Shri Vaishnav Vidyapeeth Vishwavidyalaya

M.Sc. (Forensic Science)

SEMESTER III / IX (M.SC. / B.SC.-M.SC.)

Course Code	Course Name	TEACHING & EVALUATION SCHEME (THEORY)						
		End Sem University Exam	Two Term Exam	Teachers Assessment *	L	T	P	Credit
MSFS301	**Forensic Medicine and Psychology**	60	20	20	4	1	0	5

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Learning Objectives: After studying this paper the students will know –

1. The legal procedure of court.
2. The several parameters of personal identification.
3. The different modes and sign of death.
4. The classification, identification, and medico legal aspects of wound
5. Different Interviewing and Interrogation Techniques

Learning Outcomes: After studying this paper-

1. The student will be able to understand legal procedure of court.
2. They will be acquainted with different medicolegal aspects.
3. They will know about the mode of death, cause of death, time since death and PMI
4. They will be able to evaluate different types of injuries.
5. The student will be able to understand Techniques of Interviewing and Interrogation

UNIT I: Medical Jurisprudence

Definition of Forensic Medicine and Medical Jurisprudence, Brief knowledge about legal procedure in court, inquest, Criminal court and their powers, Subpoena & oath of medical expert. Recording of medical expert evidence in courts.Types of medical evidence.Kinds of witness and rules for giving evidence.

UNIT II: Personal Identity

Definition and importance, parameters contributing to personal identity- Race, Sex, Age, complexion, Features & Photographs, Anthropometry, Fingerprints, Footprints, Tattoo marks,

Occupational Marks, Handwriting, Clothes and Ornaments, Voice & Speech, DNA, Superimposition techniques for skull. Disputed paternity.

UNIT III: Thanatology

Definition and concept of death, Modes of death (Coma, Syncope, Asphyxia), Causes of sudden Natural deaths. Changes after death (Sign of death): cessation of vital functions, changes in the Eye & Skin, Cooling, Hypostasis, Muscle changes, Postmortem lividity, Putrefaction, Adipocere, Mummification. Estimation of time since death.

Medico-legal Autopsy: Objectives, Facilities, Rules and Basic techniques, Proforma for reporting medico-legal autopsy, Viscera & its preservation.Exhumation, examination of mutilated remains, Obscure autopsy and post-mortem artifacts

UNIT IV: Traumatology

Definition and classification of injuries.
Blunt force Trauma: Abrasions, Contusions and Lacerations. Sharp force Trauma: Incised, Stab and Chop wounds. Thermal injuries: Injuries due to heat and cold, Frostbite, Burns, Scalds and Bride burning, Injuries due to Electricity, Lightening. Firearm injuries and Explosive injuries.
Medico-legal aspect of injury/hurt: simple and grievous hurts Ante- mortem & Postmortem Wounds, Age of the injury, Causative Weapon and appearance of Suicidal, Accidental and Homicidal injuries.

UNIT V: Interviewing and Interrogation Techniques

Importance of Investigative Interviewing, Influence of Psychology, and P.E.A.C.E Model of Interviewing, Cognitive Interviewing, Ethical Interviewing, And Other Interview Techniques.Interrogation and the related Techniques, Brain Electrical Oscillation Signature Profiling (BEOS), Voice-Stress Analysis/ Layered Voice Analysis, reliability, Limitations, NHRC Guidelines, Admissibility on the Court, Case Studies.

Reference Books :

1. Diagnostic & Statistical Manual-IV TR, American Psychological Association
2. Introduction to Forensic Psychology', by Bruce Arrigo.
3. KiethSimpsen& Bernard Knight : Forensic Medicine
4. Modi J. S. : Medical Jurisprudence and Toxicology.
5. Parikh C.K. :ChikitsaNyayaShastraAurVishVigyan.
6. Poison : CJ, DJ, Gee, B. Knight : Forensic Medicine
7. Psychological Testing' by Anne Anastasi, Susana Urbina, Seventh Edition.
8. Psychological Testing' by Robert J. Gregory, Fourth Edition.

	Course Name	TEACHING & EVALUATION SCHEME (THEORY)

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SEMESTER III / IX (M.SC. / B.SC.-M.SC.)

Course Code		End Sem University Exam	Two Term Exam	Teachers Assessment*	L	T	P	Credit
MSFS302	**Forensic Toxicology and Pharmacology**	60	20	20	4	1	0	5

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Learning Objectives: After studying this paper the students will know –

1. The classifications of poison
2. The extraction and isolation procedure of different types of poison.
3. The analysis different types of poison.
4. The absorption distribution metabolism and elimination of poison

Learning Outcomes: After studying this paper-

1. The student will be able to define poison and different forms of poison
2. They will be able to understand analyse the nature of poison and its effect on body
3. They will be familiar with the extraction and isolation procedure of different types of poison.
4. They will be able to examine poison and its metabolite in viscera.
5. They will be able to understand the absorption, distribution, metabolism and elimination of poison

UNIT I:Forensic Toxicology

Definition and branches of Toxicology. Concept and Significance of Forensic Toxicology. Medico legal aspects of poison. Toxicological exhibits in fatal and survival cases- their preservation. Extraction and identification of commonly used poisons. Treatment in cases of poisoning, sign & symptoms of poisoning, Analysis report. Forensic analysis of different Pesticides, Insecticides, Biocides and Fertilizers.

UNIT II: Extraction, Isolation and clean- up procedures

Non- Volatile organic poison,Stas-otto, Dovbriey Nickolls (Ammonium Sulphate) method, acid digest and Valov(Tungstate) methods, solid phases micro extraction techniques, solvent extraction method.
Volatile Poisons : Industrial solvent acid and basic Distillation
Toxic Cations : Dry Ashing and Wet digestion process
Toxic Anion : Dialysis method total alcoholic extract

UNIT – III: General Study and Analysis-I

Barbiturates, methaqualone, Hydromophine. Methadone, Meprrobamate, Mescaline, Amphetamines, LDS, Heroin, Cannabinoids, Phinothiazines

Insecticides : Types, General methods for their Analysis. Analysis of Alcohol in Blood & Urine, illicit Liquor, Methanol

Alkaloids : Definition, classification, Isolation, and general characterization.

UNIT – IV:General Study and Analysis-II

Metallic Poisons : Arsenic, Mercury, Lead, Bismuth, Antimony,Copper, Aluminum, Iron , Barium, Cadmium, Phosphorus etc.

Chemical Poisons: Acetone, Chloroform, Phenol, Chloral Hydrate, Irrespirable gases.

UNIT V:Forensic Pharmacological studies

Absorption, Distribution, Metabolism, Pathways of drug metabolism, General studies and Analysis of some vegetable poisons, Opium, AbrusPrecatorius, Cynanogenetic glycosides, Dhatura, marking nuts, Nux-vomica, Oleander and Aconite. General studies and Analysis of some Animal poison-Snake venom, Toxins and Toxalbumins, types of Toxins.

Reference Books:

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)
11. Tiwari, S.N.: Analytical Toxicology, Govt. of India Publications, New Delhi, (1987)
12. Clark, E.G.C., Isolation and identification of Drugs, Vol. I and Vol. II, Academic Press, (1986).

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		End Sem University Exam	Two Term Exam	Teachers Assessment*	L	T	P	Credit
MSFS303	Forensic Biology and DNA Profiling	60	20	20	4	1	0	5

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Learning Objectives: After studying this paper the students will know –

1. To understand the significance of blood, semen, saliva hairs etc
2. To understand the importance of bones in personal identification
3. To identify different blood groups and other biochemical markers of individuality
4. Role of insects, microbial and diatoms in forensic investigation
5. DNA structure analysis and DNA typing

Learning Outcomes: After studying this paper-

1. The students will have the understandingof various forms of biological evidence.
2. They will be able to determine the importance of biological evidence such as blood semen saliva etc in crime investigation.
3. Student will be able to identify different blood groups and other biochemical markers of individuality
4. They will be able to evaluate the significance of Microbes, insects and diatoms criminal Investigations.
5. They will be able to understand the structure of DNA and DNA typing.

UNIT I: Blood

Composition, histology, examination of blood and blood stains, Identification of lochial and menstrual stains by various methods.
Semen: Composition, Structure of spermatozoa, Forensic method of detection and identification of semen and seminal stain examination. Identification and examination of other body fluids/ stains- vaginal, saliva, urine, pus, faeces, vomit, milk, sweat and tears.
Hair: Structure, Forensic examination of Hair including determination of origin race, sex, etc.

UNIT II: Biochemical techniques

Biological and biochemical techniques: General principles of Biological/ Bio-chemicalAnalysis,pHandbuffers,Physiologicalsolution,cellandtissueculture,Cellfractionation,Biological variationsetc.CentrifugationTechniques,Immuno-chemicalTechnique,Generalprinciples,Productionofantibodies,Precipitinreaction,Gelimmune-diffusion,Immuno-electrophoresis, complementfixation,RadioImmunoAssay(RIA),Enzyme-linkedImmunoSorbentAssay(ELISA),Fluorescenceimmuneassay. Chromatographic Techniques, ElectrophoreticTechnique:Generalprinciples,Factorsaffectingelectrophoresis,Lowvoltagethinsheetelectrophoresis,Highvoltageelectrophoresis,Sodiumdodecylsulphate(SDS)polyacrylamidegelelectrophoresis,Isoelectricfocusing(IEF),Isoelectrophoresis,Preparativeelectrophoresis,HorizontalandVertical Electrophoresis.

UNIT III: Forensic Serology

Basic Concept of Genetics : Mendelian genetics, genotypes, phenotypes, mutation, multiple alleles, Expression of Gene and Gene Mapping. Analysis of protein by electrophoretic methods

Immunology: Immuno System, Immuno response, Antigens, haptens and adjuvant, Immunoglobulin's, Structure and function, raising of anti-sera, Antigen-Antibody reaction. Lectins and their forensic significance.

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, tear pus, vomit, hair, bone, nail, etc. 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 etc.

UNIT IV: Forensic Botany

Various types of wood, timber varieties, seeds and leaves – their identification and matching. Diatoms – morphology, types, methods of isolation, and forensic importance, Identification of pollen grains.

Forensic Entomology: significance of terrestrial and aquatic insects in forensic investigations and their role in crime detection, insect's succession and its relationship to determine time since death.

Forensic Odontology: Definition pattern, structure of teeth, age determination- identification of person, role in mass disaster, disease of teeth and their significance in personal identification. Determination of Stature and sex from bones, Identification of burnt bones, recovery and identification of skeletal remains in accidental cases and mass disasters.Facial reconstruction.

UNIT V: DNA typing

Structure of DNA, Damage to DNA, variation in DNA, DNA as excellent polymorphic markers
Legal perspective: Legal standard for admissibility of DNA profiling – procedural & ethical concerns, status of development of DNA profiling in India & abroad.
DNA typingtechnique – RFLP, PCR, Amplification, PCR based typing methods such as HLA DQ_{A1}Amply- type $^{(R)}$ PM Polymarkers, D 1580, STR, Gender ID, mt- DNA methods with their merits and demerits. Comparison of RFLP and PCR based method,Forensic Significance of DNA Profiling.

Reference Books:

1. Albert's, B, Bray, D, Lewis, J, Roberts K & Watson, J.D; Molecular Biology of cell, 2nd ed. Garland Pub. New York
2. Biology Methods manual; Metropolitan Police Forensic Science Laboratory, London.
3. Daniel L. Hartl& Elizabeth W. Jones; Genetics- Principle & Analysis, 4th Ed., Jones &Bartlet Pub.
4. E.J. Gardner, M.I. Simmons and D.P. Snustad; Principles of Genetics; John Wiley, New York.
5. Edwin, H. Mc Caney-Human Genetics, The Molecular Revolution, Jones & Bartlett Pub. London.
6. H.G. Greenish & E. Collin; An anatomical Atlas of vegetable Powders; J&A Churchill, London
7. Herbert R. Mauersberger; Mathews Textile Fibers – their physical, Microscopic and chemical properties; John Wiley, New York.
8. Jaiprakash G. Shewale, Ray H. Liu Forensic DNA Analysis: Current Practices and Emerging Technologies, CRC Press.
9. John M Butler: Forensic DNA Typing. Elsevier Academic Press.
10. Keith Immen and Norah Rudus, An introduction to Forensic DNA Analysis. CRC Press, New York.
11. Kimball, John W; Biology; Arvind Publishing Co. New Delhi
12. Lee M.C. and Gaenesten, R.E: DNA and other Polymorphism in Forensic Science. Year book Medical Published.
13. P.L. Williams and R. Warwick; Gray's anatomy; Churchill Livingston, London.
14. R.P. Pandey, Plant Anatomy; S. Chand, new Delhi.
15. Richard Saferstein; Forensic Hand Book; Ed.; Prentic Hall, Englewood Cliff, New Jersey.

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Course Code	Course Name	TEACHING & EVALUATION SCHEME (THEORY)						
		End Sem University Exam	Two Term Exam	Teachers Assessment*	L	T	P	Credit
MSFS304	**Emerging trends in Forensic Science**	60	20	20	4	1	0	5

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Learning Objectives: After studying this Paper the Students will Know-

1. DNA and its Role in Identification
2. Techniques used for Lie detection
3. Importance of Biometrics in personal identification
4. Importance of Environmental Forensics
5. Concept of Bioterrorism and Bio security

Unit I: DNA and its Role in Identification

Structure of DNA, Techniques in DNA typing, RFLP, PCR, Factors affecting DNA, Damage to DNA, Variation in DNA, DNA as excellent polymorphic marker, Basis of DNA typing, Introduction to touch DNA- its future prospectus.

Unit II: Techniques used in Detection of Deception

Basics of Narco analysis and its significance in forensic science, Brain fingerprinting and its use in the criminal identification, Polygraph analysis , Voice production theory-vocal anatomy, Speech signal processing & pattern recognition- basic factors of sound in speech, acoustic characteristics of speech signal, Basic introduction to computers forensics.

Unit III: Biometrics in Personal Identification

Introduction, Concepts of Biometric Authentication, Role in person Identification, Techniques and Technologies (Finger Print Technology, Face Recognition, IRIS, Retina Geometry, Hand Geometry, Cheiloscopy, Rugoscopy, Poroscopy, Ridgeology, Signature Verification , Gait pattern analysis and other forensic related techniques).

Unit IV: Environmental Forensics and Geo Forensics

Introduction to Environmental forensics: Definition, Historical perspective, application. Generic Forensic techniques for contaminant age dating and source identification.
Geo-forensics,: Introduction to Geo-Forensics, Applications of Geo-forensic, major evidences in Geo-Forensics.
GPS and GIS: Basic principles and applications of GPS and GIS

Unit V: Bioterrorism

Definition, Concepts of Biosecurity and microbial forensics, Weapons of mass destruction (WMD), mass-casualty weapons (MCW), Concept of NBC(Nuclear Biological and Chemical) and CBRNE (Chemical, Biological, Radiological, Nuclear, and high yield Explosives), Dirty Bombs, Methods for detection of Botulinum Neurotoxins, Bacillus Spores, Staphylococcal Enterotoxins B. Diagnostic Bioterrorism Response Stategies.

Reference Books:

1. B.R. Sharma: Forensic Science in Criminal Investigation and Trials, Universal Law Publishing; Fourth edition 2013.
2. James, S.H and Nordby, J.J.: Forensic Science: An introduction to scientific and investigative techniques 3rd edit. CRC Press, USA.
3. Nanda, B.B. and Tewari, R.K.: Forensic Science in India: A vision for the twenty first century Select Publisher, New Delhi (2001)
4. Richard Saferstein. Criminalistics: An Introduction to Forensic Science. 10th edit Prentice-Hall, New Jersey.
5. Deforest, Gansellen&Lee : Introduction to Criminalistics..
6. H. James, Wouldiam G. Eckert (1999) Interpretation of Blood stain evidence at Crime Scene, 2nd edition, CRC Press.
7. R.M. Morgan, P.A. Bull : Forensic Geoscience and Crime Detection (2007).
8. N. Gilbert (1993) Criminal Investigation; Third edition, Macmillan Publishing company.
9. Bernard Robertson and G.A. Vignaur (1995) Interpreting evidence John Wiley and Sons Ltd.
10. Kirk (1953) Criminal Investigation Interscience Publisher Inc. New York.
11. Ioana Gloria Petrisor: Environmental Forensics Fundamentals: A Practical Guide 1st Edition
12. Donald A. Henderson and Thomas V: Bioterrorism: Guidelines for Medical and Public Health Management.
13. Ernest P. M.D. J.D. Chiodo : Bioterrorism

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Course Code	Course Name	TEACHING & EVALUATION SCHEME (THEORY)						
		End Sem University Exam	Two Term Exam	Teachers Assessment*	L	T	P	Credit
MSFS3051	Forensic Computing & Offences	60	20	20	3	1	0	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Learning Objectives: After studying this paper the students will know –

1. The importance of cybercrime investigation
2. Recent advancement in IT act.
3. The fundamental aspects of network security.
4. Bioinformatics & its Applications

Learning Outcomes: After studying this paper –

1. Thestudents will be able to understand the importance of cybercrime investigation
2. They will be familiar with Recent advancement in IT act.
3. They will be able to understand thefundamental aspects of network security.
4. They will be able to explain the Bioinformatics & its Applications

UNIT I:Cyber Crime Investigations

Where Evidence Resides on Windows systems, Conducting a Windows investigation, File Auditing and Theft of information, handling the depating Employee, Steps in a Unix Investigation.Reviewing Pertinent Logs, Performing Keywords Searches, Reviewing Relevant Files, Identifying Unauthorized User Accounts or Groups, Identifying Rogue Processes, Checking for Unauthorized Access Points, Analyzing Trust Relationships, Detecting Trojan Loadable Kernel Models. Finding Network based Evidence, Generating Session data with TCP Trace, Reassembling sessions using TCP flow and Ethereal.

UNIT II: IT Act and web Technologies

Recent amendments in IT Act, internet & web technologies, web hosting and development, attributes in cyberspace and legal framework of cyberspace, hacking, virus, obscenity, pornography, programme manipulation, Copyright, Patent, software piracy, intellectual property rights, trademark, domain disputes, and computer security, etc., Encryption and Decryption methods. Search and seizures of evidence.Investigation of cybercrimes and tools for analysis.

UNIT III: Network Security

Threats in networks, Network security control,Firewalls, Intrusion detection systems, Secure e-mail, Networks and cryptography, Example protocols: PEM, SSL, IPsec. Principles of network forensics, Attack Traceback and attributes, Critical Needs Analysis.

UNIT IV: Bioinformatics

Bioinformatics & its Applications : Public domain databases for nucleic acid and sequences (EMBL, Gene Bank), database for protein structure (PDB) , Bioinformatics for microbial detection and forensic diagnostic design (1): Whole genome analysis, analyses for repeats (Direct and inverted); palindromes, open reading frames, annotation of genes, identification of gene.

UNIT V: Genomics

Overview of comparative genomics, Computational methods, homology algorithms (BLAST, FASTA) for proteins and nucleic acid, Oligonucleotide probe synthesis, artificial gene synthesis, primer and probe designing , CODIS and NDIS, phylogenetic analysis

Reference Books:

1. Advances in digital forensic VI by kampui chow, sujeetshenoi
2. Malware forensic by Cameron malin
3. Windows registry forensic by Harlan carvey,
4. Digital forensic for network internet and cloud computing clint garrison
5. Wireless crime and forensic investigation by Gregory kipper
6. Digital image forensic by husrevtaha, nasirmemon
7. Computer forensic in. Advances in digital forensic VI by kampui chow, sujeetshenoi
8. Malware forensic by Cameron malin
9. Windows registry forensic by Harlan carvey,
10. Digital forensic for network internet and cloud computing clint garrison
11. Wireless crime and forensic investigation by Gregory kipper.
12. Digital image forensic by husrevtaha, nasirmemon.
13. Computer forensic investigating data and image files by Ec-council
14. Network forensic tracking hackers by sherri Davidoff
15. Mastering windows network forensic by stevenanson
16. Anti computer forensic by Grednumitor
17. Computer forensic Nathan Clarkevestigating data and image files by Ec-council.

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Course Code	Course Name	TEACHING & EVALUATION SCHEME (THEORY)						
		End Sem University Exam	Two Term Exam	Teachers Assessment*	L	T	P	Credit
MSFS3052	**Wildlife Forensics**	60	20	20	3	1	0	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Learning Objectives: After studying this paper the students will know –

1. The significance of wildlife forensics .
2. Significance of environmental forensics.
3. Legal act related to wild life and environment forensics.

Learning Outcomes: After studying this paper

1. Students will understand significance of wildlife forensics
2. Students will learn Significance of environmental forensics..
3. Students will learn Legal act related to wild life and environment forensics.

(Protection) Act-1972 .

Unit-I

Wildlife Forensic: Protected and endangered species of animals and plants; Sanctuaries and their importance; Relevant provision of wild life and environmental act; Types of wildlife crimes, different methods of killing and poaching of wildlife animals; Enforcement of wildlife protection policy, Wild animals as pharmacopeias, Wildlife artifacts (Bones, skin, fur , hair, nails, blood, feather, etc.), Trade in wild animals, elephant-, Indian rhino, wild cat, poisonous snakes for venom and skin, crocodiles, salamanders, deer, birds (feathers Macau parakeets, whales, sharks, spectacle bear, Himalayan antelopes. Recovering evidence at poaching scenes, Locating the burial: Anomalies on the surface international trade in reptile skins, Challenges to species identification of reptile skin products, species and products represented in the reptile skin trade, reptile scale morphology basics and current limitations, Identifying features of major reptile groups. Wildlife

Unit-II

Environmental Forensics: Introduction to Environmental Forensics. Mercury- Natural and anthropogenic sources, detecting mercury in indoor environment and forensic aspects. Asbestos- sources and detection in air, water, fibres etc. Sewage, Lead- sources, compounds, analytical methods and lead forensics. Arsenic- sources, compounds, analytical methods and forensic aspects. Pesticides- Types, analytical testing and forensic techniques. Polycyclic aromatic hydrocarbons (PAHS)- sources, types and analytical techniques. Crude oil and refined products- oil analysis methods, oil spill analysis protocol.

Unit-III

Environment and Ecosystems: Ecosystem characteristics structure and function; environmental pollution , xenobiotic and recalcitrance, Introduction to BOD and COD, use of biosensors to determine the quality of environment, Introduction and scope of environmental management, basic concepts of sustainable development, Environmental Impact Assessment (EIA), general guidelines for the preparation of environmental impact statement (EIS), international organization for standardization (ISO)

Unit-IV

Environmental Legislation: central and state boards for the prevention and control of environmental pollution, powers and functions of pollution control boards, penalties and procedure, duties and responsibilities of citizens for environmental protection.

Unit-V

The Water (Prevention and Control of Pollution) Act 1974. Prevention and Control of Air Pollution Act 1981, Forest Conservation Act 1981, Environment (protection) Act 1986, Hazardous waste (Management and Handling) Rules, 1989, Bio-Medical Waste (Management and Handling) Rules, 1998. Issues involved in enforcement of environmental legislation, public awareness, and public interest litigations (PILs) and its role in control of environmental pollution in India.

Suggested Readings

1. Forensic science in wild life investigation, Linarce, Adrian CRC Press, Taylor & Francis
2. The wild life (protection) act, Baalu, T.R.1972, Nataraj Publication
3. Wild life (Protection act, 1972), Universal Publication
4. Wildlife protection act, 1972; Natraj Publishers
5. Instrumental Methods of Analysis 6th Edition. (1986): H.H. Willard, L.L. Merritt Jr. and others.CBS Publishers and Distributors.
6. Instrumental Methods of Chemical Analysis. (1989): Chatwal G and Anand, S.Himalaya Publishing House, Mumbai.
7. A Biologists Guide to Principles and Techniques of Practical Biochemistry. (1975): Williams, B.L. and Wilson, K.

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Course Code	Course Name	TEACHING & EVALUATION SCHEME (THEORY)						
		End Sem University Exam	Two Term Exam	Teachers Assessment*	L	T	P	Credit
MSFS3053	**Microbial Forensics**	60	20	20	3	1	0	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Learning Objectives: After studying this paper the students will know –

1. The emerging microbial technique.
2. The handling of microbial samples.
3. The forensic importance of microbes.
4. Role of microbes in investigation of suspicious disease

Learning Outcomes: After studying this paper–

1. The students will be able to understand the emerging microbial technique.
2. They will be familiar with the handling of microbial samples.
3. They will be able to know the forensic importance of microbes.
4. They will be able to understand the role of microbes in investigation of suspicious disease

UNIT I:

Microbial Forensics: Defining the microbial forensics program, epidemiology, Microbial forensic tools. Dynamics of disease transmission, Outbreak Investigation. Deliberate introduction of a biological agent. Emerging Microbial Forensic Techniques- PCR, Terminal Restriction Fragment Length Polymorphism (TRFLP), Amplified Fragment Length Polymorphism (AFLP)

UNIT II:

Single Stranded Conformation Polymorphism Analysis (SSCP), Thermal and Denaturizing Gradient Gel Electrophoresis (TGGE, DGGE), Amplified Ribosomal DNA Restriction Analysis (ARDRA), Randomly Amplified Polymorphic DNA (RAPD). Non-PCR DNA Fingerprinting Techniques with Applicability in Forensic Studies-Restriction Fragment Length Polymorphisms (RFLP) and Ribotyping. Forensic Interpretation of DNA Data, Isotopic Testing and Correlation to Contaminant Source, etc.

Microbes of Forensic Importance: Bacillus anthracis, Yersinia pestis, Francisellatularensis, Brucella spp., Burkholderia Pseudomallei, Clostridium botulinum, Listeria monocytogenes and their morphological & biochemical studies. DNA of microbes in soil for crime detection.

UNIT III:

Fungi of forensic importance: Opportunistic mycoses, Chytridiomycotazygomycota, Aspergillusfumigates, Microsporidum, Pneumocytosisjiroveci, Asp.flavus& Candida sp, epidemiology, Antifungal agents. Food borneshigella, salmonella. Etc. Forensic Aspects o**f Biological Toxins**: Microbial Forensic Analysis of Trace and unculturable specimens etc

UNIT IV:

Collection, transportation and preservation of microbial forensic samples, Categories of biological weapons, study of potential bacteria, fungi, viruses, and their toxins, mode of action, identification, preventive measures during handling, laboratory setup, epidemiologic investigation for public health.

UNIT V:

Investigation of suspicious disease outbreak, Biosafety and biosecurity, Bio surveillance, documentation, and case studies, Toxin analysis using mass spectrometry, Non-DNA methods for Biological Signatures, Electron beam based methods for bio-forensic investigations, proteomics development and application for bio-forensics, design of genomics, and design of nucleic acid signature for pathogen identification and characterization.

Reference Books:

1. Microbial Forensics : Roger G Breeze, Bruce Budowle, Steven E Schutzer
2. Handbook of computational molecular biology: Edt by SrinivasAluru
3. S.C. Rastogi, N. Mendiratta& P. Rastogi; Bio-informatics- Methods & Applications, PHI learning pvt. Ltd., (2009)
4. Dr. Westhead, J.H. Parish & R.M. Twyman, Bio-informatics, Viva Books Pvt Ltd., (2003)

Shri Vaishnav Vidyapeeth Vishwavidyalaya

M.Sc. (Forensic Science)

SEMESTER III / IX (M.SC. / B.SC.-M.SC.)

Course Code	Course Name	TEACHING & EVALUATION SCHEME (Practical)					
		End Sem University Exam	Teachers Assessment *	L	T	P	Credit
MSFS306	Practicals based on paper 1 & 2	60	40	0	0	4	2

List of practical's

1. To know the legal procedure of court
2. To maintain medical evidences.
3. To determine cephalic index of unknown skull.
4. To prepare a occupational marks data from different source for personal identification.
5. To study the life cycle of insect and explain its role in determining time since death
6. To prepare post-mortem report format.
7. Practical aspects of collection, preservation and dispatch of viscera for chemical analysis
8. To give the demonstration of postmortem and ante-mortem wound.
9. Examination and certification of injuries.
10. Separation and identification of volatile liquid by simple distillation.
11. Identification of salts and metals by simple colour test and group analysis.
12. Identification of different vegetable poison by colour test, chromatography etc.
13. Identification of insecticides and pesticides by TLC/ colour test.
14. Extraction and identification of drugs/ toxicants from biological matrix and their detection.

Shri Vaishnav Vidyapeeth Vishwavidyalaya

M.Sc. (Forensic Science)

SEMESTER III / IX (M.SC. / B.SC.-M.SC.)

Course Code	Course Name	TEACHING & EVALUATION SCHEME (Practical)					
		End Sem University Exam	Teachers Assessment *	L	T	P	Credit
MSFS307	Practicals based on paper 3&4	60	40	0	0	4	2

List of practical's

1. Preliminary and confirmatory examination of Blood
2. To Determine Species of Origin from Blood by Gel diffusion method
3. To determine the ABO and Rh factor of human blood.
4. Morphological examination of human and animal hairs
5. Preparation of slide for scale pattern study of hairs
6. Identification of species from the given hair sample.
7. Examination of given fibre by physical and chemical method.
8. Detection of salivary stains.
9. Identify the bones of human body.
10. Determine age and sex from long bones and skull.
11. To isolate and examine diatoms and classify them.
12. Isolation of microbial from air.
13. To extract DNA from different samples.
14. To separate DNA fragments using electrophoretic methods.
15. . To demonstrate the working of a biometric voice recognition system.
16. To demonstrate the working of a biometric fingerprint recognition system.
17. To demonstrate the working of a biometric signature verification system.
18. To demonstrate the working of a lie detector.
19. To demonstrate working of a biometric face recognition system.
20. To demonstrate working of a GPS software.
21. To demonstrate working of a GIS software.
22. To conduct microscopic observation of pond water and fresh water samples.
23. To conduct colorimetric fluoride tests for different water samples.