BHARATHIDASAN UNIVERSITY TIRUCHIRAPPALLI - 620 024.

B.Sc. FORENSIC SCIENCE

CHOICE BASED CREDIT SYSTEM –

LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (CBCS - LOCF)

(Applicable to the candidates admitted from the academic year 2023-24 onwards)

Sem.	Part	Course	Title	Ins. Hrs	Credit	Exam Hours	Marks		Total
							Int.	Ext.	
I	I	Language Course – I Tamil $/Other Languages + #		6	3	3	25	75	100
	II	English Course - I		6	3	3	25	75	100
	III	Core Course – I (CC)	General Forensic Science and Crime Scene Management	5	5	3	25	75	100
		Core Practical – I (CP)	Crime Scene Management Lab	4	4	3	40	60	100
		First Allied Course – I (AC)		4	4	3	25	75	100
		First Allied Practical (AP)		3	-	-	-	-	-
	IV	Value Education		2	2	3	25	75	100
	TOTAL			**30**	**21**	**-**	**-**	**-**	**600**
II	I	Language Course - II Tamil $/Other Languages + #		6	3	3	25	75	100
	II	English Course - II		6	3	3	25	75	100
	III	Core Course – II (CC)	Fingerprints and Questioned Documents	5	5	3	25	75	100
		Core Practical – II (CP)	Fingerprints and Questioned Documents Lab	4	4	3	40	60	100
		First Allied Practical (AP)		3	2	3	40	60	100
		First Allied Course – II (AC)		4	4	3	25	75	100
		Add on Course – I ##	Professional English – I	6*	4	3	25	75	100
	IV	Environmental Studies		2	2	3	25	75	100
	VI	Naan Mudhalvan Scheme (NMS) @@	Language Proficiency for Employability - Effective English	-	2	3	25	75	100
	TOTAL			**30**	**29**	**-**	**-**	**-**	**900**

III	I	Language Course – III Tamil $/Other Languages + #		6	3	3	25	75	100
	II	English Course - III		6	3	3	25	75	100
	III	Core Course – III (CC)	DNA Forensics	5	5	3	25	75	100
		Core Practical - III (CP)	DNA Analysis Lab	4	4	3	40	60	100
		Second Allied Course – I (AC)		4	4	3	25	75	100
		Second Allied Practical – (AP)		3	-	-	-	-	-
		Add on Course – II ##	Professional English - II	6*	4	3	25	75	100
	IV	Non-Major Elective I @ - Those who choose Tamil in Part I can choose a non-major elective course offered by other departments. Those who do not choose Tamil in Part I must choose either a) Basic Tamil if Tamil language was not studied in school level **or** b) Special Tamil if Tamil language was studied upto 10^{th} & 12^{th} std.	Criminalities	2	2	3	25	75	100
	TOTAL			**30**	**25**	**-**	**-**	**-**	**700**
IV	I	Language Course –IV Tamil $/Other Languages + #		6	3	3	25	75	100
	II	English Course – IV		6	3	3	25	75	100
	III	Core Course - IV (CC)	Cyber Crime and Cyber Law	5	5	3	25	75	100
		Core Practical - IV (CP)	Cyber Crime and Cyber Law Lab	4	4	3	40	60	100
		Second Allied Practical – (AP)		3	2	3	40	60	100
		Second Allied Course – II (AC)		4	4	3	25	75	100
	IV	Non-Major Elective II @ - Those who choose Tamil in Part I can choose a non-major elective course offered by other departments. Those who do not choose Tamil in Part I must choose either a) Basic Tamil if Tamil language was not studied in school level **or** b) Special Tamil if Tamil language was studied upto 10^{th} & 12^{th} std.	Questioned Document Analysis	2	2	3	25	75	100
	VI	Naan Mudhalvan Scheme (NMS) @@	Digital Skills for Employability	-	2	3	25	75	100
	TOTAL			**30**	**25**	**-**	**-**	**-**	**800**

V	III	Core Course - V (CC)	Forensic Physics and Ballistics	5	5	3	25	75	100
		Core Course – VI (CC)	Instrumentation	5	5	3	25	75	100
		Core Course – VII (CC)	Forensic Medicine and Toxicology	5	5	3	25	75	100
		Core Practical -V (CP)	Forensic Medicine and Toxicology Lab	4	4	3	40	60	100
		Major Based Elective – I (Any one)	1. Forensic Anthropology 2. Wildlife Forensic	5	4	3	25	75	100
	IV	Skill Based Elective I	Advanced Forensic Psychology	4	2	3	25	75	100
		Soft Skills Development		2	2	3	25	75	100
	TOTAL			**30**	**27**	**-**	**-**	**-**	**700**
VI	III	Core Course - VIII (CC)	Crime and Criminal Justice System	6	5	3	25	75	100
		Core Course - IX (CC)	Forensic Biology and Serology	6	5	3	25	75	100
		Core Practical – VI (CP)	Forensic Biology and Serology Lab	4	4	3	40	60	100
		Major Based Elective – II (Any one)	1. Economic Offences 2. Basics of Forensic Psychology	5	4	3	25	75	100
		Project		4	3	-	20	80	100
	IV	Skill Based Elective – II	Accident Investigation	4	2	3	25	75	100
	V	Gender Studies		1	1	3	25	75	100
		Extension Activities **		-	1	-	-	-	-
	VI	Naan Mudhalvan Scheme (NMS) @@		-	-	-	-	-	-
		TOTAL		**30**	**25**	**-**	**-**	**-**	**700**
GRAND TOTAL				**180**	**152**	**-**	**-**	**-**	**4400**

List of Allied Courses

Allied Course I (1st Year) — Botany / Physics

Allied Course II (2nd Year) — Chemistry / Computer Science

$ For those who studied Tamil upto 10th + 2 (Regular Stream).

\+ Syllabus for other Languages should be on par with Tamil at degree level.

\# Those who studied Tamil upto 10th +2 but opt for other languages in degree level under Part- I should study special Tamil in Part – IV.

The Professional English – Four Streams Course is offered in the 2nd and 3rd Semester (only for 2022-2023 Batch) in all UG Courses. It will be taught apart from the Existing hours of teaching / additional hours of teaching (1 hour /day) as a 4 credit paper as an add on course on par with Major Paper and completion of the paper is must to continue his / her studies further. (As per G.O. No. 76, Higher Education (K2) Department dated: 18.07.2020).

* The Extra 6 hrs / cycle as per the G.O. 76/2020 will be utilized for the Add on Professional English Course.

@ NCC Course is one of the Choices in Non-Major Elective Course. Only the NCC cadets are eligible to choose this course. However, NCC Course is not a Compulsory Course for the NCC Cadets.

** Extension Activities shall be outside instruction hours.

@@ Naan Mudhalvan Scheme.

SUMMARY OF CURRICULUM STRUCTURE OF UG PROGRAMMES

Sl. No.	Part	Types of the Courses	No. of Courses	No. of Credits	Marks
1.	I	Language Courses	4	12	400
2.	II	English Courses	4	12	400
3.	III	Core Courses	8	40	800
4.		Core Practical	7	29	700
5.		Allied Courses I & II	4	16	400
6.		Allied Practical	2	4	200
7.		Major Based Elective Courses	2	8	200
8.		Add on Courses	2	8	200
9.		Project	1	3	100
10.	IV	Non-Major Elective Courses (Practical)	2	4	200
11.		Skill Based Elective Courses	2	4	200
12.		Soft Skills Development	1	2	100
13.		Value Education	1	2	100
14.		Environmental Studies	1	2	100
15.	V	Gender Studies	1	1	100
16.		Extension Activities	1	1	--
17.	VI	Naan Mudhalvan Scheme	2	4	200
	Total		**45**	**152**	**4400**

PROGRAM OBJECTIVES:

- To provide the basic knowledge and principles of Forensic Science.
- To develop problem-solving skills in a stepwise fashion.
- To inculcate diverse skills and abilities involved in various fields of Forensic Science.
- To develop laboratory skills.
- To develop conceptual understanding of Criminal Justice System and Legal System.
- To develop and produce ethical and skilful graduates, who can articulate the professional Standards.

PROGRAM OUTCOME:

- Demonstrate knowledge and understanding of some basic principles and concepts of Forensic Science.
- Ability to apply knowledge and understanding of various scientific principles to solve crime cases.
- Possess high awareness of major issues and development of research areas in Forensic Science.
- Understand various aspects of Indian Law and related sections.
- Posses' laboratory skills to exacting standards of precision and care.
- Acquire professional ethics and act in a non-biased manner.

First Year **CORE COURSE I** **Semester I**

GENERAL FORENSIC SCIENCE AND CRIME SCENE MANAGEMENT

Code: **(Theory)** **Credit: 5**

COURSE OBJECTIVES:

- The significance of Forensic science to human society.
- The fundamental principles and functions of Forensic science.
- The divisions in a Forensic science laboratory.
- The methods of securing, searching and documenting crime scenes.
- The art of collecting, packaging and preserving different types of physical and trace evidence at crime scenes.
- The legal importance of chain of custody.

UNIT - I INTRODUCTION TO FORENSIC SCIENCE:

Need and functions of Forensic science. Historical aspects of Forensic science. Development of Forensic Science Laboratories. Definitions and concepts in Forensic science. Basic principles of Forensic science. Scope of Forensic science. Forensic Science in Indian scenario. Admissibility in Indian Courts. Frye standard and Daubert standard. Legal and Scientific problems.

UNIT – II BRANCHES OF FORENSIC SCIENCE AND THEIR IMPORTANCE:

Hierarchical set up of various Government Forensic Science Laboratories. Basic services of crime laboratories. Qualifications of Forensic scientists. Duties of Forensic scientists. Code of conduct for Forensic Scientists. Data depiction.

UNIT – III CRIME SCENE:

Meaning, Types of crime scenes. Safety measures at crime scenes. Role of First Responding Officer. Coordination between police personnel and Forensic scientists at crime scenes. The evaluation of 5Ws (who? what? when? where? why?) and 1H (how?).

UNIT – IV DOCUMENTATION OF CRIME SCENES:

Photography, videography, sketching- Baseline method, Triangulation method, coordinate method, extended coordinate method. Crime scene notes. Search – Definition, Objectives, Patterns- Strip/Lane method, Grid method, Zone method, Spiral method, Wheel method. Classification of crime scene evidence – physical and trace evidence. General collection, labelling, sealing and transportation of evidence. Hazardous evidence. Preservation of evidence. Chain of custody- objectives and importance.

UNIT – V IMPORTANT OF EVIDENCES:

Definition, importance, nature and principles, stages: Data collection, Hypothesis formation, Testing, Theory formation. Management of scenes of mass disasters. Important evidences for human identification.

UNIT - VI: CURRENT CONTOURS (for Continuous Internal Assessment Only):

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

REFERENCES:

1. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013).
2. S.H. James and J.J. Nordby, Forensic Science: An Introduction to Scientific andInvestigative Techniques, 2nd Edition, CRC Press, Boca Raton (2005).
3. M. S. Dahiya, Priciples and Practices in Contemporary Forensic Sciences, Shanti Prakashan (2015).
4. Robert. C. Shaler, Crime Scene Forensics: A Scientific Method Approach, CRC Press(2011)
5. M. S. Maloney, Crime Scene Investigation: Procedural Guide, CRC Press (2014)
6. B.B. Nanda and R.K. Tiwari, Forensic Science in India: A Vision for the Twenty First Century, Select Publishers, New Delhi (2001).
7. R. Saferstein, Criminalistics, 8thEdition, Prentice Hall, New Jersey (2004).
8. M. Byrd, Crime Scene Evidence: A Guide to the Recovery and Collection of Physical Evidence, CRC Press, Boca Raton (2001).
9. T.J. Gardener and T.M. Anderson, Criminal Evidence, 4th Ed., Wadsworth, Belmont (2001).

COURSE OUTCOMES:

- Basic understanding of the Scientific method and the use of the problem-solving in the field of the Forensic science.
- Identify the role of the Forensic scientist and physical evidence within the criminal justice system.
- Understand various branches of Forensic science and their functions.
- Identify and examine current and emerging concepts and practices within the Forensic science field.
- Gain basic knowledge of collecting, packaging and preserving different types of physical and trace evidence at crime scenes.

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First Year **CORE PRACTICAL I** **Semester I**

CRIME SCENE MANAGEMENT LAB

Code: **(Practical)** **Credit: 4**

COURSE OBJECTIVES:

- To secure, search and document various types of crime scenes.
- To prepare a report on Crime scenes
- The right method of collecting, packaging and preserving different types of physical and trace evidence at crime scenes.
- Reconstruction of Crime scenes.

PRACTICAL'S:

1. Securing the scene of crime and following safety measures.
2. Documentation of crime scene with sketching and listing of evidences.
3. Photography of a scene of crime and individual evidences.
4. Collection, preservation, packaging, sealing and labelling of physical evidences.
5. Collection, preservation, packaging, sealing and labelling of biological evidences.
6. To prepare a report on evaluation of indoor crime scene.
7. To prepare a report on evaluation of outdoor crime scene.
8. Demonstration of reconstruction of crime scene.
9. A case study on the importance of crime scene management.
10. A visit to the police station to discuss about the present scenario of crime scene management and suggest improvements.

COURSE OUTCOMES:

- Basic understanding of securing, searching and documenting various types of crime scenes.
- Gain basic knowledge of collecting, packaging and preserving different types of physical evidences.
- Asses the importance of evidences found at a crime scene.
- Effective report writing.
- Gain skills required for reconstruction of crime scene.

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First Year **CORE COURSE II** **Semester II**

FINGERPRINTS AND QUESTIONED DOCUMENTS

Code: **(Theory)** **Credit: 5**

COURSE OBJECTIVES:

- The fundamental principles on which the science of fingerprinting is based.
- The physical and chemical techniques of developing fingerprints on crime scene evidence.
- The significance of foot, palm, ear and lip prints.
- The importance of examining questioned documents in crime cases.
- The tools required for examination of questioned documents.
- The significance of comparing hand writing samples.

UNIT – I INTRODUCTION TO FINGERPRINTS:

Introduction. History and development of fingerprinting. Histology and formation of ridges. Fundamental principles of fingerprinting. Types of fingerprints. Fingerprint patterns. Fingerprint characters/minutiae. Classification – Henry's classification and cataloguing of fingerprint record. Automated Fingerprint Identification System.

UNIT – II DEVELOPMENT OF FINGERPRINTS:

Constituents of sweat residue. Locating latent fingerprints and development by physical and chemical techniques and its mechanism. Preservation of developed fingerprints. Digital imaging for fingerprint enhancement. Recording of fingerprints of living and deceased. Plain and rolled fingerprints.

UNIT – III CLASSIFICATION SYSTEM OF FINGERPRINTS:

Footprints- Introduction, types, development, collection and comparison. Footwear impressions- Introduction, types, location, collection, comparison and significance. Collection of standards. Gait pattern analysis. Palm prints- Introduction, examination and significance. Lip prints – Introduction, nature, classification, location, collection and examination of lip prints. Ear prints- classification, examination and their significance.

UNIT – IV QUESTIONED DOCUMENTS:

Introduction, Definition, History and development of questioned document examination. Forgery- Definition, types and Sections involved. Alterations in documents, including erasures, additions, over-writings and obliterations. Charred documents. Characteristic features of Indian currency notes and coins, passports, visas and stamp papers and their examination. Tools required- VSC, ESDA, UV-IR, Comparison Microscope. Handwriting- Introduction and development of individuality. Characteristics of handwriting-Class and individual characteristics. Factors influencing handwriting. Forgery and its types. Standards for comparison of handwriting.

Unit – V Mechanism Documents:

Printer: Introduction, parts of a printer, types of printers and their working principle Typewriter: Introduction, working principle, parts of a typewriter. Examination and comparison of printed, typed and Xeroxed documents- toner analysis, grabber marks, individual characteristics and defect marks.

UNIT – VI CURRENT CONTOURS (for Continuous Internal Assessment Only):

Alterations in documents- Computer outputs, Photocopies- including erasures, additions, over-writings and obliterations. Ink and Toner Analysis. Indented and invisible writings. Charred documents.

REFERENCES:

1. C. Champod, C. Lennard, P. Margot an M. Stoilovic, Fingerprints and other Ridge Skin Impressions, CRC Press, Boca Raton (2004).
2. Lee and Gaensleen's, Advances in Fingerprint Technology, 3rd Edition, R.S. Ramotowski (Ed.), CRC Press, Boca Raton (2013).
3. M. P. Caligiuri, the Neuroscience of Handwriting: Application for Forensic Document Examination, 1st Edition, (2012).
4. J.E. Cowger, Friction Ridge Skin, CRC Press, Boca Raton (1983).
5. Albert S. Osborn, Questioned Documents, 2nd Edition.
6. Wilson Harrison, Suspected Documents, Rowman & Littlefield, (1958)
7. O. Hilton, Scientific Examination of Questioned Documents, CRC Press, Boca Raton (1982).
8. 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).
9. R.N. Morris, Forensic Handwriting Identification: Fundamental Concepts and Principles, Academic Press, London (2000).
10. E. David, the Scientific Examination of Documents – Methods and Techniques, 2nd Edition, Taylor & Francis, Hants (1997).

COURSE OUTCOMES:

- Understand the importance of fingerprints in Forensic Science.
- Know the importance of document examination.
- Learn about various components which help in determination of the Document.
- Acquire skill required for handling questioned documents.
- Basic understanding of handwriting analysis.

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First Year	CORE PRACTICAL II FINGERPRINTS AND QUESTIONED DOCUMENTS LAB	Semester II
Code:	(Practical)	Credit: 4

COURSE OBJECTIVES:

- To record fingerprints.
- To classify fingerprints.
- To develop latent prints.
- To prepare a cast.
- To analyze handwriting.
- To identify forgery and alterations.

PRACTICAL'S:

1. To record plain and rolled fingerprints.
2. To identify different fingerprint patterns.
3. To carry out ridge tracing and ridge counting.
4. To carry out ten-digit classification of fingerprint.
5. To develop latent fingerprints using physical and chemical methods.
6. To prepare cast of foot prints.
7. To identify handwriting characters and detect forgery.
8. To examine the security features of currency notes and passports.
9. A case study on the fingerprints / questioned documents.

COURSE OUTCOMES:

- Record and classify fingerprints.
- Attain the ability to development latent fingerprints.
- Gain skills to collect footprints by preparing a cast.
- Identify features of currency notes.
- Attain the ability to detect forgery.

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Second Year	**CORE COURSE III**	**Semester III**
	DNA FORENSICS	
Code	**(Theory)**	**Credit: 5**

COURSE OBJECTIVES:

- The basic principle of DNA analysis.
- The Forensic significance of DNA typing.
- The importance of Short Tandem Repeats and Restriction Fragment Length Polymorphism in DNA technique.
- Role of DNA typing in disputed paternity and maternity testing, child swapping, kidnapping, murder, rape cases and immigration cases.

UNIT – I BASIC PRINCIPLES DNA AS BIOLOGICAL BLUEPRINT OF LIFE:

Extraction, amplification and identification of STR allies using Genetic analyzer.

UNIT – II FORENSIC DNA TYPING COLLECTION OF SPECIMENS:

Polymerase chain reaction – historical perspective, sequence polymorphisms, individualization of evidence. Restriction Fragment Length Polymorphism (RFLP), Short Tandem Repeats (STR) – role of fluorescent dyes, nature of STR loci, genetic markers, typing procedure and interpretation of results. Touch DNA.

UNIT – III PARANTAGE TESTING:

Principles of heredity. Genetics of paternity. DNA testing in disputed paternity. Mandelian laws of parentage testing.

UNIT –IV PERSONAL IDENTIFICATION:

Parentage Testing, Principles of heredity and Individual Identification. Genetics of paternity. DNA testing in disputed paternity.

UNIT – V MODELS:

Mandelian laws of parentage testing. Mathematical basis of parentage identification. Missing body cases.

UNIT – VI CURRENT CONTOURS (for Continuous Internal Assessment Only):

Reference populations and databases. Allele frequency determination. Hardy-Weinberg law. Probability determination in a population database.

REFERENCES:

1. J m butler, Advanced topics in forenics DNA typing - Methodology
2. J m butler, Fundamentals of Forensic DNA typing
3. J m butler, Forensic DNA typing - biology, technology and gentics of STR markings

4. J m butler, Advanced topics in forenics DNA typing – Interpretation
5. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013).

COURSE OUTCOMES:

- Explain the key concepts in population, evolutionary and quantitative genetics including: the basis of genetic variation; heritability; Hardy-Weinberg Equilibrium; roles of migration, mutation.
- Understand the range of molecular laboratory techniques used routinely in human Forensic analysis and population genetic analysis including sex typing, DNA profiling, Single Nucleotide Polymorphism (SNP) detection and DNA sequencing.
- Perform by hand, calculator and computer software the statistical analysis of genetic data relevant to Forensic, conservation, quantitative and evolutionary genetics, and summarize and interpret the outcomes.
- Understand the importance of DNA based evidences in various types of crimes.

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Second Year	**CORE PRACTICAL III DNA ANALYSIS LAB**	**Semester III**
Code	**(Practical)**	**Credit: 4**

COURSE OBJECTIVES:

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

1. History DNA typing
2. DNA Biology review
3. Understanding of CSI
4. Understanding of basic laboratory safety
5. Sample collection best practices
6. Microscopy of natural fibers
7. Proper storage and characterization methodologies
8. Using genetics and genome biology, students will study DNA repair and chromosome stability using yeast as a model system

COURSE OUTCOMES:

- Gain knowledge on various aspects of DNA analysis.
- Understand the practical aspects of lab safety
- Discuss the characteristics and analytical considerations of DNA encountered in Forensic Sciences/Medicine
- Understanding collection and storage mechanisms/procedures
- Summarize the role of DNA analysis in Forensic sciences

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Second Year **NON-MAJOR ELECTIVE I** **Semester III**

CRIMINALITIES

Code **(Theory)** **Credit: 2**

COURSE OBJECTIVES:

- The methods of securing, searching and documenting crime scenes.
- The art of collecting, packaging and preserving different types of physical and trace evidence at crime scenes.
- The legal importance of chain of custody.
- The importance of reconstruction of crime scene.

UNIT – I CONCEPTS OF FORENSIC SCIENCE:

Functions of Forensic Science Definitions and concepts in forensic science. Scope of forensic science. Need of forensic science. Basic principles of forensic science. Tools and techniques in forensic science. Branches of forensic science. Data depiction. Forensic science in India: Organizational set up of forensic science laboratories.

UNIT – II ELEMENTS OF CRIME:

Criminology-Definition, Aim and Scope. Theories of criminal behavior. Criminal profiling. Elements, nature, causes and consequences of crime. Deviant behavior. Social change and crime. Understanding modus operandi. Investigative strategy. Police's power of investigation. Filing of criminal charges. Correctional measures and rehabilitation of offenders.

UNIT – III CRIME SCENE MANAGEMENT:

Crime scene investigations. Protecting and isolating the crime scene. Crime scene search methods. Documentation of crime scene by photography, sketching and field notes. Types, significance and classification of physical and trace evidence. Submission of evidence. Chain of custody. Reconstruction of crime scene.

UNIT – IV MICROSCOPY:

Fundamental principles. Different types of microscopes. Electron microscope. Comparison Microscope. Forensic applications of microscopy.

UNIT –V FORENSIC PHOTOGRAPHY:

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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.

UNIT - VI: CURRENT CONTOURS (for Continuous Internal Assessment Only):

Soil evidence – importance, location, collection and comparison of soil samples. Cloth evidence – importance, collection, analysis of adhering material. Matching of pieces.

REFERENCES:

1. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013).
2. S.H. James and J.J. Nordby, Forensic Science: An Introduction to Scientific and Investigative Techniques, 2nd Edition, CRC Press, Boca Raton (2005).
3. M. S. Dahiya, Priciples and Practices in Contemporary Forensic Sciences, Shanti Prakashan (2015).
4. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).

COURSE OUTCOMES:

- Basic understanding of the Scientific method and the use of the problem-solving in the field of the Forensic science.
- Identify the role of the Forensic scientist and physical evidence within the criminal justice system.
- Understand various branches of Forensic science and their functions.
- Identify and classify various types of evidences.
- Importance of chain of custody.

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Second Year **CORE COURSE IV** **Semester IV**

CYBER CRIME AND CYBER LAW

Code **(Theory)** **Credit: 5**

COURSE OBJECTIVES:

- Various types of computer and cybercrimes.
- The types of file systems.
- The basics of computer Forensic tools.
- The process of retrieving deleted data.
- The role of first responding officer.
- The elements of cyber law and IT Act.

UNIT –I BASICS OF CYBER CRIMES:

Cyber Crimes, Types of Cybercrime and Financial Crimes, Hacking, Cyberspace, A Brief History of the Internet, Recognizing and Defining Computer Crime, Contemporary Crimes, Cyber Laws and Ethics, Law Enforcement Roles and Responses, Incident response, First Responder.

UNIT – II DIGITAL INVESTIGATION:

Digital investigation, Digital crime scene evaluation process, Search & Seizure, Digital Forensic Lab Setup, Dead v/s Live Forensics, Types of Digital Evidences, Chain of Custody, Standard Operating Procedures of cyber-forensics, Investigation Guidelines, overview of tools, Slack Space, Virtual paging.

UNIT – III EVIDENCE COLLECTION:

Evidence collection form different devices, Write Protect, Write Blockers, Disk Imaging, Data Recovery, Volatile and Non-Volatile Data Acquisition and Analysis, File Systems and Signatures, Registry Forensics, Email analysis and IP, Stenography, Cryptography, Cardcrimes.

UNIT – IV ANALYSIS OF DIGITAL DATA:

Metadata Analysis, Browser Forensics, History Extraction, Integrity, Hash Value, Datatampering, File Signature Analysis, Overview of Mobile Forensics, Network Forensics, Cloud Forensics and Malware Analysis.

UNIT –V DIGITAL EVIDENTIARY LAW:

Introduction to IT Act 2000, Basic terms and elements of the act. Amendments made in IT Act. Electronic Governance, Certifying Authorities, Digital Signature and Electronic Signature Certificates, Case Study. Legal Procedure to gather information from Outside India.

UNIT – VI CURRENT CONTOURS (for Continuous Internal Assessment Only):

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.

REFERENCES:

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

COURSE OUTCOMES:

- Understand the different theoretical and cross-disciplinary approaches (criminological, political, legal and information security/management) to the study of cyber-security and the regulation of the Internet and the Internet of Things.
- Investigate assumptions about the behavior and role of offenders and victims in cyberspace, and use basic web-tools to explore behavior on-line.
- Analyze and assess the impact of cybercrime on government, businesses, individuals and society.
- Evaluate the effectiveness of cyber-security, cyber-laws (e.g. the Budapest Convention) and other countermeasures against cybercrime and cyber warfare.

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Second Year **CORE PRACTICAL IV** **Semester IV**

CYBER CRIME AND CYBER LAW LAB

Code **(Theory)** **Credit: 4**

COURSE OBJECTIVES:

- How to respond to a cybercrime scene.
- Various tools and techniques to analyze digital evidences.
- To trace e-mails.
- How to prepare a formal report.

PRACTICAL'S:

1. To identify, seize and preserve digital evidence from crime scenes.
2. To write protect a system.
3. To carry out copying and imaging of pen drives and hard disks.
4. To identify encrypted and hidden files.
5. Analysis of metadata of files.
6. Analysis of graphic files - steganography.
7. Analysis of file systems and system registry.
8. To trace routes followed by e-mails and identify the IP address of the sender.
9. Case studies on digital/cybercrime – Reported Nationally and Internationally

COURSE OUTCOMES:

- Respond to a cybercrime scene.
- Gain the ability to perform various analysis on digital evidences.
- Trace e-mails to the sender.
- Prepare a report on Cybercrime case.

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Second Year **NON MAJOR ELECTIVE II** **Semester IV**

QUESTIONED DOCUMENT ANALYSIS

Code **(Theory)** **Credit: 2**

COURSE OBJECTIVES:

- To understand the history and development of Questioned Document Examination.
- The importance of examining questioned documents in crime cases.
- The tools required for examination of questioned documents.
- The importance of detecting frauds and forgeries by analyzing questioned documents.

UNIT – I INTRODUCTION TO QUESTIONED DOCUMENTS:

Questioned documents- Nature and Scope of Questioned Documents, Introduction, Definition and History and development of questioned documents. writing materials, general and individual characteristics, Principles of handwriting identification of handwriting and type written scripts, Forgery cases.

UNIT – II QUESTIONED DOCUMENTS EXAMINATION:

Qualifications, duties and responsibilities of Questioned document examiner. Government Examiner of Questioned Document. Basic tools- ESDA, VSC. Stages of Document Examination.

UNIT – III HANDWRITING AND SIGNATURE EXAMINATION:

Examination of security documents: Currencies, Coins, Passport and Stamp papers – Determination of age of documents – Forensic document examination – Examination of charred documents and secret writing.

UNIT – IV CLASSIFICATIONS OF DOCUMENTS:

Forgery Definition, types and Sections involved. Alterations in documents, including erasures, additions, over-writings and obliterations. Charred documents. Characteristic features of Indian currency notes, passports, visas and stamp papers and their examination. Seal examination. Paper and Ink Examination.

UNIT – V EXAMINATION OF PRINTER:

Other documents Printer: Introduction, parts of a printer, types of printers and their working principle. Typewriter: Introduction, working principle, parts of a typewriter.

UNIT – VI CURRENT CONTOURS (for Continuous Internal Assessment Only):

Examination and comparison of printed, typed and xeroxed documents – toner analysis, grabber marks, individual characteristics and defect marks.

REFERENCES:

1. Albert S. Osborn, Questioned Documents, 2nd Edition.
2. Wilson Harrison, Suspected Documents, Rowman & Littlefield, (1958)
3. O. Hilton, Scientific Examination of Questioned Documents, CRC Press, Boca Raton (1982).

COURSE OUTCOMES:

- Know the importance of document examination.
- Learn about various components which help in analysis of the Document.
- Various tools and techniques involved.
- Acquire skill required for handling questioned documents.

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Third Year **CORE COURSE V** **Semester V**

FORENSIC PHYSICS AND BALLISTICS

Code **(Theory)** **Credit: 5**

COURSE OBJECTIVES:

- 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.
- Analysis of other physical evidences.

UNIT – I CLASSIFICATION OF FIREARMS:

History and development of firearms. Classification of firearms. Weapon types and their operation. Firing mechanisms of different firearms. Ammunition – classification and constructional features of different types of cartridge cases and bullets. Different types of marks produced during firing process – firing pin marks, breech face marks, chamber marks, extractor and ejector marks.

UNIT – II BALLISTICS:

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

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

UNIT – III 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, and influence of range. Ricochet and its effects, stopping power. Wound Ballistics.

UNIT – IV MECHANISMS OF FIREARMS:

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 clothing. Identification and nature of firearms injuries. Reconstruction with respect to accident, suicide, murder and self-defense.

UNIT – V PHYSICAL EVIDENCES:

Glass – Composition, types, collection, packaging and examination of glass samples, glass fracture. Soil – Composition, types, collection, packaging and examination of soil samples. Paint– Composition, types, collection, packaging and examination of paint samples. Fiber – Composition, types, collection, Packaging and examination of fiber samples. Tampering of electric meters.

UNIT – VI CURRENT CONTOURS (for Continuous Internal Assessment Only):

Physiological Biometrics: Fingerprints, palm prints, iris, retina, geometry of hand and face. Behavioral Biometrics: Handwriting, signatures, keystrokes, gait and voice.

REFERENCES:

1. Vincent Di Maio, Gunshot wounds, 3rd Edition, CRC Press, Washington DC.
2. J. S. Wallace, Chemical Analysis of Firearms, Ammunition & Gun Shot Residue, 2nd Edition, (2018).
3. B. R. Sharma, Firearms in Criminal Investigation & Trial, (2017).
4. T. Warlow, Firearms, the Law, & Forensic Ballistics, 3nd Edition, CRC Press, (2011)
5. W.F. Rowe, Firearms identification, Forensic Science Handbook, Vol. 2, R. Saferstein (Ed.), Prentice Hall, New Jersey (1988).
6. A.J. Schwoeble and D.L. Exline, Current Methods in Forensic Gunshot Residue Analysis, CRC Press, Boca Raton (2000).
7. E. Elaad in Encyclopedia of Forensic Science, Volume 2, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).
8. B.J. Heard, Handbook of Firearms and Ballistics, Wiley and Sons, Chichester (1997).
9. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).

COURSE OUTCOMES:

- Know in detail regarding the field of Forensic ballistics including history of firearms, about ammunitions and how firearms are classified.
- Learn about the various types of mechanism of firing and also on what principles the identification and comparison of firearms, bullets and cartridge cases is based upon.
- Comprehend and get an in-depth knowledge of internal, external and terminal ballistics.
- Understand about what are gunshot residues, and how can they be analysed using chemical and instrumental techniques.
- Understand the importance of various physical evidences and their analysis.

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Third Year	**CORE COURSE VI INSTRUMENTATION**	**Semester V**
Code	**(Theory)**	**Credit: 5**

COURSE OBJECTIVES:

- The general concepts of instrumentation.
- The significance of microscopy in visualizing trace evidence and comparing it with control samples.
- 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.

UNIT – I GENERAL CONCEPTS OF INSTRUMENTATION:

General Physical and Biological concepts- Mass, Density, range of electromagnetic radiation, interaction between matter and radiation, fluorescence, phosphorescence. pH and buffers. Significance of instrumentation in Forensic Science. Centrifuge- Principles, types and Forensic applications.

UNIT – II SIGNIFICANCE OF MICROSCOPY:

Principles, ray diagrams, parts and working, sample preparation and Forensic applications of-Simple microscope, Compound microscope, Stereo microscope, Polarized light microscope, Dark-field microscope, Comparison microscope, fluorescent microscope, Electron microscope.

UNIT – III PRINCIPLES OF SPECTROSCOPY:

Principles of spectroscopy- Beer Lambert's Law, ray diagram, parts and working and Forensic applications of- UV-Visible spectroscopy and IR spectroscopy. FTIR. Principles and Forensic applications of- Atomic Absorption and Emission Spectroscopy, Raman spectroscopy, X-Ray spectroscopy. Principle, working and applications of Mass Spectroscopy.

UNIT – IV PRINCIPLES OF CHROMATOGRAPHY:

Principles, working and Forensic applications of Paper chromatography, Column chromatography, and TLC. Principles and applications of LC, HPLC and GC. GC-MS. LC-MS.

UNIT – V PRINCIPLES OF ELECTROPHORESIS:

General principles, factors affecting, Types- Horizontal and Vertical, SDS PAGE, AGE, Crossed over electrophoresis and Capillary electrophoresis, Genetic Analyzer. Forensic applications. Principles and working and Forensic applications of Autoclave, Laminar Air Flow-HEPA filters, Incubators, CO2 incubators.

UNIT – VI CURRENT CONTOURS (for Continuous Internal Assessment Only):

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.

REFERENCES:

1. D.A. Skoog, D.M. West and F.J. Holler, Fundamentals of Analytical Chemistry, 6th Edition, Saunders College Publishing, Fort Worth (1992).
2. W. Kemp, Organic Spectroscopy, 3rd Edition, Macmillan, Hampshire (1991).
3. J.W. Robinson, Undergraduate Instrumental Analysis, 5th Edition, Marcel Dekker, Inc., New York (1995).
4. J.C. Giddings, Dynamics of Chromatography, Marcel Dekker, New York.

COURSE OUTCOMES:

- Understand various principles involved in instrumentation.
- Apply various techniques to visualize trace evidences.
- Significance of various techniques involved in identifying various Chemical and Biological materials.
- Understand the working of various instruments.

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Third Year **CORE COURSE VII** **Semester V**

FORENSIC MEDICINE AND TOXICOLOGY

Code **(Theory)** **Credit: 5**

COURSE OBJECTIVES:

- The duties of the first responding officer who receives a call on homicide or suicide case.
- The steps involved in processing the death scene.
- The importance of ascertaining whether the crime was staged to appear as suicide or accident.
- The stages of decomposition.
- The importance of autopsy.
- The significance of toxicological studies in Forensic science.
- The classification of poisons and their modes of actions.
- The absorption of poisons in body fluids.

UNIT – I BASICS OF FORENSIC MEDICINE:

Definition, History and scope of Forensic Medicine. Role of first responding officer. Approaching a crime scene of death. Documenting the death scene. Medical Jurisprudence. Post Mortem Changes- Rigor Mortis, Cadaveric Spasm, Putrefaction, Mummification, Adipocere formation. Handling buried body cases- search for buried bodies, methods of exhumation. Identification of various bones. Personal identification. Medical certification and medico-legal reports. IPC sections relating to Forensic Medicine.

UNIT – II DEATH:

Death- Definition, types- natural and unnatural deaths. Suspended animation. Modes of death – Coma, Syncope and Asphyxia. Manner of death and Cause of death. Medico-legal aspects and Forensic significance of asphyxia death, drowning, death due to starvation, electrocution, heat and cold. Asphyxia – Types and classification. Medico-legal aspects Infanticide and foeticide. Signs of live birth, Determination of age of foetus.

UNIT – III INJURIES:

Injuries- Types and classification. Antemortem and post mortem injuries. Aging of injuries. Artificial injuries. Burns and scalds.

Unit – IV POISONS:

Poisons: Definition, Classification of poisons. Physico-chemical characteristics and mode of action of poisons, route of administration. Elaboration on Accidental, suicidal and homicidal poisonings. Insecticides and Pesticides. NPIC. Poisoning cases in India. Signs and symptoms of common poisoning and management of poisoning cases. Collection and preservation of viscera, blood and urine for various poison cases. Beverages: Types of alcoholic and non-alcoholic, Illicit liquors. Symptoms, analysis and tests of alcohol. Estimation of ethyl alcohol in

blood and urine. Drugs of abuse-Introduction, Classification. Symptoms and Antidotes. NDPS Act. Radioactive poisoning, Anthrax poisoning. Date-rape drugs.

UNIT – V TOXICOLOGY AND PHARMACOLOGY:

Introduction, definition, characteristics of exposure, spectrum of toxic effects. Basic steps of analytical Toxicology. Significance of toxicological findings. Techniques used in Toxicology. Human performance Toxicology. Extraction from visceral samples. Stass-Otto Method. Basic tests for identification of common poisons. Post Mortem findings in poisoning cases. Pharmacology- Introduction, Definition, Scope of Forensic Pharmacological studies, Absorption, Distribution, Metabolism and Excretion (ADME) of drugs. Pharmacokinetics and Pharmacodynamics. Dose-response relationship. Lethal dose 50 and effective dose 50.

UNIT – VI CURRENT CONTOURS (for Continuous Internal Assessment Only):

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.

REFERENCES:

1. Narayan Reddy, The Essentials of Forensic Medicine and Toxicology, 34th Edition (2017)
2. C.K Parikh, Textbook of Medical Jurisprudence and Forensic Toxicology, 6th Edition, (2007).
3. K. Smyth, The Cause of Death, Van Nostrand and Company, New York (1982).
4. Casserats and Doulls
5. Dictionary of Forensic
6. J. Singh. Modi
7. Paul Krik, Crime Investigation
8. M. Bernstein, Forensic odontology in, Introduction to Forensic Sciences, 2nd Ed., W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
9. J. Dix, Handbook for Death Scene Investigations, CRC Press, Boca Raton (1999).

COURSE OUTCOMES:

1. Gain knowledge on various aspects of Forensic Medicine.
2. Understand the basis of presumptive and confirmation testing, and compare and evaluate the use of a variety of biological matrices in toxicological analysis
3. Discuss the pharmacological characteristics and analytical considerations of several major drugs classes commonly encountered in Forensic Toxicology
4. Explain how pharmacokinetic/ pharmacodynamic parameters can be used to interpret toxicological findings
5. Summarize the role of Forensic Toxicology in areas such as sports drug testing and drug-facilitated sexual assault cases.

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Third Year **CORE PRACTICAL V** **Semester V**

FORENSIC MEDICINE AND TOXICOLOGY LAB

Code **(Practical)** **Credit: 4**

COURSE OBJECTIVES:

- To know the various stages of decomposition.
- To differentiate and identify various types of injuries.
- To perform tests to identify various poisons.
- Basic chemical tests to identify various types of drugs and poisons.

PRACTICAL'S:

1. To identify different stages of decomposition.
2. Case studies reported on infanticide / foeticide.
3. To identify and report on the different types of injuries.
4. To identify ethyl alcohol.
5. To identify methyl alcohol.
6. To identify metallic poisons from food samples.
7. To identify organic poisons from food samples.
8. To perform colour tests for acidic and basic drugs.
9. Case studies on metallic poisons.
10. To perform colour tests for pesticides.
11. To discuss case studies on methanol poisoning.

COURSE OUTCOMES:

- Gain knowledge and the ability to identify various stages of decomposition.
- Ability to differentiate between various types of injuries.
- Perform various colour tests for different types of drugs and poisons.
- Identify the presence of pesticides.

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Third Year **MAJOR BASED ELECTIVE I** **Semester V**

1) FORENSIC ANTHROPOLOGY

Code **(Theory)** **Credit: 4**

COURSE OBJECTIVES:

- Importance of Forensic anthropology in identification of persons.
- Different techniques of facial reconstruction and their Forensic importance.
- Significance of Superimposition technique and its admissibility in court of law
- Significance of Somatoscopy and Somatometry. e. Significance of Forensic Odontology.

UNIT – I SIGNIFICANCE OF FORENSIC ANTHROPOLOGY:

Scope of Forensic anthropology. Study of human skeleton. Nature, formation, and identification of human bones. Determination of age, differentiation of sex, estimation of stature from skeletal remains.

UNIT – II PERSONAL IDENTIFICATION – SOMATOSCOPY AND SOMATOMETRY:

Somatoscopy – observation of hair on head, forehead, eyes, root of nose, nasal bridge, nasal tip, chin, Darwin's tubercle, ear lobes, supra-orbital ridges, physiognomic ear breadth, circumference of head. Scar marks and occupational marks.

Somatometry – measurements of head, face, nose, cheek, ear, hand and foot, body weight, height. Indices - Cephalic index, nasal index, Cranial index, upper facial index.

Unit – III Facial reconstruction

- Introduction, Steps and Importance. Portrait Parle/ Bertillon system. Photofit/identi kit. Case study.

Unit IV Facial superimposition techniques

Cranio facial super imposition techniques – photographic super imposition, Video super imposition.

Unit V Forensic Odontology:

Definition and scope of odontology. Teeth- primary and secondary. Estimation of age from teeth. Dental charting. Bite marks. Forensic significance of bite marks. Collection, preservation, photography and comparison of bite marks evidence. Legal aspects of bite marks.

UNIT – VI CURRENT CONTOURS (for Continuous Internal Assessment Only):

Importance of tissue depth in facial reconstruction. Genetic and congenital anomalies – causes, types, identification and their forensic significance.

REFERENCES:

1. Narayan Reddy, The Essentials of Forensic Medicine and Toxicology, 34th Edition (2017)
2. C.K Parikh, Textbook of Medical Jurisprudence and Forensic Toxicology, 6th Edition, (2007).
3. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013).
4. British Pharmacopeia
5. Indian Pharmacopeia
6. Warren, The Forensic anthropology laboratory, CRC Press (2008).
7. Henry gray, Gray's anatomy for students.
8. Pickrin and Bachman, Use of Forensic anthropology.

COURSE OUTCOMES:

- Reconstruct a basic biological profile from a set of human skeletal remains.
- Recover Forensic evidence using archaeological methods as part of a mock excavation in the field.
- Describe, explain, and critically evaluate methods used in Forensic Anthropology.
- Discuss and construct an academic argument around an issue/issues in Forensic Anthropology and Archaeology case(s).
- Understand the importance of bite-mark evidences.

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Third Year **MAJOR BASED ELECTIVE I** **Semester V**

2) WILDLIFE FORENSICS

Code **(Theory)** **Credit: 4**

COURSE OBJECTIVES:

- Importance of wildlife.
- The list of animals facing threat due to wildlife crimes.
- To know the various agencies involved in conservation of wildlife.
- Elements of Wildlife Protection Act.
- How wildlife Forensics aid in conserving natural resources.

UNIT – I INTRODUCTION:

Introduction to wildlife. Common terms related to wildlife. Importance of wildlife. Concept of wildlife crime. The current scenario of illegal wildlife trade in India and the world. The steps involved- from capturing wildlife to the selling of the goods in black markets.

UNIT – II AGENCIES AND LAW:

The list of agencies involved and their function in combating wildlife crime- IUCN, CITES,TRAFFIC, WTI, Wildlife crime Control Bureau, WII, ZSI, CCMB, Institute of wood science and technology, FSL. Wildlife Protection Act.

UNIT – III WILDLIFE CRIME SCENE:

Search and seizure, documentation, types of evidences found, crime scene sketch, collection and packaging, chain of custody. Forensic Significance. Wildlife investigation team and role of each member.

UNIT – IV GENETICS AND WILDLIFE CONSERVATION:

Introduction to genetics. Species identification, Mitochondrial DNA.

UNIT – V WILDLIFE PROTECTION

Importance of genetics in wildlife protection and conservation. Case elaboration.

UNIT - VI: CURRENT CONTOURS (for Continuous Internal Assessment Only):

Salient features of Biological Diversity Act 2002

REFERENCES:

1. Linacre & Tob, Wildlife dna analysis: applications in Forensic science.
2. Jane E. Huffman, John R. Wallace, Wildlife Forensics: Methods and Applications, 1st Edition.

COURSE OUTCOMES:

- Understand the historical context of the development of wildlife conservation, and an understanding of what constitutes wildlife crime.
- Understand the significance of international trade in wildlife and a knowledge of the main provisions of CITES.
- Have a knowledge of what types of activities are incorporated under the term "poaching", and of the legislation which exists to combat it.
- Be aware of the law relating to the cruelty and persecution of animals and to habitat protection.
- Understand environmental crimes and the impact these may have on wildlife.

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Third Year **SKILL BASED ELECTIVE I** **Semester V**

ADVANCED FORENSIC PSYCHOLOGY

Code **(Theory)** **Credit: 2**

COURSE OBJECTIVES:

- The overview of Forensic Psychology and its applications.
- The legal aspects of Forensic Psychology.
- The significance of criminal profiling.
- The importance of psychological assessment in gauging criminal behavior.
- The tools and techniques required for detection of deception.
- The critical assessment of advanced Forensic techniques like Polygraph, Narco analysis and brain electrical oscillation signatures
- The elements of substance abuse disorders, delusional disorders and personality disorders.

UNIT – I HISTORY OF FORENSIC PSYCHOLOGY:

The relationship between Forensic Psychology and Law. Development of Forensic Psychology. Ethical issues in Forensic Psychology. Importance of assessments in civil and criminal cases. Mental disorders and Forensic Psychology. Psychology of evidence- Witness testimony, Confession and Statement verification.

UNIT – II CRIME AND PSYCHOPATHOLOGY:

Biological factors and crime – social learning theories, psycho-social factors, abuse. Juvenile delinquency – theories of offending (social cognition, moral reasoning), Child abuse (physical, sexual, emotional), juvenile sex offenders, legal controversies. POCSO Act. Delusional disorders. Meaning, Symptoms, Treatment and Outcome. Personality disorders- Cluster A, B and C.

UNIT – III PROFILING:

Introduction, Definition, History, Types of profiling – Inductive and Deductive, its advantages and disadvantages. Steps and approaches to Offender profiling. Geographical profiling. Salient features of Serial murderers. Case study. Profiling of sexual offenders. Paraphilias. Assessments- Introduction, Classification, Hypothesis formulation, Data gathering- Interview, psychometric assessment, Data analysis -Reliability, Validity, Specificity, Sensitivity. Importance in Forensic Scenario.

UNIT – IV TOOLS OF DETECTION:

Tools for detection of deception – interviews, non-verbal detection, statement analysis, voice stress analyzer, hypnosis. Polygraph – operational and question formulation techniques, ethical and legal aspects, the guilty knowledge test. Narco analysis and brain electrical oscillation signatures – principle and theory, ethical and legal issues. A critical review of Supreme Court on Polygraph and Narco analysis. BEOSP- brain electrical oscillation signatures

UNIT – V ALCOHOLIC AND THEIR PROBLEMS:

Alcohol Abuse and Dependence- Clinical picture, Causes, Treatment and Prevention. Drug Abuse and Dependence- Types: Narcotics, Sedatives, Stimulants, Hallucinogens. Clinical picture, Causes, Treatment and Prevention.

UNIT – VI CURRENT CONTOURS (for Continuous Internal Assessment Only):

Eye witness memory and Identification Errors. Change blindness-Amnesia for Criminal behaviour

REFERENCES:

1. David A. Crighton and Graham J. Towl, Forensic Psychology, 2nd Edition, Wiley (2010).
2. Scott-Snyder, Introduction to Forensic Psychology: Essentials for Law Enforcement, (2016).
3. 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).
4. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).
5. J.C. DeLadurantey and D.R. Sullivan, Criminal Investigation Standards, Harper & Row, New York (1980).
6. J. Niehaus, Investigative Forensic Hypnosis, CRC Press, Boca Raton (1999).
7. E. Elaad in Encyclopedia of Forensic Science, Volume 2, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).
8. Paul KrikCrime investigation**,**

COURSE OUTCOMES:

- Describe the contribution of Psychology at all levels of the criminal justice system (i.e., from interviewing witnesses and suspects of crime, to jury decision making, to the incarceration and rehabilitation of offenders, to lie detection etc.)
- Demonstrate an awareness of basic theory, research findings and methods of investigation used in Forensic Psychology
- Evaluate current knowledge of psychological motivation towards violent and sexual behaviour.
- Gain in-depth knowledge of Criminal Profiling.

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Third Year **CORE COURSE VIII** **Semester VI**

CRIME AND CRIMINAL JUSTICE SYSTEM

Code **(Theory)** **Credit: 5**

COURSE OBJECTIVES:

- The elements of crime.
- The causes and consequences of criminal behavior.
- The various agencies involved in crime detection and prevention.
- The elements of criminal justice system.
- Acts and provisions of the Constitution of India related to Forensic science.
- Elements of IEA, CrPC and IPC related to Forensic science.
- Acts governing socio-economic crimes and environmental crimes.

UNIT – I ELEMENTS OF CRIME:

Elements and definition of crime. MensRea, Actus Reus and Corpus Delicti. Caveat Emptor. Nature, causes and consequences of crime. Types - Hate crimes, property crimes, organized crimes and public disorder, domestic violence and workplace violence. White collar crimes, Blue collar crimes, Green collar crimes. Broad components of Criminal Justice System. Prosecution and Judicial Organizations. Constitution and hierarchy of courts in India, Jurisdiction of courts in criminal cases. Classification – civil, criminal cases, Cognizable and non-cognizable offences, Bailable and Non-Bailable offences. Inquests and its types. Summons and its types. FIR.

UNIT – II POLICE ADMINISTRATION:

Introduction. History of Indian Police – Policing in Ancient, Medieval and Modern India- Police Act of 1861- National Police Commission recommendations (NPC), 1979.Structure and Functioning of State and Central Police Organization. International Organizations. Arrest, Search, Seizer, Prohibition, Gambling, Narcotics and PITA.

UNIT – III CONSTITUTION OF INDIA:

Preamble, Fundamental Rights, Directive Principles of State Policy. – Articles 14, 15, 20, 21, 22, 51A.Indian Evidence Act: 32, 45, 46, 47, 57, 58, 60, 73, 135, 136, 137, 138, 141, 159.Criminal Procedure Code:53, 53A, 54, 291, 292, 293.311A.

UNIT – IV INDIAN PENAL CODE:

Offences against person: 299, 300, 302, 312, 304A, 304B, 306, 319, 320, 326, 339, 340, 351, 359, 362, 375, 376, 377. Offences against property: section 378, 383, 390, 391, 405, 415, 420, 441, 463, 471, 499, 503, and 511.

UNIT – V CONTEMPORARY FORMS OF CRIMES:

Narcotic Drugs and Psychotropic Substances Act. Drugs and Cosmetics Act. Explosive Substances Act. Arms Act. Dowry Prohibition Act. Prevention of Food

Adulteration Act. Prevention of Corruption Act. Wildlife Protection Act. Environment Protection Act. Untouchability Offences Act. Mental Health Act. I.T. Act. Prevention of damage to public property Act. Enactments for women and children.

UNIT - VI: CURRENT CONTOURS (for Continuous Internal Assessment Only):

Exposure to the following new legislations- Focus on salient features only: Narcotic, Drugs and Psychotropic Substances Act. Essential Commodity Act. Drugs and Cosmetics Act. Explosive Substances Act. Arms Act. Dowry Prohibition Act. Prevention of Food Adulteration Act. Prevention of Corruption Act. Wildlife Protection Act. I.T. Act. Environment Protection Act. Untouchability Offences Act

REFERENCES:

1. Dr. V. Krishnamachari, Law of Evidence, 7th Edition, S. Gogia & Company (2017)
2. (Chief Justice) M. Monir, Law of Evidence, 6th Edition, Universal Law Publishing Co. Pvt. Ltd., New Delhi (2002).
3. M. P Jain, Indian Constitutional Law, 8th Edition.
4. Takwani, Criminal Procedure, 3rd Edition (2011).
5. K D Gaur, Text Book on Indian Penal Code, 5th Edition (2015).
6. D. D Basu, Introduction to the Constitution of India, PHI

COURSE OUTCOMES:

- Gain knowledge about crime and its elements.
- Identify the various agencies involved in crime detection and prevention.
- Understand the structure of courts in India.
- Summarize process of Judicial Review.
- Understand the various sections and laws pertaining to Forensic Science.

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Third Year **CORE COURSE IX** **Semester VI**

FORENSIC BIOLOGY AND SEROLOGY

Code **(Theory)** **Credit: 5**

COURSE OBJECTIVES:

- The significance of biological and serological evidence.
- The Forensic importance of hair evidence.
- Collection and Packaging of biological evidences.
- The importance of biological fluids – blood, saliva, semen, sweat, urine, fecal stains and milk – in crime investigations.
- How Forensic entomology assists in death investigations.
- How wildlife Forensics aid in conserving natural resources.

UNIT – I BIOLOGICAL EVIDENCES:

Nature and importance of biological evidence. Collection and preservation of common biological evidences. Significance and origin 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. Importance of pollen grains, wood and diatoms in Forensic science.

UNIT – II BODY FLUIDS I:

Common body fluids. Composition and functions of blood. Collection and preservation of blood evidence. Distinction between human and non-human blood- Origin determination. Determination of blood groups. 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, urine, fecal stains, milk and vomit. Tests for their identifications.

UNIT – III BODY FLUIDS II:

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 – IV FORENSIC ENTOMOLOGY:

Basics of Forensic entomology. Insects of Forensic importance. Collection of entomological evidence during death investigations.

UNIT – V WILDLIFE FORENSICS:

Significance of Wildlife Forensics. Organizations involved. IUCN Red List Conservation Status- Extinct, Extinct in Wild, Critically Endangered,

Endangered, Vulnerable, Near Threatened, Least Concern. List of protected species in India. Illegal trading of wildlife items. Identification of Physical evidences pertaining to wildlife crime.

UNIT – VI CURRENT CONTOURS (for Continuous Internal Assessment Only):

Cellular antigens. ABO blood groups. Extracellular proteins and intracellular enzymes. Significance of genetic marker typing data. Sexual assault investigations.

REFERENCES:

1. J. M. Butler, Advanced Topics in Forensic DNA Typing, Academic Press, (2014).
2. Alan Gunn, Essential Forensic Biology, 2nd Edition, Wiley (2009)
3. L. Stryer, Biochemistry, 3rd Edition, W.H. Freeman and Company, New York (1988).
4. R.K. Murray, D.K. Granner, P.A. Mayes and V.W. Rodwell, Harper's Biochemistry, Appleton& Lange, Norwalk (1993).
5. S. Chowdhuri, Forensic Biology, BPRD, New Delhi (1971).
6. R. Saferstein, Forensic Science Handbook, Vol. III, Prentice Hall, New Jersey (1993).
7. 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).
8. W.G. Eckert and S.H. James, Interpretation of Bloodstain Evidence at Crime Scenes, CRC Press, Boca Raton (1989).
9. G.T. Duncan and M.I. Tracey in Introduction to Forensic Sciences, 2nd Edition, W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
10. T. Bevel and R.M. Gardner, Bloodstain Pattern Analysis, 3rd Edition, CRC Press, Boca Raton (2008).

COURSE OUTCOMES:

- Understand the general concepts and definitions used in Forensic Biology and serology.
- Understand the role of Forensic biologists in crime scene investigation.
- Locate and collect various types of biological evidences and also about the laboratory handling procedures of such evidence.
- Importance of Forensic Entomology and Wildlife Forensics.

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Third Year **CORE PRACTICAL VI** **Semester VI**

FORENSIC BIOLOGY AND SEROLOGY LAB

Code **(Practical)** **Credit: 4**

COURSE OBJECTIVES:

- To identify hair specimen.
- To examine and compare pollen grains and diatoms.
- To conduct tests for blood and other serological fluids.
- To analyze bloodstain patterns.

PRACTICAL'S:

1. To examine hair morphology and identify species.
2. To carry out microscopic examination of pollen grains.
3. To carry out microscopic examination of diatoms.
4. To carry out preliminary and confirmatory tests for blood.
5. To determine the blood group from fresh and dried blood stains.
6. To identify the given stain as saliva.
7. To identify the given stain as urine.
8. To identify various bloodstain patterns in a crime scene.
9. To prepare a case report on Wildlife Forensics.
10. To prepare a case report on Forensic Entomology.

COURSE OUTCOMES:

- Identify and examine hair and other biological evidences.
- Perform various tests to identify various biological samples.
- Gain skills to carry-out serological tests.
- Gain knowledge on the science of bloodstain pattern analysis.

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Third Year **MAJOR BASED ELECTIVE II** **Semester VI**

1) ECONOMIC OFFENCES

Code **(Theory)** **Credit: 4**

COURSE OBJECTIVES:

- 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 offences and their consequences.
- Steps involved in mitigating Economic crimes.

UNIT –I 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.

UNIT –II TYPOLOGY OF ECONOMIC CRIMES:

Insurance frauds. Corporate frauds. Bank frauds. Ponzi scheme. Pyramid scheme. Illicit trafficking in contraband goods. Credit card frauds. Illicit trafficking in arms. Illicit trafficking in explosives. Illicit drug trafficking. Trafficking in humans and organs. Cultural objects trafficking.

UNIT –III PREVENTION:

Prevention of Economic Offences, Legislations to deal with different forms of Economic offences. RBI Act. SEBI Act. Competition Commission of India Act.

UNIT –IV AGENCIES OF ENFORCEMENT

Role of NCRB, NCRB crime rates in India. Racketeering in employment. Racketeering in false travel documents.

UNIT – V FORENSIC ACCOUNTANCY

Forensic accountancy and forensic auditing. Valuation of economic losses. Violation of Intellectual Property Rights.

UNIT – VI CURRENT CONTOURS (for Continuous Internal Assessment Only):

Enforcement agencies to deal with different forms of economic offences. International perspectives – measures adopted by FBI and INTERPOL. Case histories of economic offences.

REFERENCES:

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

COURSE OUTCOMES:

- Understand Economic and financial terminologies.
- Gain knowledge on various types of Economic offences and their consequence.
- Prevention of Economic crimes.
- Identify crimes linked with Economic crimes in India.

Third Year **MAJOR BASED ELECTIVE II** **Semester VI**

2) BASICS OF FORENSIC PSYCHOLOGY

Code **(Theory)** **Credit: 4**

COURSE OBJECTIVES:

- The basic concepts of Psychology and its scope.
- The various perspectives of Psychology.
- The elements of brain and nervous system.
- The basics of cognitive processes.

UNIT – I BASIC CONCEPTS OF PSYCHOLOGY:

Definition, goals and scope of Psychology. Role of psychologist in society. Perspectives- Biological, Psychodynamic, Behaviouristic, Humanistic, Evolutionary and Cognitive. Subfields of Psychology. Scope of Forensic Psychology. Duties and responsibilities of Forensic Psychologist.

UNIT – II ELEMENTS OF BRAIN:

Nervous system- Introduction, Classification. Structure of brain and its parts. Significance of left and right brain. Structure and psychological importance in thought and language. Neurons- Structure, Neural impulse- generation and transmission, neurotransmitters and their function.

UNIT – III COGNITIVE PROCESSES:

Introduction to cognition. Sensation- Processes in sensation, types- receptors involved in each of the sensory modalities i.e., visual, auditory, gustatory, olfactory, tactile and others. Sensory adaptation. Sensory threshold, Absolute threshold, Weber's Law.

UNIT – IV PERSPECTIVES OF PSYCHOLOGY:

Attention- Introduction, definition, characteristics, selective and divided attention. Perception- Introduction, definition, Gestalt laws. Process of perception- Depth perception, constancy, movement. Correlated of perception- Awareness, motives, needs, illusion, sublimal perception and extra sensory perception.

UNIT –V CONCEPT OF INTELLIGENCE:

Thinking- Introduction, definition, theories- information processing theory, S-R theory, cognitive theory, simulation models. Types- free association, imaginal thought, reasoning, problem solving, decision making, creative thinking, concept formation, language. Intelligence- Introduction, definition, theories- factor theories, cognitive models of intelligence. Intelligence tests- characteristics and types. External and internal influences.

UNIT – VI CURRENT CONTOURS (for Continuous Internal Assessment Only):

Psychology and law. Ethical issues in forensic psychology. Assessment of mental competency. Mental disorders and forensic psychology. Psychology of evidence – eyewitness testimony, confession evidence. Criminal profiling. Psychology in the courtroom, with special reference to Section 84 IPC

REFERENCES:

1. Robert A. Baron, Psychology, Prentice Hall.
2. Feldman R.S, Understanding Psychology, McGraw Hill.
3. Wayne Weiten, Psychology – Themes and variations, Brooke/Cole Publishing Co.

COURSE OUTCOMES:

- Describe key concepts, principles and overarching themes in Psychology
- Develop a working knowledge of Psychology's content domains
- Describe applications of Psychology.
- Understand the basic concepts of brain and its components.

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Third Year **PROJECT** **Semester-VI**

Code: **Credit: 3**

The candidate shall be required to take up a Project Work by group or individual and submit it at the end of the final year. The Head of the Department shall assign the Guide who, in turn, will suggest the Project Work to the students in the beginning of the final year. A copy of the Project Report will be submitted to the University through the Head of the Department on or before the date fixed by the University.

The Project will be evaluated by an internal and an external examiner nominated by the University. The candidate concerned will have to defend his/her Project through a Viva-voce.

ASSESSMENT/EVALUATION/VIVA VOCE:

1. PROJECT REPORT EVALUATION (Both Internal & External)

   I. Plan of the Project - 20 marks

   II. Execution of the Plan/collection of Data / Organisation of Materials / Hypothesis, Testing etc. and presentation of the report. - 45 marks

   III. Individual initiative - 15 marks

2. Viva-Voce / Internal & External - 20 marks

TOTAL **- 100 marks**

PASSING MINIMUM:

	Vivo-Voce 20 Marks	**Dissertation 80 Marks**
Project	40% out of 20 Marks (i.e. 8 Marks)	40% out of 80 marks (i.e. 32 marks)

A candidate who gets less than 40% in the Project must resubmit the Project Report. Such candidates need to defend the resubmitted Project at the Viva-voce within a month. A maximum of 2 chances will be given to the candidate.

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Third Year **SKILL BASED ELECTIVE II** **Semester VI**

ACCIDENT INVESTIGATION

Code **(Theory)** **Credit: 2**

COURSE OBJECTIVES:

- The basic principle of motor vehicle accidents.
- The Forensic significance of tyre marks, skid marks and scuff marks.
- The various types of injuries resulting from accidents.
- The importance of Tachographs.

UNIT –I MOTOR VEHICLE ACCIDENTS ACCIDENT SCENE:

Sources of Forensic information. Eyewitness accounts, Locard's principle Extent of vehicle damage. Examination of vehicular lights, Visibility conditions. Photographs of accident site. Estimation of speed. Tyre marks, skid marks, scuff marks. Maintenance of vehicles. Abandoned vehicles. Importance of air bags. Railway accidents.

UNIT – II ACCIDENT ANALYSIS:

Pre-crash movement. Post-crash movement. Collision model. Gauging driver's reaction – Breathe analyzer, Occupant's kinematics. Types of injuries resulting from accident – Fake or real for clamming insurance. Hit and run investigations. Trace evidence at accident sites.

Unit – III Tachographs: Forensic significance:

Tachograph charts. Principles of chart analysis. Accuracy of speed record. Tyre slip effects. Falsification and diagnostic signals. Route tracing.

UNIT –IV: LEGAL PROCEDURE:

Legal requirements for accident investigations and control Accident reporting requirements and procedures

UNIT – V: THEORETICAL BASIS:

Accident causation theory: identifying root causes of accidents Collecting and analysing information

UNIT - VI: CURRENT CONTOURS (for Continuous Internal Assessment Only):

Interview techniques: taking statements from witnesses, Recommending and implementing preventative measures-Disclosure of information-Securing remedial action-Monitoring and review

COURSE OUTCOMES:

- Explain the key concepts in vehicle accident scenarios.

- Understand the range importance of and methods of accident analysis.
- Hands on experience on information collection from Witness/victims of accidents.
- Understand the importance of causation theories.

REFERENCES:

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

COURSE OUTCOMES:

- Differentiate between an accident and incident;
- Apply an understanding of the different steps of an investigation process;
- Describe the roles and responsibilities of an investigator;
- Detail the responsibilities of operators and other authorities within investigations;
- Apply appropriate methods and protocols by which to collect and analyse evidence within an investigation

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