

Mahakaushal University, Jabalpur (M.P.)



Scheme & Syllabus

For

B.Sc. with Research/honors

Forensic Science

2022-23

Duration of Course: 4 Years

Examination Mode: Semester

Examination System: CBCS

Mahakaushal University
Village-Aithakheda, Mukunwara Road, Post-Tilwara Jabalpur (M.P.) 482003

Introduction to Forensic Science and Criminal Law

L T P

4 0 2

Unit-I

(8 Lectures)

Development and Growth of Forensic Science: Definition, Laws and Principles, Historical Development of Forensic Science, Need, Function and Scope of Forensic Science in Present Scenario. Branches of Forensic Science.

Unit-II

(12 Lectures)

Forensic Science Laboratories: Historical Development and Growth of Forensic Science Laboratories in India – Central and State Level Laboratories, Services and Functionalities provided by various FSLs, Various Divisions of the FSL. Mobile Forensic Science Laboratory: its Functions and Utility. Introduction to Various Institutions: IITR, CCMB, CDFD, NCRB, CDTS.

Unit-III

(12 Lectures)

Law of Evidence: Evidence, Fact, Types, Testimonial and Real Evidence, Evidence in Enquiry and Trial, First Information Report, Interview and Interrogation of the Criminals, Witness, Types of Witnesses, Admissibility of the Evidence in the Court.

Unit-IV

(16 Lectures)

Indian Judiciary and Criminal Justice System: Hierarchy and Powers of the Court, Introduction to Criminal Justice System, Process and Parts of Criminal Justice System, Agencies involved in Crime Investigation, Medico-legal Experts, Judicial Officers. Court Procedure: Examination in Chief, Cross Examination and Re-examination. Court Testimony: Admissibility of Expert Testimony Police: State and Central level, Role and Function of Police, Police and Forensic Scientist relationship.

Unit-V

(12 Lectures)

Legal Provisions Related to Forensic Science: Constitution of India: Preamble, Article 20, 21, 22 Indian Penal Code: Introduction Offences against Person – Sections 299, 302, 304B, 306, 307, 319, 320, 326, 339, 340, 351, 359, 362, 375, 376, 377 Offences against Property-

Sections 378, 383, 390, 499 Indian Evidence Act- Sections 32, 45, 46, 47, 57, 58, 60, 73, 135, 136, 137, 159. Criminal Procedure Code: Sections 291, 292, 293.

Reference Books:

- Nanda, B.B. and Tiwari, R.K. Forensic Science in India- A Vision for the Twenty First Century. Select Publisher: New Delhi; (2001).
- James, S.H. and Nordby, J.J. Forensic Science: An Introduction to Scientific and Investigative Techniques. CRC Press: USA; (2003).
- Saferstein, R. Criminalistics -An Introduction to Forensic Science. Prentice Hall Inc: USA; (1995).
- Aitken, C.G.G. and Stoney, D.A. The Use of Statistics in Forensic Science. Ellis Harwood Limited: England; (1991).
- B.B. Nanda and R.K. Tiwari, Forensic Science in India: A Vision for the Twenty First Century, Select Publishers, New Delhi (2001).
- M.K. Bhasin and S. Nath, Role of Forensic Science in the New Millennium, University of Delhi, Delhi (2002).
- S.H. James and J.J. Nordby, Forensic Science: An Introduction to Scientific and Investigative Techniques, 2nd Edition, CRC Press, Boca Raton (2005).
- W.G. Eckert and R.K. Wright in Introduction to Forensic Sciences, 2nd Edition, W.G. Eckert (ED.), CRC Press, Boca Raton (1997).
- R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).
- W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013).
- Lyman M.D. Criminal Investigation- The Art and the Science. Pearson Education: India; (2013).

Forensic Science and Criminal Law Lab

Practical:

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.
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.

Reference Books:

- Lee, B.B. Nanda and R.K. Tiwari, Forensic Science in India: A Vision for the Twenty First Century, Select Publishers, New Delhi (2001).
- M.K. Bhasin and S. Nath, Role of Forensic Science in the New Millennium, University of Delhi, Delhi (2002).
- S.H. James and J.J. Nordby, Forensic Science: An Introduction to Scientific and Investigative Techniques, 2nd Edition, CRC Press, Boca Raton (2005).
- W.G. Eckert and R.K. Wright in Introduction to Forensic Sciences, 2nd Edition, W.G. Eckert (ED.), CRC Press, Boca Raton (1997).
- R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).
- W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013).

Crime Scene Investigation

L T P
4 0 2

Unit-I

(12 Lectures)

Crime Scene: Introduction, Importance, Types: Indoor and Outdoor, Primary and Secondary, Conveyance Crime Scene. Physical Evidences: Importance and Types of Physical Evidences..

Unit-II

(16 Lectures)

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, Fire Brigade and Judiciary.

Securing the Scene: Procedure and Precautions

Searching Methods: Types and Applications

Recording the Scene: Forensic Photography, Forensic Videography, Sketching, Types and Procedure, Note Making.

Collection, Preservation and Packaging: Various Methods of Collection, Preservation and Packaging for different evidences.

Chain of Custody and Forwarding: Significance of Chain of Custody, Forwarding Letter.

Unit-III

(8 Lectures)

Investigation & Examination of Various Types of Cases: (a) Murder (b) Rape (c) Burglary (d) Railway & Air Crashes (e) Road Accidents (f) Arson.

Unit-IV

(14 Lectures)

Trace Evidences: Location, Collection & Evaluation of Various Types of Trace Evidences: Paint, Soil, Glass, Detective dyes, GSR.

Tool Marks Classification of Tool Marks. Forensic Importance of Tool Marks. Collection, Preservation and Matching of Tool Marks.

Unit-V

(10 Lectures)

Forensic Photography: Photography: Basic Principles and Techniques, Exposing, Developing and Printing, Modern Developments in Photography, Digital Photography, Videography/High speed Videography, Crime Scene and Laboratory Photography.

Advances in Crime Scene Investigation 3-D Scanning of the Scene, Introduction to Biosensors, Reconstruction of the Scene. Portable Devices for Crime Investigation.

Reference Books:

- Nanda, B.B. and Tiwari, R.K. Forensic Science in India- A Vision for the Twenty First Century. Select Publisher: New Delhi; (2001)
- James, S.H. and Nordby, J.J. Forensic Science: An Introduction to Scientific and Investigative Techniques. CRC Press: USA; (2003).
- Saferstein, R. Criminalistics -An Introduction to Forensic Science. Prentice Hall: USA; (1995).
- Aitken, C.G.G.and Stoney, D.A. The Use of Statistics in Forensic Science. Ellis Harwood Limited: England; (1991).
- Hess, A.K. and Weiner, I.B. Handbook of Forensic Psychology 2nd ed. Jhon Wiley & Sons: (1999).
- Arrigo, B.A. Introduction to Forensic Psychology. Academic Press: London; (2000).
- Shapiro, D.L. Forensic Psychology Assessment an Investigative Approach:Allyn and Bacon Publisher: (1991).
- Nicharrs, J. Investigative Forensic Hypnosis: CRC Press LLC; (1999).
- Kleiner, M. Handbook of Polygraph Testing: Academic Press: San Diego; (2002).
- Bennett W.W.and Hass K.M. Criminal Investigation 6 th ed. Wordsworth Thompson Learning: (2001)

Crime Scene Investigation Lab

Practical:

1. To reconstruct a crime scene (outdoor and indoor).
2. Collection, packing and forwarding of different types of evidences.
3. To compare soil samples by density gradient method.
4. To compare paint samples by physical matching method and thin layer chromatography method.
5. To compare glass samples by refractive index method.
6. To identify and compare tool marks.
7. To Compare cloth samples by physical matching.
8. To take photographs using different filters.
9. To take photographs of crime scene exhibits at different angles.
10. To record videography of a crime scene. XI Report Writing.

Reference Books:

- Nanda, B.B. and Tiwari, R.K. Forensic Science in India- A Vision for the Twenty First Century. Select Publisher: New Delhi; (2001)
- James, S.H. and Nordby, J.J. Forensic Science: An Introduction to Scientific and Investigative Techniques. CRC Press: USA; (2003).
- Saferstein, R. Criminalistics -An Introduction to Forensic Science. Prentice Hall: USA; (1995).
- Aitken, C.G.G.and Stoney, D.A. The Use of Statistics in Forensic Science. Ellis Harwood Limited: England; (1991).
- Hess, A.K. and Weiner, I.B. Handbook of Forensic Psychology 2nd ed. Jhon Wiley & Sons: (1999).
- Arrigo, B.A. Introduction to Forensic Psychology. Academic Press: London; (2000).
- Shapiro, D.L. Forensic Psychology Assessment an Investigative Approach:Allyn and Bacon Publisher: (1991).
- Nicharrs, J. Investigative Forensic Hypnosis: CRC Press LLC; (1999).
- Kleiner, M. Handbook of Polygraph Testing: Academic Press: San Diego; (2002).
- Bennett W.W.and Hass K.M. Criminal Investigation 6 th ed.Wordsworth Thompson Learning: (2001)

Criminology & Forensic Psychology

L T P

4 0 2

Unit-I

(12 Lectures)

Crime and Punishment: Crime: Definition, Various Types of Crime, Causes and elements of Crime, Prevention of Crime, Difference in Blue- and White-Collar Crime, Introduction of Cyber Crime. Concept of Punishment, Humanitarian Approach to Concept of Punishment, Capital Punishment in India.

Unit-II

(16 Lectures)

Criminology and Criminal Behaviour: Definition, Historical Perspectives, Concepts of Criminology, Criminology as Science and Art, The field and scope of Criminology, Methods and Techniques in Criminology, Concept and Theories of Criminal Behavior, and Classification of Criminals.

Unit-III

(8 Lectures)

Social Aspects of Crime: Sociological Aspects of Crime and Criminal in the Society, Social Change and Crime, Organized Crime, Effect of Urbanization and Industrialization, Drugs and Crime.

Unit-IV

(10 Lectures)

Juvenile Delinquency: Introduction, Nature, Types of Juvenile Delinquents, Factors of Juvenile Delinquency, Juvenile Justice, Juvenile Court, Procedure of Juvenile Court, Counseling of Juvenile Delinquents, Juvenile Justice (Care and Prevention) Act, Juvenile Justice Board.

Unit-V

(14 Lectures)

Forensic Psychology: Definition, Fundamental concepts, Psychological Assessment and its importance, Psychology of Lying, Psychology of Serial Murderers and Terrorists. Detection of Deception Brain Fingerprinting & Narco Analysis: History, Method of Investigation, Significance, Limitations, Legal Aspects and Future perspectives. Polygraphy: History, Procedure of Investigation, Limitations and Legal Aspects.

Reference Books:

- Ellis, L. and Walsh, A. Criminology – A Global Perspective. Allyn and Bacon: Boston;(2000).
- Morris, E.K. and Braukmann, C.J. Behavioural Approaches to Crime and Delinquency: A Handbook of Application, Research and Concepts. Plenum Press: USA;(1987).
- Abadinsky, H. Organized Crime 2nd ed. Nelson Hall: Chicago;(1998).
- Adler, F., Laufer, W. and Meuller, G.O. Criminology 10th ed. McGraw Hill: Boston;(2022).
- Maguire, M., Morgan,R.and Reiner,R. TheOxfordHandbookofCriminology3rd ed. Oxford University Press: Oxford;(2002).
- Ahuja, R., Criminology. Rawat Publications: New Delhi;(2000).
- Bajpai, G.S.Development without Disorders. Vishwavidyalaya Prakashan: Madhya Pradesh; (2002).
- Ghosh, S.K. and Rustamji, K.F. Encyclopedia of Police in India. Natraj Books: India;(1997).
- Veeraraghavan, V. Handbook of ForensicPsychology 2nd ed. Selective & Scientific Books: India.
- Nabar, B.S. Forensic Science in CrimeInvestigation. Asia Law House: India; (2013).

Criminology & Forensic Psychology Lab

Practical:

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.

Reference Books:

- A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, *Scientific Evidence in Civil and Criminal Cases*, 4th Edition, The Foundation Press, Inc., New York (1995).
- R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).
- J.C. DeLadurantey and D.R. Sullivan, *Criminal Investigation Standards*, Harper & Row, New York (1980).
- J. Niehaus, *Investigative Forensic Hypnosis*, CRC Press, Boca Raton (1999).
- E. Elaad in *Encyclopedia of Forensic Science*, Volume 2, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).

Forensic Chemistry

L T P
4 0 2

Unit-I

(14 Lectures)

Forensic Chemistry: Introduction, Definition, Scope & Significance, Job of Forensic Chemist. Types of cases/exhibits, preliminary screening, presumptive test (color and spot test), microchemical methods of analysis, examination procedures involving standard methods and instrumental techniques, analysis of trace evidences, cosmetics and detective dyes.

Unit-II

(14 Lectures)

Drugs of Abuse: Introduction, Definition, Classification of Drugs of Abuse: Depressants, Stimulants, and Hallucinogens, their administration, sign & symptoms, drugs of abuse in sports, Narcotics Drugs and Psychotropic Substances, Designers Drugs, Date Rape Drugs and their Forensic Examination. Presumptive tests and instrumental analysis of drugs of abuse.

Unit-III

(8 Lectures)

Legal Provisions: Narcotic Drugs & Psychotropic Substances Act 1985, Prevention of Illicit Trafficking in NDPS Act 1985, Drugs Control Act 1950, Drugs & Cosmetics Act 1940 and various amendments in above mentioned acts.

Unit-IV

(12 Lectures)

Adulteration in Food and Beverages: Introduction, Definition, Prevention of Food Adulteration Act 1954, Analytical techniques for analysis of exhibits involved in food adulteration. Introduction of Beverages, Classification of Beverages (alcoholic and non-alcoholic beverages, their composition), Country Made and Illicit Liquors and their Forensic Analysis.

Unit-V

(12 Lectures)

Petroleum Products and Arson: Introduction, Definition, Classification of Petroleum Products. Examination of Petroleum Products: distillation and fractionation, various fractions and their commercial uses, standard methods of analysis of petroleum products in Forensic Exhibits. Introduction and Definition of Arson, Chemistry of fire, Origin and Cause of Fire,

Forensic Chemistry Lab

Practical:

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.

Reference Books:

- J.D. DeHaan, Kirk's Fire Investigation, 3rd Edition, Prentice Hall, New Jersey (1991).
- A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, Scientific Evidence in Civil and Criminal Cases, 4th Edition, The Foundation Press, Inc., New York (1995).
- R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).
- W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013).
- S. Ballou, M. Houck, J.A. Siegel, C.A. Crouse, J.J. Lentini and S. Palenik in Forensic Science, D.H. Ubelaker (Ed.), Wiley-Blackwell, Chichester (2013).

Types of Ignitable Liquids, Forensic Investigation of Fire and Arson Scenes, evaluation of clue material, analysis of Fire and Arson exhibits by Instrumental Methods.

Reference Books:

- J.D. DeHaan, Kirk's Fire Investigation, 3rd Edition, Prentice Hall, New Jersey (1991).
- A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, Scientific Evidence in Civil and Criminal Cases, 4th Edition, The Foundation Press, Inc., New York (1995).
- R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).
- W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013).
- S. Ballou, M. Houck, J.A. Siegel, C.A. Crouse, J.J. Lentini and S. Palenik in Forensic Science, D.H. Ubelaker (Ed.), Wiley-Blackwell, Chichester (2013).

Questioned Document Examination

L T P
4 0 2

Unit-I

(12 Lectures)

Document in General: Importance, Classification & Preliminary Examination. Nature and Problems of Document Examination, Care and Custody of Documents, Handling and Packing of Documents. Basic Tools Needed for Forensic Document Examination and their Use.

Unit-II

(12 Lectures)

Procurements of Standards- Admitted / Specimen Writings. Handwriting: Basic Principle of Handwriting Identification, Handwriting Characteristics General and Individual.

Signatures: Characteristics of Genuine and Forged Signatures and their Examination.

Unit-III

(12 Lectures)

Forgery: Definition, Types, Characteristics and their Detection. Disguised Writing and Anonymous Letters: Definition, Characteristics and Identification of Writer. Sequence of Strokes: Definition and Determination of Sequence of Strokes.

Unit-IV

(12 Lectures)

Alteration in the Document: Examination of Erasures, Additions, Overwriting and Obliteration.

Decipherment of Secret Writing, Indented and Invisible Writing, Charred Documents. Examination of Counterfeit Currency Notes, Passport, Security Documents, Credit Card, Visa, Seal and other Mechanical Impressions.

Unit-V

(12 Lectures)

Use of digital technology in the perpetration of white-collar crimes and their detection, digitally manipulated and machine generated documents- their nature, examination and reporting as well as evidence impact. Age of Document: Absolute/Relative Age, Determination of Age of Documents by Examination of Printed Matter, Typescript Writing, Signatures, Paper and Ink.

Photography of Questioned Documents, Instrumental Techniques used for Document Examinations. Examination of Ink and Paper, ESDA, VSC.

Reference Books:

- O. Hilton, Scientific Examination of Questioned Documents, CRC Press, Boca Raton (1982).
- A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, Scientific Evidence in Civil and Criminal Cases, 4th Edition, Foundation Press, New York (1995).
- R.N. Morris, Forensic Handwriting Identification: Fundamental Concepts and Principles, Academic Press, London (2000).
- E. David, The Scientific Examination of Documents – Methods and Techniques, 2nd Edition, Taylor & Francis, Hants (1997).

Questioned Document Examination Lab

Practical:

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.

Reference Books:

- O. Hilton, Scientific Examination of Questioned Documents, CRC Press, Boca Raton (1982).
- A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, Scientific Evidence in Civil and Criminal Cases, 4th Edition, Foundation Press, New York (1995).
- R.N. Morris, Forensic Handwriting Identification: Fundamental Concepts and Principles, Academic Press, London (2000).
- E. David, The Scientific Examination of Documents – Methods and Techniques, 2nd Edition, Taylor & Francis, Hants (1997).

Forensic Biology

L T P
4 0 2

Unit-I

(12 Lectures)

Biological Evidence: Introduction, Nature, Preservation, Handling and Importance of Biological Evidences. Hair: Structure of Human Hair, Significance, Nature, Location and Collection. Transfer, Persistence and Recovery of Hair Evidence. Evaluation and Tests for their Identification. Comparison of Human and Animal Hair. Fiber: Types, Classification, Characteristics of Different Fibers, Tests for their Identification.

Unit-II

(14 Lectures)

Forensic Botany: Botanical Evidences: Introduction, Types, Location, Collection, Evaluation and Forensic Significance.

1. Wood: Types of Wood and their identification and comparison.
2. Leaves: Identification of various types of leaves and their anatomy, methods of comparison.
3. Pollens: Structure, function, methods of identification and comparison.
4. Diatoms: Nature, location, structure, extraction from various body tissues, preparation of slides, methods of identification and comparison, Forensic Significance.

Unit-III

(12 Lectures)

Wild Life Forensics: Introduction and Significance of Wild Life Forensics and Wild Life Protection Act. Protected and Endangered Species of Animals and Plants. Identification and Examination of wild life materials such as skin, fur, bones, nails, horn, teeth, flowers and plants, by conventional and modern methods, Identification of Pug marks of various animals.

Unit-IV

(12 Lectures)

Forensic Entomology: Introduction and Forensic Significance of Entomology, Insects of Forensic Importance, Collection of Entomological Evidences during Death Investigations, Insect Succession on Carrion and its relationship to determine Time Since Death.

Unit-V

(10 Lectures)

Forensic Microbiology: Definition, Types and Identification of Bacteria and Viruses of Forensic Importance, Microbial profile as Identification tool and role of Microorganism in Bioterrorism.

Reference Books:

- L. Stryer, Biochemistry, 3rd Edition, W.H. Freeman and Company, New York (1988).
- R.K. Murray, D.K. Granner, P.A. Mayes and V.W. Rodwell, Harper's Biochemistry, APPLETON & Lange, Norwalk (1993).
- S. Chowdhuri, Forensic Biology, BPRD, New Delhi (1971).
- R. Saferstein, Forensic Science Handbook, Vol. III, Prentice Hall, New Jersey (1993).
- G.T. Duncan and M.I. Tracey, Serology and DNA typing in, Introduction to Forensic Sciences, 2nd Edition, W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).

Forensic Biology Lab

Practical:

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.

Reference Books:

- L. Stryer, Biochemistry, 3rd Edition, W.H. Freeman and Company, New York (1988).
- R.K. Murray, D.K. Granner, P.A. Mayes and V.W. Rodwell, Harper's Biochemistry, APPLETON & Lange, Norwalk (1993).
- S. Chowdhuri, Forensic Biology, BPRD, New Delhi (1971).
- R. Saferstein, Forensic Science Handbook, Vol. III, Prentice Hall, New Jersey (1993).
- G.T. Duncan and M.I. Tracey, Serology and DNA typing in, Introduction to Forensic Sciences, 2nd Edition, W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).

Forensic Ballistics & Explosives

L T P
4 0 2

Unit-I

(16 Lectures)

Introduction to Fire Arms and Ammunitions: Firearms: Definition, Classification of Firearms, Development, working, advantages and disadvantages of: Hand Cannon, Match Lock, Flint Lock, Wheel Lock and Percussion Lock firearms. Characteristics and firing mechanism of different Modern Firearms (Revolver, Pistol, Shot gun, Semi-automatic and Fully automatic firearms), Introduction to country made firearms.

Ammunition: Definition, Types, Components of Cartridge: Cartridge case, Primer, Propellant, Wads, Projectile.

Unit-II

(8 Lectures)

Internal Ballistics: Definition, Propellant: Shape and Size of the propellant, Ignition of the propellant, manner of burning, Lock time, Ignition time, barrel time, muzzle velocity, factors affecting muzzle velocity, theory of recoil.

Unit-III

(8 Lectures)

External Ballistics: Definition, Shape of bullet, Effect of air on trajectory, drag, drop, drift, yaw, Projectile stability, Range: effective range, extreme range. Factors affecting the range of projectile.

Unit-IV

(14 Lectures)

Wound /Terminal Ballistics: Introduction, Firearm Injuries: Types and Characteristics, Scorching, Burning, Blackening, Cavitation effect, Stopping power, Ricochet, Range determination from different type of firearms (smooth bore and rifled bore).

Firearm- Ammunition Linkage Identification of bullets, Test fire, Bullet recovery, Comparison of marks on bullets, cartridge case. Gun Shot Residue: Definition, Composition, Location, Collection, Evaluation and Forensic significance.

Unit-V

(14 Lectures)

Forensic Explosives: Definition, Classification, composition and characteristics, IED, Explosion process, Reconstruction of sequence of events, Post blast residue collection, Forensic examination of various explosive materials.

Reference Books:

- B.J. Heard, Handbook of Firearms and Ballistics, Wiley and Sons, Chichester (1997).
- W.F. Rowe, Firearms identification, Forensic Science Handbook, Vol. 2, R. Saferstein (Ed.), Prentice Hall, New Jersey (1988).
- A.J. Schwoeble and D.L. Exline, Current Methods in Forensic Gunshot Residue Analysis, CRC Press, Boca Raton (2000).
- E. Elaad in Encyclopedia of Forensic Science, Volume 2, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).

Forensic Ballistics & Explosives Lab

Practical:

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.

Reference Books:

- B.J. Heard, Handbook of Firearms and Ballistics, Wiley and Sons, Chichester (1997).
- W.F. Rowe, Firearms identification, Forensic Science Handbook, Vol. 2, R. Saferstein (Ed.), Prentice Hall, New Jersey (1988).
- A.J. Schwoeble and D.L. Exline, Current Methods in Forensic Gunshot Residue Analysis, CRC Press, Boca Raton (2000).
- E. Elaad in Encyclopedia of Forensic Science, Volume 2, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).

Forensic Toxicology

L T P
4 0 2

Unit-I

(12 Lectures)

Forensic Toxicology: Introduction, Definition, History & Development, Scope of Forensic Toxicology, Role of Forensic Toxicologist. Significance of Toxicological Findings, Dose-Response Relationship, Lethal Dose, Lethal Period, Fatal Period, LD50, LC50, Tolerance, Collection and Preservation of Toxicological Exhibits in Fatal and Survival Cases, Medico-legal Aspects.

Unit-II

(12 Lectures)

Poisons: Introduction, Definition of Poison, Classification of Poisons, Action of Poisons, Types of Poisoning: Accidental, Suicidal and Homicidal, Sign & Symptoms of Common Poisoning and their Antidotes, Collection and Preservation of Viscera for various Poisoning Cases, Detection of Poisons.

Unit-III

(12 Lectures)

Animal and Vegetable Poisons: Introduction, Definition, Nature, Type, Mode of Action, Sign & Symptoms of Animal Poisons: Snake venom, Scorpions and Cantharides Vegetable Poisons: Dhatura, Oleander, Madar, Abrus precatrious, Castor, Cannabis, Nux vomica, etc. Insect Poison: Arthropods, Arachnida.

Unit-IV

(12 Lectures)

Metallic and Industrial Poisons: Introduction, Definition, Nature, Administration, Sign & Symptoms, Postmortem Findings, Detection and Medico legal Aspects of Heavy Metals: Arsenic, Mercury, Lead, Cadmium, etc. Mineral Acids: HCl, H₂SO₄, HNO₃, etc. Alkalies: Hydrates and Carbonates of Sodium and Potassium. CO Poisoning: Signs and Symptoms, Methods of Diagnosis.

Unit-V

(12 Lectures)

Insecticides and Pesticides: Introduction, Definition, Nature, Administration, Sign & Symptoms, Postmortem Findings, Detection and Medico legal Aspects of Organophosphorus Compounds, Organochloro Compounds and Carbamates.

Reference Books:

- R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).
- F.G. Hofmann, A Handbook on Drug and Alcohol Abuse, 2nd Edition, Oxford University Press, New York (1983).
- S.B. Karch, The Pathology of Drug Abuse, CRC Press, Boca Raton (1996).
- A. Poklis, Forensic toxicology in, Introduction to Forensic Sciences, 2nd Edition, W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
- A.W. Jones, Enforcement of drink-driving laws by use of per se legal alcohol limits: Blood and/or breath concentration as evidence of impairment, Alcohol, Drug and Driving, 4, 99 (1988).
- W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013).

Forensic Toxicology Lab

Practical:

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 colour tests for barbiturates.
10. To separate drugs of abuse by thin layer chromatography.

Reference Books:

- R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).
- F.G. Hofmann, A Handbook on Drug and Alcohol Abuse, 2nd Edition, Oxford University Press, New York (1983).
- S.B. Karch, The Pathology of Drug Abuse, CRC Press, Boca Raton (1996).
- A. Poklis, Forensic toxicology in, Introduction to Forensic Sciences, 2nd Edition, W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
- A.W. Jones, Enforcement of drink-driving laws by use of per se legal alcohol limits: Blood and/or breath concentration as evidence of impairment, Alcohol, Drug and Driving, 4, 99 (1988).
- W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013).

Department Specific Elective

Forensic Medicine and Anthropology

L T P
4 0 0

Unit-I

(12 Lectures)

Forensic Anthropology: Definition, Scope and Objectives, Human Skeleton. Nature, Formation and Identification of Human Bones. Determination of Age, Sex, Stature from Skeletal Material.

Unit-II

(10 Lectures)

Personal Identification Techniques: Somatoscopy, Somatometry, Osteometry and Craniometry: their Importance in Determination of Age and Sex..

Unit-III

(6 Lectures)

Facial Reconstruction Portrait Parle/Bertillon System, Introduction and Importance of Photofit/Identi Kit System for Facial Reconstruction. Cranio Facial Super Imposition Techniques (Photographic Superimposition, Video-Superimposition, Roentgenographic Superimposition). Use of Somatoscopic and Craniometric methods in Reconstruction.

Unit-IV

(12 Lectures)

Forensic Odontology: Development, Scope & Role of Forensic Odontology in Mass Disaster. Types of Teeth and their Functions, Determination of Age from Teeth, Dental Anomalies, and their significance in Personal Identification. Bites Marks: Forensic Significance, Collection, Preservation & Photography of Bite Marks, Legal Aspects of Bite Marks.

Unit-V

(20 Lectures)

Forensic Medicine: Fundamental Aspects and Scope of Forensic Medicine, Forensic Pathology. Medico Legal Aspects of Death, Causes of Death, Determination of Time Since Death. Medico-legal Investigation of Sexual Offences including Examination of Victim and Suspect. Injuries: Types and Classification of Injuries, Anti-mortem and Post-mortem Injuries,

Aging of Injuries, Artificial Injuries. Asphyxial Death: Definition, Different Violent Asphyxial Deaths (Hanging, Strangulation, Throttling, Suffocation, Drowning) and their Medico- legal Importance.

Reference Books:

- Vij, K. Text book of Forensic Medicine and Toxicology: Principles and Practice. Elsevier: India;(2014).
- Stimson, P.G. and Mertz, C.A.Forensic Dentistry. CRC Press:(1997).
- Clement, J.G. and Ranson, D.L. Craniofacial Identification in Forensic Medicine. Oxiford University, Press:(1998).
- Beals, R.L. and Hoijer, H.An Introduction to Anthropology. Macmillan: New York; (1966).
- Krogman, W.M. And Iscan, M.Y. Human Skeleton in Forensic Medicine 2nd ed. Springfield: (1986).
- Gray, H. and Williams, P.L. Gray's Anatomy The Anatomical Basis of Clinical Practice. Churchill Livingston: Edinburgh; (1995).
- Glaister, J., Rentoul, E. and Smith, H.Glaister's Medical Jurisprudence and Toxicology. Churchill Livingston: Edinburgh; (1973).
- Modi, J.P. and Franklin, C.A.Modi's Test Book of Medical Jurisprudence & Toxicology. N.M. Tripathi: Bombay; (1988).
- El-Najjar, M.Y., Najjar, M.Y. and Mewilliams, K.R.Forensic Anthropology: The Structure, Morphology, and Variation of Human Bone and Dentition. Springfield: (1978).
- Mukherjee, J.B.Forensic Medicine & Forensic Toxicology. Academic Publisher: (1981)

Forensic Physics & Computer Forensic

L T P
4 0 0

Unit-I

(12 Lectures)

Introduction to Forensic Physics: Introduction, Definition, Physical Evidence: Nature, Collection, Preservation and Forwarding for Scientific Examination, General Overview of Instruments used in Forensic Physics.

Speaker Identification Human Vocal Cord Anatomy, Production of Voice, Speaker and Speech Identification and Authentication, Voice Analysis, Forensic Significance.

Unit-II

(12 Lectures)

Physical Evidences: Introduction, Definition, Nature, Significance of different types of Physical Evidences.

Glass: Definition, Composition, Types, Fracture Pattern, Examination, Forensic Significance.

Soil: Definition, Types, Examination and Forensic Significance.

Building Material: Introduction, Cement: Types and Composition, Determination of Adulterants, Analysis of Concrete.

Impressions: Introduction, Different types of Impressions: Foot Print, Shoe Print, Tyre Impressions, Skid Marks, Preservation, Lifting and Comparison.

Unit-III

(12 Lectures)

Tool Marks: Introduction, Definition, Types of Tool marks, Class Characteristics and Individual Characteristics, Location, Lifting and Examination of Tool Marks..

Unit-IV

(12 Lectures)

Mobile Forensics: Introduction, Definition and Principles, Historical Development of Mobile Phones, Mobile Device as Evidence. Process of Mobile Device Forensics: Seizure, Acquisition, Handling & Examination, Reporting.

Unit-V

(12 Lectures)

Computer Forensics: Introduction, Nature of Digital Evidences, Retrieval and Analysis of Digital Evidence, Computer Security and its relationship to Computer Forensics, Extraction Tools (Autopsy, Encase, Cellebrite UFED etc.), Emergence of Computer Crime: Classification of Computer Crimes, Computer Virus and Types, Characteristics of Computer Crime and Criminals, Prevention from Cyber Crime.

Reference Books:

- Rao, M.S. Crime Scene Management: A Scientific Approach 3rd ed. Selective & Scientific Books: New Delhi; (2018).
- Saferstein, R. Forensic Science Handbook 3rd ed. CRC Press: Boca Raton; (2020).
- Sears, F.W., Zemansky, M.W. and Young, H.D. University Physics 6th ed. Narosa; (2013).
- Dennis S. Physics in the Prevention and Detection of Crime. Contemporary Phys: (1976).
- Rose, P. Forensic Speaker Identification. Taylor and Francis: London; (2002).
- Murray, R.C. and Tedrow, J.C.F. Forensic Geology. Prentice Hall: New Jersey; (1998).
- Working Procedure Manual: Physics: BPR&D Publication.

Forensic Serology

L T P
4 0 0

Unit-I

(12 Lectures)

Blood as Evidence: Composition and Functions of Blood, Properties of Human Blood. Human Blood Groups: General Principles, Theory of their Inheritance, Blood Group Determination from Fresh Blood. Collection, Preservation and Packing of Blood Evidence.

Unit-II

(12 Lectures)

Forensic Examination of Blood: Identification (Preliminary and Confirmatory tests), Species of Origin. Individualization: Blood Grouping, Enzyme Typing.

Instrumental Technique: Spectrophotometric Method, Electrophoresis Methods: Cellulose Acetate Electrophoresis, Immuno-electrophoresis; Chromatographic Methods and Immunological Methods, Determination of Species of Blood: Precipitin Test (Ring test, Immuno-diffusion, Crossed-Over Electrophoresis and others methods.

Unit-III

(12 Lectures)

Analysis of Biological Fluids: Composition and Examination of Biological Fluids such as Saliva, Semen, Vaginal Fluid, Urine and Sweat, Protection of Biological Evidences, Collection, Packaging, Preservation & Transportation of Biological Evidences.

Unit-IV

(12 Lectures)

Blood Pattern Analysis: History of Bloodstain Pattern Interpretation, Target Surface Considerations, Size, Shape and Directionality of Blood Stains, Interpretation of Bloodstain on Clothing and Footwear, Documentation and Photography for Bloodstain Pattern Analysis.

Unit-V

(12 Lectures)

DNA Profiling: Introduction, History of DNA Typing, Human Genetics- Heredity, Alleles, Mutations and Population Genetics, Molecular Biology of DNA, Variations, Polymorphism, DNA Typing Systems- RFLP Analysis, PCR Amplifications, Sequence Polymorphism, Forensic Significance of DNA Profiling.

Reference Books:

- Medical immunology by Danniell P. Stites, Abba I. Jerr, Tristram G. Parstow, Ninth edition; Prentice Hall International Inc. 1997.
- Stern, C. (1964) : Principles of Human Genetics, Freeman, California.
- Chatterjee, C. C-(1975) Human Physiology.
- Beerman, K.E.: Blood Group Serology, Churchill, and Lincoln, P.J. (1988)
- Race, R.R, and Sanger, R. (1975) : Blood Groups in Man. Blackwell Scientific, Oxford.
- Saferstein, R. (1982): Forensic Science Handbook, Vols. I, II, & III, Prentice Hall New Jersey.
- Curry, A. S. (1965): Methods of Forensic Science, Vol IV, Interscience, New York.
- Barris, H. and Hopkinson, D.A. (1976) : Handbook of Enzyme, Electrophoresis Elsevier, North, Holland, New York.
- Gilblet, E. (1969) : Markers in Human Blood, Davis, Pennsylvania

Instrumental Methods

L T P

4 0 0

Unit-I

(12 Lectures)

Fundamental of Instrumentation: Introduction, Need of Instrumentation in Forensic Science, Qualitative and Quantitative Analysis, Destructive and Non-destructive Methods, Separation Techniques, Instrument Calibration, Standard Protocols of Handling Instruments (SOPs).

Unit-II

(12 Lectures)

Optics and Microscopy: Optics: Geometrical Optics, Image Formation, Magnification, Resolution, Lens Aberrations, Distortion of Image and Curvature of Field. Microscopy: History, Introduction, Theory, Basic Principles, Setup and Forensic Applications of Compound, Fluorescence, Polarized, Stereo and Comparison Microscopes. Electron Microscopy: Introduction, Theory, Basic Principles, Structure and Forensic Applications of Electron Microscopy [Scanning Electron Microscope (SEM), Transmission Electron Microscope (TEM)]

Unit-III

(12 Lectures)

Introductory Chromatography: History, Introduction, Definition, Principles of Chromatographic Techniques, Classification of Chromatographic Methods, Adsorption and Partition Chromatography, Application of different Chromatographic Methods in Forensic Science.

Unit-IV

(12 Lectures)

Introductory Spectroscopy: Spectroscopy, Electromagnetic Radiation, Phenomena of Emission, Absorption, Reflection, Fluorescence, Phosphorescence. Introduction to various destructive and non-destructive techniques, Beer and Lambert's law, UV/Vis, AAS, IR, X-ray and Raman Spectroscopy and their Forensic applications.

Unit-V

(12 Lectures)

Electrophoresis: Introduction, Basic Principles, Instrumentation & Forensic Applications of various Electrophoresis, Paper Electrophoresis, Cellulose Acetate Membrane Electrophoresis, Gel Electrophoresis, Agrose Gel Electrophoresis, Polyacrylamide Gel Electrophoresis, Sodium dodecyl sulphate (SDS), Two Dimensional Electrophoresis, Capillary Electrophoresis.

Reference Books:

- Kemp, W. Organic Spectroscopy 3rd ed. PALGRAVE: New York; (1991).
- Willdard, H.H., Merritt, L.L. and Dean, J.A. Instrumental Methods of Analysis 5th ed. Van Nostrand: New York; (1974).
- Lundquist, F. and Curry, A.S. Methods of Forensic Science. Inderscience: California; (1963).
- Settle, F.A. Handbook of Instrumental Techniques for Analytical Chemistry. Prentice Hall: (1997).
- Stahl, E. Thin Layer Chromatography: A Laboratory Handbook. Springer: Berlin; (1969).
- Jickells, S. and Negrusz, A. Clarke's Analytical Forensic Toxicology. Pharmaceutical Press: (2008).
- Houck, M.M. Fundamentals of Forensic Science. Academic Press: (2015).
- Skoog, D.A., West, D.M. and Holler, F.J. Fundamentals of Analytical Chemistry 6th ed. Saunders College Publishing: (1996).
- Robinson, J.W. Undergraduate Instrumental Analysis. Marcel Dekker: New York; (1987).
- Chatwal, G.R. and Anand, S.K. Instrumental Methods of Chemical Analysis 5th ed. Himalaya Publishing: Bombay; (2019).

Fingerprint Examination

L T P
4 0 0

Unit-I

(12 Lectures)

History of Fingerprinting: History and Development of Fingerprints, Important Figures in the Field of Fingerprint, Principles of Fingerprints, Importance, Nature and Location, Fingerprints as Evidence: Its Recognition, Collection and Preservation.

Unit-II

(12 Lectures)

Introduction to Fingerprints and its Pattern: Biological Development of Fingerprints, Biological Significance of Skin Pattern, Ridge Formation, Fingerprint Patterns, Pattern Areas, General and Individual Characteristics of Fingerprints.

Unit-III

(12 Lectures)

Classification of Fingerprints: Classification of Fingerprints for Comparison Purposes: Pattern Area, Core, Delta, Type Lines, Poroscopy, Edgeoscopy, Ridge Characteristics, Fingerprint Pattern Types: Essentials and its types of Loop, Arch, Whorl, Composites, Accidental patterns, etc. Classification of Fingerprints: Henry System of Classification, Single Digit Classification, Establishment and Function of Fingerprint Bureau.

Unit-IV

(12 Lectures)

Recording and Examination of Fingerprints: Ridge Counting and Tracing, Filling and Searching. Method for Making an Inked Specimen of Fingerprint. Taking of Fingerprint from Living and Dead Person. Comparison Protocols: Class and Individual Characteristics (Galton's Details), Different Ridge Characteristics.

Unit-V

(12 Lectures)

Latent Fingerprints and Presentation of Fingerprint Evidence in the Court: Latent Fingerprints and Chance Fingerprints in Criminal Investigation, Investigating Latent

Fingerprints, Various Methods of Development of Fingerprints: Physical (Black and Grey, Fluorescent and Magnetic Powder Method) and Chemical Methods, Fuming Methods, Laser Method, Lifting of Latent Fingerprints. Photography of Latent Traces. Fingerprint as Forensic Evidence, Presentation of Fingerprint Evidence and Testimony in Court.

Reference Books:

- Bridges, B.C., Vollmar, A. and Munir, M. Criminal Investigation, Practical Fingerprinting, Thumb Impressions, Handwriting, Expert Testimony Opinion Evidence. University Book Agency: Allahabad;(2000).
- James, S.H. and Nordby, J.J. Forensic Science-An Introduction to Scientific and Investigation Techniques 4th ed. CRC Press: London;(2015).
- Nanda, B.B. and Tewari, R.K. Forensic Science in India-A Vision for the Twenty-First Century. Select Publishers: New Delhi;(2001).
- Saferstein, R. Criminalistics, An Introduction to Forensic Science 6thed. Prentice Hall: New Jersey;(1998).
- Sharma, B.R. Forensic Science in Criminal Investigation and Trials 3rd ed. Universal Law Publishing: New Delhi;(2001).
- Chatterjee, S.K. Speculation in Fingerprint Identification. Calcutta; (1981).

Digital Forensic

L T P
4 0 0

Unit-I

(16 Lectures)

Digital forensic: Computer forensics and investigations as a profession, Understanding computer forensics, computer forensics versus other related disciplines, A brief History of computer Forensics, Understanding case laws, Developing computer forensics resources, Preparing for computer investigations, Understanding law enforcement agency investigations, Following the legal process, Understanding corporate investigations, Establishing company policies, Displaying warning Banners.

Unit-II

(12 Lectures)

Windows Systems and artifacts: Windows Systems and Artifacts: Introduction, Windows File Systems, File Allocation Table, New Technology File System, File System Summary, Registry, Event Logs, Prefetch Files, Shortcut Files, Windows Executables.

Unit-III

(10 Lectures)

Linux Systems and artifacts: Linux Systems and Artifacts: Introduction, Linux File Systems, File System Layer, File Name Layer , Metadata Layer, Data Unit Layer, Journal Tools, Deleted Data, Linux Logical Volume Manager, Linux Boot Process and Services, System V , BSD, Linux System Organization and Artifacts, Partitioning, File system Hierarchy, Ownership and Permissions, File Attributes, Hidden Files, User Accounts , Home Directories, Shell History GNOME Windows Manager Artifacts, Logs, User Activity Logs, Syslog, Command Line Log Processing, Scheduling Tasks..

Unit-IV

(8 Lectures)

Current Computer Forensics Tool:s Evaluating Computer Forensics Tool Needs, Types of Computer Forensics Tools, Tasks Performed by Computer Forensics Tools, Tool Comparisons, Other Considerations for Tools, Computer Forensics Software Tools, Command-Line

Forensics Tools, UNIX/Linux Forensics Tools, Other GUI Forensics Tools, Computer Forensics Hardware Tools, Forensic Workstations, Using a Write-Blocker.

Unit-V

(14 Lectures)

Identification of data: Identification of Data: Timekeeping, Forensic Identification and Analysis of Technical Surveillance Devices, Reconstructing Past Events: How to Become a Digital Detective, Useable File Formats, Unusable File Formats, Converting Files, Investigating Network Intrusions and Cyber Crime, Network Forensics and Investigating logs, investigating network Traffic, Investigating Web attacks, Router Forensics. Cyber forensics tools and case studies.

Reference Books:

- Bhojwani, I. Cory Altheide, Harlan Carvey, Digital Forensics with Open Source Tools, Syngress imprint of Elsevier.
- Bill Nelson, Amelia Phillips, Christopher Steuart, "Guide to Computer Forensics and Investigations", Fourth Edition, Course Technology.
- Angus M.Marshall, "Digital forensics: Digital evidence in criminal investigation", John-Wiley and Sons, 2008.

Accident Investigations

L T P
4 0 0

Unit-I

(14 Lectures)

Motor Vehicle Accidents - Accident scene. Sources of forensic information. Eyewitness accounts. Extent of vehicle damage. Visibility conditions. Photographs of accident site. Estimation of speed. Tire marks, skid marks, scuff marks.

Unit-II

(8 Lectures)

Maintenance of vehicles - Abandoned vehicles - Importance of air bags - Railway accidents.

Unit-III

(16 Lectures)

Accident Analysis - Pre-crash movement - Post-crash movement - Collision model - Gauging driver's reaction - Occupants's kinematics - Types of injuries resulting from accident - Biomechanics of injuries - Hit and run investigations - Trace evidence at accident sites.

Unit-IV

(12 Lectures)

Tachographs - Forensic significance of tachograph data - Tachograph charts- Principles of chart analysis -Accuracy of speed record - Tire slip effects.

Unit-V

(10 Lectures)

Falsification and diagnostic signals. Route tracing.

Reference Books:

- T.S. Ferry, Modern Accident Investigation and Analysis, Wiley, New York (1988).
- D. Lowe, The Tachograph, 2nd Edition, Kogan Page, London (1989).
- T.L. Bohan and A.C. Damask, Forensic Accident Investigation: Motor Vehicles, Michie Butterworth, Charlottesville (1995).
- S.C. Batterman and S.D. Batterman in Encyclopedia of Forensic Sciences, Volume 1, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).

DNA Forensics

L T P
4 0 0

Unit-I

(14 Lectures)

Basic Principles - DNA as biological blueprint of life - Extraction of DNA for analysis. Quantitation of DNA – yield gel quantitation and slot blot quantitation. Mitochondrial DNA – sequence analysis.

Unit-II

(14 Lectures)

Forensic DNA Typing - Collection of specimens. Polymerase chain reaction – historical perspective, sequence polymorphisms, individualization of evidence.

Unit-III

(10 Lectures)

Short tandem repeats (STR) – role of fluorescent dyes, nature of STR loci - Restriction fragment length polymorphism (RFLP) – genetic markers used in RFLP, typing procedure and interpretation of results - Touch DNA.

Unit-IV

(12 Lectures)

Parentage Testing - Principles of heredity. Genetics of paternity. DNA testing in disputed paternity. Mendelian laws of parentage testing. Mathematical basis of parentage identification - Missing body cases. Reference populations and databases.

Unit-V

(10 Lectures)

Report Writing: Role of DNA typing in identifying unrecognizable bodies - Allele frequency determination. Hardy-Weinberg law. Probability determination in a population database.

Reference Books:

- J.M. Butler, Forensic DNA Typing, Elsevier, Burlington (2005).
- K. Inman and N. Rudin, An Introduction to Forensic DNA Analysis, CRC Press, Boca Raton (1997).
- H. Coleman and E. Swenson, DNA in the Courtroom: A Trial Watcher's Guide, GeneLex Corporation, Washington (1994).
- W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013).

**Skill Based: Skill
Enhancement Courses**

Introduction to Biometry

L T P
4 0 0

Fundamental Aspects Definition, characteristics and operation of biometric system. Classification of biometric systems – physiological and behavioral. Strength and weakness of physiological and behavioral biometrics. Multimodal biometrics. Key biometric processes – enrollment, identification and verification. Positive and negative identification. Performance measures used in biometric systems – FAR, FRR, GAR, FTA, FTE and ATV. Biometric versus traditional technologies.

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

Behavioral Biometrics Handwriting, signatures, keystrokes, gait and voice.

Reference Books:

- S. Nanavati, M. Thieme and R. Nanavati, Biometrics, Wiley India Pvt. Ltd. (2002).
- P. Reid, Biometrics for Network Security, New Delhi (2004).
- J.R. Vacca, Biometric Technologies and Verification Systems, Butterworth-Heinemann, Oxford (2007).

Handwriting Identification and Recognition

L T P
4 0 0

Handwriting Identification Basis of handwriting identification. Characteristics of handwriting – scope and application. Class and individual characteristics. Arrangement, alignment, margin, slant, speed, pressure, spacing, line quality, embellishments, movement and pen lifts. Factors influencing handwriting – physical, mechanical, genetic and physiological.

Handwriting Examination Basis of handwriting comparison. Collection of handwriting samples. Forgery detection. Counterfeiting. Examination of altered and erased documents. Tools used in handwriting examination.

Handwriting Recognition Basis of handwriting recognition. Off-line and on-line handwriting recognition. Steps involved in handwriting recognition – pre-p.

Reference Books:

- O. Hilton, Scientific Examination of Questioned Documents, CRC Press, Boca Raton (1982).
- A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, Scientific Evidence in Civil and Criminal Cases, 4th Edition, Foundation Press, New York (1995).
- R.N. Morris, Forensic Handwriting Identification: Fundamental Concepts and Principles, Academic Press, London (2000).
- E. David, The Scientific Examination of Documents – Methods and Techniques, 2nd Edition, Taylor & Francis, Hants (1997).
- Z. Liu, J.H. Cai and R. Buse, Handwriting Recognition: Soft Computing and Probabilistic Approach (Volume 133), Springer Science and Business Media (2003).

Forensic Science and Society

L T P
4 0 0

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.

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

Forensic Intelligence: Role of forensic intelligence in crime analysis. Methods of crime analysis. Databases in forensic intelligence. Management of serial crimes by application of forensic intelligence.

Reference Books:

- J.F. Brown and K.S. Obenski, Forensic Engineering – Reconstruction of Accidents, C.C. Thomas, Springfield (1990).
- E.W. Killam, The Detection of Human Remains, C.C. Thomas, Springfield (1990).
- R.K. Noon, Introduction to Forensic Engineering, CRC Press, Boca Raton (1992).
- O. Ribaux and P. Margot in Encyclopedia of Forensic Sciences, Volume 1, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Ed.), Academic Press, London (2000).

Guidance and Counselling

L T P
4 0 0

Unit-I

(10 Lectures)

Introduction to Guidance: Introduction to Counselling: Meaning, Definition, Need and Importance of counselling and professional ethics in counselling.

Unit-II

(14 Lectures)

Principles of Counselling: Basic Principles of Counselling: Participation, Individualization, Confidentiality, communication, acceptance, self-confidence, self-awareness and other principles governing the counselling relationship.

Unit-III

(10 Lectures)

Types of Counselling: Types of Counselling- Individual, Group & Family Counselling, Counselling process, Interview and its significance in counselling - Use of observation in counselling and understanding of emotions in counselling. Qualities of a Counsellor.

Unit-IV

(12 Lectures)

Techniques of Counselling: Opening Techniques, Reflection of feelings, Acceptance technique, structuring techniques, silence as a technique, leading technique, interpretation technique, Techniques of group counselling, strategies and structure - barriers to effective counselling sessions; Counselling evaluation.

Unit-V

(14 Lectures)

Specialized Counselling: Premarital and post marital counselling, counselling children, counselling old people, Interpersonal conflict management, counselling AIDS patients, Counselling for De-addiction - Effectiveness of counselling and guidance in the treatment of offenders and victims.

Reference Books:

- Beck, A T. (1976) Cognitive therapy and the emotional disorders, International Universities Press, New York.
- Corey, G. (1986) Theory and practice of counseling and psychotherapy, Monterey: Brooks/Cole
- Corsini, R. J. (Ed) (1984) Current Psychotherapies, Itasca, Ill: peacock
- Davison, G. C., and Neale, J. M. (1986) Abnormal Psychology, Wiley, New York

Economic Offences

L T P
4 0 0

Taxonomy of Economic Offences/Criminogenic Factors: Fundamentals of economics in economic offences. Tax evasion. Excise duty evasion. Fraudulent bankruptcy. White collar crime. Economic exclusion. Black money. Corruption and bribery of public servants. Money laundering and hawala transactions. Insurance frauds. Corporate frauds. Bank frauds. Ponzi scheme. Pyramid scheme. Illicit trafficking in contraband goods. Illicit trafficking in arms. Illicit trafficking in explosives. Illicit drug trafficking. Trafficking in human organs. Cultural objects trafficking. Racketeering in employment. Racketeering in false travel documents.

Applied Economics in Processing Evidence: Forensic accountancy and forensic auditing. Valuation of economic losses. Violation of Intellectual Property Rights.

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.

Practical:

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 TALLY 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.

Reference Books:

- R.V. Clarke, *Situational Crime Prevention: Successful Case Studies*, 2nd Edition, Criminal Justice Press, New York (1997).
- S.P. Green, *Lying, Cheating and Stealing: A Moral Theory of White Collar Crime*, Oxford University Press, Oxford (2006).
- G. Geis, R. Meier, L. Salinger (Eds.), *White-Collar Crime: Classic & Contemporary Views*, Free Press, New York (1995).
- J. Reiman, *The Rich get Richer and the Poor get Prison*, Allyn & Bacon, Boston (1998).
- Indian Audit and Accounts department, *Audit of Fraud, Fraud Detection and Forensic Audit*, 2007.
- State Crime Branch, Haryana, *Investigation of Economic Offences*.