GOVT. HOLKAR (MODEL AUTONOMOUS) SCIENCE COLLEGE, INDORE

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

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Syllabus of Course Showing Cross-cutting Issues

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Syllabus of Course Showing Cross-cutting Issues

Content

Title: - Syllabus of Course Showing Cross-cutting Issues (Human Values & Professional Ethics)

Semester-V
BCA – 505: Human Values and Professional Ethics
Academic Year: 2021-2022

Min. Marks: 28 **Max. Marks: 85**

Unit I
Human Values; Types, Features and Classification Sources of Value System Values across Cultures.

Unit II
Morality Norms, Beliefs, Attitude Moral Norms, Moral Values Moral Standards

Unit III
Professional Ethics; Nature, Characteristics and Needs Ethics V/s Morals and Values Ethico-Moral Action Ethical Codes, Ethical Practices

Unit IV
Nature and Dimensions of Attitude Components of Attitude Attitude Formation Functions of Attitude Changing Attitude

Unit V
Moral Values and Character-Building Character; Meaning, Important Components of Character Character Development.

Text Books:

1) Beteille Andre (1991), Society and Politics in India, Athlone Press, Latest edition
2) Chakraborty S. K. (1999), Values and Ethics for Organizations, oxford university press, Latest edition
3) Fernando, A.C. (2009), Business Ethics - An Indian Perspective, Pearson Education, Latest edition

Reference Books:

1) Charles D. Fleddermann (2012), "Engineering Ethics", Pearson Education / Prentice Hall, New Jersey, (Indian Reprint), Latest edition
2) Boatright John R (2012), "Ethics and the Conduct of Business", Pearson Education, New Delhi, Latest edition
3) Crane, Andrew and Matten Dirk (2015), Business ethics, Oxford University Press Inc., New York., Latest edition
4) Murthy, C.S.V. (2016), Business Ethics – Text and Cases, Himalaya Publishing House Pvt. Ltd., Latest Edition
5) Naagrajan.R.R (2016), Professional Ethics and Human Values, New Age International Publications, , Latest edition
6) Campbell, V., & Bond, R. (1982). Evaluation of a character education curriculum. In D. McClelland, Education for values. New York: Irvington Publishers, Latest Edition.
7) R. S. Dwivedi (1995), "Human Relations and Organizational Behavior: A Global perspective", Macmillan Latest Edition

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Syllabus of B.Sc. Forensic Science for the Session 2020 onwards

B.Sc. SECOND YEAR

PAPER-I INDIAN PENAL CODE, CRIMINAL PROCEDURE CODE, INDIAN EVIDENCE ACT AND JUDICIAL SYSTEM

Maximum Marks - 40

Unit-I Indian Penal Code, 1860 (12 Lec.)

1. Offences against person (Ss. 299 to 309, 319-326, 339, 340, 354, 359, 362, 375-377).
2. Offences against property (Ss. 378 to 404,415-420,425,441)
3. Sexual offences (Ss. 375 to 377).
4. General exceptions (Ss. 76 to 106)

Unit-II Criminal Procedure Code, 1973 (14 Lec.)

1. Constitution of Criminal Court (Ss. 6 – 25) and Power of Courts (Ss. 26 – 35).
2. Arrest of Persons (Ss. 41 -60), Warrant of Arrest (Ss. 70- 81).
3. Preventive Action of the Police (Ss. 149 – 153).
4. Evidence in Inquiries and Trials (Ss. 291 – 293).

Unit-III Indian Evidence Act, 1872 (12 Lec.)

1. Relevancy of facts (Ss. 5 – 10), Admission (Ss. 17, 22, 23, 25, 26).
2. Experts (Ss. 45, 46, 47, 47A) and Proof (Ss. 56 – 58).
3. Oral Evidence (Ss. 59 – 60) and Documentary Evidence (Ss. 61 – 65, 65B, 67, 67A, 73)
4. IEA Sections – 113A,B, 114A, 137 -38, 141 -43, 146, 148, 151, 159)

Unit-IV Administration of Justice and Punishment (10 Lec.)

1. Difference between civil and criminal justice.
2. Primary and secondary function of court of law.
3. Rules for assessment of punishment.
4. Imprisonment.

Unit-V Courts in India (12 Lec.)

1. Introduction to Courts in India.
2. Functioning of Courts at State level (With special reference to Madhya Pradesh).
3. Functioning of Supreme Court of India.
4. Special Courts: CBI Court, Juvenile Court, Family Court etc.

B.Sc. SECOND YEAR

PAPER-II EXAMINATION OF PHYSICAL EVIDENCES & FORENSIC BALLISTICS

Maximum Marks - 40

Unit-I Fingerprints (12 Lec.)

1. History, Important Features and Pattern of Fingerprints.
2. Ridge Characteristics, Classification of Fingerprints: Primary and Secondary.
3. Location and Preservation of Fingerprints.
4. Development of Latent Fingerprints, Matching and Examination of Fingerprints.

Unit-II Documents & Handwriting (10 Lec.)

1. Types and Nature of Documents.
2. Ink, Paper, Writing Instruments and Their Characteristics.
3. Characteristics and factors affecting Handwriting.
4. Examination of Documents and Handwriting.

Unit-III Examination of Biological Samples (14 Lec.)

1. Blood and Blood stain, Examination of Blood Grouping.
2. Examination of Saliva, Semen and Urine.
3. Isolation, Purification and Characterization of DNA
4. Genetic Marker and DNA Fingerprinting.

Unit-IV Firing Mechanisms and Firearm Injuries (12 Lec.)

1. Gun Short Residues (GSR), Mechanism of formation of GSR, Modern methods of analysis of GSR from the shooting hand and target with special reference to clothing.
2. Firearm Injuries: Ballistic aspect of Firearm Injuries.
3. Examination of Bullet, Fire Empty Cartridge and Gunpowder.
4. Types of Firearms (Pistol, Revolver, Rifles, Machine Guns, Shotgun)
5. Ammunition :Types, Cartridge Components (Cartridge case primer propellant, Bullets, Pellets and wads)

Unit-V Examinations of Other Physical evidences (12 Lec.)

1. Evidences related to – Trap cases, Arson, Building collapse, Cyber crime.
2. Examination of Hair, Fiber and Cloths.
3. Analysis of Glass Fracture, Soil, Paint Chips and Tool Marks.
4. General idea about Dope Test.

Semester III

BCA–305: Accounting and Financial Management

Academic Year: 2021-2022

Min. Marks: 28 **Max. Marks: 85**

Unit I:

Introduction: Financial Accounting -definition and Scope, Objectives of Financial Accounting, Accounting v/s Book Keeping Terms used in accounting, users of accounting information and limitations of Financial Accounting .

Conceptual Frame Work: Accounting Concepts, Principles and Conventions, Accounting Standards concept , objectives , benefits , brief review of Accounting Standards in India , Accounting Policies , Accounting as a Measurement Discipline, Valuation Principles, accounting estimates.

Recording of Transactions: Journal, Ledger and Trial Balance based on double entry book keeping.

Unit II

Subsidiary Books: Need, uses and types, Cash Book, Bank Reconciliation Statement.

Unit III

Depreciation: Meaning, need and importance of depreciation, methods of charging depreciation. (WDV & SLM).

Preparation of final accounts: Preparation of Trading Account, Profit and Loss Account, and Balance Sheet of sole proprietary business.

Introduction to Company Final Accounts: Important provisions of Companies Act, 1956 in respect of preparation of Final Accounts. Understanding of final accounts of a Company.

Unit-IV

Cash flow Statement(as per accounting standards) , Analysis of Financial Statement- Financial ratio

Unit V

Computerized Accounting: Computers and Financial application, Accounting Software Packages. An overview of computerized accounting system- Salient features and significance, Concept of grouping of accounts, Codification of accounts , Maintaining the hierarchy of ledger. Generating Accounting Reports.

Text book:

1. Fundamentals of Accounting and Financial Analysis: By Anil Chowdhary(pearson education)

Reference books:

1. Financial Accounting By Jane Reimers(Pearson Education)
2. Accounting Made Easy By Rajesh Agarwal & R Srinivasan (TataMcGraw-Hill)
3. Financial Accounting for Management: By Amrish Gupta (Pearson Education)
4. Financial Accounting for Management: By Dr. S. N. Maheshwari (Vikas Publishing House).

Semester-VI

BCA – 604: Principles and Practices of Management

Academic Year: 2021-2022

Min. Marks: 28 Max. Marks: 85

Unit I

The Nature of Management: Definition and role of management, Functions of Manager, Scientific Management, Human Relations school of Management, Contingency Theory of Management.

Unit II

Planning: Nature and Purpose of Planning, Components of Planning, objective of Business Management by Objectives.

Unit III

Organizing: Nature of Purpose of Organizing, Departmentation, Span of management, Delegation of Authority, Line and Staff Relationships. Staffing: Nature of staffing, problems faced in staffing, process of staffing.

Unit IV

Directing Process: Principles of Direction, Problems in Human Relation, Strategies for Establishing Healthy Human Relations.

Unit V

Control: Meaning and Process of Control, Control Techniques.

Text Book:

1) "Principles of Management", Harold Koontz, O'Donnel and Heinz Weihrich ,New York: McGraw Hill Book Co

Reference Books:

1) "Management", Stoner, Freeman and Gilbert Jr., PHI, 6th Ed.
2) "Organization and Management Concepts", R.D. Agarwal, New Delhi, Tata McGraw Hill. 1995.
3) "Management", Robbins and Coulter, PHI, 8th Ed.
4) "A. - Fundamentals of Management: Essential Concepts and Applications", Robbins S. P. and Decenzo David, Pearson Education, 5th Ed.
5) "Introduction to Management Science: A Modeling and Case Studies Approach with Spreadsheets", Hillier Frederick S. and Hillier Mark S. Tata McGraw Hill, 2nd Ed., 2008.

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Semester-VI

BCA – 604: Principles and Practices of Management

Academic Year: 2021-2022

Min. Marks: 28 **Max. Marks: 85**

Unit I

The Nature of Management: Definition and role of management, Functions of Manager, Scientific Management, Human Relations school of Management, Contingency Theory of Management.

Unit II

Planning: Nature and Purpose of Planning, Components of Planning, objective of Business Management by Objectives.

Unit III

Organizing: Nature of Purpose of Organizing, Departmentation, Span of management, Delegation of Authority, Line and Staff Relationships. Staffing: Nature of staffing, problems faced in staffing, process of staffing.

Unit IV

Directing Process: Principles of Direction, Problems in Human Relation, Strategies for Establishing Healthy Human Relations.

Unit V

Control: Meaning and Process of Control, Control Techniques.

Text Book:

1) "Principles of Management", Harold Koontz, O'Donnel and Heinz Weihrich ,New York: McGraw Hill Book Co

Reference Books:

1) "Management", Stoner, Freeman and Gilbert Jr., PHI, 6th Ed.
2) "Organization and Management Concepts", R.D. Agarwal, New Delhi, Tata McGraw Hill. 1995.
3) "Management", Robbins and Coulter, PHI, 8th Ed.
4) "A. - Fundamentals of Management: Essential Concepts and Applications", Robbins S. P. and Decenzo David, Pearson Education, 5th Ed.
5) "Introduction to Management Science: A Modeling and Case Studies Approach with Spreadsheets", Hillier Frederick S. and Hillier Mark S. Tata McGraw Hill, 2nd Ed., 2008.

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Part- A: Introduction for Code

Govt. Holkar (Model, Autonomous) Science College, Indore	
Department of Forensic Science	
SYLLABUS SESSION– 2021-2022	
M.Sc. – 1st SEMESTER	
Title of the Paper (Course): Forensic Science and Criminal Justice System **Course Code: FS-11**	
Course Objective 1: To know basic principle & understanding of forensic science and criminal justice system 2: To know understanding of crime scene management.	
Course Outcomes - After completion of this paper students will come to -	
C01	Explain Fundamental principle and scope of forensic science
C02	Identify the importance and effects of preserving the crime scene
C03	Summarize the various theories of crime.
C04	Recognize the different sections of IEA, IPC and CRPC
C05	Describe relationship between courts, forensic science and police.

Part B: Content of Course

Unit 1	**Introduction to Forensic Science**: Forensic Science: Definition, Nature and Scope, Basic principles and its significance, Development of Forensic Science in India and abroad, Functions, Responsibilities and ethics of Forensic Scientist, Organizational structure of Forensic Science Laboratories at Central & State levels, Ethics in Forensic Science Institutions in India.
Unit 2	**Crime**: Definition, Types, Theories of Causation of Crime- Pre-classical and Neo-classical, Constitutional, geographic, economic, psychological and sociological, Multiple Causation approach, General Factors of Crime and forms of punishment in brief, causes prevention and characteristics of criminals. **Criminal Justice System**: Police Organization at District, State and Central Level. Organization of courts in India. Jurisdiction of Court in criminal cases, prosecution, FIR, Case Diary, Roznamacha Report Writing and Evidence Evaluation: Report formats of crime scene and laboratory findings. **Court Testimony**: Admissibility of expert testimony, pro court preparation & Court appearance, examination in-chief & re-examination, cross-examination.
Unit 3	**Crime Scene Management and Evidences:** **Scene of Crime:** Classification, protection of scene of crime, preservation of scene of crime – photography, videography and sketching method, Response to Special Crime scene (Man-made and natural). Legal and Human Consideration during investigations. **Evidences:** Meaning, Types, Searching Methods, Chain of Custody
Unit 4	**Collection, Preservation, Packing and Forwarding of Evidences:** Collection, preservation, packing and forwarding from scene of crime, Victim and deceased body in cases of Homicide Investigation, Death due to burning, Rape and Sexual offences, Hanging (Suicidal, Homicidal and Accidental), Drowning, Human Remains, Human Poisoning (Fetal and Survival), Death by

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	Firearms, Firearm exhibits, Forged, Torn and Charred Documents, Bank Notes, Capturing of Volatile evidences in computer fraud and Cyber Crime, audio and video CCTV Footage, Transportation of Digital Evidences, Blood, Semen and other biological Stains, tissues, Viscera, Hair& Fibre, Glass, Soil and Dust, Petroleum product, Latent Fingerprint, Drug and Poisons, Metals
Unit 5	**Indian Penal Code**: Introduction, general exceptions, offences against person, offences against property, Attempt to suicide, Sexual offences. **Criminal Procedure Code**: Introduction and General idea of sections: 291-93, 154,155,156,157,158,159,160,161,162,172,173,174,175 and 176. **Indian Evidence Act**: Introduction and General idea of sections: 32,45, 46,47,57,58,60,73,135,136,137, and 159. **Juvenile Delinquency**: Brief Introduction: Juvenile Justice Act, 2000, POCSO Act, 2019, Child and Adolescent Labor Act, 1986, Case Studies.

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Part D – Assessment and Evaluation		
Suggested Continuous Evaluation Methods: By Presentation, PPT, By Test, By written Exam Maximum Marks: 100 Continuous Comprehensive Evaluation (CCE): 25 External Exam (EE): 75		
Internal Assessment: Continuous Comprehensive Evaluation (CCE): 25	Class Test Assignment/Presentation	25
External Assessment: External Exam: 75 Time: 3 hours	75	75
		100

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Part A: Introduction for code:

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

Department of Forensic Science

SYLLABUS SESSION: 2021-2022

M.Sc. – 1st SEMESTER

Title of the Paper (Course): Questioned Documents, Finger Prints and other prints
Course Code: FS-13

Course Objective

1: To know about questioned document, handwriting and signature analysis.

2: To know about the fingerprint and its development & examination of others prints.

Course Outcomes - After completion of this paper students will come to-

C01	Explain questioned documents, understanding of ink and paper & its examination.
C02	Identify typewriting, forged documents and its examination.
C03	Infer fingerprint, its type and examination.
C04	Develop Latent fingerprints by physical and Chemical methods and to understand Automation Methods
C05	Identify foot & footwear print, others print & its examination and related laws.

Part B: Content of the course:

Unit 1	**Document and Writing Instruments**: History, Questioned document and their types. Instruments used to prepare documents, Ink and its types, Physical and Chemical examination, Paper & its type, Manufacturing and Examination of paper, Collection, Handing, Preservation and forwarding of documents seized from scene of crime. **Examination of Documents**: Preliminary examination of documents, instruments required for examination. **Handwriting** – Class and Individual characteristics, basis of handwriting comparison, making of exemplar, variation in handwriting. **Signature:** Genuine & Forged signatures and their examination.
Unit 2	**Forged & Typed Documents**: Alteration – Erasure, Addition, Obliteration and Sheet insertion. Secret writing & its decipherment. Charred documents, Torn Documents & their decipherment, Indented writing. **Typed & Printed Document:** Class and Individual characters & their comparison. Typed and Printed matter and their examination. **Photocopied and Scanned Documents**: Class and Individual characteristics and their comparison.
Unit 3	**Finger Prints**: History of finger print, Dactylography, Dactyloscopy, Friction Skin, formation of ridges, Ridges and Furrows, ridge characteristics, finger print patterns, Type Line, Focal point, Pattern area, Core, Delta, Ridge counting in Loops, ridge tracing in whorl. Types of Fingerprints: Latent, Visible and Plastic Prints.

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	Classification of finger prints – Henry System and its Modification, Battley Classification. Edgeoscopy, Poroscopy
Unit 4	**Fingerprint Development**: Location of Fingerprints, Development of latent prints by Physical and Chemical methods, Other emerging methods of development, Lifting of fingerprints, Development of fingerprint from cadavers. **Automation**: Introduction, History, AFIS, NAFIS, FACT, CCTNS, AMBIS, AADHAR
Unit 5	**Other Prints:** Foot and footwear prints, gait pattern, casting of print on different surface and their comparison. Forensic importance of lip print, bite mark and palm print. **Laws reference to IPC and IEA:** IPC Sections: S.29, S.29A, S.34, S.120B, S409, S.415, S.416, S.418, S.420, S.467, S. 468, S.470, S.471, S.489(A-E) **IEA Sections:** S.3, S.45, S.45A, S.47, S.73, S.114

Supriya

Vachaspati
27.11.2021

Part C: Learning Resources
1. Rev. ED: Ordway Hilton; Scientific Examination I of Questioned Documents, Elsevier, New York; (1982)
2. Albert S. Osborn; Questioned documents, Second Ed; Universal Law publishing, Delhi; (1998)
3. Albert S. Osborn; The Problem of Proot – Second Ed. Universal Law Publishing Delhi; (1998)
4. Charles C. Thomas, Typewriting Identification I.S.Q.D. Billy Bates; Springfield, Illinois, USA, (1971)
5. Charles C. Thomas, I.S.Q.D. Identification system for Questioned documents; Billy Prior Bates Springfield, Illinois, USA, (1971)
6. Wilson R. Harrison; Suspect documents – Their Scientific Examination; Universal Law Publishing, Delhi. (1997)
7. Hard less, H.R.: Disputed documents, handwriting and thumbs- print identification: profusely illustrated, Law book Co., Allahabad, (1988)
8. David R. Ashbaugh: Quantitative and Qualitative Friction ridge analysis, CRS press, (1999)
9. Mehta M.K.: Identification of Thumb Impression & cross Examination of finger prints, N.M. Tripathi (P) Ltd. Bombay (1989)
10. Henry C. Lee & R.E. Ganesslen, Advance in Finger print Technology, ~ RC press, Boca Raton, London, (1991)

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Part D – Assessment and Evaluation		
Suggested Continuous Evaluation Methods: By Presentation, PPT, By Test, By written Exam Maximum Marks: 100 Continuous Comprehensive Evaluation (CCE): 25 External Exam (EE): 75		
Internal Assessment: Continuous Comprehensive Evaluation (CCE): 25	Class Test Assignment/Presentation	25
External Assessment: External Exam: 75 Time: 3 hours	75	75
		100

Supriya

Vrchaurasia
22.11.2021

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Part A: Introduction for code:

Govt. Holkar (Model, Autonomous) Science College, Indore	
Department of Forensic Science	
SYLLABUS SESSION: 2021-2022	
M.Sc. – 3rd SEMESTER	
Title of the Paper (Course): DNA Profiling	**Course Code: FS-34-A**
Course Objective	
1: To know DNA structure. 2: To know about the DNA profiling and other techniques.	
Course Outcomes- After completion of this paper students will come to-	
CO1	Illustrate the concept of gene, nucleic acid and chromosomes.
CO2	To detect techniques in DNA profiling.
CO3	Illustrate handling, collection, preservation and storage of DNA samples.
CO4	Describe Quality Assurance, validation and forensic issues of DNA sample
C05	Interpret legal prospective of DNA profiling.

Part B: Introduction for code:

Unit 1	**Human Genome and DNA Profiling:** Concept of genes- alleles, Multiple alleles, genetic Code, Organization of Eukaryotic Cells and their genome Organization of genes and Chromosomes: Operon, Unique and Repetitive DNA, Intraped genes, gene families, structure of chromatin and chromosomes, heterochromatin, euchromatin, transposons. Conformation of Nucleic Acid- Helix, A, B and Z DNA, tRNA, Micro-RNA History of DNA Profiling and its Limitations, Introduction to Population genetics.
Unit 2	**Detection Techniques in DNA Profiling** **Concept of Sequence Variation:** VNTRs, STRs, MiniSTRs, SNPs. **Detection Techniques:** RFLP, PCR Analysis and their comparisons, Y-STR, mtDNA Analysis, PCR based typing methods such as HLA – DQA1, Amply- type ®PM Polymarker, D1S80, Gender ID, Denaturation, Renaturation and Methylation, DNA sequencing and Hybridization.
Unit 3	**Handling of DNA Samples**: Sources of DNA, Touch DNA, Collection, Preservation, Packaging and storage of Exhibits for DNA Analysis, Factors affecting DNA Stability.
Unit 4	**Quality Assurance and Validation**: Isolation and Purification, Quantification and Quality Assessment of DNA from hard and soft tissues and body fluids- blood and blood stains, semen and seminal stains, buccal smears, hair, bones and teeth **Forensic Issues**: Degraded DNA, PCR inhibition, Contamination, Mixed samples and Low Copy Number
Unit 5	**Legal perspective: legal** standard for admissibility of DNA profiling – procedural & ethical concerns, status of development of DNA profiling in India & abroad, DNA Database: uses and issues **Forensic Significance and Case Studies:** - Application in Kinship and parentage testing, Child Swapping, Missing person and Disaster Victims Identification, Civil Immigration, Veterinary and Wild Life and Agriculture Cases.

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Part C: Learning Resources
1.Daniel L. Hartl & Elizabeth W. Jones; Genetics- Principle & Analysis, 4th Ed., Jones & Bartlet ub. 1998.
2.Jaiprakash G. Shewale, Ray H. Liu Forensic DNA Analysis: Current Practices and Emerging Technologies, CRC Press, 2013
3.John M Butler: Forensic DNA Typing. Elsevier Academic Press.
4. Keith Immen and Norah Rudus, 1997. An introduction to Forensic DNA Analysis. CRC Press, New York.
5.Lee M.C. and Gaenesten, R.E: DNA and other Polymorphism in Forensic Science. Year book Medical Published.
6.Daniel L. Hartl & Elizabeth W. Jones; Genetics- Principle & Analysis, 4th Ed., Jones & Bartlet Pub. 1998.

Part D – Assessment and Evaluation		
Suggested Continuous Evaluation Methods: By Presentation, PPT, By Test, By written Exam Maximum Marks: 100 Continuous Comprehensive Evaluation (CCE): 25 External Exam (EE): 75		
Internal Assessment: Continuous Comprehensive Evaluation (CCE): 25	Class Test Assignment/Presentation	25
External Assessment: External Exam: 75 Time: 3 hours	75	75
		100

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Part A: Introduction for code:

Govt. Holkar (Model, Autonomous) Science College, Indore	
Department of Forensic Science	
SYLLABUS SESSION: 2021-2022	
M.Sc. – 3rd SEMESTER	
Title of the Paper (Course): Pharmaceutical Jurisprudence Course Code: FS-34-B	
Course Objective	
1: To know about the pharmaceutical jurisprudence. 2: To know about the different acts and law related to pharmaceutical.	
Course Outcomes- After completion of this paper students will come to-	
CO1	Define pharmaceutical and drugs legislation in India.
CO2	Recognise acts, rules related to drugs and cosmetics.
CO3	Illustrate Drugs and Cosmetic Act
CO4	Describe Drug and Magic Remedies, Food Adulteration and Factories Act
C05	Illustrate intellectual properties rights and Indian Patent Act
Part B: Content of the course:	
Unit 1	1. Evolution of Pharmaceutical and Drug Legislation in India. 2. The Pharmacy Act 1948. 3. Code of Pharmaceutical Ethics. 4. Consumer protection Act 1986. 5. Narcotic and Psychotropic substances Act 1985.
Unit 2	**Drugs and Cosmetics Act 1940 and Drugs & Cosmetic Rules 1945 (also amendments).** 1. Administration of the Act – The controlling and licensing regulation at state level and central level (the organization, function and duties of state and central drug control authorities). 2. Drugs & Cosmetic Act Rules – the provisions related to • The manufacture of drugs (other than homeopathic) including schedule C, C (1), F, F (1) and X drugs and cosmetics. • The sale and distribution of drugs (other than homeopathic) including schedule C, C (1), F, F (1) and X drugs and cosmetics.
Unit 3	**Drugs & Cosmetics Act** 1. (i) The import and export of drugs & cosmetics. (ii) Labelling and packing requirements for all categories of drugs & cosmetics. 2. (i.) List of schedules to the Drugs & Cosmetics Rules. (ii.) Detailed study of schedule M (new), U and Y. 3. Medicinal & Toilet preparations (Excise Duties) Act 1955.
Unit 4	1. Drugs and magic Remedies (Objectionable Advertisements) Act 1954. 2. Prevention of Food Adulteration Act 1954 (salient features) 3. The Factories Act 1948 and the Amendment (salient features.).
Unit 5	**IPR's and Patent Laws** 1. Intellectual Property Rights – a brief introduction to various IPR's.

	2. Indian Patent Act 1970 and the Amendments to the Act (up to date with reference to WTO Agreement) • Introduction & Objectives • Inventions and Not inventions according to the Act. • Procedure of obtaining patent for drugs and pharmaceuticals. 3. Drug Price Control Order (Latest). 4. Pharmaceutical Policy 2002.

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Part C: Learning Resources:
1. Forensic Pharmacy by B.M. Mithal, Vallabh Prakashan.
2. Forensic Pharmacy by Dr. B.S. Kuchekar, A.M. Khadatare and Sachin C. Itkar, Nirali Prakashan, Pune.
3. Drugs and Cosmetics Act 1940 by Vijay Malik, Eastern Book Company, Lucknow.
4. Bare Acts, published by Govt. of India.
5. Patent Act 1970 with patent Rules, published by Taxman Allied services (P) Ltd., 59132, New Rohtak Road, New Delhi – 110005.
6. ISO, International Organisation for Standardisation, Switzerland, 1994.

Part D – Assessment and Evaluation		
Suggested Continuous Evaluation Methods: By Presentation, PPT, By Test, By written Exam Maximum Marks: 100 Continuous Comprehensive Evaluation (CCE): 25 External Exam (EE): 75		
Internal Assessment: Continuous Comprehensive Evaluation (CCE): 25	Class Test Assignment/Presentation	25
External Assessment: External Exam: 75 Time: 3 hours	75	75
		100

Supriya

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Part A; Introduction for code:

Govt. Holkar (Model, Autonomous) Science College, Indore	
Department of Forensic Science	
SYLLABUS SESSION: 2021-2022	
Class – M.Sc. – 4th SEMESTER	
Title of the Paper (Course): Computer & Cyber Forensic Course Code: FS-44-B	
Course Objective	
1: To know about the basic information of Computer. 2: To know the Investigation process of Computer & Cyber Forensic.	
Course Outcomes- After completion of this paper students will come to-	
CO1	Explain and Summarize of Computer & Internet.
CO2	Recognize Computer Crime.
CO3	Illustrate Internet & Digital Crime.
CO4	Describe Computer & Cyber Crime.
C05	Explain social media, Cryptography & Stenography.
Part B: Content of the course:	
Unit 1	**Basic Introduction of Computer System:** Various components of computer, Motherboard, Processor, Memory, Storage devices, Operating System, Booting process, Hardware- Input and Output devices, Software and Network. **Introduction to Internet**: Definition of Network and Internet, Network types and Topologies, Types of IP Address, Internet in India.
Unit 2	**Computer Crime:** Introduction, Classification, Computer Virus- Types, Worms, Trojan Horse, Trap Door, Super Zapping, Logic Bomb, Salami Logic, Characteristics of computer crime and criminals, Common targets of computer criminals.
Unit 3	**Internet Crime:** Introduction, different types of Internet crime- Cyber Laundering, Terrorism, Cyber Warfare, Prevention of Internet Crime. Network Crime- Introduction, Types- Eavesdropping, Spoofing, Modification, Cross-site Scripting, DNA Spoofing, Routing Table Poisoning, ARP Poisoning, Web Jacking, Attacks on Wireless Network.
Unit 4	**Investigation of Computer and Cyber Crime:** Process of Investigation and Detection of Crime, Procedure of Search and Seizure of Volatile and Non- Volatile Physical Evidence, Examination of Digital Evidence. Information Technology Act, 2000.
Unit 5	**Social Media:** Introduction, Security issues in social media, Types- Cyber Bulling, Online Grooming, Cyber Stalking, social media and its impact on Business, Politics, Law and Revolutions, Importance. **Cryptography:** Introduction, Types of Keys. **Steganography:** Introduction.

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Part C: Learning Resources
1. C.E. O 'Hara and J.W. Osterburg; An Introduction to Criminalistic: Indiana University Press, Blomington, (1972).
2. R. Saferstein; Forensic Science Handbook, Vols. I, II; (Ed); Prentice Hall, Eglewood Cliffs, NJ; (1988).
3. Nickolls, L.C.; Scientific Investigation of Crime, Bulterwest, London (1956).
4. Working Procedure Manual: Physics BPR&D Publication (2000).
5. James D. McCabe; Network Analysis, Architecture and Design, 3rd edition.
6. N. M. Karie and H. S. Venter, "Taxonomy of challenges for digital forensics," Journal of Forensic Sciences, vol. 60, no. 4, July 2015, pp. 885-893.
7. M. Losavio, K. C. Seigfried-Spellar, and J. J. Sloan III, "Why digital forensics is not a profession and how it can become one," Criminal Justice Studies, vol. 29, no. 2, 2016, pp.143-162.
8. S. L. Garfinkel, "Digital forensics research: The next 10 years," Digital Investigation, vol. 7, 2 0 1 0, pp. S 6 4- S 7 3.

Part D – Assessment and Evaluation		
Suggested Continuous Evaluation Methods: By Presentation, PPT, By Test, By written Exam Maximum Marks: 100 Continuous Comprehensive Evaluation (CCE): 25 External Exam (EE): 75		
Internal Assessment: Continuous Comprehensive Evaluation (CCE): 25	Class Test Assignment/Presentation	25
External Assessment: External Exam: 75 Time: 3 hours	75	75
		100

22.11.2021

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Department of Pharmaceutical Chemistry

Class : M.Sc. IV Sem.
Subject : Pharmaceutical Chemistry
Paper: Elective 3/1
Title of the paper - Drug Design

Marks: 75 + (CCE) 25 = 100
Credit : 4

Code of the paper : PC-43-A

Part A : Introduction for Code PC (M.Sc. IV Sem. III Paper)		
1	Pre- requisite (if any)	A students must pass M.Sc. III Sem. in Pharmaceutical Chemistry.
2	Course Objectives	To make students understand about various perspectives of drug design .
	Course Learning outcomes	After successful completion of this course students should be able to
		PC-43 (A)-1 Explain historical perspective, introduction to drug design & discovery.
		PC-43 (A)-2 Describe prodrug, soft drug and structure based drug design
		PC-43 (A)-3 Explain pharmacophoric approach for drug designing
		PC-43 (A)-4 Explain fundamentals of QSAR
		PC-43 (A)-5 Describe significance of computers in medicinal chemistry

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Part B : Content of the Course

Department of Pharmaceutical Chemistry
Govt. Holkar (Model Autonomous) Science College, Indore
M.Sc. IV Semester Pharmaceutical Chemistry Session 2021-22

Paper – 3: Drug Design (PC-43-A)

M. Marks: 25 (CCE)+ 75(Th.) = 100
Min. Marks : 10 (CCE) + 30 (Th.) = 40
Credits – 4

Unit I	**Introduction to Drug Design & Discovery** Historical Development, factors affecting drug development , Generation of Lead Compound & Lead Optimization with example, Cell Biology & Genomics as a Source of Drugs, molecular modification of lead compouds.
Unit II	**I) Prodrugs and Soft drugs –** a) Prodrugs-Introduction ,prodrug formation of compounds containing various chemical groups,multiple prodrug formation. b) Soft drugs-introduction and advantages ,uses of soft drugs principle. **II) Structure based drug design-** Process of Structure based drug design and methods of design of enzyme inhibitors.
Unit-III	**Pharmacophoric Approach** Pharmacophore Based Ligand Design, Pharmacophore Concept, Pharmacophore Elements and Representation, Active Conformation, Molecular Superimposition, Receptor Excluded and Receptor Essential Volumes, Solvation Effects, Examples of 3D Pharmacophore Models and their Use.
Unit-IV	**Quantitative Structure Activity Relationships (QSAR)** Fundamentals of QSAR, Biological Data, the additivity of Group Contribution Hansch Analysis and related approaches, physicochemical properties, Statistical methods in QSAR, application of Hansch and related approaches, 3D QSAR approach.
Unit-V	**Computers in Medicinal Chemistry** Generation of 3D coordinates, Sketch approach, conversion of 2D structure in 3D form, force field, geometry optimization, energy minimizing procedures, Quantum mechanical methods, conformational analysis, pharmacophore identification, molecular modeling in 3D QSAR – CoMFA and related methods.

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DEPARTMENT OF PHARMACEUTICAL CHEMISTRY 2021-22

Govt. Holkar (Model Autonomous) Science College, Indore
Department of Pharmaceutical Chemistry

Class : M.Sc. II Sem.
Subject : Pharmaceutical Chemistry
Paper: Core 5
Title of the paper - Principles of Inorganic Pharmaceutical Chemistry -II

Marks: 75 + (CCE) 25 = 100
Credit : 4

Code of the paper : PC-21

Part A : Introduction for Code PC (M.Sc. II Sem. I Paper)		
1	Pre- requisite (if any)	A student must pass M.Sc. I Sem. in Pharmaceutical Chemistry.
2	Course Objectives	To make students understand about impurities in pharmaceutical substances & their limit tests, inorganic compounds such as gastrointestinal agents & topical agents, radiopharmaceuticals and some inorganic pharmaceutical agents.
	Course Learning outcomes	After successful completion of this course students should be able to
		PC-21-1 Explain about impurities and their tests in pharmaceutical substances.
		PC-21-2 Describe Synthesis, properties & uses of inorganic compounds such as gastrointestinal and topical agents.
		PC-21-3 Explain synthesis, properties & uses of inorganic compounds of pharmaceutical importance.
		PC-21-4 Describe Radiopharmaceuticals.
		PC-21-5 Explain calcium and iron compounds as pharmaceutical agents.

DEPARTMENT OF PHARMACEUTICAL CHEMISTRY 2021-22

Part B : Content of the Course

Department of Pharmaceutical Chemistry
Govt. Holkar (Model Autonomous) Science College, Indore
M.Sc. II Semester Pharmaceutical Chemistry Session 2021-22

Paper –1: Principles of Inorganic Pharmaceutical Chemistry -II (PC-21) M. Marks: 25 (CCE)+ 75(Th.) = 100
Min. Marks : 10 (CCE) + 30 (Th.) = 40
Credits – 4

Unit I	**Impurities in Pharmaceutical Substances and their tests-** **a)** Sources of Impurities in Pharmaceutical Chemicals **b)** Effects of Impurities **c)** Permissible Impurities in Pharmaceutical Substances **d)** Methods Used to Purify Inorganic Substances **e)** Tests of Purity **f)** Limit Test of Chloride ,Sulphate, Arsenic, Iron
Unit II	**Synthesis, Properties and Uses of the given Inorganic Compounds -**
	(a) Gastrointestinal agents- **(i)Antacids-** Sodium bicarbonate, Aluminium phosphate, Magnesium carbonate and Magnesium oxide. **(ii) Protective's and Adsorbents-** Bismuth sub carbonate, Kaolin, Activated charcoal. **(iii) Saline cathartics-** Sodium acid phosphate, Disodium hydrogen phosphate, Magnesium sulphate. **(b) Topical agents-** **(i) Dusting powders-**Talc, Zinc oxide, Zinc stearate.
Unit-III	**Synthesis, Properties and Uses of Inorganic Compounds of Pharmaceutical Importance-** **(a) Antioxidants-** Hypophosphorus acid & Sodium metabisulphite. **(b) Emetics-** Ammonium chloride, Ammonium carbonate & Potassium iodide **(c) Astringents-**Alum , Aluminium chloride & Zinc Chloride.
Unit-IV	**Radiopharmaceuticals** Introduction , Basic Properties, Half life of Radioelements ,Production of Radioisotopes, Measurement of Radioactivity, Applications of Radioisotopes used in Pharmacy, Radioactive pharmaceuticals preparations and uses- **(a) Ferric citrate Fe^{59}** **(b) Sodium phosphate P^{32}** **(c) Iodine ^{131} & Iodine ^{125}**
Unit-V	**Calcium and Iron Compounds as Pharmaceutical Agents** Role of Calcium in Body, Deficiency Disorder of Calcium, Preparation, Properties and Uses of Calcium Acetate, Calcium Chloride, Calcium Gluconate, Calcium Lactate. Importance of Iron in Human Body, Deficiency Disorder of Iron, Preparation, Properties and Uses of Ferric Ammonium Citrate, Ferrous Fumarate, Ferrous Gluconate and Ferrous Succinate.

DEPARTMENT OF PHARMACEUTICAL CHEMISTRY 2021-22

Part C : Learning Resources -
Books Suggested 1.A Text Book of Inorganic Medicinal Chemistry , Surendra N Pandya, S.G. Publisher, Varanasi 2.Pharmaceutical Chemistry Inorganic II , G. R. Chatwal, Himalaya Publishing House 3. A Text Book of Inorganic Pharmaceutical Medicinal Chemistry, Quardy & Quardy 4. Text Book of Pharmaceutical Chemistry, Bentley & Driver, Oxford University Press, New Delhi.

Part D – Assessment and Evaluation		
Suggested Continuous Evaluation Methods : By Presentation, PPT, By Test, By written Exam Maximum Marks : 100 Continuous Comprehensive Evaluation (CCE): 25 External Exam (EE) : 75		
Internal Assessment: Continuous Comprehensive Evaluation (CCE) : 25	Class Test Assignment/Presentation	25
External Assessment: External Exam : 75 Time : 3 hours	75	75
		100

Govt. Holkar (Model Autonomous) Science College, Indore
Department of Pharmaceutical Chemistry

Class : M.Sc. II Sem. Marks: 75 + (CCE) 25 = 100
Subject : Pharmaceutical Chemistry Credit : 4
Paper: Core-7
Title of the paper - Principles of Physical Pharmacy – II Code of the paper: PC-23

Part A : Introduction for Code PC (M.Sc. II Sem. III Paper)		
1	Pre- requisite (if any)	A student must have to pass M.Sc. I Sem. in Pharmaceutical Chemistry.
2	Course Objectives	To make students understand about principles of physical pharmacy, drug product designing and polymer science.
	Course Learning outcomes	After successful completion of this course students should be able to
		PC-23-1 Explain concept of rheology, properties and applications to pharmacy.
		PC-23-2 Describe coarse dispersions systems.
		PC-23-3 Explain prodrug, drug carriers and routes of drug administration.
		PC-23-4 Describe polymer on the basis of source and structure.
		PC-23-5 Explain important features of bioactive polymers and their uses.

DEPARTMENT OF PHARMACEUTICAL CHEMISTRY 2021-22

Part B : Content of the Course

Department of Pharmaceutical Chemistry
Govt. Holkar (Model Autonomous) Science College, Indore
M.Sc. II Semester Pharmaceutical Chemistry Session 2021-22

Paper – 3: Principles of Physical Pharmacy – II(PC-23) M. Marks: 25 (CCE)+ 75(Th.) = 100
Min. Marks : 10 (CCE) + 30 (Th.) = 40
Credits – 4

Unit I	**Rheology:** Concept of viscosity, factors influencing the viscosity, Introduction of rheology, Newtonian Systems, Non-Newtonian Systems, Thixotropy, Determination of Rheological Properties, Viscoelasticity, Psychorheology, Applications to Pharmacy.
Unit II	**Cearse Dispersions:** Suspensions, Interfacial Properties of Suspended Particles, Formulation of Suspensions & Emulsions, Theories of Emulsification, Physical Stability of Emulsions, Preservation of Emulsions, Rheological Properties of Emulsions, Micro emulsions, Semisolids, Drug Kinetics in Coarse Disperse Systems, Drug Diffusion in Coarse Disperse Systems.
Unit-III	**Drug Product Design:** **(A) Prodrug and Drug Carriers:** Prodrug , Liposomes, Monolithic and reservoir devices microcapsules, Nano capsules and nanoparticles **(B) Routes of administration:** Ocular administration, Nasal administration, Buccal administration, pulmonary administration, Gastrointestinal administration, Rectal administration, Transdermal administration.
Unit-IV	**Polymer Science** Introduction, classification of polymer on the basis of source and structure, polymerization in homogenous and heterogeneous system, molecular weight determination from solution viscosity, polymers as thickening agents, Pharmaceutical applications of polymers.
Unit-V	Configuration of polymer chains, Glass transition temperature, determination of Glass transition temperature and its importance. Synthetic Polymers: Plastics, elastomers , fibers, Biomedical polymers, Important features of bioactive polymers and their uses.

Part C : Learning Resources -
Books Suggested 1. Physical Chemistry, P.W. Atkins, ELBS Publication. 2. Physical Pharmacy: Physical Chemical Principles in the Pharmaceutical science Martin, Pilar Bustamante, A.H.C. Chun , Lippincott Williams & Wilkins 3. Micelles, Theoretical and Applied Aspects, V. Moraoi, Plenum Publication. 4. Introduction to Polymer Science, V.R. Gowarikar, N.V. Vishwanathan and J. Sridhar, Wiley Eastern. 5. Essentials of Physical Pharmacy, Sanjiv Aggarwal, Anmol Publication 6. Physical Pharmacy , David Attwood, Alexander T. Florence, Pharmaceutical Press

Part D – Assessment and Evaluation		
Suggested Continuous Evaluation Methods : By Presentation, PPT, By Test, By written Exam Maximum Marks : 100 Continuous Comprehensive Evaluation (CCE): 25 External Exam (EE) : 75		
Internal Assessment: Continuous Comprehensive Evaluation (CCE) : 25	Class Test Assignment/Presentation	25
External Assessment: External Exam : 75 Time : 3 hours	75	75
		100

Govt. Holkar (Model Autonomous) Science College, Indore
Department of Pharmaceutical Chemistry

Class : M.Sc. III Sem.
Subject : Pharmaceutical Chemistry
Paper: Core 9
Title of the paper - Medicinal Chemistry

Marks: 75 + (CCE) 25 = 100
Credit : 4

Code of the paper : PC-31

Part A : Introduction for Code PC (M.Sc. III Sem. I Paper)		
1	Pre- requisite (if any)	A student must have to pass M.Sc. II Sem. in Pharmaceutical Chemistry.
2	Course Objectives	To make students understand various categories of drugs their classification SAR uses & adverse effects.
	Course Learning outcomes	After successful completion of the course students should be able to
		PC-31-1 Explain classification SAR, therapeutic uses and adverse effects of NSAID's
		PC-31-2 Explain classification, SAR, MOA, synthesis, therapeutic uses and adverse effects of local & general anesthetics.
		PC-31-3 Describe classification synthesis, uses and adverse effects of antihypertensive & diuretic drugs .
		PC-31-4 Explain classification, SAR synthesis, therapeutic uses and adverse effects of anti histaminics, antimalarials, and anti tubercular agents.
		PC-31-5 Explain SAR synthesis, uses, and side effects of sulphonamides and antineoplastic agents.

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Part B : Content of the Course

Department of Pharmaceutical Chemistry
Govt. Holkar (Model Autonomous) Science College, Indore
M.Sc. III Semester Pharmaceutical Chemistry Session 2021-22

Paper – 1: Medicinal Chemistry (PC-31)

M. Marks: 25 (CCE)+ 75(Th.) = 100
Min. Marks : 10 (CCE) + 30 (Th.) = 40
Credits – 4

Unit I	**Non Steroidal Anti-inflammatory drugs (NSAIDs)** Classification and SAR of Heteroaryl acetic acid analogues, Aryl Propionic acid analogues, Salicylic acid analogues. Synthesis, Mode of action, Therapeutic uses and Adverse effects of Indomethacin, Tolmetin Sodium, Ibuprofen, Naproxen, Aspirin, Paracetamol.
Unit II	A) **Local Anesthetics:** Classification, SAR of Local Anesthetics, Mechanism & Site of action of local anesthetics, Synthesis, MOA, Uses and Adverse effects of Benzocaine, Procaine, Lignocaine, Diperodon. B) **General Anesthetics:** Definition, Classification, theories of General anesthetics, Synthesis, Uses, Adverse effects of Cyclopropane , Halothane, Chloroform, Thiopental sodium, Tribromoethanol.
Unit-III	a) **Antihypertensive drugs :** Hypertension-Types and Causes, Classification of Antihypertensives. Synthesis, uses, adverse effects of Metraminol, Naphazoline, Hexamethonium bromide, Methyl Dopa. b) **Diuretics :** Physiology of urine formation, Classification of Diuretics, SAR of Mercurials, Thiazides, Xanthines. Mechanism of action of Mercurials, Carbonic anhydrase Inhibitors, Thiazides and Loop Diuretics. Synthesis, Mode of action, Therapeutic uses and adverse effect of Ethacrynic acid, Furosemide, Chlorothiazide, Acetazolamide.
Unit-IV	a) **Anti-Histaminics:** Introduction , classification and SAR of Anti-Histamines, Mode of action of H_1 and H_2 receptor antagonists. Synthesis, therapeutic uses and adverse effect of Diphenhydramine Hydrochloride, Promethazine HCl, Chlorcyclizine HCl, Antazoline HCl. b) **Antimalarials:** Etiology of Malaria, classification of Anti-malarials, SAR of 4-aminoquinolines and 8-aminoquinolines. Synthesis, Mode of action, therapeutic uses and adverse effects of Chloroquine Phosphate, Amodiaquine Hydrochloride, Primaquine Phosphate, Proguanil Hydrochloride. c) **Anti Tubercular Agents:** Introduction, synthesis, uses and adverse effects of Ethambutol, Isonicotinic acid.
Unit-V	a) **Sulphonamides:** SAR of sulphanilamide. synthesis, uses and side effects of Sulfanilamide, Sulfapyridine, sulfadiazine, b) **Antineoplastic Agents :** Introduction, role of Alkylating Agents, synthesis ,uses, Properties & Side Effect of Mechloroethamine, Cyclophosphamide, Melphalan Uracil.

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DEPARTMENT OF PHARMACEUTICAL CHEMISTRY 2021-22

Part C : Learning Resources -
Books Suggested 1. Principles of Medicinal Chemistry Foye, W.O. Varghese Publication 2. Medicinal Chemistry Kar, Ashitosh.New Age Publication. 3. Burger's Medicinal Chemistry and Drug discovery , Jone-Wiley puplication. 4. Medicinal and Pharmaceutical Chemistry, Harikishan Singh,V. K. Kapoor, Vallabh Prakashan, Delhi.

Part D – Assessment and Evaluation		
Suggested Continuous Evaluation Methods : By Presentation, PPT, By Test, By written Exam Maximum Marks : 100 Continuous Comprehensive Evaluation (CCE): 25 External Exam (EE) : 75		
Internal Assessment: Continuous Comprehensive Evaluation (CCE) : 25	Class Test Assignment/Presentation	25
External Assessment: External Exam : 75 Time : 3 hours	75	75
		100

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Govt. Holkar (Model Autonomous) Science College, Indore
Department of Pharmaceutical Chemistry

Class : M.Sc. III Sem.
Subject : Pharmaceutical Chemistry
Paper: Elective 1/1
Title of the paper - Toxicology

Marks: 75 + (CCE) 25 = 100
Credit : 4

Code of the paper : PC-33-A

Part A : Introduction for Code PC (M.Sc. III Sem. III Paper)		
1	Pre- requisite (if any)	A student must have to pass M.Sc. II Sem. in Pharmaceutical Chemistry.
2	Course Objectives	To make students understand about poisoning, treatment of poisoning & drug dependence.
	Course Learning outcomes	After successful completion of the course students should be able to
		PC-33 (A)-1 Describe toxicants, classification and importance of toxicology and carcinogenicity
		PC-33 (A)-2 Explain drugs of abuse their classification, tolerance and dependence.
		PC-33 (A)-3 Describe poisons, their types and causes of poisoning .
		PC-33 (A)-4 Explain detailed treatment of poisoning of substances like, morphine, alcohol & metals.
		PC-33 (A)-5 Describe drugs & pregnancy and drug interactions.

Part B : Content of the Course

Department of Pharmaceutical Chemistry
Govt. Holkar (Model Autonomous) Science College, Indore
M.Sc. III Semester Pharmaceutical Chemistry Session 2021-22

Paper – 3: Toxicology (PC-33-A)

M. Marks: 25 (CCE)+ 75(Th.) = 100
Min. Marks : 10 (CCE) + 30 (Th.) = 40
Credits – 4

Unit I	a) Definition, Types of Toxicology, Toxicants and its classification, scope and importance of Toxicology b) Carcinogenicity-Introduction to carcinogens, types of carcinogens, Mutagencity, Teratogenicity, Acute, Sub-acute and Chronic Toxicity.
Unit II	**Drug Dependence** a) Definition, Drugs of Abuse, Classification of Drugs of Abuse, Drug Addiction. b) Tolerance and Dependence - Physical Dependence, Psychological Dependence, Mechanism of Tolerance and Dependence.
Unit-III	**Poisoning** Definition, Classification of Poisons, Factors Modifying the action of Poison, Types of Poisoning, Causes of Poisoning, General Treatment and Management of Poisoning.
Unit-IV	**Detailed Treatment of Poisoning of the Following Substance** a) Metals such as – As, Hg, Pb, Zn b) Morphine, L.S.D. c) Alcohol, Barbiturates, Chloroform. d) Salicylates and Paracetamol. e) Digitalis, Nicotine and Cocaine.
Unit-V	a) Environmental Pollution: Types of Pollution, Methods of Control of Pollution. b) Drugs and Pregnancy: Effects of drugs on pregnancy, Teratogenic Drugs, Drugs Contraindicated in Pregnancy. c) Drug Interaction: Definitions, Factors Predisposing to Drug Interactions, Classification and Mechanism of Drugs Interaction, Adverse Drugs Interactions.

Part C : Learning Resources -
Books Suggested 1. Pharmacology and Toxicology, Siddiquie, Anees Ahmad ; Krishna,N. Rama;Jain,S.K.Supernova Pubplishers and Dishtributors. 2. Biochemistry, Kuchel, Philip W.;Ralston,Gregory B., Mcgraw Hill Publ. 3. Essentials of Phrmacotherapeutics, F. S. K. Barar, S. Chand & Co. ,Delhi. 4. Pharmacology and Toxicology , V.N.Raje, CBS Publishers and Dishtributors. 5. fundamentals of Toxicology, Dr. Kamleshwar Pandey, Dr. J.P. Shukla and Dr. S.P. Trivedi

Part D – Assessment and Evaluation		
Suggested Continuous Evaluation Methods : By Presentation, PPT, By Test, By written Exam Maximum Marks : 100 Continuous Comprehensive Evaluation (CCE): 25 External Exam (EE) : 75		
Internal Assessment: Continuous Comprehensive Evaluation (CCE) : 25	Class Test Assignment/Presentation	25
External Assessment: External Exam : 75 Time : 3 hours	75	75
		100

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Part A: Introduction for code:

Govt. Holkar (Model, Autonomous) Science College, Indore	
Department of Chemistry	
SYLLABUS SESSION : 2021-2022	
M.Sc. – IIIrd SEMESTER (Open Elective)	
Title of the Paper (Course): Health Chemistry	**Course Code: OE-HC**
Course Objective	
To enable the students about the role of chemistry of food and to learn about bio-molecule.	
To enable the students about the role of common drugs and their chemistry	
To enable the students to learn the importance of blood and its biology including respiration and electrolytes.	
Unit no 4 enable students to learn about the enzymes and hormones involved in digestion.	
To enable the students learn about the common diseases caused by food, life style, deficiency of vitamins and contamination and infections	
Course Outcomes	
CO1	After completion of the course students will be able to organize their dietary habits.
CO2	The students will be able to identify the drugs used in diseases and the doctor's prescriptions.
CO3	The students will be able to maintain the health through the knowledge of blood chemistry.
CO4	The students will be able to maintain the digestive health through the knowledge of enzymes & hormones.
CO5	The students will be able to prevent common contagious diseases, lifestyle and food born diseases through the knowledge of this unit.

Part B: Content of the course:

Unit 1	**Health** Definition: Food, Food Pyramid- Health- Hygiene- mal-, under – and over-nutrition, their causes and remedies, sanitation, Carbohydrates- Classification, Biological functions, Protein- Classification, Biological functions, vitamins- Classification, Biological functions.
Unit 2	**Drugs** Drugs- Types of drugs- depressant, anticonvulsant, narcotics, antipyretics, antibiotics, antiseptics, analgesics, muscle relaxants and cardiovascular and vasodepressants, Steroids.
Unit 3	**Body fluids** Blood volume, groups, coagulation, blood pressure, anemia, blood sugar, heamoglobin- chemistry of respiration- urine-electrolyte balance.
Unit 4	**Enzymes, Hormones, Digestion** Types of enzymes and enzyme action, Characters of hormones- action, examples of essential hormones- digestion in mouth, stomach, intestine and pancreas- mineral metabolism.
Unit 5	**Common Diseases** Toxicants in food- cancer-types and causes- common diseases- Jaundice, vomiting, fever, rickets, scurvy, beriberi, pellagra, night blindness, ulcer, gout, goiter, diabetes, anemia and their causes,

Part C: Learning Resources:
1. Jayashree Ghosh, A Text book of Pharmaceutical Chemistry, S. Chand and Co. Ltd, 1999. UNITS II and V
2. Alex V Ramani, Food Chemistry, MJP Publishers, Chennai, 2009 UNIT I
3. Deb A C, Fundamentals of Biochemistry, New Central Book Agency, Calcutta, 1994. UNIT III
4. Satake M and Mido Y, Chemistry for Health Science, Discovery Publishing House, New Delhi, 2003 UNIT I and III
5. Ashutosh Kar, Medicinal Chemistry, Wiley Easterns Limited, New Delhi, 1993 UNIT II & IV

GOVT. HOLKAR (MODEL. AUTONOMOUS) SCIENCE COLLEGE. INDORE
DEPARTMENT OF BIOTECHNOLOGY
Syllabus Session: 2021-22

Part A: Introduction			
Program:	Class: M.Sc.	Semester: III	Session 2021-22
Subject: Biotechnology			
Course Code	BT-34		
Course Title	ELECTIVE - II Paper – XII 2/1(FOOD BIOTECHNOLOGY)		
Course Type	ELECTIVE –2/1		
Pre-requisite (If any)	M.Sc. Previous. (Biotechnology)		
Course Learning Outcomes	Course Outcomes: After the completion of course. students will have understanding of CO1: Food Processing and nutritive value of food. CO2: Concept of Food Preservation and New Preservation Technologies. CO3: Types of Food Spoilage & Food Borne Diseases. CO4: Fermented Food Products. CO5: Microbial analysis of food.		
Credit Value	4		

Total Marks

CCE (Max)	CCE (Min)	External Assessments Max	External Assessments Min	Total Max	Total Min
25	9	75	26	100	35

Experts Members (Name & Signature)

S.No.	Name	Designation	Signature
1	Dr. Kiran Billore	Chairman	
2	Dr. A. Nighojkar	VC Member	
3	Dr. Bhavesh Patel	Subject Expert	
4	Dr. R K Garg	Subject Expert	
5	Mr. Nitesh Jasani	Representative from Industry	
6	Dr. Rekha Sharma	Member	
7	Mrs. Farida Johar	Alumni	

Part B: Content of the Course	
Total number of Lecture Hours/ Week :4	
Unit	**Topic**
Unit I	**Introduction to Food Processing:** Biotechnology in relation to the food industry, nutritive value of food, and types of microorganisms associated with food, its sources, types and behavior in foods. Morphology and structure of microorganism in food – yeast. Mold and bacterial cell. Importance of microorganism in food.
Unit II	**Food Preservation:** Bioprocessing of meat, fisheries, vegetables, dairy products, enzymes and chemicals used in food processing. New Preservation Technologies.
Unit III	**Food Spoilage & Food Borne Diseases:** Microbial spoilage of food. Food -borne infections & Intoxications.
Unit -IV	**Fermented Food Products**: Dairy products, non-beverage plant products, beverages and related products of baking. Microbes as food. Probiotics, prebiotics, single cell proteins, single cell oil.
Unit V:	**Quality Control:** Microbial analysis of food. Quality control. Food Hygiene. Food Regulations and Standards.

Experts Members (Name & Signature)			
S.No.	Name	Designation	Signature
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4	Dr. R K Garg	Subject Expert	
5	Mr. Nitesh Jasani	Representative from Industry	
6	Dr. Rekha Sharma	Member	
7	Mrs. Farida Johar	Alumni	

Part C: Learning Resources
Text Books, Reference Books, Other Resources
Texts/References: 1. Roger A., Gordan B., and John T., Food Biotechnology, 1989. 2. Frazier. Food Microbiology. 3. G. Reed, Prescott and Dunn's Microbiology, CBS Publishers, 4. Introductory Food Microbiology, Author – H.A. Modi. www.freebookcentre.net>....freeFood microbiology books download eBook Online

Experts Members (Name & Signature)			
S.No.	Name	Designation	Signature
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5	Mr. Nitesh Jasani	Representative from Industry	
6	Dr. Rekha Sharma	Member	
7	Mrs. Farida Johar	Alumni	

GOVT. HOLKAR (MODEL. AUTONOMOUS) SCIENCE COLLEGE. INDORE
DEPARTMENT OF BIOTECHNOLOGY
Syllabus Session: 2021-22

Part A: Introduction			
Program:	**Class: M.Sc.**	**Semester: IV**	**Session 2021-22**
Subject: Biotechnology			
Course Code	**BT-43**		
Course Title	**ELECTIVE – III Paper- XVI 3/1(CANCERGENETICS)**		
Course Type	**Elective 3/1**		
Pre-requisite(If any)	**M.Sc. Previous. (Biotechnology)**		
Course Learning Outcomes	Course Outcomes: After the completion of course, students will have understanding of C01: The basics knowledge of tumors and biochemical and structural changes in cancer cell. C02: Concept of oncogenes and their amplification. C03: Types of cancer and different types of syndromes. C04: Tumor progression and their proliferation. C05: Gene therapy and there counseling		
Credit Value	4		

Total Marks

CCE (Max)	CCE (Min)	External Assessments Max	External Assessments Min	Total Max	Total Min
25	9	75	26	100	35

Experts Members (Name & Signature)

S.No.	Name	Designation	Signature
1	Dr. Kiran Billore	Chairman	
2	Dr. A. Nighojkar	VC Member	
3	Dr. Bhavesh Patel	Subject Expert	
4	Dr. R K Garg	Subject Expert	
5	Mr. Nitesh Jasani	Representative from Industry	
6	Dr. Rekha Sharma	Member	
7	Mrs. Farida Johar	Alumni	

Part B: Content of the Course	
Total number of Lecture Hours/ Week :4	
Unit	**Topic**
Unit I	**Introduction:** Types and general characteristics of tumors: Chromosomal aberrations in neoplasia; Cell cycle check points and cancer. Mutagenesis and mutation (types, mechanism and detection) biochemical and structural changes in cancer cell.
Unit II	**Cell Transformation and tumorigenesis:** Oncogenes and their amplification; Tumour Suppressor genes; DNA repair genes and genetic instability; Epigenetic modifications, telomerase activity, centrosome malfunction; Genetic heterogeneity and clonal evolution
Unit III	**Types of Cancer:** Retinoblastoma, Wilm'sTumour, Li-Fraumeni syndrome, colorectal cancer, breast cancer. Genetic predisposition to sporadic cancer
Unit -IV	**Tumour progression**: Angiogenesis and metastasis; Tumour specific markers.
Unit -V	**Cancer and environment**: physical, chemical and biological carcinogenesis: Cancer risk assessment, gene therapy and counseling.

Experts Members (Name & Signature)			
S.No.	**Name**	**Designation**	**Signature**
1	Dr. Kiran Billore	Chairman	
2	Dr. A. Nighojkar	VC Member	
3	Dr. Bhavesh Patel	Subject Expert	
4	Dr. R K Garg	Subject Expert	
5	Mr. Nitesh Jasani	Representative from Industry	
6	Dr. Rekha Sharma	Member	
7	Mrs. Farida Johar	Alumni	

Part C: Learning Resources
Text Books, Reference Books, Other Resources

Texts/References:

1. Alberts et al., The Science of Genetics. saunders. 1999
2. Alberts et al., Molecular biology of the cell. Garland 2008.
3. Benjamin, Genetics: A Conceptual Approach, 3rd Edition, Freeman, 2007.
4. Berg and Singer, Genes and Genome. 1998.
5. Black, Microbiology: Principles and Explorations, 6th Edition Wiley, 2004
6. Cowell, Molecular Genetics of Cancer. 2nd Revised Edition. Bios, 2001

Experts Members (Name & Signature)			
S.No.	Name	Designation	Signature
1	Dr. Kiran Billore	Chairman	
2	Dr. A. Nighojkar	VC Member	
3	Dr. Bhavesh Patel	Subject Expert	
4	Dr. R K Garg	Subject Expert	
5	Mr. Nitesh Jasani	Representative from Industry	
6	Dr. Rekha Sharma	Member	
7	Mrs. Farida Johar	Alumni	

Department of Zoology

Class : M.Sc. II Sem.
Subject : Zoology
Paper: Core 7
Title of the paper - Tools and Technique's

Marks: 75 + (CCE) 25 = 100
Credit : 4

Code of the paper : ZO23

Part A : Introduction for Code ZO (M.Sc. II Sem. VII Paper)		
1	Pre- requisite (if any)	B.Sc. in Biology including Zoology
2	Course Objectives	Knowledge regarding Tools and Technique's
	Course Learning outcomes	On completion of the course, the student is expected would be able to get the Knowledge and Understand the basic principles, working and Applications of - 1 Explain Microscopy, Colorimetry, Chromatography and of related instruments.
		-2 Demonstrate Microbiological, Cytological, Histological, Molecular biological techniques
		-3 To understand of basic principles, application and types of Radioactivity, demonstrate Immunological Surgical Immunodetection techniques.
		-4 To Learn different mode of application of microtome and cell culture techniques.
		-5 To be familiarized to cytological and molecular biological techniques.

Part B : Content of the Course

Department of Zoology

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

M.Sc. II Semester (Zoology) Session 2021-22

PAPER – 7 : Tools and Techniques in Biology (ZO23)

Max. Marks: 25 (CCE)+ 75(Th.) = 100
Min. Marks: 10 (CCE) + 30 (Th.) = 40
Credits – 4

Unit - I	1. General Principle, Instrumentation and applications of a) Colorimeter b) Spectrophotometer c) Flame photometer d) Light, Electron microscope and phase contrast microscope 2. Separation techniques:- a) Centrifugation – Ultracentrifugation, Density gradient & differential Centrifugation. b) Chromatography- Principle and Applications of Paper, TLC, Affinity, Gel and HPLC. c) Electrophoresis – Principles and Applications of PAGE and Agarose gel electrophoresis.
Unit-II	1. Microbiological Techniques:- a) Types of Bacterial culture media and sterilization. b) Inoculation Methods. c) Microbial assay of vitamins and amino acids. d) Different Staining techniques for Bacterial identification. e) Basic design and Applications of Fermentor. 2. Cryotechniques a) Cryopreservation of cells, tissues, organs and organisms. b) Freeze fracture and freeze drying method.
Unit-III	1. Radioactivity:- a) Types and applications of different Radioisotopes . b) Measurement of radioactivity. c) Autoradiography. 2. Immunological techniques and its applications:- a) Immunodiffusion (single and double). b) Immunoelectrophoresis. c) Immunofluorocence & Immunoblotting. d).ELISA & RIA.
Unit-IV	1. Microtomy a) Types of microtomes b) Fixatives & fixation of tissue c) Dehydration of tissue and paraffin block preparation d) Sectioning, stretching & staining (Single & Double) 2. Cell culture techniques. a) Design and functioning of tissue culture laboratory b) Essential components and Preparation of tissue culture media.
Unit-V	1. Cytological techniques a) Karyotyping & Giant chromosome. b) Chromosome banding techniques (G,C,Q, R, banding) c) Flow cytometry. 2. Molecular biology techniques a) Insitu hybridization (FISH and GISH), b) Southern and northern hybridization. c) DNA Sequencing methods., (d) Polymerase Chain reaction (PCR):- Principle, procedure & applications.

(Dr. Lata Bhattacharya)
Subject Expert

(Dr. Sushma Choudhary)
Subject Expert

(Dr. Kirti Trivedi)
VC Member

(Dr. Purnima Khatri)
Industrial Member

(Dr. Rekha Sharma)
Chairman & Head

(Miss Harshita Panchal)
Student representative

Part C : Learning Resources
Text Book, Reference Books, Other resources - 1. Text book of Principles and Techniques of Biochemistry and Molecular Biology– Keith Willson and Jon Walker, 2. Principles and Techniques of Practical Biochemistry -Peter N. Campbell, Anthoni D. Smith, 3. Biophysical chemistry – Upadhayay and Nath.

Part D – Assessment and Evaluation		
Suggested Continuous Evaluation Methods : By Presentation, PPT, By Test, By written Exam Maximum Marks : 100 Continuous Comprehensive Evaluation (CCE): 25 External Exam (EE) : 75		
Internal Assessment: Continuous Comprehensive Evaluation (CCE) : 25	Class Test Assignment/Presentation	25
External Assessment: External Exam : 75 Time : 3 hours	75	75
.		100

Department of Zoology

Class : M.Sc. III Sem.
Subject : Zoology
Paper: Elective 2/1
Title of the paper - Aquaculture

Marks: 75 + (CCE) 25 = 100
Credit : 4

Code of the paper : ZO34A

Part A : Introduction for Code ZO (M.Sc. III Sem. XII Paper) (Elective -2)		
1	Pre- requisite (if any)	B.Sc. in Biology including Zoology
2	Course Objectives	To import knowledge about Aquaculture.
	Course Learning outcomes	On completion of the course, the student is expected to be able to Knowledge and Understanding of – 1 Aquaculture Special reference to fisheries science.
		-2 Fish, Prawn, Mussel, Oyster and Frog Culture.
		-3 New techniques related to fish culture and transport of fish.
		-4 To prepare fish farm related information & fish preservation technique.
		-5 Fish related diseases and fish marketing.

(Dr. Lata Bhattacharya)
Subject Expert

(Dr. Ruchira Choudhary)
Subject Expert

(Dr. [illegible] Tiwari)
VC Member

(Dr. Rakha Sharma)
Chairman & Head

(Miss Harshita Panchal)
Student representative

Part B : Content of the Course

Department of Zoology
Govt. Holkar (Model, Autonomous) Science College, A.B. Road, Indore
M.Sc. III Semester Session 2021-22

Paper -12 : Aquaculture (Elective- 2) (ZO34A)

Max. Marks: 25 (CCE)+ 75(Th.)= 100
Min. Marks: 10 (CCE) + 30 (Th.) = 40
Credits – 4

Unit-1	1. Aquaculture: history, definition, scope & importance. 2. Fishery resources of India in general & Madhya Pradesh in particular. 3. Abiotic & biotic factors of water necessary for fish life. 4. Ecological characteristics of lakes & rivers. 5. General ecological characteristics of reservoirs of India.
Unit-2	1. Fish culture:- Mono, Poly, mixed and composite Fish culture. 2. Fresh water prawn culture and its prospects in India. 3. Culture of Mussels, clams, oysters & pearl oysters. 4. Sewage fed fish culture, paddy cum fish culture 5. Frog culture.
Unit-3	1. Stripping and bundh breeding 2. Hypophysation and breeding. 3. Transport of live fishes & seeds. 4. Different types of crafts & gears used for fish catching. 5. Common weeds of fish ponds and methods of their eradication.
Unit-4	1. Fresh water fish farm engineering: selection of site, construction of fish farm & soil chemistry. 2. Designing, layout & construction of different types of fish ponds. 3. Fresh water aquarium - Setting and management of fresh water aquarium. 4. Fish preservation & processing. 5. By products of fish Industry & their utility.
Unit-5	1. Water pollution, its effects on fisheries and methods of its abatment. 2. Bactrial and viral diseases in fishes and their control. 3. Proftozoan and Helminthes diseases in fishes and their control. 4. Biochemical composition and nutritional value of fish. 5. Fish marketing.

(Dr. Lata Bhattacharya)
Subject Expert

(Dr. Ruchira Choudhary)
Subject Expert

(Dr. A. K. Tiwari)
VC Nominee

(Dr. Rekha Khare)
Industrial Member

(Dr. Rekha Sharma)
Chairman & Head

(Miss Manisha Panchal)
Student representative

Part C : Learning Resources
Text Book, Reference Books, Other resources – 1. C.B.L. Shrivastava : Fishes of India, 2. Jhingaran : Fish and fisheries of India, 3. S.S. Khanna : An Introduction to fishes, 4. R.S. Rath : Fresh water Aquaculture, 5. Gopalji Shrivastava : Fishes of U.P. & Bihar

Part D – Assessment and Evaluation		
Suggested Continuous Evaluation Methods : By Presentation, PPT, By Test, By written Exam Maximum Marks : 100 Continuous Comprehensive Evaluation (CCE): 25 External Exam (EE) : 75		
Internal Assessment: Continuous Comprehensive Evaluation (CCE) : 25	Class Test Assignment/Presentation	25
External Assessment: External Exam : 75 Time : 3 hours	75	75
		100

(Dr. Lata Bhattacharya)
Subject Expert

(Dr. Ruchira Choudhary)
Subject Expert

(Dr. Kirti Tiwari)
VC Member

(Dr. Rashma Khatri)
Industrial Member

(Dr. Rekha Sharma)
Chairman & Head

(Miss Harshita Panchal)
Student representative

Department of Zoology

Class : M.Sc. IV Sem.
Subject : Zoology
Paper: Elective 4/1
Title of the paper - Pisci Culture and Economic Importance of Fishes

Marks: 75 + (CCE) 25 = 100
Credit : 4

Code of the paper : ZO44A

Part A : Introduction for Code ZO (M.Sc. IV Sem. XVII Paper) (Elective – 4)		
1	Pre- requisite (if any)	B.Sc. in Biology including Zoology
2	Course Objectives	To import knowledge about Pisci Culture and Economic Importance of Fishes
	Course Learning outcomes	On completion of the course, the student is expected to be able to Knowledge and Understanding of – 1 Different methods of fish breeding.
		-2 Management of Ponds for fish culture.
		-3 Prawn, Pearl and Composite fish Culture. Fishery resources of M.P. and India.
		-4 offshore, coastal and Deepsea fisheries of India
		-5 Role of Fisheries in Rural development.

(Dr. Lata Bhattacharya)
Subject Expert

(Dr. Ruchira Choudhary)
Subject Expert

(Dr. K.K. Tiwari)
VC Nominee

(Dr. Sharma Khatri)
Industrial Member

(Dr. Rekha Sharma)
Chairman & Head

(Miss Harshita Panchal)
Student representative

Part B : Content of the Course

Department of Zoology

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

M.Sc. IV Semester Session 2021-22

Paper-17: Pisci Culture and Economic Importance of Fishes (Ichthyology) (Elective -4) (ZO44A)

Max. Marks: 25 (CCE)+ 75(Th.)= 100
Min. Marks : 10 (CCE) + 30 (Th.) = 40
Credits – 4

Unit-I	1. Collection of fish seed from natural resources. 2. Streeping method of breeding. 3. Dry bundh breeding of carps. 4. Wet bundh breeding of carps. 5. Hypophysation and breeding of Indian major carps.
Unit-II	1. Drugs/hormones useful in induced breeding of fish. 2. Types of ponds required for fish culture. 3. Management of hatcheries and nurseries. 4. Management of rearing ponds and stocking ponds.
Unit-III	1. Composite fish cultures 2. Prawn culture techniques. 3. Pearl culture technique. 4. Fisheries resources of MP 5. Riverine fisheries in India and their problems.
Unit-IV	1. Costal fisheries in India, its problems and solution. 2. Offshore and deep sea fisheries of India, its problems and solution. 3. Role of fisheries in rural development 4. Sewage fed fisheries
Unit-V	1. Methods of fish preservation 2. Marketing of fishes in India. 3. Economic importance and by product of fishes 4. Shark liver oil, its characteristics, manufacture and importance. 5. Transport of live fish & fish seed.

Part C : Learning Resources
Text Book, Reference Books, Other resources - C.B.L. Shrivastava : Fishes of India, Jhingaran : Fish and fisheries of India, S.S. Khanna : An Introduction to fishes, R.S. Rath : Fresh water Aquaculture, Gopalji Shrivastava : Fishes of U.P. & Bihar, Fish and Fisheries – Shukla & Pandey

Part D – Assessment and Evaluation		
Suggested Continuous Evaluation Methods : By Presentation, PPT, By Test, By written Exam Maximum Marks : 100 Continuous Comprehensive Evaluation (CCE): 25 External Exam (EE) : 75		
Internal Assessment: Continuous Comprehensive Evaluation (CCE) : 25	Class Test Assignment/Presentation	25
External Assessment: External Exam : 75 Time : 3 hours	75	75
		100

Part A: Introduction for Code:

Govt. Holkar (Model, Autonomous) Science College, Indore	
Department of Forensic Science	
SYLLABUS SESSION – 2021-2022	
M.Sc. – 1st SEMESTER	
Title of the Paper (Course): **Forensic Medicine** **Course Code: FS-12**	
Course Objective	
1: To understand the basic concept of forensic medicine and legal procedures. 2: To have knowledge of personal identity traits, post-mortem examination, injuries and different modes of death.	
Course Outcomes - After completion of this paper students will come to-	
C01	Describe the Forensic medicine and legal procedures of court.
C02	Link the parameters to fix personal identity.
C03	Relate the post-mortem changes & their medico legal importance.
C04	Interpret the death and its Medico-legal Aspect
C05	Illustrate Post-mortem examination and sexual offences.
Part B: Content of the Course	
Unit 1	**Forensic Medicine**: Definition of Forensic Medicine and Medical Jurisprudence, Brief knowledge about legal procedure in court, inquest, Subpoena & oath of medical expert, Criminal court and their powers Recording of medical expert evidence in courts. Professional Negligence, Types of medical evidence, Kinds of witness and rules for giving evidence.
Unit 2	**Personal Identity**: Definition and importance, parameters contributing to personal identity- Race, Sex, Age, Complexion, Features & Photographs, Anthropometry, Stature, Scar, Hair, Teeth, Wounds, Foetal Age, Bite Marks, Fingerprints, Footprints, Tattoo marks, Birth marks, Occupational Marks, Handwriting, Clothes and Ornaments, Voice & Speech, DNA, Disputed paternity.
Unit 3	**Wounds & Injuries:** Introduction, its types, Mechanical Injury- Abrasion, Contusion, Laceration, Incised wound, Stab, Self-inflicted and fabricated, Firearm Injury, Bomb explosion wounds. **Regional Injuries:** Head Injury, Skull, Traffic Accident, Air craft, Boxing, Railway, Mass-Disasters. Medico-Legal aspects, post mortem &ante mortem wounds: General characteristics of injuries from cold, heat, burns, scalds, lightning, electricity and radiation, Forensic Importance of Wounds.
Unit 4	**Death and its Medico- legal aspects**: Modes of death (Coma, Syncope, Asphyxia), Sudden death, **Post – Mortem Changes**: Cessation of vital functions, Changes in the Eyes, Skin and muscles. Temperature, post- mortem lividity, Rigor mortis,

	Decomposition, Adipocere, Mummification, Post-mortem Interval, Estimation time since death. Mechanical Asphyxia: Hanging and its types, Ligature marks and its examination, Strangulation, Bansadola, Garroting, Mugging, Suffocation, Gagging, Choking and Café coronary. **Traumatic Asphyxia:** Burking, Postural Asphyxia, Sexual Asphyxia, Drowning (Ante Mortem and Post Mortem)
Unit 5	**Post-Mortem Examination:** Importance, external & Internal examination in brief, Viscera & its preservation, Examination of decomposed and mutilated bodies, Exhumation, Cause of death **Sexual Offences:** Sexual offences, Virginity and Pregnancy

27.11.2021

Part C : Learning Resources:
1. Modi J. S. : Medical Jurisprudence and Toxicology.
2. Taylor : Medical Jurisprudence
3. Parikh C.K. : Chikitsa Nyaya Shastra Aur Vish Vigyan.
4. Kieth Simpsen & Bernard Knight : Forensic Medicine
5. Poison : CJ, DJ, Gee, B. Knight : Forensic Medicine
6. Reddy : Forensic Medicine

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Part D – Assessment and Evaluation		
Suggested Continuous Evaluation Methods: By Presentation, PPT, By Test, By written Exam Maximum Marks: 100 Continuous Comprehensive Evaluation (CCE): 25 External Exam (EE): 75		
Internal Assessment: Continuous Comprehensive Evaluation (CCE): 25	Class Test Assignment/Presentation	25
External Assessment: External Exam: 75 Time: 3 hours	75	75
		100

27.11.2021

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Part A: Introduction for code:

Govt. Holkar (Model, Autonomous) Science College, Indore	
Department of Forensic Science	
SYLLABUS SESSION: 2021-2022	
M.Sc. – 1st SEMESTER	
Title of the Paper (Course): Instrumental Method – Physical **Course Code: FS-14**	
Course Objective	
1: To be familiar with the process of calibration, qualitative and quantitative analysis.	
2: To understand working of different instruments for forensic aspects.	
Course Outcomes- After completion of these paper students will come to-	
C01	Illustrate different spectroscopic techniques.
C02	Understand the basic concept of Atomic and Molecular Spectroscopy
C03	Illustrate the principle and instrumentation of UV- VIS and IR techniques.
C04	Explain Atomic absorption/ Emission and X- ray Spectroscopy
C05	Describe Radio Chemical Techniques
Part B: Content of the Course:	
Unit 1	**Basic Concept of Spectroscopy:** General idea on Spectroscopy, it's classification, Electromagnetic spectrum (Radiation Chart), Characteristics of radiation and their units, Dual nature of Electromagnetic Radiation, Sources of radiation, their utility and limitations, Interaction of radiation with matter: Reflection, Refraction, Dispersion, Diffraction, Scattering, Transmission, Interference and Polarization. Photoelectric effect.
Unit 2	**Basic Concept of Atomic and Molecular Spectroscopy** Absorption and Emission spectrum & their representation. Atomic energy level diagram, Molecular energy level diagram. **Types of Molecular energy:** Translational, Electronic transitional, vibrational and rotational energy their classical and quantum equation. **Types of Molecular Spectra:** Electronic, vibrational, rotational, ESR, NMR, Raman and Mossbauer spectra, Basic instrumental setup of spectrophotometer.
Unit 3	**General Principles**: Laws of absorption- Grothus-Draper Law, Lambert Law, Beers Law, Deviation from Beer's law **UV:** Range of radiation, sources used, electronic energy level diagram, types of transition, representation of UV spectra, measurement of UV spectra, Chromophore and auxochromes, types of absorption bands. Schematic diagram of general UV instrument, Qualitative and quantitative Forensic applications of UV- Visible Spectroscopy **Infrared Spectroscopy:** Range of IR spectra, source of radiation, representation of IR spectrum, degree of freedom for polyatomic molecule, normal modes of vibrations, schematic diagram of general IR instrument, measurement of IR spectra, Forensic applications of IR spectroscopy. **FTIR**: Principle, Instrumentation with Schematic diagram, Qualitative and Quantitative Forensic Applications

Unit 4	**Atomic absorption/ Emission and X- ray Spectroscopy** **Atomic Absorption Spectroscopy:** Principle, Instrumentation and technique, Interference in AAS, correction methods, advantages of AAS over emission spectroscopy, disadvantages of AAS, Forensic application of AAS. **Atomic Emission Spectroscopy:** Principle, Instrumentation and technique, Arc/spark emission, Forensic application of AES, advantages and disadvantages of AES. **X-ray techniques-** Introduction, Basic Instrumentation and Forensic Importance of X-ray Absorption, X-ray Fluorescence Spectroscopy **EDX- ray Spectroscopy:** Principle, Instrumentation with schematic diagram, working and Qualitative and Quantitative Forensic Applications.
Unit 5	**Radio Chemical Techniques:** Basic Principle and Theory, Nature of α, β and γ radiation, α- rays change, β- rays change, Radioactive decay process, rate of radioactive disintegration and half-life (Decay Law), radiation detectors, Neutron source, Neutron Activation Analysis, Radio carbon and it's techniques, **Nuclear Magnetic Resonance Spectroscopy:** Basic Principle and instrumentation. **ICP-MS**: Principle, Instrumentation, with Schematic Diagram, Working, Forensic Applications

27.11.2021

Part C : Learning Resources
1.James W. Robinson; Atomic spectroscopy, 2nd Edn. Revised & Expanded, marcel Dekkar, inc. NY. (1996)
2.N. Subrahmanyam & Brij Lal: A text book of optics, S. Chand & Co. (2004)
3. Hobart H. Willard, Lynne L. Merrett Jr. John A Dean Frank A. Settle Jr; Instrumental Method of Analysis, 7th Edn, CBS pub. & Distributors (1986)
4. K.C. Thompson & R.J. Renolds: Atomic Absorption Fluorescence & Flame Emission Spectroscopy, A practical approach, 2nd Edn. Charles Griffin & Co. (1978)
5. Robert M. Silverstein & Francis X Websters; Spectrometric Identification of Organic Compounds, 6th Edn., John Wiley & Sons, inc. (1997)
6. P.S. Kalsi V.B. Patania; Spectroscopy, Campus books International, (2004)
7. P.S. Kalsi V.B. Patania; Spectroscopy, Campus books International, (2004)
8. D.R. Khanna & H.R. Gulati; Fundamentals of Optics, Geometrical Physical & Quantum, 20th Edn., R. Chand & co. (2002)
9. R.S. Khandpur; Handbook of Analytical Instruments, Tata McGraw Hill Pub. Co. New Delhi (2004)
10. John A. Dean; Analytical Chemistry Handbook McGraw Hill Inc. (1995)

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Part D – Assessment and Evaluation		
Suggested Continuous Evaluation Methods: By Presentation, PPT, By Test, By written Exam Maximum Marks: 100 Continuous Comprehensive Evaluation (CCE): 25 External Exam (EE): 75		
Internal Assessment: Continuous Comprehensive Evaluation (CCE): 25	Class Test Assignment/Presentation	25
External Assessment: External Exam: 75 Time: 3 hours	75	75
		100

27.11.2021

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Part A: Introduction for code:

Govt. Holkar (Model, Autonomous) Science College, Indore	
Department of Forensic Science	
SYLLABUS SESSION: 2021-2022	
M.Sc. – 2nd SEMESTER	
Title of the Paper (Course): Forensic Toxicology and Pharmacology Course Code: FS-24	
Course Objective:	
1: To know about the poisoning and classification of poisons. 2: To learn the methods of post-mortem.	
Course Outcomes- After completion of this paper students will come to-	
C01	Understand different types of poisons.
C02	Illustrate Extraction and Isolation Procedure of Poisons
C03	Explain drug of abuse and its analysis process.
C04	Describe pharmacological pathway of drugs.
C05	Summarize Pharmacological Studies and Analyse Vegetable poisons
Part B : Content of the course:	
Unit 1	**Forensic Toxicology:** Introduction, Concept and Significance Poisons: Definition, classification of poison, Types of poisoning, sign and symptoms of poisoning, mode of action, Route of Administration and excretion, factors modifying the action of poisons, Toxicological exhibits in fatal and survival cases, their preservation, Treatment in cases of poisoning, Analysis report.
Unit 2	**Extraction, Isolation and clean- up procedures**: Extraction of Volatile Poisons; Distillation. **Extraction of Toxic metals in matrices:** Dry Ashing, Wet Digestion, Fresenium and Babo Method, Selective Chemical Treatment **Extraction of Toxic anions in Matrices**: Protein precipitation, Dialysis and Microdiffusion, Total Alcohol Extract. **Extraction of drugs and plant poisons in matrices**: Stas-otto, Ammonium Sulphate method, Tungstate methods, acid digest method. **Extraction of Pesticides** from matrices, urine, vomit, blood, fruits, vegetables and butter fat, Head space procedure and various clean-up procedures
Unit 3	**General Study and Analysis**: Collection, Preservation and Packaging of drugs at scene and their identification and quantitative estimation. Non-Volatile Organic Poisons: Pesticides, Rodenticides, Bactericides, Fungicides, Larvicides, with their active compounds and salient features. Toxic Cations and Anions: Source, Toxicity, Characteristics, Detection and Determination of Mercury, Arsenic, Lead, bismuth, Copper, Aluminium. Iron, Barium, Zinc.
Unit 4	**Volatile poisons and Irrespirable gases:** **Volatile Poisons:** Chemical name, Source, Physical properties and other characteristics of forensic interest.

	Irrespirable gases: Carbon monoxide, Carbon Dioxide, Hydrogen sulphide, Sulphur dioxide, Chlorine, Nitrous oxide, Methane. Methylisocyanide. War gases. Ammonia, Tear gas, Phosgene, Mustard gas. Quantitative estimation of carbon mono oxide in blood. Quantitative estimation of ethyl alcohol in blood and urine.
Unit 5	**Forensic Pharmacological studies**: Pharmacokinetics; Concept of Pharmacokinetics, Absorption, Distribution, Metabolism and excretion, Adverse drug interactions, post-mortem redistribution. Alkaloids: Definition, Classification and general characteristics and analysis Vegetable Poisons: Opium, Dhatura, Marking nut, Nux Vomica, Oleander, Aconite, Argemone Mexicana, croton, calotropis, cannabis, Erythroxylon coca, Ergot, Nerium, Plumbago, Semecarpous anacardium, Thevetia peruviana. Animal Poisons: Snake, Scorpions, Cantharides, Insects and other animal toxins

27.11.2021

Part C: Learning Resources:
1. Stolemen: Progress in Chemical Toxicology: Acad. Press, New York, (1963).
2. Cravey, R.H., Baselt, R.C.: Introduction to Forensic Toxicology, Biochemical publications. Davis C A, (1981).
3.Curry, A.S.: Poison Detection in Human Organs, C. Thomas Springfield, Illinois USA, (1963).
4.Gleason, M.N. et.al: Clinical Toxicology of Commercial products, Williams and Williams, Baltimore, USA, (1969).
5.Sunshine, I.: Guidelines for Analytical Toxicology Programme, Vol. I, CRC Press, USA, (1950.
6.Sunshine: Methods of Analytical Toxicology, CRC Press USA, (1975).
7.Working Procedure Manual – Toxicology, BPR&D Publication, (2000).
8.Saferstein: Forensic Science Handbook, Vols. I, II; (Ed); Prentice Hall, Eglewood Cliffs, NJ; (1988)
9.Modi, Jaishing P.: Textbook of Medical Jurisprudence & Toxicology, M.M. Tripathi Pub., (2001).
10.Parikh C.K. Textbook of Medical Jurisprudence, Forensic Medicines and Toxicology. CBS Pub. New Delhi (1999)

27.11.2021

Part D – Assessment and Evaluation		
Suggested Continuous Evaluation Methods: By Presentation, PPT, By Test, By written Exam Maximum Marks: 100 Continuous Comprehensive Evaluation (CCE): 25 External Exam (EE): 75		
Internal Assessment: Continuous Comprehensive Evaluation (CCE): 25	Class Test Assignment/Presentation	25
External Assessment: External Exam: 75 Time: 3 hours	75	75
		100

27.11.2021

Part A: Introduction for code:

Govt. Holkar (Model, Autonomous) Science College, Indore	
Department of Forensic Science	
SYLLABUS SESSION: 2021-2022	
M.Sc. – 3rd SEMESTER	
Title of the Paper (Course): Instrumental Methods- Biological	**Course Code: FS-32**
Course Objective	
1: To know about different instruments related to Biological Analysis. 2: To know Applied Genetic Engineering and higher detection biological methods.	
Course Outcomes- After completion of this paper students will come to-	
CO1	Understand cell and tissue culture methods
CO2	Describe centrifugal techniques
CO3	Explain Enzymatic and Radio-labelling Techniques.
CO4	Illustrate Histochemical and Immunochemical techniques.
CO5	Describe Applied Genetic Engineering
Part B: Content of the Course:	
Unit 1	**Biochemical Analysis:** pH, buffer, Cytological Techniques, Cell and Tissue Culture Methods (Plant and animal) Cell fractionation, Perfusion and homogenization of the tissue, Flow Cytometry, Biological Staining Techniques for Microbes and Plants, Culture Media techniques, Colorimetry, Karyotyping (Cytogenetic Techniques)
Unit 2	**Centrifugal Techniques** Centrifugation - Basic Principles, Relative Centrifugal Force, Sedimentation coefficient **Types of centrifuges:** Micro Centrifuge (High speed and Ultra centrifuge), preparative centrifuge (differential and density gradient) and Analytical Centrifuge, Applications-Isolation of Cell Components
Unit 3	**Enzymatic Methods of Analysis:** Principle of Catalysis, Purification and Protein Estimation (Lowry Protein Assay), Protein-Protein Interaction Assay, Protein Staining, Protein Imaging **Enzyme Assay Techniques**: UV-Visible Spectrophotometer, Luminescence method, Immuno-chemical method, Automated enzymes analysis, Immobilized enzymes. **Radio-labelling Techniques:** Detection and Measurement of different types of Radio Isotopes normally used in biology
Unit 4	**Histochemical and Immunochemical Techniques** General principles, precipitation reaction, Gel Immunodiffusion, Immune-electrophoresis, complement fixation, Antibodies Generation Detection of molecule used in RIA, ELISA, Western Blot, Immuno-precipitation, Fluocytometry, Immuno- fluorescence Technique
Unit 5	**Applied Genetic Engineering** Concept of recombinant DNA Technology and purpose, basic methodology, use of Plasmids, Restriction Endonucleases, Linkers, Adapters, Ligation.

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27.11.2024

	Hybridization Techniques: Northern, Southern, Colony Hybridization **Primer Design**: Construction of cDNA libraries in Plasmids

27.11.2021

Part C: Learning Resource:
1. Keith Wilson & John Walker; Practical Biochemistry- Principles & Techniques, 5th Edition, Cambridge University Press 2000.
2. David. L. Nelson & Michael M, Cox Lenninges; Principles of Biochemistry, 4th edition, Freeman Pub. 2005.
3. Fundamental immunology William E. Paul
4. Thomas J. Kindt, et. al. Kuby Immunology, 6th edition 2001
5. Principles of enzymology by Trevor & Palmer
6. Vogel's Text Book of Quantitative Chemical Analysis by G. H. Jeffery, J. Bassett, J.
7. Mendham and R. C. Denney, 5th Edition, Longman Scientific & Technical.
8. Molecular biology by T.A. Brown

Part D – Assessment and Evaluation		
Suggested Continuous Evaluation Methods: By Presentation, PPT, By Test, By written Exam Maximum Marks: 100 Continuous Comprehensive Evaluation (CCE): 25 External Exam (EE): 75		
Internal Assessment: Continuous Comprehensive Evaluation (CCE): 25	Class Test Assignment/Presentation	25
External Assessment: External Exam: 75 Time: 3 hours	75	75
		100

27.11.2021

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Part A: Introduction for code:

Govt. Holkar (Model, Autonomous) Science College, Indore	
Department of Forensic Science	
SYLLABUS SESSION: 2021-2022	
M.Sc. – 3rd SEMESTER	
Title of the Paper (Course): Finger Prints, Impressions and their Examination **Course Code: FS-33-B**	
Course Objective 1: To know the classification and analysis of fingerprint. 2: To know about the chemical and physical method of analysis of fingerprint and other impressions.	
Course Outcomes- After completion of this paper students will come to-	
CO1	Explain history and development of Finger Prints
CO2	Illustrate the classification of Finger prints
CO3	Describe Fingerprint Developing Methods
CO4	Illustration Fingerprints of Living and Cadaver
CO5	Describe the examination of Foot, Footwear and other impressions
Part B: Content of the Course:	
Unit 1	History and development of Fingerprints composition of sweat, formation of ridges, ridge characteristics pattern types, pattern area. Focal Point, Type lines, Ridge count, Destruction of patterns.
Unit 2	**Classification of fingerprints**: Henry System of Classification, Secondary Classification Small Letter group, Sub-secondary classification, Final classification, Major and Key classification, Single digit classification, Search of fingerprints, Fingerprint Bureau.
Unit 3	Chance Fingerprints, Latent and Visible fingerprints, Plastic Fingerprints, Development of latent fingerprints, conventional methods of development of latent fingerprints-fluorescent method, magnetic powder method, fuming method, chemical method etc., digital imaging and enhancement, application of laser and other radiation to develop latent fingerprints, metal deposition method and development of latent prints on skin.
Unit 4	Taking of fingerprints from living and dead persons, preserving and lifting of fingerprints, photography of fingerprints, digital transmission, comparison of fingerprints, basis of comparison, class characteristics, Automatic fingerprint identification system.
Unit 5	**Foot and Footwear prints**: Importance, Gait pattern, casting of footprints in different medium, electrostatic lifting of latent footprints, Taking of control samples and examination. Tyre marks/prints and skid marks, taking of control samples and examination. **Lip prints**- Nature, location, collection and evaluation. **Bite Marks**- Forensic Significance, Photography, Lifting and preservation of bite marks and evaluation. **Ear Prints**- Forensic Significance, location, collection and evaluation.

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Part C: Learning Resources:
1. David R. Ashbaugh: Quantitative and Qualitative Friction ridge analysis, CRS press, (1999)
2. E. Ronald Menzel: Fingerprint Detection with Lasers, Second edition: Marcel Dekker, Inc. USA, (1999)
3. James F. Cowger: Friction Ridge skin CRC Press London, (1993)
4. Mehta M.K.: Identification of Thumb Impression & cross Examination of finger prints, N.M. Tripathi (P) Ltd. Bombay (1989)
5. Moenssens: Finger Prints Techniques, Chitton Book Co. Philadelphia, New York. (1975)
6. Chatterjee S.K., Speculation in Finger print Identification, Jantralekha Printing works, Kolkata, (1981).
7. Cowger, James F: Friction ridge skin: Comparison and Identification of fingerprints: CRC Press, Boca Raton, New York, (1993)
8. Cook Nancy: Classifying fingerprints- Innovative learning publication Mentro Park (1995)
9. Cossidy, MJ.: footware Identification, Royal Canadian Mounted Police, Ontario, Canada (1980)
10. J.A. Seigel, P.J saukoo and G C Knupfer: Encyclopedia of Forensic Sciences Vol. I, II and III, Acad. Press (2000)
11. Smith, B.C, Holland MM, Sweel, DL and Dizinno. A: DNA and Forensic Odontology, Colorado Springs, USA, (1995)
12. Hillison, S: Dental Anthropology, Cambridge Univ. Press, UK (1996)
13. Kasprzak, J: Possibilities of Cheiloscopy in Forensic science (1980)
14. Medlin H O: Ear print Identification, Solve Crime Military Police Journal (1967)
15. Iannarelli, A V: Ear print Identification, Forensic Identification series, Paramount (1989)
16. Henry C. Lee & R.E. Ganesslen, Advance in Finger print Technology, ~ RC press, Boca Raton, London, (1991)

Part D – Assessment and Evaluation		
Suggested Continuous Evaluation Methods: By Presentation, PPT, By Test, By written Exam Maximum Marks: 100 Continuous Comprehensive Evaluation (CCE): 25 External Exam (EE): 75		
Internal Assessment: Continuous Comprehensive Evaluation (CCE): 25	Class Test Assignment/Presentation	25
External Assessment: External Exam: 75 Time: 3 hours	75	75
		100

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Part A: Introduction for code:

Govt. Holkar (Model, Autonomous) Science College, Indore	
Department of Forensic Science	
SYLLABUS SESSION: 2021-2022	
M.Sc. – 4th SEMESTER	
Title of the Paper (Course): Forensic Psychology	**Course Code: FS-43-B**
Course Objective	
1: To know the basic term of forensic psychology. 2: To know different psychometric assessment test and their application.	
Course Outcomes- After completion of this paper students will come to-	
CO1	Summarize history, ethics, scope of forensic psychology.
CO2	Illustrate Psychopathology and abnormal behaviour
CO3	Describe Investigative Techniques
CO4	Explain juvenile delinquency.
CO5	Interpret elements mental illness and their analysis.

Part B: Content of the course:

Unit 1	**Basics of Forensic Psychology:** Introduction, Definition of Forensic Psychology. History and Development of Forensic Psychology, scenario in India. Scope of Forensic Psychology, Ethics of Forensic Psychology, functions and role of forensic psychologist. Forensic Psychologists as an Expert.
Unit 2	**Psychopathology & Abnormal Behavior:** Theories of Offending, Gender & Crime, Ethnicity & Crime. Effect of Media. Terrorism & the related psychological aspects. **Psychometric Assessment tools used in Forensic Psychology:** Intelligence Tests, Achievement and Aptitude Tests, Personality Tests, MMPI Test, Rorschach Test, Thematic Apperception Test, Neuropsychological tests, Nature of Crime (Organized, Disorganized, Planned, Spontaneous), Crime Scene Analysis, Psychological Autopsy, Stages and Types of Offender Profiling. Behavioral Analysis, Serial Killers, Signature, Modus Operandi, Portrait Parley.
Unit 3	**Investigative Techniques:** **Polygraphy**: Basics of Polygraphy, Polygraphic Examination (the Pre-test Interview and Questioning Technique), Physiological and Physiological Stress Evaluator and their Admissibility in Courts, Merits and Limitations of Polygraphy **Brain Mapping:** Basics of Brain Mapping, Equipment and Procedure of Brain Mapping. **Narco-Analysis**: Basics of Narco-Analysis, Requirements and procedure, admissibility in courts, Merits and Limitations of Narco- Analysis
Unit 4	**Juvenile Delinquency:** Theories of Offending: Social Cognition, Moral Reasoning. Child Abuse: Physical, Sexual, Emotional Juvenile Sex Offenders Prevention of Delinquency

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Unit 5	**Elements of Forensic Psychiatry:** . Forensic Psychiatry: Introduction to different mental illnesses; neurosis (depression, mood disorder, Insanity, Psychosis, Delusion, delirium, schizophrenia), Impulsive control stress disorder, Anti-social personality disorder, psychopathy, Post traumatic stress disorder and post-partum stress disorder. Substance Abuse. Association between mental disorder and crime. Mc Naughten rule, diminished responsibility, testamentary capacity, competency Evaluation

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Part C: Learning Resources
1. Introduction to Forensic Psychology' by Bruce Arrigo
2. Forensic & Criminal Psychology' by Dennis Howitt.
3. Abnormal Psychology' by Halgin & Whitbourne.
4. Abnormal Psychology', by Robert C. Carson, James N. Butcher, Susan Mineka, Jill M. Hooley thirteenth Edition, Thirteenth Edition.
5. Encyclopedia of Forensic Science' by Jay A. Siegel, PekkaJ. Saukko, Geoffey C. Knupfer, Volume-1 to Volume-5.
6. Mental Disorders and Treatment' by Katherine Marsland.
7. Handbook of Forensic Psychology' by Prof. Dr. Vimala Veeraraghavan.
8. Criminal Profiling and Introduction to Behavioural Evidence Analysis' by Brent Turve, Second Edition.
9. Diagnostic & Statistical Manual-IV TR, American Psychological Association.
10. Psychological Testing' by Anne Anastasi, Susana Urbina, Seventh Edition.

Part D – Assessment and Evaluation		
Suggested Continuous Evaluation Methods: By Presentation, PPT, By Test, By written Exam Maximum Marks: 100 Continuous Comprehensive Evaluation (CCE): 25 External Exam (EE): 75		
Internal Assessment: Continuous Comprehensive Evaluation (CCE): 25	Class Test Assignment/Presentation	25
External Assessment: External Exam: 75 Time: 3 hours	75	75
		100

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Part A; Introduction for code:

Govt. Holkar (Model, Autonomous) Science College, Indore	
Department of Forensic Science	
SYLLABUS SESSION: 2021-2022	
Class – M.Sc. – 4th SEMESTER	
Title of the Paper (Course): Biometrics	**Course Code: FS-44-A**
Course Objective	
1: To know about the permanent parameter of identification of human. 2: To know the advance science of investigation.	
Course Outcomes- After completion of this paper students will come to-	
CO1	Define biometric techniques
CO2	Illustrate fingerprint and computerization of pattern& analysis.
CO3	Explain speaker and voice identification and analysis.
CO4	Identify Face recognition method.
C05	Describe Pattern Recognition & Biometrics
Part B: Content of the course:	
Unit 1	**Biometrics**: Definition, Scope, Types of biometric tool, Physiological or Behavioural, Verification Vs Identification, Applications, Biometrics Technologies, Working of Biometrics, Benefits, Application Design. Professional ethics and conduct of forensic expert, Dealing with news media.
Unit 2	**Fingerprint Recognition**: Fingerprint Scanning, Practical Applications for Fingerprint Scanning, Accuracy and Integrity, Fingerprint Matching, Fingerprint Classification, Fingerprint Image Enhancement, Fingerprint Feature Extraction, Fingerprint Form Factors, Types of Scanners: Optical - Silicon – Ultrasound, Fingerprint Matching.
Unit 3	**Speaker Recognition:** Algorithms for training, recognition and adaptation to speaker and transmission channel, mainly based on Hidden Markov Models (HMM), methods for reducing the sensitivity to external noise and distortion, acoustic modeling of static and time-varying spectral properties of speech, statistic modeling of language in spontaneous speech and written text, specific analysis and decision techniques for speaker recognition.
Unit 4	**Face Recognition:** Introduction, working, Image Quality, Facial Scan Process Flow, Verification v/s Identification, Primary Facial Recognition Technologies, Facial Recognition Application
Unit 5	**Other Advances** Pattern Recognition & Biometrics - Handprint Biometrics - DNA Biometrics Iris & retinal imaging, gait pattern, Digital Signatures, Pattern comparison, Computer simulation, Image processing, Image capturing, Image restoration & enhancement. Image editing, Compression Technique.

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Part C: Learning Resources
1. Samir Nanavathi, Michel Thieme, and Raj Nanavathi, "Biometrics -Identity verification in a network", Wiley Eastern, 2002.
2. John Chirillo and Scott Blaul," Implementing Biometric Security", Wiley Eastern Publications, 2005.
3. John Berger," Biometrics for Network Security", Prentice Hall, 2004.
4. Forensic Speaker Identification (2007) by Philip Rose
5. Bengold & Nelson Moryson – Speech and Audio signal Processing; John Wiley & Sons, USA, (1999)

Part D – Assessment and Evaluation		
Suggested Continuous Evaluation Methods: By Presentation, PPT, By Test, By written Exam Maximum Marks: 100 Continuous Comprehensive Evaluation (CCE): 25 External Exam (EE): 75		
Internal Assessment: Continuous Comprehensive Evaluation (CCE): 25	Class Test Assignment/Presentation	25
External Assessment: External Exam: 75 Time: 3 hours	75	75
		100

27.11.2021

Part A; Introduction for code:

Govt. Holkar (Model, Autonomous) Science College, Indore	
Department of Chemistry	
SYLLABUS SESSION : 2021-2022	
Class – M.Sc. – 4th SEMESTER	
Title of the Paper (Course): Medicinal Chemistry	**Course Code: CH-44-B**
Course Objective	
Medicinal Chemistry is the branch of chemistry that is related with synthesis, structure and its activity in the human body. It also signifies the structure activity relationship i.e. by changing the structure of the drug how its activity is altered.	
Different generations of drug are uses as microorganisms become immune with time, thus necessity of active new drug becomes prominent.	
The exact structure of the drug and the functional units present in it is clarified.	
Course Outcomes	
CO1	The basic knowledge of structure and its relation with its actively with the help of different theories is very important.
CO2	The study of enzymatic reactions and sulphur drugs help to know its effect on human body and mode of action.
CO3	The structure, synthesis of antibiotics helps to understand their effect on certain specific microorganisms.
CO4	Study of anti fungal and anti malarial drugs provide knowledge of their chemo therapeutic effect.
C05	Study of different classes of drug give information about their therapeutic uses.

Part B: Content of the course:

Unit 1	**Structure and activity :** Prodrugn and soft drug Relationship between chemical structure and biological activity (SAR). Receptor Site Theory. Approaches to drug design, stpes involved in design process. Introduction to combinatorial synthesis in drug discovery. Factors affecting bioactivity. Fundamental of QSAR, Free-Wilson analysis, Hansch analysis, relationship between Free-Wilson analysis and Hansch analysis, physicochemical properties.
Unit 2	**Pharmacodynamics:** Introduction, elementary treatment of enzymes stimulation, enzyme inhibition, sulfonamides- sulphacetanalide, sulphapyridine, sulphaizine, sulphaguanidine, membrane active drugs, drug metabolism, xenobiotics, biotransformation, significance of drug metabolism in medicinal chemistry.
Unit 3	**Antibiotics and antibacterials** Introduction, Antibiotic β-Lactam type - Penicillins, Cephalosporins, Antitubercular – Streptomycin, Broad spectrum antibiotics – Tetracyclines, Anticancer - Dactinomycin (Actinomycin D), ethambutol, anti-coagulants-classification, mode of action, therapeutic uses.
Unit 4	**Antifungal –** polyenes, Antibacterial – Ciprofloxacin, Norfloxacin, Antiviral – classification, mode of action, therapeutic uses, Acyclovir, **Antimalarials**: Chemotherapy of malaria. SAR. Chloroquine, pamaquin, Chloroguanide and Mefloquine

Unit 5	**Non-steroidal Anti-inflammatory Drugs:** Diclofenac Sodium, Ibuprofen and Netopam **Antihistaminic and antiasthmatic agents :** Terfenadine, Cinnarizine, Salbutamol and Beclomethasonedipropionate. Anti-ulcer drugs - classification, mode of action, therapeutic uses.

Part C: Learning Resources
1. Introduction to medicinal chemistry, A. Gringuage, Wiley-VCH.
2. Wilson and Gisvold's Text Book of Organic Medicinal and Pharmaceutical Chemistry, Ed Robert F Dorge.
3. An Introduction to Drug Design, S.S. Pandeya and J.R. Dimmock, New Age Internaitonal.
4. Burger's Medicianl Chemistry and Drug Discovery, Vol-I (Chapter 9 and Chapter 14), Ed. M.E.Wolff, John Wiley.
5. Goodman and Gilman's Pharmacoloical Basis of Therapeutics, Mc GRaw-Hill.
6. The Organic Chemistry of Drug Design and Drug Action, R.B. Silverman, Academic Press.
7. Strategies for Organic Drug synthesis and Design, D.Lednicer, John Wiley.
8. Principles of Medicinal Chemistry W.O.Foye
9. Medicinal Chemistry; The Role of organic chemist in Drug Research, S.M. Roberts and B.J. Pricer.

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

Department of Botany

Class : M.Sc. III Sem.

Subject : Botany

Paper –III-B Elective -1

Title of Paper: Economic Botany

Code of the paper: BO33-II

Part A : Introduction for code-- BO33-II		
1	Pre-requisite (if any)	The students must have passed M.Sc. II Sem. with Botany
2	Course Objectives	The paper is aimed to introducing the students for To study economic importance of plants in agriculture, Global warming, Soil fertility.
	Course Learning Outcomes	1- Study of Global warming and climate change
		2- To learn about medicinal plant of India and their uses
		3- To Study plants of economic importance - Vegetables, oil yielding plants, wild edible plants, food crops, spices and condiments, Forage- fodder plants
		4- Study of Plant products and production
		5- To study organic farming and bio-fertilizers

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

Department of Botany

Year 2021-22

Class M.Sc. III Sem. Botany

Paper –III-B

Economic Botany

UNIT-I	Plants, energy and global warming (15) • Introduction to plants, plant resources and their importance l to human race and survival (5) • Plants as key solution for major global problems viz. Energy, pollution control, agricultural productivity, global warming, climate change, soil fertility and conservation etc. (10)
UNIT-II	Plants and Industries (15) • Medicinal plants of India, Importance and uses.(3) • Plants as Ayurvedic, Allopathy and Unani medicines (3) • Cottage Industries • Fermentation, Ethyl Alcohol Fermentation (2) • Citric acid Fermentation (2) • Mushroom Cultivation (4)
UNIT-III	Plants and plant products (15) • Vegetables, oil yielding plants, wild edible plants, food crops, spices and condiments, Forage- fodder plants (5) • Fibre yielding plants, textile fibres, cordage fibres, fibres for stuffing (3) • Important timber yielding plants and non-wood forest products (2)
UNIT-IV	Plant products and production (15) • Resin, dye, tannin and gum yielding plants and their applications(2) • Grasses, their economic importance (3). Organic farming (3), Mushroom cultivation (3), Vine production(2), and Beer production(2)
UNIT-V	Soil Biology and Organic farming • Soil: Definition and Composition, mode of origin of soil, formation of soil, factors affecting soil formation. • Soil profile, soil types soil components. • Soil organisms, soil micro organisms, rhizosphere and rhizoplane micro-organisms. • Organic farming, and bio-fertilizers.

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Part C :-Learning Resources

1	A manual of ethnobotany Ed., S. K. Jain, Eciatific publications Jodhpur
2	Advances in Oilseeds Production and Technology, G. V. Ramanamurthy. ICAR New Delhi (1985)
3	Agricultural Botany. N. T. Gill and K. C. Vear. GaralDuckworth and Co. Ltd. London (1969)
4	Agrofrestry India Perspeetive. L.K. Jha and P. K. Sengupta. Ashish Publishing House,. New De li
5	Applied Ethnobotany – E.Varghesee S-VD
6	Crop Protection Principles and Practices, S.R. Chapmen and L.P. Carter. Publ. W. H. Freeman and Company Son Fran (1976)
7	Economic Botany, Hill A. Mcgrow Hill Book Company (1962)
8	Energy Plant Species. Their use and impact on environment and development. N. El. Bassam. Publ. James and James (Science Publishers) U. K. (2005)
9	Field crops of India by A.K. Aiyer. Banglore Printing and Publishing Company Bangalore (1966)
10	Forest Resources – Crises and Management Natraj Publishers, Dehradun. Vandana Shiva, V. M. Meherhomji and N.D. Joryal (1992)
11	Forestry and the People (1994) L. K. Jha and P. K. SenSharma .Ashish Pub. House, New Delhi.
12	Forestry Research and Education in India. P.D. Dogra and R C. Dhiman (edt.) 1994. ADiamond Jubilee Publication by INSA, New Delhi.
13	Handbook of Agriculture, ICAR New Delhi (1969)
14	New Crops for Food and Industry. Ed. G. E. Wickens. N. Hag. P.Day. Chapmen and Hall Publi. London Ogorzaly, McGraw Hill Intenational Edition (1986)

Part D :-Assessment and Evaluation

Saggested cntinnous Evaluation Methods: Maximum Marks: Continuous Comprehensive Evaluation (CCE) University Exam (UE):	 100 25 75	
Intenal Assesment Continuous Comprehensive Evaluation (CCE) : 25	Class Test Assignment/ Presentation	25 15X5=75
External Assesment: University Exam Setion: 75 Time: 03:00 Hours	Five Long Questions	75

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

Department of Botany

Class : M.Sc. IV Sem.

Subject : Botany

Paper –I

Title of Paper: Plant Cell, Tissue & Organ Culture

Code of the paper: BO41

Part A : Introduction for code-- BO41		
1	Pre-requisite (if any)	The students must have passed M.Sc. III Sem with Botany
2	Course Objectives	The paper is aimed to introducing the students for Plant Cell, Tissue and Organ Culture
	Course Learning Outcomes	1- Plant tissue culture Introduction and scope.
		2- To study somatic embryogenesis
		3- To study protoplast culture and Somatic hybridization.
		4- To learn about Somoclonal variation and role of tissue culture
		5- To learn about Application of plant tissue culture

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

Department of Botany

Year 2021-22

Class M.Sc. IV Sem. Botany

Paper – I

Plant Cell, Tissue & Organ Culture

UNIT-I	Plant tissue culture-General introduction and Scope. Concept of Totipotency and importance of totipotency in plant science. Concept of cytodifferetiation and organogenesis. General technique of plant tissue culture. Callus and suspension.
UNIT-II	Somatic embryogenesis. Organ culture-Meristem, anther and embyo culture-Principle, technique and significance.
UNIT-III	Protoplast culture- Principle, technique of isolation of protoplast and its significance. Viability testing of protoplast Protoplast fusion- methods and importance Hybrid selection and regeneration. Somatic hybridization.
UNIT-IV	Somoclonal variation and role of tissue culture in Agriculture. Production of disease resistant plants, virus free plants. Stress resistant plants, Herbicide resistant plants.
UNIT-V	Application of plant tissue culture-clonal propagation Artificial seeds Production of secondary metabolites/natural products. Cryopresevation and Germ plasm storage.

2

Part C :-Learning Resources

1	Introduction to plant tissue culture - M.K. Razdan
2	Introduction to plant –Biotechnology – H.S. Chawla. Oxford and IBH pub. Co. Pvt. Ltd, New Delhi.
3	Elements of Biotechnology - P.K. Gupta
4	Text Book of Biotechnology – H.K. Das
5	Biotechnology – Ashok Ganguli
6	A Text Book of Biotechnology – R.C. Dubey – S. Chand & Company LTD.
7	Plant – Biotechnology – The general manipulation of plant -Adrian Slater, Nigel Scot & Mark Fowler
8	Methods in Biotechnology & Bioengineering – D.V. Kohli,. S.P. Vyas – CBS Publisher & Distributers CBS

Part D :-Assessment and Evaluation

Saggested cntinnous Evaluation Methods: Maximum Marks: Continuous Comprehensive Evaluation (CCE) University Exam (UE):	 100 25 75	
Intenal Assesment Continuous Comprehensive Evaluation (CCE) : 25	Class Test Assignment/ Presentation	25 15X5=75
External Assesment: University Exam Setion: 75 Time: 03:00 Hours	Five Long Questions	75

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

Department of Botany

Class : M.Sc. IV Sem.

Subject : Botany

Paper –IV- A Elective 4

Title of Paper: Industrial Microbiology

Code of the paper: BO44-I

Part A : Introduction for code-- BO44-I		
1	Pre-requisite (if any)	The students must have passed M.Sc. III with Botany
2	Course Objectives	The paper is aimed to introducing the students for Industrial Microbiology
	Course Learning Outcomes	1- Basic techniques in microbiology - Microscopy, staining techniques, Culture, Nutrition and growth of microorganisms
		2- Food Microbiology: Food spoilage, Food preservation methods, Microbiological production of food such as fermented products
		3- Fermentation Industry: Selection of micro-organisms, Techniques and quality control, Production of antibiotics, steroids, Human proteins, Vaccines and vitamins
		4- Microbial Growth-Environmental influences, Physical control, Chemical control & Antibiotic controls
		5- Water quality in industry: Bacteriological safety of potable water, water quality analysis, importance of BOD.

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

Department of Botany

Year 2021-22

Class M.Sc. IV Sem. Botany

Paper – IV- A Elective 4

Industrial Microbiology

UNIT-I	Basic techniques in microbiology - Microscopy, staining techniques, Culture, Nutrition and growth of microorganisms. Replication and structure of viruses & other a cellular microorganisms, prokaryotic microorganisms, classification and diversity of Bacteria, Eukaryotic microorganisms.
UNIT-II	Food Microbiology: Food spoilage, Food preservation methods, Microbiological production of food such as fermented products, alcoholic beverages, vinegar. Fermented vegetables. Single cell protein production in industry, fermented dairy products and uses.
UNIT-III	Fermentation Industry: Selection of micro-organisms, Techniques and quality control, Production of antibiotics, steroids, Human proteins, Vaccines and vitamins.Survey of microorganisms of industrial uses. Production of organic acids, amino acids, Enzymes, Solvents and fuels.
UNIT-IV	Recovery of minerals by using microbes, Oil recovery, Biodeterioration, Mushroom culture, Biotech products including human insulin, Microbial Growth-Environmental influences, Physical control, Chemical control & Antibiotic controls.
UNIT-V	Water quality in industry: Bacteriological safety of potable water, water quality analysis, importance of BOD. Biodegradation of wastes and pollutants, Primary, Secondary and Tertiary Sewage treatments. Water quality in industry: Bacteriological safety of potable water, water quality analysis, importance of BOD. Biodegradation of wastes and pollutants, Primary, Secondary and Tertiary Sewage treatments.

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Part C :-Learning Resources

1	Introduction to Industrial Microbiology by NI. Morgan.
2	Industrial Microbiology by Patel.
3	Industrial Microbiology by Casida.
4	Industrial Microbiology by Dubey and Maheshwari

Part D :-Assessment and Evaluation

Saggested cntinnous Evaluation Methods: Maximum Marks: Continuous Comprehensive Evaluation (CCE) University Exam (UE):	 100 25 75	
Intenal Assesment Continuous Comprehensive Evaluation (CCE) : 25	Class Test Assignment/ Presentation	25 15X5=75
External Assesment: University Exam Setion: 75 Time: 03:00 Hours	Five Long Questions	75

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

Department of Botany

Year 2021-22

Class M.Sc. IV Sem. Botany

Paper –

Applied Botany

UNIT-I	Entrepreneurship - meaning, nature, importance. Traits of Entrepreneurs. Preparing for business plan legal requirements for establishing of a new unit procedure for registering business, market assessment, survey of local market, product designing branding, Research and development. DIC and various government policies for the development of entrepreneurship. Government schemes, subsidies, role of lead banks.
UNIT-II	Protected Cultivation 1- Open cultivation: Merits and demerits. 2- Protected cultivation useful for floriculture, vegetables, nursery development and fruit crops. 3- Construction & Design of polyhouse/ green house: site selection orientation, size, cost, height, ventilation, temp, humidity maintenance. 4- Technical standards for poly house, net house. 5- Cultivation & marketing of some flowers & vegetables in polyhouse. 1- Floriculture: Rose and Gladiolus. 2- Vegetables: Tomato, Capsicum Spp. 3- Nursery management in polyhouse. 6- Shade /Net house : structure, design, specification and importance.
UNIT-III	Organic Farming 1- Concept & definition, socio economic impact, organic farming and national economy. 2- Relevance of organic farming to India and global agriculture with future prospects. 3- Farming systems and crop rotation. 4- Management of available water for organic farming. 5- Earthworms, vermicompost, green manures & biofertilizers. 6- liquid organic manures, panchgavya, jeevamrut & beejamrut.
UNIT-IV	Water management 1- Introduction 2- Techniques of water management. 3- Water management strategies. 4- Water management in India. 5- Water management projects. 6- Rain water harvesting.

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UNIT-V	Medicinal plants and their use for welfare of human beings. The use of plant parts for medicinal purpose. Azadirachta indica (Neem), Ocimum sanctum (Tulsi), Phyllanthus emblica (Awala), Zingiber officinale (Adrak), Withania somnifera (Ashwagandha), Tinospora cordifolia (Giloy), Raulvolfia serpentina (Sarphgandha), Curcuma longa (Haldi) Glycyrrhiza glabra (Mulathi), Syzygium aromaticum (laung), Chlorophytum borivilianum (Safed musli) and Aloe vera (Guarpatha).

Part C :-Learning Resources

1	"How to Win Friends and Influence people" by Dale Carnegie.
2	"The 7 Habits of Highly Effective People" by Stephen Covey.
3	"Think and Grow Rich" by Napolieon Hill.

Part D :-Assessment and Evaluation		
Saggested cntinnous Evaluation Methods: Maximum Marks: Continuous Comprehensive Evaluation (CCE) University Exam (UE):	100 25 75	
Intenal Assesment Continuous Comprehensive Evaluation (CCE) : 25	Class Test Assignment/ Presentation	25 15X5=75
External Assesment: University Exam Setion: 75 Time: 03:00 Hours	Five Long Questions	75

Class: M.Sc. First Semester
Subject: Microbiology
Paper: Core 1

Marks: 75 + (CCE) 25 = 100
Credit : 4
Code of the Paper:-MB-11

Bacteriology (Paper 1)

Part A : Introduction for code M.Sc. Ist Semester		
1	Pre-requisite (if any)	To study this course a student must have the subject Microbiology/Botany/Biotechnology/Biochemistry/ in B.Sc.
2	Course Objectives	To study and identify the basic structure of bacteria and methods of cultivation, staining and control of bacteria.
	Course Learning outcomes	On completion of the course, the student will be profound in complete Knowledge and Understanding of the subject.
		1.Students will study and learn to identify the basic structure of bacteria.
		2.Students will study and learn about the growth phases of bacteria
		3.Students will study and learn the methods of cultivation of bacteria.
		4.Chemical and physical control methods for bacteria.
		5.Various staining techniques for bacterial structure.

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Part B: Content of the Course

Unit	Topics
1	Classification of microorganisms – Haeckel's three kingdom concept, Whittaker's five kingdom concept, Three domain concept of Carl Woese, Basis of microbial classification. Classification and salient features of bacteria according to the Bergey's manual of determinative bacteriology.
2	Morphology and ultra structure of bacteria – morphological types – cell walls of archaebacteria and eubacteria (Gram negative and Gram positive), L- forms. Cell wall synthesis, antigenic properties. Capsule – types, composition and function. Cell membrane – structure, composition and properties.
3	Structure and function of flagella, pili, gas vesicles, chromosomes, carboxysomes, magnetosomes, phycobolisomes and nucleoid. Spores and Cysts. Reserve food materials – Polyhydroxybutyrate, polyphosphate granules, oil droplets, cyanophycin granules and sulphur inclusions.
4	Cultivation of bacteria – Aerobic and anaerobic cultivation, Shake flask and still cultivation. Nutritional types of bacteria. Bacterial growth- Culture media, Growth curve, Batch, continuous and synchronous cultures. Measurement of bacterial growth- Growth kinetics, Generation time and growth rate. Factors affecting microbial growth.
5	Control of bacteria – Microbial death curve under adverse conditions. Concepts of bioburden, thermal death constant and decimal reduction time. Control of microbes by physical and chemical agents and mechanisms of their microbicidal activity.

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Part C : Learning Resources

Text Books, Reference Books
Suggested Readings:

1. Fundamental Principles of Bacteriology	Salle
2. Biology of Microorganisms	Brock, Madigan
3. Microbiology Pelczar,	Chan & Kreig
4. Text Book on Principles of Bacteriology, Virology & Immunology	Topley and Wilson
5. General Microbiology	Stainer, Ingharam, Wheelis
6. Illustrated Genera of Imperfect Fungi	Barnett and Hunter
7. Bergey's Manual of Determinative Bacteriology (VIII Edition)	Breed and Buchanan
8. Bergey's Manual of Determinative Bacteriology (IX Edition)	Breed and Buchanan
9. Bergey's Manual of Systematic Bacteriology (II Edition)	Breed and Buchanan
10. The genetics of Bacteria and their Viruses	William Hayes
11. General Microbiology	Robert Boyd
12. An Introduction to Microbiology	Tauro, Kapoor, and Yadav
13. Microbiology-A Practical Approach	Patel & Phanse

Part D : Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 100
Continuous Comprehensive Evaluation (CCE): 25
University Exam (UE): 75

Internal Assessment Continuous Comprehensive Evaluation (CCE): 25	Class Test	10
	Assignment/ Presentation	15
	Total	**25**
External Assessment: University Exam Section:75 Time : 03.00 Hours	Five Long Questions	15 x 5 = 75
	Total	**100**
	Credits	**04**

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Class: M.Sc. First Semester
Subject: Microbiology
Paper: Core 3

Marks: 75 + (CCE) 25 = 100
Credit : 4
Code of the Paper:-MB-13

Immunology (Paper 3)

Part A : Introduction for code M.Sc. Ist Semester		
1	**Pre-requisite (if any)**	To study this course a student must have the subject Microbiology/Botany/Biotechnology/Biochemistry/ in B.Sc.
2	**Course Objectives**	To study the various method of vaccine production and immunological techniques.
	Course Learning outcomes	On completion of the course, the student will be profound in complete Knowledge and Understanding of the subject.
		1.Students will study and learn the various methods of vaccine productions.
		2.Students will study the mechanism of antibody generation and role of immunoglobulins in immunity.
		3.Understanding of various immunological techniques.
		4.Understanding of the mechanism, diagnosis and treatment of Cancer.
		5. Understanding of the mechanism of development of hypersensitivity reactions.

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Part B: Content of the Course

Unit	Topics
1	Structure, composition and types of cells and organs involved in immune system. Innate and acquired immunity. Humoral and cell mediated immune responses. Immunization – Modern methods of vaccine production.
2	Antigens – Structure, properties and types. Haptens and adjuvants. Immunoglobulins- structure, heterogeneity, types and subtypes. Physico-chemical and biological properties of immunoglobulins. Theories of antibody production. Generation of antibody diversity. Complement – Structure, components, properties and functions of complement components, Complement pathways and biological consequences of complement activation.
3	Antigen-Antibody interactions – *In vitro* methods – Agglutination, Precipitation, Complement fixation, Immunofluorescence, ELISA, Radioimmunoassay, Immuno blotting. *In vivo* methods: Skin tests and immune complex tissue demonstrations and their applications in diagnosis of microbial diseases. Hybridoma technology – Production and applications of monoclonal antibodies.
4	Structure and functions of MHC and the HL-A systems. HL-A and tissue transplantation – Tissue typing methods for organ and tissue transplantations in humans, Graft versus host reaction and rejection. Tumor immunology – tumor specific antigens, immune response to tumors, immunodiagnosis of tumors – detection of tumor markers – alpha foetal proteins.
5	Type I IgE – Mediated Hypersensitivity, Type II Antibody – Mediated Cytotoxic Hypersensitivity. Type III Immune Complex – Mediated Hypersensitivity. Type IV Delayed – Type Hypersensitivity. Autoimmunity – mechanism and diseases.

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Part C : Learning Resources

Text Books, Reference Books
Suggested Readings:

1. Essentials of Immunology	Roitt
2. Immunology (II Edition)	Kuby
3. Immunology	Klaus
4. Text Book on Principles of Bacteriology, Virology and Immunology, IX Edition (5 volumes)	Topley and Wilson's
5. The Experimental Foundations of Modern Immunology	Clark, John Willey
6. Fundamental Immunology	Paul
7. Fundamentals of Immunology	Coleman, Lombord and Sicard
8. Immunology	Weir and Steward

Part D : Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 100
Continuous Comprehensive Evaluation (CCE): 25
University Exam (UE): 75

Internal Assessment Continuous Comprehensive Evaluation (CCE): 25	Class Test	10
	Assignment/ Presentation	15
	Total	**25**
External Assessment: University Exam Section:75 Time : 03.00 Hours	Five Long Questions	15 x 5 = 75
	Total	**100**
	Credits	**04**

Class: M.Sc. Third Semester
Subject: Microbiology
Paper: Elective Paper- 2/2

Marks: 75 + (CCE) 25 = 100
Credit: 4
Code of the Paper: -MB-34 B

Agriculture Microbiology

Part A: Introduction for code M.Sc. IIIrd Semester		
1	Pre-requisite (if any)	To study this course a student must have to pass M.Sc. IInd Semester in Microbiology.
2	Course Objectives	To study the methods of production of biofertilizer, development of resistant varieties and relationship between plant and pathogen.
	Course Learning outcomes	On completion of the course, the student will be profound in complete Knowledge and Understanding of the subject.
		1. Learning methods of production of biofertilizer by using bacteria, fungi and cyanobacteria.
		2.Studying the concept and relation between plant and pathogen in development of disease.
		3.Understanding the process of development of transgenic resistance varieties.
		4.Studying about different types of plant diseases caused by fungi, bacteria & virus.
		5.Comprehending the various control method of plant diseases and importance of microorganism in organic farming.

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Part B: Content of the Course

Unit	Topics
1	Introduction to biofertilizers - Structure and characteristic features of the following biofertilizer organisms: Bacteria: *Azospirillum, Azotobacter, Bacillus, Pseudomonas, Rhizobium and Frankia.* Cyanobacteria: *Anabaena, Nostoc, Hapalosiphon.* Fungi: *Glomus, Gigaspora, Sclerocystis, Amanita, Laccaria.*
2	Principles of plant pathology: entry and establishment of pathogens in plants, host and parasite interaction, role of toxins and enzymes in pathogenesis. Disease resistance in plants – protection and defence, mechanisms of resistance (performed and induced defence, local signals, programmed cell death, induced structural barriers, phytoalexins.
3	Transgenic Resistance: Gene-to-gene resistance (horizontal and vertical), functions of plant resistance genes, features and classification of cloned resistance genes. Transformation for disease resistance: Resistance to viruses, fungi, bacteria and insects, the Bt genes and the resistance to insects.
4	Plant diseases – Epidemiology and plant disease forecasting- Principles, symptoms and control measures of the following diseases: Plant diseases caused by fungi – late blight of potato, downy mildew of grapes, Loose smut of wheat, smut of bajra, covered smut of barley, blast disease of rice, red rot of sugarcane. Plant diseases caused by bacteria – bacterial blight of paddy, angular leaf spot of cotton, common scab of potato. Plant diseases caused by viruses – tobacco mosaic, leaf curl of tomato, yellow vein mosaic of bhindi.
5	Plant disease control – Cultural methods, Agronomic practices (crop rotation, field and crop sanitation), Chemical control (fungicides, fumigants, inorganic copper/ sulphur compounds, Di thiocarbamates) - Organic agriculture and disease control. Biological control – Principle, concepts and environmental safety– bio-pesticides (bacterial, fungal and viral). Plant disease assessment methods – visual method in the field, scales for estimating disease intensity, yield losses, multiple point model and remote sensing techniques.

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Part C: Learning Resources

Text Books, Reference Books
Suggested Readings:

1. Agrio, G.N. Plant pathology
2. Alexander, M Soil Microbiology
3. Benjamin Cunnings, Merio park. California 1987 Microbial ecology, fundamentals an application.
4. Bilgrami, K.S. and H.C. Dube Modern Plant pathology
5. N.S. Subba Rao: Biofertilizers
6. Lynch J.M.: Soil Biotechnology
7. Lynch Poole Microbial ecology: A conceptual approach
8. Mehrotra, R.S.: Plant Pathology
9. Microbial ecology: Principles, methods & applications & Biological nitrogen fixation.
10. R.S. Singh: An introduction to principles of plant pathology
11. Rangaswami, G. and A. Mahadevan: Diseases of crop plants
12. Rangaswamy, G and. Bhagyaraj D. J.: Agricultural Microbiology
13. Richard, B.N.: An introduction to soil ecosystem
14. Singh, R.S.: Plant diseases R
15. Stolop H.: Microbial ecology: Organisms, habitats, Activities
16. Subba Rao N. S: Advances in Agriculture Microbiology
17. Subba Rao, N.S.: Soil microorganisms and plant growth
18. Tarr, S.A.J.: Principles of plant pathology
19. Vander Plank: Plant disease resistance
20. Vidyasekaran: Molecular plant pathology.
21. K R Aneja: Fundamental of Agriculture Microbiology

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Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:		**100**
Continuous Comprehensive Evaluation (CCE):		**25**
University Exam (UE):		**75**
Internal Assessment Continuous Comprehensive Evaluation (CCE): 25	Class Test	10
	Assignment/ Presentation	15
	Total	**25**
External Assessment: University Exam Section:75 Time : 03.00 Hours	Five Long Questions	**15 x 5 = 75**
	Total	**100**
	Credits	**04**

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Class: M.Sc. Fourth Semester
Subject: Microbiology
Paper: Core 11

Marks: 75 + (CCE) 25 = 100
Credit : 4
Code of the Paper:-MB-41

Food and Dairy Microbiology (Paper 11)

Part A : Introduction for code M.Sc. IVth Semester		
1	Pre-requisite (if any)	To study this course a student must have to pass M.Sc. IIIrd Semester in Microbiology.
2	Course Objectives	To study the advance concepts of food microbiology including preservation, production, quality control, microbial examinations and spoilage control.
	Course Learning outcomes	On completion of the course, the student will be profound in complete Knowledge and Understanding of the subject.
		1.Various food fermentation procedure for bread, vinegar, bear, wine. Study of mushroom cultivation, single cell protein, probiotics and GOMs.
		2.Studying food infection and food intoxications, and understand microbiological quality standard of food.
		3.Understanding the principle techniques of food preservation, and control of food spoilage.
		4.Comprehending various techniques using for microbiological analysis of milk and quality control.
		5.Understanding the applications of microbial enzymes in dairy industry and probiotics.

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Part B: Content of the Course

Unit	Topics
1	Food fermentations – Bread and Vinegar. Fermented beverages- Beer and Wine. Microbial cells as food (single Cell Proteins), Probiotics and Prebiotics. Mushroom cultivation, genetically modified foods.
2	Food infections – Gastroenteritis, Salmonellosis, Shigellosis. Bacterial food intoxications –Botulism and Staphylococcal intoxication. Mycotoxins – Aflatoxins. Microbiological examination of food. Quality assurance: Microbiological quality standards of food, Government regulatory practices and policies, FDA, EPA, HACCP and ISI.
3	General principles of food preservation. Preservation by using high and low temperature. Chemical preservatives and food additives. Use of irradiation for preservation. Spoilage of food – fresh food, canned food, milk products.
4	Composition of milk. Normal flora of milk, changes produced by microorganisms in milk. Pasteurization – basis of pasteurization, methods of pasteurization Milk borne diseases. Microbiological analysis of milk- Standard plate count, direct count, reduction tests, phosphatase test Grades of milk
5	Milk starter cultures, Microbiology of cheese – types of cheese, cheese manufacture, Fermented milk products-yoghurt, cultured buttermilk, acidophilus milk, kefir, kumiss Applications of microbial enzymes in dairy industry [proteases and lipases]. Utilization and disposal of dairy by-product – Whey

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Part C : Learning Resources

Text Books, Reference Books
Suggested Readings:

1. Food Microbiology 2nd Ed	Adams
2. Basic Food Microbiology	Banwart George
3. Food Microbiology: Fundamentals and Frontiers	Dolle
4. Food Microbiology	Frazier and Westhoff
5. Fundamentals of Dairy Microbiology	Prajapati
6. Essentials of Food Microbiology	Garbult
7. Microbiology of Fermented Foods.Volume I and II.	Wood
8. Microbiology of Foods	Orwin
9. Dairy Microbiology. Volume I and II.	Robinson
10. Food Microbiology: Fundamentals and Frontiers. 2nd Ed	Doyle Beuchat

Part D : Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 100
Continuous Comprehensive Evaluation (CCE): 25
University Exam (UE): 75

Internal Assessment Continuous Comprehensive Evaluation (CCE): 25	Class Test	10
	Assignment/ Presentation	15
	Total	**25**
External Assessment: University Exam Section:75 Time : 03.00 Hours	Five Long Questions	15 x 5 = 75
	Total	**100**
	Credits	**04**

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Class: M.Sc. Fourth Semester
Subject: Microbiology
Paper: Elective Paper-3/1

Marks: 75 + (CCE) 25 = 100
Credit: 4
Code of the Paper: -MB-43 A

Pharmaceutical Microbiology

Part A : Introduction for code M.Sc. IVth Semester		
1	Pre-requisite (if any)	To study this course a student must have to pass M.Sc. IIIrd Semester in Microbiology.
2	Course Objectives	To gain job opportunity in pharma industry and study various techniques of production of pharmaceutical products, spoilage and quality control.
	Course Learning outcomes	**On completion of the course, the student will be profound in complete Knowledge and Understanding of the subject.**
		1.Exploring the role of microbiologist and job opportunities in pharma industry.
		2.Training and learning about different tests performed by microbiologist in pharma industry.
		3.Knowledge about antimicrobial agents and drugs.
		4.Learning of drug delivery systems, drug targeting and mode of antimicrobial agents.
		5.Knowledge about drug development in pharma industry and new vaccine technologies.

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Part B: Content of the Course

Unit	Topics
1	Introduction to pharmaceutical industry: Role of a microbiologist in a pharma industry (Active Pharmaceutical Ingredient Production units, Formulation units, Research and Development, Quality Assurance and Regulatory Aspects). Pharmacopoeias with special reference to Indian, British, United States. Government regulatory practices and policies, FDA perspective. Good Manufacturing Practices (GMP) and Good Laboratory Practices (GLP) in pharmaceutical industry. Design and layout of sterile product manufacturing unit. (Designing of microbiology laboratory) Safety in microbiology laboratory.
2	Quality assurance and quality management in pharmaceuticals: ISO, WHO and US certification. Microbiological analysis for pharmaceutical industries: Standard operating procedures for microbiological assay of antibiotics, vitamins and amino acids, Water analysis, Microbial limit test, Sterility test, Pyrogen test (BET), Area monitoring, Growth promotion test, Calibration and validation of equipments. Microbial contamination and spoilage of pharmaceutical products (sterile injectibles, non injectibles, ophthalmic preparations and implants) and their sterilization. Chemical disinfectants, antiseptics and preservatives.
3	Antibiotics and synthetic antimicrobial agents – Structure, types and modes of action. Beta lactams and non beta lactams. Aminoglycosides, Tetracyclines, Chloramphenicol, Macrolides, Fluroquinilones. Chemosynthetic drugs-Sulphonamides. Trimethoprim, Nitrofurans and Isoniazid. Antifungal and antiviral drugs.
4	Bacterial resistance to antibiotics- Origin, mechanism, transfer, and clinical implications. Molecular principles of drug targeting, Drug delivery system in gene therapy, Microencapsulation. Nanoparticles, Liposomes, Antibodies for drug delivery. Penetrating defenses – How the antimicrobial agents reach the targets (cellular permeability barrier, cellular transport system and drug diffusion).
5	Drug development in pharmaceutical process: Production of biopharmaceuticals by genetically engineered cells: Hormones (Humulin, Humatrope), Interferons (Intron A, Referon-A), t- Plasminogen activator (Activase), Monoclonal antibodies and hybridoma technology (Monoclate, Orthoclone OKT3). Other pharmaceuticals produced by microbial fermentations (Streptokinase, Streptodornase). New vaccine technology, DNA vaccines, synthetic peptide vaccines, multivalent subunit vaccines. Vaccine clinical trials. Application of microbial enzymes in pharmaceutical industry.

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Part C : Learning Resources

Text Books, Reference Books Suggested Readings:	
1. Pharmaceutical Microbiology	Hugo & Russell
2. Analytical Microbiology Volume I & II.	Kavanagh
3. Quinolinone antimicrobial agents	Hooper, Wolfson
4. Quality control in the Pharmaceutical Industry Vol.2	Cooper
5. Biotechnology Vol 4	Rehm & Reed,
6. Pharmaceutical Biotechnology	Vyas & Dixit.
7. Good Manufacturing Practices for Pharmaceuticals Second Edition	Sydney, Murray, William
8. Advances in Applied Biotechnology Series Vol 10, Biopharmaceuticals in transition. Industrial Biotechnology Association	Webber.
9. Drug Carriers in biology and Medicine	Gregoriadis

Part D : Assessment and Evaluation

Suggested Continuous Evaluation Methods: Maximum Marks: Continuous Comprehensive Evaluation (CCE): University Exam (UE):		100 25 75
Internal Assessment Continuous Comprehensive Evaluation (CCE): 25	Class Test	10
	Assignment/ Presentation	15
	Total	25
External Assessment: University Exam Section:75 Time : 03.00 Hours	Five Long Questions	15 x 5 = 75
	Total	100
	Credits	04

Class: M.Sc. Fourth Semester
Subject: Microbiology
Paper: Elective Paper-3/2

Marks: 75 + (CCE) 25 = 100
Credit: 4
Code of the Paper: -MB-43 B

Biosafety and IPR Issues

Part A : Introduction for code M.Sc. IVth Semester		
1	Pre-requisite (if any)	To study this course a student must have to pass M.Sc. IIIrd Semester in Microbiology.
2	Course Objectives	To make the students aware about the various types of intellectual properties and standard biosafety levels.
	Course Learning outcomes	**On completion of the course, the student will be profound in complete Knowledge and Understanding of the subject.**
		1.Awareness about patents, Trademarks, Copyright & Related Rights etc.
		2.Learning the concept of patent databases, analysis and report formation.
		3.Knowledge about basics of patents, filing of applications and role of country patent office.
		4.Guideline regarding patent filing and infringement.
		5.Knowledge regarding different biosafety levels, biosafety guideline and environmental release of GOMs.

Part B: Content of the Course

Unit	Topics
1	Introduction to Intellectual Property: Types of IP: Patents, Trademarks, Copyright & Related Rights, Industrial Design, Traditional Knowledge, Geographical Indications, Protection of New GMOs; International framework for the protection of IP. IP as a factor in R&D; IPs of relevance to Biotechnology and few Case Studies
2	Introduction to History of GATT, WTO, WIPO and TRIPS. Concept of prior art: Invention in context of "prior art"; Patent databases; Searching International Databases; Country-wise patent searches (USPTO, EPO, India etc.); Analysis and report formation.
3	Basics of Patents: Types of patents; Indian Patent Act 1970; Recent Amendments; Filing of a patent application; Precautions before patenting-disclosure/non-disclosure; WIPO Treaties; Budapest Treaty; PCT and Implications; Role of a Country Patent Office; Procedure for filing a PCT application.
4	Patent filing and infringement: Patent application- forms and guidelines, fee structure, time frames; Types of patent applications: provisional and complete specifications; PCT and convention patent applications; International patenting-requirement, procedures and costs; financial assistance for patenting-introduction to existing schemes; Publication of patents-gazette of India, status in Europe and US. Patenting by research students, lecturers and scientists-University/organizational rules in India and abroad, credit sharing by workers, financial incentives. Patent infringement meaning, scope, litigation, case studies and examples.
5	Biosafety : Historical Background; Introduction to Biological Safety Cabinets; Primary Containment for Biohazards; Biosafety Levels; Biosafety Levels of Specific Microorganisms; Recommended Biosafety Levels for Infectious Agents and Infected Animals; Biosafety guidelines - Government of India; Definition of GMOs & LMOs; Roles of Institutional Biosafety Committee, RCGM, GEAC etc. for GMO applications in food and agriculture; Environmental release of GMOs;

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Part C : Learning Resources

Text Books, Reference Books
Suggested Readings:

1.P Ganguly, Intellectual Property Rights, Tata McGraw Hill, 2007.
2.IPR Biosafety & Bioethics – Deepa Goel
3. Biotechnology – B.D. Singh

Part D : Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 100
Continuous Comprehensive Evaluation (CCE): 25
University Exam (UE): 75

Internal Assessment Continuous Comprehensive Evaluation (CCE): 25	Class Test	10
	Assignment/ Presentation	15
	Total	**25**
External Assessment: University Exam Section:75 Time : 03.00 Hours	Five Long Questions	15 x 5 = 75
	Total	**100**
	Credits	**04**

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Class: M.Sc. Fourth Semester
Subject: Microbiology
Paper: Elective Paper-4/1

Marks: 75 + (CCE) 25 = 100
Credit: 4
Code of the Paper: -MB-44 A

Bio-Nanotechnology

Part A : Introduction for code M.Sc. IVth Semester		
1	Pre-requisite (if any)	To study this course a student must have to pass M.Sc. IIIrd Semester in Microbiology.
2	Course Objectives	To make the students learn about the latest development in the field of bio nanotechnology with regards to its applications and instrumentation.
	Course Learning outcomes	**On completion of the course, the student will be profound in complete Knowledge and Understanding of the subject.**
		1.To understand the basic concepts of Nanotechnology in regards to health environment and society.
		2.Knowledge about different spectroscopic techniques involved in Nano technology.
		3.Knowledge about different spectroscopic techniques involved in microscopic techniques.
		4.Learning about Nanoparticles and their synthesis.
		5.Exploring different applications of Nanobiology.

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Part B: Content of the Course

Unit	Topics
1	Introduction and history of Nanotechnology, Applications of Nanotechnology in Biology, Criteria for suitability of nanostructures for biological applications. Health, environmental and social impact of Nanotechnology, plants and microbes as nanofactotries.
2	Methods in Nanotechnology I – Spectroscopic techniques – UV – Visible Spectroscopy, Raman Spectroscopy, X - ray diffraction, Fourier Transform Infra Red spectroscopy (FTIR), Terahertz spectrometry, Surface Enhanced Raman Spectroscopy (SERS).
3	Methods in Nanotechnology II – Microscopic techniques – Confocal microscopy, Electron microscopy, Scanning probe microscopy: Scanning Tunneling Microscopy (STM) and Atomic Force Microscopy (AFM), optical microscopic methods in nanoscience. Fluorescent in *situ* hybridization (FISH), Fluorescent Biological Lables, Colourimetric assay.
4	Nanoparticles and their synthesis, Nanomaterials: Fullerens, Carbon Nanotubes (CNT), gold monolayer, quantum dots, core shell nanopracticles. Silver nanoparticles, Magnetic nanoparticles, Nanoshells. Diamondoid, Biodegradable polymers and their uses, Colloids in Nanotechnology.
5	Nanobiology, Nanosensers, Nanomedicine, Drug delivery system, Nanomachine, Nanobiosensors, Nano DNA Technology, Optical biosensors, Concept of Nanorobots and Nubots.

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Part C : Learning Resources

Text Books, Reference Books
Suggested Readings:

1. Pharmaceutical Microbiology	Hugo & Russell
2. Analytical Microbiology Volume I & II.	Kavanagh
3. Quinolinone antimicrobial agents	Hooper, Wolfson
4. Quality control in the Pharmaceutical Industry Vol.2	Cooper
5. Biotechnology Vol 4	Rehm & Reed,
6. Pharmaceutical Biotechnology	Vyas & Dixit
7. Good Manufacturing Practices for Pharmaceuticals Second Edition	Sydney, Murray, William
8. Advances in Applied Biotechnology Series Vol 10, Biopharmaceuticals in transition. Industrial Biotechnology Association	Webber.
9. Drug Carriers in biology and Medicine	Gregoriadis

Part D : Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 100
Continuous Comprehensive Evaluation (CCE): 25
University Exam (UE): 75

Internal Assessment Continuous Comprehensive Evaluation (CCE): 25	Class Test	10
	Assignment/ Presentation	15
	Total	**25**
External Assessment: University Exam Section:75 Time : 03.00 Hours	Five Long Questions	**15 x 5 = 75**
	Total	**100**
	Credits	**04**

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Title: - Syllabus of Course Showing Cross-cutting Issues (Gender)

GOVT. HOLKAR (MODEL. AUTONOMOUS) SCIENCE COLLEGE, INDORE
DEPARTMENT OF BIOTECHNOLOGY
Syllabus Session: 2021-22

Part A: Introduction			
Program:	Class: M.Sc.	Semester: II	Session 2021-22
Subject: Biotechnology			
Course Code	BT-21		
Course Title	Paper V (Molecular Biology)		
Course Type	Core Course		
Pre-requisite (If any)	B.Sc. in any Life Science Stream		
Course Learning Outcomes	Course Outcomes: After the completion of this course students will have understanding of – CO1: Idea of genome organization and DNA kinetics. CO2: Basic concept of DNA. its structure. Replication and recombination. CO3: Prokaryotic and eukaryotic transcription and their regulation CO4: Post Transcriptional modification and translation CO5: Various types of mutations and their mechanism.		
Credit Value	4		

Total Marks	CCE (Max)	CCE (Min)	External Assessments Max	External Assessments Min	Total Max	Total Min
	25	9	75	26	100	35

Experts Members (Name & Signature)			
S.No.	Name	Designation	Signature
1	Dr. Kiran Billore	Chairman	
2	Dr. A. Nighojkar	VC Member	
3	Dr. Bhavesh Patel	Subject Expert	
4	Dr. R K Garg	Subject Expert	
5	Mr. Nitesh Jasani	Representative from Industry	
6	Dr. Rekha Sharma	Member	

Part B: Content of the Course	
Total number of Lecture Hours/ Week :4	
Unit	**Topic**
Unit I	**Genome organization:** Organization of bacterial genome; Structure of eukaryotic chromosomes; Heterochromatin and Euchromatin; DNA re-association kinetics (Cot curve analysis); Repetitive and unique sequences; Satellite DNA; DNA melting and buoyant density;
Unit II	**DNA Structure;** Replication: Repair & Recombination: Structure of DNA - A-,B-, Z- and triplex DNA; Replication initiation, elongation and termination in prokaryotes and eukaryotes; Enzymes and accessory proteins; Replication of single stranded circular DNA; and DNA repair-enzymes; Photoreactivation; Excision repair; Mismatch correction; SOS repair; Recombination: Homologous and non-homologous; Site specific recombination: Chi sequences in prokaryotes; FLP/FRT and Cre/Lox recombination.
Unit III	**Prokaryotic& Eukaryotic Transcription:** Prokaryotic Transcription; Transcription unit; Promoters- Constitutive and Inducible; Operators; Regulatory elements; Initiation; Elongation; Termination-Rho-dependent and independent; Anti-termination; Transcriptional Regulation-Positive and negative; Operon concept-lac, trp, ara, his, and gal operons; Transcriptional control in lambda phage; Eukaryotic transcription and regulation; RNA polymerase structure and assembly; RNA polymerase I, II, III; Eukaryotic promoters and enhancers; General Transcription factors; TATA binding proteins (TBP) and TBP associated factors (TAF); Activators and repressors; regulation of gene expression in eukaryote including Transcriptional and post-transcriptional gene silencing.

Experts Members (Name & Signature)			
S.No.	Name	Designation	Signature
1	Dr. Kiran Billore	Chairman	
2	Dr. A. Nighojkar	VC Member	
3	Dr. Bhavesh Patel	Subject Expert	
4	Dr. R K Garg	Subject Expert	
5	Mr. Nitesh Jasani	Representative from Industry	
6	Dr. Rekha Sharma	Member	
7	Mrs. Farida Johar	Alumni	

Unit -IV	**Post Transcriptional Modifications:** Processing of hnRNA, tRNA, rRNA; 5'-Cap formation; 3'-end processing and polyadenylation; Splicing; RNA editing; Nuclear export of mRNA; mRNA stability; Catalytic RNA. Translation &Transport: Translation machinery; Composition and assembly; Universal genetic code; Degeneracy of codons; Termination codons; Genetic code in mitochondria; Wobble hypothesis; Mechanism of initiation, elongation and termination; Co- and post-translational modifications; Transport of proteins and molecular chaperones; Protein stability; Protein turnover and degradation.
Unit -V	**Bacterial mutants and mutations:** Isolation; Useful phenotypes (auxotrophic, conditional, lethal, resistant); Mutation and Types of mutations (base pair changes; frameshift; insertions; deletions; tandem duplication); Mutation rate; Mutagenic agents; Mechanisms of mutagenesis; Assay of mutagenic agents (Ames test) Genetic variation: genome polymorphism; uses of polymorphism

Experts Members (Name & Signature)			
S.No.	**Name**	**Designation**	**Signature**
1	Dr. Kiran Billore	Chairman	
2	Dr. A. Nighojkar	VC Member	
3	Dr. Bhavesh Patel	Subject Expert	
4	Dr. R K Garg	Subject Expert	
5	Mr. Nitesh Jasani	Representative from Industry	
6	Dr. Rekha Sharma	Member	
7	Mrs. Farida Johar	Alumni	

Part C: Learning Resources
Text Books, Reference Books, Other Resources
Texts/References: 1. Benjamin Lewin, Gene IX, 9th Edition, Jones and Barlett Publishers, 2007. 2. J.D. Watson, N.H. Hopkins, J.W Roberts, J. A. Seitz & A.M. Weiner: Molecular Biology of the Gene, 6th Edition, Benjamin Cummings Publishing Company Inc, 2007. 3. Alberts et al; Molecular Biology of the Cell. 4th edition, Garland, 2002. 5. Glick BR & Pasternak JJ, Molecular Biotechnology, 3rd Edition, ASM Press, 1998. www.freebookcentre.net>....freeMolecular Biology books download eBook Online

Experts Members (Name & Signature)			
S.No.	Name	Designation	Signature
1	Dr. Kiran Billore	Chairman	
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4	Dr. R K Garg	Subject Expert	
5	Mr. Nitesh Jasani	Representative from Industry	
6	Dr. Rekha Sharma	Member	
7	Mrs. Farida Johar	Alumni	

Part A Introduction				
Programme : UG/Certificate Course		**Class** : B.Sc.	**Semester** : I	**Session** : 2021-2022
Subject: Zoology				
1	**Course Code**	**S1-20-M**		
2	**Course Title**	**Cell biology, Reproductive biology and Developmental Biology (Minor)**		
3	**Course Type (Core Course/Open Elective/Generic Elective/Vocational)**	**Core Course**		
4	**Pre-requisite (if any)**	To study this course a student must have had thesubject Biology in 12th Class		
5	**Course Learning outcomes (CLO)**	Upon completion of the course students should be able to a Develop deeper understanding of what life is and howit functions at cellular level b Understand the nature and basic concepts of Cell biology, Reproductive and Developmental biology c Understand structure and functions of cell membraneand cellular organelles d. Understand the importance of latest reproductive trends, reproductive techniques to be applied for human welfare. a. Understand the general patterns and sequential developmental stages during embryogenesis; and understand how the developmental processes lead to establishment of body plan of multi-cellular organisms. b. Understand about the evolutionary development of various animals.		
6	**Credit Value**	4 credits		
7	**Total Marks**	**Max. Marks:40(CCE) +60 (End Semester or (Theory Exam) External Evaluation Total = 100 Marks**		**Min. Passing Marks:35**

(Dr. Lata Bhattacharya) Subject Expert

(Dr. Ruchira Choudhary) Subject Expert

(Dr. Kirti Tiwari) VC Member

(Dr. Prabhha Khatri) Industrial Member

(Dr. Rekha Sharma) Chairman & Head

(Miss Harshita Panchal) Student representative

Part B-Content of the Course		
Total Numbers of Lectures - Tutorials-Practical (in hours per week) : L-T-P(4-0-0)		
Total No. of Lectures : 60 L		
Paragraph	Topics	No. of Lectures
1	**Cell Biology** 1.1 Concept of Prokaryotic and Eukaryotic Cells, difference betweenProkaryotic and Eukaryotic Cells 1.2 Structure and functions of Plasma membrane 1.3 Structure and functions of Golgi body, Mitochondria, Endoplasmicreticulum, Ribosome and Lysosome 1.4 Structure and functions of Nucleus 1.5 Structure and functions of Chromosome and special type of chromosomes-Lampbrush and Polytene chromosome 1.6 Cell cycle, Mitotic and Meiotic cell division and their significance **Keywords/tags:** Prokaryote, Eukaryote, Cell organalles,Chromosomes, Cell Cycle	13
2	**Reproductive Biology** 1.1 Structure of Male reproductive system of Lepus 1.2 Structure of Female reproductive system of Lepus 1.3 Histology of Testis, and Ovary of Lepus 1.4 Gametogenesis - spermatogenesis and oogenesis, differencebetween spermatogenesis and oogenesis 1.5 Types of Eggs-based on amount and distribution of yolk withexamples **Keywords/tags:** Reproductive system, Gametogenesis, Sperms, Eggs	13

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(Miss Harshita Panchal) Student representative

3	**Recent Assisted Reproductive Techniques (ART)** 1.1 Stem cell- Types and their uses 1.2 Gene bank, Sperm bank, Superovulation, Cryopreservation 1.3 In Vitro Fertilization (IVF) and Embryo Transfer (ET)), Zygote Intra Fallopian Transfer (ZIFT), Intracytoplasmic Sperm Injection(ICSI) 1.4 Placentation -Types, examples and functions 1.5 Placenta Banking-Placenta preservation benefits **Keywords/tags:** Gene bank, Sperm bank, Superovulation, IVF, ET,ZIFT, ICSI, Placenta banking.	12
4	**Developmental Biology** 1.1 Fertilization 1.2 Embryonic development of frog up to the formation of threegenninal layers 1.3 Fate map construction in frog 1.4 Metamorphosis of Tadpole Larva 1.5 Parthenogenesis **Keywords/tags:** Fertilization, Frog embryology, Tadpolemetamorphosis, Parthenogenesis	11
5	**Embryonic Development of Chick** 1.1 Structure of hen's egg 1.2 Embryonic Development of chick embryo upto the formation ofprimitive streak 1.3 Fate map construction in chick 1.4 Extra embryonic membranes of Chick: Formation and functions. **Keywords/tags:** Hen's egg, Chick embryology, Fate map, Chickembryo membranes	11

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Chairman & Head

(Miss Harshita Panchal)
Student representative

Part C-Learning Resources
Textbooks, Reference Books, Other Resources
Suggested Readings

Textbooks: At least Five

1 Armugam, "A Text Book of Embryology", Saras Publication, 2005.
2 Gupta, PK, "Cell Biology, Genetics and Evolution", Rastogi Publications, 2013.
3 Powar, CB, "Cell Biology", Himalaya Publishing House, 2010.
4 Rastogi, VB, "Introduction to Cytology", KNRN Publication, 1988.
5 Verma and Agarwal, "A Text Book of Cytology", S. Chand & Co., 1999.
6 Verma, PS, Agarwal, V, K, "Chordate Embryology", S. Chand & Co., 200

1. Reference Book: At least Five

1 Balinsky, BI, "An Introduction to Embryology", Cengage Learning, 2012.
2 De Robertis, EDP, De Robertis, EMF, "Cell and Molecular Biology", Eighth edition, Lippincott, Williams & Wilkins, Philadelphia, 2006.
3 Haffner, L, "Human reproduction at a glance", BWL Publication,2001.
4 Larsen, "Human Embryology", Churchill Livingstone, 2001.
5 Sastry,KV, "Endocrinology and Reproductive Biology", Rastogi. Publications, 2018.
6 Pardesi,K and Dubey, A., ' Cell and Developmental Biology", Akhand publishing house,New Delhi,! edition,2020.

Suggested digital platform web links-

1. https://academic.oup.com
2. https://medineplus.gov
3. https://ncni.nlm.nih.gov

https://zoologylearningpoint.wordpress.com httos://zoologvresources.com

Suggested equivalent online courses –

1 Swayam Online Courses
https://storage.googleapis.com/uniguecourses/online.html
2. National Digital Library
https://ndl.iitkgp. ac.in/
3. e-PG Pathshala (MHRD) Portal(https://epgp.inflibnet.ac.iI}L)
4.Science Direct Open Access Content
(https://www.sciencedirect.com/book/9781843342038/open-access)

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Part D – Assessment and Evaluation				
Internal Assessment: Continuous Comprehensive Evaluation (CCE): **40 Marks** Shall be based on allotted assignments and Class Tests. The division of marks is as follows:			**External Evaluation (Theory Exam):** End Semester Exam: **60 Marks** **Time: 2 hours**	
A. **Submission of Assignment followed by Presentation**			Section (A): 05 MCQ Questions	05 x 01= 05 Marks
B. **Class Test**	Best two test Marks 20 Marks	Best two test Marks **40 Marks**		
Test I (Written test)	20 Marks		Section (B): Five Short Questions (200 Words Each)	05 x 05= 25 Marks
Test II (Written test)	20 Marks		Section (C): Two Long Questions (500 Words Each)	02 x 15= 30 Marks
Test III (Quiz/Seminar/Assignment)	20 Marks			
Total Internal Assessment (Theory) Marks (A+B)		**40 Marks**	**Total External Evaluation (Theory) Marks (A+B+C)**	**60 Marks**

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Student representative

Department of Zoology

Class : M.Sc. I Sem.
Subject : Zoology
Paper: Core 1
Title of the paper - Biosystematics ,Taxonomy and Evolution

Marks: 75 + (CCE) 25 = 100
Credit : 4

Code of the paper : ZO11

Part A : Introduction for Code ZO (M.Sc. I Sem. I Paper)		
1	Pre- requisite (if any)	B.Sc. in Biology including Zoology
2	Course Objectives	Knowledge regarding Biosystematics, Taxonomy and Evolution
	Course Learning outcomes	On completion of the course, the student is expected to be able to Knowledge and Understanding of - 1 Classification of animals on the basis of their relation to other animals by body structure & external characters and Dimension of Speciation.
		-2 Application of the principles and techniques for Taxonomic procedures. Able to apply the International rules of Nomenclature to give a scientific name to animals
		- 3 Calculation and understand different biological indices.
		- 4 Concepts and Theory of Organic Evolution.
		- 5 Macro & Micro evolution & Molecular Population Genetics.

Part B : Content of the Course

Department of Zoology

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

M.Sc. I Semester Zoology Session 2021-22

Paper – 1: Biosystematics, Taxonomy and Evolution(ZO11)

M. Marks: 25 (CCE)+ 75(Th.)= 100

Min. Marks : 10 (CCE) + 30 (Th.) = 40

Credits – 4

Unit I	Definition and basic concepts of biosystematics taxonomy and classification. History of Classification. Types of Taxonomy Chemotaxonomy, Cytotaxonomy and Molecular taxonomy Dimensions of speciation and taxonomic characters. Species concepts: different species concepts. Theories of biological classification.
Unit II	Origin of reproductive isolation, biological mechanism of genetic incompatibility. Taxonomic procedures: Taxonomic collections, preservation, curetting, process of identification. Taxonomic keys, different types of keys, their merits and demerits. International code of Zoological Nomenclature (ICZN). Operative principles, interpretation and Application of important rules: Formation of Scientific names of various Taxa.
Unit-III	Phylogenetic . gradualism and punctuated equilibrium. Modes of speciation (allopatry& sympatry) Evaluation of biodiversity indices. Evaluation of Shannon-Weiner Index. Evaluation of Dominance Index. Similarity and Dissimilarity Index.
Unit-IV	Concepts of evolution and theories of organic evolution. Neo Darwinism and population genetics: A. Hardy-Weinberg law of genetic equilibrium. B. A detailed account of destabilizing forces: i Natural selection ii Mutation iii Genetic Drift iv Migration v Meiotic drive. Trends in Evolution Molecular Evolution a) Gene evolution b) Evolution of gene families c) Assessment of molecular variation and its significance.
Unit-V	Major trends in the origin of higher categories Micro and macro evolution. Molecular population genetics Pattern of changes in nucleotide and amino and sequence. Phylogenetic and biological concept of species. Origin and Evolution & Taxonomically important microbes and animals.

Part C : Learning Resources -
Text Book, Reference Books, Other resources – 1. Principal of Animal Taxonomy – G.G. Simpsom, 2. Principal of Systematic Zoology on Ernest Mayr, 3. Origin of Species - Charles Darwin, 4. Organic Evolution – Rastogi, 5. Organic Evolution – Lull, 6. Principles of Animal Taxonomy – Ashok Verma, 7. Contemporary Taxonomy – D.L.J. Quicke

Part D – Assessment and Evaluation		
Suggested Continuous Evaluation Methods : By Presentation, PPT, By Test, By written Exam Maximum Marks : 100 Continuous Comprehensive Evaluation (CCE): 25 External Exam (EE) : 75		
Internal Assessment: Continuous Comprehensive Evaluation (CCE) : 25	Class Test Assignment/Presentation	25
External Assessment: External Exam : 75 Time : 3 hours	75	75
		100

Part A: Introduction for code:

Govt. Holkar (Model, Autonomous) Science College, Indore	
Department of Forensic Science	
SYLLABUS SESSION: 2021-2022	
M.Sc. – 3rd SEMESTER	
Title of the Paper (Course): Forensic Serology	**Course Code: FS-33-A**
Course Objective	
1: To know about the bio molecule and its examination. 2: To know the genetic, biological fluid and its examination.	
Course Outcomes -After completion of this paper students will come to-	
CO1	Illustrate Biomolecules their importance and examination.
CO2	Define Basics of genetics and genes.
CO3	Explain Immune system.
CO4	Discuss Origin of species.
CO5	Illustrate blood groups and different types of markers.
Part B : Content of the Course:	
Unit 1	**Biomolecules:** Structure and function of proteins-Amino Acids, peptides, Proteins and their Reactions. **Overview of Protein Structure**- Primary, Secondary, Tertiary and Quaternary Structure; Protein denaturation and Foldings. **Structure and Function of Carbohydrates**: Mono, Di, Oligo and Polysaccharides **Structure and Function of Lipids**: Fatty acids, Role of Lipids as structural and signal molecule **Enzymes**: Nomenclature, Classification, Kinetic Mechanism and Applications **Biological Membranes**: Composition and transport across membrane.
Unit 2	**Genetics and Gene Expression:** **Basic Concept of Genetics**: Mendelian principles of dominance, Segregation and Independent Assortment, genotypes and phenotypes, alleles and multiple alleles. **Mutation**: Types, Causes and Detection, Mutant types- Lethal, conditional, biochemical, loss of function and gain of function Structural and Numerical Alteration of Chromosomes: Deletion, Duplication, Inversion and Translocation. **Biochemical Markers of Individuality**: General understanding, classification of markers, Biochemical basis of genetic variation. Introduction of Expression of Gene and Gene Mapping
Unit 3	**Immunology**: Immune System, Immune response, Antigens, Haptens and adjuvant **Immunoglobulin:** Structure and function, raising of anti-sera, Antigen-Antibody reaction. **Lectins**: Introduction and their Forensic significance.
Unit 4	**Determination of Origin of Species**: Determination of human and animal origin form bones, hair, flesh, nails, skin, teeth, body tissue, fluids/stains viz. blood,

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	menstrual blood, semen, saliva, sweat, vomit through immuno-diffusion and immuno-electrophoresis, cross reactivity among closely related species.
Unit 5	**Serogenetic markers**: **Blood group**: History, Biochemistry and genetics of ABO, Rh, Mn and other systems, method of ABO blood grouping (absorption-inhibition, Mixed agglutination and absorption elution) from blood stains and other body fluids/stains viz. menstrual blood, semen, saliva, sweat, vomit, hair, bone, nail. Blood group specific ABH substance, determination of secretors/non secretor status, Lewis antigen, Bombay blood group **Polymorphic enzymes typing**- PGM, ESD, EAP, AK, etc., and their forensic significance, HLA typing, role of Serogenetic markers in individualization, paternity disputes.

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Part C: Learning Resources:
1. Analytical Biochemistry: Holme.
2. Handbook of forensic Science by Richard Saferstein
3. The elements of Immunology: Fahim Halim Khan
4. Fundamental immunology William E. Paul
5. An Introduction to Forensic Genetics, (2007): Goodwin William, John Wiley & Sons Ltd,
6. Basic human genetics (1991): Kapur V, Jaypee Brothers
7. Essentials of Human Genetics (2009): Kothari, Manu L, Universities Press (India) Pvt. Ltd.
8. Genetic Markers in Human Blood, (1969): Giblett, Eloise R. Blackwell Scientific Publications
9. Race, R.R, and Sanger, R. (1975): Blood Groups in Man. Blackwell Scientific, Oxford.
10. Human blood groups-Chemical and biochemical basis of antigen specificity (Second edition): Helmut Schenkel –Brunner, Springer Wein New York
11. Forensic DNA Typing: Biology, Technology, and Genetics behind STR Markers by John M. Butler

Part D – Assessment and Evaluation		
Suggested Continuous Evaluation Methods: By Presentation, PPT, By Test, By written Exam Maximum Marks: 100 Continuous Comprehensive Evaluation (CCE): 25 External Exam (EE): 75		
Internal Assessment: Continuous Comprehensive Evaluation (CCE): 25	Class Test Assignment/Presentation	25
External Assessment: External Exam: 75 Time: 3 hours	75	75
		100

27.11.2021

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

Department of Botany

Class : M.Sc. IV Sem.

Subject : Botany

Paper –II

Title of Paper: Biotechnology & Genetic Engineering

Code of the paper: BO42

Part A : Introduction for code-- BO42		
1	Pre-requisite (if any)	The students must have passed M.Sc. III Sem with Botany
2	Course Objectives	The paper is aimed to introducing the students for Biotechnology and Genetic Engineering
	Course Learning Outcomes	To learn about biotechnology and its tools and techniques.
		Genetic transfer, DNA finger printing and PCR.
		Transgenic crops and ethical issues related to it.
		Use of Biotechnology in use and development of economically important microbes.
		To know about basic concepts of Bioinformatics.

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

Department of Botany

Year 2021-22

Class M.Sc. IV Sem. Botany

Paper –BO42

Biotechnology & Genetic Engineering

UNIT-I	Biotechnology- basic concept, principle and scope. Recombinant DNA technology. Tools (Vectors and enzymes) and techniques cDNA and genomic Libraries.
UNIT-II	Agrobacterium mediated gene transfer. Transposon tagging direct gene transfer techniques DNA finger printing. Polymerase chain reaction.
UNIT-III	Strategies for development of transgenic plants Transgenic plants –Ecological risk and ethical concern. Intellectual property rights
UNIT-IV	Genetic improvement of industrial microbes, Nitrogen fixers. Fermentation technology- Basic concept, characteristic of ideal ferment or, Types of ferment or. Up stream and down stream processing Genomics-Basic concept, types and strategies for genome analysis.
UNIT-V	Protein profiling technology and its application. Bioinformatics-Basic concept and its application in biological science. Genomic projects-basic concept. High through put sequencing (bioinformatics) Microarrays.

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Part C :-Learning Resources

1. Alberts B.D. Lewis, J. Raff, M. Rubers, K. Nad Watson I.D. 1999 molecular Biology of Cell Garland pub.Co. Inc. New York, U.S.A.
2. P.K. Gupta 1999 a text Book of Cell and Molecular Biology Rastogi Pub. Meerut India.
3. Kleinsmith L.J. and Molecular Biology (2nd edition) Harper Collins College Pub. New York USA.
4. P.K. Gupta Genetics Rastogi Pub. Meerut
5. Sinha & Sinha Cytogentics & Plant Breeding Vikas Pub.

Part D :-Assessment and Evaluation

Saggested cntinnous Evaluation Methods: Maximum Marks: Continuous Comprehensive Evaluation (CCE) University Exam (UE):	100 25 75	
Intenal Assesment Continuous Comprehensive Evaluation (CCE) : 25	Class Test Assignment/ Presentation	25 15X5=75
External Assesment: University Exam Setion: 75 Time: 03:00 Hours	Five Long Questions	75

Class: M.Sc. Third Semester
Subject: Microbiology
Paper: Core 9

Marks: 75 + (CCE) 25 = 100
Credit : 4
Code of the Paper:-MB-31

Molecular Biology and Genetic Engineering (Paper 9)

Part A : Introduction for code M.Sc. IIIrd Semester		
1	Pre-requisite (if any)	To study this course a student must have to pass M.Sc. IInd Semester in Microbiology.
2	Course Objectives	To study and understand the molecular techniques, Gene mapping, DNA isolation, DNA sequences and Gene cloning.
	Course Learning outcomes	On completion of the course, the student will be profound in complete Knowledge and Understanding of the subject.
		1.Knowing the terms and terminology related to molecular biology and understanding the structure and functions of genes in living organism at the molecular level.
		2.Understanding the cloning strategies for construction of gene library.
		3.Studying about gene amplification – PCR and its applications.
		4.Importance of Hybridization techniques.
		5.Learning the concept of recombination, linkage mapping and elucidate the gene transfer mechanism in prokaryotes and eukaryotes.

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Part B: Content of the Course

Unit	Topics
1	Core techniques and essential enzymes used in r-DNA technology. Restriction digestion, ligation and transformation. Cloning vectors – Plasmids, phages and cosmids. Cloning strategies – Cloning and selection of individual genes, gene libraries – cDNA and genomic libraries.
2	Specialized cloning strategies – Expression vectors, promoter probe vectors, vectors for library construction - artificial chromosomes, Rationale for the design of vectors for the over-expression of recombination protein, selection of suitable promoter sequences, ribosome binding sites, transcription terminator, fusion protein tags, purification tags, protease cleavage sites and enzymes, plasmid copy number and inducible expression system.
3	DNA sequencing methods – Dideoxy and chemical method, sequence assembly. Automated sequencing and physical mapping of genomes. Gene amplification - PCR and its applications. Ribozymes and RNAi.
4	Expression of cloned DNA – Expression in heterologous system. Identification of cloned gene – Study of the transcript of a cloned gene. Hybridization techniques. Modification of cloned DNA – Site directed mutagenesis, Efficient expression of cloned genes.
5	Applications of r-DNA technology- Requirement and production of recombinant molecules in pharmaceutical, health, agricultural and industrial sectors and research laboratories. Transgenic animals, Agrobacterium mediated transformation, Bt cotton, Gene Therapy. Safety of recombinant DNA technology, IPR and patenting.

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Part C : Learning Resources

Text Books, Reference Books Suggested Readings:	
1. Current protocols in molecular biology.	Ausbel
2. Molecular cloning Vol. 1-III.	Sambrook and Russel
3. Principles of gene manipulation	Old and Primrose.
4. Genome analysis Four volumes	CSH Press.
5. Principles and techniques of biochemistry and molecular biology, 6th Ed.	Wilson Walker.
6. Gene Cloning	Brown

Part D : Assessment and Evaluation

Suggested Continuous Evaluation Methods: **Maximum Marks:** 100 **Continuous Comprehensive Evaluation (CCE):** 25 **University Exam (UE):** 75		
Internal Assessment Continuous Comprehensive Evaluation (CCE): 25	Class Test	10
	Assignment/ Presentation	15
	Total	**25**
External Assessment: University Exam Section:75 Time : 03.00 Hours	Five Long Questions	15 x 5 = 75
	Total	**100**
	Credits	**04**

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Title: - Syllabus of Course Showing Cross-cutting Issues (Environment & Sustainability)

DEPARTMENT OF GEOGRAPHY

Class: B. Sc. III Year — Marks: 40+ (CCE) 10 = 50

Subject: Geography — Paper: Theory -II

Title of Paper: Environment and Resource Management — Code of the Paper:323-II

Part A : Introduction for code-323-II	
Pre-requisite (if any)	To study the course, the student must have passed B. Sc. II Year.
Course Objectives	Through this paper student will be acquainted with interrelationship of the Resources and Environment and the Sustainable Development. This paper also deals with Conservation and Management for solving the environmental problems.
Course Learning Outcomes	1. Students will be able to describe about environment and its relationship with man especially focusing on contemporary issues like environmental degradation, pollution, global warming, disaster management etc.
	2. They will be able to explain the importance of biodiversity and sustainable development and various principles and theories regarding it.
	3. Students will understand the genesis, properties and distribution of soil, flora and fauna in the world. They will also be able to identify the problems regarding them and propose solutions for them.
	4. Students will understand and explain ecological principles underpinning management of resources, populations, communities, and ecosystems.
	5. Students will be able to synthesize geographic knowledge and apply innovative research strategies to solve problems in resource conservation, environmental change, and sustainable development within the community, region, and world.

Part B: Content of the Course	
As per HE Syllabus	
Particulars/ विवरण	
Unit-I	Environment- Meaning, Definition, Nature and Classification. Interrelation of Natural and Human Environment. Environment and Ecology. Environmental Degradation. Disaster Management and Conservation.
इकाई-I	पर्यावरण–अर्थ, परिभाषा, प्रकृति एवंवर्गीकरण।प्राकृतिक एवंमानवीय पर्यावरणकाअन्तर्सम्बंध। पर्यावरण एवंपरिस्थितिकी।पर्यावरणअवनयन, आपदाप्रबंधन एवंसंरक्षण।

Unit-II	Biodiversity and Sustainable Development. Quality of Human Life and Environment. Environmental Policy. Environmental Education and Legislation.
इकाई-II	जैवविविधता एवंसम्पोषितविकास, मानव जीवन की गुणवत्ता एवंपर्यावरण।पर्यावरणनीति, पर्यावरणीय शिक्षातथाविधान।
Unit-III	Sustainable Development- Meaning, Needs and Concepts. Quality of Human Life and Environment. Environmental Laws and Policies. Contemporary Environmental Issues- Population Explosion, Population and Food Security, Global Warming. Green House Effect. Urbanization, Mining and Industrialization.
इकाई–III	सम्पोषितविकास–अर्थ, आवश्यकता एवंसंकल्पनाएं।पर्यावरण एवंमानव जीवन की गुणवत्ता।पर्यावरणविधि एवंनीतियाँ।समसामयिकपर्यावरणीयमुद्दे–जनसंख्या विस्फोट, जनसंख्या एवं खाद्य सुरक्षा, वैश्विकभू–तापन, हरितगृहप्रभाव, नगरीकरण, खनन एवंऔद्योगीकरण।
Unit-IV	Soil: Genesis, Classification and Distribution. Soil Profile. Soil Degradation and Conservation. Factors influencing World Distribution of Plants and Animals. Deforestation. Social Forestry. Major Gene Pool Centers.
इकाई–IV	मृदाः उत्पत्ति, वर्गीकरण एवंवितरण।मृदापरिच्छेदिका।मृदाअवनयन एवंसंरक्षण।वनस्पति एवंजीवों के वितरणकोप्रभावितकरनेवालेकारक, निर्वनीकरण, वन्यजीव, सामाजिकवानिकी, प्रमुख जीनसमुच्चय केन्द्र।
Unit-V	Environmental Conservation and Management- Meaning, Definition, Objectives and Concepts. Resource Regions of India. Techniques of Resource Conservation- Land, Water, Air, Mineral and Forest. Resource Management and Planning with Special reference to Environment.
इकाई-V	पर्यावरणसंरक्षण एवंप्रबंधन–अर्थ, परिभाषा, उद्देश्य एवंसंकल्पनाएँ। भारत के संसाधनप्रदेश।संसाधनसंरक्षणतकनीक–भूमि, जल, वायु, खनिज एवंवन।पर्यावरण के विशेषसंदर्भमेंसंसाधनप्रबंधन एवं योजना।

Part C :-Learning Resources

Text Book , Reference Books, Other resources

Suggested Readings:

- Hagget P.: Geography- A Modern Synthesis, Harper and Row Publishers, New York, 1975.
- Simmons I. G.: The Ecology of Natural Resources, Edward Arnold, London, 1974.
- Alexander D.: Natural Disasters, New Delhi: Research Press, 1993.
- Allaby M.: Basics of Environmental science, London: Routledge, 1996.
- Baarsches W. H.: Eco-fiction: Understanding the Environmental Debate, London: Routledge, 1996.
- Brayan E. A.: Natural Hazards, Cambridge: Cambridge University press, 1991.

DEPARTMENT OF ECONOMICS

Class: B. Sc. III Year | **Marks: 40+ (CCE) 10 = 50**

Subject: Economics | **Paper: Theory -I**

Title of Paper: Development and Environment Economics | **Code of the Paper: C321-I**

Part A : Introduction for code-C321-I	
Pre-requisite (if any)	-
Course Objectives	To explain development economic Growth theories, international trade development theories and learn hardcore economic prescription to development. Demonstrate understanding of difference between growth & development, the measurement of inequality and concept of developed economics
	After the successful completion of the course students should be able to -
Course Learning Outcomes	1. Explain economic growth and development, illustrate factors of economic development.
	2. Illustrate and apply various classical theories of economic growth.
	3. Explain the concept of balanced and imbalanced growth, illustrate Harod-Domar and solow's growth model.
	4. Explain importance of gender equality and women empowerment and techniques of production.
	5. Realize the importance and influence of environment on the economy, suggest appropriate measures to correct environment degration.
Part B: Content of the Course	
As per HE Syllabus	
Particulars/ विवरण	
Unit-I	Economic Growth and Development – Concept, Characteristics of Developing Countries, Factors of Economic Development and Growth-Capital, Physical and Human Recourses, Research& Development and Technology.
इकाई-I	आर्थिक वृध्दि और विकास– अवधारणा, विकासशील देशों की विशेषताएं आर्थिक वृध्दि और विकास के तत्व–पूँजी, भौतिक और मानव संसाधन, अनुसंधान और विकास एवं तकनीक।
Unit-II	Theories of Economic Development – Adam Smith, Karl Marx and Schumpeter, Rostow's Stages of Economic Growth, Investement Criteria of Economic Development, Human Resource Development.
इकाई-II	आर्थिक विकास के सिद्धांत – एडम स्मिथ, कार्ल मार्क्स, शुम्पीटर। रोस्टोव की आर्थिक विकास की

	अवस्थाएं । आर्थिक विकास के निवेश मॉडेल। मानव संसाधन विकास।
Unit-III	Balanced vs. unbalanced Growth -Theories of Big Push (Rodan), A.Lewis, Herschman, Leibenstein, Gunnar Myrdal, and Harrod-Domar, Kuzenets Model.
इकाई–III	संतुलित बनाम असंतुलित विकास – बडे धक्के का सिद्धांत (रोडान), ए.लुईस, हर्षमैन, लीबिस्टीन, गुन्नार मिर्डल, हैरोड–डोमर, कुजनेट्स मॉडल।
Unit-IV	Economic Development and Gender Equality, Gender Development Index (GDI), Women Empowerment. Choices of Techniques of Development-Capital Intensive and Labour Intensive Techniques, Human Development Index.
इकाई–IV	आर्थिक विकास और लिंग समानता। लैंगिक विकास सूचकांक, महिला सशक्तिकरण, विकास की तकनीक का चुनाव –पूंजी प्रधान एंव श्रम प्रधान तकनीके। मानव विकास सूचकांक।
Unit-V	Environment Economics – Concepts, Components and Factors Affecting Environments, Environment – Economy Linkage, Population-Environment linkage, Market Failure for Environment Goods. Concept of Sustainable Development, Valuation of Environmental Damages:- Land, Water, Air, Forest Prevention and Control. Prevention of Pollution. Renewable and non –Renewable resources, Green Index – Concept.
इकाई-V	पर्यावरण अर्थशास्त्र – अवधारणा, घटक एंव पर्यावरण को प्रभावित करने वाले कारक , अर्थव्यवस्था– जनसंख्या अंर्तसंबंध, जनसंख्या पर्यावरण अंर्तसंबंध, बाजार विफलता के रूप में पर्यावरणीय वस्तु, धारणीय विकास की अवधारणा, पर्यावरणीय क्षति का आंकलन– भूमि, जल, वायु और वन ।पर्यावरण प्रदूषण निवारण और रोकथाम। पुनरूत्पादनीय एवं गैर पुनरूत्पादनीय संसाधन, हरित सूचकांक की अवधारणा।

Part C :-Learning Resources

Text Book , Reference Books, Other resources

Suggested Readings:

M L Jhingan : Economics of growth and development.

Heyami Y : Development Economics, Oxford University Press.

Karpagam M : Environmental Economics

सेठ एम.एल. – माइक्रो अर्थशास्त्र

योगेश शर्मा : पर्यावरण एवं मानव संसाधन विकास – पॉइन्ट पब्लिशर, जयपुर

वी सी सिन्हा : विकास एवं पर्यावरणीय अर्थशास्त्र – एस बी पी डी पब्लिशर हाउस, आगरा

दीप्ति शर्मा / महेन्द्र कुमार – पर्यावरण एवं संविकास – अर्जुन पब्लिशिंग, दिल्ली

मध्यप्रदेश हिन्दी ग्रंथ अकादमी के नवीनतम प्रकाशन

Suggestive digital platforms and Web-links:

- https://youtu.be/9VyOln2fnE4
- https://www.k-state.edu/economics/mafwayne/student/Ch_%205_%20Theories%20of%20Economic%20Development.ppt
- http://magadhmahilacollege.org/wp-content/uploads/2020/07/balanced_and_unbalanced_growth_theory.pp2_.pdf
- https://youtu.be/WuxhKC96HqQ
- https://youtu.be/idQlNUHcx54

Part D :Assessment and Evaluation		
As per HE Syllabus		
Suggested Continuous Evaluation Methods: Maximum Marks: 50 Continuous Comprehensive Evaluation (CCE): 10 College Exam: 40		
Internal Assessment: Continuous Comprehensive Evaluation (CCE): 10	Class Test	05
	Assignment/ Presentation	05
	Total	**10**
External Assessment: College Exam Section: 40 Time: **3.00 Hours**	Section (A): Multiple Choice Questions	05 x 01 = 05
	Section (B): Long Questions (200 words each)	05 x 07 = 35
	Total	**40**

Department of Higher Education, Govt. of M.P.
Under Graduate Syllabus for B.sc (Bio) 3 Years
As recommended by Central Board of Studies in Zoology
उच्च शिक्षा विभाग, म.प्र. शासन
स्नातक कक्षाओं के लिऐ त्रिवर्षीय पाठ्यक्रम
केन्द्रीय अध्ययन मण्डल प्राणीशास्त्र द्वारा अनुशंसित

Class / कक्षा	:	B.sc III year (Session-2021-22)
Paper	:	II
Subject/ विषय	:	Zoology
Title of Paper	:	Ecology and Applied Zoology
Max. Mark/ अधिकतम अंक	:	40

Unit-I Concept of Ecology
1. Abiotic and biotic factors, Component of ecosystem
2. **Energy flow in ecosystem:** Food chain, Food web and Pyramids
3. **Biogeochemical cycle** : Carbon, Oxygen, Nitrogen, Phosphorus
4. **Population Concept:** Characteristics of population. Factors affecting Population growth.
5. **Community** : characteristics of community

Unit-II Habitat Ecology
1. Fresh water habitat.
2. Marine habitat.
3. Terrestrial habitat.
4. Ecological division of India.
5. **Biodiversity** : Natural resources and their conservation with special reference to forests.

Unit-III Wild Life and Environment
1. Wild life Protection Act, National Parks and Sanctuaries of Madhya Pradesh.
2. Endangered species of India.
3. **Types of pollution** : Air, water, soil, thermal and noise pollution.
4. Urbanisation and effect of human population on environment.

Unit-IV Aquaculture
1. **Prawn culture:** Culture of fresh water prawn , methods of prawn fishing , preservation and processing of prawns
2. Pearl culture and pearl industry
3. Frog culture.
4. **Major carp culture** : Management of ponds , preservation and processing of fishes
5. Maintenance of Aquarium.

Unit-V Economic Entomology
1. **Sericulture:** Species of silkworm, Life history of *Bombyx mori*, Sericulture Industry in India.
2. **Apiculture:** Life cycle of honey bee, methods of bee keeping, products of bees, enemies of bees.
3. **Lac culture:** Lifecycle of lac insect and host plant of lac insects.
4. **Common pests:** Stored grains: *Sitophilus oryzae and Tribolium castaneum*. **Vegetable pest**: *Piers brassicae and Dacus cucurbitae*.
5. Biological control of insect pests.

(VS Shri) (Dr Neera Sahu) H.S. Rathore
Dr. Shivesh Pratap Singh 3/6/19
Prof. & Head, Dept. of Zoology
Govt. Autonomous P.G. College, Satna (M.P.)
Chairman, Board of Studies, Zoology
(Dr. R. Singh) Dr. Sushila Shivastava 03.6.19 I. Stech.

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Programme: B.Sc. **Class: B.Sc. III Year**

Title of the Paper II: Nutritional, Clinical & Environmental Biochemistry	
Course Code: **301-II**	
Course Objective: To understand about nutritional aspect and clinical processes in body.	
Course outcomes	
CO1	Students would get knowledge about a balanced diet, nutritional value of vitamins and minerals.
CO2	Students would learn about calorimetry, Respiratory quotient, BMR and energy requirement for different groups of human beings.
CO3	Students would get knowledge about the collection and preservation of biological fluids and their importance.
CO4	Describe the role of enzymes in the diagnosis of various diseases.
CO5	Students would acquire knowledge about the causes and effect of water pollution and its impact on the environment

UNIT NO.	TOPICS
I	Nutrition and dietary habits: Introduction and definition of foods and nutrition. Fat soluble vitamins (A, D, E and K), water soluble vitamins (B and C); Minerals (Ca, Fe and iodine) and their biological functions. Basic food groups: energy giving foods, body building foods and protective food. Composition of balanced diet, recommended dietary allowances (RDA) for average Indian, locally available foods, inexpensive quality foods and food stuffs rich in more than one nutrient. Balance vegetarian and non-vegetarian diets, emphasis on nutritional adequacy.
II	Nutritive and calorific value of foods: Basic concept of energy expenditure, units of energy, measurement of energy expenditure by direct or indirect calorimetry, calculation of non-protein RQ with respect to carbohydrate and lipids. Determination of heat production of the diet. The basal metabolism and methods of measuring basal metabolic rate (BMR); energy requirements during growth, pregnancy, lactation and various physical activities. Calculation of energy expenditure of average man and woman.

	Specific dynamic action (SDA) of foods, nutrition value of various kinds of foods generally used by Indian population, planning of dietary regimes for infants, during pregnancy and old age. Protein calories malnutrition (Kwashiorkor and Marasmus). Human milk and its virtues, breast v/s formulated milk feeding.
III	Clinical biochemistry: Basic concept, definition and its scope in diagnosis; a brief review of units and abbreviation used in expressing concentrations and standard solution. Quality control; Manual vs automation in clinical laboratory. Collection and preservation of biological fluids (blood, serum, plasma, urine and CSF). Importance of biochemical analysis of blood, urine and CSF; Normal values for important constituents (in SI unit) in blood (plasma/serum), CSF and urine.
IV	Clinical enzymology: Definition of functional and non-functional plasma enzyme. Isozymes and diagnostic tests. Enzyme pattern in health and diseases with special mention of plasma lipase, amylase, cholinesterase, alkaline and acid phosphates, SGOT, SGPT, LDH and CPK; Functional tests of liver and kidney. Disease related to metabolism: Hypo- and hyper-glycemia, lipid malabsorption and steatorrhea, sphingolipidosis; role of lipoproteins. Inborn errors of amino acid metabolism- alkaptonuria, phenylketonuria, albinism, gout and hyperuricemia.
V	Air pollution: Suspended particulate matter, compounds of carbon, sulphur, nitrogen and their interactions, methods of estimation of biotic and abiotic pollutants, their effect on human health. Water pollution: major pollutants from domestic, agricultural and industrial wastes, effects of pollutants on plants and animals, treatment of domestic and industrial wastes, solid-wastes and their treatment. Soil pollution: Types and causes

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Semester-IV

BCA -405: Environment Awareness and Green Computing

Academic Year: 2021-2022

Min. Marks: 28 Max. Marks: 85

Unit -I

Study of Environment and ecology & Environmental Pollution:

Definition and Importance, Public participation and Public awareness, Air, Water, Noise, Heat and nuclear pollution- Definition, Causes, effect and prevention of pollution, Disaster management- flood, earthquake, cyclones and landslides.

Unit-II

Environment and social problems, Role of mankind conserving natural resources:

Sustainable development- Introduction, Energy problems of cities, solar energy, and biogas and wind energy, Water conservation: Rainwater harvesting, Food resources- World food problem, Energy resources- increasing demand for energy, Role of information technology in protecting environment and health.

Unit III

Fundamental of Green IT:

Green IT Fundamentals: Business, IT and the Environment- Green computing: carbon foot Print Measuring, Details, reasons to bother, plan for the future, Cost Savings, Hardware Power.

Unit IV

Green Assets and Power Problems:

Green Assets: Buildings, Data Centers, Network and Devices, Green Information System: Design and Development Model, Monitoring Power Usage, Servers, Low-Cost Options, Reducing Power Use, Data De-Duplication, Low-Power Computers and peripheral devices.

Unit V

Green Supply Chain &Green PC

Paper Reduction, Green Supply Chain, Reduce Pcs And Servers, Shared Services, Hardware Cost, Cooling, Green Grid Framework, Virtualizing of IT Systems, Materials recycling, Best ways for Green PC ,Green Data Centre Case Studies.

Reference books

1. Textbook for Environmental Studies-University Grant Commission, New Delhi and Bharti Vidyapeeth Institute of Environment Education and Research, Pune
2. Woody Leonhard, Katherrine Murray, "Green Home Computing for Dummies" , August 2009, ISBN 978-0-470-46745-9
3. Alvin Galea, Michael Schaefer, Mike Ebbers, "Green Data Center: Steps for the Journey"

HEAD
Department of Computer Scienc
Govt. H... Science College
(INDORE) (M.P.)

ogram: M.Sc.

Class: IV semester

Title of the Paper V: Environmental Biochemistry	
Course Code: BC-44-B	
urse Objective: To understand various environmental components like atmosphere, ecosystem, habitat.	
Course outcomes	
CO1	Student will understand about various atmospheric components and process of soil formation.
CO2	Understand about biochemical cycles and concepts like BOD, COD, DO etc.
CO3	Critically understand the fundamentals of ecology including food chain, energy flow in ecosystem etc.
CO4	Learn about Biomes and various habitat biodiversity
CO5	Student will be exposed to various global environmental issues and international laws.

UNIT NO.	TOPICS	Hrs
I	Environmental components: Atmosphere, structure and chemical composition of atmosphere, Internal structure of the Earth, rocks and their classification, minerals and their classification. Weathering and soil formation, soil profile, soil classification, Soil erosion: Inorganic and Organic components of soil, soils quality in different regions of India.	12
II	Global Water Balance, Origin and composition of sea water, Hydrological cycle. Classification of trace elements, mobility of trace elements, biogeochemical cycles. Fundamentals of water chemistry: Concept of DO, BOD, COD, Total hardness, Redox potential; Carbonate system	12
II	Fundamentals of Ecology: Definition, subdivisions; Ecosystems: concept of ecosystems, aquatic ecosystem, terrestrial ecosystem, energy flow in ecosystems, nutritional flux, Foodchains, Food web, ecotone, edge effects, ecological habitat & niche, ecological	12

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	pyramids and ecosystem stability, concept of habitat and niche.	
	Biomes and Habitat Diversity: Classification of biomes, major biotic elements of each biome and their characteristics. Population and community ecology, population growth curves, life history strategies (r &k selection); concept of metapopulation. Ecological succession, primary and secondary, mechanism of succession.	12
	Global environmental issues and International laws: Global warming, Greenhouse effect, ozone depletion, acid rains, hazardous waste, CITES etc. Earth's carbon cycle, carbon sequestration, sustainable development. Bioremediation: Introduction and types of bioremediation, bioremediation of surface soil and sludge, bioremediation of subsurface material, In situ and Ex-situ technologies, Phytoremediation	12

EFERENCE BOOKS-

1. Fundamentals of Ecology by by Eugene Odum and Gary Barrett
2. Environmental Chemistry by V. K. Ahluwalia and Lalita S. Kumar
3. Environmental Biology by by V K Agarwal and P.S.Verma

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Programme: M.Sc. Class: III semester

Title of the Paper IV: Environmental Toxicology	
Course Code: BC-33-B	
Course Objective: To understand toxins and their effect on environment.	
Course outcomes	
CO1	Gives an idea about types of toxic substances, dose-response relationship and phase I and II reaction for detoxification
CO2	Explains tissue and organ specificity for toxicity, food toxicology, Metabolism of haloalkanes, haloalkenes and paracetamol
CO3	Student would know about the toxicology of pesticides, insecticide and herbicide, metal toxicity
CO4	Students would acquire knowledge about causes and effect of water pollution and its impact on the environment
CO5	It deals with the toxicity of natural and household products and test for toxicity

UNIT NO.	TOPICS	Hrs
I	Fundamental of toxicology. Definition and Scope. Types of toxic substances. Dose-response relationship. Xenobiotic metabolism: 1) Absorption 2) Distribution 3) Metabolism 4) Phase –I reaction and Phase II reaction.	10
II	Types of exposure. Types of toxic response. Tissue specificity and organ specificity of toxicity (w.r.t. liver, lungs, kidney) Diagnosis of toxic changes in liver and kidney. Drugs as toxic substances. Metabolism of haloalkanes, haloalkenes and paracetamol with their toxic effects on tissue. Food toxicology: Role of diet in cardiovascular disease and cancer, Toxicology of food additives.	12
III	Pesticide's Toxicology: 1) Insecticide toxicology: Organochlorines, Organophosphates, Carbamates 2) Herbicide toxicology Paraquat. Metal toxicity: 1) Arsenic 2) Mercury 3) Lead 4) Cadmium	14

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IV	Environmental Pollution: Air Pollution, Common air pollutants and their sources, acid rain, ozone layer depletion, water pollution.	10
V	Toxicity by natural products: Plant toxins, Animal Toxins, Microbial Toxins (Fungal and bacterial) Toxicity by household products: carbon monoxide, Antifreeze, Ethylene glycol, Alcohol. Toxicity testing: Acute Toxicity Test, Sub Acute Toxicity Tests, Chronic Toxicity Tests	14

REFERENCE BOOKS-

1. Principles of Biochemical Toxicology by John Trimbell
2. Introduction to Toxicology by J.A. Trimbell
3. Pharmacology and Toxicology by B. K. Rao
4. Textbook of veterinary Toxicology by H.S. Sandhu, R.S. Brar

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GOVT. HOLKAR (MODEL. AUTONOMOUS) SCIENCE COLLEGE. INDORE
DEPARTMENT OF BIOTECHNOLOGY
Syllabus Session: 2021-22

Part A: Introduction			
Program:	**Class: M.Sc.**	**Semester: III**	**Session 2021-22**
Subject: Biotechnology			
Course Code	**BT-33**		
Course Title	**ELECTIVE - i Paper – XI** **1/1 (ENVIRONMENTAL BIOTECHNOLOGY)**		
Course Type	**ELECTIVE –1/1**		
Pre-requisite (If any)	**M.Sc. Previous. (Biotechnology)**		
Course Learning Outcomes	Course Outcomes: after the completion of course. students will have understanding of CO1: The basics knowledge of Environment: basic concept and issues. Pollution: Types of pollution. methods for measurement of pollution CO2: You have idea about Air and Water pollution: Air pollution and its control through Biotechnology. CO3: You have idea basics knowledge Treatment schemes for waste water of dairy, distillery. tannery. sugar and antibiotic industries. CO4: The basics concept uses of microbes in the treatment of Environment. CO5: You have idea about Bioremediation. Biopesticides & Global environmental problems.		
Credit Value	4		

Total Marks

CCE (Max)	CCE (Min)	External Assessments Max	External Assessments Min	Total Max	Total Min
25	9	75	26	100	35

Experts Members (Name & Signature)

S.No.	Name	Designation	Signature
1	Dr. Kiran Billore	Chairman	
2	Dr. A. Nighojkar	VC Member	
3	Dr. Bhavesh Patel	Subject Expert	
4	Dr. R K Garg	Subject Expert	
5	Mr. Nitesh Jasani	Representative from Industry	
6	Dr. Rekha Sharma	Member	
7	Mrs. Farida Johar	Alumni	

Part B: Content of the Course	
Total number of Lecture Hours/ Week :4	
Unit	**Topic**
Unit I	**Environment: basic concept and issues, Pollution**: Types of pollution, methods for measurement of pollution. Methodology for environment management – the problem-solving approach, its limitation.
Unit II	**Air and Water pollution**: Air pollution and its control through Biotechnology, Water as scarce natural resources, Need for water management, Measurement of water pollution, Source of water pollution. Marine Pollution: Sources of marine pollution and its control. Waste water treatment: physical, chemical and biological treatment processes, Microbiology of waste water treatment.
Unit III	**Aerobic process:** Activated sludge. Oxidation ditches. Trickling filter. Towers, Rotating disc. Rotating drums, and Oxidation ponds. Anaerobic digestion. Anaerobic filters, up flow anaerobic sludge blanket reactor. Treatment schemes for waste water of dairy, distillery, tannery, sugar and antibiotic industries.

Experts Members (Name & Signature)			
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6	Dr. Rekha Sharma	Member	
7	Mrs. Farida Johar	Alumni	

Unit -IV	**Microbiological degradation of xenobiotic in Environment.** Ecological consideration, decay behavior & degradative plasmid. Hydrocarbons, Oil pollution. Surfactants. Pesticides. Introduction to algal biotechnology: Resource potential of algae, commercial utility of algae. Algae as a source of food, pigments and micronutrients. Environmental applications of algae for Biofuel, biofertilizer and waste water treatment. Potash Mobilizing bacteria & NPK Consortia
Unit -V	**Bioremediation of contaminated soils and waste land**, Biopesticides in integrated pest management. Soil waste source and management (composting, vermiculture, methane production). Global environmental problems. Ozone depletion, UV-B, Greenhouse effect, Acid rain, their impact and Biotechnological approaches for management

Experts Members (Name & Signature)			
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4	Dr. R K Garg	Subject Expert	
5	Mr. Nitesh Jasani	Representative from Industry	
6	Dr. Rekha Sharma	Member	
7	Mrs. Farida Johar	Alumni	

Part C: Learning Resources
Text Books, Reference Books, Other Resources
Texts/References: 1.Environmental Biotechnology by Rajmohan Joshi (Author) 2.Environmental Biotechnology: Basic Concepts and Applications 2nd Revised edition Edition (English, Paperback, Indu Shekhar Thakur) by Indu Shekhar Thakur (Author) 3.Environmental Biotechnology by M. H. Fulekar (Author) 4.Biotechnology Expanding Horizons Latest Edition 2021 (Paperback, B. D. Singh) www.freebookcentre.net>...free Environmental Biotechnology books download eBook Online

Experts Members (Name & Signature)			
S.No.	Name	Designation	Signature
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6	Dr. Rekha Sharma	Member	
7	Mrs. Farida Johar	Alumni	

Part A: Introduction for code:

Govt. Holkar (Model, Autonomous) Science College, Indore	
Department of Chemistry	
SYLLABUS SESSION : 2021-2022	
M.Sc. – 3rd SEMESTER	
Title of the Paper (Course) : Environmental Chemistry	Course Code: CH-33
Course Objective	
The main aim of the course is to equip students with the knowledge of the chemical properties of elements and compounds as well as about the chemical reaction essential for the emergence and existence of the cycling and accumulation of pollutants in the environment.	
Course Outcomes	
CO1	Upon successful completion of the course the student will be able to demonstrate knowledge of chemical & biochemical principles of fundamental environmental processes in air, water & soil.
CO2	Recognize different types of toxic substances and responses and analyzetoxicological information.
CO3	Apply basic chemical concepts to analyze chemical processes involved in different environmental problem.
CO4	Describe water purification and waste treatment processes. Describe causes and effects of environmental pollution by energy industry and discuss some mitigation strategies.
CO5	Explain energy crises and different aspects of sustainability. Discuss local & global environmental issues based on the knowledge gained throughout the course.

Part B : Content of the Course:

Unit 1	**(a) 1. Atmosphere** Atmospheric layers, Vertical temperature profile, heat/radiation budget of the earth atmosphere systems. Properties of troposphere, thermodynamic derivation of lapse rate. Temperature inversion. Calculation of Global means temperature of the atmosphere. Pressure variation in atmosphere and scale height. Biogeochemical cycles of carbon, nitrogen, sulphur, phosphorus, oxygen. Residence times. **2. Atmospheric Chemistry** Sources of trace atmospheric constituents: nitrogen oxides, sulphurdioxide and other sulphur compounds, carbon oxides, chlorofluorocarbons and other halogen compounds, methane and other hydrocarbons. **(b) Tropospheric Photochemistry** Mechanism of Photochemical decomposition of NO_2 and formation of ozone. Formation of oxygen atoms, hydroxyl, hydroperoxy and organic radicals and hydrogen peroxide. Reactions of hydroxyl radicals with methane and other organic compounds. Reaction of OH radicals with SO_2 and NO_2. Formation of Nitrate radical and its reactions. Photochemical smog meteorological conditions and chemistry of its formation.

Unit 2	**(a) Air Pollution** Air pollutants and their classifications. Aerosols-sources, size distribution and effect on visibility, climate and health. **Stratospheric Ozone Depletion** Mechanism of Ozone formation, Mechanism of catalytic ozone depletion, Discovery of Antarctic Ozone hole and Role of chemistry and meteorology. Control Strategies. **Urban Air Pollution** Exhaust emissions, damaging effects of carbon monoxide. Monitoring of CO. Control strategies. **(b) Acid Rain** Definition, Acid rain precursors and their aqueous and gas phase atmospheric oxidation reactions. Damaging effects on aquatic life, plants, buildings and health. Monitoring of SO_2 and NO_2. Acid rain control strategies. **Green House Effect** Terrestrial and solar radiation Spectra, Major greenhouse gases and their sources and Global warming potentials. Climate change and consequences.
Unit 3	**Aquatic Chemistry and Water Pollution** Redox chemistry in natural waters. Dissolved oxygen, biological oxygen demand, chemical oxygen demand, determination of DO, BOD and COD. Aerobic and anaerobic reactions of organic sulphur and nitrogen compounds in water acid-base chemistry of fresh water and sea water. Aluminum, nitrate and fluoride in water. Petrification. Sources of water pollution. Treatment of waste and sewage. Purification of drinking water, techniques of purification and disinfection.
Unit 4	**Environmental Toxicology** **Toxic heavy metals:** Mercury, lead, arsenic and cadmium. Causes of toxicity. Bioaccumulation, sources of heavy metals. Chemical speciation of Hg, Pb, As, and Cd. Biochemical and damaging effects. **Toxic Organic Compound:** Pesticides, classification, properties and uses of organochlorine and ionospheres pesticides detection and damaging effects. **Polychlorinated biphenyls:**Properties, use and environmental continuation and effects. **Polynuclear Aromatic Hydrocarbons:** Source, structures and effect as pollutants.
Unit 5	**a) Soil and Environmental Disasters** Soil composition, micro and macronutrients, soil pollution by fertilizers, plastic and metals. Methods of re-mediation of soil. Bhopal gas tragedy, Chernobyl, three mile island, Minimtata Disease, Sevoso (Italy), London smog. **b) Disaster Management: Elements of disaster management control of leakage of gas cylinder containing toxic gases such as chlorine.**

Part C : Learning Resources:
1. Environmental Chemistry, Colin Baird, W.H. Freeman Co. New York, 1998.
2. Chemistry of Atmospheres, R.P. Wayne, Oxford.
3. Environment Chemistry, A.K. De, Wiley Eastern, 2004.
4. Environmental Chemistry, S.E. Manahan, Lewis Publishers.
5. Introduction to atmospheric Chemistry, P.V. Hobbs, Cambridge.
6. Industrial hazards & plant safety, Sanjoy Banerjee- Taylor & Francis. Factories Act with M.P. Factories rules- Law Publishers

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

Department of Higher Education, Govt. of M.P.

Under Graduate Syllabus for B.Sc. (Bio) 3 Years

As recommended by Central Board of Studies in Zoology

उच्च शिक्षा विभाग, म.प्र. शासन

स्नातक कक्षाओं के लिऐ त्रिवर्षीय पाठ्यक्रम

केन्द्रीय अध्ययन मण्डल प्राणीशास्त्र द्वारा अनुशंसित

Class / कक्षा	:	B.Sc. III year (Session-2021-22)
Paper	:	I
Subject/ विषय	:	Zoology
Title of Paper	:	Genetics
Max. Mark/ अधिकतम अंक	:	40

UNIT I : Heredity and Genetic material

1. Mendel's laws of inheritance.
2. Variations: sources and types.
3. Structure, molecular organization and function of DNA and RNA and types of RNA.
4. DNA replication in Prokaryotes.
5. Nucleosome (Solenoid model).

UNIT II Gene Expression

1. Genetic Code.
2. Transcription in Prokaryotes.
3. Translation in Prokaryotes.
4. Gene expression: Regulation of protein synthesis and Lac Operon model.
5. Split gene, overlapping gene, pseudo-gene.

UNIT III : Linkage and Chromosomal aberration

1. Linkage and crossing over: Types and significance.
2. Sex determination: Chromosomal and genetic balance theory.
3. Sex linked inheritance (Haemophilia, Colour blindness).
4. Structural and numerical changes in chromosomes.
5. Mutation: Types and Mutagens.

UNIT IV : Human Genetics

1. Human Karyotype.
2. Human Genome Project.
3. Multiple allele and inheritance of blood group.
4. Autosomal and Sex Chromosome Syndromes in Human.
5. Genetic diseases in Human: Sickle cell anemia, Albinism and Thalassemia.

UNIT V : Genetic Engineering

1. Recombinant DNA technology and Gene Cloning.
2. Polymerase chain reaction.
3. Blotting- Southern, Northern and Western.
4. DNA finger printing.
5. Gene therapy and Genetic Counseling.

Dr. Shivesh Pratap Singh
Prof. & Head, Dept. of Zoology
Govt. Autonomous P.G. College, Satna (M.P.)
Chairman, Board of Studies, Zoology

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

Department of Botany

Class : M.Sc. III Sem.

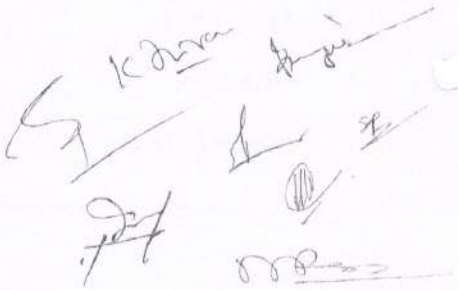
Subject : Botany

Paper –V Open Elective Paper

Title of Paper: Environmental Biology

Code of the paper: OE-EB

Part A : Introduction for code-- OE-EB		
1	Pre-requisite (if any)	The students must have passed M.Sc. II Sem. (other than Botany)
2	Course Objectives	The paper is aimed to introducing the students for To learn about environmental Biology, ecosystem, Biogeochemical cycle, population, plants Biodiversity and different types of pollution, causes and control mechanism.
	Course Learning Outcomes	To study concept and scope of environmental biology
		To learn about Biogeochemical cycles.
		Concept of population: population growth forms
		To learn about Biodiversity
		To learn about different types of pollution and details



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

Department of Botany

Year 2021-22

Class M.Sc. III Sem. Botany

Paper – V Open Elective Paper

Environmental Biology

UNIT-I	Concept and scope of environmental biology; environmental ethics. Ecosystem: concept, structure, functions and types of ecosystem. Food chains and Food web; Ecological pyramids.
UNIT-II	Biogeochemical cycles: concept; gaseous and sedimentary cycles (C, N, S, H2O Cycles); Soil: classification of soils, soil formation, Physical, biological, and chemical characters of soil.
UNIT-III	Concept of population: population growth forms; basic concept of growth rate. Inter-specific and intra-specific interaction; Commensalisms, Mutualism, Predation, Parasitism, Competition, Ecological niche.
UNIT-IV	Concept of Biodiversity: definition and importance; species diversity, generic diversity, Hot spots of biodiversity; Threats to biodiversity, biodiversity conservation. In-situ and ex-situ conservation; Botanical garden and Zoological Park.
UNIT-V	Concept of Pollution: definition, sources effect and Control of:- (i) Air pollution; (ii) Noise pollution; (iii) Water pollution; (iv) Soil pollution; (v) Thermal pollution. e-Waste; Green house gases; Global warming; Ozone depletion; Role of individual in pollution control.

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Part C :-Learning Resources

1	Smith. R.L. 1996. Ecology and Field Biology. Harper Collins. New York.
2	Odum. E.P. 1971. Fundamentals of Ecology. Saunders. Philadelphia.
3	Odum, E.P. 1983. Basic Ecology. Saunders, Philadelphia.
4	Barbour, M.G., Burk, J.H. and Pitts, W.O. 1987. Terrestrial Plant Ecology. Cummings Publication Company, California.
5	Chapman, J.L. and Reiss, M.J. 1988. Ecology: Principles and Applications. tcambridge University Press, Cambridge, U.K.
6	Systemic Botany and Ecology, J.N. Mitra.
7	Environment Studies, Dr. Anis Sidhiki, Dr. Rajiv Sharma.

Part D :-Assessment and Evaluation

Saggested entinnous Evaluation Methods: Maximum Marks: Continuous Comprehensive Evaluation (CCE) University Exam (UE):	100 25 75	
Intenal Assesment Continuous Comprehensive Evaluation (CCE) : 25	Class Test Assignment/ Presentation	25 15X5= 75
External Assesment: University Exam Setion: 75 Time: 03:00 Hours	Five Long Questions	75

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

Department of Botany

Class : M.Sc. II Sem.

Subject : Botany

Paper –III Utilization & Conservation of Plant Resources

Title of Paper:

Code of the paper: BO23

Part A : Introduction for code-- BO23		
1	Pre-requisite (if any)	The students must have passed M.Sc. I Sem with Botany
2	Course Objectives	The paper is aimed to introducing the students for Utilization & Conservation of Plant Resources
	Course Learning Outcomes	1- Students will get information about Natural Resources, their availability and use and also about types of forest in the world.
		2- They can well understand the economic important of forest plants regarding their medicinal important and importance of non wood forest products like Gum plant, Fodder plant etc.
		3- Different conservation practices for forest and natural resource conservation and its information will understood.
		4- Students can make their carrier in forest and plant product and other related field like aquatic habitat.
		5- The importance of Air, Water and Soil Pollution. Kinds, Resource, and effect of their pollution on ecosystems, Climate changes sources, Greenhouse gases, Global warming, and Ozone layer dip lection can be understood.

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

Department of Botany

Year 2021-22

Class M.Sc. II Sem. Botany

Paper - III

Utilization & Conservation of Plant Resources

UNIT-I	Major Biomes of the world- Tropical, Temperate(Boreal and Seasonal forests, rain) & Seasonal Forests; Grasslands, Deserts; Aquatic Ecosystems(wetlands, Lake ,Pond, River, Stream, Estuarine), Marine-habitats.
UNIT-II	Organization of Resources- utilization of Resources from forest, grassland and aquatic habitat ; Food forage, Fodder, Timber & Non-wood forest products; Threats to quality & quantity of resources due to over exploitation.
UNIT-III	Conservation of resources: Classifications of resources; Principles of conservation; In-situ conservation, sanctuaries, National parks, Biosphere reserves for wildlife conservation; Habitat conservation practices of conservation for forests, ranges, soil and water; Ex-situ conservation- Botanical gardens, field gene banks, seed banks, Cryobank, Microbial repositories and Medicinal plant repositories.
UNIT-IV	Pollution & Climate Change: Air, Water and Soil pollution, Kinds, Sources, Quality parameters, Effects on structure & function of ecosystems; Management of pollution; Bioremediation; Climate changes sources, Trends & role of greenhouse gases, Effect of global warming on climate, Ecosystem processes & Biodiversity; Ozone layer & Ozone hole.
UNIT-V	Resource monitoring: Remote sensing concepts & Tools, Satellite remote sensing basics sensors, Visual & digital interpretation, EMR bands and their applications; Indian remote sensing programme: thematic mapping of resources Application of remote sensing in Ecology & Forestry.GIS

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Part C :-Learning Resources

1	Moldan, B. and Billharz, S. 1997. Sustainability Indicators. John Wiley & Sons, New York.
2	Treshow, M. 1985. Air Pollution and Plant Life. Wiley Interscience.
3	Heywood, V.H. and Watson, R.T. 1995. Global Biodiversity Assessment. Cambridge University Press.
4	Mason, C.F. 1991. Biology of Freshwater Pollution. Longman.
5	Hill, M.K. 1997. Understanding Environmental Pollution. Cambridge University Press.
6	Brady, N.C. 1990. The Nature and Properties of Soils. MacMillan.
7	Kothari, A 1997. Understanding Biodiversity: Life'Sustainability and Equity. Orient Longman.
8	Kohli, R., Arya, K.S., Singh, P.H. and Dhillon, H.S. 1994. Tree Directory of Chandigarh.Lovedale Educational, New Delhi.
9	Nair, M.N.B. et. al (Eds) 1998. Sustainable Management of Non-wood Forest Products.
10	Faculty of Forestry, Universiti Putra Malaysia. 434004 PM Serdong, Selangor, Malaysia.
11	Paroda, R.S. and Arora, R.K. 1991. Plant Genetic Resources Conservation and Management. IPGRI (Publication) S0uth Asia Office, C/o NBPGR, Pusa Campus, New Delhi.
12	Pjmentel, D. and Hall, C.W. (eds) 1989. Food.and Natural Resources. Academic Press, London-New York.

Part D :-Assessment and Evaluation

Saggested cntinnous Evaluation Methods: Maximum Marks: Continuous Comprehensive Evaluation (CCE) University Exam (UE):	100 25 75	
Intenal Assesment Continuous Comprehensive Evaluation (CCE) : 25	Class Test Assignment/ Presentation	25 15X5=75
External Assesment: University Exam Setion: 75 Time: 03:00 Hours	Five Long Questions	75

Class: M.Sc. Fourth Semester
Subject: Microbiology
Paper: Core 12

Marks: 75 + (CCE) 25 = 100
Credit : 4
Code of the Paper:-MB-42

Environmental Microbiology (Paper 12)

Part A : Introduction for code M.Sc. IVth Semester		
1	Pre-requisite (if any)	To study this course a student must have to pass M.Sc. IIIrd Semester in Microbiology.
2	Course Objectives	To study the occurrence and distribution of microbial diversity in air, water and soil. Understand the concept of biopolymers, bioplastics, biosensors and biogeotechnology.
	Course Learning outcomes	On completion of the course, the student will be profound in complete Knowledge and Understanding of the subject.
		1.Learning the occurrence, abundance and distribution in air, and transmission of bacterial fungal and viral diseases through air.
		2.Understanding various biogeochemical cycles, carbon, nitrogen, phosphorus cycle, and plant microbes interaction specially rhizosphere and phyllosphere.
		3.Learning the various aspect of environmental microbiology including purification of water, waste water treatment and microbial analysis of water.
		4.Understanding the importance and application Immobilized enzymes.
		5.Role of microorganisms in Bioremediation, Biodeterioration. Bioleaching of metals, Microbial enhancement of oil recovery.

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Part B: Content of the Course

Unit	Topics
1	Aerobiology: Droplet nuclei, aerosol. Assessment of air quality. Bacterial, fungal and viral diseases transmitted through air and their preventive measures.
2	Soil Microbiology: Physical and chemical characteristics of soil. Micro flora of various soil types, rhizosphere and phyllosphere. Positive and negative microbial interactions. Biogeochemical cycles: carbon, nitrogen, phosphorus cycle. Symbiotic and non-symbiotic nitrogen fixation, Mycorrhiza, Phosphate Solubilizing Bacteria.
3	Aquatic Microbiology: Potability of water: microbial assessment of water quality. Purification of water. Major water borne diseases and their control measures. Waste Water treatment: Types and characterization of waste water. Physical, chemical and biological waste treatments, Solid waste treatment.
4	Immobilized enzymes and cells: Methods of immobilization. Applications of immobilized enzymes. Concept and production of: Microbial insecticides, Biofertilizers, Biopolymers, Bioplastics and Biosensors.
5	Bioremediation – Oil spills, Metals, Lignin and Hazardous wastes. Application of GMO in bioremediation. Biodeterioration. Biogeotechnology – Bioleaching of metals, Microbial enhancement of oil recovery.

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Part C : Learning Resources

Text Books, Reference Books
Suggested Readings:

1. Microbial ecology.	Alexander
2. Introduction to Soil Microbiology.	Alexander
3. Bioremediation	Baker and Herson.
4. Advances in microbial ecology Vol-8	Marshall.
5. Experimental Microbial Ecology	Burns and Slater
6. Essays in agricultural and food Microbiology	Norms and Pettipher
7. Soil Biology	Burges and Raw
8. Introduction to Environmental Microbiology	Michel

Part D : Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 100
Continuous Comprehensive Evaluation (CCE): 25
University Exam (UE): 75

Internal Assessment Continuous Comprehensive Evaluation (CCE): 25	Class Test	10
	Assignment/ Presentation	15
	Total	**25**
External Assessment: University Exam Section:75 Time : 03.00 Hours	Five Long Questions	15 x 5 = 75
	Total	**100**
	Credits	**04**

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GOVT. HOLKAR (MODEL AUTONOMOUS) SCIENCE COLLEGE, INDORE
DEPARTMENT OF INDUSTRIAL FISH AND FISHERIES
Syllabus Session : 2021-22

Programme: M.Sc. (FISHERIES) Class : M.Sc. III Sem

Part A: Introduction			
Program:	Class: M.Sc.	Semester :III	Session 2021-22
Subject : M.Sc. (Fisheries)			
Course Code	FF - 34		
Course Title	**Paper IV : Environmental Pollution and Aquaculture (Elective-2)**		
Course Type	Core Course		
Pre-requisite (If any)	M.Sc. IInd Sem.		
Course Learning Outcomes	CO1 Pollution ecology and source of pollution. CO2 Different types of pollution and their effects. CO3 Bioassay study and Biomedical waste. CO4 Biogeochemical cycles and xenobiotic. CO5 Aquaculture and their basic concepts.		
Credit Value	4		

(Dr.Lata Bhattarcharya) Subject Expert | (Dr.Ruchira Choudhary) Subject Expert | (Dr. Kirti Tiwari) VC Member | (Dr. Pratima Khatri) Industrial Member | (Dr. Rekha Sharma) Chairman & Head | (Mr. Mohit Rathore) Student representative

Part B : Content of the Course	
Total Number of Lecture Hours/ Week :4	
Unit	Topic
Unit I	**Unit – 1** 1. Pollution Ecology: definition. 2. Sources of pollution, classification of pollutants, primary and secondary pollutants. 3. Air pollution: definition, sources, air pollutants and its effects on human health and atmosphere, control of air pollution. 4. Water Pollution: definition and sources, water pollutants and its effects, control of water pollution.
Unit II	**Unit - 2** 1. Noise pollution, sources, physiological and psychological effects of noise pollution, control measures of noise pollution. 2. Land pollution: definition, sources, effects and control of insecticide pollution. 3. Radioactive pollution: definition, sources, effects and control measures of radioactive pollution.
Unit III	**Unit - 3** 1. Biomedical waste: sources, effects and control measures. 2. Hazardous waste: definition, sources, effects. 3. Biological and general effects of pollutants on organism. 4. Bioassay studies: definition, purpose, methodology, calculation of LC50 value, significance.
Unit -IV	**Unit – 4** 1. Biogeochemical cycles; carbon dioxide, Nitrogen and Phosphorus. 2. Bioaccumulation and biomagnifications. 3. Biotransformation of xenobiotics.
Unit -V	**Unit – 5** 1. MFS culture: basic concept of fisheries, marine, inland and brackish water fisheries. 2. Indian major carps and their culture: fish, seed resources, transport. 3. Planning and management of freshwater fish farm. 4. Fishery economics and management: role of fishery co -operative societies.

(Dr.Lata Bhattarcharya) Subject Expert | (Dr.Ruchira Choudhary) Subject Expert | (Dr. Kirti Tiwari) VC Member | (Dr. Pratima Khatri) Industrial Member | (Dr. Rekha Sharma) Chairman & Head | (Mr. Mohit Rathore) Student representative

Part C : Learning Resources
Text Books , Reference Books, Other Resources

Texts/References:

•	1. Water Pollution - P.K. Goel
•	2. A Textbook of Aquatic biology - B.B. Fassett and Arvind Kumar.
•	3. Pollution of the Ganga River - N.C. Ghosh and C.B. Sharma
•	4. APHA
•	5. Water and Waste water technology - Mark J. Hammer.
•	6. Principle of Aquaculture - R.R. Stickney
•	7. Fresh water Aquaculture - R.K. Rath

www.cmfri.org.in>ebooks (fisheries content)

(Dr.Lata Bhattarcharya) Subject Expert	(Dr.Ruchira Choudhary) Subject Expert	(Dr. Kirti Tiwari) VC Member	(Dr. Pratima Khatri) Industrial Member	(Dr. Rekha Sharma) Chairman & Head	(Mr. Mohit Rathore) Student representative

GOVT. HOLKAR (MODEL AUTONOMOUS) SCIENCE COLLEGE, INDORE
DEPARTMENT OF INDUSTRIAL FISH AND FISHERIES
Syllabus Session : 2021-22

Programme: M.Sc. (FISHERIES) Class : M.Sc. III Sem

Part A: Introduction			
Program:	Class: M.Sc.	Semester :III	Session 2021-22
Subject : M.Sc. (Fisheries)			
Course Code	FF - 34		
Course Title	**Paper IV : Ecology of Culture Systems (Elective-2)**		
Course Type	Core Course		
Pre-requisite (If any)	M.Sc. IInd Sem.		
Course Learning Outcomes	CO1 Ecological water parameter and effect of monsoon on different water culture system. CO2 Coastal ecosystem analysis. CO3 Primary and secondary production analysis in coastal regions. CO4 Microbiology of culture system. CO5 Aerobic and anaerobic degradation of organic matter.		
Credit Value	4		

(Dr.Lata Bhattarcharya) Subject Expert | (Dr.Ruchira Choudhary) Subject Expert | (Dr. Kirti Tiwari) VC Member | (Dr. Pratima Khatri) Industrial Member | (Dr. Rekha Sharma) Chairman & Head | (Mr. Mohit Rathore) Student representative

Part B : Content of the Course	
Total Number of Lecture Hours/ Week :4	
Unit	Topic
Unit I	Unit – I 1. Physical characteristics of water, Role of temperature, salinity, light, turbidity depth and wind in coastal water-bodies. 2. Circulation and mixing patterns in ponds. 3. Density dependent factors and carrying capacity in Aquatic systems. 4. Effects of monsoon on open sea and pond culture system.
Unit II	Unit – II 1. Chemical characteristic of water, coastal ecosystem analysis. 2. Carbon dioxide system, dissolved oxygen, hydrogen ion concentration. 3. Nitrogen and phosphorus cycles and organic cycling in coastal culture ecosystems, sediment: - water interactions. 4. Classification:- physical and ch emical properties of soil/sediment, sedimentation process, alkalinity, hardness, COD, BOD.
Unit III	Unit – III 1. Redox potential minerals and trace elements in culture ponds. 2. Primary and secondary production in coastal ecosystems. 3. Phytoplankton, benthic algae, primary production, estimation of primary production. 4. Pigment analysis, eutrophication, zooplankton, secondary production, limiting factors, ecological energetics and conversion ratio.
Unit -IV	Unit – IV 1. Microbiology of culture ecosystem, Classification of Aquatic micro- organism, sampling, isolation and purification of major groups of microbes from culture systems. 2. Identification and enumeration of major microbial groups. 3. Types of bacteria, fungi, actinomycetes in culture system, growth and reproduction in bacteria. 4. Factors influencing microbial population, pathogenic bacteria, role of bacteria in regeneration of nutrient and hydrogen supplied production.
Unit -V	Unit – V 1. Water quality management, nitrogen and ammonia toxicity, sledge accumulation. 2. Aerobic and anaerobic degradation of organic matter. 3. Sulphur cycle in pond bottom, effect of organic and inorganic fertilizers on pond productivity. 4. Optimum ecological factors and water quality management in culture systems.

(Dr.Lata Bhattarcharya) Subject Expert	(Dr.Ruchira Choudhary) Subject Expert	(Dr. Kirti Tiwari) VC Member	(Dr. Pratima Khatri) Industrial Member	(Dr. Rekha Sharma) Chairman & Head	(Mr. Mohit Rathore) Student representative

Part C : Learning Resources
Text Books , Reference Books, Other Resources
Texts/References:

•	Cushing D.H. 1976 The Ecology of the seas. Blackwell scientific Publication London.
•	Gerking S.D. 1978 Ecology of Freshwater Fish Production Blackwell scientific Publication London.
•	Lgna, H.S. and C.E. 1997 Dyanamics of Pond Aquaculture. CRC New York.
•	Karel, P. 1990 The lllustrted Guide to fishes of Lakes and rivers Treasure press London.
•	Nikoisky G.V. 1963 The Ecology of fishes. Academic Press London.
•	Raymont J.E. 1990 & 1983 Plankton

www.cmfri.org.in>ebooks (fisheries content)

(Dr.Lata Bhattarcharya) Subject Expert	(Dr.Ruchira Choudhary) Subject Expert	(Dr. Kirti Tiwari) VC Member	(Dr. Pratima Khatri) Industrial Member	(Dr. Rekha Sharma) Chairman & Head	(Mr. Mohit Rathore) Student representative

Part D – Assessment and Evaluation		
Suggested Continuous Evaluation Methods : By Presentation, PPT, By Test, By written Exam Maximum Marks : 100 Continuous Comprehensive Evaluation (CCE): 25 External Exam (EE) : 75		
Internal Assessment: Continuous Comprehensive Evaluation (CCE) : 25	Class Test Assignment/Presentation	25
External Assessment: External Exam : 75 Time : 3 hours	75	75
		100

(Dr.Lata Bhattarcharya) Subject Expert | (Dr.Ruchira Choudhary) Subject Expert | (Dr. Kirti Tiwari) VC Member | (Dr. Pratima Khatri) Industrial Member | (Dr. Rekha Sharma) Chairman & Head | (Mr. Mohit Rathore) Student representative

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

Syllabus 2020-2021

ACCORDING TO NEW PATTERN OF DEPT. OF HIGHER EDU. OF MP.

B.Sc. IInd Year, *HORTICULTURE*

Paper I – Establishment and management of orchard and nursery

Maximum Marks : 40

Unit-I

1. Orchard – Establishment of Orchard.
   (a) Selection of site (b) Selection of fruit (c) Layout
   (d) Preliminary operation (e) Plantation System
2. Management of orchard.
   A. Management of Newly established Orchard- Safety, Training, Intercropping, Filler Plant, Care.
   B. Management of Fruiting Orchard- Training, Prunning, Manuring & Fertilization, Irrigation, Plant Protection, Fruit Harvesting.
3. Rejuvenation of Fruit Orchard.

ईकाई 1

1. फल उद्यान– फल उद्यान की स्थापना
   अ. स्थान का चयन ब. फल का चयन स. प्रारूप / विन्यास
   द. प्रारम्भिक तैयारी ई. रोपण की विधियां
2. फलोद्यान का प्रबंधन
   अ. नवीन रोपित उद्यानों का प्रबंधन– सुरक्षा, वृक्षों की सधाई, अन्तरासस्य, पूरक वृक्ष, सामान्य देखभाल।
   ब. फलित उद्यानों का प्रबंधन– काट–छाट / कृतन, कर्षण, खाद एवं उर्वरक देना, सिंचाई, पौध संरक्षण, फलों की तुड़ाई
3. फलोउद्यान का जीर्णोद्धार या पुनजीवन

Unit - II

1. Vegetable - classification of vegetables.
2. Establishment and Management of vegetable farm.
3. Types of Vegetable Gardening- Kitchen/home gardening, Market gardening, Truck gardening, Forcing gardening, Processing gardening, Seed Production gardening, Floating gardening.
4. Ornamental Garden- Establishment and Different Style.

ईकाई 2

1. सब्जी – सब्जियों का वर्गीकरण
2. सब्जी फार्म की स्थापना एव सब्जी फार्म का प्रबन्ध।
3. सब्जी बागवानी के प्रकार– गृह वाटिका बागवानी, बाजार बागवानी, ट्रक बागवानी, बेमौसमी बागवानी, प्रसंस्करण बागवानी, बीज उत्पादन बागवानी, प्लवन बागवानी
4. शौभाकारी उद्यान– स्थापना और विभिन्न शैलियां

Unit - III

1. Seed bed – Characteristics of seed bed.
2. Nursery - Importance, Scope.
3. Establishment and layout of nursery.
4. Working and management of nursery.
5. Protected Cultivation

23/11/2020

ईकाई 3

1. बीज शैय्या – बीज शैय्या के लक्षण।
2. नर्सरी – महत्व एवं सम्भावना।
3. नर्सरी की स्थापना एवं विन्यास।
4. नर्सरी की कार्यप्रणाली एवं प्रबंधन
5. संरक्षित खेत

Unit IV

1. Horticultural tools..
   (a) Layout tools (b) Intercultural tools
   (c) Plantation tools (d) Thinning and Heading tools
   (e) Packing tools (f) Irrigation tools
   (g) Spray and Dusting tools
2. lawn - (a) Selection of site (b) Characteristics of planned good lawn.

ईकाई 4

1. उद्यानिकी के साधन–
   अ. रेखाकन के साधन ब. अतः सस्य के साधन
   स. रोपण के साधन द. विरलन एवं छटाई के साथन
   ग. पैकिंग के साधन ई. सिंचाई के साधन
   फ. छिडकाव एवं भुरकाव के साधन
2. हरियाली (लॉन) – अ. स्थान का चुनाव ब. अच्छे योजनाबद्ध लॉन की विशेषताऐ

Unit V

1. Weeds - Definition characteristics.
2. Classification of weeds and crop-weed relationship.
3. Herbicides – Types, time of application.
4. Terminologies:
   (a) Active ingredients (b) Acid equivalent
   (c) Polarity: Polar and non-polar (d) LD-50 and ED 50 values for crops.

ईकाई 5

1. खरपतवार – परिभाषा, लक्षण
2. खरपतवार का वर्गीकरण और फसल से संबंध
3. शाकनाशक – प्रकार, अनुप्रयोग का उचित समय
4. तकनीकी शब्दावली

अ. सकिय तत्व ब. अम्लीय समतुल्य स. ध्रुवीयता प्रोलोरेटी ध्रुवीय–अधुवीय
द. एल.डी. 50 और ई.डी. 50 फसलों का मूल्य

23/11/2020

Govt. Holkar (Model autonomous) Science College, Indore
Department Of Industrial Fish and Fisheries
Year 2021- 2022
Class – B.Sc III rd Year

Title of the Paper (Course) – Limnology and Fish Productivity
Code C313-2

Course Objectives: To gain in depth of knowledge about various limnological parameter of different water resources and their fish production.

Course Outcomes
CO1 Limnology- definition, history and scope.
CO2 Primary productivity of fish pond.
CO3 Reservoir fisheries.
CO4 Lentic and lotic fisheries resource of India.
CO5 Aquatic pollution causes and types.

Unit-1
i) Limnology – Definition, historical development and scope.
ii) Lakes their origin and classification.
iii) Types of Ponds.
iv) Physical parameters of water.
v) Chemical parameters of water.

Unit-2
i) Primary productivity of Fish pond and their relation to Fish culture.
ii) Plankton and its role in fish culture.
iii) Aquatic weeds and their control.
iv) Ecological classification of aquatic fauna higher aquatic plants and their significance.
v) Aquatic macrophytes.

Unit-3
i). Methods of water quality testing BOD and COD.
ii) Sewage – Definition, composition and its treatment.
iii) Reservoir Fisheries.
iv) Freshwater Ecosystem.
v) Azolla and Aquaculture.

Unit-4
i) Various morphometric parameters and zonation of sea and lake.
ii) Lentic Fisheries resources of India.
iii) Lotic fishery resources of India.
iv) Role of oxygen in freshwater.
v) Larvivorous fishes and their relation to public health.

Unit-5
i) Aquatic pollution causes and types.
ii) Common effect of aquatic pollution on fish fauna and flora.
iii) Predatory Fishes.
iv) Fish production in pond and its management.
v) Indian cultivable fishes and their crop potential in India.

(Dr.Lata Bhattarcharya)	(Dr.Ruchira Choudhary)	(Dr. Kirti Tiwari)	(Dr. Pratima Khatri)	(Dr. Rekha Sharma)	(Mr. Mohit Ratho
Subject Expert	Subject Expert	VC Member	Industrial Member	Chairman & Head	Student repres

Govt. Holkar (Model autonomous) Science College, Indore

Department Of Industrial Fish and Fisheries

Year 2021- 2022

Class – B.Sc III rd Year

Title of the Paper (Course) – Limnology and Fish Productivity
Code C313-2

Suggested Books:

1. Fundamental of Ichthyology - By S. P. Biswas

2. An introduction to Indian Fisheries - Mrs. U. Sharma, S.P. Grover

3. Fishes of U. P. & Bihar - Gopal Ji Shrivastava

4. भारतीय मत्स्यिकी अर्थशास्त्र – शशिकांत पाण्डे, राजे वर उनियाल

5. मत्स्य परिसंस्करण – एम. बासु, एम. के चौकसे

6. Modern text book of zoology (Vertebrates) - R. L. Kotpal

7. Fish & fisheries of Indian Fisheries - Gy Ghingran

8. A Text Book of Fish & Fisheries technology by – K. P Biswas

9. History of fishes - By J. R. Narmann

www.cmfri.org.in>ebooks (fisheries content)

(Dr.Lata Bhattarcharya) Subject Expert	(Dr.Ruchira Choudhary) Subject Expert	(Dr. Kirti Tiwari) VC Member	(Dr. Pratima Khatri) Industrial Member	(Dr. Rekha Sharma) Chairman & Head	(Mr. Mohit Rathore) Student representative

Govt. Holkar (Model Autonomous) Science College, Indore
Department of Pharmaceutical Chemistry

Class : B.Sc. II Year
Marks: 40 + (CCE) 10 = 50

Subject : Pharmaceutical Chemistry
Code of the paper C216-II

Paper: 2
Title of the paper - Chemistry of natural products

Part A : Introduction for Code PC (B.Sc. II Year II Paper)		
1	Pre- requisite (if any)	
2	Course Objectives	To make students understand about various natural products present naturally as a drug in plants , animals ,minerals etc.
	Course Learning outcomes	After successful completion of the course students should be able to
		216-II-1 Explain heterocyclic compounds naturally present in plants and animals
		216-II-2 Describe naturally present carbohydrates fats and oils and their pharmaceutical importance
		216-II-3 Explain amino acids, proteins and nucleic acids biologically present.
		216-II-4 Explain naturally occurring alkaloids & glycosides and their pharmaceutical usage.
		216-II-5 Describe terpenes and their medicinal uses. Steroids as a biological & medicinal compound.

Paper II *Chemistry of Natural Products* *Max. Marks : 40*

Unit I Heterocyclic compounds: Nomenclature, structure and reactions of imidazoles, oxazoles, pyrazoles, pyran, pyrimidine, purine, indole, isoquinolone.

Unit 2 Carbohydrate: Classification, nomenclature, Monosaccharide: glucose and fructose and their reactions, cyclic structure of D-glucose, Disaccharides: Maltose, lactose and sucrose, polysaccharides: Starch, cellulose, dextran, glycogen, inulin.

Fats : Fats, oils, waxes, fatty acids, physio-chemical properties, phospholipids, lecithenes, cephalins, plasmogens, glycolipids

Unit3 Amino acids : Classification, structure and stereochemistry of amino acids, properties of amino acids.

Protein : Classification, properties of proteins, primary, secondary and tertiary structure of proteins.

Nucleic acids: Introduction, structure of DNA and RNA.

Unit 4 Aklaloids: Classification, general introduction, composition, chemistry and chemical classes, biosources, therapeutic uses and commercial applications of quinine, morphine, reserpine.

Glycoloids: Classification, general introduction, composition, chemistry and chemical classes, biosources, therapeutic uses and commercial applications of senna, aloes, bitter almond. .

Unit 5 Terpenes: Classification, isolation, general introduction, composition, chemistry and chemical classes, biosources, therapeutic uses and commercial applications of citral, carvone, menthol, thymol, camphor.

Steroids: Isolation, nomenclature, chemistry of cholesterol, ergosterol, stigmasterol and cartosone.

Books Recommended

1. Heterocyclic chemistry, R.K. Bansal
2. Organic Chemistry by Morrison and Boyd
3. Heterocyclic Chemistry by T.L. Gilchrist
4. Chemistry of organic Natural products Vol. I and II by O.P. Agarwal.
5. Organic Chemistry Vol. II by Finar

Part B : Content of the Course
As Per Higher Education

Part C : Learning Resources -

Part D – Assessment and Evaluation		
Suggested Continuous Evaluation Methods : By Presentation, PPT, By Test, By written Exam Maximum Marks : 50 Continuous Comprehensive Evaluation (CCE): 10 External Exam (EE) : 40		
Internal Assessment: Continuous Comprehensive Evaluation (CCE) : 10	Class Test Assignment/Presentation	10
External Assessment: External Exam : 40 Time : 3 hours	40	40
		50

GOVT. HOLKAR (MODEL AUTONOMOUS) SCIENCE COLLEGE, INDORE
DEPARTMENT OF INDUSTRIAL FISH AND FISHERIES
Syllabus Session : 2021-22

Programme: M.F.Sc. (FISHERIES) Class : M.F.Sc. II Sem

Part A: Introduction			
Program:	Class: M.F.Sc.	Semester :II	Session 2021-22
Subject : M.F.Sc. (Fisheries)			
Course Code			
Course Title	**Paper III : Aquatic Biology**		
Course Type	Core Course		
Pre-requisite (If any)	M.F.Sc. Ist Sem.		
Course Learning Outcomes	CO1. Fresh and Marine water ecology. CO2. Primary and Secondary fish productivity. CO3. Tropical dynamic ecology and their components. CO4. Aquatic microbes their types, identification and isolation. CO5. Aquatic pollution their types.		
Credit Value	4		

(Dr.Lata Bhattarcharya) Subject Expert | (Dr.Ruchira Choudhary) Subject Expert | (Dr. Kirti Tiwari) VC Member | (Dr. Pratima Khatri) Industrial Member | (Dr. Rekha Sharma) Chairman & Head | (Mr. Mohit Rathore) Student representative

Part B : Content of the Course	
Total Number of Lecture Hours/ Week :4	
Unit	Topic
Unit I	☛ **Unit-I : Freshwater and Marine Ecology** 1) Definition, principles and role of ecology in Aquatic ecosystem. 2) Abiotic and biotic characteristics of freshwater, brackishwater and marine environment. 3) Adaptations in fishes. 4) Oceanography in relation to fishery science. 5) Chemical composition of seawater; waves, tides and influence of tides on fishery.
Unit II	☛ **Unit-II : Productivity** 1) Primary productivity, gross and net productivity, qualitative and quantitative analysis of plankton. 2) Plankton and their role in Aquatic ecosystem in relation to fisheries. 3) Benthos and macrovegetations – types and their role in Aquatic ecosystem. 4) Methods of collection, preservation and identification of major types of benthos and macrovegetations of freshwater.
Unit III	☛ **Unit-III : Trophic Dynamic Ecology** 1) Energy flow, ecological efficiency, ratios within trophic levels, organic particulate matters and their role in productivity. 2) Influence of physical factors of the sea on the transformation of matter in marine environment. 3) Food web structure, utilization and transfer of energy from one trophic level to other. 4) Food conversion and its application to ecology. 5) The biomass and trophic dynamism in pelagic communities.
Unit -IV	☛ **Unit-IV : Aquatic Microbiology** 1) Types of microbes – non-cellular, prokaryotic and eukaryotic microbes and their structure. 2) Isolation, culture and identification techniques of microbes and their enumeration methods (SPC, MPN, TCC and biomass determination). 3) Microbial physiology – Diffusion, osmosis, transport (active and passive) and group translocation, microbial nutrients and culture media (Natural, synthetic and differential media). 4) Factors affecting growth of microbes, population growth curve, its mathematical expression and microbial control (physical and chemical). 5) Cynobacteria and antagonistic characteristics of microbes and their evaluation.

(Dr.Lata Bhattarcharya) Subject Expert	(Dr.Ruchira Choudhary) Subject Expert	(Dr. Kirti Tiwari) VC Member	(Dr. Pratima Khatri) Industrial Member	(Dr. Rekha Sharma) Chairman & Head	(Mr. Mohit Rathore) Student representative

Unit -V	☛ **Unit-V : Aquatic Pollution** 1) Waste waters and their treatment (Primary, Secondary and Tertiary). 2) Determination of Biological and Chemical Oxygen Demand (BOD & COD). 3) Pollutants- Sewage, pesticides, oils, metals ,radioactive wastes, Biomedical wastes etc. Common transport processes of pollutants in Aquatic Environment; dispersal of pollutants, algal blooms and their management, Methods of pollution surveys. 4) Biodegradable materials (cellulose, hemicelluloses, liginin, xenobiotics and recalcitrants) and their degradation. 5) Types of pollutions and measures for their abatement.

(Dr.Lata Bhattarcharya) Subject Expert | (Dr.Ruchira Choudhary) Subject Expert | (Dr. Kirti Tiwari) VC Member | (Dr. Pratima Khatri) Industrial Member | (Dr. Rekha Sharma) Chairman & Head | (Mr. Mohit Rathore) Student representative

Part C : Learning Resources	
Text Books , Reference Books, Other Resources	
Texts/References:	
•	Fundamentals of Ecology – E.P. Odum.
•	Methods for Physical and Chemical Analysis of Freshwater – H.L. Golterman.
•	APHA
•	Animal Ecology and Distribution of Animals – V.B. Rastogi and M.S. Jayaraj.
•	Pesticide Impact on Fish Metabolism – K.R.S. Sambasiva Rao.
•	Water Pollution – Cause, Effect and Control – P.K. Goel.
•	Limnology – C.R. Goldman and A.J. Home.
•	Water and Waste water Technology – Mark J. Hammer.
•	Analysis of Water, Soil and Air – M.M. Saxene.
•	Aquatic Ecology – G. Ragothaman and R.K. Trivedy.
•	Water Pollution and Fish Physiology – Alan G. Heath.
•	Pond Aquaculture Water Quality Management – C.E. Boyd and C.S. Tucker.
•	Microbiological Examination of Water and Wastewater – Maria Csuros and Csaba Csuros.
•	Limnological Analysis – Robert G. Wetzel and Gene E. Likens.
•	Handbook of Oceanography Vol. 1 & 2 – S.K. Basu.
•	Oceanography – A Brief Introduction – K. Siddhartha.
www.cmfri.org.in>ebooks (fisheries content)	

(Dr.Lata Bhattarcharya) Subject Expert	(Dr.Ruchira Choudhary) Subject Expert	(Dr. Kirti Tiwari) VC Member	(Dr. Pratima Khatri) Industrial Member	(Dr. Rekha Sharma) Chairman & Head	(Mr. Mohit Rathore) Student representative

Part D – Assessment and Evaluation		
Suggested Continuous Evaluation Methods : By Presentation, PPT, By Test, By written Exam Maximum Marks : 100 Continuous Comprehensive Evaluation (CCE): 25 External Exam (EE) : 75		
Internal Assessment: Continuous Comprehensive Evaluation (CCE) : 25	Class Test Assignment/Presentation	25
External Assessment: External Exam : 75 Time : 3 hours	75	75
		100

(Dr.Lata Bhattarcharya) Subject Expert | (Dr.Ruchira Choudhary) Subject Expert | (Dr. Kirti Tiwari) VC Member | (Dr. Pratima Khatri) Industrial Member | (Dr. Rekha Sharma) Chairman & Head | (Mr. Mohit Rathore) Student representative

Govt. Holkar (Model Autonomous) Science College, Indore
Department of Pharmaceutical Chemistry

Class : M.Sc. III Sem. Marks: 75 + (CCE) 25 = 100
Subject : Pharmaceutical Chemistry Credit : 4
Paper: Core 10
Title of the paper - Chemistry of Natural Products Code of the paper : PC-32

Part A : Introduction for Code PC (M.Sc. III Sem. II Paper)		
1	Pre- requisite (if any)	A student must have to pass M.Sc. II Sem. in Pharmaceutical Chemistry.
2	Course Objectives	To make students understand about chemistry of natural products which can be used as a pharmaceutical agent.
	Course Learning outcomes	After successful completion of the course students should be able to
		PC-32-1 Explain classification occurrence and methods of structure determination of terpenoids & carotenoids.
		PC-32-2 Describe nomenclature, occurrence isolation & methods of structure elucidation of alkaloids.
		PC-32-3 Describe occurrence nomenclature and synthesis, of cholesterol.
		PC-32-4 Explain occurrence, nomenclature, isolation and methods of structure determination of plant pigments and biosynthesis of flavonoids.
		PC-32-5 Explain occurrence classification of prostaglandins, pyrethroids and rotenones.

DEPARTMENT OF PHARMACEUTICAL CHEMISTRY 2021-22

Part B : Content of the Course

Department of Pharmaceutical Chemistry
Govt. Holkar (Model Autonomous) Science College, Indore
M.Sc. III Semester Pharmaceutical Chemistry Session 2021-22

Paper – 2: Chemistry of Natural Products (PC-32)

M. Marks: 25 (CCE)+ 75(Th.) = 100
Min. Marks : 10 (CCE) + 30 (Th.) = 40
Credits – 4

Unit I	**Terpenoids and Carotenoids** Classification, nomenclature, occurrence, general methods of structure determination, isoprene rule. Structural determination and synthesis of the following representative compounds: - Citral, Geraniol, α-Terpineol, Menthol, Farnesol, Zingiberene, Santonin, Phytol, and β-Carotene.
Unit II	**Alkaloids** Definition, nomenclature and physiological action, occurrence, isolation, general methods of structure elucidation, Emde's degradation of alkaloids, classification based on nitrogen heterocyclic ring, role of alkaloids in plants. Structural determination and synthesis of the following compounds: - Ephedrine, Coniine, Nicotine, Atropine, Quinine and Morphine.
Unit-III	**Steroids** Occurrence, nomenclature, basic skeleton, Isolation, Diels' hydrocarbon. Structural determination and synthesis of Cholesterol, Androsterone , Testosterone, Estrone, Progesterone, Aldosterone.
Unit-IV	**Plant Pigments** Occurrence, nomenclature and general methods of structure determination, Isolation and synthesis of Apigenin, Luteolin, Quercetin, Myricetin, Quercetin 3-glucoside, Daidzein, Cyanidin-7-arabinoside, Hirsutidin chloride, structure determination of Hemoglobin. **Biosynthesis of flavonoids**:- Acetate pathway and Shikimic acid pathway.
Unit-V	a) **Prostaglandin:** Occurrence, classification, biogenesis and physiological effects and Synthesis of PGE2 and PGF2α. b) **Pyrethroids and Rotenones:** Structure, physical and chemical properties and Synthesis of Pyrethroids and Rotenones.

29/4/21

Part C : Learning Resources -
Books Suggested 1. Chemistry of Natural Products, V. K. Ahluwalia, Anne Books Pvt. Ltd. 2. Chemistry of Natural Products, N.R. Krishnaswamy, Universities Press. 3. Organic chemistry of Organic Natural Products I & II Chatwal G.R., Himalaya Publishing House

Part D – Assessment and Evaluation		
Suggested Continuous Evaluation Methods: By Presentation, PPT, By Test, By written Exam Maximum Marks: 100 Continuous Comprehensive Evaluation (CCE): 25 External Exam (EE) : 75		
Internal Assessment: Continuous Comprehensive Evaluation (CCE) : 25	Class Test Assignment/Presentation	25
External Assessment: External Exam: 75 Time : 3 hours	75	75
.		100

Govt. Holkar (Model Autonomous) Science College, Indore
Department of Pharmaceutical Chemistry

Class : M.Sc. III Sem.
Subject : Pharmaceutical Chemistry
Paper: Elective 2/1
Title of the paper - Pharmacognosy

Marks: 75 + (CCE) 25 = 100
Credit : 4

Code of the paper : PC-34-A

Part A : Introduction for Code PC (M.Sc. III Sem. IV Paper)		
1	Pre- requisite (if any)	A student must have to pass M.Sc. II Sem. in Pharmaceutical Chemistry.
2	Course Objectives	To make students understand about cultivation of medicinal plants and plant tissue culture.
	Course Learning outcomes	After successful completion of the course students should be able to
		PC-34 (A)-1 Explain introduction and classification of drugs from natural origin.
		PC-34 (A)-2 Explain cultivation factors affecting cultivation and plant growth hormones.
		PC-34 (A)-3 Describe classification of carbohydrates.
		PC-34 (A)-4 Describe classification of glycosides .
		PC-34 (A)-5 Explain biomedicinals from plant tissue culture secondary metabolites and phytopharmaceuticals .

Vachoury

Sanjay 29/5/14

DEPARTMENT OF PHARMACEUTICAL CHEMISTRY 2021-22

Part B : Content of the Course

Department of Pharmaceutical Chemistry
Govt. Holkar (Model Autonomous) Science College, Indore
M.Sc. III Semester Pharmaceutical Chemistry Session 2021-22

Paper – 4: Pharmacognosy (PC-34-A)

M. Marks: 25 (CCE)+ 75(Th.) = 100
Min. Marks : 10 (CCE) + 30 (Th.) = 40
Credits – 4

Unit I	**Introduction and Classification** History, scope and development of Pharmacognosy. Natural Sources of Drugs: Higher Plants, Microbes, Animals, Marine Organisms. Classifications of Drugs from Natural Origin: Morphological, Taxonomical, organized and unorganized, Pharmacological (Therapeutical), Chemical Classification.
Unit II	**Cultivation and Collection** Cultivation, Factors Affecting Cultivation, Collection, Harvesting, Drying. Plant Growth Hormones-Auxins, Gibberllins, Cytokinins, Abscisic acid, Ethylene. Pest and Pest Control Methods- Mechanical method, Agricultural method, Biological and Chemical control method.
Unit-III	**Carbohydrates** Introduction , Classification and Identification tests. Preparation, Chemical constituents and uses of – Honey, Starch, Dextran, Cellulose, Ispaghula, Acacia, Tragacanth,Tamarind , Bael & Agar.
Unit-IV	**Glycosides** Glycosides- Introduction, Classification and Identification tests. Collection and preparation, Chemical Constituents and uses of-Senna, Aloes, Digitalis, Brahmi and Bitter almond. **Resins:** Introduction, Classification. Collection and preparation, Chemical Constituents and uses of-Ginger,Turmeric, Capsicum, Tolu Balsam and Asafoetida.
Unit-V	**Plant tissue culture** Biomedicinals from plant tissue culture- Introduction, types of cultures, composition of culture medium, surface sterilization of Explants. Preparation of Tissue culture from suspension culture, solid culture. Secondary metabolites, usefulness of secondary metabolites. Scope of tissue culture in production of phyto-pharmaceuticals.

29/X/21

Part C : Learning Resources -
Books Suggested 1. Pharmacognosy , C. K. Kokate, A.P. Purohit and S.B.Gokhale , Nirali Publication. 2. Pharmacognosy and Pharmacobiotechnology, Ashutosh kar, New age of Int. Publ. 3. Text Book of Pharmacognosy, S.S.Handa & V. K. Kapoor, Nirali Publication. 4. Text Book of Pharmacognosy , Shah & Quadry, CBS Publishers and Distributors. 5. Pharmacognosy & Phyto Chemistry Part 1 Rangari, V.D., Career Publication. 6. Pharmacognosy & Phyto Chemistry Part 2 Rangari, V.D. Career Publication. 7. Pharmacognosy , V. N. Raje, CBS Publishers and Distributors. 8. Text Book of Pharmacognosy , G. K. singh and Anil Bhandari, CBS Publishers and Distributors.

Part D – Assessment and Evaluation		
Suggested Continuous Evaluation Methods : By Presentation, PPT, By Test, By written Exam Maximum Marks : 100 Continuous Comprehensive Evaluation (CCE): 25 External Exam (EE) : 75		
Internal Assessment: Continuous Comprehensive Evaluation (CCE) : 25	Class Test Assignment/Presentation	25
External Assessment: External Exam : 75 Time : 3 hours	75	75
		100

Sanjay
29/4/14

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

Department of Botany

Class : B.Sc. First & Second Sem.

Subject : Foundation Course

Title of Paper: Environmental Education Code of the paper: FC 103

Part A : Introduction for code-- FC103

1	Pre-requisite (if any)	A course intended to cerate awareness about the life of human beings which is and integral part of environment; and to inculcate the skills required to protect the environment from all sides. To study this course, the studnet must have a knowledge about the environmental components, pollution, biodiversity, and ecosystem at senior secondary, class 12th level.
2	Course Objectives	To known the basics of Botany.
	Course Learning Outcomes	1- To understand various aspects of life forms, Ecological processes and the impacts on them by the human during.
		2- To build capabilities to identify relevant environmental issues, analyze the various underlying causes evaluate the practices and policies, and develop frame work to make inform decisions.
		3- To develop empathy for all life forms, awareness, and responsibility toward environmental protection and nature preservation.
		4- To develop the critical thinking for shaping strategies such as scientific, social economic, administrative & legal, environmental protection, conservation of biodiversity, environmental equity and sustainable development.
		5- To prepare for the competitive exams.

Part B :Content of the Course

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

Department of Botany

Year 2021-22

Class B.Sc. I & II Sem. Foundation Course

Environmental Education

Unit	Topics	No. of Lectures
I	**Environment and Natural Resources:** • Multidisciplinary nature, Scope and Importance of Environment • Components of Environment: Atmosphere, Hydrosphere, Lithosphere, and Biosphere. • Brief account of Natural Resources and associated problems: Land Resource, Water Resource, Energy Resource • Concept of Sustainability and Sustainable Development *Keywords: Environment, Forest, Mineral, Food, Land, Water, Energy, Sustainable Development*	5 Hrs
II	**Biome, Ecosystem and Biodiversity:** • Major Biomes: Tropical, Temperate, Forest, Grassland, Desert, Tundra, Wetland, Estuarine and Marine • Ecosystem: Structure function and types their Preservation & Restoration • Biodiversity and its conservation practices *Keywords: Biome, Ecosystem, Biodiversity*	4 Hrs
III	**Environmental Pollution, Management and Social Issues:** • Pollution: Types, Control measures, Management and associated problems • Environmental Law and Legislation: Protection and conservation Acts • International Agreement & Programme. • Environmental Movements, communication and public awareness programme. • National and International organizations related to environment conservation and monitoring. • Role of information technology in environment and human health. *Keywords: Pollution, Environmental Legislation, Environmental Movement, Environmental programme and organization.*	6 Hrs

2

Part C :Learning Resources

- Singh; J.S., Singh S.P. and Gupta, S.R.; "Ecology; Environment Science and Conservation ", S Chand publishing , New Delhi , (2018)
- Divan, S. and Rosencranz , A. , "Environmental Law and Policy in India : Cases, Material & Status" Oxford University Press , India , (2002) 2nd Edition .
- ,Odum , E.P. , "Fundamentals of Ecology " , Philadelphia Saundres , (1971)
- Bharucha , Erach , "Environmental studies " Universities Press India Pvt. Ltd. Hyderabad (2014) (Hindi Edition also available).
- Kaushik, Anubha , Kaushik , C.P. "Perspectives in Environmental Studies "New age International Publishers , (2018). 6th Edition .
- Asthana, D. K Asthana Meera, "A Textbook of Environmental Studies", S. Chand Publishing, New Delhi, (2007)
- National Digital Library (https://ndl.iitkgp.ac.in/homestudy/science)
- Epg- pathshala (https://epgp.inflibnet.ac.in/Home/Download)
- NPTEL (https://nptel.ac.in/course.html)
- Coursera (https://www.coursera.org/search?query=environmental+science&page=1)
- इराक भरूचा, पर्यावरण अध्ययन, ओरियन्ट ब्लैकस्वान प्राइवेट लिमिटेड नई दिल्ली (2014)
- दयाशंकर त्रिपाठी, पर्यावरण अध्ययन] मोतीलाल बनारसीलाल पब्लिशर्स दिल्ली.(2006)
- रत्न जोशी, पर्यावरण अध्ययन, साहित्य भवन पब्लिकेशन्स (2018)

Part D :-Assessment and Evaluation

Suggested continuous Evaluation Methods:	
Maximum Marks:	50
Internal Assessment:	20
Minimum Marks:	
University Exam (UE) (Objective):	18
	30

GOVT. HOLKAR (MODEL. AUTONOMOUS) SCIENCE COLLEGE. INDORE
DEPARTMENT OF BIOTECHNOLOGY
Syllabus Session: 2021-22

Part A: Introduction			
Program:	**Class: M.Sc.**	**Semester: II**	**Session 2021-22**
Subject: Biotechnology			
Course Code	**BT-22**		
Course Title	**Paper VI (Bacterial Genetics and Genetic Engineering)**		
Course Type	**Core Course**		
Pre-requisite (If any)	**B.Sc. in any Life Science Stream**		
Course Learning Outcomes	Course Outcomes: After the completion of this course students will have understanding of – CO1: Bacterial recombination. Gene mapping and transposable genetic elements. CO2: Structure. function and types of bacteriophages and plasmid. CO3: Basic concepts in genetic engineering and recombinant DNA technology. C04: Various types of vectors and their properties. CO5: Versatile tools and techniques used in genetic engineering and their applications		
Credit Value	4		

Total Marks

CCE (Max)	CCE (Min)	External Assessments Max	External Assessments Min	Total Max	Total Min
25	9	75	26	100	35

Experts Members (Name & Signature)

S.No.	Name	Designation	Signature
1	Dr. Kiran Billore	Chairman	
2	Dr. A. Nighojkar	VC Member	
3	Dr. Bhavesh Patel	Subject Expert	
4	Dr. R K Garg	Subject Expert	
5	Mr. Nitesh Jasani	Representative from Industry	
6	Dr. Rekha Sharma	Member	
7	Mrs. Farida Johar	Alumni	

Part B: Content of the Course	
Total number of Lecture Hours/ Week :4	
Unit	**Topic**
Unit I	**Gene transfer in bacteria**: History; Transduction – generalized and specialized; Conjugation – F, F', Hfr; F transfer; Hfr-mediated chromosome transfer; Transformation – natural and artificial transformation; Merodiploid generation; Gene mapping by recombination Transposable genetic elements; Insertion sequences; Composite and Complex transposons; Replicative and non-replicative transposition; Genetic analysis using transposons
Unit II	**Bacteriophages and Plasmids:** Bacteriophage–structure; Assay; Lambda phage – genetic map, lysogenic and lytic cycles; Gene regulation; Filamentous phages such as M13; Plasmids – natural plasmids and types of Plasmids; their properties and phenotypes; Plasmid biology - copy number and its control; Incompatibility; Antibiotic resistance markers on plasmids (mechanism of action and resistance); Restriction-modification systems: History; Types of systems and their characteristics; Methylation dependent restriction systems; applications.
Unit III	**Basics Concepts of Genetic Engineering**: Restriction Enzymes: DNA ligase. Klenow enzyme. T4 DNA polymerase. Polynucleotide kinase. Alkaline phosphatase: Cohesive and blunt end ligation; Linkers: Adaptors; Homopolymerictailing; Labeling of DNA: Nick translation, Random priming, Radioactive and non-radioactive probes. Hybridization techniques: Northern, Southern and Colony hybridization. Fluorescence in situ hybridization; Chromatin Immunoprecipitation; DNA-Protein Interactions-Electromobility shift assay; DNaseIfootprinting; Methyl interference assay.

Experts Members (Name & Signature)			
S.No.	Name	Designation	Signature
1	Dr. Kiran Billore	Chairman	
2	Dr. A. Nighojkar	VC Member	
3	Dr. Bhavesh Patel	Subject Expert	
4	Dr. R K Garg	Subject Expert	
5	Mr. Nitesh Jasani	Representative from Industry	
6	Dr. Rekha Sharma	Member	
7	Mrs. Farida Johar	Alumni	

Unit -IV	**Cloning Vectors** : Plasmids; Bacteriophages; M13 mp vectors; PUC19 and Bluescript vectors, Phagemids; Lambda vectors; Insertion and Replacement vectors; EMBL; Cosmids; Artificial chromosome vectors (YACs; BACs); Animal Virus derived vectors-SV-40; vaccinia/bacculo& retroviral vectors; Expression vectors: pMal: GST: pET-based vectors; Protein purification; His-tag; GST-tag; MBP-tag etc.; Intein-based vectors; Inclusion bodies; Baculovirus and pichia vectors system, Plant based vectors. Ti and Ri as vectors, Yeast vectors, Shuttle vectors.
Unit -V	**Cloning Methodologies:** Insertion of Foreign DNA into Host Cells: Transformation; Construction of libraries; Isolation of mRNA and total RNA; cDNA and genomic libraries; cDNA and genomic cloning; Expression cloning; Jumping and hopping libraries; Southwestern and Farwestern cloning; Protein-protein interaction and Yeast two hybrid system; Phage display; Principles in maximizing gene expression.

Experts Members (Name & Signature)			
S.No.	**Name**	**Designation**	**Signature**
1	Dr. Kiran Billore	Chairman	
2	Dr. A. Nighojkar	VC Member	
3	Dr. Bhavesh Patel	Subject Expert	
4	Dr. R K Garg	Subject Expert	
5	Mr. Nitesh Jasani	Representative from Industry	
6	Dr. Rekha Sharma	Member	
7	Mrs. Farida Johar	Alumni	

Part C: Learning Resources
Text Books, Reference Books, Other Resources
Texts/References: 1. S.R. Maloy, J.E. Cronan, D. Friefelder. Microbial Genetics. 2nd Edition. Jones and Bartlett Publishers, 1994. 2. N. Trun and J. Trempy, Fundamental Bacterial Genetics, Blackwell publishing, 2004. 5. Hartl L D and Jones B, Analysis of genes and genomes, 3rd Edition. Jones and Bartlett Publishers. 1994. 6. S.B. Primrose, R.M. Twyman and R.W.Old; Principles of Gene Manipulation. 6th Edition, S.B.University Press, 2001. 7. J. Sambrook and D.W. Russel; Molecular Cloning: A Laboratory Manual. Vols 1-3, CSHL. 2001. 8. Brown TA, Genomes. 3rd ed. Garland Science 2006 9. Campbell AM &Heyer LJ. Discovering Genomics. Proteomics and Bioinformatics. 2nd Edition. Benjamin Cummings 2007 10. Primrose S &Twyman R. Principles of Gene Manipulation and Genomics. 7th Edition. Blackwell. 2006. www.freebookcentre.net>....freeGenetic Engineering books download eBook Online

Experts Members (Name & Signature)			
S.No.	**Name**	**Designation**	**Signature**
1	Dr. Kiran Billore	Chairman	
2	Dr. A. Nighojkar	VC Member	
3	Dr. Bhavesh Patel	Subject Expert	
4	Dr. R K Garg	Subject Expert	
5	Mr. Nitesh Jasani	Representative from Industry	
6	Dr. Rekha Sharma	Member	
7	Mrs. Farida Johar	Alumni	

Department of Zoology

Class : M.Sc. II Sem.
Subject : Zoology
Paper: Core 6
Title of the paper - POPULATION ECOLOGY AND ENVIRONMENTAL PHYSIOLOGY

Marks: 75 + (CCE) 25 = 100
Credit : 4
Code of the paper : ZO22

Part A : Introduction for Code ZO (M.Sc. II Sem. VI Paper)		
1	Pre- requisite (if any)	B.Sc. in Biology including Zoology
2	Course Objectives	To gain Knowledge regarding Population Ecology And Environmental Physiology
	Course Learning outcomes	On completion of the course, the student is expected to be able to gain Knowledge and Understanding of - 1 Populations, their characteristics and regulation of population
		-2 Correlating physiological adaptations to environment and pollution, control measures for environmental degradation.
		-3 limiting factors, predator-prey relationships and physiological responses of the body to environment.
		-4 Environmental Hazards as well as risk factors to human health.
		-5 Concept of homeostasis and methods of relaxation of Stress and body by Yoga, meditation

Part B : Content of the Course

Department of Zoology,
Govt. Holkar (Model, Autonomous) Science College, A.B. Road, Indore
M.Sc. II Semester (Zoology) Session 2021-22

PAPER – 6 : Population Ecology and Environmental physiology (ZO22)

Max. Marks: 25 (CCE)+ 75(Th.) = 100
Min. Marks: 10 (CCE) + 30 (Th.) = 40
Credits – 4

Unit - I	1. Populations and their characters. 2. Demography : Life tables, generation time, reproductive value. 3. Population growth: Growth of organisms with non-overlapping generations, stochastic and time lag models of population growth, stable age distribution. 4. Population regulation: Extrinsic and intrinsic mechanisms.
Unit-II	1. Eco-physiological adaptations to fresh water environments. 2. Eco-physiological adaptations to marine environments. 3. Eco-physiological adaptations to terrestrial environments. 4. Eco-physiological Parasitic adaptation.
Unit-III	1. Environmental limiting factors. 2. Inter and intra-specific relationship. 3. Predatory- prey relationship, predator dynamics, optimal foraging theory (patch choice, diet choice, prey selectivity, foraging time). 4. Mutulism , evolution of plant pollinator interaction.
Unit-IV	1. Environmental Hazards and human health. 2. Conservation and management of natural resources. 3. Environmental impact assessment. 4. Concept and importance of sustainable development.
Unit-V	1. Concept of homeostasis. 2. Endothermi and physiological mechanism of regulation of the body temperature. 3. Physiological response to oxygen deficient stress. 4. Physiological response to body exercise, Meditation, yoga and their effects.

(Dr. Lata Bhattacharya)
Subject Expert

(Dr. Ruchira Choudhary)
Subject Expert

(Dr. Anil Tiwari)
VC Member

(Dr. Prabha Khatri)
Industrial Member

(Dr. Rekha Sharma)
Chairman & Head

(Miss Manisha Panchal)
Student representative

Part C : Learning Resources
Text Book, Reference Books, Other resources - 1. Environmental Biology – P.K. Nair, 2. Ecology – Arumugan, 3. Ecology – Odum, 4. Ecology – Rastogi, 5. Environmental Biology – S.K. Gupta

Part D – Assessment and Evaluation		
Suggested Continuous Evaluation Methods : By Presentation, PPT, By Test, By written Exam Maximum Marks : 100 Continuous Comprehensive Evaluation (CCE): 25 External Exam (EE) : 75		
Internal Assessment: Continuous Comprehensive Evaluation (CCE) : 25	Class Test Assignment/Presentation	25
External Assessment: External Exam : 75 Time : 3 hours	75	75
		100

(Dr. Lata Bhattacharya)
Subject Expert

(Dr. Rupika Choudhary)
Subject Expert

(Dr. Kirti Tiwari)
VC Member

(Dr. Prabha Gupta)
Industrial Member

(Dr. Rekha Sharma)
Chairman & Head

(Miss. Harshita Panchal)
Student representative

Department of Zoology

Class : M.Sc. III Sem.
Subject : Zoology
Paper: Core 10
Title of the paper - Eco-toxicology

Marks: 75 + (CCE) 25 = 100
Credit : 4

Code of the paper : ZO32

Part A : Introduction for Code ZO (M.Sc. III Sem. X Paper)		
1	Pre- requisite (if any)	B.Sc. in Biology including Zoology
2	Course Objectives	To impart Knowledge of Eco-toxicology
	Course Learning outcomes	On completion of the course, the student is expected to be able to Knowledge and Understanding of - 1 Basic Knowledge of General Principles of factors of Eco-system.
		-2 Recycle and Re use techniques for solid & liquid waste, remote Sensing uses in biological System and Environment indicators.
		-3 Different type of environmental pollution
		-4 Basic Concept of Toxicology.
		-5 Effect of pesticides and heavy metals on environment and diseases caused by them.

Dr. Lata Bhattacharya
Subject Expert

(Dr. Rachna Chaudhary)
Subject Expert

Member

Member

RSharp

(Miss Harshita Panchal)
Student representative

Part B : Content of the Course

Department of Zoology

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

M.Sc. III Semester Session 2021-22

Paper – 10 : Eco- Toxicology (ZO32)

Max. Marks: 25 (CCE)+ 75(Th.)= 100
Min. Marks: 10 (CCE) + 30 (Th.) = 40
Credits – 4

Unit-1	1. General principles of Environmental Biology with emphasis on ecosystems. 2. Abiotic and biotic factors of ecosystems. 3. Communities of the environment, their structure & significance. 4. Energy flow in environment : Ecological energetics.
Unit-2	1. Productivity, Production and analysis. 2. Recycling and reuse, reduce technologies for solid and liquid wastes and their role in environmental conservation. 3. Remote sensing –basic concepts and its uses in biological systems. 4. Environmental indicators and their role in environmental balance.
Unit-3	1. Kinds of environmental pollution, causes and their control methods. 2. Radioactive compounds and their impact on the environment. 3. Vehicular exhaust pollution, causes and remedies. 4. Noise pollution causes and remedies.
Unit-4	1. Toxicology- Basic concepts, principles and various types of toxicological agents. 2. Toxicity testing principles, hazards, risks and their control methods. 3. Food toxicants and their control methods. 4. Public Health Hazards due to environmental disasters.
Unit-5	1. Pesticides, types, nature and their effects on environment. 2. Important heavy metals, their role in environment and diseases caused by them. 3. Agrochemical use and misuse, alternatives. 4. Plastic pollution and remedies.

(Dr. Lata Bhattacharya)
Subject Expert

(Dr. Ruchira Choudhary)
Subject Expert

(Dr. Alok Tiwari)
VC Member

(Dr. Archana Chatre)
Industrial Member

(Dr. Rekha Sharma)
Chairman & Head

(Miss Harshita Panchal)
Student representative

Part C : Learning Resources
Text Book, Reference Books, Other resources - 1. Clark : Elements of ecology, 2. Odum : Fundamentals of Ecology, 3. South Woods : Ecological methods, 4. Trivedi and Goel : Chemical and biological methods for water pollution studies

Part D – Assessment and Evaluation		
Suggested Continuous Evaluation Methods : By Presentation, PPT, By Test, By written Exam Maximum Marks : 100 Continuous Comprehensive Evaluation (CCE): 25 External Exam (EE) : 75		
Internal Assessment: Continuous Comprehensive Evaluation (CCE) : 25	Class Test Assignment/Presentation	25
External Assessment: External Exam : 75 Time : 3 hours	75	75
		100

(Dr. Lata Bhattacharya)
Subject Expert

(Dr. Ruchira Choudhary)
Subject Expert

(Miss Harshita Panchal)
Student representative

Department of Zoology

Class : M.Sc. III Sem.
Subject : Zoology
Paper: Elective 1/1
Title of the paper - Limnology

Marks: 75 + (CCE) 25 = 100
Credit : 4

Code of the paper : ZO33A

Part A : Introduction for Code ZO (M.Sc. III Sem. XI Paper) (Elective -1)		
1	Pre- requisite (if any)	B.Sc. in Biology including Zoology
2	Course Objectives	Knowledge regarding Limnology
	Course Learning outcomes	On completion of the course, the student is expected to be able to Knowledge and Understanding of – 1 Lottic and lentic ecosystem of fresh water with reference to fishery
		-2 Limnological parameter of water bodies
		-3 The significance of aquatic flora, fauna, insects, birds and macrophytes in water bodies
		-4 Pollution of rivers, causes and control measures.
		-5 Legislation and regulation on discharge of industrial effluents and domestic wastes in rivers and reservoirs.

(Dr. Lata Bhattacharya)
Subject Expert

(Dr. Ruchira Choudhary)
Subject Expert

(Dr. K.K. Tiwari)
VC Member

(Dr. Prabha Khatri)
Industrial Member

(Dr. Rekha Sharma)
Chairman & Head

(Miss Harshita Panchal)
Student representative

Part B : Content of the Course

Department of Zoology

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

M.Sc. III Semester Session 2021-22

Paper – 11 : Limnology (Elective – 1) (ZO33A)

M. Marks: 25 (CCE)+ 75(Th.)= 100

Min. Marks : 10 (CCE) + 30 (Th.) = 40

Credit – 4

Unit-1	1. Limnology – Definition, historical and scope. 2. Fresh water resources of India and their Management. 3. Lotic ecosystem of freshwater and their fishery (a) Rivers (b) Springs (streams). 4. Lentic ecosystem of fresh water and their fishery (a) Ponds (b) Lakes (c) Reservoir
Unit-2	1. Physical characteristics of fresh water fishery Resources – Depth, Light, Temperature, Turbidty. 2. Chemical characteristic of fresh water fishery resources – Part A – Minerals i.e., Carbonats, Bicarbonate, Phosphate, Sulphate, chloride, Nitrate, Nitrite. 3. Chemical characteristics of fresh water fishery resources Part B – Gases – CO_2 and DO. 4. Estimation and Role of BOD and COD in the fish culture.
Unit-3	1. Phytoplankton-Definition, Types, seasonal variation and role in fish culture. 2. Zooplankton Definition ,Types, seasonal variation and role in fish culture. 3. Aquatic insects and their importance in fish culture. 4. Aquatic birds and their importance in fish culture.
Unit-4	1. Aquatic (fresh water) pollution: its causes effect on fishes and remedy. 2. Pollution status of River Ganga and their remedy including Ganga action plan i.e. measures taken to clean river Ganga. 3. Pollution status of River Yamuna action plan i.e. measures taken to clean river Yamuna. 4. Bioindicatior and their relationship with water quality.
Unit-5	1. Sewage – Definition, Composition, treatment and use in pisciculture. 2. Hydrophytes and their role in fish culture. 3. Uses and Misuses of various inland water resources. 4. Legislations to regulate fresh water pollution.

(Dr. Lata Bhattacharya)
Subject Expert

(Dr. Ruchira Choudhary)
Subject Expert

(Dr. V.K. Tiwari)
VC Member

(Dr. Pradeep Khare)
Industrial Member

(Dr. Rekha Sharma)
Chairman & Head

(Miss Harshita Panchal)
Student representative

Part C : Learning Resources
Text Book, Reference Books, Other resources – 1. Anathakrishnan : Bioresources Ecology, 2. Goldman : Limnology, 3. Odum : Ecology, 4. Pawlosuske : Physico- chemical methods for water, 5. Wetzal : Limnology

Part D – Assessment and Evaluation		
Suggested Continuous Evaluation Methods : By Presentation, PPT, By Test, By written Exam Maximum Marks : 100 Continuous Comprehensive Evaluation (CCE): 25 External Exam (EE) : 75		
Internal Assessment: Continuous Comprehensive Evaluation (CCE) : 25	Class Test Assignment/Presentation	25
External Assessment: External Exam : 75 Time : 3 hours	75	75
		100

(Dr. Lata Bhattacharya)
Subject Expert

Chairman & Head

(Miss Harshita Panchal)
Student representative

DEPARTMENT OF GEOGRAPHY

Class: M. Sc. I Sem. **Marks: 75+ (CCE) 25 = 100**

Subject: Geography **Credit: 4**

Paper: Core I

Title of Paper: Geomorphology **Code of the Paper: GO-11**

Part A : Introduction for Code- GO-11	
Pre-requisite (if any)	To study the course, the student must have passed B.Sc. with Geography subject.
Course Objectives	The paper aims to provide an overview of landforms their evolution and processes that modify them. It enable the students to apply the theories and models of the subject in solving environmental problems and of human life also.
Course Learning Outcomes	1. The students will understand the concept of the subject along with its historical development and recent trends which enable them to identify its relationship with climate change.
	2. Students will learn different concepts and methods of studying landforms as well as morphogenetic regions.
	3. They will understand the endogenetic forces active beneath the surface of the earth and related phenomena.
	4. Students will analyse the exogenetic processes active on the surface of the earth and resultant landforms.
	5. They will understand the concept of slope and theories related to their development. They will analyse the applied aspect of geomorphology in solving the problems of both physical and cultural aspects.

Part B:Content of the Course	
As per HE Syllabus	
Total numbers of lectures (in hours per week): 4 hours per week	
Unit	**Topic**
Unit-I	Introduction of Geomorphology - Definition, Meaning, Nature and Scope. History of development of Geomorphology, Recent trends. Environmental Change - Climatic Change.
इकाई-I	भू–आकृति विज्ञान का परिचय– परिभाषा, अर्थ, प्रकृति एवं विषय क्षेत्र। भू–आकृति विज्ञान के विकास का इतिहास, नूतन प्रवृत्तियाँ। पर्यावरणीय परिवर्तन– जलवायु परिवर्तन।
Unit-II	Methods of study of landforms, Fundamental Concept – Concept of geological Structure and landforms, Uniformitarianism, Multi-cyclic and Polygenetic evolution of landscape,

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	concept of geomorphic process. Morphogenetic regions.
इकाई-II	स्थलरूपों के अध्ययन की विधियाँ, आधारभूत संकल्पनाएँ, भूगर्भिक संरचना तथा भूस्वरूप, एकरूपतावाद, स्थलरूपों की एक चक्रीय तथा बहुचक्रीय उत्पत्ति, भूआकृतिक प्रक्रियाओं की संकल्पना। आकार जनक प्रदेश।
Unit-III	Earth movements – Epeirogenic, Orogenic Structures with reference to evolution of Himalaya, Isostasy, Plate tectonic, Seismicity and Vulcanicity.
इकाई–III	भूसंचलन– महादेशजनक एवं पर्वत निर्माणकारी भूसंचलन, पर्वतीय संरचनाएँ हिमालय की उत्पत्ति के संबंध में। समस्थिति, प्लेट विवर्तनिकी, ज्वालामुखी क्रिया एवं भूकंपता।
Unit-IV	Exogenetic processes – Types and classification of weathering. Mass wasting. Concepts of Normal Cycle of Erosion. Dynamics of Fluvial, Glacial, Aeolian, Marine and Karst processes and resultant landforms.
इकाई–IV	बहिर्जात प्रक्रियाएँ: अपक्षय के प्रकार एवं वर्गीकरण। द्रव्यमान संचलन। सामान्य अपरदन चक्र की संकल्पना। जलीय, हिमानी, वायु, समुद्री तथा कार्स्ट प्रक्रियाओं की गत्यात्मकता तथा निर्मित भू–स्वरूप।
Unit-V	Concepts of Slope and theories related to development of slope. Applied geomorphology– Hydro geomorphology, Urban geomorphology, environmental geomorphology and its application in management of natural Hazards.
इकाई-V	ढाल की संकल्पना एवढाल के विकास से संबंधित सिद्धांत। व्यवहारिक भूआकृति विज्ञान– जलीय भूआकृति विज्ञान, नगरीय भूआकृति विज्ञान, पर्यावरणीय भूआकृति विज्ञान तथा प्राकृतिक आपदा प्रबन्धन में इनका अनुप्रयोग।

Part C: Learning Resources

Text Book , Reference Books, Other resources

Suggested Readings:

- Chorley R. J.: Spatial Analysis in Geomorphology, Methuen Publishing Ltd., London, 1972.
- Davis, W. M.: Geographical Essays, Dover Publications, New York, 1964.
- Sharma, H. S. (ed.): Perspectives in Geomorphology, Concept Publishing Company, New Delhi, 1980.
- Thornbury, W. D.: Principles of Geomorphology, John Wiley Publication, New York, 1960.
- Oliver, C. D.: Weathering, Longman Publishers, London,1979.
- Garner, H. F.: The Origin of Landscape- A Synthesis of Geomorphology, Oxford University Press, London, 1974.
- सिंह, सविन्द्र: भूआकृति विज्ञान, रस्तोगी पब्लिकेशन, मेरठ।
- शर्मा, हरिशंकर एवं कुमार प्रमिला: भूआकृति विज्ञान, मध्य प्रदेश हिंदी ग्रंथ अकादमी, भोपाल।
- मामोरिया सी. बी. एवं न्याति जे. एल.: भूआकृति विज्ञान, शिवलाल प्रकाशनए आगरा।
- राठौर, बी. एस: भू–वैज्ञानिक संरचनाएँ, मध्य प्रदेश हिंदी ग्रंथ अकादमी, भोपाल।

DEPARTMENT OF GEOGRAPHY

Class: M. Sc. I Sem. **Marks: 75+ (CCE) 25 = 100**

Subject: Geography **Credit: 4**

Paper: Core III

Title of Paper: Geography of India (Physical & Resources) **Code of the Paper:** GO-13

Part A: Introduction for Code-	
Pre-requisite (if any)	To study the course, the student must have passed B.Sc. with Geography subject.
Course Objectives	The paper aims to the apprise the students with the physical and cultural resources of India and familiarizes the students with its unity despite having diversity in each of its aspect.
Course Learning Outcomes	1. Students will learn the locational characteristics of the country along with geological and geographical structures with their characteristics.
	2. They will understand and explain the climatic classification of India along with seasonal and regional change of weather and Indian Monsoon as well. They will analyse the classification and distribution of soil and forest resources of India, related problems and their conservation.
	3. Students will get familiar with reserves, production and problems of conservation of major minerals and power resources of India.
	4. They will analyse the potential, regional distribution, development and spatial pattern of water resources in India. They will be able to describe major Resource Regions of the country.
	5. Students will understand and analyse the population dynamics of the country along with urbanisation.

Part B:Content of the Course	
As per HE Syllabus	
Total numbers of lectures (in hours per week): 4 hours per week	
Unit	**Topic**
Unit-I	India: locational characteristics, Unity in diversity. Geological structure. Major terrain units and their characteristics. Drainage system and their functional signification to the Country.
इकाई-I	भारतः स्थितिजन्य विशेषता– अनेकता में एकता, भू–गर्भिक संरचना,प्रमुख भूभाग, इकाईयाँ तथा उनकी विशेषता। अपवाह तंत्र एवं देश के लिये उनका कार्यात्मक महत्व।

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Unit-II	The Origin of Indian monsoon, regional and seasonal variation of weather. Climatic division. Soil: types, their characteristics, distribution and problems. Forest resources and their conservation.
इकाई-II	भारतीय मानसून की उत्पत्ति, मौसम का ऋत्विक एवं प्रादेशिक परिवर्तन। जलवायु विभाजन। मिट्टी:प्रकार, उनकी विशेषताएँ, वितरण एवं समस्याएँ। वन संसाधन एवं उनका संरक्षण।
Unit-III	Mineral and power resources - Reserves, production and problems of conservation of major minerals and power resources (Iron, Manganese, Bauxite, Coal, Petroleum and Hydal power).
इकाई–III	खनिज एवं शक्ति के संसाधनः प्रमुख खनिज एवं शक्ति संसाधनों (लौहा अयस्क मैग्नीज, ताबा, बॉक्साइट, कोयला, खनिज तेल एवं जल विधुत) के संचित भण्डार, उत्पादन तथा संरक्षण की समस्याएँ।
Unit-IV	Water Resources: Potential of water resources, their regional distribution and utilization, development and spatial pattern. Resource regions of India.
इकाई–IV	जल संसाधनः जल संसाधनों की सम्भाव्यता, उनका प्रादेशिक वितरण एवं उपयोगिता, विकास तथा स्थानिक प्रतिरूप। भारत के संसाधन प्रदेश।
Unit-V	Population: Number, distribution, growth with special reference to post-Independence period and its implication. Literacy and education. Trends of urbanization and it's characteristics.
इकाई-V	जनसंख्याः संख्या, वितरण, वृद्धि एवं परिणाम विशेषतः स्वतंत्रता प्राप्ति के पश्चात् के कालखण्ड के संदर्भ में। साक्षारता एवं शिक्षा। नगरीकरण कीप्रवृत्तियाँ एवं विशेषताएँ।

Part C: Learning Resources

Text Book , Reference Books, Other resources

Suggested Readings:

- Adhikari S.: Political Geography, Rawat Publication, 2017.
- Chandna R. C.: Regional Planning and Development, 6st Edition, Kalyani Publishers, New Delhi, 2019.
- Das, P. K.: The Monsoon, The National Book Trust of India, New Delhi, 1968.
- Deshpandey, C. D.: India: A Regional Interpretation, Northern Book Centre, New Delhi, 1992.
- Hussain M.: Geography of India, 9th Edition,McGraw Hill Education, 2020.
- Khullar D. R.: India: A Comprehensive Geography, Kalyani Publishers, New Delhi, 2018.
- Mukherjee, A. B. and Azazuddin, A. (ed.): India: Culture, Society and Economy, Inter India Publications, 1985.
- Pal S.K.: Physical Geography of India, Sangam Books Ltd., New Delhi,1998.
- Singh R. L.(Ed.): India: A Regional Geography, National Geographical Society of India, Varanasi,1971.
- Spate O. H. K. and Learmonth A. T. A.: India and Pakistan- Land, People and Economy,

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Methuen and CO. London, 1967.

- Tirtha R.: Geography of India, Rawat Publications, Jaipur,2002.
- Tiwari, R. C.: Geography of India, Prayag Pustak Bhawan, Allahabad, 2003.
- Valdiya K.S.: The Making of India, Geodynamic Evolution, Macmillan Publishers India Ltd., New Delhi,2010.
- Wadia D. N.: Geology of India, Macmillan & Co. Ltd., London,1919.
- अग्रवाल, पी. सी.: भारत का भूगोल, एशिया प्रकाशन कम्पनी रायपुर।
- तिवारी आर. सी.: राजनीतिक भूगोल, अंबिका पब्लिकेशन्स, इलाहाबाद।
- तिवारी, वी. एन.: भारत का भौगोलिक स्वरूप, रामप्रसाद एण्ड सन्स,
- तिवारी विजय: भारत का भूगोल, भाग 1 एवं 2, हिमालय पब्लिकेशन हाउस, मुम्बई, 2000।
- बंसल एस. सी.: भारत का वृहद् भूगोल, मीनाक्षी प्रकाशन, मेरठ।
- मामोरिया सी. बी.एवं जे. पी. शर्मा: भारत का वृहद भूगोल, साहित्य भवन प्रकाशन, 2017।
- सिंह जगदीश: भारत का भूगोल, ज्ञानोदय प्रकाशन, गोरखपुर।
- हुसैन माजिद: भारत का भूगोल, मेकग्रॉ हिल एजुकेशन, 2017।

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DEPARTMENT OF GEOGRAPHY

Class: M. Sc. II Sem. **Marks: 75+ (CCE) 25 = 100**

Subject: Geography **Credit: 4**

Paper: Core V

Title of Paper: Climatology **Code of the Paper:** GO-21

Part A: Introduction for Code-	
Pre-requisite (if any)	To study the course, the student must have passed M.Sc. I Semester in Geography subject.
Course Objectives	This paper is designed to make the students familiar with composition and structure of atmosphere along with various atmospheric processes and phenomena related to the changes in weather and maintaining the balance in the distribution of temperature and humidity throughout the globe.
Course Learning Outcomes	1. Students will become familiar with the nature and scope of climatology, its relation with meteorology and various elements of weather and climate. They will be able to demonstrate the composition and layered structure of the atmosphere along with their characteristics.
	2. The students will cognize the relationship of Earth and Sun by studying the distribution of insolation and temperature along with heat balance on Earth.
	3. Students will learn the interaction between atmosphere and Earth's surface as well as understand the role of atmospheric pressure in various circulations of air be it horizontal, vertical or modified (circular).
	4. Students will understand how the atmospheric humidity works and what changes occur in the atmosphere due to various processes related to it.
	5. Students will learn the approaches to climatic classification and describe major climates of the world.

Part B:Content of the Course	
As per HE Syllabus	
Total numbers of lectures (in hours per week): 4 hours per week	
Unit	**Topic**
Unit-I	Meaning, definition, nature and scope of climatology and its relationship with meteorology. Elements of weather and climate. Composition and structure of the atmosphere. Vertical division of the atmosphere.
इकाई-I	जलवायुविज्ञानकाअर्थ,परिभाषा, प्रकृति एवंविषय क्षेत्र तथाइसकामौसमविज्ञान से संबंध। मौसमतथाजलवायु के तत्व ।वायुमण्डलकासंगठन एवंसंरचना ।वायुमण्डलकालम्बवतविभाजन।
Unit-II	Insolation: Factors affecting the amount of solar radiation. Earth and Sun relation.

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	Distribution of solar radiation on the Earth. Heating and cooling processes of the atmosphere. Heat balance of the Earth. Vertical and Horizontal distribution of temperature.
इकाई-II	सौर्यताप: सौर्य विकिरण की मात्रा का प्रभावित करने वाले कारक, पृथ्वी एवं सूर्य संबंध, पृथ्वी पर सौर्य विकिरण का वितरण। वायुमण्डल के उष्णन तथा शीतलन की प्रक्रियाएँ, पृथ्वी का उष्मा बजट, तापक्रम का लम्बवत तथा क्षैतिज वितरण।
Unit-III	Atmospheric pressure and winds: General circulation of atmosphere. Forces controlling vertical motion of the air. Local winds. Jet Stream. Monsoon winds. El Nino. Air masses and Fronts.
इकाई–III	वायुमण्डलीय दाब तथा पवनें: वायुमण्डल का सामान्य परिसंचरण, वायु की लम्बवत गति को नियंत्रित करने वाले कारक।स्थानीय पवनें।जेट स्ट्रीम।मानसून पवनें। एलनीनो। वायुराशियाँ एवं वाताग्र।
Unit-IV	Atmospheric moisture: Humidity; Evaporation; Condensation; Precipitation; Formation, types and world distribution pattern. Adiabatic temperature change. Atmospheric stability and instability; Cyclones and Anticyclones.
इकाई–IV	वायुमण्डलीय नमी: आद्रता, वाष्पीकरण, संघनन, वर्षण–रचना, प्रकार एवं विश्व वितरण प्रतिरूप। रूद्धोष्म ताप परिवर्तन, वायुमण्डलीय स्थिरता एवं अस्थिरता, चक्रवात तथा प्रतिचक्रवात।
Unit-V	Climatic classification of Koppen and Thornthwaite. Major climates of the world- tropical, temperate, desert and mountain.
इकाई-V	कोपेन एवं थॉर्नथ्वेट का जलवायु वर्गीकरण।विश्व की प्रमुख जलवायु–उष्णकटिबंधीय,शीतोष्ण कटिबंधीय, मरूस्थलीय तथा पर्वतीय।

Part C: Learning Resources

Text Book , Reference Books, Other resources

Suggested Readings:

- Berry B. J. L. and Chorley P. J.: Atmosphere, Weather and Climate. Routledge Publishers, London & New York, 1993.
- Critchfield J. S.: General Climatology, Prentice Hall India, 1993.
- Peterson: Introduction to Meteorology, McGraw Hill Book, London, 1969.
- Lal D. S.: Climatology, Chaitanya Publication, Allahabad, 1986.
- लाल, डी. एस: जलवायुविज्ञान, शारदापुस्तक भवन।
- सिंह मंजु, मौसम एवंजलवायुविज्ञान, डिस्कवरीपब्लिशरहाउस, 2012।
- सिसोदिया एम. एस: जलवायु एवंसमुदविज्ञान, कैलाशपुस्तकसदन, भोपाल,
- सिंह रविन्द्र: जलवायुविज्ञान, प्रवालिकापब्लिकेशन।

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DEPARTMENT OF GEOGRAPHY

Class: M. Sc. II Sem. **Marks: 75+ (CCE) 25 = 100**

Subject: Geography **Credit: 4**

Paper: Core VIII

Title of Paper: Geography of Environment **Code of the Paper:** GO-24

Part A: Introduction for Code-	
Pre-requisite (if any)	To study the course, the student must have passed M.Sc. I Semester in Geography subject.
Course Objectives	This paper is designed to make the students aware of the importance of environment, its various problems and ways to solve them by using this knowledge in their day today life. It will also encourage the students to build their career in this field.
Course Learning Outcomes	1. Students will understand the basic concepts and theories of environment along with its various components so that they can relate with it in their day today life.
	2. They will comprehend the relationship between man and environment and will be able to analyse the impact of various natural phenomena on human activities.
	3. Students will get familiar with the composition, structure, function and types of ecosystems found in the world which will acquaint them in identifying the problems of various ecosystems and propose solutions accordingly.
	4. Students will understand the nature of hazards and disasters. They will be able to assess the risk, vulnerability and impact as well as management with respect to hazards.
	5. Students will be able to synthesize geographic knowledge along with various laws and acts regarding environmental conservation and apply innovative research strategies to solve various environmental problems.

Part B:Content of the Course	
As per HE Syllabus	
Total numbers of lectures (in hours per week): 4 hours per week	
Unit	**Topic**
Unit-I	Environment: Meaning, Definition, Concepts and Theories related to Environment. Components of Environment: classification and their interdependent relationship.
इकाई-I	पर्यावरणः अर्थ, परिभाषा, पर्यावरण से संबधितसंकल्पनाएँ एवंसिद्धांत।पर्यावरण के घटक: वर्गीकरणतथाअन्योन्याश्रितसंबंध।
Unit-II	Development of Environmentalism in Geography. Development of environmental studies and their approaches. Environment and Development: Impact of topography, climate and natural resources on

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	human activities.
इकाई-II	भूगोलमेंपर्यावरणवादकाविकास, पर्यावरणीय अध्ययन काविकासएवंउसकेउपागम। पर्यावरण एवंविकास–मानवीय क्रियाओंपरस्थलाकृति,जलवायु एवंप्राकृतिकसंसाधनोंकाप्रभाव।
Unit-III	Ecological Concepts: Ecosystem- meaning, definition, components, structure and functions. Introduction of major ecosystems of the world- Forests, Agriculture, Desert and Marine Ecosystems.
इकाई–III	पारिस्थतिकअवधारणाएँ: पारिस्थतिकीतत्र–अर्थ, परिभाषा, घटक,संरचना एवंकार्य। विश्व के प्रमुख पारिस्थितिकीतंत्र–वन, कृषि, मरूस्थलीय एवंसमुद्रीपरिस्थितिकीय तंत्र।
Unit-IV	Environmental Hazards: Natural and Man induced- Earthquake, Volcanoes, Cyclones, Flood, Drought and Desertification. Mitigation Strategies: Structural and Non-structural.
इकाई–IV	पर्यावरणीय प्रकोप: प्राकृतिक एवंमानवप्रेरित–भूकंप, ज्वालामुखी, चक्रवात, बाढ़, सूखा एवं मरूस्थलीकरण। निदानात्मकव्यूहरचनाएँ: संरचनात्मक एवंअसंरचनात्मक।
Unit-V	Environmental Pollution: Meaning, definition, nature and types. Causes and impact of air, water, noise and soil pollution; their prevention and control measures. Environmental Protection through laws- forest act, water and air pollution act.
इकाई-V	पर्यावरणप्रदूषण: अर्थ, परिभाषा, प्रकृति एवंप्रकार।वायु, जल, ध्वनितथामृदाप्रदूषण के कारक एवंप्रभाव; उनके रोकथाम एवंनियंत्रण के उपाय।कानुन के माध्यम से पर्यावरणसंरक्षण–वनअधिनियम, जल एवंवायुप्रदूषणनियंत्रण अधिनियम।

Part C: Learning Resources

Text Book , Reference Books, Other resources

Suggested Readings:

- Agrawal, A. and SunitaNarain: Dying Wisdom: The Fourth Citizen Report, Centre of Science and Environment, New Delhi, 1998.
- Burton, I; R. W. Kates and G. F. Whiley: The Environment as Hazards, Oxford University Press, New York, 1978.
- Cartledge, B.: Population and the Environment, Oxford University Press, New York, 1995.
- Chandna, R. C.: Environmental Awareness, Kalyani Publication, New Delhi, 1998.
- Dawson, J. and J. C. Doornkamp (eds.): Evaluating the Human Environment, Edward Arnold, London, 1975.
- Detwyler, J. R.: Mans impact on Environment, Pelican, 1970.
- Edington, J. N. and M. A. Edington: Ecology and Environmental Planning, Chapman and Hall, London, 1977.
- Goudie, A.: The Human Impact on the Natural Environment, Blackwell Oxford, United Kingdom, 1994.

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- Jain, R. K.: L.V. Urban and G. S. Stacy: Environmental Impact Analysis: A New Dimension in Decision Making, Van Nostrand Reinhold Co., New York, 1977.
- Khosho, T. N.: Environmental Concepts and Strategies, Ashish Publishing house, New Delhi.
- Khanna, B. K.: All you wanted to know about Disasters, India Publishing Agency, New Delhi, 2006.
- Mohan, M.: Ecology and Development, Rawat Publication, Jaipur, 2000.
- Munn, R. E.: Environmental Impact Assessment: Principles and Procedures, John Wiley and Sons, New York, 1979.
- Narain, S.: The Citizen, Fifth Report, Centre of Science and Environment, New Delhi, 2003.
- Mukherjee, A. and V. K. Agnihotri: Environment and Development, Concept Publishing Company, New Delhi, 1993.
- Ruding, W.: Environmental Policy, Edward Elger Publishing Ltd., U.K., 1998.
- Saxena, H. M.: Environmental Geography, Rawat Publications, Jaipur, 2000.
- Saxena, H. M.: Environmental Management, Rawat Publications, Jaipur, 2000.
- अवस्थी, एन. एम. एवंआर. पी. तिवारी: पर्यावरण भूगोल, मध्य प्रदेशहिंदीग्रंथअकादमी, भोपाल।
- नेगी, पी. एस.: पारिस्थितिकीय विकास एवंपर्यावरण भूगोल, रस्तोगी एण्ड कम्पनी, मेरठ,1995।
- रघुवंशी, अरूण एवंचंद्रलेखारघुवंशी: पर्यावरणतथाप्रदूषण, मध्य प्रदेशहिंदीग्रंथअकादमी, भोपाल, 1989।
- सिंह सविन्द्र: पर्यावरण भूगोल, प्रयागपुस्तक भवन, इलाहाबाद।
- तिवारी, वी. के.: पर्यावरणपारिस्थितिकी, हिमालय पब्लिकेशन, दिल्ली, 1998।

Govt. Holkar (Model Autonomous) Science College, Indore
Department of Physics
Syllabus Session 2021-22

CLASS - M.Sc. SEMESTER - IV
SUBJECT - PHYSICS
Title of the Paper: **Renewable Energy Resources**
PAPER – Elective-4

Marks 75+25 (CCE) =100
Min. Marks= 26+9=35
PAPER Code- PH 44 B
Credits- 4

Part - A	
Introduction for Code – 44 B Elective-4	
SUBJECT : PHYSICS (Renewable Energy Resources)	
Pre-requisite (if any)	B.Sc with Physics as one of the Subject
Course Objectives	To gain the Handling of various solar energy measurement devices.
Course Learning Outcomes	**After the completion the course the student is able to :** 1. Evaluate the thermal performance of solar thermal devices . 2. Evaluate performance of solar cell.

डॉ.जी.डी.गुप्ता
संयोजक

डॉ.संजय दीक्षित
विषय विशेषज्ञ
(कंडिका 03)

डॉ.के.एल.जाट
विषय विशेषज्ञ
(कंडिका 03)

डॉ.यदुवेन्द्र भोयल
विषय विशेषज्ञ
(कंडिका 04)

श्री मौलेष कायस्थ
उद्योगपति
(कंडिका 05)

Govt. Holkar (Model Autonomous) Science College, Indore
Department of Physics
Syllabus Session 2021-22

Part B : Content of the Course	
UNIT-I	Energy scenario and Renewable energy sources, Global energy scene world energy consumption and energy in developing countries Indian energy scene.Non conventional renewable energy sources and their potentilal.
UNIT-II	Solar and terrestrial spectra. Physics of radiaton. Interaction of light with matter Rayleigh and Mie scattering. Laws of radiation (Kirchoff law,Plank's law, Wien's displacement law) Solar Energy application, Energy storage, Thermal, Mechanical,Electrical and Magnetic chemical and Electro chemical storage.
UNIT-III	Low and high temperature collector, Solar water heating systems, Solar dryers and Solar stills.Passive heating and cooling of building. Solar cooling and Refrigeration photovoltaic conversion.
UNIT-IV	Wind energy, Mini Hydropower,Wave energy,Tidal energy, Geothermal energy,Ocean thermal energy conversion (OTEC)
UNIT-V	This unit will have a short *note* question covering all the four units. The students will have to answer any two questions out of the four.

डॉ.जी.डी.गुप्ता
संयोजक

डॉ.संजय दीक्षित
विषय विशेषज्ञ
(कंडिका 03)

डॉ.के.एल.जाट
विषय विशेषज्ञ
(कंडिका 03)

डॉ.यदुवेन्द्र चौधरी
विषय विशेषज्ञ
(कंडिका 04)

श्री शैलेष कारलीवाल
उपाधिधारी
(कंडिका 05)

Part C :-Learning Resources

Suggested Readings:

BOOKS RECOMMENDED

1. Non-Conventional Energy Sources - G.D.Rai (Khanna Publications)
2. Solar Thermal Process - G.N.Tiwari (Narosa Publication)
3. Environmental Physics (JohnWiley) - Egbert Boeker & rienk Van Groundelle
   The Physics of Atmosphere (Cambridge University Press, 1977) - J.T. Hougtion
4. Renewable Energy Resources (Eibs, 1988) - J.Twidell and J. Weir
5. An Introduction to Solar Energy for Scientists and Engineers - John Wiley, Sol Wieder 1982

Part D

Assessment and Evaluation – PH 44 B

Suggested Continuous Evaluation Method

Max. Marks = 100

Continuous Comprehensive Evaluation (CCE) = 25 Marks
Autonomous College Semester end Examination = 75 Marks

Internal Assessment :	**Class Test**	Marks Distribution
Continuous Comprehensive Evaluation (CCE):25	CCE-I CCE-II	12.5 12.5 Total= 25Marks
External Assessment:	**Question Paper Based**	**Marks Distribution**
Autonomous College Exam : 75 Marks Time : 3 Hrs	**One Question from each unit with 100% Internal choice**	15×5 = 75 Marks Total = 75 Marks

Any Remarks/ Suggestion :

डॉ.जी.डी.गुप्ता (अध्यक्ष) | डॉ.संजय दीक्षित विषय विशेषज्ञ (कंडिका 03) | डॉ.के.एल.जाट विषय विशेषज्ञ (कंडिका 03) | डॉ.मधुचन्द्र चौधल विषय विशेषज्ञ (कंडिका 04) | श्री शैलेष कावलीगारू उद्योगपति (कंडिका 05)

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

Department of Botany

Class : M.Sc. I Sem.

Subject : Botany

Paper –I

Title of Paper: Biology & Diversity of Viruses, Bacteria and Fungi

Code of the paper: BO11

Part A : Introduction for code-- BO11		
1	Pre-requisite (if any)	The students must have passed B.Sc. with Botany
2	Course Objectives	The paper is aimed to introducing the students for Biology & Diversity of Viruses, Bacteria and Fungi
	Course Learning Outcomes	1-Introduction to microbial world. 2-To recognize the morphology, reproduction and life cycle patterns of Bacteria, Fungi and Cyanobacteria. 3-Give understanding of infection cycle of microbes and fungi and their control measures. 4-Collection of fungi, Bacteria, and Cyanobacteria from different localities, their diversification and familiarize with various ecological niche. 5- Use of fungi in food and tool in industrial production.

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Part B :Content of the Course

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

Department of Botany

Year 2021-22

Class M.Sc. I Sem. Botany

Paper - I

Biology & Diversity of Viruses, Bacteria and Fungi

UNIT-I	Viruses: - Characteristics and ultra-structure of virions; isolation and purification of viruses; chemical nature of viruses; replication and transmission of viruses; economic importance of viruses.
UNIT-II	Porkaryotes:-/Archaebacteria and Eubacteria: - General account of archaebacteria, Eubacteria: general characters, ultra structure, nutrition, classification, reproduction and economic importance. General account of Actinomycetes. Mycoplasma:- Salient features, cell structure, reproduction, transmission, plant and animal diseases and their control measures. Cyanobacteria: salient features, ultra structure, reproduction and biological importance.
UNIT-III	Mycology: - General characters, substrate relationship of fungi, cell ultra structure, thallus- organization, mode of nutrition (saprophytic, parasitic, and symbiotic) and reproduction. Economic importance of fungi.
UNIT-IV	Mycology:- Recent trends in classification, (Alexopoulous, Ainswarth), Heterothallism. General account of Mastigomycotina(Saprolegnia, Phytophthora, Pythium,Peronospora,Albugo) and Zygomycotina(Mucor,Rhizopus,Pilobolous).
UNIT-V	Mycology: Diagnostic features and general account of Ascomycotina (Pennicillium, Neurospora and Peziza. Protomyces Basidiomycotina (Puccinia, Ustilago), and Deuteromycotina (Alternaria, Fusarium, Cercospora). Para-sexuality. Diseases in plants and Humans. Mycorrhizal association, symbiosis and Fungi as biocontrol agent.

2

Part C :-Learning Resources

1	Alexopoulus, C.J. Mims, C. W. and Blackwel, M; 1996: Introductory coO' Mycology,Jbon Wjley & Sons Inc.
2	Clifton, A; 1958: Introduction to Bacteria, Mcgraw- Hills Book Co.New Delhi.
3	Madigan, M T. Martinko, J. M and Parker Jack; 1997: Brock Biology Of
4	Madigan, M T. Martinko, J. M and Parker Jack; 1997: Brock Biology Of Microorganisms, (8th edition) Prentice Hall, N.J. U.S.A
5	Mehrotra, RS. and Aneja, RS.; 1998: An Introduction to Mycology, New Age Intermediate Press.
6	Rangaswamy, G. and Mahadevan, A; 1999: Diseases of Crop Plants in Indja (4th edjtjon).PrentjceHaJl oflnilia Ltd. New Delhi.
7	Webster, J.; 1985: Introduction to Fungi Cambridge University Press.
8	Dubey, R C. & Maheshwari, D. K.; 2005: A Text Book of Microbiology, S. Chand Publisher, New Delhi

Part D :-Assessment and Evaluation		
Saggested cntinnous Evaluation Methods: Maximum Marks: Continuous Comprehensive Evaluation (CCE) University Exam (UE):	100 25 75	
Intenal Assesment Continuous Comprehensive Evaluation (CCE) : 25	Class Test Assignment/ Presentation	25 15X5=75
External Assesment: University Exam Setion: 75 Time: 03:00 Hours	Five Long Questions	75

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

Department of Botany

Class : M.Sc. I Sem.

Subject : Botany

Paper –IV

Title of Paper: Plant Ecology

Code of the paper: BO14

Part A : Introduction for code-- BO14		
1	Pre-requisite (if any)	The students must have passed B.Sc. with Botany
2	Course Objectives	The paper is aimed to introducing the students for Plant Ecology
	Course Learning Outcomes	1- Understand the concept of ecosystem.
		2- Learn about cycling of minerals in ecosystem.
		3- Know about ecological succession.
		4- Learn about concept of community.
		5- Learn about population ecology.

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

Department of Botany

Year 2021-22

Class M.Sc. I Sem. Botany

Paper IV

Plant Ecology

UNIT-I	Ecology and Ecosystem: Definition; Tropic organization and structure; Food chains & webs; Energy flow pathways; Ecological efficiencies, consumption, assimilation and production; Primary production; Methods of measurement of primary production. Limiting factors.
UNIT-II	Ecosystem: Fate of matter in ecosystems: Recycling pathway; Relationship between energy flow and recycling pathways; Nutrient exchange and cycling; Biogeochemical cycles, (C, N, P and S); Physical, chemical and biological characteristics of soil, Soil Carbon Sequestration.
UNIT-III	Ecosystem: Ecosystem development and stability: Temporal changes cyclic and non cyclic;Succession processes & types; Mechanism of succession facilitation; Tolerance and inhibition models; Concept of climax community. Ecological perturbation (Natural and Anthropogenic); Ecosystem restoration.
UNIT-IV	Ecosystem: Community organization: Concepts of community and continuum; Analysis of community (analytical and synthetic characters); Community coefficients. Indices of diversity; inter-specific association; negative and positive inter action concept of ecological niche; Concepts of biodiversity; evolution and differentiation of species. allopathric & sympatric speciation. Ecads and Ecotypes
UNIT-V	Population Ecology: Population & Environment; Density & distribution; Natality; Mortality; Survivorship curves, Age structure & pyramids; Fecundity schedules, Life tables; Population growth. Exponential and logistic curves; Intra specific competition and self regulation; r-and k-strategies.

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Part C :-Learning Resources

1	Bhatnagar, S.P. and Moitra, A; 1996: Gymnosperms. New Age International Pvt. Ltd., New Delhi.
2	Singh H.; 1978: Embryology of Gymnosperms, Encyclopedia of Plant Anatomy X. Gebruder Bortraeger, Berlin.
3	Sporne K R; 1991: The Morphology of Gymnosperms; Hutchinson Univ. Library; London.
4	Foster A S. & Gifford E. M; Comparative morphology of vascular Plants; Vakils. Feffer, & Simons Private Ltd. Bombay.
5	Chamberlain; Gymnosperms -Structure & Evolution; CBS Publishers & Distributors Delhi.
6	Shukla A C. & Mishra S. P.: Essentials of Paleobotany; Vikas Publishing House Pvt. Ltd. Delhi-Bombay-:6angalore-Calcutta-Kanpur.
7	Campbell; 1939: The evolution of land plants: Stanford University.
8	Sporne, K.R. 1991. The Morphology of Pteridophytes.

Part D :-Assessment and Evaluation

Saggested cntinnous Evaluation Methods: Maximum Marks: Continuous Comprehensive Evaluation (CCE) University Exam (UE):	100 25 75	
Intenal Assesment Continuous Comprehensive Evaluation (CCE) : 25	Class Test Assignment/ Presentation	25 15X5=75
External Assesment: University Exam Setion: 75 Time: 03:00 Hours	Five Long Questions	75

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

Department of Botany

Class : M.Sc. II Sem.

Subject : Botany

Paper –I

Title of Paper: Plant Development & Reproduction

Code of the paper: BO21

Part A : Introduction for code-- BO21		
1	Pre-requisite (if any)	The students must have passed M.Sc. I Sem with Botany
2	Course Objectives	The paper is aimed to introducing the students for Plant Development & Reproduction
	Course Learning Outcomes	1- To study plant development, meristems, nodal anatomy.
		2- Study of primary and secondary anomalies.
		3- ABC model of flower development, Microsporogenesis.
		4- To study megasporogenesis and types of embroy sac.
		5- To study double fertilization, endosperm, embryo development.

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

Department of Botany

Year 2021-22

Class M.Sc. II Sem. Botany

Paper - I

Plant Development & Reproduction

UNIT-I	Plant Development: Unique features of plant development; Organization of root and shoot apical me Plant Development meristems. Leaf- leaf growth and differentiation. Root-stem organization; Nodal anatomy.
UNIT-II	Plant Development: Cell fates and lineages; Tissue differentiation specially xyle and phloem, Secretary Ducts and laticifiers; Secondary growth; Primary and secondary anomalies. Wood development in relation to environmental factors.
UNIT-III	Reproduction: Vegetative propagations and sexual reproduction. Flower is a modified shoot ; Flower development (A,B,C models) and genetics of floral-organ differentiation; Homeotic mutants in Arabidopsis and Antirrhinum; Androecium; Structure of anther; Microsporogenesis; Role of tapetum; Pollen development; Male sterility.
UNIT-IV	Reproduction: Structure of Pistil; Ovule development; Megasporogenesis and megagametogenesis; Monosporic, bisporic and tetrasporic embryo sacs; Pollination; Pollen tube greet and guidance; Pollen stigma interaction; Parthenocarpy.
UNIT-V	Reproduction: Sporophytic and gametophytic-self-incompatibility; Double fertilization and triple fusion; Endosperm development; Embryogenesis. Development of monocot & dicot embryo; Polyembryony; Apomixes. Dynam of fruit growth. Fruit maturation.

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Part C :-Learning Resources

1	Bhojwani,S.S.and Bhatnagar,S.P.2000. The Embryology of Angiosperms(4th revised and enlarged edition). Vikas Publishing House,New Delhi.
2	Burgess.J.1985.An introduction to Plant Cell Development.Cambridge University Press,Cambridge
3	Fageri,K.and Van der Pijl,L1979. The Principles of Pollination Ecology .Pergamon Press,Oxford
4	Fahn, A 1 982.Plant Anatomy.(3rd edition).Pergamon Press.Oxford.
5	F osket, D .E.1994 .Plant Growth and Development. A Molecular Approach.Academic Press,San Diego.

Part D :-Assessment and Evaluation		
Saggested entinnous Evaluation Methods: Maximum Marks: Continuous Comprehensive Evaluation (CCE) University Exam (UE):	100 25 75	
Intenal Assesment Continuous Comprehensive Evaluation (CCE) : 25	Class Test Assignment/ Presentation	25 15X5=75
External Assesment: University Exam Setion: 75 Time: 03:00 Hours	Five Long Questions	75

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

Department of Botany

Class : M.Sc. IV Sem.

Subject : Botany

Paper –IV-B Elective 4

Title of Paper: Pollution Ecology

Code of the paper: BO44-II

Part A : Introduction for code-- BO14		
1	Pre-requisite (if any)	The students must have passed M.Sc.III Sem. with Botany
2	Course Objectives	The paper is aimed to introducing the students for Pollution Ecology
	Course Learning Outcomes	1- The general concept of world environment and need to improve quality of environment by understanding of various environmental problems.
		2- The aim is to understand the environmental problems of India with special reference to Madhya Pradesh.
		3- The sources of Air, Soil, Water Pollution and steps to reduce the pollution of environment.
		4- Nuclear pollution Pollution, to understand environmental laws
		5- Role of to have pollution control boards NGO'S and awareness about environmental problems and means to control their.

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

Department of Botany

Year 2021-22

Class M.Sc. IV Sem. Botany

Paper – IV-B Elective 4

Pollution Ecology

UNIT-I	Pollution: Status and Concerns Classification of contaminants and pollutants. Brief account of major environmental disasters of the past. Indicator concept-biological indicators of pollution.
UNIT-II	Air pollution Sources and causes of air pollution. Effects of air pollution on flora and fauna, materials and structures, soil atmosphere, water bodies and on human health. Transport and dispersion of pollutants.
UNIT-III	Water Pollution Sources and causes of water pollution Status of water pollution in India and M.P. Water harvesting and recharging of water resources-concerns and remedies.
UNIT-IV	Soil pollution and other pollution types Causes and sources of soil pollution. Pesticidal and heavy metal pollution-sources, causes and effects Nuclear, thermal and noise pollution-sources, causes and effects
UNIT-V	Pollution: Monitoring and Control Monitoring systems and analytical methods for air, water and soil pollution. Control and abatement measures for air, water and soil pollution. Brief account of legislation and environmental protection acts in India.

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Part C :-Learning Resources

1	Environmental Ecology by Bill Freedman.
2	Environmental Pollution and Control by P. Aarne Vesllind
3	Environmental Pollution by B.D. Sharma
4	Air Pollution and Control by N. Sharma
5	Environmental Management G.N. Pandey
6	Modern Concepts of Ecology by H D Kumar

Part D :-Assessment and Evaluation

Saggested cntinnous Evaluation Methods: Maximum Marks: Continuous Comprehensive Evaluation (CCE) University Exam (UE):		100 25 75
Intenal Assesment Continuous Comprehensive Evaluation (CCE) : 25	Class Test Assignment/ Presentation	25 15X5=75
External Assesment: University Exam Setion: 75 Time: 03:00 Hours	Five Long Questions	75

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

Department of Botany

Class : M.Sc. IV Sem.

Subject : Botany

Paper –III-B Elective 3

Title of Paper: Plants & Society

Code of the paper: BO43-II

Part A : Introduction for code-- BO14		
1	Pre-requisite (if any)	The students must have passed M.Sc. III Sem. with Botany
2	Course Objectives	The paper is aimed to introducing the students for Plants & Society
	Course Learning Outcomes	1- The most important paper of M.Sc. classes for students is "Plant and Society" whole syllabus is designed for entrepreneurship development of students.
		2- All the possible uses of plants for livelihood of humans are included in this course.
		3- Students can go in the field of Pharma, cosmetic and paper including after studying this syllabus.
		4- They can also develop their own tissue culture lab, Bonsai garden, mushroom activation unit.
		5- Production of medicinal plants, Floriculture and Nursery Management are another fields of earning money.

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

Department of Botany

Year 2021-22

Class M.Sc. IV Sem. Botany

Paper – III-B Elective 3

Plants & Society

UNIT-I	History of plants and development of society, Role of plants in tracing human history, green revolution:- benefits and adverse consequences. Innovations for meeting world food demands. Early domestication centers of major cultivated plants, Plants in Mythology, folklores Role of Ethnobotony in relation to development of society.
UNIT-II	Plants & Human Health, Usage of plants in different systems of medicine allopathic, Homeopathic Aurvedic, Herbal Medicine, and concept of Herbal Cosmetic. Plants as health hazards. Food spoilage. Viral, Bacterial and fungal diseases of human beings.
UNIT-III	Plants in Enterprenural Areas-A: Techniques of cultivation and marketing of few Chlorophytum, Guggul, Commiphera wightii, Rauwolfia serpentina. Plants and other uses : Agriculture & Horticulture.
UNIT-IV	Plants in Enterprenural Areas - B: Use of plants in earning livelihood - Such as Bamboos, Rattans, Raw Materials of papermakings, Gums tannins, dyes, resins and fruits. Techniques of cultivation and marketing of - Aromatic Plants - Lemon grass, plasma Rosa, Floriculture - rose and gladioli.
UNIT-V	Plants in Enterprenural Areas - C: Techniques of cultivation and marketing of - Mushroom Cultivation, Nursery management, Vermiculture & Vermicompost. Mass cultivation of few plants using tissue culture techniques. Bonsii Techniques.

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Part C :-Learning Resources

1	Ethnobotany, Volume 1 Dr. Suresh Kumar (Author)
2	Ethnobotany Application of Medicinal Plants Edited By José L. Martinez Amner Muñoz-Acevedo Mahendra Rai
3	Medicinal plants by N Subramanyam

Part D :-Assessment and Evaluation

Saggested entinnous Evaluation Methods: Maximum Marks: Continuous Comprehensive Evaluation (CCE) University Exam (UE):	 100 25 75	
Intenal Assesment Continuous Comprehensive Evaluation (CCE) : 25	Class Test Assignment/ Presentation	25 15X5=75
External Assesment: University Exam Setion: 75 Time: 03:00 Hours	Five Long Questions	75

Class: M.Sc. Third Semester
Subject: Microbiology
Paper: Elective Paper-1/2

Marks: 75 + (CCE) 25 = 100
Credit: 4
Code of the Paper: -MB-33 B

Microbial Ecology

Part A: Introduction for code M.Sc. IIIrd Semester		
1	Pre-requisite (if any)	To study this course a student must have to pass M.Sc. IInd Semester in Microbiology.
2	Course Objectives	To study and learn types of ecosystems, microbial interaction and utility of microbes in sustainable development.
	Course Learning outcomes	On completion of the course, the student will be profound in complete Knowledge and Understanding of the subject.
		1.Studying various types of Ecosystems.
		2.Calculate diversity index and their practical application in ecological studies.
		3.Learning about hardy-Weinberg law of equilibrant of ecology and factors affecting it.
		4.Study about microbial interaction with human and plants.
		5.Role of microbiology in sustainable development.

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Part B: Content of the Course

Unit	Topics
1	Population, guilds, communities, homeostatis, Environment and microenvironment. Biofilms. Terrestrial environment, deep surface microbiology. Fresh water environment, lake and river microbiology. Marine Microbiology and Hydrothermal vents.
2	Diversity indices, dominance indices, information statistics indices, Shannon index, Brillouin Index, Rank abundance diagrams, community similarity analysis, Jaccard Coefficient, Sorensen coefficient, cluster analysis. Community stability, stability hypothesis, Intermediate-disturbance hypothesis. Meaning of succession: Tolerance and inhibition patterns of succession, theories of succession.
3	Genetic structure of population: - Genotype frequency, allele frequencies. Hardy-Weinberg Law: - Assumptions, predictions, derivation, extension and natural selection. Measuring genetic variation at protein level, measuring genetic variation at DNA level. Factors effecting gene frequencies: -Mutation, Random genetic drift, migration, Hardy-Weinberg natural selection, Assortative mating. Inbreeding.
4	Microbial Interactions: Competition and coexistence, Gauss hypothesis, syntropy, commensalism and Mutualism, predation, parasitism, and antagonism. Interaction with plants and animals.
5	Microbial technology and sustainable development. Management and improvement of waste land/barren land. Oil spills, damage and management petroleum and oil shore management

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Part C: Learning Resources

Text Books, Reference Books
Suggested Readings:

1.Microbial Ecology: Larryl Barton, Diana E.Northup

2.Environmental Microbiology: Fundamentals & Application: Bertrand

3.Concept of Ecology: N Arumugam, Saras Publication.

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 100
Continuous Comprehensive Evaluation (CCE): 25
University Exam (UE): 75

Internal Assessment Continuous Comprehensive Evaluation (CCE): 25	Class Test	10
	Assignment/ Presentation	15
	Total	**25**
External Assessment: University Exam Section:75 Time: 03.00 Hours	Five Long Questions	15 x 5 = 75
	Total	**100**
	Credits	**04**

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