S.S. JAIN SUBODH P.G. COLLEGE, JAIPUR

(AN AUTONOMOUS INSTITUTION)

Syllabus

Scheme of Examination and Courses of Study

Faculty of Science

Department of Forensic Science

M.Sc. Forensic Science Semester-I, II, III and IV

Rambagh Circle Jaipur-302004,Rajasthan (INDIA)

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Contents:

1. **OBJECTIVES**
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Objective: Our mission as a Forensic science program is to develop professional, ethical post graduates whose competence in problem-solving, legal analysis and application, quantitative reasoning, investigation and scientific laboratory procedures can be applied to immediate employment or advanced study.

Eligibility:

A candidate who has secured more than 55% in the Bachelor degree in Science/Forensic Science or equivalent graduate degree shall be eligible for admission to First Semester of a Master of Forensic Science. For candidates from outside state of Rajasthan 60% will be applicable irrespective of the category.

Scheme of Examination:

1. Each theory paper carries 100 marks. The internal assessment will be 30 marks and EoSE shall carry 70 marks. The EoSE will be of 3 hours duration. There will be a practical examination of 200 marks in all Semester.
2. There will be two parts in EoSE theory paper. Part A of theory paper shall contain 10 Short Answer Questions of 14marks, based on knowledge, understanding and applications of the topics/texts covered in the syllabus. Candidate has to attempt seven questions out of 10 and each question will carry two marks for correct answer.
3. Parts —B of EoSE theory paper will consisting of four questions from each unit with Internal choice of 14 marks each.
4. Each Laboratory EoSE will be of four-hour durations and involve laboratory experiments/exercises/ Seminar presentation / Synopsis presentation/Project work or field study/ FSL Training/consultancy training and viva-voce examination consisting of 200 Marks.
5. The aim of Project work/ Forensic Laboratories/ field study /Research laboratories/ Hospital training is to introduce students to research methodology in the subject and prepare them for pursuing research in theoretical or experimental or computational are as of the subject.

6. The internship shall carry a total of 200 marks, comprising 120 marks for external assessment and 80 marks for internal assessment. Students shall undertake supervised training in an approved forensic science laboratory, research institution, crime-scene unit, cyber-forensic facility, hospital, or other relevant organization. Assessment shall be based on internship performance, attendance, professional conduct, practical learning, submission of an internship report, and presentation/viva voce, as prescribed by the department.
7. The dissertation/major project shall carry a total of 300 marks, comprising 180 marks for external assessment and 120 marks for internal assessment. Students shall conduct an independent research project under the guidance of an assigned supervisor on an approved topic related to forensic science. Assessment shall consider the research proposal, literature review, research methodology, data collection and analysis, interpretation of results, dissertation writing, research progress, presentation, and viva voce. Students must submit the dissertation in the prescribed institutional format and comply with the applicable research ethics and plagiarism requirements.

The primary objective of undertaking project work, forensic laboratory work, field studies, research laboratory work, or hospital training is to familiarize students with research methodology relevant to their subject. This experience is intended to prepare students for advanced study or research in theoretical, experimental, or computational domains. The project work is to be undertaken under guidance jointly by Head of the Department and a senior faculty or a Scientist or any other suitable person with proven research excellence in the concerned field of study. The project work, forensic laboratory work, field studies, research laboratory work, or hospital training can also be taken up in an outside institution of repute Department. The guide will make continuous internal assessment of the Project work and seminar will be held at department of the college by a board of three examiners consisting of HOD, two senior faculty of the department or expert from interdisciplinary department of the institution.

1. Supplementary/ due paper/ special examinations will be resolute as per the institutions autonomous rules.
2. Grade/CGPA/percentage/division will be decided as per the autonomous guidelines of the institution.

Programme Outcomes (POs) – M.Sc. Forensic Science

- **PO1- Demonstrate** advanced knowledge of forensic science principles**, including forensic biology, chemistry, toxicology, digital forensics, and crime scene investigation.**
- **PO2- Apply** scientific methods and analytical techniques **for collection, preservation, examination, and interpretation of forensic evidence**
- **PO3- Integrate** legal, ethical, and professional standards **in forensic practice, ensuring admissibility of evidence in courts of law.**
- **PO4- Analyze and interpret** forensic data and laboratory findings **to assist criminal investigations and medico-legal decision making.**
- **PO5- Use** modern forensic instruments, technologies, and quality management systems **in compliance with national and international standards.**
- **PO6- Demonstrate** critical thinking, problem-solving, and decision-making skills **in complex forensic cases.**
- **PO7- Communicate** forensic findings effectively **through scientific reports, documentation, and expert testimony.**
- **PO8- Engage in** research, lifelong learning, and professional development **to address emerging challenges in forensic science.**

Programme-Specific Outcomes (PSOs) – M.Sc. Forensic Science

- **PSO1- Conduct** systematic crime scene investigation**, evidence collection, documentation, and reconstruction using scientific and legal protocols**
- **PSO2- Perform** forensic laboratory analyses **involving biological, chemical, toxicological, trace, and digital evidence using validated methods.**
- **PSO3- Interpret** toxicological, serological, genetic, and instrumental results **for identification, cause-of-death analysis, and criminal linkage.**
- **PSO4- Apply** forensic laws, criminal procedures, and expert witness principles **in medico-legal and judicial contexts.**
- **PSO5- Implement** forensic quality management systems**, accreditation requirements, and ethical practices in laboratory operations.**
- **PSO6- Design and execute** forensic research projects**, case studies, and scientific investigations addressing real-world forensic problems.**

Semester I

Paper Code	Nomenclature	Credits	Marks		Total Marks
			External	Internal	
PGFS S1PI	Fundamentals of Forensic Science	4	70	30	100
PGFS S1PII	Forensic Criminology	4	70	30	100
PGFS S1PIII	Analytical Instrumental Techniques in Forensics	4	70	30	100
PGFS S1PIV	Advanced Forensic Toxicology	4	70	30	100
PGFS S1LCI	Forensic Lab Course-I & Seminar	4	60	40	200
PGFS S1LCII	Forensic Lab Course-II Minor Project	4	60	40	

Semester II

Paper Code	Nomenclature	Credits	Marks		Total Marks
			External	Internal	
PGFS S2PI	Forensic Biological Sciences	4	70	30	100
PGFS S2PII	Forensic Questioned Document and Fingerprint	4	70	30	100
PGFS S2PIII	Crime Scene Management and Forensic photography	4	70	30	100
PGFS S2PIV	Basic Concepts of Digital Forensics	4	70	30	100
PGFS S2LCIII	Forensic Lab Course-III & Seminar	4	60	40	200
PGFS S2LCIV	Forensic Lab Course-IV & Minor Project	4	60	40	

Semester III

Paper Code	Nomenclature	Credits	Marks		Total Marks
			External	Internal	
PGFS S3CPI (Core Paper)	Ballistics & Forensic Physics	4	70	30	100
PGFS S3CPII (Core Paper)	Forensic Medicine and Anthropology	4	70	30	100
Specialization A : Forensic Biology, Serology and DNA Profiling					
PGFSS3 EPIII A	Forensic Serology	4	70	30	100
PGFSS3 EPIV A	Forensic Genetics and DNA Profiling	4	70	30	100
PGFSS3 EPV A	Forensic Immunology, Proteomics and Bioinformatics	4	70	30	100
Specialization B : Digital and Cyber Forensics					
PGFSS3 EPIII B	Cyber law, Risk and Compliance	4	70	30	100
PGFSS3 EPIV B	Incident Response and Digital Forensic	4	70	30	100
PGFSS3 EP V B	Ethical Hacking and Penetration Testing	4	70	30	100
Practical (Core and Elective Papers)					
PGFS S3LC V	Forensic Core Lab Course V & Seminar	4	60	40	200
PGFS S3LCE VI A	Forensic Elective Lab Course VI A (Forensic Biology, Serology and DNA Profiling) & Synopsis	4	60	40	
PGFS S3LCE VI B	Forensic Elective Lab Course VI B (Digital and Cyber Forensics) & Synopsis				

Semester IV

Paper Code	Nomenclature	Credits	Marks		Total Marks
			External	Internal	
PGFS S4PI	Research Methodology in Forensic Science	4	70	30	100
PGFS S4PII	Internship	8	120	80	200
PGFS S4PIII	Dissertation/ Major Project	12	180	120	300

Semester-I

M.Sc. Forensic Science Semester-I

Paper I

PGFSS1PI: Fundamentals of Forensic Science

Duration: 3hrs. **Max.Marks:70**

Note: There will be two parts in end semester theory paper.
Part A of the paper shallcontain7 short answer questions of 14 marks. Each question will carry two marks
Part B of the paper will consist of four questions, one question from each unit with internal choice. Each question will carry 14 marks.

Course Objectives

- To introduce the fundamental concepts, principles, and scope of forensic science
- To understand the organizational structure and functioning of forensic institutions
- To explain the role of police, ethics, and legal standards in forensic investigations
- To familiarize students with environmental forensics and biometric identification systems

Unit-I

Definition of Forensic Science, History and Development of Forensic Science Basic principles of forensic science, Branches of forensic science, Multidisciplinary nature, Forensic Psychology and investigative techniques, Forensic Technology solving crimes with advanced technology, Forensic Evidences: Concise of Forensic Physical, Biological, Chemical and Psychological evidences Laws and Principles of Forensic Science: Law of Exchange, Law of Individuality, Law of Comparison, Law of Progressive Changes and Law of Probability

Unit-II

Organizational Setup Organizational structure of Forensic Science Laboratories at State and Central level, FPB, NICFS, CDTS (Central Detective Training School), NCRB Qualifications and duties of Forensic Scientists Academic centers of education and research, Indian and Academy of Forensic Science, Interpol and FBI, Research fields in Forensic Science

Unit-III

Police and Forensic Science: Relationship between police and forensic expert, Role of Police at the Crime scene, scientific help at crime scene, forensic case documentation by Police, Technological Advance and Police. Frye and Daubert standards, Ethics in Forensic Science.

Unit-IV

Environmental Forensics: Definition, Legal processes involving environmental forensic science. Basic principles and its applications

Biometrics in Personal Identification: Introduction, Concepts of Biometric Authentication and its role in person Identification

Course Outcomes

After completing the course, students will be able to:

- Describe the principles, laws, and types of forensic evidence used in crime investigation
- Explain the structure, roles, and functions of national and international forensic organizations
- Understand the interaction between police and forensic experts, including ethical and legal aspects
- Apply basic knowledge of environmental forensics and biometrics in personal identification and legal contexts

Suggested Reading

1. Houck, M.M & Siegel, J.A; Fundamentals of Forensic Science, Academic Press, London, 2006.
2. Sharma, B.R; Forensic Science in Criminal Investigation & Trials, Universal Publishing Co., New Delhi, 2003
3. NandaB. BandTewari, R.K;ForensicScienceinIndia-AvisionforthTwentyFirst Century, Select Publisher, New Delhi, 2001.
4. James,S.HandNordby,J.J;ForensicScience-AnIntroductiontoScientificandInvestigative Techniques, CRC Press, USA, 2003.
5. Saferstein;Criminalistics-AnIntroductionofForensicScience,PrenticeHallInc, USA,2007.
6. Barry,A.J.Fisher;TechniquesofCrimeSceneInvestigation,7thEd,CRCPress, New York, 2003.
7. Morby, J.& Reckoning,D; TheArtofForensicDetection, CRC PressNew York,2003.

M.Sc. Forensic Science Semester-I

Paper II

PGFSS1PII: Forensic Criminology

Duration: 3hrs. **Max. Marks:70**

Note: There will be two parts in end semester theory paper.

Part A of the paper shallcontain7 short answer questions of 14 marks. Each question will carry two marks

Part B of the paper will consist of four questions, one question from each unit with internal choice. Each question will carry 14 marks.

Course Objectives

- To introduce the concept, nature, and types of crime along with their social causes in India
- To provide knowledge of forensic criminology, crime control, prevention, and criminal profiling
- To familiarize students withcriminal investigation procedures and judicial processes
- To develop understanding of therole of forensic experts, legal provisions, and evidentiary laws

Unit-I

Introduction to Crime, Concept and Definition of Crime, Types of crime and its causes: Property crimes, public order crimes, violent crimes, cybercrimes, juvenile delinquency, Society-Criminal interaction and various types of crimes in India.

Unit-II

Introduction of Forensic Criminology, Control and Prevention of Crime, Criminal Profiling: Definition, Need and Types, theories of criminology (differential association theory, self- concept and containment theory, labelling theory, barrier theory, etc.), punitive aspects (theories of Punishment), probation & parole

Unit-III

Investigation: FIR, Case diaries, types of complaints, cognizable and non-cognizable offences, police custody & Judicial custody, Bailable and non bailable offences, Procedure of filing charge sheet. Constitution of Courts and their Powers. Lok Adalat's, LokAykut's and Juvenile Courts. Fundamental Rights

Unit-IV

Forensic Expert: Definition and related Laws & Issues, Expert Witness, Indian Evidence IT Act, Bhartiya Sashay Adhamiya (IEA),Bhartiya Nagarik Suraksha Sanhita (Cr PC), POCSO

Course Outcomes

After completing the course, students will be able to:

- Explain the concept of crime, its classification, causes, and societal impact
- Describe criminological theories, criminal profiling, punishment theories, probation, and parole
- Understand investigation procedures, FIR, court structure, and fundamental rights
- Interpret the role of forensic experts and apply relevant legal provisions including IEA, BNSS (CrPC), IT Act, and POCSO

Suggested Reading

1. Swansan,C.R,Terrbles,L&Taylor;PoliceAdministration,PrenticeHall,USA,1998
2. Gross; Criminal Investigation-A Practical Text book for Magistrates, Police Officers, and Lawyers; Universal Law Publishing Co., New Delhi, 2000.
3. Lyman, M.D; Criminal Investigation – The Art &the Science, Prentice Hall, New Jersey, 2002.
4. O'Hara CE& Osterberg, JW; An Introduction to Criminalistics., Indiana University.Press, London, 1972.
5. Swansson, C.R,Chamelin, N.C,&Territ,L; Criminal Investigator,McGrawhill,New York, 2000.
6. The Indian Evidence Act, (1872), Amendment Act (2002); Universal Law Publishing Co., 2003.
7. The Code of Criminal Procedure (1973) Amendment Act,(2001);Universal Law Publishing Co., 2002.
8. Rattan Lal& DhirajLal;The Indian Penal Code,28thEd.Wadhwa&Co.Nagpur,2002.

M.Sc. Forensic Science Semester-I

Paper III

PGFSS1PIII: Analytical Instrumental Techniques in Forensics

Duration: 3hrs. **Max. Marks:70**

Note: There will be two parts in end semester theory paper.

Part A of the paper shallcontain7 short answer questions of 14 marks. Each question will carry two marks

Part B of the paper will consist of four questions, one question from each unit with internal choice. Each question will carry 14 marks.

Course Objectives

- To understand principles and instrumentation of microscopy and analytical techniques
- To gain knowledge of spectroscopic, chromatographic, and electrophoretic methods
- To familiarize with advanced instruments like GC–MS, LC–MS, SEM, TEM, NMR, and Raman
- To develop skills in analytical data interpretation for forensic and scientific applications

Unit–I

Microscopy- Basic principles, Simple and Compound microscope, Comparison microscope, Phase contrast Microscope, Stereoscopic microscope, Fluorescent Microscopy, Infra-red Microscopy, Scanning Electron Microscope (SEM) & Transmission Electron Microscope (TEM). Chromatographic Techniques- Basic principles, theory and instrumentation Electrophoretic Technique- Basic principles, theory and instrumentation

Unit-II

Introduction to UV- Visible Spectrophotometry, qualitative and quantitative methods for detection. Fluorescence Spectrophotometry, Types of sources, instrumentation, atomic absorption spectroscopy: Instrumentation and techniques, atomic emission spectroscopy Instrumentation and techniques qualitative analysis and application.

Unit-III

Mass Spectrometry Sample flow, Ionization methods, Mass analyzer, Vacuum systems, data handling correlation of mass spectra and molecular structure, Fourier transform mass spectrometry, GCMS, LCMS, inductively coupled plasma MS (ICP-MS), High performance liquid chromatography

Unit-IV

Raman spectroscopy: Instrumentation, sample handling and illumination, structural analysis, Introduction to X-ray absorption and fluorescence methods X-ray diffraction, Nuclear magnetic resonance spectroscopy: Basic principles, theory and instrumentation.

Course Outcomes

After completing the course, students will be able to:

- Explain working principles of microscopy and separation techniques
- Apply spectroscopic methods for qualitative and quantitative analysis
- Understand and interpret results from mass spectrometry and hyphenated techniques
- Correlate instrumental data with molecular structure and composition

Suggested Reading

1. Robinson, J.W; Atomic Spectroscopy, 2nd Ed. Revised & Expanded, Marcel Dekkar, Inc, New York, 1996.
2. Workman, J; Art Springsteen; Applied Spectroscopy- A compact reference for Practitioners, Academic Press, London, 1997.
3. Subrahmanyam, N. &Lal B; A text Book of Optics, S. Chand & Company, New Delhi, 2004.
4. Willard, H.H. Lynne L. Merrett, J. Dean, A. Frank, A. Settle. J; Instrumental Methods of Analysis, 7th Edn.CBS pub.& Distributors, New Delhi, 1986.
5. Khandpur, R.S; Handbook of Analytical Instruments, Tata McGraw Hill Pub. Co. New Delhi, 2004.
6. Thomson, K.C. & Renolds, R.J; Atomic Absorption Fluorescence & Flame Emission Spectroscopy, A Practical Approach, 2nd Edn. Charles Griffith & Company, New South Wales, 1978.
7. Dudley, H. Williams & Fleming, I; Spectroscopic Methods in Organic Chemistry, 4thEdn, Tata McGraw- Hill Publishing Company, New Delhi, 1994.

M.Sc. Forensic Science Semester-I

Paper IV

PGFSS1PIV: Advanced Forensic Toxicology

Duration: 3hrs. **Max.Marks:70**

Note: There will be two parts in end semester theory paper.

Part A of the paper shallcontain7 short answer questions of 14 marks. Each question will carry two marks

Part B of the paper will consist of four questions, one question from each unit with internal choice. Each question will carry 14 marks.

Course Objectives

- To introduce the concept, history, scope, and international organizations related to forensic toxicology
- To understand the classification of poisons, principles, instrumentation, and applications of forensic toxicology
- To provide knowledge of veterinary, environmental, entomo-toxicology, and clinical toxicology
- To develop skills inanalysis, detection, and interpretation of poisons in biological and environmental samples

Unit-I

Introduction, History International organization related to Forensic Toxicology, Different mode of Classification of Poisons, Areas of Forensic Toxicology, Elements of Forensic Toxicology, Applications, Scientific Principles, Instrumentation and equipments Forensic Veterinary Toxicology: Definition, cases, common animal disease states affecting small animals and large animals, Legal and regulatory issues

Unit-II

Entomo-toxicology: Definition and Forensic utility, Environmental Forensic Toxicology, Introduction, principles and application, environmental data, ground water characterization, soil, vapour survey, analytical methods. Forensic techniques in environmental litigation

Ptomaine: Introduction, interference caused in analysis of poison, especially in putrefied viscera, poisoning cases due to ptomaine.

Unit-III

Clinical Toxicology: Introduction and history of clinical toxicology , Toxidrome, Laboratory principles, Pharmacokinetics and Toxicokinetics overview, Administration, liberation, and absorption of toxicants, Prevention of absorption from the gastrointestinal tract, Distribution and Metabolism of Toxicants in the body, Elimination of toxicants, Enhancement of elimination of toxicants, Types of Antidotes

Unit-IV

Analysis of Poisons, Method of analysis of Basic drugs / poisons, Method of analysis of Acidic drugs / poisons, Method of analysis of metallic poisons and volatile poisons, Analysis of samples taken under Food Adulteration Act, Toxicological analysis of decomposed materials.

Course Outcomes

After completion of the course, students will be able to:

- Explain the fundamentals, classification, and areas of forensic and veterinary toxicology along with legal aspects
- Describe principles and applications of environmental, entomo-toxicology, and clinical toxicology
- Understand toxicokinetics, toxidromes, antidotes, and laboratory principles in clinical toxicology
- Apply appropriate analytical methods for detection of poisons in biological, food, and decomposed samples

Suggested Reading

1. Modi's (1988) Medical Jurisprudence &Toxicology, M.M. Trirathi Press Ltd. Allahabd,.
2. Saferstein, R (1982)Forensic Science Hand Book, VolI, II and III, PretinceHall, NI.
3. Saferstein,R (2000) Criminalistics.
4. Curry(1986) Analytical Methods in HumanToxicology, Part II.
5. Curry,A.S. (1976)Poison Detection in Human Organs.
6. E.Stahl (1969) Thin Layer Chromatography :A LaboratoryHandbook.

M.Sc. Forensic Science Semester -I

Paper Code: PGFSS1LCI

Forensic Lab Course-I

1. Ethics in Forensic Lab
2. Crime Scene Documentation
3. Psychological analysis in Forensics
4. To study the different types of evidences in forensic science.
5. To Study the Different Searching patterns in a crime scene
6. To study the various Sections of Bharatiya Nagarik Suraksha Sanhita (BNSS) and Bharatiya Nyaya Sanhita (BNS)
7. Biometric Authentication in Forensics
8. To understand the various aspects of crime scene evaluation.
9. Visit To Forensic Science Laboratory
10. Case Study

M.Sc. Forensic Science Semester -I

Paper Code: PGFSS1LCII

Forensic Lab Course-II

1. Preparation of buffers and standard solutions
2. Separation of mixture using centrifugation.
3. Concepts and working GC, GC-MS and HPLC
4. To study the principle and working of chromatography.
5. PAGE electrophoresis, determination of serum protein through PAGE
6. Agarose gel electrophoresis, determination of serum protein.
7. Principal and Working of PCR
8. Microscopic examination of forensic evidences (Blood, Semen, Hair, Fiber,Glass, Wool and related biological sample)
9. To Study the concepts and working of the gas Chromatography.
10. Application of Entomo-toxicology in relation to Forensics
11. Analysis of Adulterants in various samples.

Semester-II

M.Sc. Forensic Science Semester -II

Paper I

PGFSS2PI: Forensic Biological Sciences

Duration: 3hrs. **Max. Marks: 70**

Note: There will be two parts in end semester theory paper.

Part A of the paper shallcontain7 short answer questions of 14 marks. Each question will carry two marks

Part B of the paper will consist of four questions, one question from each unit with internal choice. Each question will carry 14 marks.

Course Objectives

- To develop fundamental understanding of nucleic acids, genetic inheritance, and DNA technologies used in forensic science.
- To impart biological knowledge of human biological fluids, blood, and serological markers relevant to forensic investigations.
- To introduce principles of forensic serology, blood group systems, and bloodstain pattern analysis for crime scene interpretation.
- To familiarize students with specialized biological branches of forensic science, including wildlife forensics, forensic entomology, diatomology, and palynology.

Unit I

Structure and Functions of Nucleic acids, Introduction to Mendelian inheritance and its extensions, Pedigree analysis, Techniques and equipment for DNA extraction and purification, DNA quantitation, DNA separation and detection techniques, Polymerase Chain Reaction (PCR), DNA polymorphism, DNA analysis and its forensic importance, Important case studies of DNA fingerprinting. Elementary idea of SWGDAM

Unit II

Biology, Composition and identification of biological fluids like Sweat, Saliva, Urine, Semen and Vaginal secretion, and their forensic significance. Normal and pathological variations in biological fluids with age, sex, and health status, Elementary idea of Biological markers and their significance in forensic identification and interpretation

Unit-III

Basic Serology: Blood and its composition, Hemoglobin and its variants, Blood Typing/Grouping - 'ABO' system and its significance in forensic investigation., Other blood group antigens - 'Rh sub types', MN, I, P, Kell, Duffy, Kidd, Lewis, Lutheran and Bombay blood group. Introduction of Bloodstain Pattern Analysis (BPA) and its Interpretations, Importance and Legal aspects of BPA.

Hair examination: Morphological, anatomical and Microscopic examination of hair. Characteristics of hair to determine the species origin, race and sex

Unit-IV

Wildlife Forensics : Definition and advances in wildlife forensics; Threats to the natural resources and wild species inhabiting globally; Importance of Wildlife Conservation; Classification of Species as per IUCN Red Data Book; CITES; Wildlife (Protection) Act, 1972 of India and other related acts; Different Methods of Poaching; Conventional methods of species identification; Morphological identification and examination of wildlife parts and products; Application of DNA technologies used in Wildlife Forensics.

Forensic Entomology: Basic elements of Entomology, Importance of insects in forensic investigations, life cycles of insects to determine time since death, Applications of Forensic Entomology.

Diatoms Examination : Introduction to Diatoms, Types and Structure of Diatoms, Importance and examination of Diatoms in Forensic Science. Introduction to Forensic Palynology and forensic importance

Course Outcomes

After completing the course, students will be able to:

- Explain genetic principles, chromosomal abnormalities, and inheritance patterns in forensic investigations.
- Apply DNA analysis techniques and interpret forensic DNA evidence in criminal and civil cases.
- Analyze biological evidence such as blood, body fluids, bloodstain patterns, and hair for forensic significance.
- Understand wildlife forensic methods and apply entomological, diatom, and palynological evidence in forensic investigations.

Suggested Reading

1. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.

2. Textbook of Practical Physiology by C.L. Ghai, Jaypee brother's medical publishers, New Delhi.

3. Forensic Science in Wildlife Investigations. Adrian Linacre Taylor and Francis, 2009

4. Forensic Entomology: The Utility of Arthropods in Legal Investigations Jason H. Byrd, James L. Castner Taylor and Francis, 2009

5. Microbial forensics By Roger Breeze, Bruce Budowle, Steven E. Schutzer. Elsevier.

M.Sc. Forensic Science Semester -II

Paper II

PGFSS2PII: Forensic Questioned Document and Fingerprint

Duration: 3hrs. **Max.Marks:70**

Note: There will be two parts in end semester theory paper.

Part A of the paper shallcontain7 short answer questions of 14 marks. Each question will carry two marks

Part B of the paper will consist of four questions, one question from each unit with internal choice. Each question will carry 14 marks.

Course Objectives

- To introduce the concept and types of forensic documents and their evidentiary value
- To develop understanding of handwriting and signature identification principles
- To explain the fundamentals, history, and classification of fingerprints
- To familiarize students with methods of collection, preservation, and analysis of fingerprints

Unit-1

Introduction to Questioned Documents and its types

Definition of documents, Types of questioned documents. collection, handling and presentation of documents. Basic tools needed for forensic documents' examination – ultraviolet, visible, infrared and fluorescence spectroscopy, photomicrography, microphotography, video spectral comparator, electrostatic detection apparatus.

Unit-II

Handwriting & Signature Identification

Principle of handwriting, individual and class handwriting characteristics, Identification, External, internal, and physical characteristics affecting the handwriting of a person. Signatures: Authentic signatures, forged signatures, disguised signatures. Factors affecting the handwriting and signature of individuals. Comparison of handwriting

Unit-III

Introduction to Fingerprints and History of Fingerprints

Introduction of fingerprints, principles of fingerprints, History of fingerprints and importance of fingerprints, Frictional Skin Ridges and dermal ridges development, Composition of sweat, Fingerprint pattern: loops, arches, whorls, composites, etc.

Unit-IV

Methods of Collection and Preservation of Fingerprints

Methods of collection of fingerprints from living and deceased Individuals, Preservation and lifting of fingerprints, Poroscopy and Edgeoscopy for the analysis of fingerprint details, Ridge Characteristics, Standards Of proof and AIFS in Fingerprint Comparison

Course Outcomes

After completion of the course, students will be able to:

- Identify and examine questioned documents using basic forensic tools and techniques
- Analyze handwriting and signatures for identification and detection of forgery
- Explain fingerprint principles, patterns, and ridge characteristics
- Apply appropriate methods for collection, preservation, and comparison of fingerprints in forensic cases

Suggested Reading

1. "Scientific Examination of Questioned Documents" by Ordway Hilton Publisher: CRC Press

2. "Handwriting Identification: Facts and Fundamentals" by Roy A. Huber and A.M. Headrick Publisher: CRC Press.

3. "Forensic Document Examination: Principles and Practice" by Katherine M. Koppenhaver Publisher: CRC Press

4. "Forensic Handwriting Identification: Fundamental Concepts and Principles" by Ron Morrisb Publisher: Academic Press

5. Handwriting Analysis and Recognition" by Srihari Sargur N., Srinivasan H. S.Publisher: World Scientific Publishing

M.Sc. Forensic Science Semester-II

Paper III

PGFSS2PIII: Crime Scene Management and Forensic Photography

Duration: 3hrs. **Max.Marks:70**

Note: There will be two parts in end semester theory paper.

Part A of the paper shallcontain7 short answer questions of 14 marks. Each question will carry two marks

Part B of the paper will consist of four questions, one question from each unit with internal choice. Each question will carry 14 marks.

Course Objectives

- To provide comprehensive knowledge of crime scene concepts, types, and systematic processing
- To develop understanding of crime scene management, securing, recording, and reconstruction techniques
- To train students in proper collection, preservation, handling, and documentation of physical and biological evidence
- To familiarize students with forensic photography and videography as essential tools for crime scene documentation and court presentation

Unit-1

Crime Scene

Introduction of crime scene, Importance and processing of crime scene, Types of Crime Scene: Indoor and outdoor, Primary and secondary and crime scenes based on size of evidence. Crime scene notes.

Crime Scene Procedures

Crime scene Management – initial response, role of first responding officer, duty management; Role and qualities of an Investigating officer, Role of forensic scientists, forensic doctors, Role of different agencies involved in crime scene management: Police, Fire Brigade, Medico legal experts.

Unit-II

Securing and Recording the Crime Scene

Protecting a scene of crime – various steps involved, contamination issues, Recording a crime scene: Crime Scene Survey, search patterns – Strip method, grid method, zone/quadrant method, spiral method, Point to point method, wheel method.

Crime scene sketching- Indoor and outdoor, triangulation method, baseline method, field notes, handling clues, modern aids, Crime Scene Reconstruction and its utility, case studies for reconstructing a crime scene.

Unit-III

Collection and Preservation of Evidence

Collection and preservation of evidence along with control samples and standards: blood, urine, saliva, semen, tissue, hair, soil, paint, glass, bullet, cartridge case, clothing, weapons (knife, firearm), documents, drugs, fingerprints, tool marks, explosive material, bite marks;

General safety considerations while handling evidence in the crime scene; Forwarding evidence to the Forensic Science Laboratory; Chain of custody, report writing & expert testimony

Unit-IV

Fundamentals of Photography

Introduction to photography, Photographic Instruments: light source, types of camera and lenses, optical Filters, Fundamentals Of light and vision, Basic principle of black and white photography and color photography, Modern photography and its importance in forensic science

Forensic photography

Crime scene photography, macro photography, Micro photography, crime scene Videography Photography Of fingerprints and documents, Court Representation and admissibility in judicial Systems

Course Outcomes

After completion of the course, students will be able to:

- Explain the importance, types, and procedures of crime scene investigation and management
- Apply appropriate methods for securing, searching, recording, and reconstructing crime scenes
- Collect, preserve, and document various types of forensic evidence while maintaining chain of custody
- Use principles of forensic photography and videography for accurate documentation and legal admissibility

Suggested Reading

1. B.R. Sharma, Forensic Science in Criminal Investigation and trials - Universal Law Publishing Company, 2003, ISBN 817534332X, 9788175343320
2. The Encyclopaedia of Crime Scene Investigation (Facts on File Crime Library) 1st Edition by Michael Newton
3. "The Camera" by Ansel adams
4. Langford, M. Basic Photography. Focal Press., Excellent for fundamentals of cameras, lenses, light, exposure, filters, and composition.
5. Robinson, E. M. *Crime Scene Photography*. Academic Press. – Standard reference for crime scene, macro, micro photography, and evidentiary documentation.
6. Schafer, J. N., & Robinson, E. M. *Forensic Photography: Importance of Accuracy*. Academic Press.– Emphasizes accuracy, scale, lighting, and court admissibility.
7. James, S. H., Nordby, J. J., & Bell, S**.** *Forensic Science: An Introduction to Scientific and Investigative Techniques*. CRC Press.– Relevant chapters on forensic imaging, videography, fingerprints, and documents.
8. Bodziak, W. J. Footwear Impression Evidence. CRC Press.– Useful for close-up and impression photography techniques.

M.Sc. Forensic Science Semester-II

Paper IV

PGFSS2PIV: Basic Concepts of Digital Forensics

Duration:3 hrs. **Max.Marks:70**

Note: There will be two parts in end semester theory paper.

Part A of the paper shallcontain7 short answer questions of 14 marks. Each question will carry two marks

Part B of the paper will consist of four questions, one question from each unit with internal choice. Each question will carry 14 marks.

Course objectives

- To introduce number systems, logical operations, and basic computer architecture relevant to digital systems.
- To provide understanding of computer forensics, digital evidence, computer crimes, and cyber threats.
- To familiarize students with mobile phone forensics, forensic tools, and digital signature & cryptography concepts.
- To develop knowledge of audio, video, and image forensics, including enhancement, authentication, and CCTV analysis.

Unit-1

Number Systems and logical operations:

Binary, Octal, Decimal and Hexadecimal, Conversion and Operations on Binary Number Systems, Representing Information in Hexadecimal and Binary, Logical operations on binary number system.

Computer Architecture:

Components of computer, Input Devices, Central Processing Unit, Primary and secondary Storage Devices, Output Devices, Secondary Storage Devices: Understanding Disk, Volume and Partition, HDD and SSD Structures

Unit-II

Computer Forensics:

Introduction, Nature of digital evidence, Retrieval and analysis of digital evidence, Sources of digital evidence, Computer security and its relationship to computer forensics. Emergence of computer crime: Classification of computer crimes, computer virus and types, computer worms, Trojan Horse, trap door, super zapping, logic bomb, salami logic, characteristics of computer crime and criminals.

Unit-III

Cell phone/mobile Forensics

Introduction, Forensic toolkit, EnCase, Ilook Investigator. Digital signature and cryptography: signature in paper based society, Transfer of computer based documents, digital signature and authentication, digital signature generation and verification, certification of public keys, certification of authority**.**

Unit-IV

Audio Forensics

Introduction to voice identification/speaker recognition, Speech Enhancement, Speaker profiling: Segregation of Speech samples, auditory analysis/listener's approach, spectrographic approach or voiceprint analysis, automatic speaker recognition technique. Audio Authentication.

Video/Image Forensics

Video processing and enhancement, Video authentication, Metadata analysis, hash value generation, video analysis: frame extraction, frame by frame analysis, shot by shot analysis. Technical aspects of the video, collection, handling and preservation of video files, Introduction to CCTV Forensics

Course Outcomes

After completion of the course, students will be able to:

- Understand number systems, binary logic, and computer architecture, including storage devices such as HDDs and SSDs.
- Identify, collect, and analyze digital evidence, classify computer crimes, and understand malware and cyber-offence mechanisms.
- Explain mobile forensics procedures, use forensic tools such as EnCase and Ilook Investigator, and understand digital signatures and cryptography.
- Apply principles of audio, video, and image forensics, including speaker recognition, media authentication, metadata analysis, and CCTV forensic examination.

Suggested Reading

1. Practical Guide to Computer Forensics Investigations, A (Pearson IT Cybersecurity Curriculum (ITCC)) 1st Edition by Darren R. Hayes
2. Learn Computer Forensics: A beginner's guide to searching, analysing, and securing digital evidence 1st Edition by William Oettinger
3. Investigating Windows Systems 1st Edition by Harlan Carvey
4. Computer Systems_ Digital Design, Fundamentals of Computer Architecture and Assembly Language
5. Carle, B., & Jensen, R. C. (2018). Understanding Video Management Systems
6. Wolper, V. E. (2020). Photograph Restoration and Enhancement: Using Adobe Photoshop CC 2021 Version (3rd ed.). Mercury Learning & Information

M.Sc. Forensic Science Semester- II

Paper Code: PGFSS2LCIII

Forensic Lab Course-III

Forensic Biological Sciences

1. Protocol of handling different biological sample and maintaining their chain of custody.
2. Forensic identification of biological fluids involves a systematic, multi-stage process to detect, screen, and confirm substances like blood, semen, or saliva.
3. To examine the given sample using starch iodine test to analyze weather it is saliva or not.
4. Examination of blood and Blood pattern Analysis
5. Preparation of human blood smear and to study blood cells.
6. Determination of RBC, WBC, haemoglobin, MCV, MCH, MCHC.
7. Quantative estimation Nucleic acid: DNA and RNA
8. Paper chromatography: unidimensional chromatography using samples and biological materials.
9. To study morphology and anatomy of Hair.

Forensic Questioned document and fingerprint

1. To study the collection, preservation and handling of Questioned documents.
2. Identification of Handwriting-general characteristics and individual characteristics.
3. Examination and Identification of Signature Forgeries
4. Examination of additions, alterations, and obliterations in the documents.
5. Examination of indented handwriting.
6. Examination of sequence of intersecting strokes
7. To take plain and rolled fingerprints and to identify the patterns.
8. To develop latent fingerprint with powder

M.Sc. Forensic Science Semester- II

Paper Code: PGFSS2LCIV

Forensic Lab Course- IV

Crime Scene Management and Forensic Photography

1. Perform protection and documentation of indoor and outdoor crime scene and perform search, collection and packing of physical evidences.
2. Perform protection and documentation of indoor and outdoor crime scene and perform search, collection and packing of biological evidences.
3. Perform sketching of indoor and outdoor crime scene using triangulation method.
4. To reconstruct different hypothesized scene of crime.
5. To study the components in Forensic kit used in Fingerprints examination.
6. To study the components in Forensic kit used in Serological examination.
7. To study the components in Forensic kit used in Crime Scene Examination.
8. To study the components in Forensic kit used in Impression casting

Basic concepts of Digital Forensics

1. To study about types of IP addresses.
2. To study about ports and protocols of networks.
3. To study about the DNS information. Recording, editing, processing, and conversion of audio files.
4. Speech acquisition and Spectrographic analysis of Voice.
5. Detection of tampering in audio & video files.
6. Audio restoration and speech enhancement
7. Analysis and enhancement of video/image/CTV Footage

Semester-III

M.Sc. Forensic Science Semester-III

Paper-I

PGFSS3 PI: Ballistics and Forensic Physics

Duration: 3 hrs. **Max.Marks:70**

Note: There will be two parts in end semester theory paper.

Part A of the paper shallcontain7 short answer questions of 14 marks. Each question will carry two marks

Part B of the paper will consist of four questions, one question from each unit with internal choice. Each question will carry 14 marks.

Course objectives

- To introduce the principles, history, classification, construction, and safe handling of firearms and ammunition used in forensic investigations.
- To provide theoretical and practical understanding of internal, external, terminal, and wound ballistics and the factors influencing projectile behaviour.
- To develop competency in examination of firearm injuries, determination of range of fire, and analysis of gunshot residue for shooter identification.
- To impart knowledge of forensic examination and interpretation of trace evidence including paint, glass, and toolmarks using physical, chemical, and instrumental techniques

Unit-I

Firearms

Introduction to firearms, history of firearms, Classification of firearms, Characteristics and Working mechanism of Standard: Rifled firearms, small arms, shot guns & Non-standard: Improvised, Country made, Imitative firearms, identification of origin.

Ammunition Constructional parts, Classifications of Ammunition on basis of constructional features, Functional assembly of different types of ammunition & their types, Safety aspects for handling firearms and ammunition, cartridge-firing mechanism.

Types of Ballistics

Internal Ballistics; Definition, Ignition of propellent, Shape and size of propellent, Factors Affecting the internal ballistics; lock time, ignition time, barrel time, erosion, corrosion, Equation of motion of projectile, Density of loading; pressure, Heat problems, Vibration and jump, Projectile Velocity Determination, Theory of recoil.

Unit-II

Terminal Ballistics

Introduction of terminal ballistics, tumbling of bullets, effect of instability of bullet, effect of intermediate targets, influence of range cavitations-temporary and permanent cavity, ricochet and its effect, stopping power

External Ballistics; principle of external ballistics, Vacuum trajectory, trajectory formation and its computation, effect of air resistance on Trajectory, Angle Of fall, Influence Of earth on trajectory, base drag, yaw, shape of projectile and stability of projectile, ballistic coefficient and limiting velocity and limiting velocity, measurements of trajectory parameters, Escape velocity and Ricochet.

Unit-III

Wound ballistics

Explosive wound, evaluation of injuries caused due to various firearms (Shot Gun, Rifle, Handguns and country made Firearms), measurements of wound ballistics parameters, post mortem and antemortem firearm injuries. Determination of range of fire and firearm injuries: burning, scorching, blackening, tattooing and metal fouling and GSR dispersion, bullet recovery and time of firing

Gunshot residue

Introduction to GSR, Composition of GSR depending upon propellent and primer mixture, GSR distribution, Location source and collection of GSR, GSR analysis, Spot test, Chemical Test, Identification Of shooter and instrumental techniques used for the analysis of GSR, Practical Problems related with GSR detection

Unit-IV

Paint

Types of paint and their composition, micro-chemical analysis- solubility test, pyrolysis gas chromatography, TLC, IR spectroscopy, elemental analysis, massspectrometer, interpretation of paint evidence.

Glass

Types of glass and their composition-soda-lime, boro-silicate, safety glass, laminated, light sensitive, tampered/ toughened, wire glass, coloured glass. Matching and comparison. Forensic examinations of glass fractures, Color, fluorescence, physical measurements, refractive index, density gradient, and element alanalysis of glass evidence

Toolmarks

Types of toolmarks, class characteristics and individual characteristics, tracing and lifting of marks, Photographic examination of tool marks and cut marks. Restoration of erased / obliterated marks- Method of making-cast, punch, engrave; methodsof obliteration, method of restoration- etching (etchings for different metals), magnetic, electrolytic etc., recording of restored marks – restoration of Tool marks.

Course Outcomes

After completion of the course, students will be able to:

- Explain the construction, working mechanisms, classification, and identification of standard and improvised firearms and ammunition.
- Analyze internal, external, terminal, and wound ballistics to evaluate projectile behavior, trajectory, recoil, ricochet, and firearm-related injuries.
- Examine gunshot residue and firearm injuries to determine range of fire, time of firing, and association of a suspect with a firearm discharge.
- Perform forensic analysis and comparison of paint, glass, and toolmark evidence and interpret laboratory findings for reconstruction and court presentation.

Suggested Reading:

1. Robertson, D., & Taylor, G. (1993). Introduction to forensic physics. CRC Press
2. Labatt, P. R. (2005). Ballistics: theory and design of guns and ammunition. CRC Press
3. Crosse, C. A. (2002). Forensic ballistics in court: interpretation and presentation of firearms evidence. CRC Press.
4. Heard, B. J. (2019). Handbook of firearms and ballistics: examining and interpreting forensic evidence. John Wiley & Sons.
5. Lee, J. D. (2012). Forensic physics: A comprehensive guide for forensic scientists. Wiley.

M.Sc. Forensic Science Semester-III

Paper-II

PGFSS3 PII: Forensic Medicine and Anthropology

Duration: 3hrs. **Max. Marks :70**

Note: There will be two parts in end semester theory paper.

Part A of the paper shallcontain7 short answer questions of 14 marks. Each question will carry two marks

Part B of the paper will consist of four questions, one question from each unit with internal choice. Each question will carry 14 marks.

Course objectives

- To provide fundamental knowledge of death, injuries, and their medico-legal significance in forensic investigations.
- To familiarize students with medical jurisprudence, medico-legal autopsy procedures, and personal identification methods.
- To introduce the principles and applications of forensic anthropology, including craniometry and facial reconstruction.
- To develop understanding of skeletal analysis for estimation of age, sex, stature, and cause of death in medico-legal cases.

Unit-I

Death

Definition, cause, manner and mechanism of death, determination of time since death, medico legal aspects of death investigation;Asphyxia Deaths: Definition, violent asphyxia death hanging, ligature strangulation, throttling, suffocation, Drowning, Death from starvation, cold and heat, anaphylactic deaths

Injury

Mechanism of injury, Types of injuries: abrasions, bruises, lacerations, incised wounds, stab wounds, firearm injuries, defense wounds, self-inflicted wounds, injury patterns, medico legal aspects of injuries, ante-mortem and post-mortem injuries, aging of injury, artificial injury; Thermal Injuries-Burns, dowry deaths, scalds, electricity, lightning, explosions

Unit-II

Medical Jurisprudence

Medico legal Autopsy and Personal Identification Introduction and legal procedure, Law and Medicine, Law in relation to the Medical Profession, Definition of Autopsy, objectives, requirements, precautions, external examination, internal examination, collection and preservation of different viscera for analysis, postmortem report, Personal identification: Parameters of personal Identification race, religion, sex, age, teeth, bones, and miscellaneous, Identification in mass disasters.

Unit-III

Introduction to Forensic Anthropology

Introduction to Forensic Anthropology: Definition, Brief History, Scope, Applications and Integration of Forensic Anthropology.

Craniometry and Facial reconstruction

Identification of human skull, determining the age and sex of the skull and its measurement. Facial reconstruction using photography, clay modelling etc. and its importance. Importance of tissue depth to reconstruct various facial features. Identification of gender by human skull and pelvis

Unit-IV

Study of Skeletal material

Human and animal remain: Study of burned bones and bone fragments. Assessing and determining the time and cause of Death using the skeletal remains, Attribution of Sex, Estimation of Age and reconstruction of stature from long bones and their medico legal implication, Establishment of Partial and Complete identity of skeletal material and dead bodies

Course Outcomes

After completion of the course, students will be able to

- Differentiate types of death and injuries, determine time since death, and explain their medico-legal implications.
- Describe medico-legal autopsy procedures and apply principles of personal identification, including mass disaster scenarios.
- Analyze human skeletal and cranial remains to estimate age, sex, and reconstruct facial features.
- Establish partial or complete identity from skeletal remains and interpret findings for legal purposes.

SUGGESTEDREADING:

1. Modi JS: Medical Jurisprudence and Toxicology

2. Taylor: Medical Jurisprudence

3. Anil Aggrawal: Text book of Medical Jurisprudence and Toxicology

4. Forensic DNA Typing, Second Edition: Biology, Technology, and Genetics of STR Markers 2nd Edition (2005) - John M. Butler, Academic Press, ISBN:0121479528

5. Forensic Science: An Introduction to Scientific and Investigative Techniques – Stuart H. James, Jon J. Nord by, CRC Press, ISBN:0849327

M.Sc. Forensic Science Semester-III

Specialization A- Forensic Biology, Serology and DNA Profiling

Paper-III A

PGFSS3 EP III A: Forensic Serology

Duration: 3hrs. **Max.Marks:70**

Note: There will be two parts in end semester theory paper.

Part A of the paper shallcontain7 short answer questions of 14 marks. Each question will carry two marks

Part B of the paper will consist of four questions, one question from each unit with internal choice. Each question will carry 14 marks.

Course objectives

- To understand the principles, scope, and significance of forensic serology and the proper handling of biological evidence.
- To develop skills in the identification and examination of biological materials using conventional serological techniques.
- To apply blood group systems and serological markers in forensic investigations and parentage analysis.
- To understand modern forensic serology techniques, quality assurance practices, and the interpretation and reporting of serological evidence.

Unit I

Introduction to Forensic Serology and Biological Evidence

Introduction, scope and significance of forensic serology; role of serology in criminal investigation; types of biological evidence; collection, preservation, packaging, transportation and storage of biological samples; prevention of contamination; chain of custody; laboratory safety and quality assurance; composition and properties of blood; forensic significance of blood, semen, saliva, urine, sweat, vaginal secretions, menstrual blood and other biological fluids.

Unit II

Identification of Biological Evidence

Principles and forensic significance of species determination

Identification of human and animal origin from bones, hair, skin, nails, teeth, soft tissues, and biological fluids/stains (blood, menstrual blood, semen, saliva, sweat, tears, pus, vomit, etc.)

Species determination using immunodiffusion, immunoelectrophoresis, precipitin test, and other serological methods.

Unit III

Blood Group Systems and Forensic Applications

ABO, Rh, MNS, Kell, Duffy, Kidd and Lewis blood group systems; blood grouping from dried stains; secretor and non-secretor status; serum protein and enzyme polymorphism; significance of blood groups in forensic investigations; parentage exclusion and limitations of conventional serological techniques.

Unit IV

Modern Forensic Serology

Rapid body fluid identification methods; immunochromatographic assays; protein biomarkers; mRNA and microRNA markers; examination of mixed and degraded biological samples; quality assurance and quality control in forensic serology laboratories; interpretation and reporting of serological evidence; recent advances in forensic serology.

Course Outcomes

- Explain the principles of forensic serology and demonstrate proper collection, preservation, and management of biological evidence.
- Identify human and animal biological samples using serological methods and evaluate their forensic significance.
- Apply blood group systems and serological techniques in forensic casework, including parentage exclusion.
- Interpret and report forensic serological findings using modern analytical techniques while adhering to quality assurance and laboratory standards.

Suggested reading

1. The examination and Typing of Blood Stains in the crime laboratory-BJ Culliford, U.S.Dept. of Justice, Washington D. C.
2. Blood Group Serology - Boorman KE, Dodd BE and LOncoln PJ, ChuchillLivingstoneInc. New York.
3. Laboratory Procedure Manual - Forensic Serology (2005), Directorate of Forensic Science, MHA, New Delhi
4. Lehninger Principles of Biochemistry 6th Edition (2012) – Nelson and Cox, W.H. Freeman, ISBN: 978-142923414
5. Molecular Biology of the Cell, 6th Edition (2014) – Bruce Alberts, et al., Garland Science, ISBN: 978-0815341055

M.Sc. Forensic Science Semester-III

Specialization A- Forensic Biology, Serology and DNA Profiling

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Paper IV A

PGFSS3 EP IV A : Forensic Genetics and DNA Profiling

Duration:3hrs **Max.Marks:70**

Note: There will be two parts in end semester theory paper.

Part A of the paper shallcontain7 short answer questions of 14 marks. Each question will carry two marks

Part B of the paper will consist of four questions, one question from each unit with internal choice. Each question will carry 14 marks.

Course objectives

- To understand the fundamental principles of forensic genetics, human genome organization, DNA structure, inheritance, and genetic polymorphism.
- To develop knowledge of DNA evidence collection, extraction, quantification, amplification, and quality assurance in forensic DNA laboratories.
- To apply DNA profiling techniques and statistical interpretation for individual identification, kinship analysis, and forensic investigations.
- To understand advanced forensic genomic technologies, emerging DNA analysis methods, and the legal, ethical, and privacy issues associated with forensic genetics.

Unit I

Fundamentals of Forensic Genetics

Organization of the human genome; Structure and organization of DNA; human genome; nuclear and mitochondrial DNA; DNA replication and mutation; molecular basis of genetic polymorphism; STR, VNTR, SNP and Y-STR markers; Principles of inheritance; Hardy–Weinberg equilibrium and forensic significance of genetic variation.

Unit II

DNA Extraction, Quantification and Amplification

Biological samples suitable for forensic DNA analysis; collection and preservation of DNA evidence; manual and automated DNA extraction methods; DNA purification and quality assessment; DNA quantification methods; principles of PCR, multiplex PCR, inhibition studies, contamination control, laboratory workflow, validation and quality assurance in forensic DNA laboratories.

Unit III

DNA Profiling and Forensic Applications

Principles of DNA fingerprinting; STR profiling; capillary electrophoresis; allele designation and profile interpretation; statistical evaluation of DNA evidence; kinship analysis; paternity and complex relationship testing; DNA mixture interpretation; low copy number DNA; Y-STR, X-STR and mitochondrial DNA analysis; forensic applications in violent crimes, missing persons, mass disasters and wildlife investigations. Elementary idea of SWGDAM

Unit IV

Advanced Forensic Genomics

Next-generation sequencing (NGS) in forensic science; Rapid DNA technology; forensic genomics; DNA phenotyping; ancestry informative markers; epigenetic markers for age estimation and tissue identification; microbial forensics; environmental DNA (eDNA); national DNA databases; legal, ethical and privacy concerns; artificial intelligence in DNA interpretation; future perspectives in forensic genomics.

Course Outcomes

- Explain the principles of forensic genetics, DNA structure, inheritance, and genetic markers used in forensic investigations.
- Perform and evaluate DNA extraction, quantification, PCR amplification, and quality control procedures for forensic biological evidence.
- Interpret DNA profiles using STR and related markers for individual identification, kinship analysis, and criminal investigations.

- Assess advanced forensic genomic technologies, including NGS, Rapid DNA, DNA phenotyping, and AI-based DNA interpretation, while considering ethical and legal implications.

Suggested Reading

1. Daniel L. Hartl & Elizabeth W. Jones; Genetics- Principle & Analysis, 4th Ed., Jones & Bartlet Pub. 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.

M.Sc. Forensic Science Semester-III

Specialization A- Forensic Biology, Serology and DNA Profiling

Paper-V A

PGFSS3 EP VA: Forensic Immunology, Proteomics and Bioinformatics

Duration: 3hrs. **Max.Marks:70**

Note: There will be two parts in end semester theory paper.

Part A of the paper shallcontain7 short answer questions of 14 marks. Each question will carry two marks

Part B of the paper will consist of four questions, one question from each unit with internal choice. Each question will carry 14 marks.

Course objectives

- To understand the fundamental principles of immunology, immune responses, and their relevance to forensic science.
- To develop knowledge of immunological techniques and diagnostic methods used in forensic investigations.
- To understand the principles and applications of forensic proteomics for the identification and characterization of biological evidence.
- To explore bioinformatics, molecular databases, multi-omics technologies, and emerging tools such as artificial intelligence in forensic molecular biology.

Unit I

Principles of Immunology

Evolution of the immune system; innate and adaptive immunity; hematopoiesis; cells and organs of the immune system; antigens and antibodies; immunoglobulin classes and functions; antigen-antibody interactions; complement system; cytokines; major histocompatibility complex (MHC); hypersensitivity reactions; autoimmune disorders and their forensic relevance.

Unit II

Immunological Techniques and Diagnostic Applications

Principles and applications of immunological techniques including immunodiffusion, immunoelectrophoresis, radioimmunoassay, ELISA, immunofluorescence, immunohistochemistry, Western blotting and flow cytometry; monoclonal and polyclonal antibodies; hybridoma technology; biosensors and rapid immunodiagnostic assays; vaccines and vaccine development; emerging immunological tools in forensic investigations

Unit III

Forensic Proteomics

Introduction to proteomics; protein extraction from biological samples; protein separation and characterization; mass spectrometry and protein sequencing; protein microarrays; functional proteomics; proteome databases; biomarkers in forensic investigations; applications of proteomics in blood, semen, saliva, fingerprints, hair, bone, muscle and urine; forensic proteomic case studies.

Unit IV

Bioinformatics and Emerging Molecular Technologies

Biological data and databases; sequence retrieval, annotation and Biological databases and sequence repositories; NCBI, EMBL and DDBJ; BLAST, sequence alignment and phylogenetic analysis; forensic DNA databases including CODIS; transcriptomics, metabolomics and integrated multi-omics; artificial intelligence and machine learning in forensic biology; validation of molecular methods; quality assurance; current advances and future directions in forensic molecular biology

Course Outcomes

- Explain the principles of immunology, antigen–antibody interactions, and immune mechanisms relevant to forensic investigations.
- Apply immunological techniques for the detection, analysis, and interpretation of forensic biological evidence.
- Evaluate proteomic approaches and biomarkers for the examination of biological samples in forensic casework.
- Utilize bioinformatics resources and emerging molecular technologies to analyze forensic data while ensuring quality assurance and scientific validity.

SUGGESTEDREADING:

1. J. Owen, J. Punt, S. Stranford, (2012) Kuby Immunology (8th Edition), WH Freeman and Company, USA.

2. D. Male, J. Brostoff, D. Roth, I. Roitt, (2012) Immunology (8th Edition), Saunders, Elsevier, USA.

3. K. Murphy (2011) Janeway's Immunobiology (8th Edition), Garland Science, USA.

4. A. Abbas, A. Lichtman, S. Pillai, (2014) Cellular and Molecular Immunology (8th Edition), Saunders, Elsevier, USA

M.Sc. Forensic Science Semester-III

Specialization- Digital and Cyber Forensics

THEORY

Paper-III B

PGFSS3 EP III B: Cyber law, Risk and Compliance

Duration:3hrs. **Max. Marks: 70**

Note: There will be two parts in end semester theory paper.

Part A of the paper shallcontain7 short answer questions of 14 marks. Each question will carry two marks

Part B of the paper will consist of four questions, one question from each unit with internal choice. Each question will carry 14 marks.

Course objectives

- To provide an understanding of IT security assessment, audit processes, governance, and compliance requirements.
- To develop knowledge of IT infrastructure auditing, risk baselines, CIA principles, and penetration testing methods.
- To introduce risk management concepts and business continuity planning, including risk mitigation and continuity strategies.
- To familiarize students with disaster recovery planning, cyber laws, ethical issues, and international auditing standards.

Unit I

IT Security Assessment and Audit

Define Security assessment, IT security audit and compliance. Difference between audit and assessment, Importance of governance and compliance. Scope and planning of IT compliance audit, Audit process and types of IT audits. Computer Assisted Audit Techniques (CAATs) for sampling, application review, and auditing application controls.

Unit II

IT Infrastructure Compliance and Audit

Risk baseline and acceptable risk levels. Seven domains of IT infrastructure, IT infrastructure audit reporting. Devices and components in each domain. Maximizing confidentiality, integrity, and availability (CIA) Penetration testing and configuration validation

Unit III

Risk Management and Business Continuity

Introduction to Risk Analysis, Risk Identification, Risk Assessment, Risk Response and Mitigation, Risk Reporting, Introduction to Business Continuity Planning (BCP), Overview of BCP Life Cycle, Need for BCP, Identifying and Selecting Business Continuity Strategies

Unit IV

Disaster Recovery, Cyber Law, and Standards

Introduction to Disaster Recovery (DR) planning, Identification of potential disaster status, DR Strategies, Plans for Business Resumption, Category to Cyber-crime, Cyber Law, IT Act 2000 and its amendments, International Cyber Laws, Cyber Ethics, Child Sexual Abuse Material related to cyber domain, various acts related to social media, privacy and security on cyber domain, Auditing Standards and Frameworks: ISO/IEC 27001/2, COBIT, SOC Compliance, HIPAA, Case Studies.

Course Outcomes

After completion of the course, students will be able to:

- Differentiate between IT security assessment and audit, plan compliance audits, and apply CAATs effectively.
- Evaluate IT infrastructure compliance, assess risks across domains, and ensure confidentiality, integrity, and availability.
- Conduct basic risk analysis and propose business continuity strategies for organizational resilience.
- Interpret cyber laws, disaster recovery frameworks, and major audit standardssuch as ISO/IEC 27001, COBIT, and the Information Technology Act, 2000 for real-world compliance and case analysis.

Suggested Reading:

1. Auditing IT Infrastructures for Compliance by Martin M. Weiss, Michael Solomon, Jones & Bartlet Learning, 2015
2. The IT Regulatory and Standards Compliance Handbook by Craig S. Wright, Syngress, 2015
3. Information Technology Control and Audit 5th Edition by Angel R. Otero, 2019
4. (Internal Audit and IT Audit Series) The Complete Guide to Cyber Security Risks and Controls by Anne Kohnke, Dan Shoemaker, Ken Sigler, 2016
5. PCI DSS An Integrated Data Security Standard Guide- A Pressby Jim Seaman, 2020

M.Sc. Forensic Science Semester-III

Specialization- Digital and Cyber Forensics

Paper IV B

PGFSS3 EP IVB: Incident Response and Digital Forensic

Duration: 3hrs. **Max. Marks :70**

Note: There will be two parts in end semester theory paper.

Part A of the paper shallcontain7 short answer questions of 14 marks. Each question will carry two marks

Part B of the paper will consist of four questions, one question from each unit with internal choice. Each question will carry 14 marks.

Course objectives

- To introduce students to cyber incidents, information warfare, and core incident response concepts, including incident categorization and prioritization.
- To develop practical understanding of incident handling, live response, malware analysis, and network monitoring techniques.
- To impart knowledge of digital forensics principles, electronic evidence handling, and chain of custody procedures.
- To familiarize learners with file system, registry, and log analysis for reconstructing digital activities and timelines.

Unit I

Cyber Incidents and Incident Response Basics

Cyber incident statistics and computer security incidents. Information warfare and core information security concepts. Types, identification, signs, categories, and prioritization of incidents. Need, goals, and purpose of incident response. Incident cost estimation, reporting mechanisms, vulnerability resources, incident management, and incident response team roles and responsibilities. Disaster recovery technologies and impact of virtualization on incident handling

Unit II

Incident Handling and Live Response

Incident handling process and real-time log capture and analysis. Botnet detection and mitigation. Enterprise incident response and recovery solutions. Timeline analysis and malware handling procedures. Incident report writing standards, Style and quality assurance, Live response: tools, data collection, and best practices for Windows and Unix systems. Network monitoring concepts, setup, log collection, and network data analysis.

Unit III

Digital Forensics and Evidence Handling

Introduction to digital forensics, principles, branches, and digital crime scene handling, Electronic evidence types and documentation, Evidence acquisition process: identification, imaging, write-blockers, labeling, packaging, transportation, and chain of custody. Evidence integrity, SOPs, preservation, Data recovery and data carving: importance, methods, and differences.

Unit IV

File System, Registry, and Log Analysis

File system analysis of FAT and NTFS, partition reconstruction, and unallocated space analysis. Windows Registry structure and analysis for user activity artefacts. Analysis of installed applications, devices, shared locations, and recent documents, Event and log analysis, Windows event files (EVT and EVTX), and third-party application logs.

Course Outcomes

After completion of the course, students will be able to:

- Identify, classify, prioritize, and manage cyber incidents, and explain the structure and role of an incident response team.
- Perform incident handling and live response, including log analysis, botnet detection, malware handling, and incident report writing.
- Collect, preserve, and document digital evidence following forensic principles, SOPs, and chain of custody requirements, ensuring legal admissibility.
- Analyze file systems, Windows Registry, and system/application logs to reconstruct user activity and support digital investigations in compliance with standards such as ISO/IEC 27001 and NIST Incident Response Framework.

Suggested Reading:

1. Computer Incident Response and Forensics Team Management: Conducting a Successful Incident Response by Leighton Johnson
2. Incident Handling and Response: A Holistic approach for an efficient security incident management by Jithin Aby Alex.
3. Blue Team Handbook: Incident Response Edition by Don Murdoch
4. The Computer Incident Response Planning Handbook: Executable Plans for Protecting Information at Risk by N. K. McCarthy
5. Critical Incident Management: A Complete Response Guide, Second Edition by John McNall, Thomas T. Gillespie, Vincent F. Faggiano

M.Sc. Forensic Science Semester-III

Specialization- Digital and Cyber Forensics

THEORY

Paper-V B

PGFSS3 EP VB: Ethical Hacking and Penetration Testing

Duration:3hrs. **Max. Marks:70**

Note: There will be two parts in end semester theory paper.

Part A of the paper shallcontain7 short answer questions of 14 marks. Each question will carry two marks

Part B of the paper will consist of four questions, one question from each unit with internal choice. Each question will carry 14 marks.

Course Objectives

- Understand the fundamentals of computer networks and penetration testing.
- Learn vulnerability assessment and network reconnaissance techniques.
- Apply web application and network penetration testing tools.
- Develop skills in vulnerability exploitation and security assessment.
- Practice ethical, legal, and professional standards in cybersecurity.

UNIT I

Fundamentals of Computer Networks and Vulnerability Assessment

Introduction to computer networks; OSI and TCP/IP models; network layers and protocols; fundamentals, objectives and types of Vulnerability Assessment and Penetration Testing (VAPT); penetration testing life cycle; manual and automated vulnerability assessment; vulnerability scanners; OpenVAS, Nessus and Netcat.

UNIT II

Footprinting, Reconnaissance and Network Scanning

Passive and active reconnaissance; WHOIS, DNS enumeration and OSINT; network mapping; host discovery; ping sweeping; port scanning; OS fingerprinting; TCP three-way handshake; Nmap scan techniques; service and version detection; Wireshark for packet analysis; vulnerability identification and network enumeration.

UNIT III

Web Application Penetration Testing and Exploitation

Web application penetration testing; brute-force and dictionary attacks; Cross-Site Scripting (XSS); SQL Injection and SQLmap; authentication and session attacks; buffer overflow; privilege escalation; exploitation using Metasploit Framework; post-exploitation techniques including persistence, pivoting, data exfiltration and evidence collection.

UNIT IV

Password Security, Reporting and Ethical Practices

Password attacks using John the Ripper, Ophcrack and rainbow tables; Burp Suite for web security testing; Cross-Site Request Forgery (CSRF), file inclusion and file upload vulnerabilities; penetration testing reports, risk assessment and remediation; patch management; ethical and legal issues (CFAA, GDPR); NDA, Statement of Work (SOW), and professional certifications (CEH, OSCP).

Course Outcomes

After completion of the course, students will be able to:

- Explain the fundamentals of computer networks, vulnerability assessment, and penetration testing.
- Perform reconnaissance, network scanning, and vulnerability assessment using standard security tools.
- Identify and exploit common web application and network vulnerabilities.
- Conduct password security testing and post-exploitation analysis using penetration testing tools.
- Prepare penetration testing reports and recommend appropriate security and mitigation measures while adhering to ethical and legal standards.

Suggested Reading

1. Cyber Security by Nina Godbole & Sunit Belapure

2. Cryptographic & N/W security: Principles & Practices by Stalling, Prentice Hall.

3. Network Security Essentials: Applications & standards by Stalling, Pearson Education Asia, 2003.

4. Basic Security Testing with Kali Linux, by Daniel Dieterle, freely available online.

5. Gray Hat Hacking the Ethical Hacker's Handbook, Branko Spasojevic, TMH, 2018.

6. Ethical Hacking and Penetration Testing Guide, by Rafay Baloch, Auerbach Publications.

M.Sc. Forensic Science Semester -III

Paper Code: PGFSS3LCV

Forensic Lab Course-V

Ballistics and Forensic Physics

1. To study the various parts and their function of firearms.
2. Examination and comparison of fired bullet with reference to caliber, rifling characteristics, and identification of firearm
3. Determination of shot numbers from size and weight of shots
4. Identification of various propellants.
5. Examination of Gunshot Residues.
6. Collection and preservation of various Physical Evidences related to ballistics
7. Physical and chemical analysis of Paint Samples
8. Forensic examination of glass Fraction, Reflective Index Determination and Density analysis of glass samples.
9. Density gradient analysis of Soil samples
10. Classification and Examination of various tool marks .
11. Case Study/ Minor Project

Forensic Medicine and Anthropology

1. To Study the characteristics of various types of injuries and visualise them.
2. Postmortem examination in various Asphyxia deaths.
3. Postmortem examination of various homicidal/ accidental injuries
4. To study the human skeleton and comparison of human male and female skeleton.
5. Estimation of height, weight using long bones
6. Determination of age from skull sutures.
7. Examination of pathological changes in bones .
8. Determination of sex from human skull and pelvis .
9. Examination of ligature and knot types.
10. Anthropometry. - Identification of individuals.
11. Identification and preservation of viscera.
12. Case Study/ Minor Project

M.Sc. Forensic Science Semester -III

Paper Code: PGFSS3LC VI A
Forensic Lab Course-VI A

Specialization A- Forensic Biology, Serology and DNA Profiling

III A: FORENSIC SEROLOGY

1. To perform blood grouping (ABO and Rh) by fresh blood
2. Presumptive Chemical Color Tests for Bloodstain Detection
3. Confirmatory Micro-Crystal Tests for Bloodstains
4. Determination of ABO Blood Grouping from Dried Bloodstains
5. Determination of Secretor / Non-Secretor Status from Saliva
6. Microscopic Identification of Vaginal Epithelial Cells
7. DNA extraction from various forensic samples
8. Biochemical and microscopic examination of Saliva, Semen stain and Urine

IV A: FORENSIC GENETICS AND DNA PROFILING

1. Perform a practical of extracting DNA from blood samples by different methods.
2. Spectrophotometric DNA Purity and Yield Assessment.
3. Drafting a Court-Admissible Forensic DNA Analysis Report
4. Differentiation of Mitochondrial DNA (mtDNA) vs. Nuclear DNA Inheritance
5. DNA Extraction from Hair Shafts and Epithelial Cells using Manual Organic Lysis
6. Demonstration of proper collection, labeling, sealing, documentation, packaging, and preservation of forensic biological samples.
7. To visualize exponential DNA amplification by PCR technique
8. Prepare an agarose gel, load DNA samples, run electrophoresis, and interpret the bands using a DNA ladder.

V A: FORENSIC IMMUNOLOGY, PROTEOMICS AND BIOINFORMATICS

1. Extraction of proteins from various biological samples.
2. Protein estimation by different techniques.
3. Separation of proteins by SDS-PAGE
4. Identification of different leukocytes from a stained peripheral blood smear.
5. Qualitative Antigen-Antibody Interaction by Ouchterlony Double Immunodiffusion
6. To understand the principle, procedure, and applications of ELISA in disease diagnosis.
7. Analysis of protein structure using RASMOL
8. Restriction digestion of DNA.

M.Sc. Forensic Science Semester -III

Paper Code: PGFSS3LC VI B

Forensic Lab Course-VI B

Specialization- Digital and Cyber Forensics

Paper III B: CYBER LAW, RISK AND COMPLIANCE

1. Study and implementation of the IT security assessment and audit process.
2. To study about Sys-Internals.
3. To study about Windows Logs based on scenarios.
4. To study about filter logs based on scenarios.
5. To study and implement any SIEM (Security Information & Event Management) tool.
6. To study real-time visibility across an organization's information security systems using any SIEM tool.
7. To study Event log management that consolidates data from numerous sources using any SIEM tool.
8. To perform acquisition of any drive (HDD, SSD, USB) using FTK Imager.
9. To perform primary level analysis using HxD Editor.
10. To perform detailed analysis of Forensic Image using Forensic Toolkit.

Paper IV B: INCIDENT RESPONSE AND DIGITAL FORENSICS

1. Study of cyber incidents and incident response life cycle through case studies.
2. To perform Brute Force attack.
3. To perform SQL Injection, File Upload, attack on the Lab Environment.
4. To perform Social Engineering attacks using SET.
5. To study capturing network packets using Wireshark (Fundamentals).
6. Using Sysinternals tools for Network Tracking and Process Monitoring, monitor Hard disk and virtual memory.
7. Recovering and Inspecting deleted files using any tool.
8. To study and analyse web browsing history.
9. To study cache and cookies analysis.
10. Preparation of a complete digital forensic examination report based on the acquired evidence.

Paper V B: ETHICAL HACKING AND PENETRATION TESTING

1. Study and configuration of basic computer network settings using the OSI and TCP/IP models.
2. Perform operating system fingerprinting using Nmap.
3. Conduct a full reconnaissance and scanning exercise on asimulated target network.
4. Exploit a vulnerable web application using SQL injection and gainunauthorized access.
5. Perform post-exploitation tasks such as privilege escalation and data exfiltration.
6. Create a detailed penetration testing report based on the findings from practical exercises.
7. Analyze a case study involving an ethical dilemma in penetration testing and propose a solution.

Semester-IV

M.Sc. Forensic Science Semester-IV

THEORY

Paper-I

PGFSS4 PI:- Research Methodology in Forensic Science

Duration:3hrs. **Max. Marks: 70**

Note: There will be two parts in end semester theory paper.

Part A of the paper shallcontain7 short answer questions of 14 marks. Each question will carry two marks

Part B of the paper will consist of four questions, one question from each unit with internal choice. Each question will carry 14 marks.

Course objectives

- To develop fundamental knowledge of research methodology, research design, data collection, sampling, and statistical analysis.
- To enable students to formulate research problems, hypotheses, research plans, and appropriate experimental designs.
- To create awareness about research ethics, plagiarism, intellectual property rights, copyright, and legal aspects of research.
- To develop skills in research proposal writing, scientific report/thesis preparation, presentation, and publication.

Unit-I

Introduction to Research and Research Design

Introduction to research Objectives and types of research: Descriptive vs. Analytical, applied vs. Fundamental, Quantitative vs. Qualitative, and Conceptual vs. Empirical; Research Formulation: Literature review and development of hypothesis; Research design and methods: Developing a research plan - Exploration, Description, Diagnosis, and Experimentation; determining experimental and sample designs

Unit-II

Data Analysis Methods

Data Collection and Analysis: Methods of data collection – Sampling methods and data processing in Forensic Science; Data Analysis: Types of data, Basic concept of frequency distribution, Measure of central values – Mean, median, and mode, Measure of dispersion, Range, mean deviation and standard deviation, Types of Errors in forensic science. probability, theory and classical definition of probability, Bayes theorem of probability, conditional probability and coincidence probability, Chi-square test, ANOVA, SPSS.

Unit-III

Research Ethics in Forensic Science

Ethics in research and its importance in Forensic Science, Basics of ethical issues in research; Understanding intellectual property rights and copyright; Ethical standards and practices in research; Plagiarism and its prevention; Legal aspects of research and intellectual property in forensic science. Basics of Ethical issues, Intellectual property rights, Copy right, Reproduction of published material: Plagiarism in scientific research and communications.

Unit-IV

Reporting, Presentation and Publication:

Research proposal: Meaning and purpose of a research proposal, Steps for preparing proposal, Framework and arrangement of subheadings in a research proposal, Reviewing literature and note-taking, Research report: Introduction, purpose, and different forms of report, Qualities of research reports, Presentation of preliminary, general, and technical reports, Format and necessary elements of a research report, Precautions for report preparation, Reporting and thesis writing in forensic science: Structure and components of scientific reports and thesis, Significance and different steps in the preparation, Illustrations, Bibliography. Presentations: Oral and Poster, Importance of effective communication in scientific research.

Course Outcomes

After completing the course, students will be able to:

- Formulate research problems and hypotheses and select suitable research designs and methods.

- Collect, process, analyze, and interpret research data using appropriate statistical techniques such as descriptive statistics, Chi-square, ANOVA, and SPSS.
- Apply ethical principles and legal standards in research, including plagiarism prevention, copyright, and intellectual property rights.
- Prepare and communicate research work effectively through research proposals, scientific reports, theses, oral presentations, posters, and publications.

Suggested Reading :

1. Kerlinger, F. N. (1983). Foundations of behavioral research, 2nd Indian reprint.
2. Rajamanickam, M. (2001). Statistical methods in psychological and educational research. Concept publishing company.
3. Smith, J. A. (2015). Qualitative psychology: A practical guide to research methods. Qualitative psychology, 1-312.
4. Engen, T., Kling, J. W., & Riggs, L. A. (1971). Experimental psychology.