

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RESEARCH ARTICLE | SEPTEMBER 13 2021

# Synthesis, structural and optical properties of Cr-Doped nickel oxide (NiO)

Suraj Parwani; Ravindra R. Kinge; K. K. Choudhary; Netram Kaurav; R. C. Dixit

Check for updates

+ Author & Article Information

*AIP Conference Proceedings* 2369, 020224 (2021)
https://doi.org/10.1063/5.0061301

Cr doped nickel oxide (NiO) were successfully synthesized using a one-step solid state reaction method. The X-ray diffraction patterns analysis shown that all doped NiO powder samples were exhibited polycrystalline structures. When NiO doped with the different elements such as Cr then substantial modifications and anomalies were observed in NiO such as, morphology, thickness, lattice constant, stress/strain, crystallite size, and dislocation density. The doping in NiO also altered optical properties. Moreover, the characteristic deviations in the doped NiO powder have been thoroughly discussed.

Topics

Doping, Optical properties, Polycrystalline material, X-ray diffraction, Transition metal oxides

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# SSR DOCUMENT

2020

## CRITERION – 3

## MoUs/Linkages/Collaborations

Sai Electronics, 1508-E, Sai Vihar Colony, Rau, Indore

**Document Title:**

A one-day visit and training on the fabrication and Maintenance of Electronic Laboratory equipment was conducted in an active MoU with Sai Electronics, Rau, Indore.

कार्यालय प्राचार्य
शासकीय होलकर विज्ञान महाविद्यालय, इन्दौर
☎ 0731-2464074 ● फैक्स : 0731-2446806, 2764027
Email : principalhsc@rediffmail.com ● Web Site: www.collegeholkar.org

**Memorandum of Understanding for Academic and Industrial/academic Cooperation**
**Between**
**Department of Electronics, Government Holkar (Model Autonomous) Science College Indore (M.P.) INDIA**
**And**
**SaiElectronics, Rau, Indore**

This Memorandum of Understanding made between the department of electronics, Government Holkar (Model, Autonomous) Science College, Indore (M.P.), India and SaiElectronics, Rau, Indore (M.P.), India, agree to explore the possibilities of providing a framework for educational, technical, and industrial cooperation for students and teachers of the Department of Electronics at Government Holkar (Model, Autonomous) Science College in Indore.

The Memorandum of Understanding (MOU) establishes the following:

**SCOPE OF THE AGREEMENT**

1. To encourage academic and technological collaboration, training on advanced technologies/tools would be provided by industry faculty/staff.
2. Industry will provide pilotage for internship/major or minor projects/summer projects/projects for students.
3. In response to academic demand, the industry will give specific stream-oriented lectures.
4. Students will be permitted to tour the industry to gain a better understanding of the instrument development process.

**EXECUTION OF THE MOU:**

The Department of Electronics will be implementing a nodal department from Government Holkar (Model Autonomous) Science College, Indore side. A faculty/staff will be assigned by the proprietor from the cooperation side.

**TERM OF THE MOU:**

This MOU shall be effective upon signature by the two institutes and shall remain in force for 5 years and will be extended further on mutual understanding.

**FINANCIAL LIABILITIES**

There are no financial liabilities for either participant in implementing the MOU.

This MOU is signed by

Head of the Department
ELECTRONICS
Govt. Holkar Science College
INDORE

**Dr. Netram Kaltray, HOD,** Department of Electronics,
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

**Dr. Suresh T. Silawat, Principal**
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

प्राचार्य
शासकीय होलकर विज्ञान महाविद्यालय
इन्दौर (म.प्र.)

SAI ELECTRONICS RAU, INDORE

**Mr. S. K. Sahu, Proprietor**
SaiElectronics, Rau, Indore

**Date of Implementation**

18/09/2019

Tin. No. : 23069083942

Sai Electronics

Scientific Laboratory Instruments
(Physics, Electronic, Chemistry & Biology)
Dealers & Suppliers

**Memorandum of Understanding for Academic and Industrial/academic Cooperation**
**Between**
**Department of Electronics, Government Holkar (Model Autonomous) Science College Indore (M.P.) INDIA**
**And**
**SaiElectronics, Rau, Indore**

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Head of the Department
ELECTRONICS
Govt. Holkar Science College
INDORE

**Dr. Netram Kaurav, HOD,** Department of Electronics,
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

**Dr. Suresh T. Sikarwar, Principal**
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

प्राचार्य
शा. अहिल्या स्वशासी
विज्ञान महाविद्यालय,
इंदौर (म.प्र.)

SAI ELECTRONICS
RAU, INDORE

**Mr. S. K. Sahu, Proprietor**
SaiElectronics, Rau, Indore

**Date of Implementation**
18/09/2019

# SKILL DEVELOPMENT PROGRAM
2019-20

| S. No | Component/Activities | Details |
|---|---|---|
| 1 | Name of the Department / Unit / Agency: | Department of Electronics |
| 2 | Name of the Activity: | One Day Visit/Training On Fabrication and Maintenance of Electronic Laboratory Equipment |
| 3 | Name of the Scheme: | Visit/Training under the MOU |
| 4 | Date and Year of the Activity: | 03/02/2020 |
| 5 | Number of Students Participated in the activity: | 08 |
| 6 | Report of the Activity (in 100 words): | Electronics Department, Government Holkar (Model, Autonomous) Science College, Indore organized a one-day industrial training on 03/02/2020 at Sai Electronics, under the MoU signed by industry and the institute. In this training, students learned about the fabrication and maintenance of electronic laboratory equipment. Students also learned to fabricate some basic circuits of electronics in this industrial training. Through this training, 08 students of B.Sc. benefited. After this training, students did practice in the department laboratory, and they developed basic laboratory equipment circuits on breadboard with the help of faculty and staff from the department. This visit is permitted by the Principal, Dr. Suresh T. Silawat, and the Head of the Department, Dr. Netram Kaurav. |

शासकीय होल्कर विज्ञान महाविद्यालय
इन्दौर (म.प्र.) भारत – 452 017
फोन नं. : 0731-2464074, 244049
ईलेक्ट्रॉनिकी विभाग

Date:- 20/01/2020

To,

Director,
Sai Electronics,
1508 – E, SaiVihar Colony,
Rau, Indore,

Subject: -Proposal/Permission Letter for One-Day Visit/Training in Industry

Respected Sir,

The purpose of this letter is to request permission for a one-day visit/training. For the students of B.Sc. Electronics Employment/Learning Purpose, I request you to Kindly Provide some practical education to the students about industrial procedures, Products, and facilities. The 8 students will be part of the trip accompanied by one teacher. Your kind consideration of our request will help.

I request you to kindly confirm our student's visit/Training.

**Students List**

| S.No | Students Name | S.No | Students Name |
|---|---|---|---|
| 1 | Purvashi Vohra | 5 | Kamlesh Dangi |
| 2 | Abhay Kumar | 6 | Kshitij Yadav |
| 3 | Harshita Sakwar | 7 | Anushka Jain |
| 4 | Dipika Pathak | 8 | Nisha Samediya |

Thanks for your kind corporation

प्राप्त किया

O/C

SAI ELECTRONICS RAU, INDORE

Dr. Netram Kaurav
HOD
Department of Electronics
विभागाध्यक्ष
इलेक्ट्रॉनिकी विभाग
शा. होल्कर विज्ञान महाविद्यालय
इन्दौर

Sai Electronics

Tin. No. : 230690839

Scientific Laboratory Instrumen
(Physics, Electronic, Chemistry & Biolog
Dealers & Supplie

To,

Head,

Department of Electronics,

Govt. Holkar Science College, Indore

Subject: -Consent Letter for One-Day Industrial Visit/Training of your Students.

Dear Sir,

This is with reference to your request regarding the one-day visit for Fabrication and Maintenance of Laboratory Equipment, we hear by considering your request for the same. We are preparing a module for practical education, industrial procedures and etc.

You are requested to arrange a visit on 03/02/2020 date.

Thanking you

SAI ELECTRONICS RAU, INDORE

1508 - E, Sai Vihar Colony, Rau, Indore - 453 331 (M.P.) Mob.: 9993936902
E-Mail : saielectronics83@gmail.com

| | | |
|---|---|---|
| 7 | List of Participants | Enclosed |

**Students List**

| S.No | Students Name | S.No | Students Name |
|---|---|---|---|
| 1 | Purvashi Vohra | 5 | Kamlesh Dangi |
| 2 | Abhay Kumar | 6 | Kshitij Yadav |
| 3 | Harshita Sakwar | 7 | Anushka Jain |
| 4 | Dipika Pathak | 8 | Nisha Samediya |

# SSR DOCUMENT

2019

## CRITERION – 3

## MoUs/Linkages/Collaborations

**Research Institute of Organic Agriculture Switzerland (FiBL) and the BioRe Association (India)**

**Document Title:**

**Guest lectures were delivered by Dr. Gurbir Bhullar and Dr. Navreet Bhullar of the Research Institute of Organic Agriculture Switzerland (FiBL) under collaborative activity.**

# MEMORANDUM OF UNDERSTANDING

**between the**

**Research Institute of Organic Agriculture, Switzerland (FiBL)**

**and the**

**Government Holkar (Model, Autonomous) Science College Indore (India)**

**as well as the**

**bioRe Association (India)**

In the spirit of international understanding, Govt. Holkar (Model, Autonomous) Science College Indore, India and Research Institute of Organic Agriculture, Switzerland (FiBL), agree to examine the possibility of establishing a framework for educational and research cooperation for our students, faculty and staff.

In preparation for establishing a formal framework for future activities, the parties hereto agree as follows:

1. Explore possibilities for faculty and staff exchanges for research, lectures, and discussions that mutually benefit both institutions;
2. Explore the feasibility of student exchanges and study programs;
3. Seek support for projects determined to be mutually beneficial to both institutions;
4. The terms of joint activities and arrangements for specific visit, exchanges, and other forms of cooperation will be agreed upon in writing prior to the initiation of any activity. Any commitment of resources, financial or otherwise, in support of these activities must be contained in subsequent specific agreements;
5. While no binding commitments have been made, we sign this Memorandum of Understanding in recognition of our common interests and agree to consult periodically concerning the status of our collaboration.

For the Research Institute of Organic Agriculture, Switzerland (FiBL)

15.12.19

Dr. Gurbir S. Bhullar

(System Project Coordinator)

For the Government Holkar (Model, Autonomous) Science College Indore (India)

15/12/19

Dr. Suresh T. Silawat

(Principal)

For bioRe association

President bioRe association

For Principal Investigator

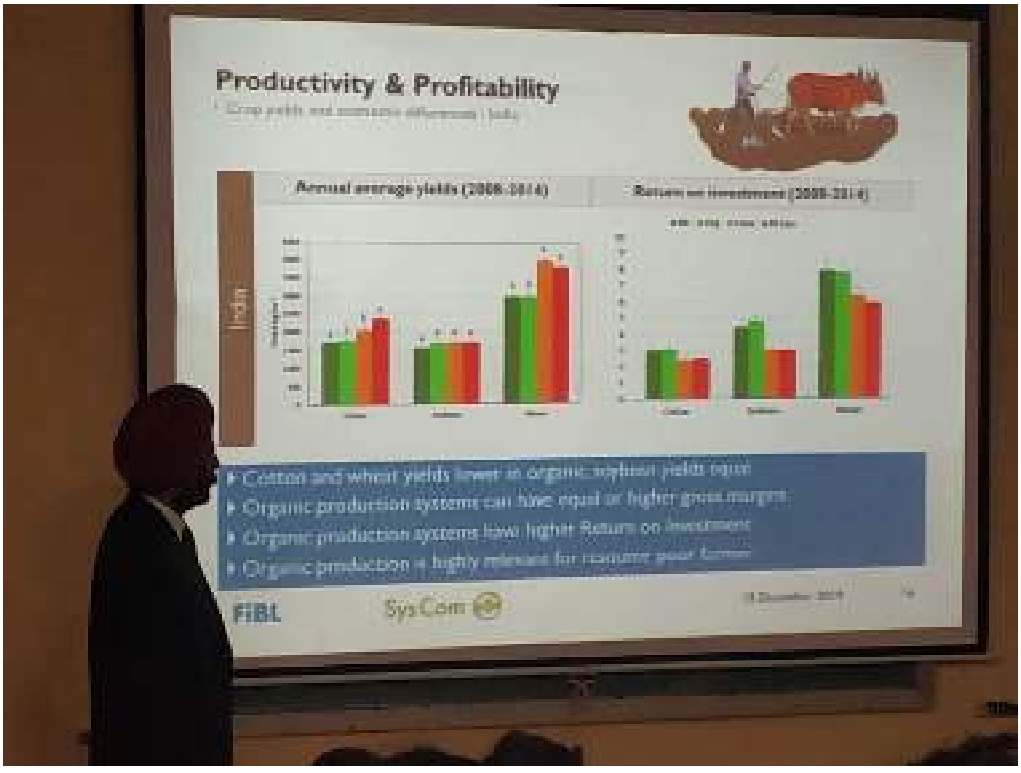
15/12/19

Dr. Sanjeeda Iqbal

(Professor & Head Dept. of Botany)

## Guest lecture by Dr. Gurbir Bhullar, Switzerland

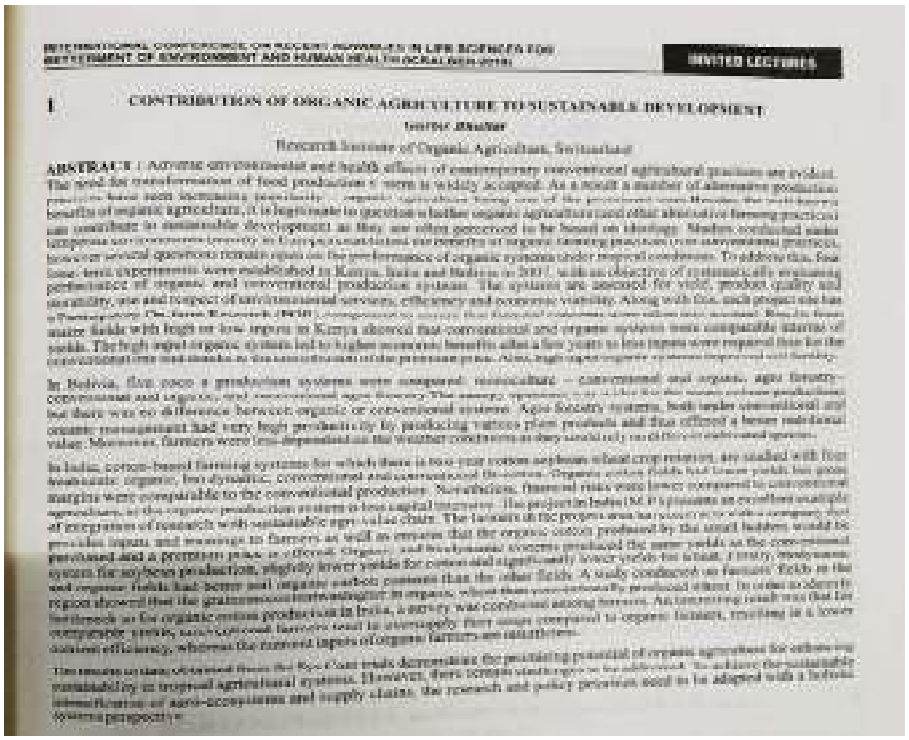




## Interaction with students



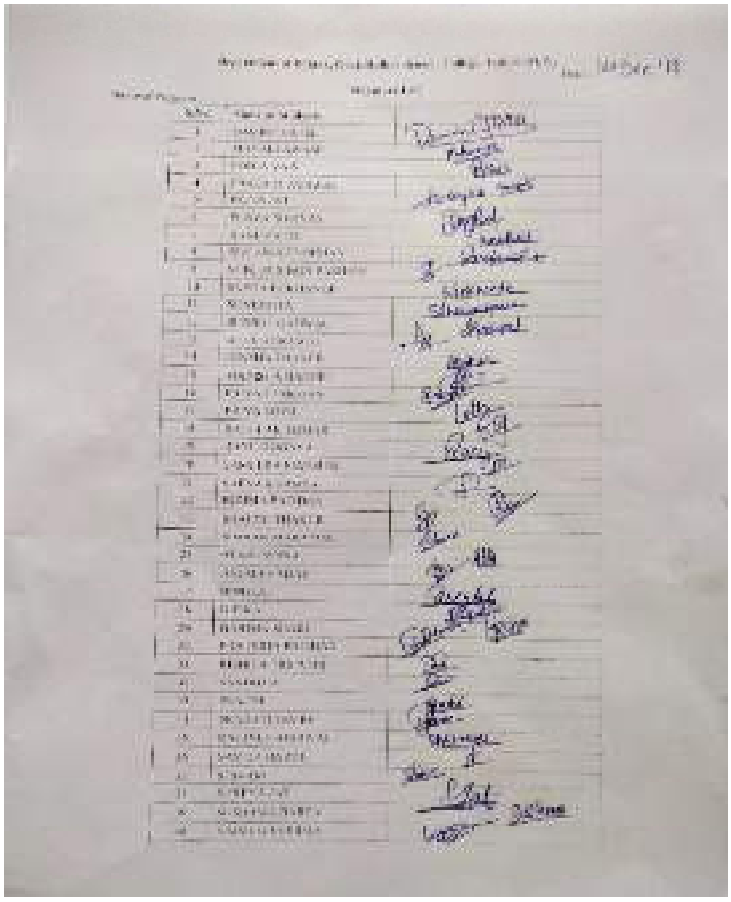


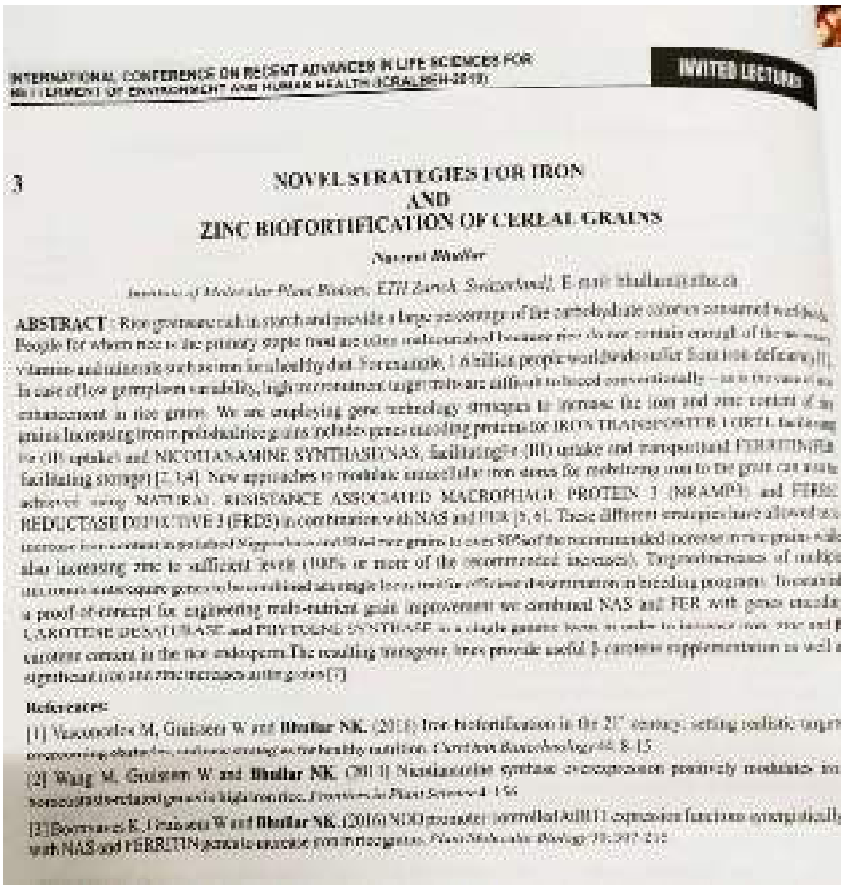
1 CONTRIBUTION OF ORGANIC AGRICULTURE TO SUSTAINABLE DEVELOPMENT

ABSTRACT

## Guest lecture by Dr. Gurbir Bhullar, Switzerland



# Guest lecture by Dr. Navreet Bhullar, Switzerland



INTERNATIONAL CONFERENCE ON RECENT ADVANCES IN LIFE SCIENCES FOR ... OF ENVIRONMENT AND HUMAN HEALTH (ICRALSEH-2016)

INVITED LECTURES

3

## NOVEL STRATEGIES FOR IRON AND ZINC BIOFORTIFICATION OF CEREAL GRAINS

*Navreet Bhullar*

*Institute of Molecular Plant Biology, ETH Zurich, Switzerland*, E-mail: bhullarn@ethz.ch

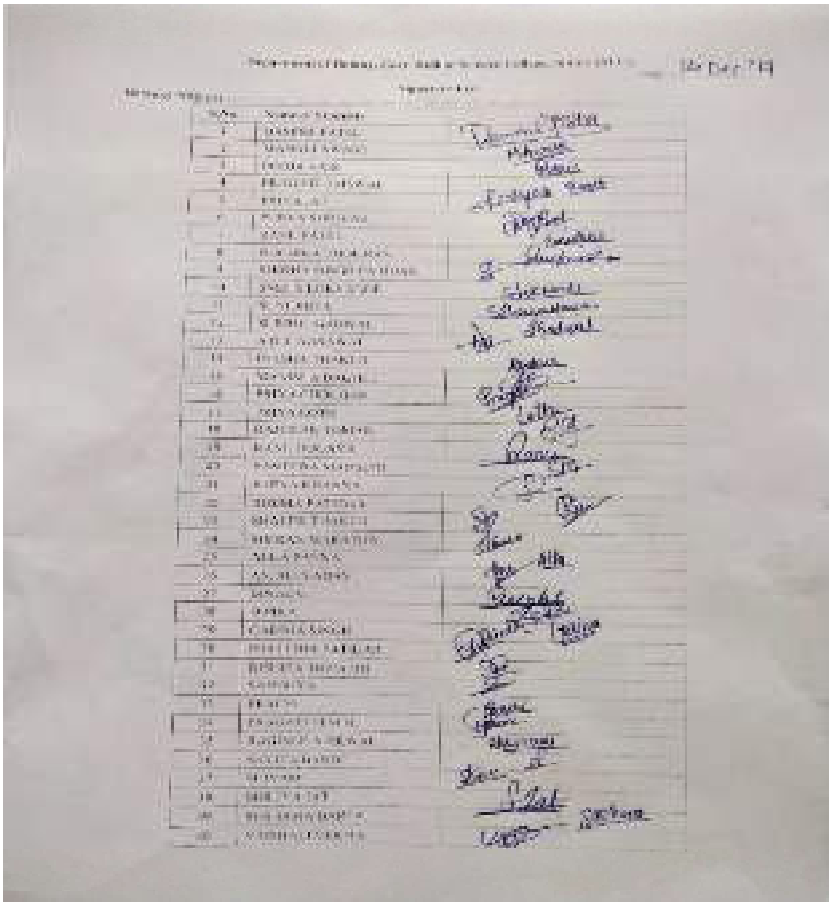
**ABSTRACT**: Rice grain rich in starch and provide a large percentage of the carbohydrate calories consumed worldwide. People for whom rice is the primary staple food are often malnourished because rice does not contain enough of the micronutrients, vitamins and minerals such as iron for a healthy diet. For example, 1.4 billion people worldwide suffer from iron deficiency [1]. In case of low genetic variability, high micronutrient target traits are difficult to breed conventionally – as is the case for iron enhancement in rice grains. We are employing gene technology strategies to increase the iron and zinc content of rice grains. Increasing iron in polished rice grains includes genes encoding proteins IRON TRANSPORTER 1 (IRT1) facilitating Fe (II) uptake and NICOTIANAMINE SYNTHASE (NAS) facilitating Fe (II) uptake and transportand FERRITIN facilitating storage) [2, 3, 4]. New approaches to mobilize stored iron stores for redirecting iron to the grain can also be achieved using NATURAL RESISTANCE ASSOCIATED MACROPHAGE PROTEIN 1 (NRAMP1) and FERRIC REDUCTASE DEFECTIVE 3 (FRD3) in combination with NAS and FER [5, 6]. These different strategies have allowed us to increase iron content in polished *Oryza sativa* Nipponbare and Kitaake rice grains to over 50% of the recommended increase in rice grain while also increasing zinc to sufficient levels (100% or more of the recommended increase). The effectiveness of multiple transgenes to square grain to be combined advantageously over conventional determinants in breeding programs. To establish a proof-of-concept for engineering multi-nutrient grain improvement we combined NAS and FER with genes encoding CAROTENE DESATURASE and PHYTOENE SYNTHASE in a single genetic locus to increase iron, zinc and provitamin A carotene content in the rice endosperm. The resulting transgenic lines provide useful β-carotene supplementation as well as significant iron and zinc increases in the grains [7].

**References:**

[1] Vasconcelos M, Grusak M and **Bhullar NK.** (2018) Iron biofortification in the 21st century: setting realistic targets, overcoming obstacles, and new strategies for healthy nutrition. *Current Opinion Biotechnology* 44: 8-15

[2] Wang M, Gruissem W and **Bhullar NK.** (2013) Nicotianamine synthase overexpression positively modulates iron homeostasis-related genes and iron traffic. *Frontiers in Plant Science* 4: 156

[3] Boonyaves K, Gruissem W and **Bhullar NK.** (2016) NAS promoter: controlled AtIRT1 expression functions synergistically with NAS and FERRITIN genes to increase iron in rice grains. *Plant Molecular Biology* 91: 507-519



# SSR DOCUMENT

2019

## CRITERION – 3

## MoUs/Linkages/Collaborations

**Noble Alchem Pvt. Ltd. (Agribooster), Sanwer Road, Indore, M.P.**

**Document Title:**

**collaborative research work on the effect of Soluble Silica on the Plant Growth, leaf Chlorophyll content, and Bulb Quality of garlic (Allium sativum L.) against Drought Stress with Noble Alchem Pvt. Ltd., Indore**

# Government Holkar Science College, Indore (MP)

## Department of Biochemistry

### Certificate of Collaboration

This is to certify that the **Department of Biochemistry, Govt. Holkar Science College, Indore, and Noble Alchem Pvt. Ltd. (Agribooster), Sanwer Road, Indore, M.P.** with the mutual collaborative work have successfully published a Research Paper entitled **"Effect of Soluble Silica on the Plant Growth, Leaves Chlorophyll Content and Bulb Quality of the Garlic (*Allium sativum L.*) against Drought Stress"** in the session 2019-20.



**Head**

Department of Biochemistry

A-5889
[1-7]

RESEARCH ARTICLE Indian Journal of Agricultural Research, Volume Issue : ()

# Effect of Soluble Silica on the Plant Growth, Leaves Chlorophyll Content and Bulb Quality of the Garlic (*Allium sativum* L.) against Drought Stress

Harsha Goyal[1], Angurbala Bafna[1], Nagesh Vyas[2], Rohan Gupta[2]

10.18805/IJARe.A-5889

## ABSTRACT

**Background:** Garlic is an aromatic spice with nutritional and medicinal values. Climatic variations such as drought, adversely affect Garlic's morpho-physiological, biochemical attributes and diminish its bulb quality. Soluble silica is a plant-available form of silicon (Si). Silica is beneficial for plant's healthy growth especially against stress conditions. The present study was aimed to evaluate the effect of soluble silica on the garlic plant growth, leaves chlorophyll content and bulb quality against drought stress.

**Methods:** Garlic was cultivated during the *Rabi* season (2019-2020) in the experimental field Lohar pipliya (Dewas), India. Randomized experimental blocks consisted of six treatments as follows: $T_1$- Control (well-watered), $T_2$- Drought stress (water supply reduced by about 50%), $T_3$- Drought + a basal dose of NPK fertilizers (BDF) in soil, $T_4$, $T_5$, $T_6$- Drought + BDF + foliar sprays of 7.5, 10 and 12.5 ml $L^{-1}$ soluble silica respectively. Silica sprays were applied seven-time at a regular interval of 15-days. After 120-days of sowing, plant growth in terms of plants height and number of leaves $plant^{-1}$ were measured. 120-days leaves chlorophyll, MDA and proline content were estimated. Garlic bulb's quality in terms of fresh-dry weight and diameter were recorded at the final harvest.

**Result:** Results revealed that drought significantly reduced Garlic's plant height, bulb quality (weight and diameter), chlorophyll (Chl-*a* and Chl-*b*) and increased MDA, proline content in contrast to the well-watered garlic. Fertilizers (BDF) feebly improved garlic bulb quality. However, fertilizers (BDF) supplemented with soluble silica sprays (7.5 ml $L^{-1}$<12.5 ml $L^{-1}$<10 ml $L^{-1}$) significantly increased plant height, bulb weight and diameter, leaves chlorophyll, proline and reduced MDA content over the drought-stressed Garlic. Fertilizers (BDF) supplemented with Soluble silica maintained plant water content, reduced oxidative stress and increased leaves chlorophyll content. These resulted in good quality garlic bulbs in terms of weight and diameter despite the drought stress.

**Key words:** Chlorophyll, Drought stress, Garlic bulb quality, MDA, Proline, Soluble silica.

## INTRODUCTION

Garlic (*Allium sativum* L., Family Alliaceae) is the second-largest bulbous crop that originated 5000 years ago in Central Asia (Benke *et al*., 2020). India (5.3%) is the second principal producer of Garlic after China (79.8%) and exports it in the fresh-dehydrated form to other countries such a Bahrain, Germany and Japan (Lawande *et al*., 2009). Garlic is widely used as a spice in flavoring food because of the distinctive aroma of organosulphur compounds like allicin (diallyl thiosulphate) (Bhatia *et al*., 2020). Garlic has various health benefits; it is used as a natural antibiotic for the common cold, fever, bronchitis and lowers serum cholesterol and triglycerides in cardiovascular diseases (Reyes *et al*., 2018, Morales-Gonzalez *et al*., 2020, Vijaya *et al*., 2020).

Garlic production solely depends on the irrigation water supply because of its shallow roots and water-sensitive nature. Adverse climatic variations such as drought severely affect garlic growth, quality and yield in drylands (Sattar *et al*., 2020). Water scarcity inhibits seed germination and seedling growth (Maksimovic *et al*., 2021), causes cellular dehydration, stomatal closure and imbalance in reducing equivalents in plants (Hussain *et al*., 2019). These trigger synthesis of reactive oxygen species (ROS) in cellular organelle like mitochondria, chloroplast, peroxisome. ROS damage membrane lipid, protein, nucleic acid and negatively affect plant growth and development (Chung *et al*., 2020, Hasanuzzaman *et al*., 2020).

Routinely used agriculture practices and fertilizers were not enough for the plants to cope with the climatic adversities and require additional growth nutrients. Silicon (Si) is a quasi-essential (Zargar *et al*., 2019), an anti-stress agent against abiotic and biotic stresses (Malhotra and Kapoor, 2019). Although Si is abundant in soil, plants are not able to utilise its complex form (Zargar *et al*., 2019). Soluble silica (Agribooster™) a new water-soluble form of silicon, that can be utilised directly by plants and exhibits numerous beneficial effects on plant growth, quality and yield against climatic

[1]Department of Biochemistry, Government Holkar Science College, Indore-452 001, Madhya Pradesh, India.
[2]Noble Alchem Pvt. Ltd., Indore-452 015, Madhya Pradesh, India

**Corresponding Author:** Harsha Goyal, Department of Biochemistry, Government Holkar Science College, Indore-452 001, Madhya Pradesh, India. Email: harsha-goyal1@yahoo.co.in

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adversities. Previous studies suggested that soluble silica mitigated heavy metal (Pb) toxicity on *Vigna radiata* (Goyal *et al*., 2017), *Triticum aestivum* (Sharma *et al*., 2018). Si mitigated salt stress in Soybean (Chung *et al*., 2020), drought stress in Maize (Parveen *et al*., 2019), sudden environmental stress (Rangwala *et al*., 2018) and elevated temperature in Barley (Hussain *et al*., 2019). Polysilicate ($SiO_2.nH_2O$) impregnates plant tissues like sclerenchyma, epidermis, vascular bundle to provide strength and rigidity against external stress (Mandlik *et al*., 2020). It maintained turgor pressure, nutrient accumulation in Canola against the drought stress (Bukhari *et al*., 2020). Si balanced the water status of plants by apoplastic role (Thorne *et al*., 2020), improved chlorophyll pigments and antioxidants (SOD, CAT and POD) activity in maize seedlings (Sattar *et al*., 2020).

Our study explored the possibilities of the use of soluble silica foliar sprays (a plant-available form of silicon) along with routinely used fertilizers (BDF) to reduce the adverse effect of drought on Garlic's plant growth, 120-days leaves chlorophyll (Chl-*a* and Chl-*b*), MDA, proline content and bulb quality.

## MATERIALS AND METHODS

### Experimental field and plant material

A field experiments on the garlic (*Allium sativum L.*) crop of variety-Amleta were carried out during *Rabi* season (28 October 2019 to 21 March 2020) at the agricultural research field, Lohar pipliya village, Dewas (MP), India (22° 54′ 42″N longitude and 75° 59′31″E latitude). Growth and Biochemical parameters of 120-days Garlic leaves and harvested matured bulbs were recorded at the Department of Biochemistry, Govt. Holkar Science College, Indore (M.P).

The soil characteristics before treatments were: pH 7. 98, E.C 0.92 d $Sm^{-1}$, Organic carbon 0.48%, N, P, K, are 196, 11.2 and 480 kg $ha^{-1}$ respectively. There was no rainfall and field temperature was varied from 22°C to 34°C during the complete growth period.

### Experimental design

The experimental setup was designed as randomized complete blocks consisted of six treatments, each having a 2×1.8 $m^2$ block area (Fig 3a). Garlic bulbs were carefully separated into individual cloves and sown in the field so that the distal end was upward and covered with soil.

| Tt. no. | After 15-days of sowing, Garlic plants were treated with six treatments as follows: |
|---|---|
| $T_1$ | Control (well-watered). |
| $T_2$ | Drought stress (water supply reduced by about 50% as compared to control). |
| $T_3$ | Drought stress + a basal dose of N, P, K fertilizers in soil (BDF). |
| $T_4$ | Drought stress + BDF + foliar spray of 7.5 ml $L^{-1}$ soluble silica fertilizer. |
| $T_5$ | Drought stress + BDF + foliar spray of 10 ml $L^{-1}$ soluble silica fertilizer. |
| $T_6$ | Drought stress + BDF + foliar spray of 12.5 ml $L^{-1}$soluble silica fertilizer. |

Here, soluble silica fertilizer (Agribooster™) was used as a plant-available form (PAF) of silicon (Si). It consisted of 13.1 % $SiO_2$. Silica was sprayed seven-time in a regular interval of 15-days from sowing up-to-the Garlic bulb maturity. Weeds were removed manually. After 120-days of sowing (DAS), Garlic leaves from each treatment were sampled for biochemical assay and at final harvest matured Garlic bulbs were collected for quality assay (Fig 3c and 3d).

### Plant growth (height and number of leaves plant$^{-1}$)

120-days (DAS) Garlic plant height (cm) and the number of leaves were recorded in triplicates (Fig 3b) (Wu *et al*., 2015).

### Bulb quality (weight and diameter)

After harvest, Garlic bulbs and pseudo-stem diameter (cm), were measured through a vernier calliper. Its fresh and dry weight (gm) was measured using an electronic balance in triplicates (Mann, 1952).

### Chlorophyll content

Chl-*a and* Chl-*b* content of 120-days Garlic leaves (200 mg) were extracted in 80% alcohol and estimated using Lichtenthaler and Welburn (1983) equation:

Chl-*a* (µg $mL^{-1}$) = 12.21 ($A_{663}$) - 2.81 ($A_{646}$) and Chl-*b* (µg $mL^{-1}$) = 20.13 ($A_{646}$) - 5.03 ($A_{663}$).

### Malondialdehyde (MDA) estimation

MDA level of 120-Days Garlic leaves (100 mg) were estimated using: $A = \varepsilon cl$,

where

A = Absorbance at 532 nm.

ε = Extinction coefficient (155 $mM^{-1}cm^{-1}$).

l = length of cell (1cm).

C = Concentration (Heath and Packer, 1968).

### Proline estimation

Proline content of 120-Days Garlic leaves (500 mg) were determined using a standard curve and estimated on a fresh weight basis of sample: µmoles of Proline/g tissue = µg proline/ ml × toluene (ml) × 5/ g sample 115.5 (Bates *et al*., 1973).

## RESULTS AND DISCUSSION

### Chlorophyll content in garlic leaves

As shown in Table 1 and Fig 1, Chl-*a* and Chl-*b* content in Garlic leaves were reduced under drought stress ($T_2$) compared to the well-watered control ($T_1$). Here, reduced fresh weight, increased MDA and proline content in Garlic leaves ($T_2$) (Table 1) indicates that water scarcity has induced oxidative stress in plants. Abid *et al*.,(2018) revealed that stomatal closure in drought stressed-wheat leaves, reduces carbon assimilation, cause an imbalance between excited electrons and their use in light reaction to trigger overgeneration of reactive oxygen species (ROS). Chlorophyll content in Garlic leaves might have reduced due to oxidative damage of chloroplast thylakoid membrane and inhibition of chlorophyll biosynthesis enzymes by ROS. Our

suggestions were in favor of other findings that drought reduced chlorophyll content in maize hybrid varieties Xida-319 and Xida-889 (Hussain *et al*., 2019) and Wheat (Pozo *et al*., 2020). Routinely used fertilizers (BDF) ($T_3$) insignificantly improved Chl-*a* and Chl-*b* content in Garlic leaves as compared with drought Garlic leaves ($T_2$). Supplementation of silica sprays to fertilizers (BDF) significantly increased leaves Chl-*a* and Chl-*b* content ($T_4$, $T_5$, $T_6$) in order 7.5 ml $L^{-1}$ <12.5 ml $L^{-1}$ <10.0 ml $L^{-1}$ over the Garlic grown under drought without any treatments ($T_2$). Previous studies of Ma, (2012), Sapre and Vakharia, (2016), Greger *et al*., (2018), Alamri *et al*., (2020) suggested that silicon deposits at the leaf bundle sheath and form the silica cuticle layer (epidermis) to reduce the transpirational water loss in plants. In our study, reduced MDA level and highly significantly increased proline (osmoprotectant) content in garlic treated with BDF+silica sprays ($T_4$, $T_5$, $T_6$) as compared to drought garlic ($T_2$) shows that silica has balanced water content in plants and might have prevented Chloroplast thylakoid membrane from oxidative damage. Our study is in favour with Dehghanipoodeh *et al., (*2018) that Potassium silicate ($K_2SiO_3$) (10 mmol $L^{-1}$) maintained the water content of the Strawberry plants. Sun *et al*., (2021) also showed that 15 g $L^{-1}$ of water-soluble silicon (Si-50G, Si-60G) has improved proline, sugar and protein (osmolytes) content to prevent membrane damage and increased chlorophyll content in maize seedlings.

### Growth attributes of garlic plants

In our study, the Garlic plant's growth was assessed based on height and the number of leaves on the plants. As shown in Table 2 and Fig 2, drought ($T_2$) reduced garlic plant height significantly and the number of leaves $plant^{-1}$ insignificantly over the well-watered plant ($T_1$). It is evident that plants absorb growth nutrients from soil in a water-soluble form. Here, garlic plant's height were reduced might be due to insufficient availability of water-soluble nutrients from soil. Secondly, reduced light-capturing pigments (Chl) possibly affected plants photosynthetic activity and diminished garlic plant height in drought stress. The basal dose of NPK fertilizers ($T_3$) has slightly improved plant growth against drought stress ($T_2$). However, BDF+silica sprays ($T_{4,5,6}$) have

**Table 1:** Showing the effect of soluble silica on chlorophyll (Chl-*a*, Chl-*b* and Chl-*a*/*b* ), MDA and proline content of garlic leaves against drought stress.

| Type | Conc. of Silica (ml $L^{-1}$) | Chl *a* (mg/g) | Chl *b* (mg/g) | Chl *a*/*b* (mg/g) | MDA (mM/g) | Proline (µmoles/g) |
|---|---|---|---|---|---|---|
| Control | 0 | 13.182±0.15 a, b**, c* | 6.364±0.20 a, b*, c* | 2.073±0.09 a, b*, c* | 0.00299±0.0001 a, b*, c* | 14.66±0.57 a, b*, c* |
| Drought | 0 | 11.728±0.42 a**, b, $c^{ns}$ | 5.976±0.07 a*, b, $c^{ns}$ | 1.926±0.01 a*, b, $c^{ns}$ | 0.00347±0.00003 a**, b, $c^{ns}$ | 16.33±0.58 a*, b, $c^{ns}$ |
| Drought + BDF | 0 | 11.839±0.22 a**, $b^{ns}$, c | 6.146±0.09 $a^{ns}$, $b^{ns}$, c | 1.922±0.04 $a^{ns}$, $b^{ns}$, c | 0.00324±0.0001 a*, $b^{ns}$, c | 17.33±1.15 a*, $b^{ns}$, c |
| Drought + BDF + silica | 7.5 ml $L^{-1}$ | 12.512±0.42 a*, b*, $c^{ns}$ | 6.134±0.06 $a^{ns}$, b*, $c^{ns}$ | 2.040±0.002 $a^{ns}$, b*, $c^{ns}$ | 0.00317±0.0001 $a^{ns}$, b*, c* | 20.33±1.15 a**, b**, c* |
| | 10.0 ml $L^{-1}$ | 12.544±0.42 a*, b*, c* | 6.154±0.06 $a^{ns}$, b*, c* | 2.049±0.01 $a^{ns}$, b*, c* | 0.00299±0.0002 $a^{ns}$, b*, c** | 20.66±0.57 a***, b***, c* |
| | 12.5 ml $L^{-1}$ | 12.648±0.42 a*, b*, c* | 6.171±0.03a $^{ns}$, b*, c* | 2.048±0.01 $a^{ns}$, b*, c* | 0.00311±0.0001 $a^{ns}$, b*, c* | 19.66±0.57 a***, b**, c* |

$^{ns}$ indicates not significant, * indicates significant, ** indicates highly significant *** indicates extremely significant. a-shows the p-value in contrast to control, b- shows the p-value, in contrast to, drought stress, c-shows the p-value in contrast to fertilzer.

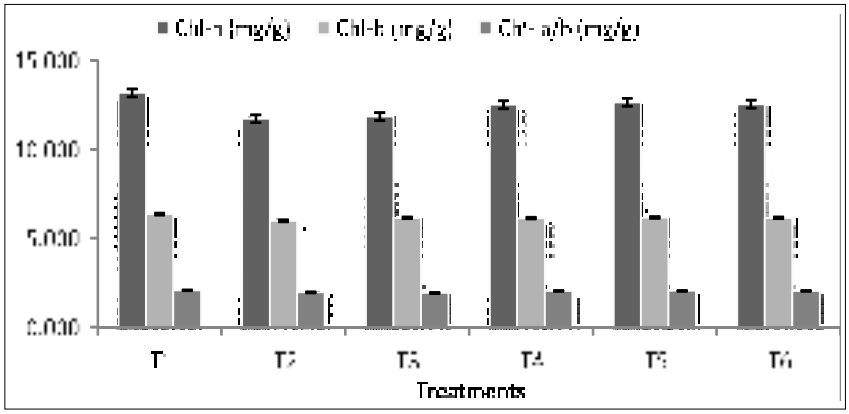



**Fig 1:** Effect of soluble silica on Chl-*a*, Chl- *b*, Chl- *a*/*b* content in garlic leaves against drought stress.

**Table 2:** Showing the effect of Soluble silica on growth and bulb quality of garlic against drought stress.

| Type | Conc. of silica ( ml $L^{-1}$) | Height of garlic plant (cm) | No. of leaves $plant^{-1}$ | Pseudo-stem diameter (cm) | Garlic bulb diameter (cm) | Fresh weight of Garlic bulb (gm) | Dry weight of Garlic bulb (gm) |
|---|---|---|---|---|---|---|---|
| Control | 0 | 75.333±3.785 | 7.000±1.000 | 0.567±0.1528 | 3.867±0.2887 | 38.42 ±1.3 | 20.113±1.3805 |
| | | a, b**, c* | $a, b^{ns}, c^{ns}$ | $a, b^{ns}, c^{ns}$ | $a, b^{*}, c^{ns}$ | a, b**, c | $a, b^{*}, c^{ns}$ |
| Drought | 0 | 52.833±5.107 | 6.333±0.577 | 0.500±0.100 | 2.900±0.500 | 28.22±1.4 | 15.40±0.624 |
| | | $a^{**}$, b, $c^{ns}$ | $a^{ns}$, b, $c^{ns}$ | $a^{ns}$, $b^{***}$ $c^{ns}$ | $a^{*}$, b, $c^{ns}$ | $a^{**}$, b, $c^{ns}$ | $a^{*}$, b, $c^{*}$ |
| Drought + BDF | 0 | 58.000±5.408 | 6.667±0.577 | 0.567±0.115 | 3.600±0.300 | 31.23±1.7 | 17.423±4.245 |
| | | $a^{*}$, $b^{ns}$, c | $a^{ns}$, $b^{ns}$, c | $a^{ns}$, $b^{ns}$ ,c | $a^{ns}$, $b^{ns}$, c | $a^{*}$, $b^{ns}$, c | $a^{ns}$, $b^{*}$, c |
| Drought + BDF + Silica | 7.5 ml $L^{-1}$ | 65.67±4537 | 7.333±1.155 | 0.567±0.058 | 4.100±0.100 | 33.55±1.5 | 22.707±1.308 |
| | | $a^{ns}$, $b^{**}$, $c^{*}$ | $a^{ns}$, $b^{*}$, $c^{*}$ | $a^{*}$, $b^{**}$, $c^{**}$ | $a^{**}$, $b^{**}$,$c^{**}$ | $a^{*}$, $b^{ns}$, $c^{*}$ | $a^{**}$, $b^{**}$, $c^{**}$ |
| | 10.0 ml $L^{-1}$ | 74.333±4.509 | 8.0±1.00 | 0.607±0.058 | 4.500±0.100 | 40.727±0.595 | 32.043±1.257 |
| | | $a^{ns}$, $b^{**}$, $c^{*}$ | $a^{ns}$, $b^{*}$, $c^{**}$ | $a^{*}$, $b^{**}$,$c^{**}$ | $a^{**}$, $b^{**}$,$c^{**}$ | $a^{*}$, $b^{***}$, $c^{**}$ | $a^{***}$, $b^{**}$, $c^{**}$ |
| | 12.5 ml $L^{-1}$ | 73.00±1.328 | 8.0±1.00 | 0.633±0.208 | 4.467±0.153 | 36.977±2.9 | 27.09 ±1.257 |
| | | $a^{ns}$, $b^{**}$, $c^{**}$ | $a^{ns}$, $b^{*}$, $c^{**}$ | $a^{*}$, $b^{**}$, $c^{**}$ | $a^{**}$, $b^{**}$,$c^{**}$ | $a^{ns}$, $b^{*}$, $c^{*}$ | $a^{***}$, $b^{**}$, $c^{**}$ |

$^{ns}$ indicates not significant, * indicates significant, ** indicates highly significant. a-shows the p-value in contrast to control, b-shows the p-value, in contrast to, drought stress, c-shows the p-value in contrast to fertilizer.

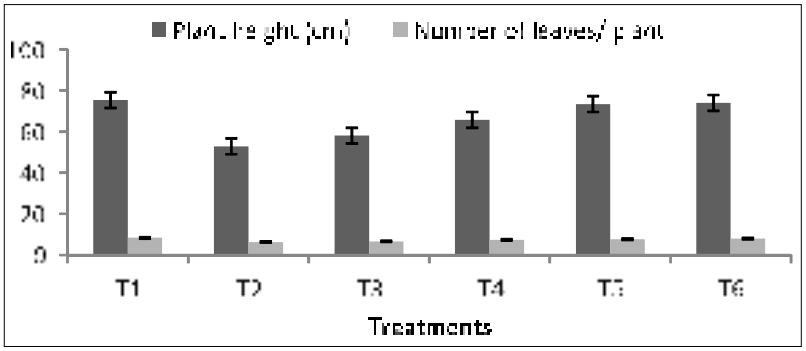



**Fig 2:** Effect of soluble silica on the height of the Garlic plants under drought stress.

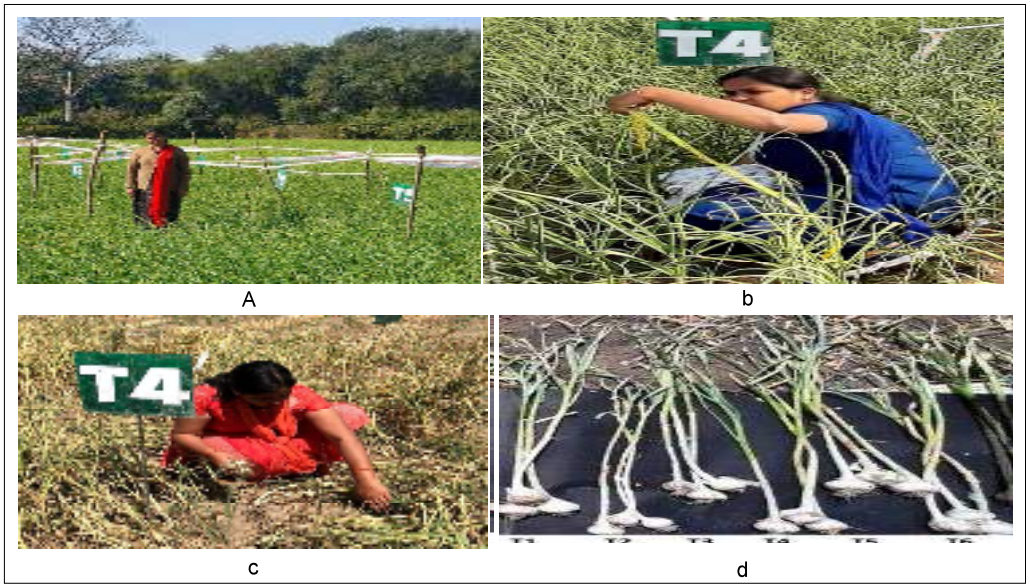



**Fig 3** a): Showing randomised blocks for garlic; b) Showing garlic plant height measurement; c) Garlic bulb collection from research field; d) Comparison between Garlic grown in different treatments.

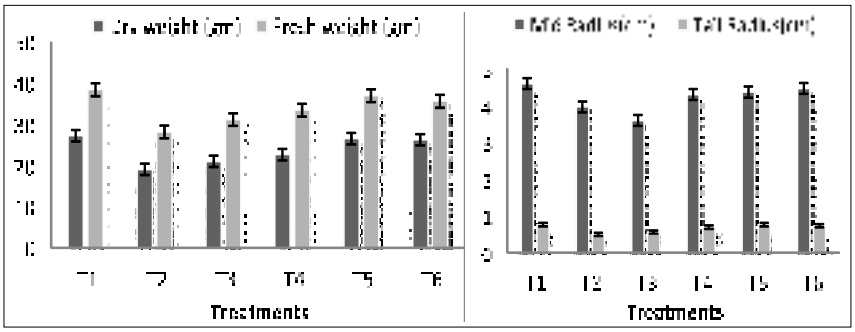



**Fig 4:** Effect of soluble silica on the fresh-dry weight and diameter of the Garlic bulbs against drought stress.

significantly increased plant height over the drought plants($T_2$) in order, 7.5 ml $L^{-1}$ <12.5 ml $L^{-1}$ <10 ml $L^{-1}$. Our study is in agreement with Kowalska *et al*., (2020) that foliar sprays of orthosilicic acid (Si) (24%) increased plant height and number and weight of ear in spring wheat. Si increased plant growth by balancing water and nutrient content (Rizwan *et al*., 2015). Similarly, 1000 kg $ha^{-1}$ treatment of potassium silicate ($K_2SiO_3$) increased the pH of the soil and P, Ca, Zn, S, Mo, Mn and Cu nutrients available to the plants (Greger *et al*., 2018). 250 kg $ha^{-1}$ dose of Si (Diatomaceous earth, Calcium silicates, Bagasse ash) with a basal supply of fertilizer increased plant growth by enhancing nitrogen and potassium intake (Gade *et al.,* 2019), (Minden *et al*., 2020). Various Osmolytes such as proline, antioxidants and secondary metabolites helps plants to combate drought stress (Kusvuran and Dasgan, 2017). Silicon enhanced proline and antioxidants in wheat to reduce oxidative stress in term of $H_2O_2$ level (Sapre and Vakharia, 2016). Similarly in our study, silica prevented plants lodging, increased proline content, reduced MDA level that might have increased photosynthetic food synthesis and uptake of essential nutrients from the soil for plants vegetative growth.

**Garlic bulb quality**

Garlic bulb quality is the main criteria for the farmers to earn a profitable income. A perusal of our data presented in Table 2 and Fig 4, revealed that drought ($T_2$) considerably reduced the fresh-dry weight and diameter of the Garlic bulb over the control ($T_1$). As per Omar and Wabel (2010), the Garlic bulb is mainly constituted by water (65%), sugar, protein and fiber. Water deficiency and reduced leaves chlorophyll content might have declined photosynthetic food storage and affected bulb weight and diameter negatively. However, foliage applied silica sprays (7.5, 10, 12.5 ml $L^{-1}$) + NPK fertilizers ($T_4, T_5, T_6$) in the soil improved bulb diameter, fresh-dry weight in contrast to the bulbs grown under limited water supply ($T_2$). This is in favor with Bhangare and Shinde (2020) that foliarly applied silicon has improved onion bulb diameter. Dorairaj *et al*.,(2020) showed that silicon increased uprightness in rice plants and thus due to more photosynthetic activity weight of the panicle and 100 rice grains was increased. Foliage applied Si protected Soybean from lodging by lignin deposition and increased photosynthetic rate in soybean leaves. Magd *et al*., (2013) reported that bulb weight depends on the quantity of organic food such as sugar and protein transferred from leaves to the bulb. Hussaina *et al*., (2021) showed that foliage applied Si protected Soybean from lodging by lignin deposition and enhanced photosynthetic rate in Soybean leaves. Our studies show that silica mitigated water stress and increased chlorophyll content in Garlic plants ($T_4$, $T_5$, $T_6$) as compared to drought plants. Sufficient water availability and increased chlorophyll content in silica treated leaves might have increased photosynthetic food synthesis and translocation and accumulation of synthesised food to bulb increased bulb weight and diameter compared with the drought bulbs.

## CONCLUSION

Drought (water scarcity) induced oxidative stress and reduced chlorophyll (light-harvesting pigments) in Garlic leaves. These might have declined photosynthetic food storage and negatively affected Garlic plant height, bulb fresh-dry weight and diameter. Routinely used fertilizers insignificantly improved bulb quality. Supplementation of fertilizers (BDF) with silica foliar sprays significantly relieved Garlic plants from oxidative stress by retaining water content and increasing proline (osmoprotectant) concentration. Probably silica also increased uptake of essential growth nutrients of soil and NPK fertilizers (BDF). Thus, the interactive effect of soluble silica foliar sprays and NPK fertilizer (BDF) in soil made it possible to obtain good quality Garlic bulbs in terms of weight and diameter despite the drought. Our studies suggested that soluble silica can be integrated with routine agriculture practices to protect plants from drought stress.

## ACKNOWLEDGEMENT

We are thankful to Dr. Suresh Kumar Silawat, Principal and Prof. Dr. A. Bafna, Head of the department, Government Holkar Science College, Indore (M.P), for permitting us to use lab facilities.

**Conflict of interest:** None.

## REFERENCES

Abid, M., Ali, S., Qi, L., Zahoor, R., Tian, Z., Jiang, D., Snider, J. and Dai, T. (2018). Physiological and biochemical changes during drought and recovery periods at tillering and jointing stages in wheat (*Triticum aestivum* L.). Scientific Reports. (8): 4615. 1-16.

Alamri, S., Hu, Y., Mukherjee, S., Aftab, T., Ahad, S.F., Raza, A., Ahmad, M., Siddiqui, M.H. (2020). Silicon-induced postponement of leaf senescence is accompanied by modulation of antioxidative defence and ion homeostasis in mustard (*Brassica juncea*) seedlings exposed to salinity and drought stress. Plant Physiology and Biochemistry. 157: 47-59.

Bates, L.S., Waldren, R.P., Teare, I.D. (1973). Rapid determination of free proline for water-stress studies. Plant Soil. (39): 205-207.

Bhangare, R.V., Shinde, S.S. (2020). Study on effect of soil and foliar application of silicon on growth, yield and quality on *Kharif* onion (Allium *cepa* L.). Bhartia Krishi Anusandhan Patrika. 2020 (35): 128-134.

Bathia, G.E., Beshbishy, A.M., Wasef, L.G., Elewa, Y.H, Sagan, A.A., Mohamed, E. Hack, M., Taha, A.E., Elhakim, Y.M. and Devkota, H.P. (2020). Chemical constituents and pharmacological activities of garlic (*Allium sativum* L.): A review. Nutrients MDPI. (12): 1872. 1-21.

Benke, A.P., Khar, A., Mahajan, V., Gupta, A. and Singh, M. (2020). Study on the dispersion of genetic variation among Indian Garlic ecotypes using agro morphological traits. Indian Journal of Genetics and Plant Breeding. 80(1): 1-25.

Bukhari, M.A., Sharif, M.S., Ahmad, Z., Barutcular, C., Afzal, M., Akbar, H.A. and Sabagh, A.E. (2020). Silicon mitigates drought stress in wheat (*Triticum aestivum* L.) through improving photosynthetic pigments, biochemical and yield characters. Silicon. 1-10.

Chung, Y.S., Kim, K.S., Hamayun, M. and Kim, Y. (2020). Silicon confers soybean resistance to salinity stress through the regulation of reactive oxygen species and reactive nitrogen species. Frontier Plant Science. 10: 1725. 1-11.

Mai, V.C., Le, T.K.D., Nguen, T.K.C. (2020). Antioxidative response of *Glycine max* (L.) Merr. Cv. Namdan to drought stress. Indican Journal of Agricultural Research. 54: (4)656-660.

Dehghanipoodeh, S., Ghobadi, C, Baninasab, B., Gheysari, M., Bibadabi, S. (2018). Effect of silicon on growth and development of strawberry under water deficit conditions. Horticultural Plant Science. 4(6): 226-232.

Dorairaj, D., Ismail, M.R., Sinniah, U.R. and Tan, K.B. (2020). Silicon mediated improvement in agronomic traits, physiological parameters and fiber content in *Oryza sativa*. Acta Physiologiae Plantarum. 42: 38. 1-11.

Gade, P.R, Shete, B.J. and Joshi, V.R. (2019). Effect of sources and levels of silicon on uptake of major nutrients and silicon in Garlic. Asian Journal of Science and Technology. 10(9): 10113-10116.

Godke, P.H. andhale, P.S., Gijare, U.M., Thangasamy, A., Khade, Y.P., Mahajan, V. and Singh, M. (2018). Physiological and biochemical response in Onion crop to drought stress. International Journal of Current Microbial Applied Science. 7(1): 2054-2062.

Greger, M., Landberg, T. and Vaculik, M. (2018). Silicon influences soil availability and accumulation of mineral nutrients in various plant species. Plants (Basel) MDPI. 7(2): 1-16.

Goyal, H., Bafna, A., Vyas, N., Gupta, R. and Rangwala, T. (2017). Soluble silica as a boon for alleviating toxic effects of heavy metals on *Vigna radiata* grown hydroponically in sewage. International Journal of Agriculture Science and Research. 7(5): 283-294.

Hasanuzzaman, M., Bhuyan, M.B., Zulfiqar, F., Raza, A., Mohsin, S.M., Mahmud, J.A., Fujita, M. and Fotopoulos, V. (2020). Review: Reactive oxygen species and antioxidant defense in plants under abiotic stress: Revisiting the crucial role of a universal defense regulator. Antioxidants MDPI. 9 (8): 1-52.

Heath, R.L. and Packer, L. (1968). Photoperoxidation in isolated chloroplast I-kinetics and stoichiometry of fatty acid peroxidation. Archive of Biochemistry and Biophysics. 125: 189-198.

Hussain, H., Men, S., Hussain, S., Chen, Y., Ali, S., Zhang, S., Zhang, K., Li, Y., Xu, Q., Liao, C. and Wang, L. (2019). Interactive effect of drought and heat stress on morphological attributes, yield, nutrient uptake and oxidative status in Maize hybrids. Scientific Reports. 9: 3890. 1-12.

Hussain, S., Shuxiana, Li., Mumtaza, M., Shafiqa, I., Iqbalc, N., Bresticd, M., Shoaibf, M., Sisia, Q., Lia, W., Meia, X., *et al.* (2021). Foliar application of silicon improves stem strength under low light stress by regulating lignin biosynthesis genes in soybean [*Glycine max* (L.) Merr]. Journal of Hazardous Material. 401: 1-11.

Kusvuran, S., Dasgan, H.Y. (2017). Effect of drought stress on physiological and biochemical changes in *Phaseolus vulgaris* L. Legume Research. 2017(40): 55-62.

Kowalska, J., Tyburski, J., Jakubowska, M., Krzyminska, J. (2020). Effect of different forms of silicon on growth of spring wheat cultivated in the organic farming system. Silicon. 13: 211-217.

Lawande, K.E, Khar, A., Mahajan, V., Srinivas, P.S., Sankar, V. and Singh, R.P. (2009). Onion and garlic research in India. Journal of Horticultural Science. (4): 2. 91-119.

Lichtenthaler, H.K. and Wellburn, A.R. (1983). Determination of total carotenoids and chlorophylls a and b of leaf extracts in different solvents. Biochemical Society Transaction. 11: (5): 591-592.

Ma, J.F., Nishimura, K. and Takahashi, E. (2012). Effect of silicon on the growth of rice plants at different growth stages. Soil Science and Plant Nutrition. 35(3): 347-356.

Magd, A.E., Zaki, M.F., Abd, E., Al, F.S. and Samad, E. (2013). Growth analysis and chemical constituents of garlic plants in relation to morphological growth stages. Journal of Applied Sciences Research. 9(2): 1170-1180.

Malhotra, C. and Kapoor, R.T. (2019). Silicon: A sustainable tool in abiotic stress tolerance in plants. Plant Abiotic Stress Tolerance. (7): 333-356.

Mandlik, R., Thakral, V., Raturi, G., Shinde, S., Nikolic, M., Tripathi, D., Sonah, H., Deshmukh R.R. (2020). Significance of silicon uptake, transport and deposition in plants. Journal of Experimental Botany. 71(21): 6703-6713.

Mann, L.K., (1952). Anatomy of Garlic bulb and factor affecting bulb development. Hilgardia. 21(8): 195-251.

Minden, V., Schaller, J., Venterink, H.O. (2020). Plants increase silicon content as a response to nitrogen or phosphorus limitation: A case study with *Holcus lanatus*. Plant and Soil. 1-14.

Morales-Gonzalez, J.A., Madrigal-Bujaidar, E., Sanchez-Gutierrez, M., Izquierdo- Vega, J.A., Valadez-Vega, M.D., Alvarez-Gonzalez, I., Morales- Gonzalea, A. and Madrigal-Santillan, E. (2020). Garlic (*Allium sativum* L.): A brief review of its antigenotoxic effects. Food (MDPI). (8): 343. 1-17.

Omar, S.H., Al-Wabel, N.A. (2010). Organosulphur compounds and possible mechanism of garlic in cancer. Saudi Pharma Journal. 18(1): 51-58.

Parveen, A., Liu, W., Hussain, S., Asghar, J., Perveen, S. and Xiong, Y. (2019). Silicon priming regulates morpho-physiological growth and oxidative metabolism in maize under drought stress. Plants (Basel), MDPI. 8(1): 1-14.

Pozo, A.D., Mendez, A.M., Romero, S., Gariiga, M., Estrada, F., Alcaino, M., Camargo, A., Corke, F.M.K., Doonan, J.H. and Lobos, G.A., (2020). Genotypic variations in leaf and whole-plant water use efficiencies are closely related in bread wheat genotypes under well-watered and water-limited conditions during grain filling. Scientific Report. 10(460): 1-13.

Reyes, B.A.S., Dufourt, E.C., Ross, J., Warner, M.J., Tanquilut, N.C., Albert, B., Leung, A.B., (2018). Selected Phyto and Marine Bioactive compounds: an alternative for the treatment of type 2 diabetes. Studies in Natural Product Chemistry. 55: 111-143.

Rizwan, M., Ali, S., Ibrahim, M., Farid., Adrees, M., Bharwana, S.A., Rehman, M.Z., Qayyum, M.F. and Abbas, F. (2015). Mechanism of Silicon mediated alleviation of drought and salt stress in plants. Environmental Science Pollution Research. 22: 15416-15431.

Sapre, S., Vakharia, D. (2016). Role of silicon under water deficit stress in wheat: (Biochemical perspective): A review. Agricultural Reviews. 37(2): 109-116.

Sattar, A., Sher, A., Ijaz, M., Ul- Allah, S. and Butt, M., Irfan, M., Rizwan, M.S. and Ali, H. and Cheema, M.A. (2020). Interactive effect of biochar and silicon on improving morpho-physiological and biochemical attributes of maize by reducing Drought hazards. Journal of Soil Science and Plant Nutrition. 20: 1819-1826.

Sharma, S., Bafna, A., Vyas, N. and Gupta, R. (2018). Role of Soluble silica in counteracting lead toxicity in wheat (*Triticum aestivum* L.,). International Journal of Agricultural Biochemistry. 31(2): 175-180.

Sun, Y., Xu, J., Miao, X., Lin, X., Liu, X., Wanzhen, L., Ren, H. (2021). Effects of exogenous silicon on maize seed germination and seedling growth. Scientific Reports. 11: 2021.

Rangwala, T., Bafna, A., Vyas, N., Gupta, R. (2018). Role of soluble silica in alleviating oxidative stress in Soybean crop. Indian Journal of Agriculture Research. 52: 9-15.

Maksimovic, T., Janjic, N., Lubarda, B. (2021). Effect of drought-induced stress on seed germination and seedling growth of *Zea mays* L. Indian Journal of Agricultural Research. 55: 197-201.

Thorne, S.J., Hartley, S.E., Maathuis, F.J. (2020). Is silicon a panacea for alleviating drought and salt stress?. Frontiers in Plant Science. 1-44.

Vijaya, P., Kaur, H., Garg, N., Sharma, S. (2020). Protective and therapeutic effects of garlic and tomato on cadmium-induced neuropathy in mice. The Journal of Basic and Applied Zoology. (81): 23. 1-11.

Wu, C., Wang, M., Dong, Y., Cheng, Z., Meng, H. (2015). Growth, bolting and yield of Garlic (*Allium sativum* L.) in response to clove chilling treatment. Scientia Horticulturae. 194 (2015): 43-52.

Zargar, S.M., Mahajan, R., Bhat, J.A, Nazir, M. and Deshmukh, R. (2019). Role of silicon in plant stress tolerance: opportunities to achieve a sustainable cropping system. 3 Biotechnology. 9(73): 1-16.

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2019

## CRITERION – 3

## MoUs/Linkages/Collaborations

Govt. Mata Jija Bai Girls P.G. College, Indore

**Document Title:**

Lecture delivered by Dr. Meenal Shrivastava, Title: Electronic Spectral Studies under MoU activity

**Memorandum of Understanding**
**Between**
**Deptt. Of Chemistry M.J.B.Govt P.G. Girls P.G. College ,Indore(M.P.)**
**And**
**Deptt. Of Chemistry Holkar Science College, Indore (M.P.)**

Deptt. of Chemistry M.J.B.P.G.Govt.Girls College Motitabela Indore and Deptt. of Chemistry Holkar Science College Indore desiring to support the cooperation between two departments in education and training programs .
Both the departments agreed to implement cooperation programs including-

1)The exchange of academic materials .
2) Conducting Lectures
3) Curriculum development
4) Participating in Seminars ,Symposium & other Type of academic discussions.
5) internship for P.G. Students

**Implementation of MOU-**

To-implement this MOU Head of both the chemistry deptt are authorized .Any cooperation under this MOU is Subject to the availability of funding, sources and approval by relevant authority .

**Entry into force, duration & termination -**

This MOU shall enter into force on the date of signing and sha l be valid for an unlimited period from that date .

The agreement may be terminated by either Deptt. by providing 180 days written notice to the Head of Department .

18/10/18

**Signature**

Head of Chemistry Department

M.J.B.P.G.Govt.Girls College Indore

**Head of Department**
*Chemistry Dept.*
Mata Jijabai Govt. P.G. Girls College
Moti Tabela, INDORE

18/10/18

**Signature**

Head of Chemistry Department

Holkar science College Indore

23.10.18

**Principal**
Holkar Science Coll
INDORE

# Report of Activities under MoU between Department of Chemistry, MJB Govt. P G Girls College, Indore, M.P., and Department of Chemistry, Govt. Holkar science College, Indore.

## Sessions : 2017-2018. 2018-2019 & 2021-2022

The Department of Chemistry at MJB Govt. P G Girls College, Indore, M.P., and the Department of Chemistry at Govt. Holkar Science College, Indore, collaborated under an MoU with the following activities:

1. **On 2nd and 3rd March 2018, Dr. Rajshree Somani gave a lecture on "Pericyclic Reactions."**
   Dr. Rajshree Somani, a renowned expert, delivered an enlightening lecture on "Pericyclic Reactions" on 2nd and 3rd March 2018. The lecture was jointly organized by the Department of Chemistry at Govt. Holkar Science College, Indore, and MJB Govt. P G Girls College, Indore. Dr. Somani's presentation delved into the intricacies of pericyclic reactions, elucidating their mechanisms and significance in organic chemistry. The audience, comprising students and faculty from both institutions, greatly benefited from the comprehensive and insightful content. The lecture fostered an atmosphere of knowledge sharing and academic collaboration, enhancing the participants' understanding and interest in this specialized field of chemistry.

2. **On 6th and 7th March 2019, Dr. Meenal Shrivastava delivered a lecture on "Electronic Spectral Studies."**
   Dr. Meenal Shrivastava, a distinguished expert, delivered a captivating lecture on "Electronic Spectral Studies" on 6th and 7th March 2019. The lecture was organized by the Department of Chemistry at Govt. Holkar Science College, Indore, in collaboration with MJB Govt. P G Girls College, Indore. Dr. Shrivastava's presentation provided in-depth insights into the principles and applications of electronic spectral studies in the field of chemistry. Her expertise and engaging delivery captivated the audience, comprising students, faculty, and researchers. The lecture enriched the participants' understanding and sparked interest in the subject, fostering academic collaboration and promoting knowledge exchange between the two institutions.

3. **On 3rd December 2022, Dr. M K Dwivedi conducted a lecture on "UV Spectroscopy."** On 3rd December 2022, Dr. M K Dwivedi delivered an insightful lecture on "UV Spectroscopy." The lecture, organized collaboratively by the Department of Chemistry at Govt. Holkar Science College, Indore, and MJB Govt. P G Girls College, Indore, provided an in-depth understanding of UV spectroscopy's principles and applications. Dr. Dwivedi's expertise and engaging presentation captivated the audience, which comprised students and faculty members from both institutions. The lecture not only enhanced the participants' knowledge of UV spectroscopy but also encouraged academic collaboration and knowledge exchange between the two colleges. It proved to be a valuable and enriching experience for all attendees.

***These lectures provided valuable insights and knowledge exchange between the two institutions, fostering academic collaboration and enhancing the learning experiences of students and faculty.***

Professor And Head
Department of Chemistry
Govt. Holkar Sc. College,INDOR

**Dr. Anamika Jain**
**Professor & Head**
**Department of Chemistry**
**Govt. Holkar Science College, Indore**

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# SSR DOCUMENT

2019

## CRITERION – 3

## MoUs/Linkages/Collaborations

**Document Title:**

**Internship for Govt. Mata Jija bai girls P.G. college Chemistry Students**

# Mata Jija Bai Govt. Girls P.G. College
Moti Tabela , Indore

E-mail : ggpgcind@gmail.com, hegpgcmtind@mp.gov.in


दिनांक : 19.12.2018

प्रति

विभागाध्यक्ष
शासकीय होलकर विज्ञान महाविद्यालय,
इन्दौर म.प्र.

विषय – एम.ओ.यू. के अंतर्गत शैक्षणिक आदान–प्रदान के लिये हमारे महाविद्यालय के स्नातकोत्तर रसायनशास्त्र विषय के विद्यार्थियों को इंर्टनशिप में सम्मिलित करने बाबद्।

महोदय,

उपरोक्त विषयांतर्गत लेख है कि शासकीय होलकर विज्ञान, इन्दौर एवं माता जीजाबाई शासकीय कन्या महाविद्यालय, मोतीतबेला, इन्दौर के मध्य हुए एम.ओ.यू. के अंतर्गत शैक्षणिक आदान–प्रदान के लिये हमारे महाविद्यालय के स्नातकोत्तर रसायनशास्त्र विषय के विद्यार्थियों को आपके महाविद्यालय के रसायनशास्त्र विभाग द्वारा दिनांक 21 जनवरी 2019 से दिनांक 05 फरवरी 2019 तक आयोजित इंर्टनशिप में सम्मिलित करने का कष्ट करें।

सधन्यवाद्।

Head of the Chemistry Dept. Govt. Girls P.G. College Indore

विभागाध्यक्ष
रसायनशास्त्र विभाग
माता जीजाबाई शासकीय कन्या महाविद्यालय, मोतीतबेला,
इन्दौर म.प्र.

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
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# SSR DOCUMENT

2019

## CRITERION – 3

## MoUs/Linkages/Collaborations

Dr. G. S. Okram, UGC-DAE CSR, Indore

**Document Title:**

**Research activity and joint publication with Dr. G. S. Okram, UGC-DAE CSR, Indore, as Principal Collaborator from the CSR side**

# UGC-DAE Consortium for Scientific Research

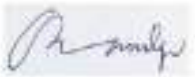
*(Formerly: Inter University Consortium for DAE Facilities; IUC-DAEF)*
(An Autonomous institution under University Grants Commission, New Delhi)
University Campus, Khandwa Road, Indore-452001, MP, India
Phone (+91)0731-2463913/2762267/2463913 Fax: 0731-2462294/2465437

Dr. Gunadhor S. Okram
Scientist G/ Engineer G
Website http://www.csr.ernet.in/csr/indore/facilities/ltl/profile.html
Email: okramgs@gmail.com, okram@csr.ernet.in


12 July 2019

**Collaboration certificate**

This is to certify that Dr. Netram Kaurav of Government Holkar (Model, Autonomous) Science College (GHSC), A. B. Road, Indore is a Principal Investigator for the three-year Collaborative Research Scheme project (but extended for another year due to COVID19 lockdown) entitled "*Synthesis and characterization of monodisperse nickel nanoparticles-assisted carbon membranes and their application in gas separation*" of this institute with sanction order No. CSR-IC-MSRSR-02/CRS-210/2017-18/1291, dated 31st March, 2018 under my collaboration with him as the Principal Collaborator of CSR Indore-Centre. This is being issued for the **year 2018-2019** as per the requirements of GHSC of a collaboration certificate.



G. S. Okram

# UGC-DAE Consortium for Scientific Research

(Formerly: Inter University Consortium for DAE Facilities: IUC-DAEF
(An Autonomous Institution under University Grants Commission, New Delhi)( **A Society Registered Under M.P. Society RegistrikaranAdhiniyam, 1973)** Registered Office and Head Office : UGC-DAE Consortium, University Campus, Khandwa Road, Indore-452 017. Phone 0731-2463913/2762267/2463913 Fax: 0731-2462294/2465437


**No. CSR/Acctts/2018-19/**555 **16 August 2018**

To
Principal,
Holkar Science College.
**INDORE (M.P.)**

**Sub.** : "Collaborative research entitled **"Synthesis and characterization of monodisperse nickel nanoparticles assisted carbon membranes and their application in gas separation"** sanctioned to Dr. Netram Kaurav, Department of Physics, Holkar Science College, Indore (M.P.)

**Ref:** Our letter No. **CSR-IC/MSRSR-02/CRS-210/2017-18/ 1291** dated **31 March 2018**

Dear Sir,

An amount of **Rs. 2,39,880/-** has been deposited on **13-08-2018** in your Account No. **53015687345** on **State Bank of India,** Holkar Science College Campus Branch, Indore towards grants sanctioned for year **2018-19** to CRS project mentioned above. **Photo-copy of the Pay-in-slip** is enclosed herewith. Detail of sanction is as follows:

| S. No. | Particulars | Amount (Rs.) |
|---|---|---|
| 1. | Project Fellow @(14000/-*12) +16% HRA | 1,94,880.00 |
| 2. | Contingency | 15,000.00 |
| 3. | Consumbles | 30,000.00 |
| | **Total Deposited Amount** | **2.39.880.00** |

The next instalment of money, if any sanctioned, will be released only on production of a statement of account and a utilization certificate (copy enclosed) from your institution.

The conditions for the award of the grant in aid have been set out in our earlier letter cited above.

Please acknowledge receipt of this letter and send us a stamped receipt by return of post.

Yours sincerely,

Upadhyaya

Administrative Officer I (Accounts)

Encl. as above.

Copy to : 1. Dr. Netram Kaurav, Department of Physics, Holkar Science College, Indore (M.P.)

2. Centre-Director, UGC-DAE CSR, Indore.

## PROGRESS REPORT

## Project Title: Synthesis and characterization of monodisperse nickel nanoparticles assisted carbon membranes and their application in gas separation

| Title of paper | Name of the author/s | Department of the teacher | Name of journal | Year of publication | ISSN number | Link to the recognition in UGC enlistment of the Journal | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Link to website of the Journal | Link to article/paper /abstract of the article | Is it listed in UGC Care list |
| Gas permeation properties of nickel nanoparticle-embedded PPO/PVP polymers based carbon membrane | Disha Harinkhere,Netram Kaurav | Physics | Materials Today: Proceedings | 2022 | 2214-7853 | https://www.sciencedirect.com/journal/materials-today-proceedings | https://doi.org/10.1016/j.matpr.2022.07.195 | Scopus Indexed |
| Structural and optical properties of PPO/PVP blended polymer film | Disha Harinkhere, Nikita Karma, K.K. Choudhary, Netram Kaurav | Physics | Materials Today: Proceedings | 2021 | 2214-7853 | https://www.sciencedirect.com/journal/materials-today-proceedings | https://doi.org/10.1016/j.matpr.2021.10.206 | Scopus Indexed |
| Preparation and Characterization of Membranes Supports for Filteration Application | Disha Harinkhere, Netram Kaurav | Physics | Materials Today: Proceedings | 2021 | 2214-7853 | https://www.sciencedirect.com/journal/materials-today-proceedings | https://doi.org/10.1016/j.matpr.2021.10.508 | Scopus Indexed |
| Temperature-dependent transport properties of a FeTe compound | Pavitra Devi Lodhi, Netram Kaurav, K K Choudhary, Y K Kuo | Physics | Bulletin of Materials Science (Springer) | 2019 | 0973-7669 | https://www.springer.com/journal/12034 | https://doi.org/10.1007/s12034-019-1953-7 | Scopus Indexed |
| High pressure structural phase transition and elastic properties of ZnSexTe1-x semiconducting compounds | Saligram Verma, Arvind Jain, K. K. Choudhary and Netram Kaurav | Physics | International Journal of Modern Physics B | 2019 | 0217-9792 | https://www.worldscientific.com/worldscinet/ijmpb | https://doi.org/10.1142/S0217979219502503 | Scopus Indexed |
| Measurement and Analysis of Normal-State Transport Properties of FeSe Superconductor | Pavitra Devi Lodhi, Netram Kaurav, K. K. Choudhary, Y. K. Kuo | Physics | Journal of Low Temperature Physics (Springer) | 2019 | 1573-7357 | https://www.springer.com/journal/10909 | https://doi.org/10.1007/s10909-019-02198-3 | Scopus Indexed |
| Synthesis and characterization of ZnO nanoparticles by thermal decomposition method | Rathore R.; Harinkhere D.; Kaurav N. | Physics | AIP Conference Proceedings | 2019 | 0094-243X | https://pubs.aip.org/aip/acp | https://doi.org/10.1063/1.5098752 | Scopus Indexed |
| Effect of sintering temperature on the dielectric properties of non-stoichiometric nickel oxide | Dubey P.; Choudhary K.K.; Singh K.; Kaurav N. | Physics | AIP Conference Proceedings | 2019 | 0094-243X | https://pubs.aip.org/aip/acp | https://doi.org/10.1063/1.5098725 | Scopus Indexed |
| Structural and Raman analysis of double perovskite La2CoTi0.7Ni0.3O6 | Solanki N.; Lodhi P.D.; Kaurav N. | Physics | AIP Conference Proceedings | 2019 | 0094-243X | https://pubs.aip.org/aip/acp | https://doi.org/10.1063/1.5098715 | Scopus Indexed |

GOVT. HOLKAR (MODEL AUTONOMOUS)
SCIENCE COLLEGE, INDORE
(An ISO 9001:2015 & ISO 14001:2015 Certified Instituion)

# SSR DOCUMENT

2019

## CRITERION – 3

## MoUs/Linkages/Collaborations

PG Tech Research Institute, Indore

**Document Title:**

One-week Workshop on "Qualitative and Quantitative Analysis" under collaborative understanding

# MEMORANDUM OF UNDERSTANDING

The MoU

1.1 This MoU made and agreed upon between Govt. Holkar Science College -Indore, M.P which expression shall where the context admits include its successors and permitted assignees of one part.

AND

1.2 PG Tech Research Institute (PGTRI, Indore, herein after called PGTRI which expression shall where the context so admits include its successors and permitted assignees of other part.

**PREAMBLE:**

2.1 Whereas Govt. Holkar Science College -Indore, Education and Research activity to students of pharmacy and various discipline of pharmaceutical sciences.

2.2 Whereas PGTRI, Indore will provide the working infrastructure for completion of research work for their dissertation.

2.3 Therefore in consideration of the premises and mutual covenants, hereinafter contained, the parties hereto agree as follows:

**OBJECTIVES AND SCOPE OF MoU:**

3.1 To encourage pharmaceutical research, guide M.Sc. Pharma Chemistry students/Ph.D. Scholars of different streams for carrying out dissertation work at PGTRI, Indore and Govt. Holkar Science College -Indore and for other research collaborations from time to time.

**RESPONSIBILITIES OF PARTIES:**

4.1 The Govt. Holkar Science College -Indore may depute the students of M.Sc. Pharma Chemistry/ Ph.D. Scholars for carrying out dissertation work at PGTRI, Indore for a period needed for the same.

4.2 Both the Institutes will utilize the intellectual knowledge and technical infrastructure of each other for research purposes.

4.3 PGTRI, Indore will provide working infrastructure for completion of dissertation work to the students.

4.4 Govt. Holkar Science College -Indore, M.P may nominate/ co guides from PGTRI, Indore for dissertation work.

4.5 PGTRI may allow students to use facilities at PGTRI with due permission from Director PGTRI.

4.6 Govt. Holkar Science College -Indore students will prepare the dissertation synopsis in consultation with the PGTRI authorities as per available facilities and infrastructure etc.

4.7 PGTRI and Govt. Holkar Science College -Indore will reserve all rights on the data generated on the projects however the students may be allowed to submit dissertation on projects allotted to them by Govt. Holkar Science College -Indore with permission from PGTRI.

4.8 Students deputed will report to Director/ Incharge PGTRI and shall be answerable to him in all matters.

4.9 Students will not indulge in any action or inaction on their part which is not in consonance with the ordinance rules or extant instructions of Govt. Holkar Science College -Indore and PGTRI and illegal activities and in such case the authorities of either institution to will be empowered initiate suitable disciplinary action.

EFFECTIVE DATE, DURATION AND TERMINATION OF MoU:

5.1 The MoU shall be Re-effective from 04/03/2017 up to un limited period or from the date of signing whichever is earlier and shall remain in force for a period of 10 years from the said date.

5.2 All notices and other communications required to be served on parties under the terms of this MoU, shall be considered to be duly served if the same have been delivered to or posted by registered mail to:

In case of Govt. Holkar Science College -Indore, M.P
Principal,
Department of –Pharma Chemistry, Indore,
Govt. Holkar Science College -Indore
Bhawakua Indore

In case of PGTRI Director,

5.3 It is agreed that the progress of this MoU will be monitored by the Principal, Govt. Holkar Science College -Indore, Indore, M.P and Director, PGTRI, Indore through periodic meetings.

5.4 This MoU is valid for a period of Un Limited Period starting w.e. f. –Date 04/03/2017 to Un limited Period subject to further extension on mutually agreed terms and conditions. Any mid course change/alteration/termination as introduced/suggested by the review committee comprising of Principal, Govt. Holkar Science College -Indore, M.P and Director, PGTRI, Indore shall also be deemed to be valid for both the Institutions.

5.5 Committee comprising of Principal Govt. Holkar Science College -Indore, Indore, M.P; Director, PGTRI and a nominated representative of Directors will monitor the progress of research work.

5.6.1 This MoU has been executed in two copies, one copy to be retained by PGTRI, Indore and other by Govt. Holkar Science College -Indore, M.P.

IN WITNESS WHEREOF the parties hereto have signed this agreement.

Dr. Ro[illegible] Vyas
Principal,
Govt. Holkar Science Auto. College,
Indore

Dr. M.K.Dwivedi
Prof. & Head-Pharma Chemistry
Govt.Holkar Science Auto. College,
Indore

PROFESSOR & HEAD
Department of Pharmaceutical Chemistry
Govt. Holkar Science College
INDORE (M.P.)

Witness

Mr. Ashish Tiwari
Director
PG Tech Research Institute
Indore

Witness

# Qualitative and Quantitative analysis

| S. No | Component/Activities | Details of event |
|---|---|---|
| 1 | Name of the Department / Unit / Agency: | **Pharmaceutical Chemistry** |
| 2 | Name of the Activity: | Workshop under MoU |
| 3 | Date and Year of the Activity: | $10^{th}$ -$15^{th}$ October 2019 |
| 4 | Number of Students Participated in the activity: | 116 |
| 5 | Report of the Activity (in 100 words): | Department of Pharmaceutical Chemistry Organized a One week Workshop on **"Qualitative and Quantitative analysis"** in **collaboration with PG Tech Research Institute Indore. (**10 to 15 October 2019) it was inaugurated by Patron Dr. Suresh T. Silawat<br><br>Dr. Ashok Sharma (DAVV)<br>Dr. Pratibha Sharma (DAVV)<br>Dr. R.C. Dixit<br>Dr. Anamika Jain<br>Various topics like FTIR, UV VISIBLE, Antibactarial, Food Analysis and Quality Control were Included in this Workshop |
| 6 | Photo of Activity: |  |

| | | |
|---|---|---|
| 7 | List of Participants | |

**Department of Pharmaceutical Chemistry**
**Government Holkar Science College, Indore (M.P.)**
**and**
**PG Tech. Research Institute Indore (M.P.)**

**"One week Workshop on Qualitative and Quantitative Analysis"**

**(10th to 15th October 2019)**

**List of Participants**

| S. No. | Name of Participants | Mobile No. |
|---|---|---|
| 1 | Dr. Vijay R. Chourey | 9425884269 |
| 2 | Dr. Ashok Barua | 9329437018 |
| 3 | Dr. Rekha Killedar | 9826041597 |
| 4 | Dr. Neelima Pradhan | 8818886416 |
| 5 | Dr. Anamika Jain | 9826299191 |
| 6 | Dr. Aprna Gandhe | 9424841995 |
| 7 | Dr. Reeta Agrawal | 9425320226 |
| 8 | Dr. Namrta Pathak | 9425081156 |
| 9 | Dr. Pushpa Makwana | 9425919663 |
| 10 | Dr. Pramila Kori | 9425061750 |
| 11 | Dr. Meenal Shrivastav | 9993928660 |
| 12 | Dr. Vinita Khare | 9826366780 |
| 13 | Dr. P.K. Jain | 9425369298 |
| 14 | Dr. Prakash Solanki | 9826536488 |
| 15 | Dr. Padmaja Naidu | 9685774247 |
| 16 | Dr. Ram Prajapati | 9826063427 |
| 17 | Dr. Kamla Shivani | 9826074230 |
| 18 | Dr. Smita Dubey | 9926895881 |
| 19 | Dr. Preeti Chaturvedi | 9826077016 |
| 20 | Dr. Juhi Banerjee | 9977371998 |
| 21 | Dr. Bijendra Rai | 9425450749 |

| | | |
|---|---|---|
| 22 | Dr. Swagta Gupta | |
| 23 | Dr. K.R.Magarde | |
| 24 | Dr. Prakash More | |
| 25 | Dr. Monika Sauyal | |
| 26 | Dr. N.K.Jain | 9926064840 |
| 27 | Dr. Rachna Dubey | 9425495872 |
| 28 | Dr. Mangla Dave | 9425084377 |
| 29 | Dr. Uday Manohar Chitnis | 9425905771 |
| 30 | Dr. Pramila Sadhav | 9755282422 |
| 31 | Pallavi Gupta | 7389651821 |
| 32 | Ankesh Ahirwar | 7999151030 |
| 33 | Satish Rai | 7000543411 |
| 34 | Ritu Bharti | 9617641344 |
| 35 | Rashi Dubey | 9770067892 |
| 36 | Dr. Nameeta Bende | 9424540041 |
| 37 | Dr. Vibha Dubey | 9826061864 |
| 38 | Dr. Manjeet Malhotra | 9826970640 |
| 39 | Dr. Deepali Amb (Prasad) | 9827340191 |
| 40 | Dr. Amrita Khatri | 9302222727 |
| 41 | Vishwajeet Malviya M.Sc. | 9806646229 |
| 42 | Dr. Sandeep Kumar Gohar | 9893428546 |
| 43 | Dr. Smriti Chitnis | 9893217030 |
| 44 | Dr. Pushpa Jain | 9407423298 |
| 45 | Dr. Anita Gangrade | 9826798234 |
| 46 | Dr. Usha Masin | 9826611555 |
| 47 | Dr. Saroj Mahajan | 9425950221 |
| 48 | Dr. Rajshree Somani | 9630385500 |
| 49 | Dr. Rekha Pundir | 9424890626 |

| | | |
|---|---|---|
| 50 | Dr. Laxmi Tantuway | 9425655346 |
| 51 | Dr. Vijashri Nilosey | 9425062177 |
| 52 | Dr. Geeta Sarasan | 9424068476 |
| 53 | Mrs. Snehlata Hada | 9424047377 |
| 54 | Priyanka Trivedi | 9669796470 |
| 55 | Pratiksha Mishra | 9424579283 |
| 56 | Dr. Ranjana Verma | |
| 57 | Archana Bhatt | 9300113599 |
| 58 | Sunita Vyas | 7746040703 |
| 59 | Divya Rana Tomar | 9098984540 |
| 60 | Dr. Santosh Gaherwal | 9827247048 |
| 61 | Dr. Renu Jain | 9827617578 |
| 62 | Dr. Anjali Kumar | 9424880751 |
| 63 | Dr. Manoj Khare | 9425480868 |
| 64 | Dr. Chhaya Chouhan | 9669309643 |
| 65 | Neha Joshi | 7415833353 |
| 66 | Minakshi Panwar | 8889031559 |
| 67 | Niharika Gupta B.Sc | 7389884815 |
| 68 | Nandini Romish B.Sc | 9669813654 |
| 69 | Muskan Padiyar B.Sc | 6265064101 |
| 70 | Unnati Gupta B.Sc | |
| 71 | Sheetal Verma B.Sc | 7610526357 |
| 72 | Shivani Jat M.Sc | 7999770782 |
| 73 | Anshika Upadhyay B.Sc. | 9752541535 |
| 74 | Utsav Base B.Sc. | 9918559496 |
| 75 | Mariya Saify B.Sc. | 6261936234 |
| 76 | Maryam Chakkiwala M.Sc. | 7869695772 |
| 77 | Leena Barde B.Sc | 7693010811 |

| | | |
|---|---|---|
| 78 | Manohar Solanki | 9993646643 |
| 79 | Rashmi Agrawal | |
| 80 | Rashmi Joshi | |
| 81 | Hema Kochar | |
| 82 | Anjali Yadav | |
| 83 | Richa Sharma | |
| 84 | Himansha Kumawat M.sc | 9887572517 |
| 85 | Swati Mukati M.sc | 9826376706 |
| 86 | Ashmita Sharma M.sc | 8964043648 |
| 87 | Shubham Dubey M.sc | 9039401747 |
| 88 | Aniket Verma M.Sc. | 9644532208 |
| 89 | Gaurav Patil M.sc | 9644527597 |
| 90 | Akansha Shrivastava M.sc | 7415407096 |
| 91 | Tanushree Agrahari M.sc | 9770730506 |
| 92 | Sachin Mishra B.Sc. | 7828249694 |
| 93 | Rahul Bhalerav B.Sc. | 9644822733 |
| 94 | Chanchal Chandora B.Sc. | 9131137616 |
| 95 | Shubham Parmar B.Sc. | 7879224307 |
| 96 | Pushpa Tayade B.Sc. | 9993048716 |
| 97 | Devyani Kestwall B.Sc. | 7067619274 |
| 98 | Aaditya Bhatore B.Sc. | 9630635342 |
| 99 | Jaya Sharma B.Sc. | 9753691763 |
| 100 | Ritika Patel B.Sc | 7440999670 |
| 101 | Sheetal Solanki B.Sc. | 7694823917 |
| 102 | Nidhi Sharma M.sc | 9876794359 |
| 103 | Tarun Chouhan B.Sc. | 9406617839 |
| 104 | Lalit Thakur M.sc | 9098019130 |
| 105 | Ritu Pal M.Sc. | 9926470525 |

| | | |
|---|---|---|
| 106 | Rajneesh Patel B.Sc | 8236837573 |
| 107 | Swadhinta Pushpak M.Sc. | 8349816967 |
| 108 | Mamta Chourasiya M.Sc. | 7566003861 |
| 109 | Shivani Bhawsar M.Sc | 7000090049 |
| 110 | Shalini Maheshwari M.Sc. | 9977089241 |
| 111 | Sapna Patidar M.Sc. | 7354427161 |
| 112 | Anita Devi Prajapati M.Sc. | 8602548921 |
| 113 | Durgesh Bhalot M.Sc. | 7828459341 |
| 114 | Deepak Chhapre B.Sc | 7693963386 |
| 115 | Shivani Malviya M.Sc. | 9407206903 |
| 116 | Sushmita Prajapati M.Sc. | 8989436589 |

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# SSR DOCUMENT

2019

## CRITERION – 3

## MoUs/Linkages/Collaborations

Dr. Kamal Kumar Choudhary, Army Cadet College (ACC), Indian Military Academy, Dehradun, Uttrakhand

**Document Title:**

Collaborative Research activity and joint publication

# Army Cadet College
## Indian Military Academy
Dehradun, Uttarakhand -248007; Phone: 0135-2775768

**Dr. K. K. Choudhary**

**Professor and Head,**
**Faculty of Science**


No.

Date: 03 Jul 2019

## RESEARCH COLLABORATION

Prof. R. C. Dixit, Dr. H. S. Dager and Dr. Netram Kaurav, Department of Physics, Govt. Holkar Science College, Indore are engaged in collaborative research with Dr. Kamal Kumar Choudhary, Professor, Army Cadet College, Indian Military Academy, Dehradun.

This research collaboration is focused on research activities in the fields of Thermoelectric properties of nanomaterials, superconducting materials, research at high pressure and related topics.

By the virtue of this collaboration, the research groups at both institutions will be able to share the expertise and research facilities at each other's institutes and will be able to guide the research scholars. However, there will be no financial implication on any of the institution due to this research collaboration.

This research collaboration will be effective for the academic session 2019-2020 and will be carried forward based on the need and agreement of both the research groups.

**(Dr.K. K. Choudhary)**

Dr K K Choudhary
Professor (Physics)
Army Cadet College Wing
Indian Military Academy
Dehradun-248007

RESEARCH ARTICLE | MAY 29 2020

# Effect of pressure on structural and elastic properties of Scandium phosphide

Poornima Karil ; Nikita Karma; K. K. Choudhary; Netram Kaurav

Check for updates

+ Author & Article Information

*AIP Conference Proceedings* 2224, 030001 (2020)

https://doi.org/10.1063/5.0000475

We have investigated the effect of pressure on structural and elastic properties of Scandium Phosphide (ScP) semiconducting material by using aneffective inter-ionic potential method, which contain the long-range Coulomb and vander Waals (vdW) interactions and the short-range repulsive interaction of up to second-neighbor ions within the Hafemeister and Flygare approach. First, the Slater-Kirkwood variational method is performed to calculate the vdW coefficients. The calculated value of the phase transition pressure (Pt) is 250GPa for *B*1 (NaCl) type phase structure to *B*2(CsCl) type phase structure, it was found that the calculated value of transition pressure is agreeing with the reported data. We have also focused on the elastic properties of ScP compound within the effective inter-ionic potential approach and the second order elastic constants (SOEC) were predicted in both the phases.

Topics

Phase transitions, Elasticity, Transition metals, Ionic potential, Variational methods

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RESEARCH ARTICLE | MAY 29 2020

# Structural phase transition and elastic properties of gallium phosphide semiconducting compound

Poornima Karil ; Nikita Karma; K. K. Choudhary; Netram Kaurav

Check for updates

+ Author & Article Information

*AIP Conference Proceedings* 2224, 030002 (2020)
https://doi.org/10.1063/5.0000476

We have carried out structural and elastic propertiesof Gallium Phosphide (GaP) semiconducting compound. For this Purpose, we used effective inter-ionic potential method, which consist of the long-range Coulomb and van der Waals (vdW) interactions and the short-range repulsive interaction of up to second-neighbor ions within the Hafemeister and Flygare approach. First, we used the Slater-Kirkwood variational method to estimate the vdW coefficients. The estimated value of the phase transition pressure (Pt) is 26GPa for *B*3(ZnS) type phase structure to *B*1(NaCl) type phase structure, which is agreeing with the experimental and theoretical reported data. We have also predicted the elastic properties of GaP compound within the effective inter-ionic potential approach.

Topics

**Phase transitions**, **Semiconductors**, **Elasticity**, **Ionic potential**, **Variational methods**

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# SSR DOCUMENT

2019

## CRITERION – 3

## MoUs/Linkages/Collaborations

Department of Forensic Science, IEHE, Bhopal (M.P.)

**Document Title:**

Lecture delivered by Mr. Rajendra Prasad in the FDP Modern Tools Use in Scientific Investigation of Crime Scenes



तमसो मा ज्योतिर्गमय

DEC, 2016

# MEMORANDUM OF UNDERSTANDING FOR ACADEMIC AND SCIENTIFIC COOPERATION

BETWEEN

(INSTITUTE FOR EXCELLENCE IN HIGHER EDUCATION (IEHE), BHOPAL, M. P.

AND

GOVT. HOLKAR (MODEL, AUTONOMOUS) SCIENCE COLLEGE INDORE M.P)

The representatives of Institute for Excellence in Higher Education, Bhopal and **DEPARTMENT OF FORENSIC SCIENCE, GOVT. HOLKAR (MODEL, AUTONOMOUS) SCIENCE COLLEGE INDORE (M.P)**, agree to this Memorandum of Understanding.

The Memorandum of Understanding (MOU) establishes the following:

## 1. OBJECTIVE OF THE AGREEMENT

To establish a mutually beneficial relationship built on academic and scientific cooperation. Areas of cooperation between the **Institute for Excellence in Higher Education, Bhopal, M. P.** and **Department of Forensic Science, Govt. Holkar (Model, Autonomous) Science College Indore (M.P)** include the exchange of researchers, students, publications, academic programs and research projects.

## 2. GOALS AND FORMS OF COOPERATION

The signing institutions agree to provide opportunity, as appropriate, for the following activities towards the completion of the objective of this MOU.

1. Exchange of students and/or researchers with the objective of offering courses and realizing research projects in areas mutually agreed upon by both institutes through prior invitation and in accordance with the procedures and expectations established by each institute and specific department.
2. Exchange of books, scientific publications, study programs, academic projects, course information, seminars, conferences and any other data and information of common interest.
3. Develop joint research projects and joint publications.
4. All joint activities will be realized through the mutual agreement and clearly established conditions and mutual obligations of the appropriate institute entity.

## 3. IMPLEMENTATION OF THE MEMORANDUM OF UNDERSTANDING

The objectives of the MOU will be implemented and regulated in the following manner:

1. **Student Exchange**

   a. Students and research scholars may visit the corresponding departments of these institutes after finalizing a mutually acceptable schedule.

   b. All the expenses shall be the direct responsibility of the student concerned (subject to any agreements on payment arrangements made by either institution with its own students). These expenses include:

      1. Travel expenses
      2. Reprographic and Internet Usage Expenses
      3. Required student services fees at the host institution
      4. Books and academic supplies

Forensic Science Department
Govt. Holkar Science College
Indore (M.P.)

5. Administrative fees, if any.

**ii. Exchange of researchers**

With the objective of strengthening ties through joint projects and research activities of both institutes, the MOU allows for the creation of researcher exchange. The following conditions will apply:

a. The researchers will maintain their status as research scholars at their home institution for the duration of the exchange.
b. The researchers will be allowed to make use of the instruments and other research facilities available in various departments of these institutes after prior approval of the visiting schedule.
c. The appropriate academic departments and administrative offices will assist in securing housing and other necessary arrangements for living in the host institution's city.

**iii. Research and Resources**

**Institute for Excellence in Higher Education, Bhopal** and **Department of Forensic Science Govt. Holkar (Model, Autonomous) Science College INDORE (M.P)** remote research and realize collaborative projects, giving priority to interdisciplinary works.

## 4. DURATION AND RECINDENCE OF MOU

a. The agreement shall come into effect on ----------. Changes to this agreement shall be made by mutual consent between both institutions. In cases of disagreement, the Institute wishing to depart from the agreement shall, wherever possible, give two months' notice of its intention to do so. The agreement shall be reviewed after a period of one year.

b. This MOU is being signed purely with the intention of academic and scientific cooperation without any financial liabilities.

This MOU is signed by,

**Head**
**Department of Chemistry**
**Institute for Excellence in Higher Education, Bhopal**

Dr. Vijay R. Chourey
Professor and Head
Forensic Science Department
Govt. Holkar Science College
Indore (M.P.)

**&**

**Head**
**Department of Forensic Science**
**Govt. Holkar (Model, Autonomous) Science College Indore (M.P)**

**In presence of the following witnesses:**

1. Dr. Anjana Acharya
2. Dr. Suman Malik.



Principal
Holkar Science College
INDORE

# MEMORANDUM OF UNDERSTANDING FOR ACADEMIC AND SCIENTIFIC COOPERATION

## BETWEEN

## DEPARTMENT OF FORENSIC SCIENCE, INSTITUTE FOR EXCELLENCE IN HIGHER EDUCATION (IEHE), BHOPAL, M. P.

## AND

## DEPARTMENT OF FORENSIC SCIENCE, GOVT. HOLKAR (MODEL, AUTONOMOUS) SCIENCE COLLEGE, INDORE, M. P.

---

The representatives of **DEPARTMENT OF FORENSIC SCIENCE, INSTITUTE FOR EXCELLENCE IN HIGHER EDUCATION, BHOPAL** and **DEPARTMENT OF FORENSIC SCIENCE, GOVT. HOLKAR (MODEL, AUTONOMOUS) SCIENCE COLLEGE, INDORE (M. P.)** agree to this Memorandum of Understanding.

The Memorandum of Understanding (MOU) establishes the following:

### 1. OBJECTIVE OF THE AGREEMENT

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### 2. GOALS AND FORMS OF COOPERATION

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1. Exchange of students and/or researchers with the objective of offering courses and realizing research projects in areas mutually agreed upon by both institutes through prior invitation and in accordance with the procedures and expectations established by each institute and specific department.
2. Exchange of books, scientific publications, study programs, academic projects, course information, seminars, conferences and any other data and information of common interest.
3. Develop joint research projects and joint publications.
4. All joint activities will be realized through the mutual agreement and clearly established conditions and mutual obligations of the appropriate institute units.

### 3. IMPLEMENTATION OF THE MEMORANDUM OF UNDERSTANDING:

The objectives of the MOU will be implemented and regulated in the following manner:

#### i. Student Exchange

a. Students and research scholars may visit the corresponding departments of these institutes after finalizing a mutually acceptable schedule.

b. All the expenses shall be the direct responsibility of the student concerned (subject to any agreements or per diem arrangements made by either institution with its own students). These expenses include:

1. Travel expenses.
2. Reprographic and Internet Usage Expenses.
3. Required student services fees at the host institution.
4. Books and academic supplies.
5. Administrative fees, if any.

#### ii. Exchange of researchers

With the objective of strengthening ties through joint projects and research activities of both institutes, the MOU allows for the creation of researcher exchange. The following conditions will apply:

a. The researchers will maintain their status as research scholars at their home institution for the duration of the exchange.

b. The researchers will be allowed to make use of the instruments and other research facilities available in various departments of these institutes after prior approval of the visiting schedule.

c. The appropriate academic departments and administrative offices will assist in securing housing and other necessary arrangements for living in the host institution's city.

**iii. Research and Resources**

**Department of Forensic Science, Institute for Excellence in Higher Education, Bhopal (M. P.)** and **Department of Forensic Science, Govt. Holkar (Model, Autonomous) Science College, Indore (M. P.)** promote research and explore collaborative projects, giving priority to interdisciplinary works.

## 4. DURATION AND RECINDENCE OF MOU

a. The agreement shall come into effect on 26/4/22. Changes in this agreement shall be made by mutual consent between the institutions. In cases of disagreement, the institution willing to depart from the agreement shall, whatever possible, give two months' notice of its intention to do so. The agreement shall be reviewed after a period of five years.

b. This MoU is being signed purely with the intention of academic and scientific cooperation without any financial liability.

This MOU is signed by

विभागाध्यक्ष
न्यायिक विज्ञान
उच्च शिक्षा उत्कृष्टता संस्थान
भोपाल (म.प्र.) - 462042

Head
Department of Forensic Science
Institute for Excellence in Higher Education, Bhopal (M. P.)

&

Forensic Science Department
Govt. Holkar Science College
Indore (M.P.)

Head
Department of Forensic Science
Govt. Holkar (Model, Autonomous) Science College, Indore (M. P.)

In presence of the following witness.

26/4/22

1. Mr. Mohd. Afhar
2. Dr. Rajendra Laxmanrao Pawar 26/04/2022

Govt. Holkar (Model, Autonomous) Science College, Indore
(M.P.) Pin - 452017
Department of Forensic Science

Memorandum of Understanding
Between
Department of Forensic Science, Institute for Excellence in Higher Education, Bhopal (M.P.)
And
Department of Forensic Science, Govt. Holkar (Model, Autonomous) Science College, Indore (M.P.)

We jointly enter into a MOU for the Expertise sharing, training, collaborative research, promote projects/ internship programs, organization of moot courts, workshop etc for learning and training purpose of students, faculties and other associated personnel's.

Following Activity has been conducted under this:

- **Faculty Exchange/ Guest Lecture**
  Invited Resource Person- Mr. Rajendra Prasad
  Online Faculty Development program on "Modern Tools use in Scientific Investigation of Crime Scene"
  Date: 22/04/2019

Govt. Holkar (Model, Autonomous) Science College, Indore
(M.P.) Pin - 452017
Department of Forensic Science

Date: - 20/04/2019

To,
Mr. Rajendra Prasad,
Assistant Professor,
Institute for Excellence in Higher Education,
Bhopal, (M.P.)

Subject:- Invitation letter for Online Faculty Development Program **"Modern Tools Use in Scientific Investigation of Crime Scene".**

Dear Sir,

Department of Forensic Science, Govt. Holkar (Model, Autonomous) Science College, Indore (M.P.) Pin - 452017 is going to organize an Online Faculty Development Program "Modern Tools Use in Scientific Investigation of Crime Scene" from 22/04/2019 to 27/04/2019.

We are pleased to inform you that we are inviting you as a resource person on 22/04/2019 in our Programme.

We would be delighted with their presence in the Faculty Development Programme.

V.R. Chourey

Dr. V.R. Chourey
HOD
Department of Forensic Science
Govt. Holkar (Autonomous, Model) Science

# SSR DOCUMENT

2019

## CRITERION – 3

## MoUs/Linkages/Collaborations

Electronics & Electriclas, 18a, Electronic Complex, Pardeshipura, Pardeshipura, Indore, Madhya Pradesh

**Document Title:**

One-day industrial training on 11/12/2019 at Electronics and Electrical, Indore, was organized by the Electronics Department under the MoU.

कार्यालय प्राचार्य
शासकीय होलकर विज्ञान महाविद्यालय, इन्दौर
☎ 0731-2464074 ● फैक्स : 0731-2446806, 2764027
Email : principalhsc@rediffmail.com ● Web Site: www.collegeholkar.org

**Memorandum of Understanding for Academic and Industrial Cooperation**
**Between**
**Department of Electronics, Govt. Holkar (Model, Autonomous) Science College Indore (M.P.)**
**INDIA**
**And**
**Electronics & Electricals, 18-A Electronics Complex, Pardesipura, Indore (M.P.), INDIA**

The purpose of this agreement is to promote cooperation in educational, technical, and industrial environments/behavior between the Department of Electronics, Govt. Holkar (Model, Autonomous) Science College, Indore (M.P.), India and Electronics & Electricals, 18-A Electronics Complex, Pardesipura, Indore (M.P.), India.

The Memorandum of Understanding (MOU) establishes the following:

**PURPOSE OF THE AGREEMENT**

1. The industry would guide on internship/Major projects/minor projects/summer projects/projects to students.
2. Recommend/deliver the lectures on relevant technologies, trends, and tools to support students.
3. To understand the culture of tech product development, industry facilitating to allow visits for students and faculties.
4. In response to academic demand, the industry will give training on current technologies.
5. Other activities as mutually agreed.

**ROLE OF PARTIES**

The Government Holkar (Model, Autonomous) Science College in Indore, will assign a Faculty member from the department and the cooperative side, the director will designate a faculty/staff member.

**COMPLETION PERIOD OF MOU**

This MOU will be signed by the institutes and the industry, and it will be in effect for 5 years, with the possibility of extension based on mutual agreement.

**FINANCIAL LIABILITIES**

There are no financial liabilities for either participant in implementing the MOU.

This MOU is signed by,

Head of the Department
ELECTRONICS
Govt. Holkar Science College
INDORE

**Dr. Netram Kaurav, HOD**, Department of Electronics,
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

**Dr. Suresh T. Silawat, Principal**
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

**Mr. Shailesh Kasliwal, Partner**
Electronics & Electricals, 18-A Electronics Complex, Pardeshipura, Indore (M.P.)

**Date of Implementation 27/Nov/2019**

E&E

**ELECTRONICS & ELECTRICALS**
18-A, Electronic Complex, Pardeshipura,
INDORE - 452 010 (M.P.) INDIA

**Memorandum of Understanding for Academic and Industrial Cooperation**
**Between**
**Department of Electronics, Govt. Holkar (Model, Autonomous) Science College Indore (M.P.)**
**INDIA**
**And**
**Electronics & Electricals, 18-A Electronics Complex, Pardesipura, Indore (M.P.), INDIA**

The purpose of this agreement is to promote cooperation in educational, technical, and industrial environments/behavior between the Department of Electronics, Govt. Holkar (Model, Autonomous) Science College, Indore (M.P.), India and Electronics & Electricals, 18-A Electronics Complex, Pardesipura, Indore (M.P.), India.

The Memorandum of Understanding (MOU) establishes the following:

**PURPOSE OF THE AGREEMENT**

1. The industry would guide on internship/Major projects/minor projects/summer projects/projects to students.
2. Recommend/deliver the lectures on relevant technologies, trends, and tools to support students.
3. To understand the culture of tech product development, industry facilitating to allow visits for students and faculties.
4. In response to academic demand, the industry will give training on current technologies.
5. Other activities as mutually agreed.

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**FINANCIAL LIABILITIES**

There are no financial liabilities for either participant in implementing the MOU.

This MOU is signed by,

Head of the Department
ELECTRONICS
Govt. Holkar Science College

**Dr. Netram Kaurav, HOD** Department of Electronics,
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

प्राचार्य

**Dr. Suresh T. Silawat, Principal**
Govt. Holkar (Model, Autonomous) Science College, Indore, (M.P.)

**Mr. Shailesh Kasliwal, Partner**
Electronics & Electricals, 18-A Electronics Complex, Pardeshipura, Indore (M.P.)

**Date of Implementation 27/Nov/2019**

# SKILL DEVELOPMENT PROGRAM
2019-20

| S. No | Component/Activities | Details |
|---|---|---|
| 1 | Name of the Department / Unit / Agency: | Department of Electronics |
| 2 | Name of the Activity: | One Day Visit/Training on Electronic equipment Manufacture Unit |
| 3 | Name of the Scheme: | Hands-On Training |
| 4 | Date and Year of the Activity: | 11/12/2019 |
| 5 | Number of Students Participated in the activity: | 10 |
| 6 | Report of the Activity (in 100 words): | A one-day industrial training on 11/12/2019 at Electronics and Electrical was organized by the Electronics Department, Government Holkar (Model, Autonomous) Science College, Indore as part of an agreement between the company and the college. The manufacturing of electronic equipment was covered in this industrial visit for the students. Additionally, students learned how to design equipment producers. Ten students from the department benefited from this training. After completing this instruction, the students practiced in the department lab and, with the assistance of the department's instructors and staff, created basic kits of laboratory equipment. The Principal, Dr. Suresh T. Silawat, and the Department Head, Dr. Netram Kaurav, have approved this visit. |

# शासकीय होल्कर विज्ञान महाविद्यालय
## इन्दौर (म.प्र.) भारत – 452 017

फोन नं. : 0731–2464074, 244049

**इलेक्ट्रॉनिकी विभाग**

Date:- 03/12/2019

To,

Director,
Electronics And Electricals,
18 A Electronic Complex
Pardeshipura, Indore

Subject: -Proposal/Permission Letter for One-Day Visit/Training in Industry

Respected Sir,

The purpose of this letter is to request permission for a one-day visit/training. For the students of B.Sc. III Year Employment/Learning Purpose, I request you to Kindly Provide some practical education to the students about industrial procedures, Products, and facilities. The 10 students will be part of the trip accompanied by one teacher. Your kind consideration of our request will help.

I request you to kindly confirm our students the visit/Training.

**Students List**

| S.No | Students Name | S.No | Students Name |
|---|---|---|---|
| 1 | Aditi Mudgal | 6 | Jyoti Dyama |
| 2 | Anas Shaikh | 7 | Koustabh Parsai |
| 3 | Aniket Mishra | 8 | Nainika Patwa |
| 4 | Ankit Patel | 9 | Sakshi Rana |
| 5 | Anuj Raghuwanshi | 10 | Tabbsum |

Thanks for your kind corporation

3/12/2019

Dr. Netram Kaurav
HOD
Department of Electronics

विभागाध्यक्ष
इलेक्ट्रानिकी विभाग
शासकीय विज्ञान महाविद्यालय,
इन्दौर

E&E

ELECTRONICS & ELECTRICALS
18-A, Electronic Complex, Pardeshipura,
INDORE - 452 010 (M.P.) INDIA

No

Dated 04-12-2019

The Principal – Electronics Deptt
Government Holkar Science College,
AB Road,
**INDORE**

Dear Sir,

Sub.:- Your letter dated 0312-2019 regarding Industrial visit of the students.

With reference to your above mentioned letter, we hereby confirm the date on 11-12-2019 at around 10 AM.

We look forward to the visit of 10 students along with the faculty member.

Thanking you,

Yours faithfully,
For **ELECTRONICS & ELECTRICALS**

For Electronics & Electricals

**SHAILESH KASLIWAL** Partner

e-mail : info@eeindia.in • Website : www.eeindia.in • Phone : (0731) 2558811 • Mobile : 98270-23888

| | | |
|---|---|---|
| 7 | List of Participants | Enclosed |

**Students List**

| S.No | Students Name | S.No | Students Name |
|---|---|---|---|
| 1 | Aditi Mudgal | 6 | Jyoti Dyama |
| 2 | Anas Shaikh | 7 | Koustubh Parsai |
| 3 | Aniket Mishra | 8 | Nainika Patwa |
| 4 | Ankit Patel | 9 | Sakshi Rana |
| 5 | Anuj Ranghuwanshi | 10 | Tabbsum |

# SSR DOCUMENT

2018

## CRITERION – 3

## MoUs/Linkages/Collaborations

**Noble Alchem Pvt. Ltd. (Agribooster), Sanwer Road, Indore, M.P.**

**Document Title:**

**Research Activities were carried out: 1) Role of soluble silica in alleviating oxidative stress in soybean crops; 2). The Role of Soluble Silica in Counteracting Lead Toxicity in Wheat (Triticum aestivum L.)**

# Government Holkar Science College, Indore (MP)

## Department of Biochemistry

### Certificate of Collaboration

This is to certify that the **Department of Biochemistry, Govt. Holkar Science College, Indore, and Noble Alchem Pvt. Ltd. (Agribooster), Sanwer Road, Indore, M.P.** with the mutual collaborative work have successfully published a Research Paper entitled **"Role of soluble silica in alleviating oxidative stress in soybean crop"** in the session 2018-19.



**Head**

Department of Biochemistry

Indian J. Agric. Res., 52 (1) 2018 : 9-15
Print ISSN:0367-8245 / Online ISSN:0976-058X

AGRICULTURAL RESEARCH COMMUNICATION CENTRE
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# Role of soluble silica in alleviating oxidative stress in soybean crop

**T. Rangwala*[1], A. Bafna[1], N. Vyas[2] and R. Gupta[2]**

Department of Biochemistry,
Government Holkar Science College, Indore-452 017, Madhya Pradesh, India.
Received: 26-08-2017 Accepted: 02-11-2017 DOI: 10.18805/IJARe.A-4882

## ABSTRACT

Sudden changes in environment causes abiotic and biotic stress due to which farmers are facing problem of decreased yield. The present study was designed to improve yield by alleviating oxidative stress in crops. Silicon is gaining importance in promoting growth and yield of plants. Soluble silica in the form of Agribooster™ was sprayed on test field of soybean during cultivation. Proline content was found to be decreased significantly in soybean sprayed with soluble silica. Significantly decreased malondialdehyde content was observed in soybean which indicates beneficial role of silica in preventing lipid peroxidation. Soluble silica increased peroxidase activity by increasing water availability and total phenol content was also found to be increased significantly in soybean. So from the present study it can be concluded that silica when applied on crops in soluble form prevent oxidative stress caused due to various environmental factors which may help in better quality product and yield.

**Key words:** Agribooster TM, Malondialdehyde, Peroxidase, Phenol, Proline.

## INTRODUCTION

One of the main determinants of agricultural production is climate. There is significant concern about the effects of climate change and its variability on agricultural production throughout the world (Chakraborty and Hazari, 2017). In today's scenario sudden climatic changes are causing damage to crops by increasing oxidative stress. Silicon which was not believed to be essential for plant growth is becoming a boon for the development of plants. Silica in soluble form imparts many benefits for plants including enhanced growth, improvement in combating various adverse conditions like resistance to drought, salinity; heavy metal toxicity stresses etc and yield (Epstein, 1999; Ma *et al.,* 2006). Silica have been shown to protect plant against various abiotic stress such as extremes of temperature, UV radiation etc. Water losses may be decreased through deposition of silica (Haynes, 2014). Silica imparts erectness and also improves photosynthesis in plants (Dorneles *et al.,* 2016). Exposure of plants to different environmental stress, biotic or abiotic, produces various reactive oxygen species (Chiban *et al.,* 2011). As shown in Fig. 1, superoxide radical ($O_2$-), hydrogen peroxide ($H_2O_2$), hydroxyl radical (OH) and singlet oxygen are all reactive oxygen species which trigger synthesis of each other (Marschner, 1995). Silica shows positive effect on growth of many plants and provides resistance against stress (Broadley *et al.,* 2012). In plants subjected to multiple stresses, silica is actively involved in various metabolic and physiological activities (Sacala, 2009). Mechanism involved in ameliorative effect of silica to different stresses is activation of antioxidative defence (Liang *et al.,* 2003).

These ROS cause damage to cell membrane, proteins, nucleic acid and lipids (Foyer *et al.,* 1994). However, the most susceptible target is polyunsaturated fatty acids. Removal of hydrogen atoms from polyunsaturated fatty acid initiates the pathway for lipid peroxidation and causes accumulation of malondialdehyde as shown in Fig. 2

Within the plant cell, enzymatic as well as non-enzymatic antioxidant system is present which helps to maintain ROS balance (Yan *et al.,* 1996). Peroxidase is one of the components of enzymatic antioxidative system whih convert $H_2O_2$ to water and oxygen causing detoxification of ROS.

$$AH_2 + H_2O_2 \xrightarrow{\text{Peroxidase}} A + 2H_2O$$

$$AH_2 + ROOH \xrightarrow{\text{Peroxidase}} A + ROH + H_2O$$

Proline is believed to act as osmoprotectant by accumulating in high concentration in plant cells. It also helps in detoxification of ROS, thus maintain of membrane integrity in plants (Demiralay *et al.,* 2013). Proline is mainly involved in osmotic adjustment of cell, stabilization of membrane and detoxification of harmful ions in plants exposed to salt stress (Ashraf and Foolad, 2007).

*Corresponding author's e-mail: tasneemdharwala@yahoo.com
[1]Department of Biochemistry, Govt. Holkar Science College, Indore-452 017, Madhya Pradesh, India.
[2]Noble Alchem Pvt. Ltd.,Sanwer Road, Indore-452 017, Madhya Pradesh, India.

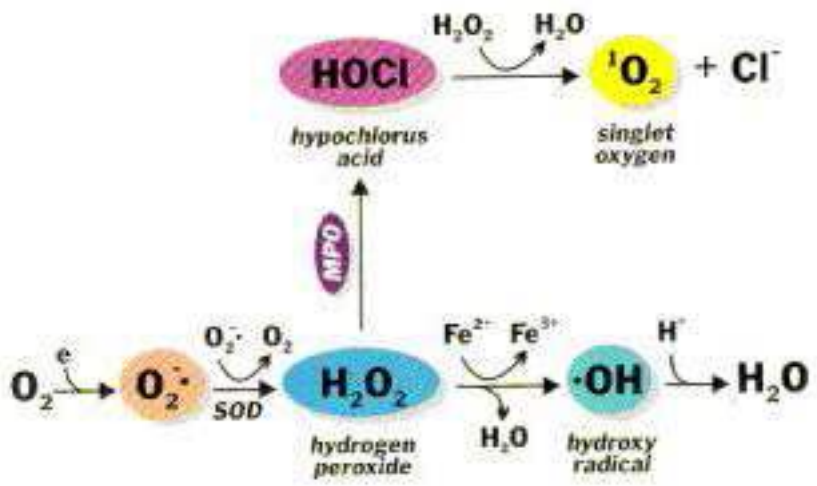



**Figure 1:** Generation of reactive oxygen species, where MPO is myeloperoxidase and SOD is superoxide dismutase. Grisham, (1992) and Mosker (1194)

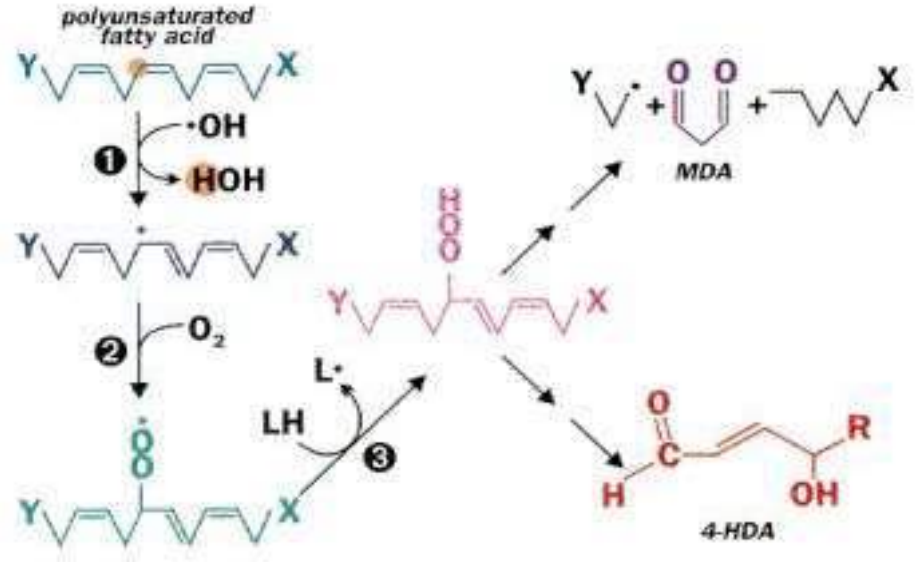



**Figure 2:** Peroxidation of polyunsaturated fatty acid Foyer *et al.*,(1994)

Phenolic compounds as a part of non-enzymatic system is believed to show antioxidant action. Phenolic compounds accumulation is induced in various stress condition like presence of heavy metals which suggest their role in combating such stress. Phenol has ability to form chelates with metal ions which shows its antioxidant property. These metal ions are involved in catalysing oxygenation reactions. Phenolic compounds inhibit lipid peroxidation by trapping the lipid alkoxyl radical and thereby preventing damage caused by ROS. This activity depends on the structure of the phenolic compounds and the number and position of the hydroxyl group in the molecules (Millic *et al.,* 1998). Phenolic compounds also inhibit activity of oxidizing enzymes. (Elavarthi and Martin, 2010)

In the present study, oxidative stress parameters were assessed in soybean obtained after cultivation in absence and presence of soluble silica to know the beneficial role of silica in alleviating stress. Foliar spray of soluble silica was done. Foliar spray helps in rapid and direct utilization of nutrients (Geetha and Velayutham, 2016).

## MATERIALS AND METHODS

Soybean (*Glycine max* L.) was sown on 23rd June 2016 at five fields located in District Dewas, Madhya Pradesh, India. Geographical location of fields selected as per Latitude Longitude read by GPS 76 Garmin was N- 22 58'32.2" – 34.4" E- 076 10' 32.9"– 32.2"

First flowering was observed on 28th July 2016. Agribooster™ containing soluble silica was diluted to 1%

and sprayed on soybean crop twice (22nd July and 25th August 2016) approximately at the interval of one month after sowing seeds. Unsprayed crop served as control. The soybean crop was harvested on 13th September 2016 and seeds were collected to evaluate different oxidative stress parameters.

**Proline content:** Proline was estimated according to the method of Bates *et al.,* (1973). Proline was selectively extracted from soybean using aqueous sulphosalycilic acid. The extracted proline was made to react with 2 ml glacial acetic acid and ninhydrin which is prepared by using glacial acetic acid and phosphoric acid. (pH 1.0) to form chromophore (red color) which was read at 520nm. Except proline other amino acid reacts with ninhydrin prepared in ethanol.

**MDA content**: Malondialdehyde (MDA), a decomposition product of polyunsaturated fatty acid component of membrane lipid was extracted using 5% TCA and estimated using thiobarbituric acid (TBA) as reactive material (Heath and Packer, 1968).

**Peroxidase activity**: It was determined according to method of Summer and Gjessing, (1943). The enzyme activity was assayed using ortho-dianisidine as hydrogen donor and $H_2O_2$ as electron acceptor. The rate of formation of yellow orange colored dianisidine dehydrogenation product was measure of peroxidase activity and was assayed spectrophotometrically at 430 nm.

**Total phenol content**: It was estimated using Folin-Ciocalteu reagent which contains oxidizing agent phosphomolybdate. Under alkaline condition phenol reacts to form blue color complex, the molybdenum blue which is measured at 650 nm colorimetrically. Catechol was used as standard. (Bray and Thorpe, 1954)

## RESULTS AND DISCUSSION

Values are expressed as mean ± SD. p- value was calculated to assess significant difference as compared to control (Table 1).

Proline content was found to be decreased significantly (p value < 0.05) in soybean of test fields T1 and T3. In T2 and T4 fields of soybean, decrease in proline content was highly significant (p value < 0.01) as compared to control (Fig. 3). Decrease in proline content in soybean of test field T1, T2 T3, T4 was found to be 58.8%, 71.5%, 56.6% and 68.7% respectively.

Extremely significant decrease (p value < 0.000) in malondialdehyde was observed content in soybean of test

**Table 1:** Oxidative stress parameters in soybean after foliar spray of Agribooster$^{TM}$

| Parameters | Control plant | Treated plant (T1) | Treated plant (T2) | Treated plant (T3) | Treated plant (T4) |
|---|---|---|---|---|---|
| Proline content (µmoles/ gm) | 5.03 ± 1.26 (0.72) | 2.07 ± 0.73* (0.42) | 1.43 ± 0.25** (0.14) | 2.18 ± 0.39* (0.22) | 1.57 ± 0.36** (0.20) |
| Malondialdehyde content (nmoles/ gm) | 2.65± 0.27 (0.15) | 0.73 ± 0.16*** (0.09) | 0.45± 0.05*** (0.02) | 0.49±0.006*** (0.003) | 0.69± 0.19*** (0.11) |
| Peroxidase Activity (units/min/gm) | 0.61 ± 0.32 (0.18) | 18.01 ± 3.44*** (1.99) | 5.2± 2.05** (1.18) | 2.68 ±1.21* (0.69) | 2.23±0.57* (0.32) |
| Total Phenol content (mg/gm) | 64.33 ±8.14 (4.71) | 80 ± 3* (1.73) | 80 ± 6.08* (3.51) | 85.33 ± 5.85* (3.38) | 77.33 ± 2.51* (1.45) |

* indicates p value < 0.05 and is significant as compared to control
** indicates p value < 0.01 and is highly significant as compared to control
*** indicates p value < 0.001 and is extremely significant as compared to control
Parenthesis indicates standard error

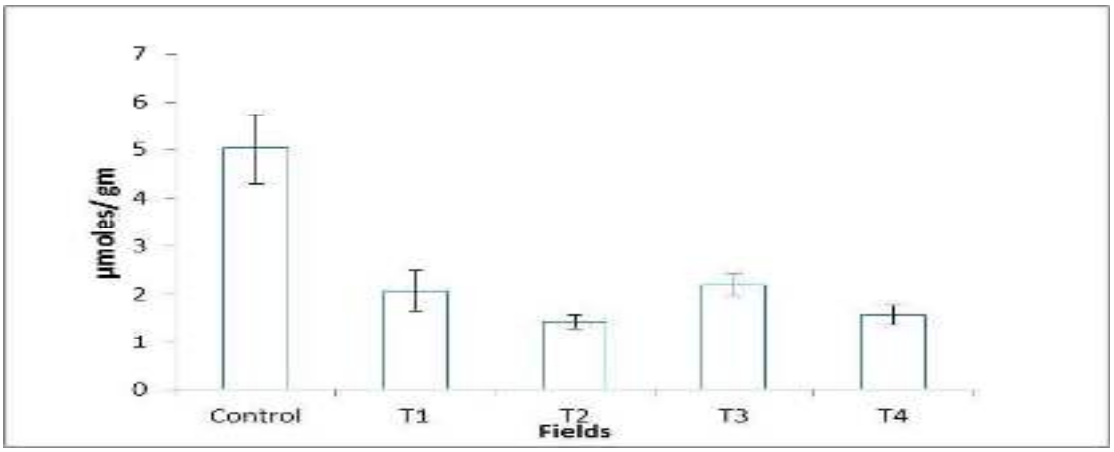



**Figure 3:** Effect of soluble silica on proline content of soybean

fields as compared to control (Fig. 4). 72.4%, 83.01%, 81.50% and 73.96% decrease was observed in malondialdehyde content in soybean of test field T1, T2, T3 and T4 respectively.

Activity of peroxidase enzyme was observed to be increased significantly (p value <0.05) in the seeds of test fields T3 (3.93%) and T4 (2.65%) as compared to control (Fig. 5). In soybean of T1 (28.52%) field increase in peroxidase activity was extremely significant (p value < 0.000) and in soybean of field T2 (7.52%) increase was highly significant (p value < 0.01) as compared to control.

Total phenol content in soybean was significantly increased in all the test fields as compared to control. Increase in total phenol content was found to be 24.35%, 24.35%, 32.64% and 20.2% in soybean of T1, T2, T3 and T4 fields respectively (Fig. 6).

Proline is an amino acid involved in osmoregulation. It provides high turgor potential for maintaining growth (Ashraf and Harris, 2004). Proline is also considered as a potent antioxidant and potential inhibitor of programmed cell death in plants (Pireivatloum *et al.,* 2010). Accumulation of proline is indicator of immediate response to stress (Kundar *et al,* 2016). Decrease in proline content was observed in *P. multiflorum* when sprayed with silica (Rubinowska *et al.,* 2014). Similar results were obtained by Kaya *et al.,* (2006) and Tuna *et al.,* (2008) while cultivating corn and wheat respectively under different stress conditions. Silica have been shown to enhance the water

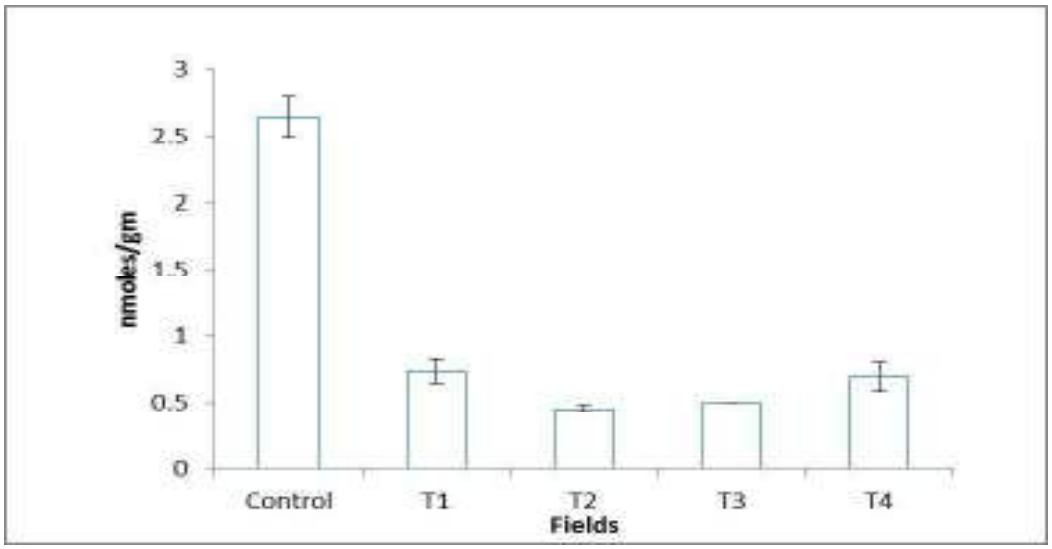



**Figure 4:** Effect of soluble silica on malondialdehyde (MDA) content of soybean.

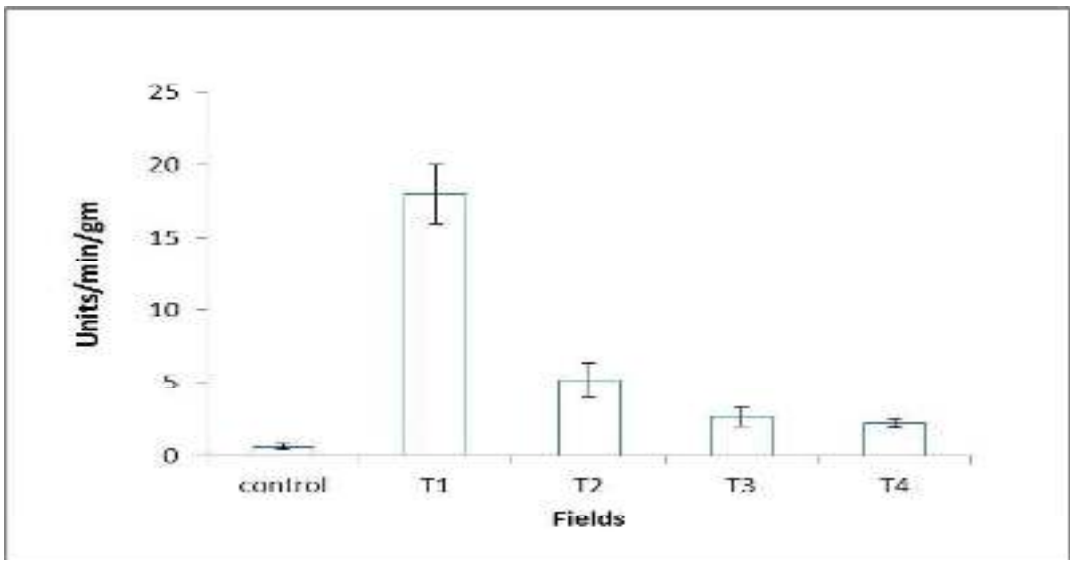



**Figure 5:** Effect of soluble silica on peroxidase activity of soybean

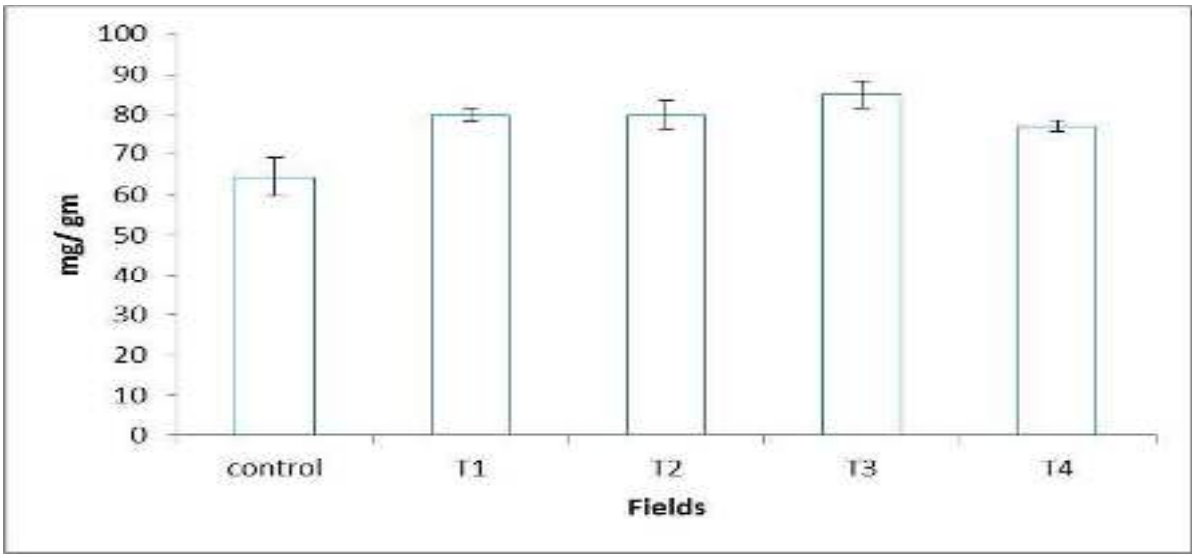



**Figure 6:** Effect of soluble silica on total phenol content of soybean.

status; relieving the oxidative stress and improving osmotic adjustment in plants which may favour decrease in proline content in silica treated plants.

As shown in Fig. 2, hydroxyl radical mainly cause peroxidation of lipid. Application of silica in soluble form increases availability of water which releases more protons to neutralise harmful hydroxyl ion preventing peroxidation of lipid present in the membrane. Thus malondialdehyde which is major product of membrane lipid peroxidation had decreased in presence of silica. Liang *et al.,* (2003) found that in silica-treated plants membrane lipid peroxidation had decreased, which indicates greater membrane stability under stress. Silica prevented membrane damage caused due to drought and UV B radiation (Shen *et al.,* 2010). Kazemi *et al.,* (2012) observed decrease in malondialdehyde content under influence of silica solution on Lisanthus.

Various studies have suggested that silicon protect plant from oxidative damage by promoting conversion of superoxide to $H_2O$ and $O_2$ and also by increasing activities of $H_2O_2$ scavenging enzymes peroxidase (Dong *et al.,* 2014). Silica activates antioxidant defence system in plants in condition of salt stress (Mahmoud *et al.,* 2017). Peroxidase is believed to have scavenging role against stress condition. Increased availability of water in presence of silica helps in activation of peroxidase enzyme which has protective role in combating stress condition. Thus silica helps to relieve stress condition so that plants can utilize major part of their energy in synthesis of macromolecules which results in improved quality of plant product. Present results are supported by the work of Ahmad and Haddad (2011) who also found significant increase in activity of peroxidase in wheat under water deficit stress in presence of silica. Sayed and Gadallah (2014) suggested that silica induce increase in oxidative defence abilities in drought stressed maize. In the case of saline soils, silica increased the activity of antioxidant enzymes in wheat (Saqib *et al.,* 2008). Silica provides protection from harmful effect of UV B light by enhancing activity of peroxidase enzyme (Shen *et al.,* 2010).

Secondary metabolites such as phenol are synthesized under drought stress and act as antioxidant to protect plants (Nascimento and Fett-Neto, 2010). Phenolic compounds protect cells against the negative effects of ROS such as lipid peroxidation, protein denaturation and DNA damage (Allakhverdiev *et al.,* 2008). Phenolic compounds can scavenge ROS (Amar-owicz and Weidner 2009). It has been shown that plants which are supplemented with silica can have better defence system by elevating production of phenolics (Ma and Yamaji, 2006). (Kidd *et al.,* 2001) reported release of phenolic compounds against aluminium tolerance.

## CONCLUSION

Silica when used in soluble form can enhance antioxidant capacity of crops so that they can survive and grow under adverse environmental conditions. Silica can become a boon for the farmers to increase their yield.

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## REFERENCES


Ahmad, S. T., Haddad, R. (2011). Study of silicon effects on antioxidant enzyme activities and osmotic adjustment of wheat under drought stress. Czech J. *Genet.Plant.,* **47**: 17-27.

Allakhverdiev, S. I., Kreslavski, V. D., Klimov, V. V., Los, D. A., Carpentier, R., Mohanty, P. (2008). Heat stress: an overview of molecular responses in photosynthesis. *Photosynth Res.,* **98**: 541–550.

Amarowicz, R., Weidner, S. (2009). Biological activity of grapevine phenolic compounds. In: Roubelakis-Angelakis KA (ed) *Grapevine Molecular Physiology and Biotechnology*, 2nd edn. Springer, New York, 389–405.

Ashraf, M. and Foolad, M.R. (2007). Roles of Glycine betaine and proline in improving plant abiotic stress tolerance. *Environ. Expt. Bot.,* **59**: 206-216.

Ashraf, M. and Harris, P.J.C. (2004). Potential Biochemical Indicators of salinity tolerance in plants. *Plant Sci.,* **166:** 3-16.

Bates, L. S., Waldren, R. P., Teare, I. D. (1973). Rapid determination of free proline for water-stress studies. *Plant Soil.,* 39: 205–207.

Bray, H.G. and Thorpe W.V. (1954*). Meth. Biochem. Anal.* **1:** 27-52.

Broadley, M., Brown, P., Cakmak, I., Ma, J. F., Rengel, Z. and Zhao, F. (2012). Beneficial elements. In: Marschner's Mineral Nutrition of Higher Plants. 3rd edition. [Marschner,P. (Ed.)], UK, London, *Academic Press*, London. 249-269.

Chakraborty, B. and Hazari, S. (2017). Impact of climate change on yields of major agricultural crops in Tripura. *Indian J. Agric. Res.,* **51** (4) : 399-401.

Chiban, M., Soudani, A., Sinan, F., Tahrouch, S. and Persin, M. (2011). Characterization and application of dried plants to remove heavy metals, nitrate, and phosphate ions from industrial wastewaters . *Soil, Air and Water.* **39**(4): 376-383.

Demiralay, M., Saglam, A., Kadýoglu, A. (2013). Salicylic acid delays leaf rolling by inducing antioxidant enzymes and modulating osmoprotectant content in Ctenanthesetosa under osmotic stress. *Turk. J. Biol.* **37**: 49-59.

Dong, Y., Xu, L., Wang, Q., Fan, Z., Kong J. and Bai X. (2014). Effects of exogenous nitric oxide on photosynthesis, antioxidative ability, and mineral element contents of perennial ryegrass under copper stress. *J. Plant Inter.* **9:** 402-411.

Dorneles, A.O.S., Pereira, A.S., Rossato, L.V., Possebom, G., Sasso, V.M., *et al.,* (2016). Silicon reduces aluminum content in tissues and ameliorates its toxic effects on potato plant growth. *Ciênc. Rural.* **46**: 506 -512.

Elavarthi, S., Martin, B. (2010). Spectrophotometric assays for antioxidant enzymes in plants. *Methods Mol Biol.* 639, 273–281.

Epstein, E. (1999). Silicon. Annu. Rev. Plant Physiol. *Plant Mol. Biol.* **50**: 641-644.

Foyer, C. H., Lelandais, M., Kunert, K. J. (1994). Photooxidative stress in plants. *Plant Physiol.* **92**: 696-717.

Geetha, P. and Velayutham, A. (2016). Yield attributes, yield and uptake of nutrients as influenced by basal and foliar application of nutrients on rice fallow blackgram. *Indian J. Agric. Res.,* **50** (2) : 122-125.

Grisham, M. B. (1992). Reactive Metabolites of Oxygen and Nitrogen in Biology and Medicine, *RG Landes Co.,* Austin.

Haynes, R.J. (2014). A contemporary overview of silicon availability in agricultural soils. *J. Plant Nutr. Soil Sci.* 1–14.

Heath, R. L., and Packer, L. (1968). Photoperoxidation in isolated chloroplasts.I-Kinetics & stoichiometry of fatty acids peroxidation. *Arch. Biochem. Biophys.* **125**: 189-198.

Kaya C., Tuna L., and Higgs D., (2006). Effect of silicon on plant growth and mineral nutrition of maize grown under water-stress conditions. *J. Plant Nutr.* **29**: 1469–1480.

Kazemi M., Asadi M., and Aghdasi S., (2012). Postharvest life of cut *Lisianthus* flowers as affected by silicon, malic acid and acetylsalicylic acid. *Res. J. Soil. Biol.* **4:** 15–20.

Kidd, P. S., Llugany, M., Gunsé, B., and Barcelo, J. (2001). The role of root exudates in aluminium resistance and silicon induced amelioration of aluminium toxicity in three varieties of maize (*Zea mays* L.) *Journal of Experimental Botany*. **52**:1339-1352.

Kundar, R., Reddy, P. And Rao, M., (2016). Effect of PEG mediated water stress on solute accumulation, relative water content, biomass and antioxidant enzymes in rice. *Indian J. Agric. Res.*, **50** (5) : 398-405.

Liang, Y.C.,Chen,Q. R., Liu, Q., Zhang, W. H., and Ding, R. X. (2003). Exogenous silicon (Si) increases antioxidant enzyme activity and reduces lipid peroxidation in roots of salt-stressed barley (*Hordeum vulgare* L.). *J. Plant Physiol.* **160**: 1157–1164.

Ma, J. F., Tamai, K., Yamaji, N., Mitani, N., Konishi, S., Katsuhara, *et al.,* (2006). A silicon transporter in rice. *Nature*. **440:** 688-691.

Ma, J.F., and Yamaji, N. (2006). Silicon Uptake and accumulation in higher plants. *Trends in Plant Science.* **11**: 392–397.

Mahmoud, E.F. A. H., Hegazy, S. H., Noaman, S. H., Dayala, M.N. (2017). Effect of silica ions and nano silica on rice plants under salinity stress. *Ecological Engineering*., **99**: 282-289.

Marschner, H. (1995). Mineral Nutrition of Higher Plants, *2nd ed. Academic Press Limited*, London. 889.

Millic, B.L., Djilas, S.M., and Canadanovic-Brunet, J.M. (1998). Antioxidative activity of phenolic compounds on the metal-ion breakdown of lipid peroxidation system. *Food Chem.* 61, 443.

Moslen, M. T. (1994). Free Radicals in Diagnostic Medicine, *D. Armstrong, ed*., Plenum Press, New York.

Nascimento, N.C., Fett-Neto, F. (2010). Plant secondary metabolism and challenges in modifying its operation: an overview. *Methods Mol Biol.* **643:** 1–13.

Pireivatloum, J., Qasimov, N., Maralian, H. (2010). Effect of soil water stress on yield and proline content of four wheat lines. *Afr. J. Biotech*. **9:** 36-40.

Rubinowska, K., Pogroszewska, E., Laskowska, H., Szot, P., Zdybel, A., *et al.,* (2014). The Subsequent Effct of Silicon on Physiological and Biochemical Parameters of *Polygonatum Multiflorum* (L.) All. 'Variegatum' Cut Shoots *Acta Sci. Pol*., Hortorum Cultus. **13**(1): 167-178.

Sacala, E. (2009). Role of silicon in plant resistance to water stress. *J Elem*. **14**: 619-630.

Saqib, M., Zorb, C., and Schubert, S. (2008). Silicon-mediated improvement in the salt resistance of wheat (*Triticum aestivum*) results from increased sodium exclusion and resistance to oxidative stress. *Functional Plant Biology* **35**: 633–639.

Sayed, S. A., Gadallah, M. A. A. (2014). Effects of silicon on *Zea mays* plants exposed to water and oxygen deficiency. Russ. *J. Plant. Physiol*., **61**: 460-466.

Shen, X., Zhau, Y., Duan, L., Li, Z., Eneji, E., and Li, J., (2010). Silicon effects on photosynthesis and antioxidant parameters of soybean seedlings under drought and ultraviolet-B radiation. *Journal of plant Physiology*., **167**(15): 1248-1252.

Summer, J.B., Gjessing, E.C. (1943). *Arch. Biochem*., **2:** 291.

Tuna A.L., Kaya C., Higgs D., Murillo-Amador B., Aydemir S., Girgin A.R., (2008). Silicon improves salinity tolerance in wheat plants. *Environ. Exp. Bot.* **62**: 10–16.

Yan, B., Dai, Q., Liu, X., Huang, S., and Wang, Z. (1996). Flooding-induced membrane damage, lipid oxidation and activated oxygen generation in corn leaves. *Plant Soil* **179:** 261-268.

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### Certificate of Collaboration

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# Role of Soluble Silica in Counteracting Lead Toxicity in Wheat (*Triticum aestivum* L.)

SANDHYA SHARMA[1*], ANGURBALA BAFNA[1], ROHAN GUPTA[2] and NAGESH VYAS[2]
[1]Department of Biochemistry, Govt. Holkar Science College, Indore-452001; [2]Noble Alchem Pvt. Ltd., Sanwer Road, Indore-452001, India

**The pollution of agricultural lands due to various heavy metals causes serious problems to the environment and produces a number of unfavourable physiological modifications in crop. Lead (Pb) is one of the major and common concerns among heavy metals because of its high level in the environment; it causes significant adverse effects on plant processes. Different remediation approaches have been used to overcome the toxic effect of heavy metals on crop plants. In Indian scenario, use of soluble silica is a modern and economical technique to minimize the negative effect of heavy metal stress. The objective of present study was to observe the effect of foliar spray of soluble silica in the form of Agribooster™ on lead treated and untreated wheat (*Triticum aestivum l.*) crop. Shoot length, total chlorophyll and stress parameters malondialdehyde (MDA), proline content and activity of peroxidase enzyme were assayed in six week old wheat crop. Significant increase was observed in shoot length and total chlorophyll in soluble silica treated wheat crop as compared to lead treated crop. Significant decrease in level of MDA and proline content were observed after soluble silica application in lead treated crop as well as control. Insignificant increase in peroxidase activity was observed after soluble silica application in lead treated wheat crop compared to only lead treated crop. From the present study it can be concluded that treatment of Agribooster™ *was* found significantly effective in counteracting the stress created by lead on wheat crop.**

***Key words:*** Agribooster™, lead stress, malondialdehyde, peroxidase , proline

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Plants are continuously exposed to unfavourable conditions and stresses including heavy metal toxicity. Heavy metal toxicity produces a number of unfavourable modifications in plant physiological processes such as inactivation of enzymes, replacement of certain metal ions of bio-molecules, conformational changes and disruption of the membrane integrity (1). Among the heavy metals, lead has longer persistence in soil.It affects both the production of crop and human health. It has become a major environmental contaminant of soil and air originating mainly from mining and smelting processes, industrial wastes, pesticides and urban activities(2). Lead has high tendency to accumulate in the environment because of its strong absorption in soil and sedimentation. At the morphological level, metal stress reduced plant growth because of adverse effect on cell elongation and cell wall elasticity (3). At the molecular level heavy metal toxicity may stimulate the formation of free radicals and reactive oxygen species leading to oxidative stress (4).

Plants possess defence system against oxidative destruction. This system consists of low molecular weight antioxidants like ascorbic acid, reduced glutathione, tocopherols and antioxidative enzymes such as peroxidase, superoxide dismutase, catalase. Peroxidase, an iron containing antioxidative enzyme which catalyses breakdown of harmful hydrogen peroxide and playing important role in detoxification of ROS. Level of MDA is as an indicator of oxidative damage. Lipid peroxidation involves the oxidative degradation of unsaturated fatty acids present in membrane and leads to formation of MDA. Proline acts as a vital osmoticum present in cellular system and gets accumulated in intracellular environment under numerous biotic and abiotic stresses to maintain intracellular redox potential. Silicon is the second most common element found in soil after oxygen. Silicon content in soil ranges from < 1 to 45% bydry weight while the silica (Si to $SiO_2$ - 2.1; Si to $SiO_3$ - 2.6) constitute 50-70% of the soil mass varying from less than 20% to almost 100%. One of the main functions of Si is in improving the plants growth

*Author for correspondence: Email: sandhyasharma1216@yahoo.com

and yield especially under stress condition. Si supply improves the structural integrity of crops and also improves plant tolerance to diseases, drought and metal toxicities (5). Silica shows positive effect on growth of many plants and provides resistance against stress (6). Application of silicon alleviates Mn toxicity in cucumber (7). Therefore, the aim of present work was to observe the role of soluble silica in relieving stress in wheat crop grown in soil treated with lead nitrate.

## Materials and Methods

Stress was given in the form of lead nitrate in the soil. Soluble silica (Agribooster™) was sprayed after lead treatment. Six weeks old wheat leaves were used to study various parameters.

***Experimental design:*** Field experiments were conducted at village Loharpipliya, district Dewas (M.P.). Geographical location of fields selected as per Latitude Longitude read by GPS 76 Garmin was N- 22 54'37.7" – 38.4" E- 075 59' 33.3"– 34". Randomized block of size 3.6 $m^2$in the field were designed for four different treatments and assigned as block T1, T2, T3 and T4. Wheat (*Triticumaestivum L.*) was sown on 22$^{nd}$October 2017.

Types of treatment are as mentioned in Table 1.

**Table 1:** Showing the treatments

| | |
|---|---|
| T1 | Control |
| T2 | Silica (7.5 ml per litre) |
| T3 | Lead (50 mg per kg of soil) |
| T4 | Lead (50 mg per kg of soil)+ Silica (7.5 ml per litre) |

As per agriculture norms 3.6 $m^2$area of block contains approximately 720 Kg of soil. To create lead stress, 50 mg lead nitrate per Kg of soil was added in T3 and T4 block (15$^{th}$ Nov 2017) after 27 days of sowing wheat. The crop of block T2 and T4 was irrigated with 5 litre water having soluble silica (Agribooster™) in the concentration of 7.5 ml per litre after 8 days (23$^{rd}$ Nov 2017) of creating lead stress.

***Methods used to study the oxidative stress:*** To observe the toxic effect of lead and alleviating effect of soluble silica leaves were collected on 8$^{th}$ Dec 2017after 15 days of soluble silica application. Shoot length was recorded by using the Inches tape. Chlorophyll was extracted from wheat leaves using 80% acetone, and absorbance at 663nm and 645nm were read in a spectrophotometer (8). Proline was extracted using sulphosalysilic acid and measured using acid ninhydrin (9). Leaf tissues were homogenized in 3 % sulfosalicylic acid and the homogenate was centrifuged at 3,000×*g* for 20min. The supernatant was treated with acid ninhydrin, boiled for 1 h, and then the absorbance was determined at 520 nm. MDA is a decomposition product of polyunsaturated fatty acids was utilized as a biomarker for lipid peroxidation (10). The level of lipid peroxidation was quantified by measuring the amount of MDA, which is determined by thiobarbituric acid (TBA) reaction at 532 nm (11). Peroxidase activity was assayed spectrophotometrically at 430 nm (12). Specific activity of enzyme was expressed as units/min/mg protein considering one unit of enzyme as an increase in OD by 1.0 under standard conditions.

## Results and Discussion

Table 2 shows the soil analysis data before and after treatment. Small change in pH was observed after lead and silica treatments. Increased absorption of organic carbon and nitrogen were observed after silica treatment as compared to both control and lead treated plants. Absorption of lead was increased in presence of silica. Lead can form organo- metallic complexes with organic matter and increases the solubility of lead, resulting in an increase in lead bioavailability and lead uptake by plants. Absorption of nitrogen increased in presence of silica. Lead present in soil may form lead nitrate complex with soil nitrogen and absorbed through the plant root.

***Shoot length:*** In the present study shoot length was significantly decreased in presence of lead (T3) (Table 3). This decrease may be due to accumulation of lead

**Table 2:** Soil analysis before and after lead and silica treatment

| S. No. | Parameters | Soil analysis before sowing | T1 | T2 | T3 | T4 |
|---|---|---|---|---|---|---|
| 1 | pH | 7.2 | 7.37 | 7.45 | 7.31 | 7.48 |
| 2 | Electrical conductivity (mmhos/cm) | 0.3 | 0.41 | 0.39 | 0.46 | 0.33 |
| 3 | Organic carbon (%) | 0.76 | 0.43 | 0.40 | 0.37 | 0.34 |
| 4 | Nitrogen (Kg/ha) | 280 | 186 | 180 | 168.9 | 157.8 |
| 5 | Phosphorus (Kg/ha) | 9 | 11.6 | 12.4 | 9.6 | 13.2 |
| 6 | Potassium (Kg/ha) | 260 | 310 | 340 | 360 | 350 |
| 7 | Lead (ppm) | 0.40 | 0.171 | 0.12 | 0.02 | ND |

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in the shoot region resulting in reduction of meristematic cells (13) (Fig. 1). Lead inhibits the growth of plants by reducing the activity of enzymes involved in the growth (14). Toxic level of Heavy metal exerts adverse effect on biosynthesis and translocation of auxin (15). There may be interference in absorption of growth promoting essential nutrients from soil in presence of heavy metals (16, 17). Addition of silica in soil significantly improved shoot length in T4 as compared to lead treated plants (T3). This improved shoot length may be interference of Silica in accumulation of lead.

***Chlorophyll content:*** In the present study, total chlorophyll was reduced significantly in presence of Pb (T3) shown in Table 3 & Fig. 2. Pb may prevents the incorporation of iron in phytoporphyrin ring of chlorophyll molecule (18, 19). Heavy metal stress generates free radicals which may cause oxidation/reduction of aldehydic group present in structure of chlorophyll molecule (20). Lead present in soil may have inhibited key enzyme delta-aminolevulinic acid dehydratase (ALAD) and reduced uptake of essential n+utrients $Mg^{2+}$, $Fe^{2+}$, $Zn^{2+}$ (21, 16) required for chlorophyll biosynthesis. Heavy metals also distort chloroplast ultra structure by aggregating pigment protein complex in photosystems (22). According to Goyal *et. al.*, chlorophyll content was decreased when *V.radiata* grown hydrophonically in sewage water having lead (20). On addition of soluble silica total chlorophyll content was increased significantly in T4 as compared to lead treated plants T3.Foliar spray with silicon photosynthetic pigments of Faba beans was significantly increased when grown under heavy metal stress (Pb and Cd) (23), due to enhanced uptake of essential nutrients like N, P, and K. Silica might have stimulated phosphorylation pathway or activation of Mg2+ and ATPase activity and enhanced chlorophyll biosynthesis (24).

***Peroxidase activity:*** Highest peroxidase activity was observed in control plant (T1). Generation of ROS such as superoxide radicals (O2-), hydroxyl radicals ($OH^-$)

**Table 3:** Effect of soluble silica application on shoot length and total chlorophyll content in *Triticum aestivum* L. grown under lead stress.

| S.No. | Treatments | Plant height (in inches) | P value | Total chlorophyll (mg/g) | P value |
|---|---|---|---|---|---|
| 1 | T1 | 18±1 | | 0.4±0.03 | |
| 2 | T2 | 19±1 | 0.14 $^{ns}$ (a) | 0.45±0.06 | 0.21 $^{ns}$ (a) |
| 3 | T3 | 14.1±141 | 0.009**(a) | 0.30±0.001 | 0.004** (a) |
| 4 | T4 | 18.1±1.5 | 0.42 $^{ns}$ (a) 0.01*(b) | 0.36±0.04 | 0.09 $^{ns}$ (a) 0.04* (b) |

(a) – compared to control.; (b) - compared to lead stress.
* significant; ** highly significant; *** extremely significant
ns not significant; Parentheses () indicates the – standard error.

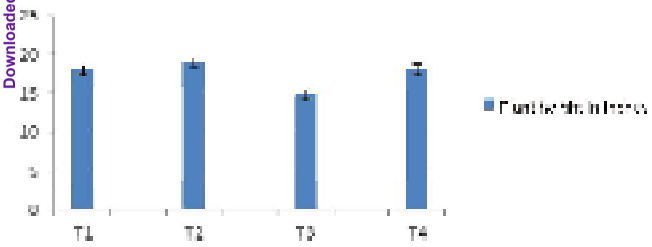


**Fig. 1:** Effect of soluble silica application on shoot length of *Triticum aestivum* L. grown under lead stress.

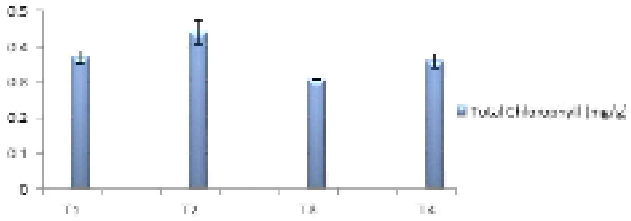


**Fig. 2:** Effect of soluble silica application on total chlorophyll content of *Triticum aestivum* L. grown under lead stress.

**Table 4:** Effect of soluble silica application on MDA, proline and peroxidase activity in *Triticum aestivum* L. grown under lead stress.

| S. No. | Treatments | Malondialdehyde (mM/g) | | Proline (µ moles/g) | | Peroxidase activity (units/min/g) | |
|---|---|---|---|---|---|---|---|
| | | Mean±SD | P value | Mean±SD | P value | Mean±SD | P value |
| 1 | T1 | 5.06 ±0.32 (0.18) | | 45.84±3.9 (2.25) | | 3.15±0.14 (0.08) | |
| 2 | T2 | 3.8±0.6 (0.34) | 0.01* (a) | 13.84±3.9 (2.25) | 0.0002***(a) | 0.95±0.6 (0.34) | 0.04*(a) |
| 3 | T3 | 5.9±0.2 (0.11) | 0.01* (a) | 64.8±6.8 (3.9) | 0.007**(a) | 1.27±0.12 (0.06) | 0.05* (a) |
| 4 | T4 | 3.05±0.8 (0.46) | 0.01*(a) 0.002**(b) | 37.19±3.9 (2.25) | 0.003**(a) 0.001***(b) | 1.68±0.8 (0.46) | 0.09ns(a) 0.2$^{ns}$ (b) |

(a) – compared to control.; (b) - compared to lead stress.; * significant; ** highly significant; *** extremely significant; ns not significant; Parentheses () indicates the – standard error.

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and hydrogen peroxide (H2O2) is a normal metabolic product. Under environmental stress conditions, the reactive oxygen species (ROS) production in plants increases and causes an oxidative damage (25). Peroxidase acts as a ROS scavenger and play protective role against stress. Thus increased peroxidase activity was found in control plant.

After soluble silica application significant decrease in peroxidase activity was observed in T2 as compared to control. Silica perform many function under stress conditions like maintenance of water status, nutrient balance, form physical and mechanical barrier by accumulating in the cell wall, hence reduce generation of ROS, causing reduction in expression of peroxidase gene.Application of silicon enhances the water uptake ability in sorghum and improves drought tolerance (26). Silicon deposition occurred in the cell wall which is served as physical and mechanical barrier against external stress (27). Similarly soluble silica application alleviates abiotic stress like salinity stress (28) drought stress (29), radiation damage, nutrient imbalance, high temperature, freezing (30). Silicon enhances the water holding capacity by reducing transpiration rate (31), accelerate water uptake efficiency from the soil (32) and maintain $Na^+$ and $K^+$ uptake by plants (33).

In the present study Peroxidase activity was significantly decreased in lead stressed wheat plants (T3) as compared to control (T1). Lead is a redox-inactive metal exert their oxidative stress effects by chelating to sulfhydryl groups present in the active site of the enzyme (34). Our result support the findings of others (35) who reported that cadmium stress reduce the peroxidase activity in roots of wheat seedlings and thus create the oxidative stress.

In the present study, no significant difference in peroxidase activity was observed when lead treated plants were treated with soluble silica (T4). The possible reason for this insignificant difference might be that whatever amount of peroxidase is inactivated by lead is still remain inactivated even in presence of soluble silica. Moreover silica creates stress free environment for crop so, there is no need of synthesizing additional amount of peroxidase.

***Lipid peroxidation:*** Significant increase in MDA was observed in lead stressed wheat plants (T3) as compared to control (T1) (Fig.3). Decrease in peroxidase activity may favour the elevated level of free radicals. Hydroxyl radicals are most potential toxic ROS. The unsaturated fatty acids are more susceptible to hydroxyl radical attack and peroxidation occurs in its presence. The MDA, product of the free radical mediated lipid peroxidation is an indicator of oxidative stress[35]. Similarly increased MDA level in water hyacinth was observed due to lead stress (36). Lead toxicity impairs metabolic activities of plant and enhances generation of reactive oxygen species which induces oxidative stress (37). After application of soluble silica, MDA level was decreased significantly in T2 and T4 as compared to control (T1) as well as lead stressed plant (T3). Application of soluble silica increases water availability resulting in release of more protons neutralising harmful hydroxyl ion suppressing peroxidation of lipid present in the membrane (38). The result of present study is in line with Shi *et al*. (7), they reported reduced lipid peroxidation

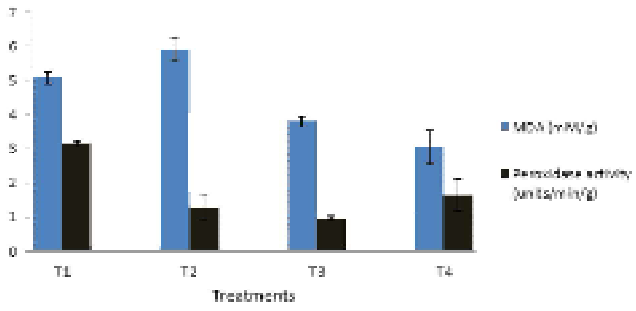



**Fig. 3:** Effect of soluble silica application on MDA and peroxidase activity in *Triticum aestivum* L. grown under lead stress.

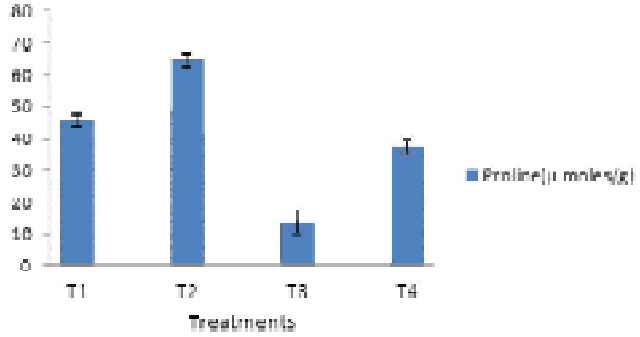



**Fig. 4:** Effect of soluble silica application on proline in *Triticum aestivum* L. grown under lead stress.

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and alleviation of Mn toxicity in presence of silica.

***Proline:*** Significant increase in proline content was observed in lead stressed wheat plants (T3) as compared to control (T1) (Fig.4). Proline maintains cellular homeostasis by regulating water potential through osmotic adjustment and reduce metal uptake. Proline biosynthesis induced in presence of heavy metal because they cause imbalance in osmolyte concentration. Proline is a low molecular weight compound and plays an important role in cell protection against ROS-induced damage. Proline is involved in metal ion chelation hence maintain normal range of free radicals, stabilizes biological membrane, reduces electrolyte leakage and thus prevent cells from oxidative burst (16). Significant decrease in proline content was observed in soluble silica treated plants T2 and T4 as compared to control (T1) and lead stressed (T3) wheat plants. Soluble silica application in soil maintains osmolyte balance by regulating salt concentration and reduces the proline content. Decrease in proline content was reported in *P. multiflorum* when sprayed silica (39). Silica application reduced uptake of Na+ and increased K+ uptake and thus improved ionic balance of *V. radiata* (16).

In present study, heavy metal toxicity reduced peroxidase activity, led to increased free radical generation and resulted in increased lipid peroxidation and proline content in presence of lead. Treatment with soluble silica as Agribooster™ suppressed the generation of free radicals by enhancing availability of water and regulating salt concentration thus reduced the MDA level and proline content in stressed as well as control wheat leaves. Present study revealed that soluble silica is beneficial in counteracting stress caused by the presence of lead in wheat.

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## Acknowledgement

We express our sincere thanks to Dr. Rooplekha Vyas, Principal and Prof. A. Bafna, Head, Department of Biochemistry, Govt. Holkar Science College Indore (M.P.) for providing us necessary laboratory facilities and encouragement.

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## References

1 **Ali S, Farooq MA, Yasmeen T, Hussain S & Arif MS** (2013) *Ecotoxicology and Environmental Safety*, **89**, 66.

2 **Marchiol L, Assolari S, Sacco P & Zerbi G** (2004) *Environmental Pollution,* **132**, 21.

3 **Yruela I** (2005) *Brazilian Journal of Plant Physiology*, **17**, 145.

4 **Li K & Ramakrishna W** (2011) *J Hazard Mater,* **15**, 531.

5 **Ma JF, Mitani N, Nagao S, Konishi S, Tamai K, Iwashita T & Yano M** (2004) *Plant Physiology,* **136**, 3284.

6 **Broadley M, Brown P, Cakmak I, Ma JF, Rengel Z & Zhao F** (2012) *Marshmer's Mineral Nutrition of Higher Plants*, 3rd edition. (Marschner, P, Editor), UK, London, Academic Press, London, 249.

7 **Shi QH, Bao ZY, Zhu ZJ, He Y, Qian QQ & Yu JQ** (2005) *Phytochemistry,* **66**, 1551.

8 **Sadasivan S & Manickan A** (1992) In *Biochemical Methods for Agricultural Sciences.* Willey Eastern Ltd. New Delhi, p.184.

9 **Bates LS, Waldran RP & Teare ID** (1973) *Plant and Soil*, **39**, 205.

10 **Mittler R** (2002) *Trends in Plant Science*, **7,** 405.

11 **Heath RL & Packer L** (1968) *Archives of Biochemistry and Biophysics*, **125,** 189.

12 **Summer JB & Gjessing EC** (1943) *Archives of Biochemistry and Biophysics*, **2**, 291.

13 **Srivastava D, Baunthiyal M, Kumar A, Yadav K, Yadav D & Kumar S** (2018) *Journal of Pharmacognosy and Phytochemistry*, **7**, 479.

14 **Kaur G, Singh HP, Batish DR & Kohli RK** (2012) *J Environ Biol,* **33,** 265.

15 **Neto L, Paiva ALS, Machado RD, Arenhart FA & Pinheiro MM** (2017) *Genetics and Molecular Biology*, **40**, 373.

16 **Lamhamdi M, Galiou QEl, Bakrim A, Munoz JCN, Estevez MA, Aarab A & Lafont R** (2013) *Saudi Journal of Biological Science*, **20**, 29.

17 **Alia N, Sardar K, Said M, Salma K, Sadia A, Sadaf S, Toqeer A & Miklas S** (2015) *International Journal of Environmental Research and Public Health*, **12**, 7400.

18 **Nyitrai M, Szent-Gyorgyi AG & Geeves MA** (2002) *Biochemical Journal*, **365**, 19.

19 **Jaleel CA, Jayakumar K, Chang-Xing Z & Iqbal M** (2009) *Journal of Scientific Research*, **1**, 128.

20 **Goyal H, Bafna A, Rangwala T, Vyas N & Gupta R** (2017) *International Journal of Agricultural Science and Research (Ijasr)*, **7**, 283.

21 **John R, Ahmad P, Gadgil K & Sharma S** (2008) *Plant Soil and Environment*, **54,** 262.

22 **Sharma P & Dubey RS** (2005) *Brazilian Journal of Plant Physiology*, **17**, 1.

23 **Sharifa S & Muriefah A** (2015) *International Journal of Advanced Research in Biological Sciences*, **2**, 1.

24 **Malhotra C & Kapoor RT** (2015) *International Journal of Chemical and Biochemical Sciences*, **8**, 1.

25 **Ali AA & Alqurainy F** (2006) *Transworld Research Network Press, India*, 324.

26 **Hattori T, Sonobe K, Inanagaa S, An P, Tsuji W, Araki H, Eneji AE & Morita S** (2007) *Environmental and Experimental Botany*, **60,** 177.

27 **Pozza E, Pozza, A & Botelho D** (2015) *Revista Ceres*, **62**, 323.

28 **Lee SK, Sohn EY, Hamayun M, Yoon JY & Lee IJ** (2010) *Agroforestry Systems,* **80**, 333.

29 **Sapre S & Vakharia DN** (2016) *Agricultural Reviews*, **37**, 109.

29 **Balakhnina T & Borkowska A** (2013) *International Agrophysics*, **27,** 225.

30 **Meena VD, Dotaniya ML, Coumar V, Rajendiran S, Ajay Kundu S & Rao S** (2014) *Proceedings of the National Academy of Sciences, India Section B: Biological Sciences,* **84**, 505.

31 **Emamverdian A & Ding Y** (2017) *International Journal of Environmental and Agriculture Research*, **3**, 40.

32 **Enteshari S, Alishavandi R & Delavar K** (2011) *Iranian Journal of Plant Physiology*, **2**, 315.

33 **Koedrith P & Seo YR** (2011) *International Journal of Molecular Sciences*, **12,** 9576.

34 **Dey SK, Dey J, Patra S & Pothal D** (2007) *Brazilian Journal of Plant Physiology*, **19**, 53.

35 **Malar S, Vikram SS, Favas PJ & Perumal V** (2014) *Botanical Studies*, **55**, 1.

36 **Singh H, Singh A, Hussain I & Yadav V** (2017) *Tropical Plant Research*, **4**, 225.

37 **Rangwala T, Bafna A, Vyas N & Gupta R** (2018) *Indian Journal of Agricultural Research*, **52,** 9.

38 **Rubinowska K, Pogroszewska E, Laskowska H, Szot P & Zdybel A** (2014) Shoots *Acta Scientiarum Polonorum*, Hortorum Cultus, **13**, 167.

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2018

## CRITERION – 3

## MoUs/Linkages/Collaborations

Govt. Mata Jija Bai Girls P.G. College, Indore

**Document Title:**

Lecture delivered by Dr. Rajshree Somani, Title: Pericyclic Reactions under MoU activity

**Memorandum of Understanding**
**Between**
**Deptt. Of Chemistry M.J.B.Govt P.G. Girls P.G. College ,Indore(M.P.)**
**And**
**Deptt. Of Chemistry Holkar Science College, Indore (M.P.)**

Deptt. of Chemistry M.J.B.P.G.Govt.Girls College Motitabela Indore and Deptt. of Chemistry Holkar Science College Indore desiring to support the cooperation between two departments in education and training programs .
Both the departments agreed to implement cooperation programs including-

1)The exchange of academic materials .
2) Conducting Lectures
3) Curriculum development
4) Participating in Seminars ,Symposium & other Type of academic discussions.
5) internship for P.G. Students

**Implementation of MOU-**

To-implement this MOU Head of both the chemistry deptt are authorized .Any cooperation under this MOU is Subject to the availability of funding, sources and approval by relevant authority .

**Entry into force, duration & termination -**

This MOU shall enter into force on the date of signing and sha l be valid for an unlimited period from that date .

The agreement may be terminated by either Deptt. by providing 180 days written notice to the Head of Department .

18/10/18

**Signature**

Head of Chemistry Department

M.J.B.P.G.Govt.Girls College Indore

**Head of Department**
*Chemistry Dept.*
Mata Jijabai Govt. P. G. Girls College
Moti Tabela, INDORE

18/10/18

**Signature**

Head of Chemistry Department

Holkar science College Indore

23.10.18

**Principal**
Holkar Science Coll
INDORE

# Report of Activities under MoU between Department of Chemistry, MJB Govt. P G Girls College, Indore, M.P., and Department of Chemistry, Govt. Holkar science College, Indore.

## Sessions : 2017-2018. 2018-2019 & 2021-2022

The Department of Chemistry at MJB Govt. P G Girls College, Indore, M.P., and the Department of Chemistry at Govt. Holkar Science College, Indore, collaborated under an MoU with the following activities:

1. **On 2nd and 3rd March 2018, Dr. Rajshree Somani gave a lecture on "Pericyclic Reactions."**
   Dr. Rajshree Somani, a renowned expert, delivered an enlightening lecture on "Pericyclic Reactions" on 2nd and 3rd March 2018. The lecture was jointly organized by the Department of Chemistry at Govt. Holkar Science College, Indore, and MJB Govt. P G Girls College, Indore. Dr. Somani's presentation delved into the intricacies of pericyclic reactions, elucidating their mechanisms and significance in organic chemistry. The audience, comprising students and faculty from both institutions, greatly benefited from the comprehensive and insightful content. The lecture fostered an atmosphere of knowledge sharing and academic collaboration, enhancing the participants' understanding and interest in this specialized field of chemistry.

2. **On 6th and 7th March 2019, Dr. Meenal Shrivastava delivered a lecture on "Electronic Spectral Studies."**
   Dr. Meenal Shrivastava, a distinguished expert, delivered a captivating lecture on "Electronic Spectral Studies" on 6th and 7th March 2019. The lecture was organized by the Department of Chemistry at Govt. Holkar Science College, Indore, in collaboration with MJB Govt. P G Girls College, Indore. Dr. Shrivastava's presentation provided in-depth insights into the principles and applications of electronic spectral studies in the field of chemistry. Her expertise and engaging delivery captivated the audience, comprising students, faculty, and researchers. The lecture enriched the participants' understanding and sparked interest in the subject, fostering academic collaboration and promoting knowledge exchange between the two institutions.

3. **On 3rd December 2022, Dr. M K Dwivedi conducted a lecture on "UV Spectroscopy."** On 3rd December 2022, Dr. M K Dwivedi delivered an insightful lecture on "UV Spectroscopy." The lecture, organized collaboratively by the Department of Chemistry at Govt. Holkar Science College, Indore, and MJB Govt. P G Girls College, Indore, provided an in-depth understanding of UV spectroscopy's principles and applications. Dr. Dwivedi's expertise and engaging presentation captivated the audience, which comprised students and faculty members from both institutions. The lecture not only enhanced the participants' knowledge of UV spectroscopy but also encouraged academic collaboration and knowledge exchange between the two colleges. It proved to be a valuable and enriching experience for all attendees.

***These lectures provided valuable insights and knowledge exchange between the two institutions, fostering academic collaboration and enhancing the learning experiences of students and faculty.***

Professor And Head
Department of Chemistry
Govt. Holkar Sc. College,INDOR

**Dr. Anamika Jain**
**Professor & Head**
**Department of Chemistry**
**Govt. Holkar Science College, Indore**

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2018

## CRITERION – 3

## MoUs/Linkages/Collaborations

PG Tech Research Institute, Indore

**Document Title:**

Internship/Training Program: 52 participants successfully completed a training program in analytical and scientific instruments.

# MEMORANDUM OF UNDERSTANDING

The MoU

1.1 This MoU made and agreed upon between Govt. Holkar Science College -Indore, M.P which expression shall where the context admits include its successors and permitted assignees of one part.

AND

1.2 PG Tech Research Institute (PGTRI, Indore, herein after called PGTRI which expression shall where the context so admits include its successors and permitted assignees of other part.

**PREAMBLE:**

2.1 Whereas Govt. Holkar Science College -Indore, Education and Research activity to students of pharmacy and various discipline of pharmaceutical sciences.

2.2 Whereas PGTRI, Indore will provide the working infrastructure for completion of research work for their dissertation.

2.3 Therefore in consideration of the premises and mutual covenants, hereinafter contained, the parties hereto agree as follows:

**OBJECTIVES AND SCOPE OF MoU:**

3.1 To encourage pharmaceutical research, guide M.Sc. Pharma Chemistry students/Ph.D. Scholars of different streams for carrying out dissertation work at PGTRI, Indore and Govt. Holkar Science College -Indore and for other research collaborations from time to time.

**RESPONSIBILITIES OF PARTIES:**

4.1 The Govt. Holkar Science College -Indore may depute the students of M.Sc. Pharma Chemistry/ Ph.D. Scholars for carrying out dissertation work at PGTRI, Indore for a period needed for the same.

4.2 Both the Institutes will utilize the intellectual knowledge and technical infrastructure of each other for research purposes.

4.3 PGTRI, Indore will provide working infrastructure for completion of dissertation work to the students.

4.4 Govt. Holkar Science College -Indore, M.P may nominate/ co guides from PGTRI, Indore for dissertation work.

4.5 PGTRI may allow students to use facilities at PGTRI with due permission from Director PGTRI.

4.6 Govt. Holkar Science College -Indore students will prepare the dissertation synopsis in consultation with the PGTRI authorities as per available facilities and infrastructure etc.

4.7 PGTRI and Govt. Holkar Science College -Indore will reserve all rights on the data generated on the projects however the students may be allowed to submit dissertation on projects allotted to them by Govt. Holkar Science College -Indore with permission from PGTRI.

4.8 Students deputed will report to Director/ Incharge PGTRI and shall be answerable to him in all matters.

4.9 Students will not indulge in any action or inaction on their part which is not in consonance with the ordinance rules or extant instructions of Govt. Holkar Science College -Indore and PGTRI and illegal activities and in such case the authorities of either institution to will be empowered initiate suitable disciplinary action.

EFFECTIVE DATE, DURATION AND TERMINATION OF MoU:

5.1 The MoU shall be Re-effective from 04/03/2017 up to un limited period or from the date of signing whichever is earlier and shall remain in force for a period of 10 years from the said date.

5.2 All notices and other communications required to be served on parties under the terms of this MoU, shall be considered to be duly served if the same have been delivered to or posted by registered mail to:

In case of Govt. Holkar Science College -Indore, M.P
Principal,
Department of –Pharma Chemistry, Indore,
Govt. Holkar Science College -Indore
Bhawakua Indore

In case of PGTRI Director,

5.3 It is agreed that the progress of this MoU will be monitored by the Principal, Govt. Holkar Science College -Indore, Indore, M.P and Director, PGTRI, Indore through periodic meetings.

5.4 This MoU is valid for a period of Un Limited Period starting w.e. f. –Date 04/03/2017 to Un limited Period subject to further extension on mutually agreed terms and conditions. Any mid course change/alteration/termination as introduced/suggested by the review committee comprising of Principal, Govt. Holkar Science College -Indore, M.P and Director, PGTRI, Indore shall also be deemed to be valid for both the Institutions.

5.5 Committee comprising of Principal Govt. Holkar Science College -Indore, Indore, M.P; Director, PGTRI and a nominated representative of Directors will monitor the progress of research work.

5.6.1 This MoU has been executed in two copies, one copy to be retained by PGTRI, Indore and other by Govt. Holkar Science College -Indore, M.P.

IN WITNESS WHEREOF the parties hereto have signed this agreement.

Dr. Ro[illegible] Vyas
Principal,
Govt. Holkar Science Auto. College,
Indore

Dr. M.K.Dwivedi
Prof. & Head-Pharma Chemistry
Govt.Holkar Science Auto. College,
Indore

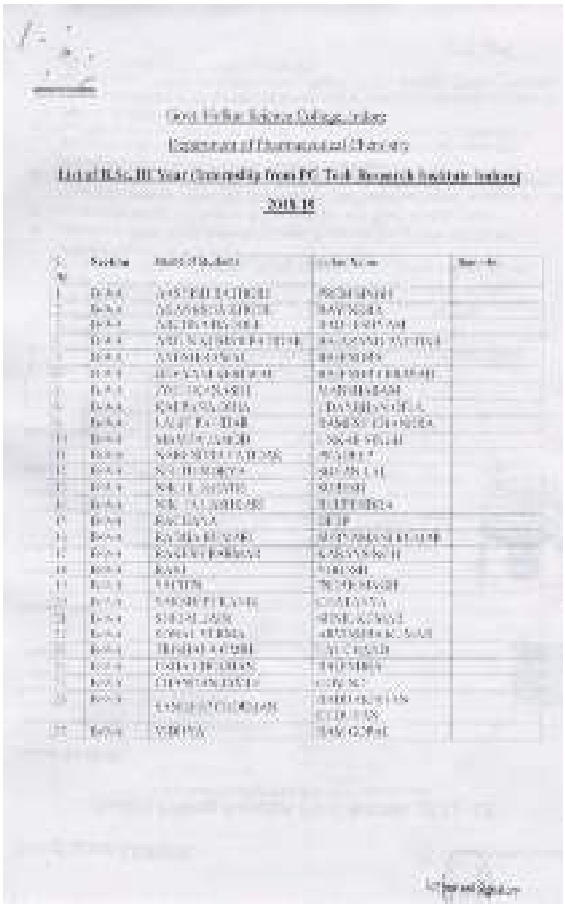
PROFESSOR & HEAD
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Govt. Holkar Science College
INDORE (M.P.)

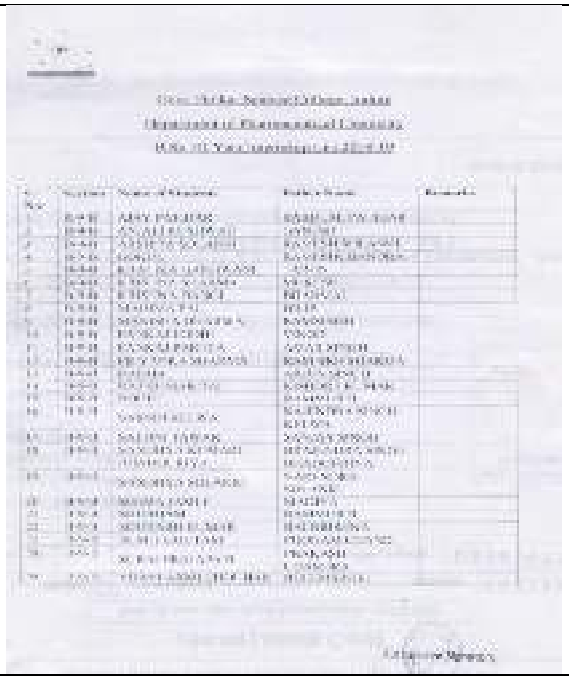
Witness

Mr. Ashish Tiwari
Director
PG Tech Research Institute
Indore

Witness

| S. No | Component/Activities | Details of event |
|---|---|---|
| 1 | Name of the Department / Unit / Agency: | **Pharmaceutical Chemistry** |
| 2 | Name of the Activity: | Internship/Training Program From PG Tech Research Institute Indore under MoU |
| 3 | Date and Year of the Activity: | 27/01/2018 to 10/02/2018 |
| 4 | Number of Students Participated in the activity: | 52 |
| 5 | Report of the Activity (in 100 words): | **Internship From PG Tech Research Institute Indore (Activity under MOU)**<br>Department of Pharmaceutical Chemistry has organized Internship/Training Program for B.Sc. Final Year Students (2018-19) the training program was of 15 days ie 29/01/2018 to 10/02/2018. The Training program on Analytical and Scientific Instrumentation provided students knowledge regarding instruments like pH. Meter, Conductivity Meter, Colorimeter, etc. The Training Program was a part of activity done under MOU between the to organizations Dr. M.K.Dwivedi Coordinated with PG. Tech Research Institute to organize the Training Program. |

| | | |
|---|---|---|
| 6 | Photo of Activity: |  |
| 7 | List of Participants |  |

| | | |
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## MoUs/Linkages/Collaborations

Dr. Kamal Kumar Choudhary, Army Cadet College (ACC), Indian Military Academy, Dehradun, Uttrakhand

**Document Title:**

Collaborative Research activity and joint publication

# Army Cadet College
## Indian Military Academy
Dehradun, Uttarakhand -248007, Phone: 0135-2775769

**Dr. K. K. Choudhary**

**Professor and Head,**
**Faculty of Science**


No.

Date: 07 Jul 2018

## RESEARCH COLLABORATION

Prof. R. C. Dixit, Dr. H. S. Dager and Dr. Netram Kaurav, Department of Physics, Govt. Holkar Science College, Indore are engaged in collaborative research with Dr. Kamal Kumar Choudhary, Professor, Army Cadet College, Indian Military Academy, Dehradun.

This research collaboration is focused on research activities in the fields of Thermoelectric properties of nanomaterials, superconducting materials, research at high pressure and related topics.

By the virtue of this collaboration, the research groups at both institutions will be able to share the expertise and research facilities at each other's institutes and will be able to guide the research scholars. However, there will be no financial implication on any of the institution due to this research collaboration.

This research collaboration will be effective for the academic session 2018-2019 and will be carried forward based on the need and agreement of both the research groups.

(Dr.K. K. Choudhary)

Dr K K Choudhary
Professor (Physics)
Army Cadet College Wing
Indian Military Academy
Dehradun-248007

RESEARCH ARTICLE | APRIL 24 2019

# Effect of sintering temperature on the dielectric properties of non-stoichiometric nickel oxide

Paras Dubey ; K. K. Choudhary; Kiran Singh; Netram Kaurav

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*AIP Conference Proceedings* 2100, 020171 (2019)
https://doi.org/10.1063/1.5098725

Non-stoichiometric nickel oxide was synthesized by solid state route method at different sintering temperatures upto 1100 °C. The structure of synthesized compounds were analyzed by X ray diffraction analysis (XRD) and the dielectric constant was found to different for samples of different stoichiometry. These results were interpreted as the decomposition temperature increases, which heals the defects present in the non-stoichiometric nickel oxide and loss peak shifts to the higher frequency which is due to long range hopping of charge carriers.

Topics

Dielectric properties, Sintering, X-ray diffraction, Transition metal oxides, Stoichiometry

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## Abstract

This paper discusses the high pressure-dependent crystal structure phase transformation and elastic behavior of $ZnSe_xTe_{1-x}$ ($x$ = 0.0, 0.2, 0.55, 0.81, 0.93 and 1.0) by speculating effective interionic interaction potential (EIoIP), that contains long-range type Coulomb force, short-range overlap repulsion of the Hafemeister and Flygare types and the van der Waals (vdW) interaction. The assessed values of structural phase transition pressure and the considerable volume discontinuity associated with the pressure–volume phase diagram support the structural phase transformation from zinc blende ($B3$) type to rock-salt ($B1$) type crystal structure. The equation of state curves (relationship between $V(p)/V(0)$ and pressure in the pressure–volume phase diagram) for both the zinc blende ($B3$) and rock-salt ($B1$) structures is in reasonably good agreement with that of experimental observations. Moreover, systematic variations of the second-order elastic constants (SOEC) with pressure have been found to follow systematic trends showed by the other systems with $B3$ type to $B1$ type pressure-dependent structural phase transition.

**Keywords:** Structural phase transition ▪ high pressure ▪ elastic constants ▪ interionic interaction potential

**PACS:** 62.50.−p, 64.70.Kb, 62.20.Dc, 62.20.−x, 65.40.−b

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RESEARCH ARTICLE | APRIL 24 2019

# Interpretation of Raman modes in FeTe and $FeTe_{0.9}S_{0.1}$ compounds

Pavitra Devi Lodhi ; K. K. Choudhary; Netram Kaurav

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+ Author & Article Information

*AIP Conference Proceedings* 2100, 020182 (2019)

https://doi.org/10.1063/1.5098736

In the present investigation, we have prepared FeTe and $FeTe_{0.9}S_{0.1}$ compounds via conventional solid-state reaction method. We have measured X-ray diffraction and Raman spectra of poly-crystalline FeTe and $FeTe_{0.9}S_{0.1}$ at room temperature. X-ray profile of FeTe and $FeTe_{0.9}S_{0.1}$ confirmed the primitive tetragonal unit cell. Further, Raman active mode corresponds to $A_{1g}$ (Te) Te vibrations are at around (395 $cm^{-1}$) $B_{1g}$ ((Fe)), corresponds to Fe vibrations (598 $cm^{-1}$) and the $E_{2g}$ (Te, Fe)) modes were found to doubly degenerated at (473 $cm^{-1}$). The mode observed in the spectrum of Raman at 1301 $cm^{-1}$ is extremely near to the energy difference between $x_2$-$y_2$ and xz/yz which attributed to electronic Raman scattering in d-orbitals of Fe.

Topics

Raman scattering, Raman spectroscopy, X-ray diffraction

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Published: 13 May 2019

# Measurement and Analysis of Normal-State Transport Properties of FeSe Superconductor

Pavitra Devi Lodhi, Netram Kaurav, K. K. Choudhary & Y. K. Kuo

*Journal of Low Temperature Physics* **196**, 494–509 (2019)

**486** Accesses | **3** Citations | Metrics

## Abstract

Transport properties such as thermal conductivity ($\kappa$), Seebeck coefficient ($S$) and electrical resistivity ($\rho$) of the FeSe superconductor were measured and analyzed theoretically. The samples were synthesized through a solid-state reaction route via vacuum encapsulation and characterized by X-ray diffraction and Rietveld refinement analysis. It is found that the Seebeck coefficient, $S(T)$, exhibits an anomalous temperature dependence and shows a crossover of sign at around 190 K, which is an artifact of coexistence of electron and hole bands, wherein carrier diffusive Seebeck coefficient $S_c^{\mathrm{diff}}(T)$ and phonon drag contribution $S_{ph}^{\mathrm{drag}}(T)$ can successfully explain the experimental results. The

measured thermal conductivity $\kappa(T)$ develops a phonon peak at around 80 K, presumably due to various phonon scattering mechanisms. Our thermal conductivity analysis indicates not only phonon thermal conductivity ($\kappa_{ph}$), but also the carrier contribution to thermal conductivity ($\kappa_c$) is also important, particularly, around room temperatures. Electrical resistivity of *FeSe* shows superconducting transition ($T_C$) around 10 K and shows a metallic temperature dependence above $T_C$ which is explained using the Bloch–Gruneisen function of the temperature-dependent resistivity.

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## References

1. Y. Kamihara, H. Hiramatsu, M. Hirano, R. Kawamura, H. Yanagi, T. Kamiya, H. Hosono, J. Am. Chem. Soc. **128**, 10012 (2006)

2. Y. Kamihara, T. Watanabe, M. Hirano, H. Hosono, J. Am. Chem. Soc. **130**, 3296 (2008)

3. F. Caglieris, A. Braggio, I. Pallecchi, A. Provino, M. Pani, G. Lamura, A. Jost, U. Zeitler, E.G. D'Agliano, P. Manfrinetti, M. Putti, Phys. Rev. **B**(90), 134421 (2014)

4. M.A. McGuire, R.P. Hermann, A.S. Sefat, B.C. Sales, R. Jin, D. Mandrus, F. Grandjean, G.J. Long, New J. Phys. **11**, 025011 (2009)

5. A. Kondrat, G. Behr, B. Büchner, C. Hess, Phys. Rev. B **83**, 092507 (2011)

6. A. Poddar, S. Mukherjee, T. Samanta, R.S. Saha, R. Mukherjee, P. Dasgupta, C. Mazumdar, R. Ranganathan, Phys. C **469**, 789 (2009)

7. I. Pallecchi, G. Lamura, M. Tropeano, M. Putti, R. Viennois, E. Giannini, D. Van der Marel, Phys. Rev. B **80**, 214511 (2009)

8. X.G. Luo, M.A. Tanatar, J.-Ph. Reid, H. Shakeripour, N. Doiron-Leyraud, N. Ni, S.L. Bud'ko, P.C. Canfield, Huiqian Luo, Zhaosheng Wang, Hai-Hu Wen, Ruslan Prozorov, and Louis Taillefer, arXiv:0904.4049

9. L. Ding, J.K. Dong, S.Y. Zhou, T.Y. Guan, X. Qiu, C. Zhang, L.J. Li, X. Lin, G.H. Cao, Z.A. Xu, and S.Y. Li, arXiv:0906.0138

10. J.K. Dong, T.Y. Guan, S.Y. Zhou, X. Qiu, L. Ding, C. Zhang, U. Patel, Z.L. Xiao, S.Y. Li, arXiv:0906.3852v1

11. Federico Caglieris, Fabio Ricci, Gianrico Lamura, Albert Martinelli, A Palenzona, Ilaria Pallecchi, Alberto Sala, Gianni Profeta, and Marina Putti. Sci. Technol. Adv. Mater. **13**, 054402 (2012)

12. C.C. Chang, T.K. Chen, W.C. Lee, P.H. Lin, M.J. Wang, Y.C. Wen, P.M. Wu, M.K. Wu, Physica C **514**, 423 (2015)

13. H. Hosono, K. Kuroki, Phys. C **514**, 399 (2015)

14. F.C. Hsu, J.-Y. Luo, K.-W. Yeh, T.-K. Chen, T.-W. Huang, P.M. Wu, Y.-C. Lee, Y.-L. Huang, Y.-Y. Chu, D.-C. Yan, M.-K. Wu, Proc. Natl Acad. Sci. USA **105**, 14262 (2008)

15. K. Tanabe, H. Hosono, Japan. J. Appl. Phys. **51**, 010005 (2011)

16. J.F. Ge, Z.L. Liu, C. Liu, C.L. Gao, D. Qian, Q.K. Xue, Y. Liu, J.F. Jia, Nat. Mater. **14**, 285 (2015)

17. M. Tropeano, I. Pallecchi, M.R. Cimberle, C. Ferdeghini, G. Lamura, M. Vignolo, A. Martinelli, A. Palenzona, M. Putti, Supercond. Sci. Technol. **23**, 054001 (2010)

18. A.S. Sefat, M.A. McGuire, B.C. Sales, R. Jin, J.Y. Howe, D. Mandrus, Phys. Rev. B **77**, 174503 (2008)

19. M.A. McGuire, A.D. Christianson, A.S. Sefat, B.C. Sales, M.D. Lumsden, R. Jin, E.A. Payzant, D. Mandrus, Y. Luan, V. Keppens, V. Varadarajan, J.W. Brill, R.P. Hermann, M.T. Sougrati, F. Grandjean, G.J. Long, Phys. Rev. B **78**, 094517 (2008)

20. M. Tropeano, C. Fanciulli, C. Ferdeghini, D. Marré, A.S. Siri, M. Putti, A. Martinelli, M. Ferretti, A. Palenzona, M.R. Cimberle, C. Mirri, S. Lupi, R. Sopracase, P. Calvani, A. Perucchi, Supercond. Sci. Technol. **22**, 034004 (2009)

21. E.D. Mun, S.L. Bud'ko, N. Ni, A.N. Thaler, P.C. Canfield, Phys. Rev. **B**(80), 054517 (2009)

22. Y. Mizuguchi, Y. Takano, J. Phys. Soc. Japan **79**, 102001 (2010)

23. S. Margadonna, Y. Takabayashi, M.T. McDonald, K. Kasperkiewicz, Y. Mizuguchi, Y. Takano, A.N. Fitch, E. Suarde, K. Prassides, Chem. Commun. **43**, 5607 (2008)

24. R. Khasanov, M. Bendele, K. Conder, H. Keller, E. Pomjakushina, V. Pomjakushin, New J. Phys. **12**, 073024 (2010)

25. E. Pomjakushina, K. Conder, V. Pomjakushin, M. Bendele, R. Khasanov, Phys. Rev. B **80**, 024517 (2009)

26. R. Viennois, E. Giannini, D. van der Marel, and R. Černý, In: Proceedings of the Ninth International Conference on Materials and

Mechanisms of Superconductivity (M2S-IX), Tokyo (2009)

27. Ilaria Pallecchi, Federico Caglieris, Marina Putti, Supercond. Sci. Technol. **29**, 073002 (2016)

28. T. Inabe, H. Ogata, Y. Maruyama, Y. Achiba, S. Suzuki, K. Kikuchi, I. Ikemoto, Phys. Rev. Lett. **69**, 3797 (1992)

29. K.K. Choudhary, D. Prasad, N. Kaurav, D. Varshney, J. Phys. Chem. Solids **71**, 47 (2010)

30. A.B. Kaiser, and C. Uher, in: A. Narlikar (Ed.), Studies of High temperature Superconductors, vol. 7, Nova Science Publishers, New York, 353 (1991)

31. C. Uher, in: D.M. Ginsberg (Ed.) Physical properties of High Temperature Superconductors, vol. 3 Singapore: World Scientific, 159 (1992)

32. Y. Liu, R.K. Kremer, C.T. Lin, Supercond. Sci. Technol. **24**, 035012 (2011)

33. I. Pallecchi, F. Bernardini, F. Caglieris, A. Palenzona, S. Massidda, M. Putti, Eur. Phys. J. B **86**, 338 (2013)

34. T.M. McQueen, Q. Huang, V. Ksenofontov, C. Felser, Q. Xu, H. Zandbergen, Y.S. Hor, J. Allred, A.J. Williams, D. Qu, J. Checkelsky, N.P. Ong, R.J. Cava, Phys. Rev. B **79**, 014522 (2009)

35. R. D. Barnard, Thermoelectricity in metals and alloys, Taylor and Francis Ltd. London (1972); J. Callaway, Quantum theory of the Solid State, Academic Press London (1991)

36. D. Varshney, K.K. Choudhary, R.K. Singh, New J. Phys. **5**(1), 72 (2003)

37. D. Varshney, K.K. Choudhary, R.K. Singh, J. Supercond. Inco. Novel Magn. **15**, 603 (2002)

38. D. Varshney, K.K. Choudhary, R.K. Singh, Supercond. Sci. Technol. **15**, 1119 (2002)

39. J.M. Ziman, *Electrons and Phonon* (Oxford University Press, New York, 1960)

40. J.P. Carbotte, Rev. of Mod. Phys. **62**, 1102 (1990)

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## Author information

### Authors and Affiliations

**Department of Physics, Government Holkar Science College, Indore, MP, 452001, India**
Pavitra Devi Lodhi & Netram Kaurav

**Army Cadet College, Indian Military Academy, Dehradun, UK, 248007, India**
K. K. Choudhary

**Department of Physics, National Dong Hwa University, Hualien, 97401, Taiwan**
Y. K. Kuo

### Corresponding author

Correspondence to K. K. Choudhary.

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**Iron-based superconductors**

**Thermal conductivity** **Resistivity**

**Seebeck coefficient**

RESEARCH ARTICLE | APRIL 24 2019

# Structural phase transition and elastic behavior of WN

Shubhangi Soni ; Mumtaz Azad; K. K. Choudhary; Netram Kaurav

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*AIP Conference Proceedings* 2100, 020085 (2019)

https://doi.org/10.1063/1.5098639

Structural and elastic properties of WN has been investigated using theoretical model calculations. The long range Coulomb, van der Waals (vdW) interaction and the short range repulsive interaction up to second-neighbor ions within the Hafemeister and Flygare approach with modified ionic charge are properly incorporated in effective interionic potential (EIOP) model. We first deduced vdW coefficients with the help of Slater-Kirkwood variational method. A structural phase transition from ambient ZnS (*B*3)-type structure to NaCl (*B*1)-type was identified in pressure volume curve in WN compound. The estimated value of transition pressure is 2GPa in WN compound. Further, the variation of second order elastic constants ($C_{11}$, $C_{12}$ and $C_{44}$) were followed the systematic decreasing trends with pressure.

Topics

**Phase transitions**, **Elastic modulus**, **Variational methods**

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# Structural phase transition and elastic properties of molybdenum nitride

Shubhangi Soni ; R. Kinge; K. K. Choudhary; Netram Kaurav

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*AIP Conference Proceedings* 2100, 020082 (2019)

https://doi.org/10.1063/1.5098636

In the present paper, structural and elastic properties of transition metal nitride (MoN) were investigated through effective inter-ionic potential method. The used potential consists of the long-range Coulomb and van der Waals (vdW) interactions and the short-range repulsive interaction of up to second-neighbor ions within the Hafemeister and Flygare approach. First, we have employed the Slater-Kirkwood variational method to estimate the vdW coefficients. The estimated value of the phase transition pressure (Pt) is 7 GPa for *B*3(ZnS) type structure to *B*l(NaCl) type structure, which is consistent with the available experimental data. We have also predicted the elastic properties MoN compound.

Topics

**Phase transitions**, **Elasticity**, **Nitrides**, **Transition metals**, **Ionic potential**, **Variational methods**

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Published: 13 September 2019

# Temperature-dependent transport properties of a FeTe compound

Pavitra Devi Lodhi, Netram Kaurav, K K Choudhary & Y K Kuo

*Bulletin of Materials Science* **42**, Article number: 269 (2019)

**529** Accesses | **2** Citations | Metrics

## Abstract

Temperature-dependent transport properties of a FeTe parent compound have been investigated by measurements of electrical resistivity $\rho(T)$, thermal conductivity $\kappa(T)$ and Seebeck coefficient $S(T)$. The sample was synthesized using a standard solid state reaction route *via* vacuum encapsulation and characterized by X-ray diffraction spectroscopy, which indicated a tetragonal phase with the space group $P4/nmm$. The resistivity measurement data of the parent FeTe compound do not exhibit superconductivity however, it shows an anomaly in the temperature-dependent resistivity at around 67 K, which corresponds to structural phase transition in the vicinity of a magnetic phase transition. In the

low temperature regime, Seebeck coefficient, $S(T)$, exhibited an anomalous dip feature and negative throughout the temperature range, indicating an electron-like, single band charge carrier mechanism. We have also estimated the power factor and thermoelectric figure of merit $ZT$, which is found to be significantly smaller than other compositions of iron chalcogenides.

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## References

1. Kamihara Y, Watanabe T, Hirano M and Hosono H 2008 *J. Am. Chem. Soc.* **130** 3296

2. Rotter M, Tegel M and Johrendt D 2008 *Phys. Rev. Lett.* **101** 107006

3. Wang X C, Liu Q, Lv Y, Gao W, Yang L X, Yu R C *et al* 2008 *Solid. State Commun.* **148** 538

4. Hsu F C, Luo J Y, Yeh K W, Chen T K, Huang T W, Wu P M *et al* 2008 *Proc. Natl. Acad. Sci. USA* **105** 14262

5. Mizuguchi Y, Tomioka F, Tsuda S and Yamaguchi T 2008 *Appl. Phys. Lett.* **93** 52505

6. Tropeano M, Pallecchi I, Cimberle M R, Ferdeghini C, Lamura G, Vignolo M *et al* 2010 *Supercond. Sci. Technol.* **23** 054001

7. Pallecchi I, Lamura G, Tropeano M, Putti M, Viennois R, Giannini E *et al* 2009 *Phys. Rev. B* **80** 214511

8. Matusiak M, Pomjakushina E and Conder K 2012 *Physica C* **483** 21

9. Pallecchi I, Caglieris F and Putti M 2016 *Supercond. Sci. Technol.* **29** 073002

10. Thomas E L, Wong-Ng W, Phelan D and Millican J N 2009 *J. Appl. Phys.* **105** 073906

11. Mizuguchi Y and Takano Y 2010 *J. Phys. Soc. Jpn.* **79** 102001

12. Ziman J M 1960 *Electrons and phonon* (New York: Oxford University Press)

13. Shaikh M W, Varshney D and Mansuri I 2009 *J. Alloys Compd.* **486** 726

14. Callaway J 1991 *Quantum theory of the solid state* (London: Academic Press)

15. Barnard R D 1972 *Thermoelectricity in metals and alloys* (London: Taylor and Francis Ltd.)

16. Caglieris F, Braggio A, Pallecchi I, Provino A, Pani M, Lamura G *et al* 2014 *Phys. Rev. B* **90** 134421

17. Inabe T, Ogata H, Maruyama Y, Achiba Y, Suzuki S, Kikuchi K *et al* 1992 *Phys. Rev. Lett.* **69** 3797

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## Author information

### Authors and Affiliations

**Department of Physics, Government Holkar Science College, Indore, 452001, India**
Pavitra Devi Lodhi & Netram Kaurav

**Army Cadet College, Indian Military Academy, Dehradun, 248007, India**
K K Choudhary

**Department of Physics, National Dong Hwa University, Hualien, 97401, Taiwan**
Y K Kuo

### Corresponding author

Correspondence to K K Choudhary.

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**Thermoelectric properties**

**thermal conductivity** **resistivity**

**Seebeck coefficient**

RESEARCH ARTICLE | APRIL 24 2019

# Theoretical analysis of the structural phases of MnO under high pressure

Saligram Verma; Arvind Jain; K. K. Choudhary; Netram Kaurav

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*AIP Conference Proceedings* 2100, 020107 (2019)

https://doi.org/10.1063/1.5098661

In the present paper, we have evaluated the phase transformation and elastic properties of MnO at high pressure by formulating effective interionic interaction potential. The elastic constants, including the long-range Coulomb and van der Waals (vdW) interactions and the short-range repulsive interaction of up to second-neighbor ions within the Hafemeister and Flygare approach, are derived. Assuming that both the ions are polarizable, we employed the Slater-Kirkwood variational method to estimate the vdW coefficients. From the present study, we predict a structural phase transition from NaCl structure (*B*1) to CsCl structure (*B*2). The estimated value of the phase transition pressure (Pt) and the magnitude of the discontinuity in volume at the transition pressure are consistent as compared to the other theoretical data. The variations of elastic constants with pressure follow a systematic trend identical to that observed in others compounds of NaCl type structure family.

Topics

Phase transitions, Elastic modulus, Ions and properties, Transition metal oxides, Variational methods

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Date : December 04, 2018

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| 2 | Ms. Gargee Vyas | F | Dr. Prakasam M. |
| 3 | Ms. Leesha Joshi | F | Dr. Somdutt |
| 4 | Ms. Priyanka Chouhan | F | Dr. Vikas Adhlaka |
| 5 | Ms. Rashi Choubey | F | Dr. A. K. Singh |

It is informed that at present the students are busy in their final semester Theory Examinations which are followed by Practical Examinations. The date schedules are enclosed herewith. All students will reach WIHG, Dehradun on January 01, 2019 and report their respective Supervisors. For training, they will stay for one month from January 01 to January 31, 2019. The students will make their own arrangements for lodging, boarding etc.

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[Dr. Vishnu Gadgil]
Professor & Head
Department of Geology
Govt. Holkar [Model, Autonomous] Science College
Indore – 452001
Email ID : geology_hsc@rediffmail.com

Forwarded by Principal

Principal,
Holkar Science College
INDORE (M.P.)

Alternate Contacts :
Dr. Vishnu Gadgil : 9425384421 v_g326@yahoo.com
Dr. Narendra Joshi : 9425348454 njoshigeo@gmail.com

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Professor & Head
Department of Geology
Govt. Holkar [Model, Autonomous] Science College
Indore – 452001
Email ID : geology_hsc@rediffmail.com

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Dr. Vishnu Gadgil : 9425384421 v_g326@yahoo.com
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Dr. R. K. Sehgal
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Wadia Institute of Himalayan Geology
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Indore - 452001
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Alternate Contacts :
Dr. Vishnu Gadgil : 9425384421 v_g326@yahoo.com
Dr. Narendra Joshi : 9425348454 njoshigeo@gmail.com

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No.

Date: 05 Jul 2017

## RESEARCH COLLABORATION

Prof. R. C. Dixit, Dr. H. S. Dager and Dr. Netram Kaurav, Department of Physics, Govt. Holkar Science College, Indore are engaged in collaborative research with Dr. Kamal Kumar Choudhary, Professor, Army Cadet College, Indian Military Academy, Dehradun.

This research collaboration is focused on research activities in the fields of Thermoelectric properties of nanomaterials, superconducting materials, research at high pressure and related topics.

By the virtue of this collaboration, the research groups at both institutions will be able to share the expertise and research facilities at each other's institutes and will be able to guide the research scholars. However, there will be no financial implication on any of the institution due to this research collaboration.

This research collaboration will be effective for the academic session 2017-2018 and will be carried forward based on the need and agreement of both the research groups.

(Dr.K. K. Choudhary)
Dr. K K Choudhary
Professor (Physics)
Army Cadet College Wing
Indian Military Academy
Dehradun-248007

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## Abstract

The temperature-dependent specific heat $C_p(T)$ of nanocrystalline (NC) Cu (8 nm) and Pd (6 nm) is theoretically analyzed and compared with the specific heat of their corresponding bulk materials in the temperature range from 150 K to 300 K. It is revealed that the $C_p$ values of NC Cu (Pd) are about 10% (40%) higher as compared to that of their corresponding bulk form, the softening of phonon frequencies at interfaces in NC materials is argumented as the main mechanism responsible for enhancement in $C_p$ in the present work. Lattice (phonon) specific heat is obtained following an overlap repulsive potential using Debye model. In NC materials having large interface volume ratio, the phonon frequencies and Debye temperature are comparatively less at the interfaces than at the core of nanocrystal. The contributions to specific heat due to atoms present at interfaces ($C_{\rm ph}^{\rm IF}$) and those present at the core of nanocrystal ($C_{\rm ph}^{\rm NC}$) are estimated separately by estimating the characteristic Debye temperature ($\theta_D$) from elastic force constant ($\kappa$). The temperature derivative of the internal energy yields the electronic contribution to specific heat ($C_{\rm el}$). The present investigation based on the softening of phonon frequencies mechanism is successful to explain the enhancement in specific heat by nanocrystallization.

**Keywords:** Nanocrystalline materials ▪ specific heat ▪ phonons

**PACS:** 61.46.+w, 75.40.-s, 74.25.Kc

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RESEARCH ARTICLE | MAY 08 2018

# Investigation of transport properties of FeTe compound

Pavitra Devi Lodhi; Neha Solanki; K. K. Choudhary; Netram Kaurav

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*AIP Conference Proceedings* 1953, 120031 (2018)

https://doi.org/10.1063/1.5033096

Transport properties of FeTe parent compound has been investigated by measurements of electrical resistivity, magnetic susceptibility and Seebeck coefficient. The sample was synthesized through a standard solid state reaction route via vacuum encapsulation and characterized by x-ray diffraction, which indicated a tetragonal phase with space group P4/nmm. The parent FeTe compound does not exhibit superconductivity but shows an anomaly in the resistivity measurement at around 67 K, which corresponds to a structural phase transition along with in the vicinity of a magnetic phase transition. In the low temperature regime, Seebeck coefficient, S(T), exhibited an anomalous dip feature and negative throughout the temperature range, indicating electron-like charge carrier conduction mechanism.

Topics

Crystal structure, Electrical resistivity, Magnetic susceptibility, Phase transitions, Superconductivity, Transport properties, Resistivity measurements, Thermoelectric effects, X-ray diffraction, Solid-state reaction route

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RESEARCH ARTICLE | MAY 08 2018

# Nano sized $La_2Co_2O_6$ double perovskite synthesized by sol gel method

Neha Solanki; Pavitra Devi Lodhi; K. K. Choudhary; Netram Kaurav

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+ Author & Article Information

*AIP Conference Proceedings* 1953, 030126 (2018)

https://doi.org/10.1063/1.5032461

We report here the synthesis of double perovskite $La_2Co_2O_6$ (LCO) compound by a sol gel route method. The double perovskite structure of LCO system was confirmed via X-ray diffraction (XRD) analysis. Further, the lattice parameter, unit cell volume and bond length were refined by means of rietveld analysis using the full proof software. Debye Scherer formula was used to determine the particle size. The compound crystallized in triclinic structure with space group P-1 in ambient condition. We also obtained Raman modes from XRD spectra of poly-crystalline LCO sample. These results were interpreted for the observation of phonon excitations in this compound.

Topics

Molecular geometry, Crystal lattices, Crystal structure, Crystallography, Phonons, Sol-gel process, Solgels, Perovskites, X-ray diffraction

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RESEARCH ARTICLE | MAY 08 2018

# Polaron formation in normal state optical conductivity of iron-based superconductor

K. K. Choudhary ; Pavitra Devi Lodhi; Netram Kaurav

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*AIP Conference Proceedings* 1953, 110040 (2018)

https://doi.org/10.1063/1.5033065

Normal state Optical conductivity σ(ω) of Iron-Based superconductor LaFeAsO have been investigated using polaron formation mechanism. The coherent Drude free carrier excitations as well as the incoherent motion of carriers leading to a polaron formation, originated from inter and intra layer transitions of charge carriers are incorporated in the present model. Coherent motion of Drude carriers obtained from an effective interaction potential leads to a peak at zero frequency regime which is an indication of metallic conduction in superconducting materials and also produces a long tail at higher frequencies infrared region. Whereas, the incoherent motion *i.e.* hopping of carriers from Fe to Fe in the FeAs layer and from FeAs layer to LaO layer produces two different peaks at around 100 $cm^{-1}$ and 430 $cm^{-1}$ respectively. Two contributions, Drude and hopping carriers successfully explain the anomalies observed in the optical conductivity of metallic state of the iron-based superconductors.

Topics

Polarons, Superconductors

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RESEARCH ARTICLE | APRIL 10 2018

# Preparation and characterization of double perovskite $La_2CoTiO_6$

Neha Solanki ; K. K. Choudhary; Netram Kaurav

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*AIP Conference Proceedings* 1942, 140053 (2018)

https://doi.org/10.1063/1.5029184

We report synthesis of a double perovskite $La_2CoTiO_6$ (LCTO) compound by a citrate route method with varying sintering temperature as 900, 1100, and 1350 °C for 24 h. The structure of LCTO was confirmed via X-ray diffraction (XRD) analysis. The lattice parameter, unit cell volume and bond length were refined by means of Rietveld analysis. An evolution of structural change from orthorhombic to monoclinic structure was identified with respect to sintering temperature. Also the particle size was found to be increasing with increasing the sintering temperature.

Topics

Molecular geometry, Crystal lattices, Crystal structure, Sintering, Perovskites, X-ray diffraction

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RESEARCH ARTICLE | MAY 08 2018

# Pressure induced structural phase transition in metal nitrides: An effective interionic potential calculations

Shubhangi Soni ; K. K. Choudhary; Netram Kaurav

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*AIP Conference Proceedings* 1953, 040011 (2018)
https://doi.org/10.1063/1.5032631

Structural and elastic properties of transition metal nitrides, *X*N (X = Co, Fe and Cu), are investigated through an effective inter-ionic potential method. The *B*3(ZnS) type ambient crystal structure of these compounds undergoes to B1(NaCl) type structure with pressure. Structural phase transition pressure in CoN, FeN and CuN was 35, 55 and 35 GPa, respectively, predicated by computing Gibbs' free energy (*G*) as a function of pressure and has good agreement with available theoretical results. The elastic properties were also estimated as a function of pressure. It is found that the elastic constants increased linearly with increasing pressure due to stronger hybridization, bonding and covalent properties of constituent elements of a compound.

Topics

Phase transitions, Elastic modulus, Free energy, Transition metals, Ionic potential, Public policy and governance

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RESEARCH ARTICLE | APRIL 10 2018

# Raman analysis of non stoichiometric $Ni_{1-\delta}O$

Paras Dubey ; K. K. Choudhary; Netram Kaurav

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*AIP Conference Proceedings* 1942, 140072 (2018)

https://doi.org/10.1063/1.5029203

Thermal decomposition method was used to synthesize non-stoichiometric nickel oxide at different sintering temperatures upto 1100 °C. The structure of synthesized compounds were analyzed by X ray diffraction analysis (XRD) and magnetic ordering was studied with the help of Raman scattering spectroscopy for the samples sintered at different temperature. It was found that due to change in sintering temperature the stoichiometry of the sample changes and hence intensity of two magnon band changes. These results were interpreted as the decomposition temperature increases, which heals the defects present in the non-stoichiometric nickel oxide and antiferromagnetic spin correlation changes accordingly.

Topics

Magnetic ordering, Magnons, Raman scattering spectroscopy, Sintering, X-ray diffraction, Transition metal oxides

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Letter | Published: 12 June 2018

# Seebeck Coefficient Measurement and Its Narrow Band Model Interpretation in $FeTe_{0.5}Se_{0.5}$ Superconductor

Pavitra Devi Lodhi, Netram Kaurav, K. K. Choudhary & Y. K. Kuo

*Journal of Superconductivity and Novel Magnetism* **31**, 2671–2676 (2018)

**238** Accesses | **1** Citations | Metrics

## Abstract

We have measured Seebeck coefficient ($S$) of $FeTe_{0.5}Se_{0.5}$ superconducting sample from 10 to 300 K. The variation of Seebeck coefficient with temperature of this system was found to be very anomalous, and the overall experimental observation of the $S(T)$ was studied in the outline of a narrow-band model. In high-temperature region, the Seebeck coefficient is almost independent of temperature. Further, from the study of high-temperature magnitude of $S$, sample undergoes a change in sign in the Seebeck coefficient, wherein, appearance of a negative peak around 22 K and subsequently, its Seebeck coefficient goes to zero in

the superconducting transition temperature regime around 11 to 13 K. It is revealed that the bandwidth and a small asymmetry involved in narrow bands give a realistic explanation to the anomalous temperature dependence of Seebeck coefficient of $FeTe_{0.5}Se_{0.5}$ system.

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## References

1. Ye, K.W., Huang, T.W., Huang, Y.L., Chen, T.K., Hsu, F.C., Wu, P.M., Lee, Y.C., Chu, Y.Y., Chen,

C.L., Luo, J.Y., Yan, D.C., Wu, M.K.: Eur. Phy. Lett. **84**, 37002 (2008)

2. Mizuguchi, Y., Tomioka, F., Tsuda, S., Yamaguchi, T., Takano, Y.: Appl. Phys. Lett. **94**, 012503 (2009)

3. Subedi, A., Zhang, L., Singh, D.J., Du, M.H.: Phys. Rev. B **78**, 134514 (2008)

4. Mizuguchi, Y., Tomioka, F., Tsuda, S., Yamaguchi, T., Takano, Y.: Appl. Phys. Lett. **93**, 152505 (2008)

5. Zhang, L.J., Singh, D.J., Du, M.H.: Phys. Rev. B **79**, 012506 (2009)

6. Fruchart, D., Convert, P., Wolfers, P., Madar, R., Senateur, J.P., Fruchart, R.: Mater. Res. Bull. **10**, 169 (1975)

7. Liu, T.J., Hu, J., Qian, B., Fobes, D., Mao, Z.Q., Bao, W., Reehuis, M., Kimber, S.A.J., Prokeš, K., Matas, S., Argyriou, D.N., Hiess, A., Rotaru, A., Pham, H., Spinu, L., Qiu, Y., Thampy, V., Savici, A.T., Rodriguez, J.A., Broholm, C.: Nat. Mater. **9**, 716 (2010)

8. Bendele, M., Babkevich, P., Katrych, S., Gvasaliya, S. N., Pomjakushina, E., Conder, K., Roessli, B., Boothroyd, A. T., Keller, R. H.: Phys. Rev. B **82**, 212504 (2010)

9. Han, M.J., Savrasov, S.Y.: Phys. Rev. Lett. **103**, 067001 (2009)

10. Liu, Y., Lin, C.T.: J. Supercond. Nov. Magn. **24**, 183–187 (2011)

11. Caglieris, F., Ricci, F., Lamura, G., Martinelli, A., Palenzona, A., Pallecchi, I., Sala, A., Profeta, G., Putti, M.: Sci. Technol. Adv. Mater. **13**, 054402 (2012)

12. Williams, J., Qu, D., Checkelsky, J., Ong, N.P., Cava, R.J.: Phys. Rev. B **79**, 014522 (2009)

13. Mun, E.D., Bud'ko, S.L., Ni, N., Thaler, A.N., Canfield, P.C.: Phys. Rev. B **80**, 054517 (2009)

14. Pallecchi, L., Caglieris, F., Putti, M.: Supercond. Sci. Technol. **29**, 073002 (2016)

15. Gasumyants, V.E., Kaidanov, V.I., Vladimirskaya, E.V.: Physica C **248**, 255 (1995)

16. Kaurav, N., Wu, K.K., Kuo, Y.K., Shu, G.J., Chou, F.C.: Phys. Rev. B **79**, 075105 (2009)

17. Hu, R., Bozin, E.S., Warren, J.B., Petrovic, C.: Phys. Rev. B **80**, 214514 (2009)

18. Maletz, J., Zabolotnyy, V.B., Evtushinsky, D.V., Thirupathaiah, S., Wolter, A.U.B., Harnagea, L., Yaresko, A.N., Vasiliev, A.N., Chareev, D.A., Böhmer, A.E., Hardy, F., Wolf, T., Meingast, C., Rienks, E.D.L., Büchner, B., Borisenko, S.V.: Phys. Rev. B **89**, 220506(R) (2014)

19. Tamai, A., Ganin, A.Y., Rozbicki, E., Bacsa, J., Meevasana, W., King, P.D.C., Caffio, M., Schaub, R., Margadonna, S., Prassides, K., Rosseinsky, M.J., Baumberger, F.: Phys. Rev. Lett. **104**, 097002 (2010)

20. Zargar, A.R., Pal, A., Hafiz, A.K., Awana, V.P.S.: J. Supercond. Nov. Magn. **27**, 897–901 (2014)

21. Awana, V.P.S., Pal, A., Vajpayee, A., Mudgel, M., Kishan, H., Husain, M., Zeng, R., Yu, S., Guo, Y.F., Shi, Y.G., Yamaura, K., Takayama-Muromachi, E.: J. Appl. Phys. **107**, 09E128 (2010)

22. Kuo, Y.K., Lue, C.S., Hsu, F.H., Li, H.H., Yang, H.D.: Phys. Rev. B **64**, 125124 (2001)

23. McGuire, M.A., Hermann, R.P., Sefat, A.S., Sales, B.C., Jin, R., Mandrus, D., Grandjean, F., Long, G.J.: New J. Phys. **11**, 025011 (2009)

24. Pallecchi, I., Lamura, G., Tropeano, M., Putti, M., Viennois, R., Giannini, E., Marel, D. V.: Phys. Rev. B **80**, 214511 (2009)

25. Matusiak, M., Pomjakushina, E., Conder, K.: Phys. C **483**, 21 (2012)

26. Shiliang, L., Clarina, D.L.C., Huang, Q., Chen, Y., Lynn, J.W., Hu, J., Huang, Y.L., Hsu, F.C., Yeh, K.W., Wu, M.K., Pengcheng, D.: Phys. Rev. B **79**, 054503 (2009)

27. Bao, W., Qiu, Y., Huang, Q., Green, M.A., Zajdel, P., Fitzsimmons, M.R., Zhernenkov, M., Chang, S., Fang, M., Qian, B., Vehstedt,

E.K., Yang, J., Pham, H.M., Spinu, L., Mao, Z.Q.: Phys. Rev. Lett. **102**, 247001 (2009)

28. Martinelli, A., Palenzona, A., Tropeano, M., Ferdeghini, C., Putti, M., Cimberle, M., Nguyen, M.R., Affronte, T.D., Ritter, C.: Phys. Rev. B **81**, 094115 (2010)

29. Ma, F., Ji, W., Hu, J., Lu, Z.Y., Xiang, T.: Phys. Rev. Lett. **102**, 177003 (2009)

30. Chi, S., Schneidewind, A., Zhao, J., Harriger, L.W., Li, L., Luo, Y., Cao, G., Xu, Z., Loewenhaupt, M., Hu, J., DaiChi, P.S.: Phys. Rev. Lett. **102**, 07006 (2009)

31. Zhang, C., Li, H.F., Song, Y., Su, Y., Tan, G., Netherton, T., Redding, C., Carr, S.V., Sobolev, O., Schneidewind, A., Faulhaber, E., Harriger, L.W., Li, S., Lu, X., Yao, D.X., Das, T., Balatsky, A.V., Brückel, T., Lynn, J.W., Dai, P.: Phys. Rev. B **88**, 064504 (2013)

32. Stock, C., Rodriguez, E.E., Green, M.A., Zavalij, P., Rodriguez, J.A.R.: Phys. Rev. B **84**, 045124 (2011)

33. Kotegawa, H., Fujita, M.: Sci. Technol. Adv. Mater. **13**, 054302 (2012)

34. McQueen, T.M., Huang, Q., Ksenofontov, V., Felser, C., Xu, Q., Zandbergen, H., Hor, Y.S., Allred, J., Williams, A.J., Qu, D., Checkelsky, J., Ong, N.P., Cava, R.J.: Phys. Rev. B **79**, 014522 (2009)

35. Sales, B.C, Sefat, A.S., McGuire, M.A., Jin, R.Y, Mandrus, D., Mozharivskyj, Y.: Phys. Rev. B **79**, 094521 (2009)

36. Heikes, R.R., Miller, R.C., Mazelsky, R.: Physica **30**, 1600 (1964)

37. MacDonald, D.K.C.: Thermoelectricity: an Introduction to the Principles. Wiley, New York (1962)

38. Martynova, O.A., Gasumyants, V.E.: Phys. Solid State **48**, 1223 (2006)

39. Samuel, E.I., Bai, V.S., Sivakumar, K.M., Ganesan, V.: Phys. Rev. B **59**, 7178 (1999)

40. Xia, Y., Qian, D., Wray, L., Hsieh, D., Chen, G.F., Luo, J.L., Wang, N.L., Hasan, M.Z.: Phys. Rev. Lett. **103**, 037002 (2009)

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## Author information

### Authors and Affiliations

**Department of Physics, Government Holkar Science College, Indore, Madhya Pradesh, 452001, India**

Pavitra Devi Lodhi & Netram Kaurav

**Army Cadet College, Indian Military Academy, Dehradun, Uttarakhand, 248007, India**

K. K. Choudhary

**Department of Physics, National Dong Hwa University, Hualien, 97401, Taiwan**

Y. K. Kuo

### Corresponding author

Correspondence to Netram Kaurav.

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### Keywords

**Seebeck coefficient** **Narrow band model**

RESEARCH ARTICLE | MAY 08 2018

# Size effect on thermoelectric properties of $Bi_2Te_3$ nanoparticles

K. K. Choudhary; Uttam Sharma; Pavitra Devi Lodhi; Netram Kaurav

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*AIP Conference Proceedings* 1953, 030275 (2018)

https://doi.org/10.1063/1.5032610

$Bi_2Te_3$ nanoparticles exhibit size dependent thermoelectric properties which gives an opportunity to tune the size for optimization of the thermoelectric figure of merit (*ZT*). We have quantitatively analyzed the thermoelectric properties of $Bi_2Te_3$ using phonon scattering mechanism by incorporating the scattering of phonons with defects, grain boundaries, electrons and Umklapp phonon scatterings. The maximum value of $ZT = 0.92$ is obtained at $T = 400\ K$ for $30\ nm\ Bi_2Te_3$ nanoparticles in comparison to $ZT = 0.45$ for $150\ nm$ nanoparticles at the same temperature. With decrease in size of nanoparticles interface volume ratio increases which increase the phonon scatterings with grain boundaries and point defects, results in decrease in thermal conductivity due to reduction in mean free path of phonons. As a result of decrease in thermal conductivity (κ), Seeback coefficient (*S*) and *ZT* increases.

Topics

Thermal conductivity, Crystallographic defects, Semiconductors, Thermoelectric effects, Nanoparticle, Phonon scattering

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RESEARCH ARTICLE | MAY 08 2018

# Structural stability and mechanical properties of technetium mononitride (TcN)

Shubhangi Soni ; K. K. Choudhary; Netram Kaurav

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*AIP Conference Proceedings* 1953, 040010 (2018)

https://doi.org/10.1063/1.5032630

Among the nitrides, 3d and 4d transition metal nitrides have been investigated both experimentally and theoretically due to their predominant performances and enormous applications. In the present paper, we have attempted to predict the structural stability and mechanical properties of technetium mononitride (TcN) using an effective interionic interaction potential, which includes the long range Coulomb, van der Waals (vdW) interaction and the short-range repulsive interaction upto second-neighbor ions within the Hafemeister and Flygare approach. Our theoretical approach reveals the structural phase transition of the TcN *B*3 to *B*1 structure, wherein, the Gibbs' free energies of both the structures were minimized. The variations of elastic constants with pressure follow a systematic trend identical to that observed in other compounds of ZnS type structure family.

Topics

Phase transitions, Elastic modulus, Free energy, Ions and properties, Nitrides, Transition metals

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# Study of synthesis and optical properties of Cu nanoparticles

Jaiveer Singh[1], Pavitra Devi Lodhi[2], K. K. Choudhary[3] and Netram Kaurav[2]

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jaiveer24singh@gmail.com
netramkaurav@yahoo.co.uk

[1] Department of Physics, ISLE, IPS Academy, Rajendra Nagar, Indore 452012, India

[2] Department of Physics, Government Holkar Science College, A. B. Road, Indore 452017, MP, India

[3] Department of Physics, Indian Military Academy, Dehradun (Uttarakhand) 248007, India

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## Abstract

Nanoparticles of Copper (Cu) have attracted great interest in recent years because of their unique physical and optical properties that are of industrial importance. To understand their basic properties, Cu nanoparticles were synthesized by Polyol method. The synthesized powder was characterized by X-ray diffraction (XRD) and Fourier Transform Infrared Spectroscopy (FTIR). The average particle size and lattice parameter estimated by XRD were found to be ~42.5 nm and 3.617 Å respectively. The results suggest suitability of these nanoparticles as dopants in other materials such as polymer materials and oxides.

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