Total Credits = 22

SEMESTER 3rd		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BHFSS1-301	Forensic Dermatoglyphics	3	0	0	40	60	100	3
BHFSS1-302	Technological Methods in Forensic Science	3	0	0	40	60	100	3
BHFSS1-303	Forensic Entomology	3	0	0	40	60	100	3
BHFSS1-304	Introduction to Biometry	3	0	0	40	60	100	3
BHFSS1-305	Forensic Biology and Serology	3	1	0	40	60	100	4
BHFSS1-306	Forensic Dermatoglyphics Practical	0	0	4	60	40	100	2
BHFSS1-307	Technological Methods in Forensic Science Practical	0	0	4	60	40	100	2
BHFSS1-308	Forensic Entomology Practical	0	0	4	60	40	100	2
	Total	**-**	**-**	**-**	**380**	**420**	**800**	**22**

Total Credits = 26

SEMESTER 4th		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BHFSS1-401	Forensic Chemistry	3	1	0	40	60	100	4
BHFSS1-402	Questioned Documents	3	1	0	40	60	100	4
BHFSS1-403	Forensic Biology	3	1	0	40	60	100	4
BHFSS1-404	Handwriting Identification and Recognition	3	1	0	40	60	100	4
BHFSS1-405	Security Document & Bank Notes	3	1	0	40	60	100	4
BHFSS1-406	Forensic Chemistry Practical	0	0	4	60	40	100	2
BHFSS1-407	Questioned Documents Practical	0	0	4	60	40	100	2
BHFSS1-408	Forensic Biology Practical	0	0	4	60	40	100	2
	Total	**-**	**-**	**-**	**380**	**420**	**800**	**26**

Total Credits = 20

SEMESTER 5th		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BHFSS1-501	Forensic Ballistics	3	1	0	40	60	100	4
BHFSS1-502	Forensic Toxicology	3	1	0	40	60	100	4
BHFSS1-503	Digital Forensics	3	1	0	40	60	100	4
BHFSS1-504	Economic Offences	3	1	0	40	60	100	4
BHFSS1-505	Forensic Ballistics Practical	0	0	4	60	40	100	2
BHFSS1-506	Forensic Toxicology Practical	0	0	4	60	40	100	2
	Total	**-**	**-**	**-**	**280**	**320**	**600**	**20**

Total Credits = 32

SEMESTER 6th		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BHFSS1-601	Forensic Anthropology	3	1	0	40	60	100	4
BHFSS1-602	Forensic Medicine	3	1	0	40	60	100	4
BHFSS1-603	Forensic Serology/Accident Investigations	3	1	0	40	60	100	4
BHFSS1-604	Dissertation	0	0	32	0	700	700	16
BHFSS1-605	Forensic Anthropology Practical	0	0	4	60	40	100	2
BHFSS1-606	Forensic Medicine Practical	0	0	4	60	40	100	2
	Total	**-**	**-**	**-**	**240**	**960**	**1200**	**32**

Overall Marks / Credits

Year	Marks	Credits
1st	1200	38
2nd	1600	48
3rd	1800	52
Total	**4600**	**138**

FORENSIC DERMATOGLYPHICS

Course Code: BHFSS1-301 **L T P C** **Duration - 45 hrs**
3 0 0 3

Course Objectives:

After studying this paper the students will know –

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

Course Outcome:

- It enables the scholar to study the different ridge pattern of skin dealing with it is a well-established study that deals with the fingerprints that are unique for identification at a personal level that helps to link the suspect in a particular crime scene.

Unit 1 (5 Hrs)

- Basics of Fingerprinting: Introduction and history, with special reference to India. Biological basis of fingerprints. Formation of ridges.

Unit 2 (10 Hrs)

- Fundamental principles of fingerprinting: Types of fingerprints. Fingerprint patterns. Fingerprint characters/minutiae. Plain and rolled fingerprints. Classification and cataloging of fingerprint records. Automated Fingerprint Identification System. Significance of poroscopy and edgeoscopy.

Unit 3 (15 Hrs)

- Development of Fingerprints: Latent prints, Constituents of sweat residue. 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, Digital imaging for fingerprint enhancement, Fingerprinting the deceased, Developing fingerprints on gloves.

Unit 4 (15 Hrs)

- Other Impressions: Importance of footprints, Casting of footprints, Electrostatic lifting of latent footprints. Palm prints. Lip prints - Nature, location, collection and examination of lip prints. Ear prints and their significance. Palm prints and their historical importance.

Suggested Readings

- J.E. Cowger, *Friction Ridge Skin*, CRC Press, Boca Raton (1983).
- D.A. Ashbaugh, *Quantitative-Qualitative Friction Ridge Analysis*, CRC Press, Boca Raton (2000).
- C. Champod, C. Lennard, P. Margot and M. Stoilovic, *Fingerprints and other Ridge Skin Impressions*, CRC Press, Boca Raton (2004).
- Lee and Gaensleen's, *Advances in Fingerprint Technology*, 3rd Edition, R.S. Ramotowski (Ed.), CRC Press, Boca Raton (2013).

FORENSIC DERMATOGLYPHICS PRACTICAL

Course Code: BHFSS1-306 **L T P C** **Duration - 60 Hrs**

0 0 4 2

Course Objectives: Teaching the students and defining the correct identification techniques used for footprints, fingers and palms. It is an essential trait of human morphology that also demonstrates sexual morphology.

Course Outcome:

- It enables the scholar to study the different ridge pattern of skin dealing with it is a well-established study that deals with the fingerprints that are unique for identification at a personal level that helps to link the suspect in a particular crime scene.

Experiment

- To record plain and rolled fingerprints.
- To carry out ten digit classification of fingerprints.
- To identify different fingerprint patterns.
- To identify core and delta.
- To carry out ridge tracing and ridge counting.
- To investigate physical methods of fingerprint detection.
- To investigate chemical methods of fingerprint detection.
- To use different light sources for enhancing developed fingerprints.
- To prepare a cast of footprints.

Suggested Readings

- J.E. Cowger, *Friction Ridge Skin*, CRC Press, Boca Raton (1983).
- D.A. Ashbaugh, *Quantitative-Qualitative Friction Ridge Analysis*, CRC Press, Boca Raton (2000).
- C. Champod, C. Lennard, P. Margot and M. Stoilovic, *Fingerprints and other Ridge Skin Impressions*, CRC Press, Boca Raton (2004).
- Lee and Gaensleen's, *Advances in Fingerprint Technology*, 3rd Edition, R.S. Ramotowski (Ed.), CRC Press, Boca Raton (2013).

TECHNOLOGICAL METHODS IN FORENSIC SCIENCE

Course Code: BHFSS1-302 **L T P C** **Duration - 45 hrs**

3 0 0 3

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

- The importance of chromatographic and spectroscopic techniques in processing crime scene evidence.
- The utility of colorimetry, electrophoresis and neutron activation analysis in identifying chemical and biological materials.
- The significance of microscopy in visualizing trace evidence and comparing it with control samples.
- The usefulness of photography and videography for recording the crime scenes.

Course Outcome: This course will enable the students to:

- Students are expected to learn the use of proper techniques for the investigation and identification facts related to using chemical treatments around the crime scenes and learning the techniques to combating global terrorism.

Unit 1 (15 Hrs)

- **Instrumentation:** Sample preparation for chromatographic and spectroscopic evidence. Chromatographic methods. Fundamental principles and forensic applications of thin layer chromatography, gas chromatography and liquid chromatography.

Unit 2 (15 Hrs)

- **Spectroscopic methods:** Fundamental principles and forensic applications of Ultraviolet-visible spectroscopy, infrared spectroscopy, atomic absorption spectroscopy, atomic emission spectroscopy and mass spectroscopy. X-ray spectrometry. Colorimetric analysis and Lambert-Beer law. Electrophoresis – fundamental principles and forensic applications. Neutron activation analysis – fundamental principles and forensic applications.

Unit 3 (10 Hrs)

- **Microscopy:** Fundamental principles. Different types of microscopes. Electron microscope. Comparison Microscope. Forensic applications of microscopy.

Unit 4 (5 Hrs)

- **Forensic photography:** Basic principles and applications of photography in forensic science. 3D photography. Photographic evidence. Infrared and ultraviolet photography. Digital photography. Videography. Crime scene and laboratory photography.

Suggested Readings

- D.A. Skoog, D.M. West and F.J. Holler, *Fundamentals of Analytical Chemistry,* 6th Edition, Saunders College Publishing, Fort Worth (1992).
- W. Kemp, *Organic Spectroscopy*, 3rd Edition, Macmillan, Hampshire (1991).
- J.W. Robinson, *Undergraduate Instrumental Analysis*, 5th Edition, Marcel Dekker, Inc.,New York (1995).
- D.R. Red sicker, *The Practical Methodology of Forensic Photography*, 2nd Edition,CRC Press, Boca Raton (2000).

TECHNOLOGICAL METHODS IN FORENSIC SCIENCE PRACTICAL

Course Code: BHFSS1-307 **L T P C** **Duration - 60 Hrs**
0 0 4 2

Course objective: There are many different modern technologies that are currently employed in the field of forensics for the proper conduction of investigation to examine the crime evidence. Many of the methods include the details of microscopy including TEM and SEM.

Course outcome: student's to be experts in scanning electron microscopy, DNA fingerprinting, alternative light photography, facial reconstruction and LA-ICP-MS. This is because they are easy to use and are affordable and easy to use.

Experiment

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

Suggested Readings

- D.A. Skoog, D.M. West and F.J. Holler, *Fundamentals of Analytical Chemistry,* 6th Edition, Saunders College Publishing, Fort Worth (1992).
- W. Kemp, *Organic Spectroscopy*, 3rd Edition, Macmillan, Hampshire (1991).
- J.W. Robinson, *Undergraduate Instrumental Analysis*, 5th Edition, Marcel Dekker, Inc.,New York (1995).
- D.R. Red sicker, *The Practical Methodology of Forensic Photography*, 2nd Edition,CRC Press, Boca Raton (2000).

FORENSIC ENTOMOLOGY

Course Code: BHFSS1-303 **L T P C** **Duration - 45 hrs**
3 0 0 3

Course Objectives: After studying this paper the students will know-

- The overview of forensic entomology and its applications.
- The stages of death.
- The role insects play in the decomposition of carrion.
- The life cycle of insects.
- The forensic importance of insects.

Course Outcome: This course will enable the students to:

- Identify the relationship between insect type and the stages of death.
- Distinguish among major insect types associated with carrion.
- Estimate time of death.
- Types and identification of microbes of forensic significance.

UNIT-I **(10 Hrs)**

- Forensic Entomology: Introduction and history of entomology, general entomology and arthropod biology and taxonomy of arthropod, forensically important insects.

UNIT-II **(10 Hrs)**

- Insects of forensic importance; collection of entomological evidence during death investigations; the role of aquatic insects in forensic investigations; life cycles of insects.

UNIT-III **(15 Hrs)**

- Stages of decomposition: insect succession on carrion and its relationship to determine time since death; factors influencing insect succession on carrion, its application to forensic entomology.

UNIT –IV **(10 Hrs)**

- Forensic Enotomotoxicology: Current concepts, trends, challenges and techniques. Implication of morphmetric and growth rate

Reference Book:

1. J.H.Byrd and J.K. Tomberlin, 3rd Edition Forensic Entomology (2009).
2. D.B.Rivers And G.A. Dahlem, 1st Edition, the Science of Forensic Entomology(2022).
3. J.Amendt, M.Lee Goff and C.P.Campobasso, Current Concept of Forensic Entomology (2010)

FORENSIC ENTOMOLOGY PRACTICAL

Course Code: BHFSS1-308 **L T P C** **Duration - 60 Hrs**
0 0 4 2

Course Objective: The significance of serological and biological evidences in forensic investigation. The techniques and tests required for detection of blood, hair, semen samples and plant evidences.
Course Outcomes: It enables the scholar to methods to detect the blood stains, semen stains, and hair sample that down the area of search for investigation and helps to link the suspect in a particular crime scene. They observe different plant, human and non-human samples.
Experiments:

- To study the equipment, tools and preservatives.
- Methods of collecting entomological evidences.

- To study the microclimatic conditions and ecological features of the scene.
- To study the processing entomological evidences at the laboratory
- To study the methods of post-mortem internal evidences.

Reference Book:

1. J.H.Byrd and J.K. Tomberlin, 3rd Edition Forensic Entomology (2009).
2. D.B.Rivers And G.A. Dahlem, 1st Edition, the Science of Forensic Entomology(2022).
3. J.Amendt, M.Lee Goff and C.P.Campobasso, Current Concept of Forensic Entomology (2010)

INTRODUCTION TO BIOMETRY

Course Code: BHFSS1-304 **L T P C** **Duration - 45 hrs**

3 0 0 3

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

- The basis of biometry.
- The classification of biometric processes.
- The importance of behavioral biometry.

Course Outcome: This course will enable the students to:

- The subject will elucidate the origin, classification of biometry and biometric processes. It unravels the importance of physiological and behavioral biometry.

Unit 1 (20 Hrs)

- **Fundamental Aspects:** Definition, characteristics and operation of biometric systems. 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.

Unit 2 (10 Hrs)

- **Performance measures used in biometric systems**: FAR, FRR, GAR, FTA, FTE and ATV. Biometric versus traditional technologies.

Unit 3 (10 Hrs)

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

Unit 4 (5 Hrs)

- **Behavioral Biometrics:** Handwriting, signatures, keystrokes, gait and voice.

Suggested Readings

- ***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).

FORENSIC BIOLOGY AND SEROLOGY

Course Code: BHFSS1-305 **L T P C** **Duration - 60 hrs**
3 1 0 4

Course 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.
- The importance of bloodstain patterns in reconstructing the crime scene.

Course Outcome: This course will enable the students to:

- It will familiarize the students with different techniques of advanced molecular biology viz. PCR, DNA fingerprinting, DNA sequencing as well as basic morphological and scalp patterns of hair of different organisms.

Unit 1 (20 Hrs)

- **Biological Evidence:** Nature and importance of biological evidence. Significance of hair evidence. Transfer, persistence and recovery of hair evidence. Structure of human hair. Comparison of hair samples. Morphology and biochemistry of human hair. Comparison of human and animal hair. 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 (20 Hrs)

- **Forensic Importance of Body fluids:** Identification of body fluids. Composition and functions of blood. Collection and preservation of blood evidence. Distinction between human and non-human blood. Determination of blood groups. Antigens and antibodies. Semen. Forensic significance of semen. Composition, functions and morphology of spermatozoa. Collection, evaluation and tests for identification of semen. Individualization on the basis of semen examination. Composition, functions and forensic significance of saliva, sweat, milk and urine. Tests for their identifications.

Unit 3 (10 Hrs)

- **Bloodstain Pattern Analysis:** Bloodstain characteristics. Impact blood stain patterns. Cast-off bloodstain patterns.

Unit 4 (10 Hrs)

- **Projected Bloodstain patterns.** Contact bloodstain patterns. Blood trails. Bloodstain drying times. Documentation of bloodstain pattern evidence. Crime scene reconstruction with the aid of bloodstain pattern analysis.

Suggested Readings

- L. Stryer, *Biochemistry*, 3rd Edition, W.H. Freeman and Company, New York (1988).
- W.G. Eckert and S.H. James, *Interpretation of Bloodstain Evidence at Crime Scenes*,CRC Press, Boca Raton (1989).
- R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).
- 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).
- T. Bevel and R.M. Gardner, *Bloodstain Pattern Analysis*, 3rd Edition, CRC Press, BocaRaton (2008).

4th Semester

FORENSIC CHEMISTRY

Course Code: BHFSS1-401 **L T P C** **Duration - 60 Hrs**

3 1 0 4

Course Objectives:

After studying this paper, the students will know:

- The methods of quantitative and qualitative analysis.
- Different separation techniques and titrimetric methods.
- Different gravimetric methods of analysis.
- The method of searching, collecting, preserving and analysing arson evidence.
- The techniques of locating hidden explosives.
- The method of searching, collecting, preserving and analysing fire scene evidence.

Course Outcome: This course will enable the students to:

- Identify the crime scene evidence and define the root cause of any crime.
- Define the location, scenic pattern.
- Analyse trace amounts of materials in crime scene evidence, classification of explosives, including the synthesis and characterization of representative analogs, bomb scene management, categorization and features of the fire scene.

Unit 1 (20 Hrs)

Introduction to quantitative and qualitative analysis with special reference to forensic.

Introduction to separation techniques: solvent extraction, solid phase extraction, ion exchange separation, crystallization and precipitation.

Titrimetric analysis: classification, neutralization, oxidation and reduction, complexation.

Unit 2 (10Hrs)

Gravimetric analysis: electrogravimetry, coulometry & volumetric analysis. Principle, theory, types and applications of gravimetric, coulometry & volumetric analysis in forensic.

Unit 3 (10 Hrs)

Post blast residue collection and analysis. Blast injuries. Detection of hidden explosives.

Chemistry of fire. Conditions for fire. Searching the fire scene. Fire scene patterns. Location of point of ignition. Recognition of type of fire.

Unit 4 (20 Hrs)

Analysis of fire debris. Analysis of ignitable liquid residue. Post-flashover burning. Scientific investigation and evaluation of clue materials. Information from smoke staining.

Suggested Readings

- 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 SceneInvestigation*, 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).

FORENSIC CHEMISTRY PRACTICAL

Course Code: BHFSS1-406 **L T P C** **Duration - 60 Hrs**
0 0 4 2

Course Objectives: The discipline arose due to the combination of forensics with techniques of chemistry. The subject deciphers the classification of explosives, composition and identification. It attempts to inform the chemistry, conditions of fire, scene patterns, scientific investigation protocols and identification of clues.

Course Outcome: This course will enable the students to:

- It will develop the scholar to identify the crime scene evidence and define the root cause of any crime.
- The student will be able to define the location, scenic pattern, methods of analyzing trace amounts of petroleum products in crime scene evidence, classification of explosives, including the synthesis and characterization of representative analogs, bomb scene management, categorization and features of the narcotics, drugs and psychotropic matter.

Experiment

- To carry out analysis of gasoline.
- To carry out analysis of diesel.
- To carry out analysis of kerosene oil.
- To analyze arson accelerators.
- To prepare a case report on a case involving arson.
- To carry out analysis of explosive substances.
- To separate explosive substances using thin layer chromatography.
- To prepare a case report on bomb scene management.

Suggested Readings

- 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 SceneInvestigation*, 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 DOCUMENTS

Course Code: BHFSS1-402 **L T P C** **Duration - 60 Hrs**

3 1 0 4

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

- The importance of examining questioned documents in crime cases.
- The tools required for examination of questioned documents.
- The significance of comparing handwriting samples.
- The importance of detecting frauds and forgeries by analyzing questioned documents.

Course Outcome: This course will enable the students

- To attempt to showcase the importance of investigating questioned documents, tools necessary for the examination of the same. It imparts the information relevant for comparing different handwriting evidence of crime scenes. Its attempts to highlight the importance of identifying frauds and forgeries by evaluating questioned documents.

Unit 1 (5 Hrs)

- Nature and Scope of Questioned Documents: Definition of questioned documents. Types of questioned documents. Preliminary examination of documents.

Unit 2 (15 Hrs)

- 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 3 (20 Hrs)

- Comparison of Documents: Comparison of handwriting. Development of individuality in handwriting. Natural variations and fundamental divergences in handwritings. Class and individual characteristics. Merits and demerits of exemplar and non-exemplar samples during comparison of handwriting.

Unit 4 (20 Hrs)

- Standards for comparison of handwriting. Comparison of paper, ink, printed documents, typed documents, Xeroxed documents.
- 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.

Suggested Readings

- ***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 andPrinciples*, Academic Press, London (2000).
- E. David, *The Scientific Examination of Documents – Methods and Techniques*, 2nd Edition, Taylor & Francis, Hants (1997).

QUESTIONED DOCUMENTS PRACTICAL

Course Code: BHFSS1-407 **L T P C** **Duration - 60 Hrs**

0 0 4 2

Course Objectives: This course will enable the students to be able to identify natural disparity such as line quality defects, alterations, obliteration in handwriting characters for comparative analysis.
Course Outcome: The subject will provide information for the detection and tracing of simulated forgery by analyzing various factors.
Experiment:

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

Suggested Readings

- ***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 andPrinciples*, Academic Press, London (2000).
- E. David, *The Scientific Examination of Documents – Methods and Techniques*, 2nd Edition, Taylor & Francis, Hants (1997).

FORENSIC BIOLOGY

Course Code: BHFSS1-403 **L T P C** **Duration - 60 Hrs**
3 1 0 4

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

- The significance of biology in forensic.
- The importance of biological systems at molecular level.
  - The importance of organ systems in body.
  - The importance of microbes in forensic.
  - How wildlife forensics aid in conserving natural resources.
  - How diatomology assists in forensic investigations.

Course Outcome: This course will enable the students to:

- Signify the importance of biology and biological evidence at crime scenes
- Comprehend different DNA typing, PCR and post PCR processing techniques.
- Imply the role of micobes, diatomology in forensic.
- Understand wild fife forensics.

Unit 1:(20 Hrs)

Forensic Biology:
Definition and scope Importance, Important Cases involving Forensic Biology. Cell: Definition, Theories, Classification and Significance of Cells in Forensic Science. Cell Organelles and their Functions, Difference between Eukaryotic and Prokaryotic Cell, Difference between Plant and Animal Cell. Cell Division: Definition, Types, Difference between Somatic and Germinal Cell and Totipotency and Apoptosis. Genetics and Inheritance: Heredity and variation; Mendelian inheritance; Chromosomes and genes; Karyotyping: Banding techniques; DNA and RNA Mt DNA: structure, types, replication and Eukaryotic Gene expression; Central Dogma; Mutations-Polymorphism Significance in Forensic.

Unit 2 (10 Hrs)

Human Organ Systems:
Epithelial, muscular; Integumentary System: definition and formation of skin. Layers of skin (over all anatomy), glands associated with skin.
Organization of Organs and systems in the human body: Digestive, Circulatory, Respiratory, Excretory, Nervous, Skeletal and Reproductive systems.

Unit 3 (10 Hrs)

Microbial Forensics:
Types and identification of bacteria and viruses in forensic science, Microbial profiles as identification tools, use of microorganisms in bioterrorism, Anthrax, transmission of HIV as a criminal act, role of microbes in food poisoning.

Unit 4 (10 Hrs)

Wild Life Forensics:
Introduction, protected and endangered species of animals and plants. Identification 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 5 (10 Hrs)

Forensic Diatomology:

Nature, location, Structure and life cycle of diatoms, methods of identification and comparison, Diatom Monitoring and D-Mapping of water bodies, Extraction from water samples, Slide preparation and identifying features. Diatom Test: Ante-mortem and Post-mortem drowning, Diatom as a forensic evidence, Forensic significance of Diatom Test, Fate of Diatom inside the body, Extraction methods of diatoms from body, Criterion of Concordance, Validity of Diatom test and its Limitations.

Suggested Readings

- Agarwal (2018). Modern textbook of Botany, Universal Publication.
- Ananthanarayanan (2017). A textbook of Microbiology, The Orient Blackswan.
- Gennard, D. (2013). Forensic entomology: an introduction. Wiley.
- Gunn. A (2006). Essentials of Forensic Biology, Chichester: John Wiley & Sons, Ltd.
- Gunn, A. (2011). Essential forensic biology. John Wiley & Sons.
- Pelczar. M, (2001). Microbiology, McGraw Hill Education.
- Saferstein, R (2004). Forensic Science Handbook; Vol; III; New Jersey; Prentice Hall.
- Talwar. G. P (2002). Textbook of Biochemistry and Human Biology, Prentice Hall India Learning Private Limited.
- Verma. P. S (2004). Cell Biology Genetics Molecular Biology Evolution and Ecology.

FORENSIC BIOLOGY PRACTICAL

Course Code: BHFSS1-408 **L T P C** **Duration - 60 Hrs**

0 0 4 2

Course Objective: This course will enable the students to familiarize the students with different techniques of advanced molecular biology viz. PCR, DNA fingerprinting, DNA sequencing as well as basic morphological and scalp patterns of hair of different organisms.

Course Outcome: This course will enable the students to:

- The subject provides detailed information regarding the significance of biological and serological evidence at crime scenes and the connotation of different DNA typing, PCR and post PCR processing techniques.

Experiment:

- To examine hair morphology and determine the species to which the hair belongs.
- To prepare slides of scale patterns of human hair.
- To examine human hair for cortex and medulla.
- To carry out microscopic examination of pollen grains.
- To carry out microscopic examination of diatoms.
- To cite a crime case in which diatoms have served as forensic evidence.
- To prepare a case report on forensic entomology.
- To prepare a case report on problems of wildlife forensics.

Suggested Readings

- 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)

HANDWRITING IDENTIFICATION AND RECOGNITION

Course Code: BHFSS1-404 **L T P C** **Duration - 60 Hrs**

3 1 0 4

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

- Important features in handwriting identification.
- Basis of handwriting characteristics.
- Significance of forensic documentation.

Course Outcome: A student should learn the great need and importance of such expertise in courts and law because it is required for the authenticity of different signatures. Different types of handwritings along with alterations, as different individual personalities.

Unit 1 (5 Hrs)

- Handwriting Identification: Basis of handwriting identification. Characteristics of handwriting – scope and application. Class and individual characteristics.

Unit 2 (15 Hrs)

- Arrangement, alignment, margin, slant, speed, pressure, spacing, line quality, embellishments, movement and pen lifts. Factors influencing handwriting – physical, mechanical, genetic and physiological.

Unit 3 (20 Hrs)

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

Unit 4 (20 Hrs)

- Handwriting Recognition: Basis of handwriting recognition. Off-line and on-line handwriting recognition. Steps involved in handwriting recognition – pre-processing, feature extraction and classification. Applications of handwriting recognition.

Suggested Readings

- 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 andPrinciples*, 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).

SECURITY DOCUMENTS & BANK NOTES

Course Code: BHFSS1-405 **L T P C** **Duration - 60 Hrs**
3 1 0 4

Course Objectives: The course focuses on the following objectives-

- Developing an understanding and appreciation for the scope of security documents Questioned Documents.
- Develop an understanding of different types of security documents and their salient features and characteristics.
- Brief description of Bank notes, security features and their examination.

Course Outcome:

- This course will describe the basic principles of different types of security documents and their salient features and characteristics, security features and their examination. The students will gain an understanding of the threats to information resources and learn about counter measurements and their Limitations.

Unit 1 (5 Hrs.)

- Introduction to Security Documents Introduction of security documents, identity documents in India, Introduction to security feature used in various.

Unit 2 (15 Hrs.)

- Disputed Documents Types of security documents, passports, stamp paper, stamps, voter ID Cards, PAN Card credit cards, Aadhar card, Ration card, driving license, educational documents, etc.

Unit 3 (20 Hrs.)

- Bank Notes Introduction to Bank Notes, Currency notes, brief description on currency Governing and Manufacturing bodies in India, salient features for identification of genuine bank notes of 50, 100, 500, 1000 rupees Introduction to counterfeiting, comparison of genuine and counterfeiting.

Unit 4 (20 Hrs)

- Examination of Fake currencies Latest introduced security features, Process underlying the examination and Instrumentation used to differentiate, salient features of identification of original and fake security features in various documents.

Suggested Readings

- Charles, C. Thomas, I.S.Q.D. Identification System for Questioned Documents, Billy Prior Bates, Springfield, Illinois, USA, 1971.
- Lingard, J. R., (1985). Bank Security Documents, Butterworths.
- Budhram, T., (2007). Examining the Unique Security Features of a Credit Card with the Aim of Identifying Possible Fraudulent Use, University of South Africa.
- Fumy, W. and Paeschke, M. (2011). Handbook of e- ID Security, Publicis Publishing.
- Kelly, J. S. Lindblom, B. S. (2006). Science, Handwriting Examination and the Courts. Scientific Examinations of Questioned Documents, 2nd edition, CRC Press, Taylor & Francis group

5th Semester

FORENSIC BALLISTICS

Course Code: BHFSS1-501 **L T P C** **Duration - 60 Hrs**
3 1 0 4

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

- The classification of firearms and their firing mechanisms.
- The methods of identifying firearms.
- The characteristics of ammunition.
- The importance of firearm evidence.
- The nature of firearm injuries.
- The methods for characterization of gunshot residue.

Course Outcome:

- This course will enable the students to the information is deduced in a purified form that is admissible in the court of law or any other legal system. Scientific analysis of bullet impacts to arrive at a basic logical inference defining about the incident.

Unit 1 (15 Hrs)

- 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, barreltime, erosion, corrosion and gas cutting.

Unit 2 (15 Hrs)

- 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 3 (15 Hrs)

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

Unit 4 (15 Hrs)

- 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.

Suggested Readings

- ***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 ResidueAnalysis*, 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 PRACTICAL

Course Code: BHFSS1-505 **L T P C** **Duration - 60 Hrs**

0 0 4 2

Course Objective: This practical lab is very essential for the forensic students as this involves the tool that marks evidence, firearm and ammunition. Moreover, this helps to match the bullet grain with the firearm from where it has been fired.

Course Outcome: Understanding the skills required to study ballistic fingerprinting is based on inevitable variations of firearms.

Experiment

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

Suggested Readings

- ***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 ResidueAnalysis*, 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

Course Code: BHFSS1-502 **L T P C** **Duration - 60 Hrs**
3 1 0 4

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

- The significance of toxicological studies in forensic science.
- The classification of poisons and their modes of actions.
- The absorption of poisons in body fluids.
- The forensic identification of illicit liquors.
- The classification and characteristics of narcotics, drugs and psychotropic substances.
- The menace of designer drugs.
- The methods of identifying and purifying narcotics, drugs and psychotropic substances.

Course Outcome:

- This course will enable the students and scholars to learn to make such intricate scientific tests on bodily fluids and samples of tissues for the identification of any drug or chemicals that are present in the body. Learning the techniques of pathology and autopsy.

Unit 1 (15 Hrs)

- 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.
- 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.

Unit 2 (15 Hrs)

- Animal poisons. Snake venom. Mode of action. Carbon monoxide poisoning. Vegetable poisons. Poisonous seeds, fruits, roots and mushrooms. Beverages. Alcoholic and non-alcoholic illicit liquors. Analysis and identification of ethyl alcohol. Estimation of ethyl alcohol in blood and urine. Proof spirit. Crime scene management in illicit liquor cases.

Unit 3 (20 Hrs)

- Narcotics, Drugs and Psychotropic Substances: Definition of narcotics, drugs and psychotropic substances. Broad classification– Narcotics, stimulants, depressants and hallucinogens. General characteristics and common examples 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. Clandestine drug laboratories. Collection and preservation of drug evidence. Testing of narcotics, drugs and psychotropic substances.

Unit 4 (10 Hrs)

- 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.

Suggested Readings

- R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).
- F.G. Hofmann, *A Handbook on Drug and Alcohol Abuse*, 2nd Edition,OxfordUniversity 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 PRACTICAL

Course Code: BHFSS1-506 **L T P C** **Duration - 60 Hrs**

0 0 4 2

Course Objective: This practical laboratory teaches the students the application of different scientific analysis and their usefulness in the judicial system, most of the time this proves the main events of a crime scene.

Course Outcome: Training the students in such techniques makes them understand how to analyze and interpret the evidence. Such evidence also includes blood, saliva, firearms residue and tire tracks, etc.

Experiment

- To identify biocides.
- To identify metallic poisons.
- To identify organic poisons.
- To identify ethyl alcohol.
- To identify methyl alcohol.
- To carry out quantitative estimation of ethyl alcohol.
- To prepare iodoform.
- To identify drugs of abuse by spot tests.
- To perform color tests for barbiturates.
- To separate drugs of abuse by thin layer chromatography

Suggested Readings

- R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).
- F.G. Hofmann, *A Handbook on Drug and Alcohol Abuse*, 2nd Edition,OxfordUniversity 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).

DIGITAL FORENSICS

Course Code: BHFSS1-503 **L T P C** **Duration - 60 Hrs**
3 1 0 4

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

- The basics of digital forensics.
- The cases which fall under the purview of digital crimes.
- The types of digital crimes.
- The elements involved in investigation of digital crimes.

Course Outcome: After studying this course, you should be able to:

- The origins of forensic science
- The difference between scientific conclusions and legal decision-making
- The role of digital forensics and the relationship of digital forensics to traditional forensic science, traditional science and the appropriate use of scientific methods
- Outline a range of situations where digital forensics may be applicable
- Identify and explain at least three current issues in the practice of digital forensic investigations.

Unit 1 (15 Hrs)

- 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 (15 Hrs)

- Computer Crimes: Definition and types of computer crimes. Distinction between computer crimes and conventional crimes. Reasons for commission of computer crimes. Breaching security and operation of digital systems.

Unit 3 (15 Hrs)

- Computer virus, and computer worm – Trojan horse, trap door, super zapping, logic bombs. Types of computer crimes – computer stalking, pornography, hacking, crimes related to intellectual property rights, computer terrorism, hate speech, private and national security incyber space. An overview of hacking, spamming, phishing and stalking.

Unit 4 (15 Hrs)

- Computer Forensics Investigations: Seizure of suspected computer. Preparation required prior to seizure. Protocol to be taken at the scene. Extraction of information from the hard disk. Treatment of exhibits. Creating bitstreams of the original media. Collection and seizure of magnetic media. Legal and privacy issues. Examining forensically sterile media. Restoration of deleted files. Password cracking and E-mail tracking. Encryption and decryption methods. Tracking users.

Suggested Readings

- R.K. Tiwari, P.K. Sastry and K.V. Ravikumar, *Computer Crimes and ComputerForensics*, Select Publishers, New Delhi (2003).
- C.B. Leshin, *Internet Investigations in Criminal Justice*, Prentice Hall, New Jersey (1997).
- R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).
- E. Casey, *Digital Evidence and Computer Crime*, Academic Press, London (2000).

ECONOMIC OFFENSES

Course Code: BHFSS1-504 **L T P C** **Duration - 60 Hrs**

3 1 0 4

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

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

Course Outcome: This course will enable the students to:

- Such subjects focus towards the development of studies that enhance student's knowledge about the functionality of government and law.
- Understanding the process that leads towards the development of the economy at a fast pace.

Unit 1 (15 Hrs)

- Taxonomy of Economic Offenses/Criminogenic Factors: Fundamentals of economics in economic offenses. Tax evasion. Excise duty evasion. Fraudulent bankruptcy. White collar crime. Economic Exclusion. Black money. Corruption and bribery of public servants.

Unit 2 (15 Hrs)

- 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.

Unit 3 (15 Hrs)

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

Unit 4 (15 Hrs)

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

Suggested Readings

- 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 & ContemporaryViews*, 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 ForensicAudit*, 2007.
- State Crime Branch, Haryana*, Investigation of Economic Offences*.

6th Semester

FORENSIC ANTHROPOLOGY

Course Code: BHFSS1-601 **L T P C** **Duration - 60 Hrs**

3 1 0 4

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

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

Course Outcome: This course will enable the students to:

- Eventually one should be able to hone the skills required by teamwork, for achieving different and shared goals. A scholar should be able to learn the problem solving art that supports an individual for facing difficulties and setbacks. Initiative taking capacity that is required when being asked to perform a substantial task linked with the improvement of things

Unit 1 (15 Hrs)

- Significance of Forensic Anthropology: Scope of forensic anthropology. Study of human skeleton. Nature, formation, and identification of human bones. Determination of age, sex, stature from skeletal material.

Unit 2 (15 hrs)

- 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.

Unit 3 (15 Hrs)

- 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 4 (15 Hrs)

- Facial Reconstruction: Portrait Parle/ Bertillon system. Photofit/identi kit. Facial superimposition techniques. Craniofacial superimposition techniques – photographic superimposition, video superimposition, Roentgenographic superimposition. Use of somatoscopic and craniometric methods in reconstruction. Importance of tissue depth in facial reconstruction. Genetic and congenital anomalies – causes, types, identification and their forensic significance.

Suggested Readings

- M.Y. Iscan and S.R. Loth, The scope of forensic anthropology in, *Introduction to Forensic Sciences*, 2nd Ed., W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
- D. Ubelaker and H. Scammell, *Bones*, M. Evans & Co., New York (2000).
- S.Rhine, *Bone Voyage: A Journey in Forensic Anthropology*, University of MexicoPress, Mexico (1998).

FORENSIC ANTHROPOLOGY PRACTICAL

Course Code: BHFSS1-605 **L T P C** **Duration - 60 Hrs**

0 0 4 2

Course Objective: Dealing with different types of crime scenes enables students to learn how to collect the evidence left behind the criminals and convicts. One should know the skills necessary for investigation in a crime laboratory.

Course Outcome: This course will enable the students to:

- A scholar should be able to learn the problem solving art that supports an individual for facing difficulties and setbacks. Initiative taking capacity that is required when being asked to perform a substantial task linked with the improvement of things

Experiment

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

Suggested Readings

- M.Y. Iscan and S.R. Loth, The scope of forensic anthropology in, *Introduction to Forensic Sciences*, 2nd Ed., W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
- D. Ubelaker and H. Scammell, *Bones*, M. Evans & Co., New York (2000).
- S.Rhine, *Bone Voyage: A Journey in Forensic Anthropology*, University of MexicoPress, Mexico (1998).

FORENSIC MEDICINE

Course Code: BHFSS1-602 **L T P C** **Duration - 60 Hrs**

3 1 0 4

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

- The duties of the first responding officer who receives a call on a homicide or suicidecase.
- The steps involved in processing the death scene.
- The importance of ascertaining whether the crime was staged to appear as suicide or accident.
- The importance of bloodstain patterns in reconstructing the crime scene.
- The importance of autopsy.
- The importance of forensic odontology

Course Outcome: This course will enable the students to:

- Students are taught such basic tools of forensic medicine that deal with an autopsy that has been used for the identification of dead, autopsies that are conducted to determine the cause of death.

Unit 1 (15 Hrs.)

- **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, suspects. Interviewing onlookers and segregating possible witnesses. Suspect in custody – initial interrogation and searching for evidence. Miranda warning card. Assessing the crime scene. Request for forensic team. Importance of command post and logbook. Management of crowd and media.

Unit 2 (15 Hrs.)

- Importance of taking notes. Items to be a part of nothing. Documenting the death scene. Processing evidence. Evaluation of injuries. Importance of canvass form. Indexing the death investigation. 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 3 (15 Hrs.)

- Autopsy: Forensic pathology. Medico-legal aspects of death. Causes of death. Determination of time since death. Investigation of sexual offences. Death by drowning. Injuries. Types and classification of injuries. Antemortem and post mortem injuries. Aging of injuries. Artificial injuries.

Unit 4 (15 Hrs.)

- **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.

Suggested Readings

- K. Smyth, *The Cause of Death*, Van Nostrand and Company, New York (1982).
- M. Bernstein, Forensic odontology in, *Introduction to Forensic Sciences*, 2nd Ed., W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
- J. Dix, *Handbook for Death Scene Investigations*, CRC Press, Boca Raton (1999).
- H.B. Baldwin and C.P. May in, *Encyclopedia in Forensic Science*, *Volume 1*, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).
- V.J. Geberth, *Practical Homicide Investigation*, CRC Press, Boca Raton (2006).
- T. Bevel and R.M. Gardner, *Bloodstain Pattern Analysis*, 3rd Edition, CRC Press, Boca Raton (2008).
- 7. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013).

FORENSIC MEDICINE PRACTICAL

Course Code: BHFSS1-606 **L T P C** **Duration - 60 Hrs**

0 0 4 2

Course Objective: Students are taught with the basics of medicine that has fundamental application of medicine to establish the facts for the civil or criminal cases, because such investigations are helpful during the time of suspicious death.

Course Outcome: This course will enable the students to:
Students are taught such basic tools of forensic medicine that deal with an autopsy that has been used for the identification of dead, autopsies that are conducted to determine the cause of death

Experiment

- To design a questionnaire for the first responder to the death scene.
- To design a protocol to deal with the media at the crime scene.
- To design a checklist for the forensic scientists at the death scene.
- To design a canvass form giving a description of an unidentified victim.
- To analyze and preserve bite marks.

Suggested Readings

- K. Smyth, *The Cause of Death*, Van Nostrand and Company, New York (1982).
- M. Bernstein, Forensic odontology in, *Introduction to Forensic Sciences*, 2nd Ed., W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
- J. Dix, *Handbook for Death Scene Investigations*, CRC Press, Boca Raton (1999).
- H.B. Baldwin and C.P. May in, *Encyclopedia in Forensic Science*, *Volume 1*, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).
- V.J. Geberth, *Practical Homicide Investigation*, CRC Press, Boca Raton (2006).
- T. Bevel and R.M. Gardner, *Bloodstain Pattern Analysis*, 3rd Edition, CRC Press, Boca Raton (2008).
- 7. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013).

FORENSIC SEROLOGY/ACCIDENT INVESTIGATION

Course Code: BHFSS1-603 **L T P C** **Duration - 60 Hrs**
3 1 0 4

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

- The significance of serological evidence.
- The usefulness of genetic markers in forensic investigations.
- The forensic fluids blood, urine, semen, saliva, sweat and milk in crime investigations of bloodstain patterns

Course Outcome: This course will enable the students to:

- The subject provides detailed information regarding the significance of serological evidence at Accident/ Motor Vehicle analysis and the connotation of body fluid genetic marker blood stream pattern analysis.

Unit 1 (15 Hrs.)

- Forensic Importance of Body fluids :Common body fluids. Composition and functions of blood. Collection and preservation of blood evidence. Distinction between human and non-human blood. Determination of blood groups. Antigens and antibodies. Forensic characterization of bloodstains. Typing of dried stains. Blood enzymes and proteins. Semen. Forensic significance of semen. Composition, functions and morphology of spermatozoa. Collection, evaluation and tests for identification of semen. Individualization on the basis of semen examination. Composition, functions and forensic significance of saliva, sweat, milk and urine. Tests for their identifications.

Unit 2 (15 Hrs.)

- **Genetic Marker Analysis**: Cellular antigens. ABO blood groups Extracellular proteins and intracellular enzymes. Significance of genetic marker typing data. Sexual assault investigations.
- **Bloodstain Pattern Analysis:** Bloodstain characteristics. Impact bloodstain patterns. Cast-off bloodstain patterns. Projected bloodstain patterns. Contact bloodstain patterns. Blood trails. Bloodstain drying times. Documentation of bloodstain pattern evidence. Crime scene reconstruction with the aid of bloodstain pattern analysis.

Unit 3 (15 Hrs.)

- **Motor Vehicle Accidents:** Accident scene. Sources of forensic information. Eyewitness accounts. Extent of vehicle damage. Visibility conditions. Photographs of the accident site. Estimation of speed. Tire marks, skid marks, scuff marks. Maintenance of vehicles. Abandoned vehicles. Importance of airbags. Railway accidents.

Unit 4 (15 Hrs.)

- **Accident Analysis:** Pre-crash movement. Post-crash movement. Collision model. Gauging driver's reaction. Occupants' kinematics. Types of injuries resulting from accidents. Biomechanics of injuries. Hit and run investigations. Trace evidence at accident sites.
- Forensic significance of tachograph data. Tachograph charts. Principles of chart analysis. Accuracy of speed record. Tire slip effects. Falsification and diagnostic signals. Route tracing.

Suggested Readings

- W.G. Eckert and S.H. James, *Interpretation of Bloodstain Evidence at Crime Scenes*,CRC Press, Boca Raton (1989).
- G.T. Duncan and M.I. Tracey 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).
- T. Bevel and R.M. Gardner, *Bloodstain Pattern Analysis*, 3rd Edition, CRC Press, BocaRaton (2008).
- 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*, MichieButterworth, 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).

DISSERTATION

Course Code: BHFSS1-604

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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.