Proposed syllabus and Scheme of Examination
for
B.Sc. (Honors) Forensic Science

Submitted by

Department of Anthropology
University of Delhi
Delhi-110007

(Under Choice Based Credit System)

To

Faculty of Science
University of Delhi
Delhi-110007

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B.Sc. (Hons) in Forensic Science

Objectives
The Universal Declaration of Human Rights directs the member nations to create such conditions under which the ideals of free human beings, enjoying civil and political freedom from fear and want, can be achieved. The Constitution of India, through its various articles, strives to ensure security and safety of citizens in accordance with the principles of Universal Declaration of Human Rights. However, crime is a violation of these principles. In a country like India, where majority of population is uneducated, social set up is heterogeneous, public-police relations are not very cordial, poverty is rampant and unemployment widespread, it is not surprising that crime rate is increasing exponentially. If we have to create conditions conducive to harmonious development, we must mitigate the crime rate. This can best be achieved by relying on the support of forensic science system. Unfortunately, in our country, forensic science is not viewed as a core investigative skill in crime detection. In fact, there is a lack of understanding of the forensic process itself. It is for this reason that less than 10% of the police cases are, at present, being referred for forensic examination. Less than 5% are solved by the application of forensic science. The rest are solved by third degree method – a practice which the human rights organizations will not allow in days to come.

In majority of serious crime cases, hi-tech measures are being adopted by perpetrators of crime. The counter measures have to be more sophisticated to surpass them. This calls for strengthening the foundations of forensic science at national level. It is with this aim that we wish to initiate a B.Sc. (Hons) Course in Forensic Science.

The following are the objectives of this course.
1. To emphasize the importance of scientific methods in crime detection.
2. To disseminate information on the advancements in the field of forensic science.
3. To highlight the importance of forensic science for perseverance of the society.
4. To review the steps necessary for achieving highest excellence in forensic science.
5. To generate talented human resource, commensurating with latest requirements of forensic science.
6. To provide a platform for students and forensic scientists to exchange views, chalk-out collaborative programs and work in a holistic manner for the advancement of forensic science.

Eligibility
* Passed Class XII from a recognized Board in science stream.
* The admission will be done on merit basis taking into consideration the aggregate marks obtained in the following three subjects:
  (i) Physics
  (ii) Chemistry
  (iii) Any one out of Mathematics or Biology in whichever subject the candidate has scored higher marks.
### OVERVIEW OF CURRICULUM

#### I. CORE COURSE

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#### II. ELECTIVE COURSE

**A. Discipline Specific**

Two each in Semester V and VI. To be chosen from the following.

- DSE-1: Digital Forensics
- DSE-2: Economic Offences
- DSE-3: Forensic Serology
- DSE-4: Accident Investigations
- DSE-5: DNA Typing
- DSE-6: Dissertation (in Semester VI only)

**B. Generic Elective/Interdisciplinary**

One each in Semester I, II, III and IV. To be chosen from the following.

- GE-1: Physics
- GE-2: Chemistry
- GE-3: Botany
- GE-4: Zoology
- GE-5: Anthropology
- GE-6: Computer Science
- GE-7: Economics
- GE-8: Psychology

#### III. ABILITY ENHANCEMENT COURSE

**1. Ability Enhancement Compulsory**

One each in Semester I and II.

- AECC-1: Environmental Science
- AECC-2: English/MIL Communication

*The College will have an option to take either of the two papers in a particular Semester (I or II), while the students have to appear in both the papers.*

**2. Ability Enhancement Elective (Skill Based)**

One each in Semester III and IV. To be chosen from the following.

- AEEC-1: Introduction to Biometry
- AEEC-2: Handwriting Identification and Recognition
- AEEC-3: Forensic Science and Society
I. CORE COURSE

FIRST YEAR

SEMESTER-I

PAPER: FSHT-101

Introduction to Forensic Science

Credits: 4

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

a. The significance of forensic science to human society.
b. The fundamental principles and functions of forensic science.
c. The divisions in a forensic science laboratory.
d. The working of the forensic establishments in India and abroad.

Unit 1: History of Development of Forensic Science in India

Functions of forensic science. Historical aspects of forensic science.
Definitions and concepts in forensic science. Scope of forensic science. Need of forensic science. Basic principles of forensic science.
Frye case and Daubert standard.

Unit 2: Tools and Techniques in Forensic Science

Branches of forensic science. Forensic science in international perspectives, including set up of INTERPOL and FBI.
Data depiction. Report writing.

Unit 3: Organizational set up of Forensic Science Laboratories in India


Practicals

Credits: 2

1. To study the history of crime cases from forensic science perspective.
2. To cite examples of crime cases in which apprehensions arose because of Daubert standards.
3. To review the sections of forensic science at INTERPOL and compare with those in Central Forensic Science Laboratories in India. Include suggestions for improvements if any.
4. To study the annual reports of National Crime Records Bureau and depict the data on different type of crime cases by way of smart art/templates.
5. To write report on different type of crime cases.
6. To review how the Central Fingerprint Bureau, New Delhi, coordinates the working of State Fingerprint Bureaus.
7. To examine the hierarchical set up of different forensic science establishments and suggest improvements.
8. To examine the list of projects undertaken by the Bureau of Police Research and Development and suggest the thrust areas of research in Police Science.
9. To compare and contrast the role of a Police Academy and a Police Training School.
10. To compare the code of conduct prescribed by different establishments for forensic scientists.

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

a. The importance of criminology.
b. The causes of criminal behavior.
c. The significance of criminal profiling to mitigate crime.
d. The consequences of crime in society.
e. The elements of criminal justice system.

Unit 1: Basics of Criminology

Unit 2: Crime

Unit 3: Criminal Justice System

Practicals
1. To review past criminal cases and elucidate which theory best explains the criminal behavior of the accused.
2. To review crime cases where criminal profiling assisted the police to apprehend the accused.
3. To cite examples of crime cases in which the media acted as a pressure group.
4. To evaluate the post-trauma stress amongst victims of racial discrimination.
5. To correlate deviant behavior of the accused with criminality (take a specific example).
6. To evaluate victimology in a heinous crime.
7. To examine a case of juvenile delinquency and suggest remedial measures.
8. To evaluate how rising standards of living affect crime rate.
9. To review the recommendations on modernization of police stations and evaluate how far these have been carried out in different police stations.
10. To visit a ‘Model Police Station’ and examine the amenities vis-à-vis conventional police stations.
11. To examine steps being taken for rehabilitation of former convicts and suggest improvements.
12. To prepare a report on interrogation cells and suggest improvements.
Suggested Readings

SEMESTER-II

PAPER: FSHT-201

Criminal Law

Credits: 4

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

a. Elements of Criminal Procedure Code related to forensic science.


d. Acts governing environmental crimes.

Unit 1: Law to Combat Crime

Classification – civil, criminal cases. Essential elements of criminal law. Constitution and hierarchy of criminal courts.

Criminal Procedure Code. Cognizable and non-cognizable offences.

Bailable and non-bailable offences.

Sentences which the court of Chief Judicial Magistrate may pass.

Summary trials – Section 260(2).

Judgements in abridged forms – Section 355.


Sections 375 & 377 and their amendments.

Indian Penal Code pertaining to offences against property Sections – 378, 383, 390, 391, 405, 415, 420, 441, 463, 489A, 497, 499, 503, 511.


Sections 32, 45, 46, 47, 57, 58, 60, 73, 135, 136, 137, 138, 141.

Section 293 in the code of criminal procedure.

Unit 2: Constitution of India

Preamble, Fundamental Rights, Directive Principles of State Policy. – Articles 14, 15, 20, 21, 22, 51A.

Unit 3: Acts Pertaining to Socio-economic and Environmental Crimes


Dowry Prohibition Act.


Practicals

Credits: 2

1. To prepare a schedule of five cognizable and five non-cognizable offences.

2. To study the powers and limitations of the Court of Judicial Magistrate of First Class.

3. To prepare a schedule of the offences which may be tried under Section 260(2) of Criminal Procedure Code.

4. To study a crime case in which an accused was punished on charge of murder under Section 302.

5. To study a crime case in which an accused was punished on charge of rape under Section 375.
6. To cite example of a case in which the opinion of an expert was called for under Section 45 of the Indian Evidence Act.
7. To cite a case wherein a person was detained under Article 22(5) of the Indian Constitution. Express your views whether the rights of the person as enlisted in this Article were taken care of.
8. To cite a case under Article 14 of the Constitution of India wherein the Right to Equality before Law was allegedly violated.
9. To list the restrictions imposed on Right to Freedom of Worship under the Constitution of India.
10. To prepare a schedule of persons convicted under Narcotics, Drugs and Psychotropic Act statistically analyze the age group to which they belonged.
11. To study a case in which Drugs and Cosmetic Act was invoked.
12. To study a case in which Explosive Substances Act was invoked.
13. To study a case in which Arms Act was invoked.
15. To study a case wherein the Untouchability Offences Act was invoked on the basis of Article 15 of the Constitution of India.

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

a. The overview of forensic psychology and its applications.

b. The legal aspects of forensic psychology.

c. The significance of criminal profiling.

d. The importance of psychological assessment in gauging criminal behavior.

e. The tools and techniques required for detection of deception.

f. The critical assessment of advanced forensic techniques like polygraphy, narco analysis and brain electrical oscillation signatures.

Unit 1: Basics of Forensic Psychology

Unit 2: Psychology and Criminal Behavior

Unit 3: Detection of Deception
Tools for detection of deception – interviews, non-verbal detection, statement analysis, voice stress analyzer, hypnosis. Polygraphy – operational and question formulation techniques, ethical and legal aspects, the guilty knowledge test. Narco analysis and brain electrical oscillation signatures – principle and theory, ethical and legal issues.

Practicals

1. To cite a crime case where legal procedures pertaining to psychic behavior had to be invoked.

2. To prepare a report on relationship between mental disorders and forensic psychology.

3. To review a crime case involving serial murders. Comment on the psychological traits of the accused.

4. To cite a crime case involving a juvenile and argue for and against lowering the age for categorizing an individual as juvenile.

5. To study a criminal case in which hypnosis was used as a means to detect deception.

6. To prepare a case report on thematic appreciation test.

7. To prepare a case report on Minnesota multiphasic personality inventory test.

8. To prepare a case report on thematic appreciation test.

9. To prepare a case report on word association test.

10. To prepare a case report on Bhatia’s battery of performance test of intelligence.

11. To cite a criminal case in which narco analysis was used as a means to detect deception.
Suggested Readings


Forensic Dermatoglyphics  

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

a. The fundamental principles on which the science of fingerprinting is based.
b. Fingerprints are the most infallible means of identification.
c. The world’s first fingerprint bureau was established in India.
d. The method of classifying criminal record by fingerprints was worked out in India, and by Indians.
e. The physical and chemical techniques of developing fingerprints on crime scene evidence.
f. The significance of foot, palm, ear and lip prints.

Unit 1: Basics of Fingerprinting

Introduction and history, with special reference to India. 

Unit 2: Development of Fingerprints


Unit 3: Other Impressions


Practicals  

1. To record plain and rolled fingerprints.
2. To carry out ten digit classification of fingerprints.
3. To identify different fingerprint patterns.
4. To identify core and delta.
5. To carry out ridge tracing and ridge counting.
6. To investigate physical methods of fingerprint detection.
7. To investigate chemical methods of fingerprint detection.
8. To use different light sources for enhancing developed fingerprints.
9. To prepare cast of foot prints.

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

a. The importance of chromatographic and spectroscopic techniques in processing crime scene evidence.

b. The utility of colorimetry, electrophoresis and neutron activation analysis in identifying chemical and biological materials.

c. The significance of microscopy in visualizing trace evidence and comparing it with control samples.

d. The usefulness of photography and videography for recording the crime scenes.

Unit 1: Instrumentation
Sample preparation for chromatographic and spectroscopic evidence.
Chromatographic methods. Fundamental principles and forensic applications of thin layer chromatography, gas chromatography and liquid chromatography.
Electrophoresis – fundamental principles and forensic applications.
Neutron activation analysis – fundamental principles and forensic applications.

Unit 2: Microscopy

Unit 3: Forensic photography
Basic principles and applications of photography in forensic science.

Practicals

1. To determine the concentration of a colored compound by colorimetry analysis.
2. To carry out thin layer chromatography of ink samples.
3. To carry out separation of organic compounds by paper chromatography.
4. To identify drug samples using UV-Visible spectroscopy.
5. To take photographs using different filters.
6. To take photographs of crime scene exhibits at different angles.
7. To record videography of a crime scene.

Suggested Readings

Criminalistics

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

a. The methods of securing, searching and documenting crime scenes.

b. The art of collecting, packaging and preserving different types of physical and trace evidence at crime scenes.

c. The legal importance of chain of custody.

d. The tools and techniques for analysis of different types of crime scene evidence.

Unit 1: Crime Scene Management

Unit 2: Crime Scene Evidence

Unit 3: Forensic Physics

Practicals

1. To prepare a report on evaluation of crime scene.
2. To reconstruct a crime scene (outdoor and indoor).
3. To compare soil samples by density gradient method.
4. To compare paint samples by physical matching method.
5. To compare paint samples by thin layer chromatography method.
6. To compare glass samples by refractive index method.
7. To identify and compare tool marks.
8. To compare cloth samples by physical matching.
Suggested Readings


SEMESTER-IV

PAPER: FSHT-401

Forensic Chemistry

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

a. The methods of analyzing trace amounts of petroleum products in crime scene evidence.

b. The methods of analyzing contaminants in petroleum products.

c. The method of searching, collecting, preserving and analyzing arson evidence.

d. The classification of explosives, including the synthesis and characterization of representative analogs.

e. The significance of bomb scene management.

f. The techniques of locating hidden explosives.

g. The classification and characteristics of the narcotics, drugs and psychotropic substances.

Unit 1: Petroleum and Petroleum Products

Unit 2: Cases Involving Arson

Unit 3: Explosives

Practicals

1. To carry out analysis of gasoline.
2. To carry out analysis of diesel.
3. To carry out analysis of kerosene oil.
4. To analyze arson accelerators.
5. To prepare a case report on a case involving arson.
6. To carry out analysis of explosive substances.
7. To separate explosive substances using thin layer chromatography.
8. To prepare a case report on bomb scene management.
Suggested Readings
Learning Objectives: After studying this paper the students will know –
a. The importance of examining questioned documents in crime cases.
b. The tools required for examination of questioned documents.
c. The significance of comparing hand writing samples.
d. The importance of detecting frauds and forgeries by analyzing questioned documents.

Unit 1: Nature and Scope of Questioned Documents
Basic tools needed for forensic documents’ examination – ultraviolet, visible, infrared and fluorescence spectroscopy, photomicrography, microphotography, visible spectral comparator, electrostatic detection apparatus.
Determining the age and relative age of documents.

Unit 2: Comparison of Documents
Merits and demerits of exemplar and non-exemplar samples during comparison of handwriting.
Standards for comparison of handwriting.
Comparison of paper, ink, printed documents, typed documents, Xeroxed documents.

Unit 3: Forgeries
Alterations in documents, including erasures, additions, over-writings and obliterations.
Indented and invisible writings.
Charred documents.
Examination of counterfeit Indian currency notes, passports, visas and stamp papers.
Disguised writing and anonymous letters.

Practicals
1. To identify handwriting characters.
2. To study natural variations in handwriting.
3. To compare handwriting samples.
4. To detect simulated forgery.
5. To detect traced forgery.
6. To study the line quality defects in handwriting samples.
7. To examine the security features of currency notes, passports and plastic money.
8. To study alterations, obliterations and erasures in handwriting samples.
9. To cite a case wherein Section 45 of Indian Evidence Act was invoked, seeking expert opinion for authentication of handwriting and/or signatures.
10. To cite a case wherein Section 489A of the Indian Penal Code was invoked in context of fake currency.
Suggested Readings


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

- The significance of biological and serological evidence.
- The forensic importance of hair evidence.
- The importance of biological fluids – blood, urine, semen, saliva, sweat and milk – in crime investigations.
- How wildlife forensics aid in conserving natural resources.
- How forensic entomology assists in death investigations.

Unit 1: Biological Evidence
Nature and importance of biological evidence.
Types and identification of microbial organisms of forensic significance.
Identification of wood, leaves, pollens and juices as botanical evidence. Diatoms and their forensic significance.

Unit 2: Wildlife Forensics
Fundamentals of wildlife forensic. Significance of wildlife forensic. Protected and endangered species of animals and plants. Illegal trading in wildlife items, such as skin, fur, bone, horn, teeth, flowers and plants. Identification of physical evidence pertaining to wildlife forensics. Identification of pug marks of various animals.

Unit 3: Forensic Entomology

Practicals
1. To examine hair morphology and determine the species to which the hair belongs.
2. To prepare slides of scale pattern of human hair.
3. To examine human hair for cortex and medulla.
4. To carry out microscopic examination of pollen grains.
5. To carry out microscopic examination of diatoms.
6. To cite a crime case in which diatoms have served as forensic evidence.
7. To prepare a case report on forensic entomology.
8. To prepare a case report on problems of wildlife forensics.

Suggested Readings
Forensic Ballistics

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

a. The classification of firearms and their firing mechanisms.
b. The methods of identifying firearms.
c. The characteristics of ammunition.
d. The importance of firearm evidence.
e. The nature of firearm injuries.
f. The methods for characterization of gunshot residue.

Unit 1: Firearms

History and development of firearms. Classification of firearms. Weapon types and their operation. Firing mechanisms of different firearms.

Internal Ballistics – Definition, ignition of propellants, shape and size of propellants, manner of burning, and various factors affecting the internal ballistics: lock time, ignition time, barrel time, erosion, corrosion and gas cutting.

External Ballistics – Vacuum trajectory, effect of air resistance on trajectory, base drag, drop, drift, yaw, shape of projectile and stability, trajectory computation, ballistics coefficient and limiting velocity, Measurements of trajectory parameters, introduction to automated system of trajectory computation and automated management of ballistic data.

Terminal Ballistics – Effect of projectile on hitting the target: function of bullet shape, striking velocity, striking angle and nature of target, tumbling of bullets, effect of instability of bullet, effect of intermediate targets, influence of range. Ricochet and its effects, stopping power.

Unit 2: Ammunition

Types of ammunition. Constructional features and characteristics of different types of cartridges and bullets. Primers and priming compounds. Projectiles. Headstamp markings on ammunitions. Different types of marks produced during firing process on cartridge – firing pin marks, breech face marks, chamber marks, extractor and ejector marks.

Unit 3: Firearm Evidence

Matching of bullets and cartridge cases in regular firearms. Identification of bullets, pellets and wads fired from improvised, country made firearms. Automated method of bullet and cartridge case comparison. Determination of range of fire and time of fire.

Mechanisms of formation of gunshot residues. Methods of analysis of gunshot residues from shooting hands and targets, with special reference to clothings.

Identification and nature of firearms injuries. Reconstruction with respect to accident, suicide, murder and self defence.
Practicals

1. To describe, with the aid of diagrams, the firing mechanisms of different types of firearms.
2. To correlate the velocity of bullet with the impact it produces on the target.
3. To correlate the striking angle of the bullet with the impact on the target.
4. To estimate the range of fired bullets.
5. To carry out the comparison of fired bullets.
6. To carry out the comparison of fired cartridge cases.
7. To identify gunshot residue.
8. To correlate the nature of injuries with distance from which the bullet was fired.
9. To differentiate, with the aid of diagram, contact wounds, close range wounds and distant wounds.

Suggested Readings

Forensic Toxicology

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

a. The significance of toxicological studies in forensic science.
b. The classification of poisons and their modes of actions.
c. The absorption of poisons in body fluids.
d. The forensic identification of illicit liquors.
e. The classification and characteristics of the narcotics, drugs and psychotropic substances.
f. The menace of designer drugs.
g. The methods of identifying and purifying narcotics, drugs and psychotropic substances.

Unit 1: Basics of Toxicology
Significance of toxicological findings. Techniques used in toxicology. Toxicological analysis and chemical intoxication tests.
Postmortem Toxicology. Human performance toxicology.
Dose-response relationship. Lethal dose 50 and effective dose 50.

Unit 2: Poisons
Classification of poisons. Physico-chemical characteristics and mode of action of poisons.
Accidental, suicidal and homicidal poisonings.
Signs and symptoms of common poisoning and their antidotes. Collection and preservation of viscera, blood and urine for various poison cases.
Identification of biocides and metal salts in body fluids. Metabolism and excretion of poisons. Application of immunoassays in forensic work.
Vegetable poisons. Poisonous seeds, fruits, roots and mushrooms.
Crime scene management in illicit liquor cases.

Unit 3: Narcotics, Drugs and Psychotropic Substances
Definition of narcotics, drugs and psychotropic substances. Broad classification – Narcotics, stimulants, depressants and hallucinogens. General characteristics and common example of each classification. Natural, synthetic and semi-synthetic narcotics, drugs and psychotropic substances.
Designer drugs. Tolerance, addiction and withdrawal symptoms of narcotics, drugs and psychotropic substances.
Crime scene search for narcotics, drugs and psychotropic substances – searching a suspect, searching a dwelling, searching a vehicle.
Isolation techniques for purifying narcotics, drugs and psychotropic substances – thin layer chromatography, gas-liquid chromatography and high performance liquid chromatography.
Presumptive and screening tests for narcotics, drugs and psychotropic substances.
Microcrystalline testing of drugs of abuse.
Analysis of narcotics, drugs and psychotropic substances in breast milk, saliva, urine, hair and antemortem blood.

Drugs and driving. Dope tests.

Analysis of narcotics, drugs and psychotropic substances in postmortem blood. Postmortem changes affecting the analysis of narcotics, drugs and psychotropic substances.

**Practicals**

1. To identify biocides.
2. To identify metallic poisons.
3. To identify organic poisons.
4. To identify ethyl alcohol.
5. To identify methyl alcohol.
6. To carry out quantitative estimation of ethyl alcohol.
7. To prepare iodoform.
8. To identify drugs of abuse by spot tests.
9. To perform color tests for barbiturates.
10. To separate drugs of abuse by thin layer chromatography.

**Credits:** 2

**Suggested Readings**

SEMESTER-VI

PAPER: FSHT-601

Forensic Anthropology  

Credits: 4

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

a. Importance of forensic anthropology in identification of persons.
b. Different techniques of facial reconstruction and their forensic importance.
c. Significance of somatoscopy and somatometry.

Unit 1: Significance of Forensic Anthropology

Unit 2: Personal Identification – Somatoscopy and Somatometry
Somatoscopy – observation of hair on head, forehead, eyes, root of nose, nasal bridge, nasal tip, chin, Darwin’s tubercle, ear lobes, supra-orbital ridges, physiognomic ear breadth, circumference of head. Scar marks and occupational marks.
Somatometry – measurements of head, face, nose, cheek, ear, hand and foot, body weight, height. Indices - cephalic index, nasal index, cranial index, upper facial index.

Unit 3: Facial Reconstruction

Practicals  

Credits: 2

1. To determine of age from skull and teeth.
2. To determine of sex from skull.
3. To determine sex from pelvis.
4. To study identification and description of bones and their measurements.
5. To investigate the differences between animal and human bones.
6. To perform somatometric measurements on living subjects.
7. To carry out craniometric measurements of human skull.
8. To estimate stature from long bone length.
9. To conduct portrait parley using photofit identification kit.

Suggested Readings

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

a. The duties of the first responding officer who receives a call on homicide or suicide case.

b. The steps involved in processing the death scene.

c. The importance of ascertaining whether the crime was staged to appear as suicide or accident.

d. The importance of bloodstain patterns in reconstructing the crime scene.

e. The importance of autopsy.

f. The importance of forensic odontology

Unit 1: Death Investigations
Fundamental aspects and scope of forensic medicine.
Approaching the crime scene of death. Obtaining first hand information from the caller.
Rendering medical assistance to the victim, if alive. Protecting life. Recording dying declaration.
Identifying witnesses and, if possible, suspect. Interviewing onlookers and segregating possible witnesses.
Suspect in custody – initial interrogation and searching for evidence. Miranda warning card.
Importance of taking notes. Items to be a part of noting.
Handling buried body cases – search for buried bodies, methods of exhumation.
Suicide cases – evaluating the type of injuries, gauging the psychological state of victim, suicide notes.

Unit 2: Autopsy

Unit 3: Forensic Odontology
Development, scope and role of forensic odontology in mass disaster and anthropology. Types of teeth and their comparative anatomy.
Bite marks. Forensic significance of bite marks. Collection, preservation and photography of bite marks evidence. Legal aspects of bite marks. Estimation of age from teeth.

Practicals
1. To design a questionnaire for the first responder to the death scene.
2. To design a protocol to deal with the media at the crime scene.
3. To design a checklist for the forensic scientists at the death scene.
4. To design a canvass form giving description of an unidentified victim.
5. To analyze and preserve bite marks.
Suggested Readings

II. ELECTIVE COURSE (DISCIPLINE SPECIFIC)

DSE-1: Digital Forensics
Credits: 4

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

a. The basics of digital forensics.
b. The cases which fall under the purview of digital crimes.
c. The types of digital crimes.
d. The elements involved in investigation of digital crimes.

Unit 1: Fundamentals and Concepts
Fundamentals of computers Hardware and accessories – development of hard disk, physical construction, CHS and LBA addressing, encoding methods and formats. Memory and processor. Methods of storing data. Operating system. Software. Introduction to network, LAN, WAN and MAN.

Unit 2: Computer Crimes

Unit 3: Computer Forensics Investigations

Practicals
Credits: 2

1. To identify, seize and preserve digital evidence from crime scenes.
2. To detect deletions, obliterations and modifications of files using encase software.
3. To trace routes followed by e-mails and chats.
4. To identify the IP address of the sender of e-mails.
5. To demonstrate concealment techniques using cryptographic PGP.
6. To identify encrypted files.
7. To identify hidden files.
8. To use digital signatures for securing e-mail and online transactions.
9. To acquire data from PCs/laptops/HDDs/USBs, pen drives, memory cards and SIM cards.
10. To use symmetric and asymmetric keys for protection of digital record.
11. To carry out imaging of hard disks.
Suggested Readings
DSE-2: Economic Offences

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

a. Basic economic and financial terminology.
b. Economic crimes in India are linked to several other crimes.
c. Economic crimes often have a bearing on national security.
d. Types of common economic offences and their consequences.
e. Steps involved in mitigating economic crimes.

Unit 1: Taxonomy of Economic Offences/Criminogenic Factors
Fundamentals of economics in economic offences.
Corruption and bribery of public servants. Money laundering and hawala transactions.
Racketeering in employment. Racketeering in false travel documents.

Unit 2: Applied Economics in Processing Evidence
Forensic accountancy and forensic auditing.

Unit 3: Prevention of Economic Offences
Legislations to deal with different forms of economic offences. RBI Act. SEBI Act. Competition Commission of India Act.
Credit card frauds.
Enforcement agencies to deal with different forms of economic offences.
International perspectives – measures adopted by FBI and INTERPOL.
Case histories of economic offences.

Practicals

1. To prepare a draft on fraudulent bankruptcy.
2. To cite a case of money laundering and hawala transactions in India and prepare a note on it.
3. To cite a case involving bank fraud and suggest measures to prevent such crimes.
4. To study a case involving illicit drug trafficking and trace the route by which the item was being smuggled.
5. To prepare a report on trafficking of heritage artefacts, including religious deities in India.
6. To study the applications of accounting software.
7. To study the applications of TELLY software.
8. To review the legislative measures to deal with a particular economic offence, identifying the loopholes and suggesting ways to plug the loopholes.
9. To prepare a schedule of national agencies involved in curbing economic offences. Outline their specific duties.
Suggested Readings
DSE-3: Forensic Serology Credits: 4

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

a. The significance of serological evidence.
b. The importance of biological fluids – blood, urine, semen, saliva, sweat and milk – in crime investigations.
c. The usefulness of genetic markers in forensic investigations.
d. The forensic importance of bloodstain patterns

Unit 1: Forensic Importance of Body fluids

Unit 2: Genetic Marker Analysis

Unit 3: Bloodstain Pattern Analysis

Practicals Credits: 2
1. To determine blood group from fresh blood samples.
2. To determine blood group from dried blood sample.
3. To carry out the crystal test on a blood sample.
4. To identify blood samples by chemical tests.
5. To identify the given stain as saliva.
6. To identify the given stain as urine.
7. To carry out cross-over electrophoresis.
8. To study the correlation between impact angle and shape of bloodstain.
9. To identify the point of convergence from the bloodstain patterns.

Suggested Readings
Unit 1: Motor Vehicle Accidents

Unit 2: Accident Analysis

Unit 3: Tachographs

Practicals
1. To lift tire marks.
2. To study the pattern of skid marks.
3. To study the pattern of scuff marks.
4. To estimate the speed of the vehicle from skid marks.
5. To prepare a report on a major road accident.
6. To prepare a report on a major train accident.

Suggested Readings
DSE-5: DNA Forensics

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

a. The basic principle of DNA analysis.
b. The forensic significance of DNA typing.
c. The importance of short tandem repeats and restriction fragment length polymorphism in DNA technique.
d. Role of DNA typing in parentage testing.

Unit 1: Basic Principles

Unit 2: Forensic DNA Typing

Unit 3: Parentage Testing

Practicals

1. To carry out the separation of amino acids by thin layer chromatography.
2. To carry out extraction of DNA from body fluids.
3. To preparation of gel plates for electrophoresis.
4. To carry out electrophoresis for separation of enzymes.
5. To prepare a report on the role of DNA typing in solving paternity disputes.

Suggested Readings

The dissertation will be based on a research topic in Forensic Science/Criminology. The topic will be assigned in consultation with police and forensic science establishments, giving due consideration to the problem areas faced by these institutions. The students will be expected to undertake extensive field work, in collaboration with mobile police laboratories.
III. ABILITY ENHANCEMENT ELECTIVE COURSE

AEEC-1: Introduction to Biometry                  Credits: 2

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

a. The basis of biometry.
b. The classification of biometric processes.
c. The importance of behavioral biometry.

Unit 1: Fundamental Aspects

Unit 2: Physiological Biometrics
Fingerprints, palm prints, iris, retina, geometry of hand and face.

Unit 3: Behavioral Biometrics
Handwriting, signatures, keystrokes, gait and voice.

Suggested Readings
AEEC-2: Handwriting Identification and Recognition

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

a. Important features in handwriting identification.
b. Basis of handwriting characteristics.
c. Significance of forensic documentation.

Unit 1: Handwriting Identification

Unit 2: Handwriting Examination

Unit 3: Handwriting Recognition

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

a. Importance of forensic engineering.
b. Importance of forensic archeology.
c. Importance of forensic intelligence.

Unit 1: Forensic Engineering
Role of mechanical, electronics and computer engineers in forensic science. Accident investigations. Failure of signaling and control systems. Ergonomics. Applications of animations, simulations and digital imaging in solving crime cases. Episodes involving fire engineering.

Unit 2: Forensic Archeology
Role of forensic archeology. Searching the archeological site. Methods of digging the burial site. Recovery of remains. Documenting the recovered material. Preservation of remains.

Unit 3: Forensic Intelligence

Suggested Readings
**GENERIC ELECTIVE COURSES**

*To be offered to students of other disciplines*

One each in Semester I, II, III and IV. To be chosen from the following.

- **GE-1:** Criminalistics
- **GE-2:** Forensic Dematoglyphics
- **GE-3:** Forensic Chemistry
- **GE-4:** Forensic Biology and Serology
- **GE-5:** Forensic Anthropology and Forensic Medicine
- **GE-6:** Digital Forensics
Learning Objectives: After studying this paper the students will know –

a. The significance of forensic science to human society.
b. The fundamental principles and functions of forensic science.
c. The working of the forensic establishments in India and abroad.
d. The causes of criminal behavior and significance of criminal profiling.
e. The consequences of crime in society.
f. The methods of securing, searching and documenting crime scenes.
g. The art of collecting, packaging, preserving and analyzing different types of physical and trace evidence.

Unit 1: Functions of Forensic Science

Unit 2: Criminology

Unit 3: Crime Scene Management
Practicals

1. To study the history of crime cases from forensic science perspective.
2. To review the sections of forensic science at INTERPOL and compare with those in Central Forensic Science Laboratories in India. Include suggestions for improvements if any.
3. To study the annual reports of National Crime Records Bureau and depict the data on different type of crime cases by way of smart art/templates.
4. To examine the hierarchical set up of different forensic science establishments and suggest improvements.
5. To examine the list of projects undertaken by the Bureau of Police Research and Development and suggest the thrust areas of research in Police Science.
6. To compare and contrast the role of a Police Academy and a Police Training School.
7. To compare the code of conduct prescribed by different establishments for forensic scientists.
8. To review past criminal cases and elucidate which theory best explains the criminal behavior of the accused.
9. To review crime cases where criminal profiling assisted the police to apprehend the accused.
10. To examine the role of media in creating awareness on right to live in a crime-free society.
11. To evaluate the post-trauma stress amongst victims of racial discrimination.
12. To compare glass samples by refractive index method.
13. To compare paint samples by thin layer chromatography.
14. To compare fibre evidence by examining their cross sections.
15. To compare soil samples by density gradient method.
16. To identify and compare tool marks.

Suggested Readings

Learning Objectives: After studying this paper the students will know –
a. The fundamental principles on which the science of fingerprinting is based.
b. Fingerprints are the most infallible means of identification.
c. The world’s first fingerprint bureau was established in India.
d. The method of classifying criminal record by fingerprints was worked out in India, and by Indians.
e. The physical and chemical techniques of developing fingerprints on crime scene evidence.
f. The significance of foot, palm, ear and lip prints.

Unit 1: Basics of fingerprinting
Introduction and history, with special reference to India.
Classification method for fingerprint record keeping. Automated Fingerprint Identification System.

Unit 2: Development of Fingerprints
Latent fingerprints’ detection by physical and chemical techniques.
Mechanism of detection of fingerprints by different developing reagents.
Application of light sources in fingerprint detection. Preservation of developed fingerprints.

Unit 3: Other Impressions
Importance of footprints. Casting of foot prints, Electrostatic lifting of latent foot prints.
Palm prints and their historical importance.

Practicals
1. To enumerate with the aid of diagrams, different types of fingerprint patterns and fingerprint characters.
2. To record plain and rolled Fingerprints.
3. To identify core and delta in sample fingerprints.
4. To examine the patterns of all your ten fingers and carry out the primary classification of your index card.
5. To detect of fingerprints by powder method.
6. To detect fingerprints by ninhydrin method
7. To detect fingerprints by iodine method.
8. To detect fingerprints by silver nitrate method
9. To lift the developed fingerprints from different surfaces using tape.
10. To cast footprints using plaster of Paris.
11. To study the patterns in lip prints.
Suggested Readings
Learning Objectives: After studying this paper the students will know –

a. The methods of analyzing trace amounts of petroleum products in crime scene evidence.
b. The methods of analyzing contaminants in petroleum products.
c. The classification and characteristics of the narcotics, drugs and psychotropic substances.
d. The methods of identifying narcotics, drugs and psychotropic substances.
e. The forensic identification of illicit liquors.
f. The classification of explosives, including the synthesis and characterization of representative analogs.
g. The significance of bomb scene management.

Unit 1: Petroleum and Petroleum Products

Unit 2: Narcotics, Drugs, Psychotropic Substances and Alcoholic Beverages

Unit 3: Explosives

Practicals

1. To carry out analysis of gasoline.
2. To carry out analysis of diesel.
3. To carry out analysis of kerosene oil.
4. To identify illicit drugs by spot tests.
5. To perform color tests for opiates.
6. To perform color tests for barbiturates.
7. To identify methyl alcohol.
8. To identify ethyl alcohol.
9. To carry out chemical tests on explosive substances.
Suggested Readings


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

a. The significance of biological and serological evidence.
b. The forensic importance of hair evidence.
c. The importance of biological fluids – blood, urine, semen, saliva, sweat and milk – in crime investigations.
d. The importance of bloodstain patterns in reconstructing the crime scene.

Unit 1: Biological Evidence

Unit 2: Forensic Importance of Body fluids

Unit 3: Bloodstain Pattern Analysis

Practicals

1. To examine hair morphology and determine the species to which the hair belongs.
2. To prepare slides of scale pattern of human hair.
3. To examine human hair for cortex and medulla.
4. To carry out microscopic examination of pollen grains.
5. To carry out microscopic examination of diatoms.
6. To determine blood group from fresh blood samples.
7. To carry out chemical identification of human blood.
8. To carry out crystal test of human blood.
9. To carry out cross-over electrophoresis.
10. To carry out identification of saliva.
11. To carry out identification of urine.
12. To study the correlation between impact angle and shape of bloodstain.
13. To identify the point of convergence from the bloodstain patterns.
Suggested Readings

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

a. Importance of forensic anthropology in identification of persons.
b. Different techniques of facial reconstruction and their forensic importance.
c. Significance of somatoscopy and somatometry.

Unit 1: Significance of Forensic Anthropology

Unit 2: Personal Identification – Somatoscopy and Somatometry
Somatoscopy – observation of hair on head, forehead, eyes, root of nose, nasal bridge, nasal tip, chin, Darwin’s tubercle, ear lobes, supra-orbital ridges, physiognomic ear breadth, circumference of head. Scar marks and occupational marks.
Somatometry – measurements of head, face, nose, cheek, ear, hand and foot, body weight, height. Indices - cephalic index, nasal index, cranial index, upper facial index.

Unit 3: Facial Reconstruction

Practicals
1. To determine of age from skull and teeth.
2. To determine of sex from skull.
3. To determine sex from pelvis.
4. To study identification and description of bones and their measurements.
5. To investigate the differences between animal and human bones.
6. To perform somatometric measurements on living subjects.
7. To carry out craniometric measurements of human skull.
8. To estimate stature from long bone length.
9. To conduct portrait parley using photofit identification kit.

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

a. The basics of digital forensics.
b. The cases which fall under the purview of digital crimes.
c. The types of digital crimes.
d. The elements involved in investigation of digital crimes.

Unit 1: Fundamentals and Concepts
Fundamentals of computers Hardware and accessories – development of hard disk, physical construction, CHS and LBA addressing, encoding methods and formats. Memory and processor. Methods of storing data. Operating system. Software. Introduction to network, LAN, WAN and MAN.

Unit 2: Computer Crimes

Unit 3: Computer Forensics Investigations

Practicals
1. To identify, seize and preserve digital evidence from crime scenes.
2. To detect deletions, obliterations and modifications of files using encase software.
3. To trace routes followed by e-mails and chats.
4. To identify the IP address of the sender of e-mails.
5. To demonstrate concealment techniques using cryptographic PGP.
6. To identify encrypted files.
7. To identify hidden files.
8. To use digital signatures for securing e-mail and online transactions.
9. To acquire data from PCs/laptops/HDDs/USBs, pen drives, memory cards and SIM cards.
10. To use symmetric and asymmetric keys for protection of digital record.
11. To carry out imaging of hard disks.
Suggested Readings