Shri Vaishnav Vidyapeeth Vishwavidyalaya

M.Sc. (Forensic Science) 2021-2023

SEMESTER III

COURSE CODE	CATEGORY	COURSE NAME	TEACHING &EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MSFSN301	DC	**Forensic Medicine and Psychology**	**60**	**20**	**20**	**30**	**20**	**4**	**0**	**2**	**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.

Suggested Readings:

1. Diagnostic & Statistical Manual-IV TR, American Psychological Association
2. DSM-IV Mental Disorders Diagnostics, Etiology and Treatment, by Michaen, Allan.
3. Introduction to Forensic Psychology', by Bruce Arrigo.
4. Kieth Simpsen & Bernard Knight : Forensic Medicine
5. Modi J. S. : Medical Jurisprudence and Toxicology.
6. Parikh C.K. :Chikitsa Nyaya ShastraAurVishVigyan.
7. Poison : CJ, DJ, Gee, B. Knight : Forensic Medicine
8. Psychological Testing' by Anne Anastasi, Susana Urbina, Seventh Edition.
9. Psychological Testing' by Robert J. Gregory, Fourth Edition.
10. Reddy : Forensic Medicine.
11. Taylor : Medical Jurisprudence

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Practicals

1. To know the legal procedure of court
2. To maintain medical evidences.
3. To determine cephalic index of unknown skull.
4. To prepare an 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. Any other related to the course

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MSFSN302	DC	**Forensic Biology and DNA Profiling**	**60**	**20**	**20**	**30**	**20**	**4**	**0**	**2**	**5**

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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.

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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-chemical Analysis, pH and buffers, Physiological solution, cell and tissue culture,Cell fractionation, Biological variations etc. Centrifugation Techniques,Immuno-chemical Technique, General principles, Production of antibodies, Precipitin reaction, Gel immune-diffusion,Immuno-electrophoresis, complement fixation, RadioImmuno Assay (RIA), Enzyme-linked Immuno Sorbent Assay(ELISA), Fluorescence immuneassay. Chromatographic Techniques, Electrophoretic Technique: General principles, Factors affecting electrophoresis, Low voltage thin sheet electrophoresis, High voltage electrophoresis, Sodium dodecyl sulphate(SDS) polyacryl amide gel electrophoresis, Isoelectricfocusing(IEF), Isoelectrophoresis, Preparative electrophoresis, Horizontal and Vertical 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 typing technique – 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.

Suggested Readings:

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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Practicals:

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. Any other related to the course

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MSFSN303	DC	Scientific Investigation of Crime	60	20	20	00	00	4	0	2	5

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UNIT I: Physical patterns

Introduction- Physical patterns in identification, individualization and reconstruction.

Pattern due to blood, Pattern on glass, firearms related patterns, patterns in arson and fires served articles and physical matches, comparison of imprints, indentation, striation, typical presentations, Gait patterns, Bite patterns.Modus operandi, portrait parley.

UNIT II: Death Investigation

Cause of death (Natural and Unnatural), Determination of nature of death and general characteristics of suicides, murder and accidents.

Impression of body at scene of crime, inspection of scene of crime.Role of skeletal remains in investigation. Forensic investigation in firearm related cases. Forensic investigation in asphyxia deaths. Forensic investigation in poisoning cases.

UNIT III:Motor Vehicle Investigation

Identification and search of physical evidences. Involvement of vehicle in crime, theft investigation. Investigation in hit and run cases. Role of skid marks, scuff marks etc. Inspection of Vehicles, glass fracture analysis, paint chip examination. Motor Vehicle Claim Investigation.

UNIT IV: Investigation in offences against properties

Criminal Tress Pass, House Breaking and Theft (HBT), Burglary and Robbery, Investigation in fire and Arson Cases, Investigation in cases of Mass Disaster, Investigation in explosive related cases. Investigation in Bank Frauds.

UNIT V: DNA in Police Work

Role of DNA in sexual offence, disputed paternity, child swapping, identity in dead and living person, civil immigration. Veterinary and wild life and agriculture cases. Legal standards of admissibility of DNA Profiling

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. Kirk (2000) Vehicular Accident investigation and reconstruction.
7. H. James, Wouldiam G. Eckert (1999) Interpretation of Blood stain evidence at Crime Scene, 2nd edition, CRC Press.
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. B. R. Sharma (1980) Footprints, Tracks and Trials. Central Law Agency. Allahabad.
12. Koblinsky et al. (2005) DNA -Forensic and Legal Implications.

Practicals:

1. Identification of Some poisonous seeds.
2. Determination of speed of Vehicle involved in Hit & Run cases.
3. To study various wear and tear characteristics on footwear.
4. Reconstruction and evolution of different types of Crime scene.
5. Analysis of gait patterns under various Circumstances.
6. Analysis of post blast explosive residues.
7. Analysis of questioned document related to bank fraud.
8. Casting and analysis of Pugmarks of Animals.