THE ASSAM
ROYAL GLOBAL UNIVERSITY
— GUWAHATI —

ROYAL SCHOOL OF LIFE SCIENCES (RSLSC)

Department of Forensic Science

Course Structure & Syllabus
(Based on National Education Policy 2020)

For Undergraduate Programme

B.Sc. (H) IN FORENSIC SCIENCE
(4 Years Single Major)

WEF AY 2025-26

STRUCTURE OF THE SYLLABUS FOR 4 YEAR UG PROGRAMME

SCHOOL NAME   **- Royal School of Life Sciences**

DEPARTMENT NAME   **- Department of Forensic Science**

PROGRAMME NAME   **- B.Sc. (H) Forensic Science**

1st SEMESTER					
COMPONENT	**COURSE CODE**	**COURSE TITLE**	**LEVEL**	**CREDIT**	**L-T-P**
Major (Core)	FSC142M101	Introduction to Forensic Science	100	2	2-0-0
Major (Core)	FSC142M112	Introduction to Forensic Science (Practical)	100	1	0-0-2
Major (Core)	FSC142M103	Crime & Society	100	3	2-1-0
Minor	FSC142N101	Basic Forensic Biology	100	3	3-0-0
Interdisciplinary (IDC)	IKS992K101	Introduction to Indian Knowledge System - I	100	3	3-0-0
Ability Enhancement course (AEC)	CEN982A101	Communicative English - I	100	1	1-0-0
Ability Enhancement course (AEC)	BHS982A102	Behavioral Science - I	100	1	1-0-0
Skill Enhancement Course (SEC)	FSC142S101	Forensic Photography and Documentation	100	3	3-0-0
Value Added Course (VAC)	VAC - I	One Course from a Basket of Available Courses to be Selected	100	3	3-0-0
MOOCs	MOOCs - I	*MOOCs/online courses will be identified by the department from the list of courses available on the MOOCs online platform/SWAYAM portal	100	3	
TOTAL CREDIT FOR 1st SEMESTER				**23**	

2nd SEMESTER					
COMPONENT	**COURSE CODE**	**COURSE TITLE**	**LEVEL**	**CREDIT**	**L-T-P**

Major (Core)	FSC142M201	Criminal Law	100	3	3-0-0
Major (Core)	FSC142M202	Basics of Forensic Chemistry	100	2	2-0-0
Major (Core)	FSC142M213	Basics of Forensic Chemistry (Practical)	100	1	0-0-2
Minor	FSC142N201	Cyber Forensics	100	3	3-0-0
IDC	IKS992K201	Introduction to Indian Knowledge System - II	100	3	3-0-0
AEC	CEN982A201	Communicative English - II	100	1	1-0-0
AEC	BHS982A202	Behavioral Science - II	100	1	1-0-0
SEC	FSC142S201	Handwriting Identification and Recognition	100	2	2-0-0
SEC	FSC142S212	Handwriting Identification and Recognition (Practical)	100	1	0-0-2
VAC	VAC - II	One Course from a Basket of Available Courses to be Selected	100	3	3-0-0
MOOCs	MOOCs - II	*MOOCs/online courses will be identified by the department from the list of courses available on the MOOCs online platform/SWAYAM portal	100	3	
TOTAL CREDIT FOR 2nd SEMESTER				**23**	

3rd SEMESTER

COMPONENT	COURSE CODE	COURSE TITLE	LEVEL	CREDIT	L-T-P
Major (Core)	FSC142M301	Forensic Dermatoglyphics	200	3	2-1-0
Major (Core)	FSC142M312	Forensic Dermatoglyphics (Practical)	200	1	0-0-2
Major (Core)	FSC142M303	Forensic Physics	200	3	2-1-0
Major (Core)	FSC142M314	Forensic Physics (Practical)	200	1	0-0-2
Minor	FSC142N301	Crime Scene Investigation	200	4	4-0-0
IDC	FSC142I301	Fundamentals of Forensic Science	200	3	3-0-0

AEC	CEN982A301	Communicative English - III	200	1	1-0-0
AEC	BHS982A302	Behavioral Science - III	200	1	1-0-0
SEC	FSC142S301	Introduction to Digital Forensics	200	3	3-0-0
MOOCs	MOOCs - III	*MOOCs/online courses will be identified by the department from the list of courses available on the MOOCs online platform/SWAYAM portal	100	3	
TOTAL CREDIT FOR 3rd SEMESTER				**23**	

4th SEMESTER					
COMPONENT	**COURSE CODE**	**COURSE TITLE**	**LEVEL**	**CREDIT**	**L-T-P**
Major (Core)	FSC142M401	Forensic Psychology	200	4	3-1-0
Major (Core)	FSC142M402	Analytical Methods-I	200	4	3-1-0
Major (Core)	FSC142M403	Forensic Anthropology and Odontology	200	3	2-1-0
Major (Core)	FSC142M414	Forensic Anthropology and Odontology (Practical)	200	1	0-0-2
Minor	FSC142N401	Technical Methods	200	3	3-0-0
Minor	FSC142N402	Accident Investigation-Motor Vehicles	200	3	3-0-0
AEC	CEN982A401	Communicative English - IV	200	1	1-0-0
AEC	BHS982A402	Behavioral Science - IV	200	1	1-0-0
MOOCs	MOOCs - IV	*MOOCs/online courses will be identified by the department from the list of courses available on the MOOCs online platform/SWAYAM portal	100	3	
TOTAL CREDIT FOR 4th SEMESTER				**23**	

5th SEMESTER					
COMPONENT	**COURSE CODE**	**COURSE TITLE**	**LEVEL**	**CREDIT**	**L-T-P**
Major (Core)	FSC142M501	Forensic Toxicology	300	3	2-1-0
Major (Core)	FSC142M502	Forensic Biology	300	3	2-1-0

Major (Core)	FSC142M503	Questioned Document	300	3	2-1-0
Major (Core)	FSC142M514	Forensic Toxicology (Practical)	300	3	0-0-6
Minor	FSC142N501	Biometrics And Emerging Techniques	300	4	4-0-0
Project	FSC142M525	Research Project	300	4	
TOTAL CREDIT FOR 5th SEMESTER				**20**	

6th SEMESTER					
COMPONENT	**COURSE CODE**	**COURSE TITLE**	**LEVEL**	**CREDIT**	**L-T-P**
Major (Core)	FSC142M601	Analytical Methods-II	300	4	3-1-0
Major (Core)	FSC142M602	Forensic Ballistics	300	3	2-1-0
Major (Core)	FSC142M603	Molecular Forensics	300	3	2-1-0
Major (Core)	FSC142M614	Molecular Forensics (Practical)	300	3	0-0-6
Major (Core)	FSC142M605	Forensic Medicine and Medical Jurisprudence	300	3	2-1-0
Minor	FSC142N601	Forensic Linguistics	300	4	4-0-0
TOTAL CREDIT FOR 6th SEMESTER				**20**	

7th SEMESTER					
COMPONENT	**COURSE CODE**	**COURSE TITLE**	**LEVEL**	**CREDIT**	**L-T-P**
Major (Core)	FSC142M701	Forensic Entomology	400	4	3-1-0
Major (Core)	FSC142M702	Forensic Serology	400	4	3-1-0
Major (Core)	FSC142M703	Forensic Accounting and Auditing	400	4	3-1-0
Major (Core)	FSC142M714	Forensic Entomology and Serology (Practical)	400	4	0-0-8
Minor	FSC142N701	Forensic Pharmacology	400	4	4-0-0
TOTAL CREDIT FOR 7th SEMESTER				**20**	

8th SEMESTER					
COMPONENT	**COURSE CODE**	**COURSE TITLE**	**LEVEL**	**CREDIT**	**L-T-P**
Major (Core)	FSC142M801	Research Methodology	400	4	4-0-0
Minor	FSC142N801	Incident Response and Management	400	4	4-0-0
Project	FSC142M822	Project Dissertation	400	12	
TOTAL CREDIT FOR 8th SEMESTER				**20**	

Detailed Syllabus

SEMESTER – I

Paper Sl. No.	Paper - 1	Scheme of Evaluation	Theory
Name of the Course	Introduction to Forensic Science	**L-T-P-C**	2-0-0-2
Type of Course	Major/Core	**Credits Assigned**	2
Paper Code	FSC142M101	**Level of the Course**	100

Pre-requisite: Basic knowledge of biology, chemistry, physics (up to class 12), political science and history (up to class 10)

Course objective: To introduce and learn the basic concepts forensic science and its history, and to develop an idea about its organizational structure and functions and its components in India.

Course Outcome: After successful completion of the course, student will be able to		
CO	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**define** the concept of forensic science, learn the history, its scope, and applications.	BT1
CO2	**understand** the various organizations of forensic laboratory and agencies involved in crime detection and investigation	BT2
CO3	**construct** the knowledge of tools and technique related to forensic science.	BT3
CO4	**categorize** the different components and its importance in knowing the subject	BT4

Module	Course content	Lectures
I	**Concepts in forensic science:** Definition and scope of forensic science; Functions of Forensic Science; Evidence; classification of evidence: according to Indian Evidence Act, based on nature of evidence, class and individual evidence; Principles of forensic science; Frye Rule; Daubert Standards; Terminologies in forensic science: First responder, chain of custody, mahazaar, FIR and its types.	**11**
II	**History and development of Forensic Science:** Historical aspects of forensic science; Definitions and concepts in forensic science; Branches of Forensic Science, History and development of police Administration in India.	**11**

Module	Course content	Lectures
III	**Organizational set up of Forensic Science Laboratories in India**: Hierarchical set up of Central Forensic Science Laboratories, State Forensic Science Laboratories, Fingerprint Bureaus, National Crime Records Bureau, Police & Detective Training Schools, Bureau of Police Research & Development, Directorate of Forensic Science and Mobile Crime Laboratories. **Scene of Crime:** Definition of scene of crime, Types of scenes of crime- Indoor, Outdoor and mobile; Protection and Preservation of scene of crime - Videography, Photography, Sketching; Types of sketching, Searching methods and its types.	11
IV	**Quality Assurance and Ethics in Forensic Science:** Importance of quality assurance in forensic science; Laboratory accreditation and standards (e.g., ISO 17025), Ethical principles and codes of conduct in the forensic field ,. Overview of ethics in forensic science, Ethical considerations in testifying as an expert witness	11
Total		**44**

National Credit Hours for the course: 30 x 2 = 60 NCH

Distribution of Credits		
Lecture/ Tutorial	**Practicum**	**Experiential Learning**
44	0	16 Laboratory Visit, Field Trips, Group Work, Discussions, Presentations and Quiz

Suggested Readings:

Textbooks:

1. Introduction to Forensic Sciences (2nd Edition). CRC Press. James, S. H., Nordby, J. J., Bell, S. (2014).

2. Forensic Science in Crime Investigation. Asia Law House. S Nath, R. C. (2013). Forensic Science and Crime Investigation: Abhijeet Publications.

Reference Books:

1. Saferstein, R. (2017). Criminalistics: An Introduction to Forensic Science. Pearson.

Paper Sl. No.	Paper - 2	Scheme of Evaluation	Practical
Name of the Course	Introduction to Forensic Science (P)	**L–T–P–C**	0-0-2-1
Type of Course	Major/Core	**Credits Assigned**	1
Paper Code	FSC142M112	**Level of the Course**	100

Pre-requisite: Basic knowledge of biology, chemistry, physics (up to class 12), political science and history (up to class 10)

Course objective: To introduce and learn the basic concepts forensic science and its history, and to develop an idea about its organizational structure and functions and its components in India.

Course Outcome: After successful completion of the course, student will be able to		
CO	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**define** the concept of forensic science, learn the history, its scope, and applications.	BT1
CO2	**understand** the various organizations of forensic laboratory and agencies involved in crime detection and investigation	BT2
CO3	**construct** the knowledge of tools and technique related to forensic science.	BT3
CO4	**categorize** the different components and its importance in knowing the subject	BT4

Module No.	List Of Practical	Hours
I	1. How to write an FIR and types of FIR.	3
	2. The use if searching methods for crime scene (outdoor and indoor SOC)	4
II	3. Outdoor Crime scene Investigation (Accident)	4
	4. Indoor Crime scene Investigation (Murder)	4
III	5. Sketching and its types	3
	6. Collection, packing, labeling and forwarding of evidence.	3
IV	7. Introduction to Lab and Safety Protocols in Forensic Science Laboratory	4
	8. Preliminary Examination of unknown samples.	5
	Total	30

Paper Sl. No.	Paper - 3	Scheme of Evaluation	Theory
Name of the Course	Crime and Society	L-T-P-C	2-1-0-3
Type of Course	Major/Core	Credits Assigned	3
Paper Code	FSC142M103	Level of the Course	100

Course objective: The goal of the course is to help the students adopt the forensic professionalism philosophy. Students will learn about the importance of ethical issues in improving the criminal justice system. The ethical rules for researchers will help to raise the standard of study.

Course Outcome : After successful completion of the course, student will be able to		
CO	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**define** the importance of criminology and penology for crime detection.	BT1
CO2	**understand** the usage of the acts and laws pertaining to forensic science.	BT2
CO3	**apply** knowledge about theoretical perspectives on crime.	BT3
CO4	will be able to understand the **relationship** of crime and society.	BT4

Module	Course content	Lecture
I	**Introduction to Sociology of crime:** Definition and characteristics of crime in modern society, Causes of crime (social, economic, political, cultural, biological, atmospheric, geographical and other). Classification of crime and offences. **Types of crime and its causes:** Property crimes, public order crimes, violent crimes, cyber crimes, juvenile delinquency, Society-Criminal interaction and various types of crimes in India.	15
II	**Basics of Criminology:** Theories of criminal behavior-classical, positivist, sociological. Criminal anthropology. Criminal profiling. Understanding modus operandi. Investigative strategy. Role of media.	15
III	**Crime:** Hate crimes, organized crimes and public disorder, domestic violence and workplace violence; Sexual offence, Dowry and Dowry Death, White collar crimes, Juvenile delinquency. Social change and	15

	crime. Psychological Disorders and Criminality. Situational crime prevention. Drug addiction and crime.	
IV	**Criminal Justice System:** Broad components of criminal justice system. Policing styles and principles. Police's power of investigation. Filing of criminal charges. Community policing. Policing a heterogeneous society. Correctional measures and rehabilitation of offenders. Human rights and criminal justice system in India; Punishment and its types, Prison and its types.	15
	Total	**60**

National Credit Hours for the course: 30 x 3 = 90 NCH

Distribution of Credits		
Lecture/ Tutorial	Practicum	Experiential Learning
60	0	30 Laboratory Visit, Field Trips, Group Work, Discussions, Presentations and Quiz Doing case studies, assignments, quiz and brain storming sessions

Text Books:

1. Banshi Dhar Dwivedi; 'A - Z Criminology' Centrum Press, New Delhi, 2009

2. Chokalingam.K; Criminology (Tamil) Parvathi Printers, Chennai.

3. Amodh K.Kanth; Juvenile Justice: The Indian Context and Prayas Experiment 'Kumarappa Rockless Award Lecuture, Annyak Conference of the Indian Society of Criminology' , Chennai-2002.

Reference Books:

1. Hagan, F. E. (2017). Introduction to Criminology: Theories, Methods, and Criminal Behavior (9th ed.). SAGE Publications.

2. Konch, K. (2017). Crime and Society. Notion Press.

3. · Burke, R. H. (2018). An Introduction to Criminological Theory (5th ed.). Routledge.

4. · Lilly, J. R., Cullen, F. T., & Ball, R. A. (2018). Criminological Theory: Context and Consequences (7th ed.). SAGE Publications.

5. Siegel, L. J. (2021). Criminology: The Core (7th ed.). Cengage Learning.

6. Petersen, T. S. (2024). Ethics and Situational Crime Prevention. Routledge.

Paper Sl. No.	Paper - 4	Scheme of Evaluation	Theory
Name of the Course	Basic Forensic Biology	**L-T-P-C**	3-0-0-3
Type of Course	Minor	**Credits Assigned**	3
Paper Code	FSC142N101	**Level of the Course**	100

Course objective: The objective of this subject is to enable the students to develop the knowledge of basics of biology and its application.

Course Outcome : After successful completion of the course, student will be able to		
CO	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**define** the basics of biology and its uses in forensic science	BT1
CO2	**explain** the differences between plant, animal and microbes	BT2
CO3	**experiment with** various specimens and study them in detail.	BT3
CO4	**analyze** and **apply** the concept of genetics and inheritance in different living organisms	BT4

Module	Course content	Lecture
I	**Plant and Animal Biology:** Cell: Organelles and their Functions, Difference between Eukaryotic and Prokaryotic Cell, Difference between Plant and Animal Cell. Cell Division: Definition, Meiosis and Mitosis. Plants: Algae, Bryophyta, Pteridophyta and Gymnospermae; Animals: Non-chordates, chordates; Forensic aspects of Botany: Palynology and Limnology;	**15**
II	**Human Biology: Elementary tissues of the body:** epithelial, muscular; 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, skeletal.	**15**

III	**Microbiology:** Microbes; Bacteria: Classification; gram staining; diseases and prevention; Antibiotics; Virus: Classification; diseases and prevention; Fungi: Classification; diseases and prevention; Parasites: Classification; diseases and prevention; Beneficial microbes; Forensic aspects of Microbiology; Biological warfare.	**15**
IV	**Genetics and Inheritance:** Heredity and variation; Mendelian inheritance; Chromosomes and genes; Karyotyping: Banding techniques; DNA and RNA. Mt DNA: structure, types, Mutations-Polymorphism Significance in Forensic.	**15**
Total		**60**

National Credit Hours for the course: 30 x 3 = 90 NCH

Distribution of Credits		
Lecture/ Tutorial	**Practicum**	**Experiential Learning**
60	0	30 Laboratory Visit, Field Trips, Group Work, Discussions, Presentations and Quiz

Text Books:

1. Agarwal (2018). Modern textbook of Botany, Universal Publication. Ananthanarayanan (2017).

2. A textbook of Microbiology, The Orient Blackswan. Gennard, D. (2013).

3. Forensic entomology: an introduction. Wiley. Gunn. A (2006).

4. Essentials of Forensic Biology, Chichester: John Wiley & Sons, Ltd. Gunn, A. (2011).

4. Essential forensic biology. John Wiley & Sons. Pelczar. M, (2001). Microbiology, McGraw Hill Education.

Reference Books:

1. Saferstein, R (2004). Forensic Science Handbook; Vol; III; New Jersey; Prentice Hall.

2. Talwar. G. P (2002). Textbook of Biochemistry and Human Biology, Prentice Hall India Learning Private Limited.

3. Verma. P. S (2004). Cell Biology Genetics Molecular Biology Evolution and Ecology, S Chand.

SEMESTER – I

Paper Sl. No.	Paper - 5	**Scheme of Evaluation**	T&P

Name of the Course	Forensic Photography and Documentation	L-T-P-C	3-0-0-3
Type of Course	Skill Enhancement Course	Credits Assigned	3
Paper Code	FSC142S101	Level of the Course	100

Course objective: The objective of the course is to guide the students to enhance their hand skills with different photography techniques and documents.

Course Outcome : After successful completion of the course, student will be able to		
CO	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**remember** the basics of hand rendering techniques	BT1
CO2	**explain** key terminologies technically used in the field of photography**.**	BT2
CO3	**apply** different techniques through different situation/ cases	BT3
CO4	**analyze** different types of photographing techniques	BT4

Module	Course content	Lecture
I	**Optics**: Refraction and reflection, Total internal reflection, Lens combination, Interference, Polarization(introduction, Brewster's law, polarizer and analyzer), Diffraction and its types. Fiber optics(structure, classification, and application)	15
II	**Introduction to camera and photography**: Historical development of photography, significance and objective of utilizing photography in law Enforcement and Crime Investigation. Types of Subject Brightness. Basic terms, principles and concepts of photography. Types of camera and components of camera with use.	15
III	**Sketching and photographing methods**: Crime scene Photography, General Direction, over-all view, mid-range view, close-up view photography. Crime Scene Sketching. Photographs admissible in court.	15
IV	**Document Photography**: Basic Principles and techniques of black & white and color photograph. Specialized photography- UV, IR, transmitted light and side light photography, contact Photography, Microphotography, Photomicrography. Digital watermarking and digital imaging..	15
Total		**60**

National Credit Hours for the course: 30 x 3 = 90 NCH

Distribution of Credits		
Lecture/ Tutorial	**Practicum**	**Experiential Learning**
60	00	30 Laboratory Visit, Field Trips, Group Work, Discussions, Presentations and Quiz

Textbooks:

1. Miller, L. S., & Marin, L. (2015). Crime Scene Photography (3rd ed.). Anderson Publishing/Elsevier.

2. Robinson, E. M. (2016). Crime Scene Photography (3rd ed.). Academic Press.

3. Staggs, S. (2022). Crime Scene and Evidence Photography (4th ed.). Staggs Publishing.

4. Priziobela, S. (2022). Photography for The Crime Scene Investigator. CRC Press.

5. Fish, J. T., Miller, L. S., Braswell, M. C., & Wallace Jr., E. W. (2013). Crime Scene Investigation (3rd ed.). Routledge.

Reference Books:

1. Redsicker, D. R. (2000). The Practical Methodology of Forensic Photography (2nd ed.). CRC Press.

2. Scientific Working Group on Imaging Technology (SWGIT) Documents. (Various Years). Published by the FBI (and successor/related bodies like OSAC).

3. Bodziak, W. J., & Wertheim, K. (Eds.). (2017). Forensic Footwear Evidence (2nd ed.). CRC Press.

Paper Sl. No.	Paper - 1	Scheme of Evaluation	Theory
Name of the Course	Criminal Law	L-T-P-C	3-0-0-3
Type of Course	Major/Core	Credits Assigned	3
Paper Code	FSC142M201	Level of the Course	100

Prerequisite: Basic knowledge of biology of class XII.

Course objective: To provide the students with the knowledge of important laws pertaining to forensic science and the criminal justice system.

Course Outcome : After successful completion of the course, student will be able to		
CO	Course Outcome	Blooms Taxonomy Level
CO1	**remember** the constitution and Indian acts	BT1
CO2	**understand** laws related to forensic science	BT2
CO3	**apply** these laws while practicing in the field/labs	BT3
CO4	**appraise** the provisions of the Indian Penal Code with respect to the offences.	BT4

Modules	Course content	Lecture
I	**Law to Combat Crime I:** Classification – civil, criminal cases. Essential elements of crime; Constitution and hierarchy of criminal courts. Definitions of- IPC, CrPC, IEA. Criminal Procedure Code(CrPC) Cognizable and non-cognizable offences. Bailable and non-bailable offences. Sentences which the court of Chief Judicial Magistrate may pass. Summary trials – Section 260(2). Judgements in abridged forms – Section 355.	**15**
II	**Law to Combat Crime II**: Indian Penal Code pertaining to offences against persons (life) – Sections 121A, 299, 300, 302, 304A, 304B, 307, 309, 319, 320, 324, 326, 351, 354, 359, 362. Sections 375 & 377 and their amendments. Indian Penal Code(IPC) pertaining to offence against property Sections – 378, 383, 390, 391, 405, 415, 420, 441, 463, 489A, 497,	**15**

	499, 503, 511. Indian Evidence Act – Evidence and rules of relevancy in brief. Expert witness. Cross examination and re-examination of witnesses. Article 32, 45, 46, 47, 57, 58, 60, 73, 135, 136, 137, 138, 141. Section 293 in the code of criminal procedure. Witness and its types.		
III	**Constitution of India**: Preamble, Fundamental Rights, Directive Principles of State Policy. – Articles 14, 15, 20, 21, 22, 51A. FIR, Panchnama, Inquest(Police and magistrate) , Dying declaration, Dying deposition, Sub-poena(summons).	15	
IV	**Acts Pertaining to Socio-economic and Environmental Crimes:** 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	15	
Total		**60**	

National Credit Hours for the course: 30 x 3 = 90 NCH

Distribution of Credits		
Lecture/ Tutorial	Practicum	Experiential Learning
60	0	30 Laboratory Visit, Field Trips, Group Work, Discussions, Presentations and Quiz

Text Books:

1. D.A. Bronstein, Law for the Expert Witness, CRC Press, Boca Raton (1999).

2. Vipa P. Sarthi, Law of Evidence, 6th Edition, Eastern Book Co., Lucknow (2006).

3. A.S. Pillia, Criminal Law, 6th Edition, N.M. Tripathi Pvt Ltd., Mumbai (1983).

Reference Books:

1. R.C. Nigam, Law of Crimes in India, Volume I, Asia Publishing House, New Delhi (1965).

5. (Chief Justice) M. Monir, Law of Evidence, 6th Edition, Universal Law Publishing Co. Pvt. Ltd., New Delhi (2002).

SEMESTER – II

Paper Sl. No.	Paper - 2	Scheme of Evaluation	Theory
Name of the Course	Basics of Forensic Chemistry	**L-T-P-C**	2-0-0-2
Type of Course	Major/Core	**Credits Assigned**	2

Paper Code	FSC142M202	Level of the Course	100

Course objective: To introduce the students to the basic concepts of chemistry and forensic chemistry.

Course Outcome : After successful completion of the course, student will be able to		
CO	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**rememb**er the use of chemicals and chemistry.	BT1
CO2	**understand** the use of chemistry in examination of various evidences	BT2
CO3	**examining** . the different petroleum products and explosive Substances	BT3
CO4	**distinguishing** the concept of alcoholic and non-alcoholic beverages in solving various crimes/cases	BT4

Modules	Course content	Lecture
I	**Structure of atom**: Quantum and wave mechanical approaches to the structure of atom, **Periodic classification and Properties**: (a)Mendeleev, Modern, Extended and long form. (b) Periodic properties: Atomic and ionic radii, crystal co-ordination no., Radius ratio, factors influencing magnitude of ionic radii. Periodic variations of atomic and ionic radii. Ionization energy, electron affinity and electro-negativity. : **Structure of Organic Molecules**: Electronic theory of bonding. Wave mechanical model of Atom and Chemical bonding. Atomic Orbital theory, Nature and types of Covalent bond. Hybridization. Electro negativity Polarity Resonance. Hydrogen bonding..	11
II	**Petroleum and Petroleum Products:** Introduction to Petroleum Products, Properties,Distillation and fractionation of petroleum. Commercial uses of different petroleum fractions. Analysis of petroleum products. Analysis of traces of petroleum products in forensic exhibits. Comparison of petroleum products. Adulteration of petroleum products. **Phenolphthalein in trap case**: Chemistry and Forensic examination of Phenolphthalein used in Bribe trap cases, and related legal issues.	11
III	**Analysis of beverages:** Classification of beverages, Fermented and Distilled methods, Analysis of Beverages: Alcoholic and non-alcoholic beverages and their composition, Characteristics of Beer, wines and Whisky, Congeners in alcoholic beverages, Analysis of alcoholic beverages as per BIS and PFA Act. Distinction between licit and illicit liquors.	11
IV	**Fire and Arson:** Light and Flame, Chemistry of Fire, Combustion reaction, Fire Triangle, Fire Tetrahedron; Backdraft, Thermo-chemistry of Fire, Heat Capacity and Phase changes, Accelerants & types of accelerants, Combustible and Flammable liquids, Flash point, Fire point, Ignition point, Auto Ignition point, vapour density, vapour pressure, Fire extinguisher. Conditions for fire, Fire scene patterns.	11

		Location of point of ignition. Recognition of type of fire. Searching the fire scene. **Arson:** Legal Definition, Arson motives, Degrees of Arson, Collection and preservation of arson evidence. Analysis of fire debris and ignitable liquid residue. Post-flashover burning. Scientific investigation and evaluation of clue materials. Information from smoke staining.	
	Total		**44**

National Credit Hours for the course: 30 x 3 = 90 NCH

Distribution of Credits		
Lecture/ Tutorial	Practicum	Experiential Learning
60	0	30 Laboratory Visit, Experimenting, Group Work, Discussions, Presentations and Quiz

Textbooks:

1. Bell, S. (2018). Forensic Chemistry (3rd ed.). Pearson.

2. Jackson, A. R. W., & Jackson, J. M. (2016). Forensic Science (4th ed.). Pearson.

3. Siegel, J. A., & Mirakovits, K. (2015). Forensic Science: The Basics (3rd ed.). CRC Press.

4. Johll, M. E. (2021). Forensic Chemistry: Fundamentals and Applications. Jones & Bartlett Learning.

5. Khan, J. I., Kennedy, T. J., & Christian Jr., D. R. (2012). Basic Principles of Forensic Chemistry. Humana Press.

Reference Books:

1. Saferstein, R. (Ed.). (Various Years, e.g., 2009 for Vol 1-3 of Forensic Science Handbook series). Prentice Hall / CRC Press.

2. ·Tebbett, I. (Ed.). (2007). Forensic Chemistry. Humana Press.

3. Meyers, R. A. (Ed.). (2000). Encyclopedia of Analytical Chemistry: Applications, Theory, and Instrumentation. Wiley.

4. Moffat, A. C., Osselton, M. D., & Widdop, B. (Eds.). (2011). Clarke's Analysis of Drugs and Poisons (4th ed.). Pharmaceutical Press.

5. Lurie, I. S., & Wittwer Jr., J. D. (Eds.). (1983). High-Performance Liquid Chromatography in Forensic Chemistry. Marcel Dekker.

6. Yinon, J., & Zitrin, S. (1993). Modern Methods and Applications in Analysis of Explosives. John Wiley & Sons.

7. De Forest, P. R., Gaensslen, R. E., & Lee, H. C. (1983). Forensic Science: An Introduction to Criminalistics. McGraw-Hill.

SEMESTER – II

Paper Sl. No.	Paper - 3	Scheme of Evaluation	Practical
Name of the Course	Basics of Forensic Chemistry (P)	**L-T-P-C**	0-0-2-1
Type of Course	Major/Core	**Credits Assigned**	1
Paper Code	FSC142M213	**Level of the Course**	100

Course objective: To introduce the students to the basic concepts of chemistry and forensic chemistry.

Course Outcome : After successful completion of the course, student will be able to		
CO	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**remembe**r the use of chemicals and chemistry.	BT1
CO2	**understand** the use of chemistry in examination of various evidences	BT2
CO3	**examining** . the different petroleum products and explosive Substances	BT3
CO4	**distinguishing** the concept of alcoholic and non-alcoholic beverages in solving various crimes/cases	BT4

Module No.	List Of Practical	Hours
I	1. To study the boiling and melting points of different petroleum products. 2. To identify the dyes present in Petroleum products using TLC.	4 4
II	3. Characterization and analysis of adulteration of Petroleum products. 4. Identifying the bribe and trap cases with help of phenolphthalein	4 4
III	5. Learning the chemistry of fire	4
IV	6. Examination of ethanol. 7. Examination of methanol.	5 5
	Total	30

Textbooks:

1. Bell, S. (2018). Forensic Chemistry (3rd ed.). Pearson.

2. Tauk, J. S. (2023). Practical Forensic Analytical Chemistry. Notion Press.

3. Jehn-Rendu, C., & Inman, K. (2023). The Forensic Chemist's Companion: A condensed handbook for the modern forensic chemist. Independently published.

4. Stauffer, E., Dolan, J. A., & Newman, R. (2008). Fire Debris Analysis. Academic Press.

5. Jackson, A. R. W., & Jackson, J. M. (2016). Forensic Science (4th ed.). Pearson.

Reference Books:

1. Saferstein, R. (Ed.). (Various Years, e.g., 2009 for Vol 1-3 of Forensic Science Handbook series). Prentice Hall / CRC Press.

2. Meyers, R. A. (Ed.). (2000). Encyclopedia of Analytical Chemistry: Applications, Theory, and Instrumentation. Wiley.

3. Tebbett, I. (Ed.). (2007). Forensic Chemistry. Humana Press (Now part of Springer).

4. Moffat, A. C., Osselton, M. D., & Widdop, B. (Eds.). (2011). Clarke's Analysis of Drugs and Poisons (4th ed.). Pharmaceutical Press.

5. Official Methods of Analysis of AOAC INTERNATIONAL. (Current Edition). AOAC International.

6. ASTM International Standards. (Various Years). ASTM International.

7. United Nations Office on Drugs and Crime (UNODC). (Various Years). Manuals and Guidelines for a Forensics Laboratory. UNODC.

SEMESTER – II

Paper Sl. No.	Paper - 4	Scheme of Evaluation	Theory
Name of the Course	Cyber Forensics	L-T-P-C	3-0-0-3
Type of Course	Minor	Credits Assigned	3
Paper Code	FSC142N201	Level of the Course	100

Course objective: To enable learner to understand, explore and acquire a critical understanding about Cyber Law. To develop competencies for dealing with frauds and deceptions (Confidence Tricks, Scams) and other Cyber Crimes e.g., Child Pornography etc. that are taking place via the internet.

Course Outcome : After successful completion of the course, student will be able to

CO	Course Outcome	Blooms Taxonomy Level
CO1	**remember** the basics of computer science in daily world	BT1
CO2	**understand** the characteristics, properties, potential of cyber space.	BT2
CO3	develop the understanding of relationship between forensic science and cyberspace and **illustrate** the impact of it.	BT3
CO4	**analyze** the in-depth knowledge of Information Technology Act and Legal Frame Work of Right To Privacy, Piracy, Data Security and Data Protection	BT4

Module	Course content	Lecture
I	**Introduction to the Course:** The Development of Information and Communication Technology (ICT) and Social Change; Definition of Cyber Crime and its Position in the Crime Typology; Key Concepts in the Course, i.e. Information Technology, Information System, Information Society, and Cybercrime	15
II	Relation and Impact of the Development of ICT on the Emergence of Cyber Crime: Relation and Impact of the Development of e-Business and e-Commerce on the Emergence of Cyber Crime; Relation and Impact of the Development of Hardware, Software, and Data Resources on the Emergence of Cyber Crime; Relation and Impact of the Development of Telecommunication, Network, and the Internet on the Emergence of Cyber Crime	15
III	Classification of computer crimes, computer virus and types, computer worms, Trojan Horse, trap door, super zapping, logic bomb, salami logic, characteristics of computer crime and criminals.; Criminological Theories which Explain Cyber Crime; Computer Fraud; Hacktivism; Cyberpornography	15
IV	**Computer Forensics**: Introduction, Nature of digital evidence, Sources of digital evidence, Retrieval and analysis of digital evidence, Computer security and its relationship to computer forensicsHate Crimes and Cyberterrorism, Piracy, Cyberstalking, Privacy Violation, and Identity Theft, Prevention of the Cyber Crime, Policing the Cyber Crime,	15
	Total	60

National Credit Hours for the course: 30 x 3 = 90 NCH

Distribution of Credits		
Lecture/ Tutorial	Practicum	Experiential Learning

| 60 | 00 | 30 |
| | | Discussions, Presentations and Quiz |

Textbooks:

1. Nelson, B., Phillips, A., & Steuart, C. (2019). Guide to Computer Forensics and Investigations (6th ed.). Cengage Learning.

2. Prosise, C., Mandia, K., & Pepe, M. (2003). Incident Response and Computer Forensics (2nd ed.). McGraw-Hill Osborne Media.

3. Casey, E. (2011). Digital Evidence and Computer Crime: Forensic Science, Computers, and the Internet (3rd ed.). Academic Press.

4. Maras, M.-H. (2021). Cybercriminology (2nd ed.). Oxford University Press.

5. Vacca, J. R. (2023). System Forensics, Investigation, and Response (4th ed.). Jones & Bartlett Learning.

6. Mohay, G., Anderson, A., Collie, B., de Vel, O., & McKemmish, R. (2003). Computer and Intrusion Forensics. Artech House.

Reference Books:

1. Siegel, Larry J. (2016). Criminology: Theories, Patterns, and Typologies (12th Ed.). Cengage Learning.

2. Clough, Jonathan. (2010). Principles of Cybercrime. Cambridge University Press.

3. Yar, Majid. (2006). Cybercrime and Society. Sage Publications Ltd.

SEMESTER – II

Paper Sl. No.	Paper - 5	Scheme of Evaluation	Theory
Name of the Course	Handwriting Identification And Recognition	**L-T-P-C**	2-0-0-2
Type of Course	Skill Enhancement Course	**Credits Assigned**	2
Paper Code	FSC142S201	**Level of the Course**	100

Course objective: To impart the knowledge on the importance of examining questioned documents in crime cases, tools required for examination of questioned documents, the significance of comparing hand writing samples and understand the importance of detecting frauds and forgeries by analyzing questioned documents.

Course Outcome : After successful completion of the course, student will be able to		
CO	Course Outcome	Blooms Taxonomy Level
CO1	**learn** the basic characteristics of handwriting recognition	BT1
CO2	**understand** the characteristics, properties, physical and visual potential of film and photography	BT2
CO3	**apply** learnt concepts to their work and apply different steps followed in handwriting recognition	BT3
CO4	**analyze** and apply the theoretical knowledge of handwriting knowledge in questioned document examination	BT4

Module	Course content	Lecture
I	**Handwriting identification:** Basis of handwriting identification. Development of Individuality in Handwriting Comparison of Handwriting: Natural Variations, Characteristics of handwriting-scope and application. Class and individual characteristics. Arrangement, alignment, margin, slant, speed, pressure, spacing, line quality, embellishments, movement and pen lifts. Factors influencing handwriting- physical, mechanical, genetic and physiological.	15
II	**Handwriting Examination:** Basis of handwriting comparison. Collection of handwriting samples. Forgery and its types and characteristics, identification and examination of forgeries, Counterfeiting. Examination of altered and erased documents. Tools used in handwriting examination. **Decipherment of secret indented and charred documents**: Preservation of documents, Examination of seal and other mechanical impressions, examination of sequence of intersecting of strokes. Standards for Comparison and Disguise etc.	15
III	**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.	15
IV	**Basic tools for examination of Documents:** Application of Basic tools for the examination of Questioned document, Ultraviolet, Visible and Fluorescence Spectroscopy, Stereo-zoom Microscopy, Photomicrography, Microphotography. Video Spectral Comparator, Electrostatic Detection Apparatus.	15
Total		**60**

National Credit Hours for the course: 30 x 3 = 90 NCH

Distribution of Credits		
Lecture/ Tutorial	Practicum	Experiential Learning

60	0	30
		Discussions, Presentations and Quiz, Case Solving

TEXTBOOKS & REFERENCE BOOKS:

1. O. Hilton, Scientific Examination of Questioned Documents, CRC Press, Boca Raton (1982).

2. 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).

3. Albert S. Osborn; Questioned Documents, 2nd Ed., Universal Law Pub., Delhi.

SEMESTER – II

Paper Sl. No.	Paper - 6	Scheme of Evaluation	Practical
Name of the Course	Handwriting Identification And Recognition (P)	**L-T-P-C**	0-0-2-1
Type of Course	Skill Enhancement Course	**Credits Assigned**	1
Paper Code	FSC142S212	**Level of the Course**	100

Course objective: To impart the knowledge on the importance of examining questioned documents in crime cases, tools required for examination of questioned documents, the significance of comparing hand writing samples and understand the importance of detecting frauds and forgeries by analyzing questioned documents.

Course Outcome : After successful completion of the course, student will be able to		
CO	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**learn** the basic characteristics of handwriting recognition	BT1
CO2	**understand** the characteristics, properties, physical and visual potential of film and photography	BT2
CO3	**apply** learnt concepts to their work and apply different steps followed in handwriting recognition	BT3
CO4	**analyze** and apply the theoretical knowledge of handwriting knowledge in questioned document examination	BT4

Module No.	List Of Practical	Hours
I	1. Identification of Handwriting Individual Characteristics 2. Comparison of handwritings. 3. Study of natural variations and fundamental divergences in handwriting.	3 3 3
II	4. Detection of Simulated forgery. 5. Detection of traced forgery.	3 3
III	6. Decipherment of Secret handwriting 7. Study of Disguise in handwriting.	3 3
IV	8. Case study 1 9. Case study 2 10. Case Study 3	3 3 3
	Total	30

Textbooks:

1. Huber, R. A., & Headrick, A. M. (1999). Handwriting Identification: Facts and Fundamentals. CRC Press.

2. Morris, R. (2020). Forensic Handwriting Identification: Fundamental Concepts and Principles (3rd ed.). Academic Press.

3. Levinson, J. (2001). Questioned Documents: A Lawyer's Handbook. Academic Press. (While for lawyers, it often covers fundamental examination principles relevant for practical understanding).

4. Hilton, O. (1992). Scientific Examination of Questioned Documents (Revised ed.). CRC Press. (A classic, foundational text).

5. Koppenhaver, K. M. (2007). Forensic Document Examination: Principles and Practice. Humana Press.

Reference Books:

1. Kelly, J. S., & Lindblom, B. S. (2006). Scientific Examination of Questioned Documents (2nd ed., S. G. Rilett Ed.). CRC Press. (Often seen as a standard reference work).

2. Ellen, D. (2018). Scientific Examination of Documents: Methods and Techniques (4th ed.). CRC Press.

3. Sareen, V., & Kumar, A. (Eds.). (2020). Modern Trends in Questioned Document Examination. Notion Press.

4. Conway, J. V. P. (1959). Evidential Documents. Charles C. Thomas Publisher. (An older, but still referenced work for principles).

5. Harrison, W. R. (1958). Suspect Documents: Their Scientific Examination. Sweet & Maxwell. (A foundational reference).

6. ASTM International Standards. (Various Years). E444 Standard Guide for Scope of Work of Forensic Document Examiners, E2290 Standard Guide for Examination of Handwritten Items, and others related to forensic document examination. ASTM International.

7. Plamondon, R., & Srihari, S. N. (2000). Online and off-line handwriting recognition: A comprehensive survey. IEEE Transactions on Pattern Analysis and Machine Intelligence, 22(1), 63-84. (For the "recognition" aspect, if leaning towards computational methods, this survey is a key reference).

8. Nielson, D. M. (2020). Scientific Analysis of Questioned Documents. CRC Press.

Paper Sl. No.	Paper - 1	Scheme of Evaluation	Theory
Name of the Course	Forensic Dermatoglyphics	L-T-P-C	2-1-0-3
Type of Course	Major/Core	Credits Assigned	3
Paper Code	FSC142M301	Level of the Course	200

Course objective: The objective of this course is to impart complete knowledge to students regarding the various aspects of Forensic dactyloscopy. The importance of development, collection, preservation fingerprints and other impressions encountered at a crime scene.

	Course Outcome : After successful completion of the course, student will be able to	
CO	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**define** fingerprints and other prints.	BT1
CO2	**understand** the importance of collection and analysis of fingerprints and other prints.	BT2
CO3	**acquire** knowledge of the development and collection methods of different variety of prints found at scene of crime.	BT3
CO4	**analyse** and compare the samples of different types of prints.	BT4

Modules	Course content	Lecture Hours
I	**Basics of Fingerprinting**: Introduction and with special reference to India. Biological basis of fingerprints. Formation of ridges. Fundamental principles of fingerprinting, ridge counting, ridge tracing, ridge characteristics.	**15**
II	**Fingerprint characteristics/ minutiae**: Types of fingerprint pattern, characteristics/ minutiae of fingerprints, plain rolled fingerprints. Classification of fingerprints- Henry's system, Secondary classification, sub- secondary classification, final classification and key classification.	**15**
III	**Development of Fingerprints**: sweat and its composition, types of fingerprints, development of fingerprints (physical and chemical). Application of light sources in fingerprint detection. Preservation of developed fingerprints. Modern methods of fingerprinting, Automated Fingerprint Identification System.	**15**

IV	**Other prints/ impressions**: Introduction to prints/ impressions, Importance of footprints. Gait pattern and gait pattern analysis. Collection, tracing, lifting and casting of footprints, Palm prints, Lip prints, forensic examination of lip prints, Ear prints and their significance.	15
	Total	**60**

Notional Credit Hours for the course = 30 x 3 = 90

Distribution of Credits		
Lecture/ Tutorial	**Practicum**	**Experiential Learning**
60	0	30 Laboratory Visit, Experimenting,Group Work, Discussions, Presentations and Quiz

Suggested Readings

1.J.E. Cowger, Friction Ridge Skin, CRC Press, Boca Raton (1983).

2. D.A. Ashbaugh, Quantitative-Qualitative Friction Ridge Analysis, CRC Press, Boca

Raton (2000).

3. C. Champod, C. Lennard, P. Margot an M. Stoilovic, Fingerprints and other Ridge Skin

Impressions, CRC Press, Boca Raton (2004).

4. Lee and Gaensleen's, Advances in Fingerprint Technology, 3rd Edition, R.S.

Ramotowski (Ed.), CRC Press, Boca Raton (2013).

SEMESTER – III

Paper Sl. No.	Paper - 2	**Scheme of Evaluation**	Practical
Name of the Course	Forensic Dermatoglyphics (P)	**L-T-P-C**	0-0-2-1
Type of Course	Major/Core	**Credits Assigned**	1
Paper Code	FSC142M312	**Level of the Course**	200

Course objective: To introduce the students to the basic concepts of Forensic Dermatoglyphics and other prints importance.

Course Outcome : After successful completion of the course, student will be able to		
CO	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**define** types of fingerprints	BT1
CO2	**understand** the importance of collection, preservation of fingerprints.	BT2
CO3	**identify** different types of fingerprints prints based on class and individual characteristics.	BT3
CO4	**analyse** fingerprints and other prints such lip prints, footprints and ear prints.	BT4

Module	Course content	Lecture Hours
I	1. To record plain and rolled fingerprints 2. To conduct Primary classification of fingerprint. 3. To conduct physical methods of fingerprint detection (powder method)	7
II	4. To conduct chemical methods of fingerprint detection 5. Comparison of fingerprints by class and individual characteristics 6. To use different light sources for enhancing developed fingerprints	8
III	7. To prepare cast of foot prints 8. To prepare cast of shoe print 9. Development and lifting of latent fingerprints using fluorescent powder on colourful surface	7
IV	10. Collection and comparison of palm prints. 11. Comparison and identification of lip prints. 12. Case study on fingerprint identification.	8
Total		30

Notional Credit Hours for the course = 30 x 1 = 30

Distribution of Credits		
Lecture/ Tutorial	**Practicum**	**Experiential Learning**
0	30	0 Laboratory Visit, Experimenting,Group Work, Discussions, Presentations and Quiz

Textbooks:

1. Cowger, J. F. (1983). Friction Ridge Skin: Comparison and Identification of Fingerprints. Elsevier Science Publishing Co.

2. Champod, C., Lennard, C. J., Margot, P. A., & Stoilovic, M. (2004). Fingerprints and Other Ridge Skin Impressions. CRC Press.

3. Jain, A. K., Flynn, P., & Ross, A. A. (Eds.). (2007). Handbook of Biometrics. Springer.

4. Bridges, B. C. (1942). Practical Fingerprinting. Funk & Wagnalls Company.

5. Moenssens, A. A. (1971). Fingerprint Techniques. Chilton Book Company.

Reference Books:

1. Scientific Working Group on Friction Ridge Analysis, Study and Technology (SWGFAST) Documents. (Various Years). (Available through forensic science organization archives, e.g., The International Association for Identification (IAI) or OSAC).

2. Ashbaugh, D. R. (1999). Quantitative-Qualitative Friction Ridge Analysis: An Introduction to Basic and Advanced Ridgeology. CRC Press.

3. Cummins, H., & Midlo, C. (1961). Finger Prints, Palms and Soles: An Introduction to Dermatoglyphics. Dover Publications.

4. Lee, H. C., & Gaensslen, R. E. (Eds.). (2001). Advances in Fingerprint Technology (2nd ed.). CRC Press.

5. The Federal Bureau of Investigation (FBI). (Various Years). The Science of Fingerprints: Classification and Uses. U.S. Government Printing Office.

6. Interpol. (Various Years). Interpol Guide to Fingerprint Identification. (And other relevant fingerprint publications by Interpol).

SEMESTER – III

Paper Sl. No.	Paper - 3	Scheme of Evaluation	Theory
Name of the Course	Forensic Physics	**L-T-P-C**	2-1-0-3
Type of Course	Major/Core	**Credits Assigned**	3
Paper Code	FSC142M303	**Level of the Course**	200

Course objective: The course aims to provide the students with knowledge of types of glass and their composition. It aims to impart forensic aspects of fibre examination and examination of tool marks. It will help the students to better understand the physical evidence, its importance and application of different examination for various evidence.

Course Outcome : After successful completion of the course, student will be able to		
CO	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**define** concept of Forensic Physics and its importance in forensic science.	BT1
CO2	**compare** various glass sample and its importance in forensic science.	BT2
CO3	**apply** various techniques used in examination of physical evidence	BT3
CO4	**categorize** and classify various tool marks and patterns.	BT4

Module	Course content	Lecture
I	**Glass:** Composition of glass and types of glasses-soda-lime, boro-silicate, safety glass, laminated, light sensitive, tampered / toughened, wire glass, coloured glass. Matching and comparison of glass. Forensic examinations of glass fractures, rib marks, hackle marks, cone fracture, wavy, backward fragmentation, concentric and radial fractures.	14
II	**Paint evidence:** collection, packaging and preservation. Analysis by destructive and nondestructive methods. Importance of paint evidence in hit and run cases. Fiber evidence – artificial and man-made fibres. Collection of fiber evidence. Identification and comparison of fibres.	16
III	**Soil:** its types and composition of soil, sample preparation, removal of contaminants, colour, molecular particle size distribution, turbidity test, pH, microscopic examination. **Fibers:** artificial and man- made fibres. Collection of fibre evidence. Identification and comparison of fibres.	15
IV	**Tool marks:** Types of tool marks compression marks, striated marks, combination of compression and striated marks, repeated marks, class characteristics and individual characteristics, tracing and lifting of marks. Collection, preservation and matching of tool marks.	15
Total		**60**

Notional Credit Hours for the course = 30 x 3 = 90

Distribution of Credits		
Lecture/ Tutorial	**Practicum**	**Experiential Learning**
60	0	30

		Discussions, Presentations and Quiz, Case Solving

TEXTBOOKS & REFERENCE BOOKS:

1. Caddy, B; Forensic Examination of Glass and Paint Analysis and Interpretation, CRC Press, New York, 2001.

2. Shaw, D; Physics in the Prevention and Detection of Crime, Contem Phys.Vol.17, 1976.

3. Saferstein, R; Forensic Science Handbook. Vol.I,II, (Ed.), Prentice Hall, New Jersey, 1988.

4. Working Procedure Manual; Physics BPR&D Publication, 2000.

5. Sharma, B.R; Forensic Science in Criminal Investigation and Trials(3rdEd.), Universal Law Publishing Co., New Delhi, 2001.

SEMESTER – III

Paper Sl. No.	Paper - 4	Scheme of Evaluation	Practical
Name of the Course	Forensic Physics (P)	**L-T-P-C**	0-0-2-1
Type of Course	Major/Core	**Credits Assigned**	1
Paper Code	FSC142M314	**Level of the Course**	200

Course objective: It will help the students to better understand the physical evidence, its importance and application of different examination for various evidence.

Course Outcome : After successful completion of the course, student will be able to		
CO	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**define** concept of Forensic Physics and its importance in forensic science.	BT1
CO2	**compare** various glass sample and its importance in forensic science.	BT2
CO3	**apply** various techniques used in examination of physical evidence	BT3
CO4	**categorize** and classify various tool marks and patterns.	BT4

Module	Course content	Lecture Hours

I	1. General comparison of soil. 2. Density gradient analysis of soil sample. 3. Comparison of identity of small glass pieces by flotation method.	07
II	4. Determination of refractive index of glass. 5. Restoration of erased identification mark. 6. Comparison of strings/ threads/ ropes.	08
III	7. Physical and chemical analysis of paint samples. 8. Comparison of tool marks. 9. Comparison of paint chips under microscope.	07
IV	10. Microscopic examination of various fibers. 11. Physical matching of broken pieces of different object. 12. Case study.	08
Total		30

Notional Credit Hours for the course = 30 x 1 = 30

Distribution of Credits		
Lecture/ Tutorial	**Practicum**	**Experiential Learning**
0	30	0 Laboratory Visit, Experimenting,Group Work, Discussions, Presentations and Quiz

Textbooks:

1. Krauss, T. C. (2018). Forensic Gcse Science: The Practical Guide. CreateSpace Independent Publishing Platform.
2. Walker, J. S. (2016). Physics (5th ed.). Pearson. (A general physics textbook, but chapters on mechanics, optics, and materials are foundational for forensic applications).
3. James, S. H., & Nordby, J. J. (Eds.). (2005). Forensic Science: An Introduction to Scientific and Investigative Techniques (2nd ed.). CRC Press. (Contains chapters relevant to forensic physics applications).
4. Siegel, J. A., Saukko, P. J., & Knupfer, G. C. (Eds.). (2000). Encyclopedia of Forensic Sciences (Vol. 1-3). Academic Press. (While an encyclopedia, specific sections can serve as textbook material for various forensic physics topics).
5. Baxter, G. (1990). Practical Forensic Ballistics. Thomas Publishing Company.

Reference Books:

1. DiMaio, V. J. M. (2015). Gunshot Wounds: Practical Aspects of Firearms, Ballistics, and Forensic Techniques (3rd ed.). CRC Press.
2. Thornton, J. I., & Peterson, J. L. (2002). Forensic Science: An Introduction to Scientific and Investigative Techniques. (Chapters on physical evidence often include physics principles).

3. Rivers, R. W. (2009). Practical Aspects of Criminal and Forensic Investigations: Scientific Examination of Documents. CRC Press. (Specific sections may apply physics to document examination equipment/techniques).

4. ASTM International Standards. (Various Years). Standards related to firearms, toolmarks, glass analysis, and other areas involving physical evidence. ASTM International.

5. Heard, B. J. (2008). Handbook of Firearms and Ballistics: Examining and Interpreting Forensic Evidence (2nd ed.). Wiley.

SEMESTER – III

Paper Sl. No.	Paper - 5	Scheme of Evaluation	Theory
Name of the Course	Crime Scene Investigation	**L-T-P-C**	4-0-0-4
Type of Course	Minor	**Credits Assigned**	4
Paper Code	FSC142N301	**Level of the Course**	200

Course objective: To enable learner to understand, explore and acquire a critical understanding about 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 tools and techniques for analysis of different types of crime scene evidence.

Course Outcome : After successful completion of the course, student will be able to		
CO	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**define** and classify the crime scene and types.	BT1
CO2	**understand** the principle/ laws of forensic science.	BT2
CO3	**identify** different types of evidences like physical and trace evidence.	BT3
CO4	**analyse** the nature, collection and preservation of physical evidences	BT4

Module	Course content	Lecture
I	**Types of crime scenes:** definition of crime scene, indoor and outdoor. Securing and isolating the crime scene. Crime scene search methods. Safety measures at crime scenes. Legal considerations at crime scenes. Documentation of crime scenes, Duties of first responders at crime scenes	**23**

II	**Crime scene evidences:** Classification of crime scene evidence, physical and trace evidence, Locard principle. Collection, labelling, sealing of evidence. Hazardous evidence. Preservation of evidence. Chain of custody. Reconstruction of crime scene.	22	
III	**Physical evidences:** Glass evidence, Matching of glass samples by mechanical fit and refractive index measurements, Paint evidence, collection, packaging and preservation, Importance of paint evidence in hit and run cases, Cloth evidence, comparison of cloth samples.	22	
IV	**Trace evidences-** Fibre evidence, Identification and comparison of fibres. Soil evidence, collection and comparison of soil samples. Hair evidence, Tool mark evidence. Classification of tool marks. Forensic importance of tool marks.	23	
	Total	90	

Notional Credit Hours for the course = 30 x 4 = 120

Distribution of Credits		
Lecture/ Tutorial	**Practicum**	**Experiential Learning**
90	0	30 Discussions, Presentations and Quiz, Case Solving

Textbooks:

1. Fisher, B. A. J., Tilstone, W. J., & Woytowicz, C. (2009). Introduction to Criminalistics: The Foundation of Forensic Science. Academic Press.
2. Gardner, R. M., & Krouskup, D. R. (2018). Practical Crime Scene Processing and Investigation (3rd ed.). CRC Press.
3. Horswell, J. (Ed.). (2004). The Practice of Crime Scene Investigation. CRC Press.
4. James, S. H., Nordby, J. J., & Bell, S. (Eds.). (2013). Forensic Science: An Introduction to Scientific and Investigative Techniques (4th ed.). CRC Press.
5. Chisum, W. J., & Turvey, B. E. (2011). Crime Reconstruction (2nd ed.). Academic Press.
6. Geberth, V. J. (2015). Practical Homicide Investigation: Tactics, Procedures, and Forensic Techniques (5th ed.). CRC Press. (While homicide-focused, it extensively covers crime scene investigation).
7. Miller, L. S., & Marin, L. (2015). Crime Scene Photography (3rd ed.). Anderson Publishing/Elsevier.

Reference Books:

1. Lee, H. C., Palmbach, T., & Miller, M. T. (2001). Henry Lee's Crime Scene Handbook. Academic Press.
2. Wonder, A. Y. (2006). Bloodstain Pattern Evidence: Key Concepts and Related Issues. Looseleaf Law Publications.

3. Bevel, T., & Gardner, R. M. (2008). Bloodstain Pattern Analysis with an Introduction to Crime Scene Reconstruction (3rd ed.). CRC Press.

4. National Institute of Justice (NIJ). (Various Years). Crime Scene Investigation: A Guide for Law Enforcement. U.S. Department of Justice. (And other relevant guides and publications from NIJ).

5. Swanson, C. R., Chamelin, N. C., Territo, L., & Taylor, R. W. (2011). Criminal Investigation (11th ed.). McGraw-Hill.

SEMESTER – III

Paper SL No.	Paper - 6	Scheme of evaluation	Theory
Name of the course	Fundamentals of Forensic Science	**L-T-P-C**	3-0-0-3
Type of course	Inter-Disciplinary Course	**Credits assigned**	3
Paper code	FSC142I301	**Level of the course**	200

Course objective: To introduce students to the field of forensic science and criminalistics. Provide an overview of the methodologies and techniques used in crime scene investigation and analysis. Overall understanding of various types of forensic evidence in criminal proceedings. The handling of real-world case investigations by forensic experts and law enforcement agencies.

Course outcome: After successful completion of the course, student will be able to		
CO	**Course outcome**	**Blooms Taxonomy Level**
CO1	**define** the fundamental concepts and principles of forensic science and criminalistics.	BT1
CO2	**demonstrate** knowledge of crime scene management and evidence collection and packaging procedures.	BT2
CO3	**apply** methods for analysis and interpretation of forensic evidences, including fingerprints, DNA, and trace evidence.	BT3
CO4	**examine** the role of forensic science in the criminal justice system and its impact on legal proceedings.	BT4

Module	Course content	Lectures
I	**Introduction to forensic science:** History and development, Role of Forensic Science in Criminal Justice, Key Disciplines, Basic Principles and Methods, Importance of Evidence and Chain of Custody.	**15**

II	**Crime scene investigation:** Definition and Types of Crime Scene, Steps in Crime Scene Management, Crime Scene Documentation, Basic Tools and Equipment, Role of Crime Scene Investigators.	15
III	**Types of forensic evidences:** Physical (fingerprints, footprints) , chemical (drugs, toxicology), biological(DNA, blood, hair), digital (computer and mobile devices)and trace evidences(fiber,glass,paint etc.)	15
IV	**Criminal Investigation Process:** Definition and Objectives, Investigative agencies of India, Role of Law Enforcement Agencies and Forensic Experts in Investigations, Case Studies: Real-World Applications of Forensic Science.	15
Total		**60**

Distribution of credits		
Lecture/Tutorial	**Practicum**	**Experimental Learning**
60	0	30 Discussions, Presentations and Quiz, Case Solving

Textbooks:

1. Saferstein, R. (2020). Criminalistics: An Introduction to Forensic Science (13th ed.). Pearson.
2. Houck, M. M., & Siegel, J. A. (2015). Fundamentals of Forensic Science (3rd ed.). Academic Press.
3. James, S. H., Nordby, J. J., & Bell, S. (Eds.). (2013). Forensic Science: An Introduction to Scientific and Investigative Techniques (4th ed.). CRC Press.
4. Jackson, A. R. W., & Jackson, J. M. (2016). Forensic Science (4th ed.). Pearson.
5. Bell, S. (2019). Forensic Science: An Introduction. CRC Press.
6. Siegel, J. A., & Mirakovits, K. (2015). Forensic Science: The Basics (3rd ed.). CRC Press.

Reference Books:

1. Siegel, J. A., Saukko, P. J., & Knupfer, G. C. (Eds.). (2000). Encyclopedia of Forensic Sciences (Vols. 1-3). Academic Press.
2. Jamieson, A., & Moenssens, A. (Eds.). (2009). Wiley Encyclopedia of Forensic Science (5 Volume Set). Wiley.
3. Saferstein, R. (Ed.). (Various Years, e.g., Vol 1-3 of Forensic Science Handbook series). Prentice Hall / CRC Press.
4. Bowen, R. T. (Ed.). (1999). Ethics and the Practice of Forensic Science. CRC Press.
5. Kiely, T. F. (2005). Forensic Evidence: Science and the Criminal Law (2nd ed.). CRC Press.

SEMESTER – III

Paper Sl. No.	Paper - 7	Scheme of Evaluation	Theory
Name of the Course	Introduction to Digital Forensics	L-T-P-C	3-0-0-3
Type of Course	Skill Enhancement Course	Credits Assigned	3
Paper Code	FSC142S301	Level of the Course	200

Course objective: After studying this paper, students will know the fundamental and forensic examinations of digital evidence. The legal and privacy issues of digital evidence, the tools of cyber forensics and the types of cybercrime.

Course Outcome : After successful completion of the course, student will be able to		
CO	Course Outcome	Blooms Taxonomy Level
CO1	**learn** the basic digital forensics.	BT1
CO2	**understand** the characteristics The cases which fall under the purview of digital crimes.	BT2
CO3	**apply** learnt concepts to their work and apply different steps followed in handwriting recognition	BT3
CO4	**analyze** and apply the theoretical knowledge of handwriting knowledge in questioned document examination	BT4

Module	Course content	Lecture Hours
I	**Fundamentals and Concepts:** Fundamentals of computers Hardware and accessories. Memory and processor. Methods of storing data. Operating system. Software. Introduction to network, LAN, WAN and MAN.	15
II	**Digital Forensic I:** Cyber Crime and digital evidence, types of cybercrimes, digital evidence, nature of digital Evidence, precautions while dealing with digital Evidence. Introduction to Cyber forensic, Cyber forensic investigation process.	16
III	**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. Computer virus, and computer worms – Trojan horse, trap door, super zapping, logic bombs. Types of computer crimes.	14

IV	**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.	**15**
	Total	**60**

Notional Credit Hours for the course = 30 x 3 = 90

Distribution of Credits		
Lecture/ Tutorial	**Practicum**	**Experiential Learning**
60	0	30 Discussions, Presentations and Quiz, Case Solving

Textbooks:

1. Nelson, B., Phillips, A., & Steuart, C. (2019). Guide to Computer Forensics and Investigations (6th ed.). Cengage Learning.
2. Casey, E. (2011). Digital Evidence and Computer Crime: Forensic Science, Computers, and the Internet (3rd ed.). Academic Press.
3. Sammons, J. (2014). The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics (2nd ed.). Syngress.
4. Vacca, J. R. (2023). System Forensics, Investigation, and Response (4th ed.). Jones & Bartlett Learning.
5. Mohay, G., Anderson, A., Collie, B., de Vel, O., & McKemmish, R. (2003). Computer and Intrusion Forensics. Artech House.

Reference Books:

1. Carrier, B. (2005). File System Forensic Analysis. Addison-Wesley Professional.
2. Casey, E. (Ed.). (2010). Handbook of Digital Forensics and Investigation. Academic Press.
3. Altheide, C., & Carvey, H. (2011). Digital Forensics with Open Source Tools. Syngress.
4. Prosise, C., Mandia, K., & Pepe, M. (2003). Incident Response and Computer Forensics (2nd ed.). McGraw-Hill Osborne Media.
5. National Institute of Standards and Technology (NIST). (Various Years). Special Publications (SP) 800 Series on Computer Security (e.g., SP 800-86: Guide to Integrating Forensic Techniques into Incident Response). NIST.

SEMESTER – IV

Paper Sl. No.	Paper - 1	**Scheme of Evaluation**	Theory
Name of the Course	Forensic Psychology	**L-T-P-C**	3-1-0-4
Type of Course	Major/Core	**Credits Assigned**	4
Paper Code	FSC142M401	**Level of the Course**	200

Course objective: The objective of this course is to impart knowledge about forensic psychology and its applications. The legal aspects of forensic psychology, its significance of criminal profiling, and the importance of psychological assessment in gauging criminal behavior.

Course Outcome : After successful completion of the course, student will be able to		
CO	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**define** psychology, nature, and its goals.	BT1
CO2	**understand** the importance of sensation, adaptation, gestalt principle.	BT2
CO3	**acquire** knowledge of tools of deceptions.	BT3
CO4	**analyse** and compare the classification of psychiatric disorders	BT4

Modules	**Course content**	**Lecture**
I	**Basics of forensic psychology**: Define forensic psychology, nature, definition and its goals, History of Psychology, branches of psychology, early schools of psychology, current psychological perspective- biological, psychodynamic, behavioristic, humanistic, cognitive, and cultural. Modern perspectives, and Scientific Study methods in psychology- Naturalistic Observation, Experimental, Case Studies and Survey. Careers, qualification and professional specialties in psychology.	22
II	**Basic psychological process**: Sensation- selection, sensory adaptation, analysis and coding. Perception- sensing, perceiving, classifying, gestalt principles. Neurons -structure and function, synapse, and neurotransmitters, Neuron and Nerves; Building the Network, Central Nervous System and Peripheral Nervous System, The Brain-structure and function, Glandular system.	23
III	**Psychological disorders:** Classification of psychiatric disorders- Common Psychiatric Disorders- Schizophrenia, Bipolar Disorders, Anxiety Disorders, Phobia, Personality Disorder, Attention Deficit Hyperactive Disorder, Psychology of Serial murderers, terrorism	22
IV	**Detection and deception:** Tools of detection- interviews, non-verbal detection, statement analysis, voice stress analyzer, hypnosis. Polygraphy, its ethical and legal aspects. Narco analysis and Brain Fingerprinting – principle and theory, ethical and legal issues. Brain electrical oscillation signatures- principle, technique and legal aspects.	23
	Total	**90**

Notional Credit Hours for this course: 30 x 4 = 120

Distribution of Credits		
Lecture/ Tutorial	**Practicum**	**Experiential Learning**

90	0	30 Laboratory Visit, Experimenting,Group Work, Discussions, Presentations and Quiz

Textbooks:

1. Introduction to Forensic Psychology: Research and Application by Curt R. Bartol and Anne M. Bartol

2. Forensic Psychology by Joanna Pozzulo, Craig Bennell, and Adelle Forth

3. Criminological and Forensic Psychology by Helen Gavin

Reference Books:

1. Psychological Evaluations for the Courts: A Handbook for Mental Health Professionals and Lawyers by Gary B. Melton, John Petrila, Norman G. Poythress, and Christopher Slobogin.

2. The Encyclopedia of Psychology and Law edited by David S. Goldstein and David L. Shapiro.

SEMESTER – IV

Paper Sl. No.	Paper - 2	Scheme of Evaluation	Theory
Name of the Course	Analytical Methods-I	**L-T-P-C**	3-1-0-4
Type of Course	Major/Core	**Credits Assigned**	4
Paper Code	FSC142M402	**Level of the Course**	200

Course objective: The objective of this course is to impart knowledge about various tools and techniques used in forensic science.

Course Outcome : After successful completion of the course, student will be able to		
CO	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**define** the importance of microscope in the field of forensic science.	BT1
CO2	**understand** the working principle of spectrophotometer.	BT2
CO3	**acquire** knowledge about various chromatographic techniques.	BT3
CO4	**analysis** using the x-ray based techniques in forensic science. and compare the classification of psychiatric disorders	BT4

Module	Course content	Lecture
I	**Microscopy**: Microscope - History, Components of Microscope, Types of Microscope: Single Lens (Simple) Microscope, Compound Microscope, Light Microscope.	22
II	**Spectroscopy**: Spectrophotometer - Principle, Instrumentation, Beer-Lambert's Law, Applications, UV-Visible Spectroscopy, Applications, Infrared Spectroscopy ,Applications, Limitations.	23
III	**Chromatography:** Chromatography - History, Principle, Components, Types of Chromatography: Paper Chromatography, Column Chromatography, Thin-Layer Chromatography.	22
IV	**X-Ray and X-Ray based Techniques:** X-Rays, X-Ray Diffraction (XRD) Analysis, Principle, Instrumentation, Working, Applications, Advantages and Disadvantages.	23
Total		**90**

Notional Credit Hours for this course: 30 x 4 = 120

Distribution of Credits		
Lecture/ Tutorial	Practicum	Experiential Learning
90	0	30 Laboratory Visit, Experimenting,Group Work, Discussions, Presentations and Quiz

Textbooks:

1. Skoog, D. A., Holler, F. J., & Crouch, S. R. (2017). Instrumental Analysis.

2. Silverstein, R. M., Webster, F. X., & Kiemle, D. J. (2014). Spectrometric Identification of Organic Compounds.

Reference Books:

1. Snyder, L. R., Kirkland, J. J., & Dolan, J. W. (2010). Introduction to Modern Liquid Chromatography.

2. Cullity, B. D., & Stock, S. R. (2001). Elements of X-Ray Diffraction.

SEMESTER – IV

Paper Sl. No.	Paper - 3	Scheme of Evaluation	Theory
Name of the Course	Forensic Anthropology and Odontology	L-T-P-C	2-1-0-3
Type of Course	Major/Core	Credits Assigned	3
Paper Code	FSC142M403	Level of the Course	200

Course objective: To impart the knowledge on the importance of examining human skeleton and non- human skeleton in crime cases, basic concept of stature identification, gender detection and odontological studies and its importance in bite mark identification.

Course Outcome : After successful completion of the course, student will be able to		
CO	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**learn** the basic characteristics of handwriting recognition	BT1
CO2	**understand** the characteristics, properties, physical and visual potential of film and photography	BT2
CO3	**apply** learnt concepts to their work and apply different steps followed in handwriting recognition	BT3
CO4	**analyze** and apply the theoretical knowledge of handwriting knowledge in questioned document examination	BT4

Module	Course content	Lecture Hours
I	**Forensic Anthropology:** Definition, scope and objectives, nature, formation, and identification of human bones. Determination of age, sex, stature from skeletal material, Anatomy of different bones.	**15**
II	**Somatoscopy:** Introduction, Observation of various regions of body, scar marks and occupational marks, forensic significance in personal identification. **Somatometry:** Introduction, forensic significance in personal identification .Measurements of head, face, nose, cheek, ear, hand and foot, body weight, height.	**15**
III	**Facial reconstruction:** Photographic Super Imposition, Video-Superimposition, Roentgen graphic Superimposition. Use of somatoscopic and craniometric methods in reconstruction.	**15**
IV	**Forensic Odontology:** Development and scope, role in mass disaster. Structural variation in teeth, types of teeth- functions, determination of age from teeth: eruption sequence, Gustafson's	**15**

		method, dental anomalies, their significance in personal identification.	
	Total		**60**

Notional Credit Hours for this course: 30 x 3 = 90

Distribution of Credits		
Lecture/ Tutorial	**Practicum**	**Experiential Learning**
60	0	30 Discussions, Presentations and Quiz, Case Solving

Textbooks:

1. Byers, S. N. (2016). Introduction to Forensic Anthropology (5th ed.). Routledge.
2. Christensen, A. M., Passalacqua, N. V., & Bartelink, E. J. (2019). Forensic Anthropology: Current Methods and Practice (2nd ed.). Academic Press.
3. Klepinger, L. L. (2006). Fundamentals of Forensic Anthropology. Wiley-Liss.
4. Clement, J. G., & Ranson, D. L. (Eds.). (1998). Craniofacial Identification in Forensic Medicine. Arnold.
5. Keiser-Nielsen, S. (1980). Person Identification by Means of the Teeth: A Practical Guide. John Wright & Sons.

Reference Books:

1. Buikstra, J. E., & Ubelaker, D. H. (Eds.). (1994). Standards for Data Collection from Human Skeletal Remains. Arkansas Archeological Survey.
2. Bowers, C. M. (Ed.). (2011). Forensic Dental Evidence: An Investigator's Handbook (2nd ed.). Academic Press.
3. Scheuer, L., & Black, S. (2000). Developmental Juvenile Osteology. Academic Press.
4. Ubelaker, D. H. (1999). Human Skeletal Remains: Excavation, Analysis, Interpretation (3rd ed.). Taraxacum.
5. Stimson, P. G., & Mertz, C. A. (Eds.). (1997). Forensic Dentistry. CRC Press.

SEMESTER – IV

Paper Sl. No.	Paper - 4	Scheme of Evaluation	Practical
Name of the Course	Forensic Anthropology and Odontology (P)	**L-T-P-C**	0-0-2-1
Type of Course	Major	**Credits Assigned**	1

Paper Code	FSC142M414	Level of the Course	200

Course objective: To impart the knowledge on the importance of forensic anthropology in identification of persons, its different techniques of facial reconstruction and their forensic importance, and significance of somatoscopy and somatometry.

Course Outcome : After successful completion of the course, student will be able to		
CO	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**recall** the basic concept of human skeleton.	BT1
CO2	**understand** the concept of age determination.	BT2
CO3	**apply** various methods and techniques in determining of various age, sex, and gender.	BT3
CO4	**compare** the human and non- human skeleton.	BT4

Detailed syllabus:

Practical would be based on the theory syllabus and would broadly include the following:

Module	Course content	Lecture Hours
I	1. Osteology: Human skeleton axial and appendicular skeleton. 2. Determination of sex from skull and pelvis. 3. Determination of age from skull sutures.	7
II	4. Determination of age from dentition. 5. To perform osteometric measurements on long bones and estimation of statures. 6. To perform craniometric measurements on skull.	8
III	7. To perform somatometric measurement on living subject. 8. To investigate the difference between animal and human bones. 9. Demonstration of bone and dental pathology.	8
IV	10. Somatoscopy: Morphological observations of different body characters. 11. Human and non-human bone case study. 12. To conduct portrait parley using photo fit identification kit.	7
Total		**30**

Notional Credit Hours for this course: 30 x 1 = 30

Distribution of Credits		
Lecture/ Tutorial	**Practicum**	**Experiential Learning**
0	30	0 Discussions, Presentations and Quiz, Case Solving

Textbooks:

1. Byers, S. N. (2016). Introduction to Forensic Anthropology (5th ed.). Routledge.

2. Christensen, A. M., Passalacqua, N. V., & Bartelink, E. J. (2019). Forensic Anthropology: Current Methods and Practice (2nd ed.). Academic Press.

3. Keiser-Nielsen, S. (1980). Person Identification by Means of the Teeth: A Practical Guide. John Wright & Sons.

4. Clement, J. G., & Ranson, D. L. (Eds.). (1998). Craniofacial Identification in Forensic Medicine. Arnold.

5. Taylor, K. M. (2001). Forensic Art and Illustration. CRC Press. (Often includes chapters on facial reconstruction based on anthropological data).

6. Pickering, R. B., & Bachman, D. C. (2009). The Use of Forensic Anthropology (2nd ed.). CRC Press.

Reference Books:

1. Buikstra, J. E., & Ubelaker, D. H. (Eds.). (1994). Standards for Data Collection from Human Skeletal Remains. Arkansas Archeological Survey.

2. Scheuer, L., & Black, S. (2000). Developmental Juvenile Osteology. Academic Press.

3. Ubelaker, D. H. (1999). Human Skeletal Remains: Excavation, Analysis, Interpretation (3rd ed.). Taraxacum.

4. Bowers, C. M. (Ed.). (2011). Forensic Dental Evidence: An Investigator's Handbook (2nd ed.). Academic Press.

5. Clement, J. G., & Marks, M. K. (Eds.). (2005). Computer-Graphic Facial Reconstruction. Academic Press.

6. Stimson, P. G., & Mertz, C. A. (Eds.). (1997). Forensic Dentistry. CRC Press.

SEMESTER – IV

Paper Sl. No.	Paper - 5	Scheme of Evaluation	Theory
Name of the Course	Technical Methods	**L-T-P-C**	3-0-0-3
Type of Course	Minor	**Credits Assigned**	3
Paper Code	FSC142N401	**Level of the Course**	200

Course objective: The objective of this course is to know about the principles and applications of various tools and techniques used in forensic science.

Course Outcome : After successful completion of the course, student will be able to		
CO	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**define** the role that a microscope plays in the discipline of forensic science.	BT1
CO2	**understand** the working principle of different spectroscopy techniques	BT2
CO3	**apply** various chromatography techniques in forensic science.	BT3
CO4	**analysis** of the samples using the x-ray based techniques in forensic science.	BT4

Modules	Course content	Lecture
I	**Microscopy**: Microscope - History, Components of Microscope, Single Lens (Simple) Microscope, Compound Microscope, Fluorescence Microscope, Stereo Microscope, Comparison Microscope, Light Microscope.	15
II	**Spectroscopy**: Spectrophotometer - Principle, Instrumentation, Beer-Lambert's Law, Applications, UV-Visible Spectroscopy, Applications, Infrared Spectroscopy, Applications, Limitations.	15
III	**Chromatography:** Chromatography - History, Principle, Components, Paper Chromatography, Column Chromatography, Thin-Layer Chromatography.	15
IV	**X-Ray and X-Ray based Techniques:** X-Rays, X-Ray Diffraction (XRD) Analysis, Principle, Instrumentation, Working, Applications, Advantages and Disadvantages.	15
Total		**60**

Notional Credit Hours for this course: 30 x 3 = 90

Distribution of Credits		
Lecture/ Tutorial	**Practicum**	**Experiential Learning**
60	0	30 Laboratory Visit, Experimenting,Group Work, Discussions, Presentations and Quiz

Textbooks:

1. Fisher, B. A. J., & Fisher, D. R. (2012). Techniques of Crime Scene Investigation (8th ed.). CRC Press.
2. White, P. C. (Ed.). (2019). Crime Scene to Court: The Essentials of Forensic Science (4th ed.). Royal Society of Chemistry.

3. Bell, S. (2012). Forensic Chemistry (2nd ed.). Pearson.
4. Houck, M. M. (Ed.). (2001). Mute Witnesses: Trace Evidence Analysis. Academic Press.
5. Caddy, B. (Ed.). (2001). Forensic Examination of Glass and Paint: Analysis and Interpretation. Taylor & Francis.

Reference Books:

1. Inman, K., & Rudin, N. (2001). Principles and Practice of Criminalistics: The Profession of Forensic Science. CRC Press.
2. Jamieson, A., & Moenssens, A. (Eds.). (2009). Wiley Encyclopedia of Forensic Science (5 Volume Set). Wiley.
3. Houde, J. (2005). Crime Lab: A Guide for Nonscientists. Calico Press.
4. De Forest, P. R. (2009). An Introduction to Forensic Science: The Science of Criminalistics. Janaway Publishing.
5. McCrone, W. C., & Delly, J. G. (1973). The Particle Atlas. Ann Arbor Science Publishers. (A classic reference for forensic microscopy).

SEMESTER – IV

Paper Sl. No.	Paper - 6	Scheme of Evaluation	Theory
Name of the Course	Accident Investigation-Motor Vehicles	**L-T-P-C**	3-0-0-3
Type of Course	Minor	**Credits Assigned**	3
Paper Code	FSC142N402	**Level of the Course**	200

Course objective: The objective of this course is to study the significance of photographs in accident cases, the importance of physical and trace evidences, and the outcome of accidental analysis.

Course Outcome : After successful completion of the course, student will be able to		
CO	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**define** the types of accidental injuries.	BT1
CO2	**understand** the importance of tire marks and skid marks in accident cases.	BT2
CO3	**acquire** knowledge about Pre- and post-crash movements.	BT3
CO4	**analysis** of tachograph charts.	BT4

Modules	Course content	Lecture Hours
I	**Road Accidents**: Importance of accident scene, Forensic information sources, Eyewitness - its importance, assessment of vehicle damage, Visibility conditions, accident site photographs.	15
II	**Surface Markings** : Tire marks, skid marks, scuff marks etc, and their importance, abandoned vehicles, Importance of air bags in vehicle accidents, Maintenance of vehicles, speed estimation, Railway accidents and its analysis.	15

III	**Analysis of accidents:** Pre- and post-crash movements, Collision model, Occupants's kinematics, Types of accidental injuries, Biomechanics of injuries, investigations of Hit and run cases, analysis trace evidence found at accident sites.	**16**
IV	**Tachographs:** tachograph data - its forensic significance, Tachograph charts and analysis, Accuracy of speed record, Effects of tire slipping, Route tracing, Falsification signals.	**14**
	Total	**60**

Notional Credit Hours for this course: 30 x 3 = 90

Distribution of Credits		
Lecture/ Tutorial	**Practicum**	**Experiential Learning**
60	0	30 Laboratory Visit, Experimenting,Group Work, Discussions, Presentations and Quiz

Textbooks:
1. Baker, J. S., & Fricke, L. B. (1986). The Traffic-Accident Investigation Manual: At-Scene Investigation and Technical Follow-Up (9th ed.). Northwestern University Center for Public Safety.
2. Rivers, R. W. (1999). Traffic Crash Investigation (2nd ed.). Institute of Police Technology and Management.
3. Limpert, R. (1999). Motor Vehicle Accident Reconstruction and Cause Analysis (5th ed.). LexisNexis.
4. Fricke, L. B. (1990). Traffic Accident Reconstruction. Northwestern University Traffic Institute.
5. Larsen, D. A. (2018). Motorcycle Traffic Accident Reconstruction. Charles C Thomas Publisher.

Reference Books:
1. Carroll, J. R., & Knaub, J. (2013). Vehicle Accident Analysis and Reconstruction Methods (2nd ed.). CRC Press.
2. Daily, J., & Shigemura, N. (2002). Fundamentals of Traffic Crash Reconstruction. Institute of Police Technology and Management.

Paper Sl. No.	Paper - 1	Scheme of Evaluation	Theory
Name of the Course	Forensic Toxicology	L-T-P-C	2-1-0-3
Type of Course	Major	Credits Assigned	3
Paper Code	FSC142M501	Level of the Course	300

Course objective: This course aims to integrate theoretical foundations of forensic toxicology (history, legal frameworks, crime scene protocols) with advanced analytical techniques (GC-MS, HPLC, extraction methods) and regulatory standards (GHS, GLP) to equip students with skills in toxicant detection, sample handling, and mechanistic analysis. Students will apply this knowledge to assess toxicity risks, interpret dose-response relationships, and manage poisoning cases, ensuring compliance with legal and ethical guidelines in criminal investigations and public health contexts.

CO	Course Outcome	Blooms Taxonomy Level
Course Outcome : After successful completion of the course, student will be able to		
CO1	**define** the fundamental principles of forensic toxicology.	BT1
CO2	**explain** the procedures for toxicological sample collection and extraction methods.	BT2
CO3	**apply** dose-response parameters and regulatory frameworks to study the toxicants.	BT3
CO4	**analyze** molecular mechanisms and toxico-kinetic/dynamic processes to differentiate toxicity pathways of xenobiotics.	BT4

Modules	Course content	Lecture Hours
I	**Forensic Toxicology Fundamentals:** History, Scope, and Significance of forensic toxicology, Legal Aspects: Medico-legal implications, laws related to poisons, nodal agencies, stakeholders, Crime Scene Protocols: Poison-related scenes, drug paraphernalia, poisoning management, Roles & Responsibilities: Forensic toxicologists' duties, expert witness testimony, Reporting: Formats for autopsy and laboratory reports.	15
II	**Toxicological Sample Handling, Extraction, and Analysis:** Sample Collection & Preservation: Biological/non-biological samples, matrices, viscera types, preservatives, containers, shelf-life, Guidelines (national/international), PPE, safety measures, Extraction Methods: Liquid-liquid extraction, acid/base/neutral/volatile/non-volatile/plant poison isolation, Detection & Analysis: Chemical tests,	15

		instrumental methods (e.g., GC-MS, HPLC), decomposed material analysis, Challenges in toxicological examination.	
III		**Regulatory Frameworks in Toxicology:** Toxicants and types (chemical, biological, physical), Dose Terminology: LD50, threshold dose, therapeutic index, Sources of poisoning, Exposure variables: Duration, frequency, routes, Regulatory Systems: Toxicity testing models (in vitro, in vivo, computational), Laws and regulations (national: EPA, FDA; international: WHO, ICH), Regulatory bodies: US EPA, EU-ECHA, CDSCO, Risk Assessment: Hazard vs. risk, GHS, Quality Standards: Good Laboratory Practice (GLP).	15
IV		**Toxic Mechanisms & Xenobiotic Effects:** Mechanisms of Toxicity: Dose-Response Relationships, Factors affecting toxicity, Molecular mechanisms, Toxico-Kinetics/Dynamics: Absorption, distribution, metabolism, excretion (ADME), Detoxification: Biotransformation, bioaccumulation, Antidotal therapies, Specific Toxicants & Effects: Drugs: Mechanisms, organ-specific toxicity, Pesticides: Organophosphate/Carbamate neurotoxicity, Heavy Metals, Metabolic acidosis, hepatotoxicity, Plant/Animal Toxins: Aconite, snake venom, Xenobiotic Symptoms/Treatment: Case-based management.	12
Total			**60**

Notional Credit Hours for this course: 30 x 3 = 90

Distribution of Credits		
Lecture/ Tutorial	Practicum	Experiential Learning
60	0	30 Laboratory Visit, Experimenting,Group Work, Discussions, Presentations and Quiz

Textbooks:

1. Klaassen, C. D. (Ed.). (2019). Casarett & Doull's Toxicology: The Basic Science of Poisons (9th ed.). McGraw-Hill Education.

2. Levine, B. (Ed.). (2017). Principles of Forensic Toxicology (4th ed.). AACC Press.

3. Flanagan, R. J., Taylor, A., Watson, I. D., & Whelpton, R. (2007). Fundamentals of Analytical Toxicology. Wiley.

4. Tebbett, I. (2003). Introduction to Forensic Toxicology. Academic Press.

5. Karch, S. B. (2007). Drug Abuse Handbook (2nd ed.). CRC Press.

Reference Books:

1. Moffat, A. C., Osselton, M.D., & Widdop, B. (Eds.). (2011). Clarke's Analysis of Drugs and Poisons (4th ed.). Pharmaceutical Press.

2. Baselt, R. C. (2020). Disposition of Toxic Drugs and Chemicals in Man (12th ed.). Biomedical Publications.

3. Drummer, O. H., & Gerostamoulos, D. (2002). Postmortem Drug Analysis. CRC Press.

4. Shaw, L. M. (Ed.). (2001). The Clinical Toxicology Laboratory: Contemporary Issues of the Nineties. AACC Press.

5. Repetto, M. R., & Repetto, M. (Eds.). (2008). Repetto's Illustrated Toxicology (2nd ed.). AACC Press.

SEMESTER – V

Paper Sl. No.	Paper - 2	Scheme of Evaluation	Theory
Name of the Course	Forensic Biology	**L-T-P-C**	2-1-0-3
Type of Course	Major	Credits Assigned	3
Paper Code	FSC142M502	Level of the Course	300

Course objective: This course aims to provide students with a comprehensive understanding of forensic biology, emphasizing the identification, collection, and analysis of biological evidence (e.g., hair, pollen, diatoms, insects, blood, body fluids). It combines traditional techniques (serology, blood grouping, entomology) with advanced spectroscopic methods (FTIR, Raman) to address forensic challenges such as species determination, post-mortem interval estimation, and crime scene reconstruction, while integrating case studies and legal protocols for real-world application.

CO	Course Outcome	Blooms Taxonomy Level
Course Outcome : After successful completion of the course, student will be able to		
CO1	**recall** the fundamental concepts of forensic biology.	BT1
CO2	**explain** the principles of hair evidence analysis, forensic limnology, and entomology.	BT2
CO3	**apply** serological techniques and genetic principles to analyze bloodstains, and determine their origin.	BT3
CO4	**analyze** biological fluid evidence using presumptive/confirmatory tests and spectroscopic methods.	BT4

Modules	Course content	Lecture Hours
I	**Introduction to Forensic Biology:** Brief History of Forensic Biology: Developments and Scope in the field of Forensic Biology, Branches of Forensic Biology Different types of biological Evidences and their significance in Forensic Science Collection, Preservation, Packing,	**12**

	Forwarding and Documentation of Biological Evidences, Types and identification of microbial organisms of forensic significance, case studies, Introduction to wood and its anatomy, Identification of endangered wood & its significances. **Forensic Palynology:** Introduction and history, structure of pollen, identification and comparison of pollen, forensic significance.	
II	**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, case studies. **Forensic Limnology:** Introduction, Role of algae & fungi in Forensic Science, Identification of diatoms from biological matrices from soil & water, Diatoms testing, Legal aspects of Diatoms. **Forensic Entomology:** Introduction and History, Anatomy and Taxonomy of Forensically relevant Insects (Diptera), Estimating Post-mortem Interval/ Time, Forensically important Aquatic Insects, Insects as weapons and Threats to National Security, Collection of entomological evidence during death investigations.	24
III	**Forensic Serology:** Blood and its composition, Haemoglobin and its variants, History and genetics of ABO and Rh blood grouping system and its significance in forensic investigation, Other forensically relevant blood group like MN, I, P, Kell, Duffy, Kidd, Lewis, Lutheran and Bombay blood group, Secretors and non- secretors, HLA antigens and its importance.	12
IV	**Identification of Biological Fluids:** Study of blood stain patterns, Composition, presumptive and confirmatory tests for blood, semen, saliva, urine, and other biological fluids, origin of species, Blood grouping of dried blood stains, semen, saliva stains, Recent developments in detection of various body fluids by spectroscopic techniques (FTIR and Raman). Polymorphic enzymes and their forensic significance.	12
	Total	60

Notional Credit Hours for this course: 30 x 3 = 90

Distribution of Credits		
Lecture/ Tutorial	**Practicum**	**Experiential Learning**
60	0	30 Laboratory Visit, Experimenting,Group Work, Discussions, Presentations and Quiz

Textbooks:

1. Li, R. (2015). Forensic Biology (2nd ed.). CRC Press.

2. Goodwin, W., Linacre, A., & Hadi, S. (2010). An Introduction to Forensic Genetics (2nd ed.). Wiley-Blackwell.

3. Butler, J. M. (2011). Advanced Topics in Forensic DNA Typing: Methodology. Academic Press.

4. James, S. H., Nordby, J. J., & Bell, S. (Eds.). (2013). Forensic Science: An Introduction to Scientific and Investigative Techniques (4th ed.). CRC Press.

5. Gunn, A. (2009). Essential Forensic Biology (2nd ed.). Wiley-Blackwell.

Reference Books:

1. Butler, J. M. (2005). Forensic DNA Typing: Biology, Technology, and Genetics of STR Markers (2nd ed.). Academic Press.

2. Inman, K., & Rudin, N. (2000). An Introduction to Forensic DNA Analysis (2nd ed.). CRC Press.

3. Robertson, J., Vignaux, G. A., & Berger, C. E. H. (2016). Interpreting DNA Evidence: A Guide for the Non-Scientist. Wiley.

4. Saferstein, R. (Ed.). (2010). Forensic Science Handbook, Volume I (2nd ed.). Prentice Hall.

5. Coyle, H. M. (Ed.). (2004). Forensic Botany: Principles and Applications to Criminal Casework. CRC Press.

SEMESTER – V

Paper Sl. No.	Paper - 3	Scheme of Evaluation	Theory
Name of the Course	Questioned Document	**L-T-P-C**	2-1-0-3
Type of Course	Major	**Credits Assigned**	3
Paper Code	FSC142M503	**Level of the Course**	300

Course objective: This course aims to equip students with expertise in analyzing questioned documents using scientific methodologies (e.g., spectroscopy, microscopy) and handwriting analysis techniques to detect alterations, determine document authenticity, and identify counterfeits (currency, passports). It emphasizes practical skills in tampering detection, mechanical impression analysis, and legal protocols for forensic investigations and courtroom testimony.

Course Outcome : After successful completion of the course, student will be able to		
CO	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**recall** foundational concepts of questioned document examination.	BT1

CO2	**explain** the principles of handwriting individuality, exemplar/non-exemplar sample limitations, and analytical methods.		BT2
CO3	**apply** forensic techniques to identify document tampering, recover indented/invisible writings, and authenticate materials in real-case scenarios.		BT3
CO4	**analyze** security features in counterfeit currency, passports, and high-risk documents .		BT4

Modules	Course content	Lecture Hours
I	**Questioned Document Examination:** Definition and types of questioned documents, Preliminary examination procedures, Basic tools for forensic document examination: Ultraviolet, Visible, Infrared, and Fluorescence Spectroscopy, Photomicrography, Microphotography, Visible Spectral Comparator, Electrostatic Detection Apparatus.	**15**
II	**Handwriting Analysis & Age Determination:** Development of individuality in handwriting: natural variations, fundamental divergences, Class and individual characteristics in handwriting, Comparison of handwriting: determination of stroke sequence, exemplar vs. non-exemplar samples (merits/demerits), Standards for handwriting comparison, Determining the age and relative age of documents.	**15**
III	**Document Alterations & Tampering Detection:** Alterations in documents: erasures, additions, over-writing, obliterations, Detection of indented and invisible writings, Examination of charred documents, Comparison of paper, ink, printed/typed/xeroxed documents.	**15**
IV	**Counterfeit & Mechanical Impression Analysis:** Examination of counterfeit Indian currency notes, passports, visas, stamps, credit cards, seals, Analysis of mechanical impressions (e.g., stamp pads, seals), Techniques for identifying forged security features in official documents, Protocols for verifying authenticity in high-risk documents.	**15**
Total		**60**

Notional Credit Hours for this course: 30 x 3 = 90

Distribution of Credits		
Lecture/ Tutorial	**Practicum**	**Experiential Learning**
60	0	30 Laboratory Visit, Experimenting,Group Work, Discussions, Presentations and Quiz

Texbooks:

1. Hilton, O. (1992). Scientific Examination of Questioned Documents (Revised ed.). CRC Press.

2. Koppenhaver, K. M. (2007). Forensic Document Examination: Principles and Practice. Humana Press.

3. Huber, R. A., & Headrick, A. M. (1999). Handwriting Identification: Facts and Fundamentals. CRC Press.

4. Morris, R. (2020). Forensic Handwriting Identification: Fundamental Concepts and Principles (3rd ed.). Academic Press.

5. Levinson, J. (2001). Questioned Documents: A Lawyer's Handbook. Academic Press.

Reference Books:

1. Kelly, J. S., & Lindblom, B. S. (2006). Scientific Examination of Questioned Documents (2nd ed., S. G. Rilett Ed.). CRC Press.

2. Ellen, D. (2018). Scientific Examination of Documents: Methods and Techniques (4th ed.). CRC Press.

3. Nielson, D. M. (2020). Scientific Analysis of Questioned Documents. CRC Press.

4. Sareen, V., & Kumar, A. (Eds.). (2020). Modern Trends in Questioned Document Examination. Notion Press.

5. Conway, J. V. P. (1959). Evidential Documents. Charles C. Thomas Publisher.

6. Harrison, W. R. (1958). Suspect Documents: Their Scientific Examination. Sweet & Maxwell.

SEMESTER – V

Paper Sl. No.	Paper - 4	Scheme of Evaluation	Practical
Name of the Course	Forensic Toxicology (Practical)	**L-T-P-C**	0-0-6-3
Type of Course	Major	**Credits Assigned**	3
Paper Code	FSC142M514	**Level of the Course**	300

Course objective: This course aims to develop expertise in the extraction (wet/dry digestion, microwave), analysis (color tests, TLC, UV-Vis, GC-MS, HPLC, ICP-MS), and quantification of toxicants (heavy metals, pesticides, plant poisons, drugs, alcohol derivatives) through hands-on proficiency in analytical methodologies. Students will master calibration techniques, advanced instrumentation (HS-GC, ICP-MS), and forensic protocols to identify adulterants, toxins, and illicit substances, ensuring compliance with regulatory and investigative standards.

Course Outcome : After successful completion of the course, student will be able to		
CO	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**identify** the principles and procedural steps for extracting heavy metals and isolating volatile/non-volatile poisons.	BT1
CO2	**explain** the principles of color tests and thin-layer chromatography for detecting plant poisons and pesticides, and **describe** the role of UV-Vis spectroscopy in drug analysis.	BT2
CO3	**apply** UV-Vis spectroscopy to plot calibration curves and quantify analyte concentrations.	BT3
CO4	**analyze** alcohol derivatives using head-space GC to differentiate volatile compounds in forensic samples.	BT4

Modules	**Course content**	**Lecture Hours**
I	1. Extraction of heavy metals using wet digestion and dry digestion. 2. Extraction of volatile and non-volatile poisons 3. Analysis of heavy metals using colour tests (reinsch test).	**15**
II	4. Colour test and TLC of various plant poisons and pesticides 5. Analysis of drug using UV-Vis spectroscopy. 6. Preparation of standard and working solutions.	**15**
III	7. Plotting of calibration curve and quantification using UV-Vis Spectroscopy 8. Analysis of organochlorine, Organophosphorus, Carbamates and Pyrethroids by colour tests, TLC, GC-MS methods. 9. Identification of common plant poisons Oleander, Dhatura, Calotropis and Ricin.	**15**
IV	10. Analysis of alcohol and derivatives by head-space gas chromatography (HS-GC). 11. Extraction and Analysis of heavy metals by microwave extraction and ICP-MS. 12. Analysis of non-volatile drugs by HPLC.	**15**
	Total	**60**

Notional Credit Hours for this course: 30 x 3 = 90

Distribution of Credits

Lecture/ Tutorial	Practicum	Experiential Learning
0	60	30 Laboratory Visit, Experimenting,Group Work, Discussions, Presentations and Quiz

Textbooks:

1. Levine, B. (Ed.). (2017). Principles of Forensic Toxicology (4th ed.). AACC Press.

2. Flanagan, R. J., Taylor, A., Watson, I. D., & Whelpton, R. (2007). Fundamentals of Analytical Toxicology. Wiley.

3. Karch, S. B. (Ed.). (2007). Drug Abuse Handbook (2nd ed.). CRC Press.

4. Starkey, D. B. (2018). Introduction to Forensic Toxicology. Morton Publishing Company.

5. Tebbett, I. (2003). Introduction to Forensic Toxicology. Academic Press.

Reference Books:

1. Moffat, A. C., Osselton, M.D., & Widdop, B. (Eds.). (2011). Clarke's Analysis of Drugs and Poisons (4th ed.). Pharmaceutical Press.

2. Baselt, R. C. (2020). Disposition of Toxic Drugs and Chemicals in Man (12th ed.). Biomedical Publications.

3. Drummer, O. H., & Gerostamoulos, D. (2002). Postmortem Drug Analysis. CRC Press.

SEMESTER – V

Paper Sl. No.	Paper - 5	Scheme of Evaluation	Theory
Name of the course	Biometrics and Emerging Techniques	**L-T-P-C**	4-0-0-4
Type of Course	Minor	**Credits Assigned**	4
Paper Code	FSC142N501	**Level of the course**	300

Course Objective: This course provides a comprehensive understanding of biometric technologies, their applications, and security aspects. It covers the fundamentals of biometrics, key processes such as verification, identification, and biometric matching, as well as performance measures and classification into physiological and behavioural biometrics. Emerging biometric techniques, including novel physiological and behavioural traits, are also explored. Additionally, the course examines biometric system security, addressing

vulnerabilities, adversary attacks, and protective measures to enhance biometric template security.

Course Outcome: After successful completion the course, the student will be able to

CO	Course Outcome	Blooms Taxonomy Level
CO1	**define** the fundamentals and modules of a biometric system	BT1
CO2	**explain** and compare the different types of biometric systems.	BT2
CO3	**apply** emerging biometric traits in new biometric systems	BT3
CO4	**classify** different biometric module attacks and its security measures	BT4

Module	Course Content	Lecture
I	**Introduction:** Biometric fundamentals, Biometric technologies, Biometrics vs traditional techniques, Characteristics of a good biometric system, Benefits of biometrics **Key biometric modules:** verification, identification and biometric matching, Performance measures in biometric systems – rates and errors, Classification of biometric system: physiological and behavioural biometrics.	**22**
II	**Physiological biometric systems:** Fingerprint Recognition, Iris Recognition, Retina scanning, Face recognition, Hand geometry, palm vein recognition.	**23**
III	**Emerging physiological biometrics:** Nail bed identification, blood pulse identification, Body salinity identification. **Emerging behavioural biometrics:** brain wave pattern, Touch Dynamics, Mouse Movement Analysis, Eye Movement Tracking.	**22**
IV	**Biometric system security:** overview, vulnerabilities in biometric system, Adversary attacks: Insider Attacks, Infrastructure attacks, Attacks on user Interface: Impersonation, Obfuscation, Spoofing, biometric template security, encoded biometric schemes, advantages and limits of biometric system security.	**23**
	Total	**90**

Notional Credit Hours for this course: 30 x 4 = 120

<table>
<tr><th colspan="3">Distribution of credits</th></tr>
<tr><th>Lecture/ Tutorial</th><th>Practicum</th><th>Experiential Learning</th></tr>
<tr><td>90</td><td>0</td><td>30
Laboratory visit, field trips, group work, discussions, presentations, and quiz.</td></tr>
</table>

Textbooks:

1. Jain, A. K., Ross, A. A., & Nandakumar, K. (2011). Introduction to Biometrics. Springer.

2. Wayman, J., Jain, A., Maltoni, D., & Maio, D. (Eds.). (2005). Biometric Systems: Technology, Design and Performance Evaluation. Springer.

3. Bolle, R. M., Connell, J. H., Pankanti, S., Ratha, N. K., & Senior, A. W. (2004). Guide to Biometrics. Springer.

4. Reid, P. (2004). Biometrics for Network Security. Prentice Hall.

5. Modi, S. K. (2008). Biometrics in Identity Management: A Primer. Artech House.

Reference Books:

1. Jain, A. K., Flynn, P., & Ross, A. A. (Eds.). (2007). Handbook of Biometrics. Springer.

2. Maltoni, D., Maio, D., Jain, A. K., & Prabhakar, S. (2009). Handbook of Fingerprint Recognition (2nd ed.). Springer.

3. Li, S. Z., & Jain, A. K. (Eds.). (2011). Handbook of Face Recognition (2nd ed.). Springer.

4. Ross, A. A., Nandakumar, K., & Jain, A. K. (2012). Handbook of Multibiometrics (2nd ed.). Springer.

5. Tistarelli, M., & Champod, C. (Eds.). (2017). Handbook of Biometrics for Forensic Science. Springer.

Paper Sl. No.	Paper - 1	Scheme of Evaluation	Theory
Name of the Course	Analytical Methods - II	L-T-P-C	3-1-0-4
Type of Course	Major	Credits Assigned	4
Paper Code	FSC142M601	Level of the Course	300

Course objective: This course aims to provide students with a comprehensive understanding of advanced forensic instrumentation techniques, including spectroscopy, chromatography, and microscopy. It aims to develop practical skills for operating and interpreting data from sophisticated instruments like GC-MS, LC-MS, SEM, and FTIR, while introducing emerging technologies such as portable instruments, microfluidics, and nanotechnology. The course also focuses on enhancing students' problem-solving abilities to analyze forensic evidence and apply these techniques effectively in real-world investigations.

Course Outcome : After successful completion of the course, student will be able to		
CO	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**recall** the fundamental principles, instrumentation, and applications of advanced spectroscopic techniques in forensic science.	BT1
CO2	**explain** the working principles, instrumentation, and forensic applications of hyphenated techniques such as GC-MS, LC-MS, and ICP-MS, and compare their advantages and limitations.	BT2
CO3	**apply** bioinformatics tools and software to analyze STR profiles and interpret forensic DNA data.	BT3
CO4	**analyze** the role of forensic DNA phenotyping in predicting physical traits and its ethical implications.	BT4

Modules	Course content	Lecture
I	**Advanced Spectroscopy Techniques:** Fluorescence Spectroscopy: Principles, fluorescence, phosphorescence, instrumentation, applications, Raman Spectroscopy, Raman scattering, instrumentation, applications, FTIR Spectroscopy: Principle, IR absorption, instrumentation interferometers, applications, Atomic Absorption Spectroscopy (AAS): Principles, forensic applications: toxic metal analysis, GSR analysis.	22
II	**Hyphenated Techniques:** GC-MS: Principles, Instrumentation: Columns, ionization methods (EI, CI), mass analyzers, Applications: Forensic toxicology, drugs, arson (volatile compounds), LC-MS: Principles, Instrumentation: Pumps, columns, ionization, Applications: Complex mixtures, drugs/metabolites, non-volatile compounds, ICP-MS: Principles/Applications: Trace metal analysis, Comparison: GC-MS vs. LC-MS: Volatility vs. Polarity.	23
III	**Electron Microscopy and Imaging:** SEM: Principles; Instrumentation: Electron guns, detectors, vacuum systems;	22

		Applications: Analysis of gunshot residue, hair, fibers, and other trace evidence; TEM: Principles; Instrumentation: Electron beams, lenses, detectors; Applications: Nanomaterial analysis and biological evidence; AFM: Principles, applications in surface analysis; Digital Imaging: Techniques for crime scene reconstruction; Applications.	
IV		**Emerging Forensic Instrumentation:** Portable Forensic Instruments: Handheld Raman spectrometers, XRF analyzers; Applications: On-site drug analysis, explosive detection, and material identification; Microfluidic devices: Principles; Applications: Forensic DNA analysis, drug detection, and rapid testing; Spectroscopic Imaging Techniques: Hyperspectral imaging and its applications in forensic science.	23
		Total	90

Notional Credit Hours for this course: 30 x 4 = 120

Distribution of Credits		
Lecture/ Tutorial	Practicum	Experiential Learning
90	0	30 Laboratory Visit, Experimenting,Group Work, Discussions, Presentations and Quiz

Textbooks:

1. Skoog, D. A., Holler, F. J., & Crouch, S. R. (2017). Principles of Instrumental Analysis (7th ed.). Cengage Learning.

2. Houck, M. M. (Ed.). (2016). Forensic Chemistry: Fundamentals and Applications. Wiley.

3. Rouessac, F., & Rouessac, A. (2007). Chemical Analysis: Modern Instrumentation Methods and Techniques (2nd ed.). Wiley.

4. Stoecker, W. (2016). Forensic Microscopy for the Generalist. Academic Press.

5. Bell, S. (2019). Forensic Science: An Introduction. CRC Press.

Reference Books:

1. Saferstein, R. (Ed.). (Various Years). Forensic Science Handbook (Vols. 1-3). Prentice Hall / CRC Press.

2. Willard, H. H., Merritt, Jr., L. L., Dean, J. A., & Settle, Jr., F. A. (1988). Instrumental Methods of Analysis (7th ed.). Wadsworth Publishing Company.

3. Pavia, D. L., Lampman, G. M., Kriz, G. S., & Vyvyan, J. R. (2014). Introduction to Spectroscopy (5th ed.). Cengage Learning.

4. Yinon, J. (Ed.). (1999). Forensic and Environmental Detection of Explosives. Wiley.

5. Yinon, J. (1997). Forensic Mass Spectrometry. CRC Press.

6. Meyers, R. A. (Ed.). (2000). Encyclopedia of Analytical Chemistry: Applications, Theory, and Instrumentation. Wiley.

Paper Sl. No.	Paper - 2	Scheme of Evaluation	Theory
Name of the Course	Forensic Ballistics	L-T-P-C	2-1-0-3
Type of Course	Major	Credits Assigned	3
Paper Code	FSC142M602	Level of the Course	300

Course objective: This course aims to provide a comprehensive understanding of firearms mechanics (classification, assembly, ballistics) and ammunition design, integrating theoretical principles (trajectory dynamics, pressure/recoil analysis) with practical skills in forensic firearm identification, GSR analysis, and toolmark comparison. Students will apply this knowledge to analyze ballistic evidence, reconstruct shooting incidents, and adhere to legal protocols for criminal investigations and courtroom testimony.

Course Outcome : After successful completion of the course, student will be able to		
CO	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**recall** the classifications, historical evolution, and functional assembly principles of firearms.	BT1
CO2	**explain** the constructional components, classification criteria, and functional mechanisms of ammunition.	BT2
CO3	**apply** principles of internal, external, and terminal ballistics to compute trajectories.	BT3
CO4	**analyze** class and individual characteristics on firearms/ammunition and gunshot residue evidence.	BT4

Modules	Course content	Lecture
I	**Firearms Fundamentals & Classification:** Firearms characteristics, classification of firearms: rifled firearms, small arms, shotguns, improvised/country-made firearms, History and background of firearms, Functional assembly & operating principles, standard vs. non-standard firearms, Identification of origin, improvised/imitative firearms.	15
II	**Ammunition Construction & Safety:** Ammunition constructional parts and classifications based on features: ignition type, purpose, design, caliber/gauge, Functional assembly of ammunition types, cartridge-firing mechanism: ignition sequence, pressue dynamics, ejection mechanisms, Safety protocols for handling firearms and ammunition.	15
III	**Ballistics Theory & Dynamics:** Types of ballistics: internal, external, terminal, Trajectory formation, computation: vacuum/earth trajectory, air resistance effects, Projectile-target interactions: bullet shape, velocity, angle, intermediate targets, range, Challenges in ballistics: heat, pressure, recoil, barrel fouling, vibration.	15
IV	**Forensic Firearm Analysis & Evidence:** Firearm/ammunition identification: class/individual characteristics (striations, breech	15

	marks), Gunshot residue (GSR): composition, collection, chemical/instrumental analysis, shooter identification, Forensic techniques: linkage of cartridge cases/projectiles to firearms, Case studies involving firearms evidence.		
	Total		**60**

Notional Credit Hours for this course: 30 x 3 = 90

Distribution of Credits		
Lecture/ Tutorial	**Practicum**	**Experiential Learning**
60	0	30 Laboratory Visit, Experimenting,Group Work, Discussions, Presentations and Quiz

Textbooks:

1. Heard, B. J. (2011). Forensic Ballistics in Court: Interpretation and Presentation of Firearms Evidence. Wiley-Blackwell.
2. Hatcher, J. S., Jury, F. J., & Weller, J. (1962). Firearms Investigation, Identification, and Evidence. The Stackpole Company.
3. Warlow, T. A. (2004). Firearms, the Law, and Forensic Ballistics (2nd ed.). CRC Press.
4. Inman, K., & Rudin, N. (2001). Principles and Practice of Criminalistics: The Profession of Forensic Science. CRC Press. (Contains foundational chapters relevant to ballistics).
5. Baxter, G. (1990). Practical Forensic Ballistics. Thomas Publishing Company.

Reference Books:

1. DiMaio, V. J. M. (2015). Gunshot Wounds: Practical Aspects of Firearms, Ballistics, and Forensic Techniques (3rd ed.). CRC Press.
2. Heard, B. J. (2008). Handbook of Firearms and Ballistics: Examining and Interpreting Forensic Evidence (2nd ed.). Wiley.
3. National Research Council. (2008). Ballistic Imaging. National Academies Press.
4. ASTM International Standards. (Various Years). Standards related to firearms and toolmarks examination. ASTM International.
5. Association of Firearm and Tool Mark Examiners (AFTE). AFTE Journal. (A key reference for ongoing research, case studies, and methodologies).
6. Sellier, K. G., & Kneubuehl, B. P. (1994). Wound Ballistics and the Scientific Background. Elsevier.

SEMESTER – VI

Paper Sl. No.	Paper - 3	Scheme of Evaluation	Theory
Name of the Course	Molecular Forensics	**L-T-P-C**	2-1-0-3
Type of Course	Major	**Credits Assigned**	3
Paper Code	FSC142M603	**Level of the Course**	300

Course objective: This course aims to equip students with a robust understanding of molecular biology principles (DNA replication, PCR, sequencing) and recombinant DNA technology, integrating advanced forensic applications (STR profiling, mtDNA analysis, NGS) and bioinformatics tools (BLAST, CODIS). Students will develop skills to design, analyze, and interpret DNA data for human identification, kinship testing, and criminal investigations, bridging laboratory techniques with computational approaches for forensic case resolution.

Course Outcome : After successful completion of the course, student will be able to
CO	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**recall** the fundamental concepts of molecular biology.	BT1
CO2	**explain** the mechanisms of transcription and translation in prokaryotes and eukaryotes.	BT2
CO3	**apply** modern DNA forensic techniques to interpret DNA mixtures, calculate paternity/sibship indices, and utilize genealogical databases for human identification.	BT3
CO4	**analyze** forensic biological data using bioinformatics tools and database systems.	BT4

Modules	Course content	Lecture Hours
I	**Molecular Biology:** Organization of genome in prokaryotes and eukaryotes, Chemical structure of DNA and RNA, DNA replication: Enzymes and accessory proteins, Mechanism of DNA replication in prokaryotes and eukaryotes, Procedure for collection and preservation of biological sample for DNA analysis, Techniques of DNA isolation and its quantitation, Polymerase Chain Reaction and its variants in PCR and primer designing, DNA separation and detection techniques, Methods of DNA sequencing.	15
II	**Central Dogma and rDNA Technology:** Transcription: RNA polymerases, features of prokaryotic and eukaryotic promoters, Synthesis and processing of prokaryotic and eukaryotic transcripts. Transport of RNA, Translation: Structure and role of t-RNA in protein synthesis, genetic code and its deciphering, Introduction and concept of recombinant DNA technology, Cloning strategies: Genomic libraries, cDNA libraries, single gene cloning, Types of vectors, Plasmids, cosmids, lamda phage vectors, shuttle vectors, BACs, YACs, Methods of transferring recombinant DNA to host cells.	15
III	**DNA Forensics:** Modern techniques for DNA extraction and quantification, STR Profiling, Types of errors, DNA Mixtures – Current status of tools and guidelines, Paternity/maternity indices, Sibship indices, Mitochondrial DNA analysis for human and related databases, Advanced Y-STR and X-STR analysis and its significance in establishing paternal relationships, Identity, Phenotypic and ancestry	15

		informative markers, Genealogy and its applications in forensic genetics, Next Generation Sequencing and Genome analysis.	
IV		**Forensic Bioinformatics:** Biological Data: The form of biological information, Primer designing for forensically important markers, Various databases for lineage and mtDNA markers, Databases – Format and Annotation, common sequence file formats, annotated sequence databases, Data – Access, Retrieval and Submission; Data retrieval tools, Sequence Similarity Searches: Local v/s global, Distance metrics, Similarity and homology, Scoring matrices, FASTA, BLAST, variants of BLAST, Multiple Sequence Alignment, Database management tools in DNA Forensics: CODIS and DNAxs.	15
Total			**60**

Notional Credit Hours for this course: 30 x 3 = 90

Distribution of Credits		
Lecture/ Tutorial	Practicum	Experiential Learning
60	0	30 Laboratory Visit, Experimenting,Group Work, Discussions, Presentations and Quiz

Textbooks:

1. Butler, J. M. (2011). Advanced Topics in Forensic DNA Typing: Methodology. Academic Press.
2. Goodwin, W., Linacre, A., & Hadi, S. (2010). An Introduction to Forensic Genetics (2nd ed.). Wiley-Blackwell.
3. Li, R. (2015). Forensic Biology (2nd ed.). CRC Press.
4. Lincoln, P. J., & Thomson, J. (Eds.). (1998). Forensic DNA Profiling Protocols. Humana Press.
5. Rudin, N., & Inman, K. (2002). An Introduction to Forensic DNA Analysis (2nd ed.). CRC Press.

Reference Books:

1. Butler, J. M. (2005). Forensic DNA Typing: Biology, Technology, and Genetics of STR Markers (2nd ed.). Academic Press.
2. Primorac, D., & Schanfield, M. (Eds.). (2014). Forensic DNA Applications: An Interdisciplinary Perspective. CRC Press.
3. Robertson, J., Vignaux, G. A., & Berger, C. E. H. (2016). Interpreting DNA Evidence: A Guide for the Non-Scientist. Wiley.

4. Saferstein, R. (Ed.). (2010). Forensic Science Handbook, Volume I (2nd ed.). Prentice Hall. (Contains key chapters on DNA analysis).
5. Scientific Working Group on DNA Analysis Methods (SWGDAM) Documents. (Various Years). (Essential standards and guidelines).
6. Butler, J. M. (2015). Advanced Topics in Forensic DNA Typing: Interpretation. Academic Press.

SEMESTER – VI

Paper Sl. No.	Paper - 4	Scheme of Evaluation	Practical
Name of the Course	Molecular Forensics (Practical)	L-T-P-C	0-0-6-3
Type of Course	Major	Credits Assigned	3
Paper Code	FSC142M614	Level of the Course	300

Course objective: To provide hands-on experience in fundamental and advanced techniques in molecular biology and forensic science. Students will learn to extract DNA from biological samples such as blood and saliva, measure its concentration and purity, and amplify specific regions using PCR. The course also covers DNA fragment separation, microscopic examination, blood typing, bloodstain pattern analysis, serological tests, STR analysis, complex DNA mixture interpretation, geographic ancestry prediction, and environmental DNA (eDNA) detection for species identification.

Course Outcome : After successful completion of the course, student will be able to		
CO	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**recall** the fundamental steps and principles involved in extracting DNA from biological samples.	BT1
CO2	**explain** the principles and procedures involved in microscopic examination of biological samples, blood typing, bloodstain pattern analysis, and serological tests for body fluids	BT2
CO3	**apply** bioinformatics tools and software to analyze Short Tandem Repeats (STRs) and interpret complex DNA mixtures, demonstrating the ability to use these tools for forensic identification and genetic profiling.	BT3
CO4	**analyze** data from Ancestry-Informative Marker (AIM) Analysis to predict geographic ancestry and evaluate environmental DNA (eDNA) results to detect species presence.	BT4

Modules	Course content	Lecture Hours
I	1. Extraction of DNA from biological samples: blood and saliva. 2. Measurement of the concentration and purity of extracted DNA.	15

	3. Amplification of specific regions of DNA using PCR. 4. Separation and visualization of DNA fragments based on size.		
II	5. Microscopic Examination of Biological Samples 6. Blood Typing 7. Bloodstain Pattern Analysis 8. Serological Tests for Body Fluid (Blood)	15	
III	9. Analysis of Short Tandem Repeats (STRs) using bioinformatics tools. 10. Analysis of complex DNA mixtures using software tools.	15	
IV	11. Prediction of geographic ancestry using Ancestry-Informative Marker (AIM) Analysis. 12. Detection of species presence in environmental samples using eDNA.	15	
Total		**60**	

Notional Credit Hours for this course: 30 x 3 = 90

Distribution of Credits		
Lecture/ Tutorial	Practicum	Experiential Learning
0	60	30 Laboratory Visit, Experimenting, Group Work, Discussions, Presentations and Quiz

Textbooks:

1. Butler, J. M. (2011). Advanced Topics in Forensic DNA Typing: Methodology. Academic Press.
2. Lincoln, P. J., & Thomson, J. (Eds.). (1998). Forensic DNA Profiling Protocols. Humana Press.
3. Rudin, N., & Inman, K. (2002). An Introduction to Forensic DNA Analysis (2nd ed.). CRC Press.
4. Rapley, R., & Whitehouse, D. (Eds.). (2007). Molecular Forensics. Wiley.
5. Newman, J. C., & Vook, S. (2012). Forensic DNA Extraction and Purification. John Wiley & Sons.

Reference Books:

1. Butler, J. M. (2005). Forensic DNA Typing: Biology, Technology, and Genetics of STR Markers (2nd ed.). Academic Press.
2. Inman, K., & Rudin, N. (2001). Principles and Practice of Criminalistics: The Profession of Forensic Science. CRC Press.

SEMESTER – VI

Paper Sl. No.	Paper - 5	Scheme of Evaluation	Theory

Name of the Course	Forensic Medicine and Medical Jurisprudence	**L-T-P-C**	2-1-0-3
Type of Course	Major	**Credits Assigned**	3
Paper Code	FSC142M605	**Level of the Course**	300

Course objective: This course aims to equip students with foundational knowledge and practical skills in forensic medicine, crime scene management, and death investigation. It focuses on mastering protocols for evidence collection, suspect interrogation, post-mortem analysis (e.g., time-of-death estimation, asphyxia cases), and specialized investigations (violence, abuse, thermal/mechanical injuries), ensuring adherence to legal standards and ethical practices for effective criminal justice outcomes.

Course Outcome : After successful completion of the course, student will be able to		
CO	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**recall** foundational principles of forensic medicine.	BT1
CO2	**explain** the investigative protocols for suspect interrogation, evidence management, and crime scene documentation.	BT2
CO3	**apply** techniques for exhumation, suicide assessment, and post-mortem analysis to determine cause/mode of death.	BT3
CO4	**analyze** mechanical injuries, thermal/electrocution fatalities, and patterns of violence.	BT4

Modules	Course content	Lecture Hours
I	**Forensic Medicine & Initial Crime Scene Response:** Fundamental aspects, scope, and objectives of forensic medicine, Need for forensic medicine, Approaching the crime scene of death: inquest procedures, recording dying declarations, Identifying witnesses/suspects, interviewing onlookers, and segregating potential witnesses.	**15**
II	**Investigative Protocols & Evidence Management:** Suspect in custody: initial interrogation, evidence search, Miranda rights, Crime scene assessment: forensic team coordination, command post/logbook management, crowd/media control, Documentation: note-taking, death scene documentation, evidence processing, injury evaluation, Tools and forms: canvass form, indexing death investigations.	**15**

III	**Death Investigation & Post-Mortem Analysis:** Buried body cases: search/exhumation methods, Suicide cases: injury analysis, psychological state assessment, suicide notes, Death definitions, types, causes, modes, and post-mortem changes (e.g., rigor mortis, livor mortis), Time since death estimation, molecular/systemic death, Objectives of medico-legal autopsy, Asphyxia-related deaths: hanging, strangulation, drowning.	**15**
IV	**Specialized Forensic Investigations (Violence, Injury, and Abuse):** Mechanical injuries: classification, ante/post-mortem distinction, aging, self-inflicted wounds, Violence against women/children: injury patterns, child abuse, human trafficking protocols, Thermal deaths (burns/hypothermia), electrocution, Sexual offences: victim/accused investigation protocols.	**15**
	Total	**60**

Notional Credit Hours for this course: 30 x 3 = 90

Distribution of Credits		
Lecture/ Tutorial	**Practicum**	**Experiential Learning**
60	0	30 Laboratory Visit, Experimenting,Group Work, Discussions, Presentations and Quiz

Textbooks:

1. Reddy, K. S. N. (2023). The Synopsis of Forensic Medicine and Toxicology (34th ed.). Jaypee Brothers Medical Publishers.
2. Modi, J. P. (2021). Modi's A Textbook of Medical Jurisprudence and Toxicology (27th ed., K. Mathiharan, Ed.). LexisNexis.
3. Biswas, G. (2022). Review of Forensic Medicine and Toxicology (5th ed.). Jaypee Brothers Medical Publishers.
4. Nageshkumar, G. R. (2015). Textbook of Forensic Medicine and Toxicology. Jaypee Brothers Medical Publishers.
5. Karmakar, R. N. (2015). JB Biswas's Textbook of Medical Jurisprudence and Toxicology (6th ed.). Academic Publishers.

Reference Books:

1. Vij, K. (2020). Textbook of Forensic Medicine and Toxicology: Principles and Practice (6th ed.). Elsevier India.
2. Pillay, V. V. (2022). Textbook of Forensic Medicine and Toxicology (22nd ed.). Paras Medical Publisher.
3. Parikh, C. K. (2018). Parikh's Textbook of Medical Jurisprudence, Forensic Medicine and Toxicology (8th ed.). CBS Publishers & Distributors.
4. DiMaio, V. J. M., & DiMaio, D. (2001). Forensic Pathology (2nd ed.). CRC Press.
5. Knight, B., & Saukko, P. (2015). Knight's Forensic Pathology (4th ed.). CRC Press.

Paper Sl. No.	Paper - 6	Scheme of Evaluation	Theory
Name of the Course	Forensic Linguistics	**L-T-P-C**	3-1-0-4
Type of Course	Minor	**Credits Assigned**	4
Paper Code	FSC142N601	**Level of the Course**	300

Course objective: To introduce students to the foundational principles and applications of forensic linguistics, focusing on language analysis in legal contexts. Students will learn about authorship attribution, discourse analysis, forensic phonetics, and the interpretation of legal texts. By the end of the course, students will be equipped with the skills to analyze language evidence and understand its role in legal and forensic investigations.

Course Outcome: After successful completion of the course, student will be able to

Sl.No.	Course Outcome	Blooms Taxonomy Level
CO1	**identify** the primary areas of application for forensic linguistics in legal contexts.	BT1
CO2	**explain** the characteristics of legal language, including its complexity, formality, and use of jargon.	BT2
CO3	**apply** knowledge of authorship attribution to analyze real-world cases involving disputed texts.	BT3
CO4	**analyze** speech samples to identify unique phonetic features for speaker identification.	BT4

Module	Course content	Lectures
I	**Introduction to Forensic Linguistics:** Definition and scope; History and development of forensic linguistics; Key areas of application (legal language analysis, authorship analysis, forensic phonetics); Interdisciplinary Nature of Forensic Linguistics; Ethical challenges in forensic linguistics; Responsibilities of a forensic linguist.	22
II	**Language and the Law:** Characteristics of legal language (complexity, formality, jargon); Ambiguity and interpretation in statutes, contracts, and wills; Courtroom interaction: Power dynamics, questioning techniques, and witness testimony; Police interviews and interrogations: Language strategies and coercion; Plain Language Movement; Language Rights in Legal Contexts.	23
III	**Authorship Attribution and Stylistics:** Introduction to stylistics: Lexical, syntactic, and semantic features; Authorship attribution: Quantitative vs. qualitative methods; Tools and software for stylistic analysis; Introduction to tools like AntConc, WordSmith, and LIWC; Challenges and limitations in authorship attribution; Forensic Linguistics in Digital Communication.	22
IV	**Forensic Phonetics and Discourse Analysis:** Basics of speech production and acoustics; Speaker identification and voice line-ups; Discourse Analysis in Forensic Contexts; Analyzing written and spoken texts for clues; Detecting deception, coercion, and manipulation; Forensic Applications of Discourse Analysis: Analyzing threatening letters, ransom notes, and confessions; Identifying linguistic markers of deception; Ethical Considerations.	23
Total		**90**

Notional Credit Hours for the course: 30 x 4 = 120 NCH

Distribution of Credits		
Lecture/ Tutorial	**Practicum**	**Experiential Learning**
90	0	30 Laboratory Visit, Field Trips, Group Work, Discussions, Presentations and Quiz

Textbooks:

1. Olsson, J. (2008). Forensic Linguistics: An Introduction to Language, Crime and the Law (2nd ed.). Continuum.
2. Coulthard, M., & Johnson, A. (2007). An Introduction to Forensic Linguistics: Language in Evidence. Routledge.
3. Gibbons, J. (2003). Forensic Linguistics: An Introduction to Language in the Justice System. Blackwell Publishing.
4. Shuy, R. W. (2002). Linguistic Battles in Trademark Disputes. Palgrave Macmillan.
5. Solan, L. M. (1993). The Language of Judges. The University of Chicago Press.

Reference Books:

1. Coulthard, M., Johnson, A., & Wright, D. (Eds.). (2016). The Routledge Handbook of Forensic Linguistics. Routledge.
2. Tiersma, P. M., & Solan, L. M. (Eds.). (2012). The Oxford Handbook of Language and Law. Oxford University Press.
3. McMenamin, G. R. (2002). Forensic Linguistics: Advances in Forensic Stylistics. CRC Press.
4. Gibbons, J., & Turell, M. T. (Eds.). (2008). Dimensions of Forensic Linguistics. John Benjamins Publishing Company.
5. Shuy, R. W. (1993). Language Crimes: The Use and Abuse of Language Evidence in the Courtroom. Blackwell Publishing.

SEMESTER – VII

Paper Sl. No.	Paper - 1	**Scheme of Evaluation**	Theory
Name of the Course	Forensic Entomology	**L-T-P-C**	3-1-0-4

Type of Course	Major/Core	Credits Assigned	4
Paper Code	FSC142M701	Level of the Course	400

Course objective: This course provides comprehensive knowledge of forensic entomology's legal applications. Students will learn fundamental principles: identifying forensically important insects, insect succession on decomposing remains, and collecting, preserving, and analyzing entomological evidence.[1] The course aims to equip students with skills to evaluate entomological findings and their significance in estimating post-mortem intervals (PMI) and other medico-legal investigations.

Course Outcome : After successful completion of the course, student will be able to

CO	Course Outcome	Bloom's Taxonomy Level
CO1	Define forensic entomology and identify common forensically important insect groups.	BT1
CO2	Understand the principles of insect succession on carrion and the factors affecting insect development and colonization.	BT2
CO3	Apply appropriate techniques for the collection, preservation, and rearing of entomological evidence from a simulated crime scene.	BT3
CO4	Analyze entomological data to estimate a minimum Post-Mortem Interval (PMI) and interpret findings in the context of a case scenario.	BT4

Module	Course content	Lectures
I	**Foundations of Forensic Entomology:** Introduction to Forensic Entomology: History, development, pioneers. Basic Entomology: Relevant insect anatomy, physiology, classification (Diptera, Coleoptera). Insect Life Cycles & Development: Metamorphosis, influencing factors (temperature, humidity, nutrition), degree-day accumulations. Corpse as an Ecosystem: Ecological principles, carrion community.	22
II	**Forensically Important Insects and Decomposition:** Flies of Forensic Importance (Diptera): Study of Calliphoridae, Sarcophagidae, Muscidae, Piophilidae, Phoridae, Stratiomyidae. Adult/immature identification. Beetles of Forensic Importance	23

		(Coleoptera): Study of Silphidae, Staphylinidae, Histeridae, Cleridae, Dermestidae. Adult/immature identification. Decomposition Process: Stages. Chemical/physical changes. Insect Succession on Carrion: Colonization patterns; affecting factors (environmental, geographical, individual).	
III		**Evidence Collection, Analysis, and PMI Estimation:** Crime Scene Procedures: Entomologist's role; documentation, collection, preservation of evidence (adults, larvae, pupae, eggs, artifacts). Rearing Entomological Evidence: Techniques for rearing immature insects for identification. Post-Mortem Interval (PMI) Estimation: Methods using development data; succession data. Limitations.	22
IV		**Entomotoxicology and Medico-legal Applications:** Entomotoxicology: Detecting drugs, toxins, GSR in insects when human tissues are unviable. Molecular Methods: DNA analysis for species ID, linking insects to remains/locations, population genetics. Aquatic Forensic Entomology: Insects on remains in aquatic environments; different succession/decomposition patterns. Other Applications: Myiasis in neglect/abuse; insect artifacts; stored product pests; wildlife crime. Professional standards, ethics, expert witness role.	23
		Total	**90**

Notional Credit Hours for the course: 30 x 4 = 120 NCH

Distribution of Credits		
Lecture/ Tutorial	**Practicum**	**Experiential Learning**
90	0	30 Laboratory Visit, Field Trips, Group Work, Discussions, Presentations and Quiz

Textbooks:

1. Rivers, D.B., & Dahlem, G.A. (2022). *The Science of Forensic Entomology* (2nd ed.). Wiley Blackwell.
2. Gennard, D.E. (2012). *Forensic Entomology: An Introduction* (2nd ed.). Wiley-Blackwell.

Reference Books:

1. Byrd, J.H., & Castner, J.L. (Eds.). (2009). *Forensic Entomology: The Utility of Arthropods in Legal Investigations* (2nd ed.). CRC Press.
2. Gordh, G., & Headrick, D.H. (2011). *A Dictionary of Entomology* (2nd ed.). CABI.
3. Capinera, J.L. (Ed.). (2008). *Encyclopedia of Entomology*. Springer.
4. Amendt, J., Goff, M.L., Campobasso, C.P., & Grassberger, M. (Eds.). (2010). *Current Concepts in Forensic Entomology*. Springer.

SEMESTER – VII

Paper Sl. No.	Paper - 2	Scheme of Evaluation	Theory
Name of the Course	Forensic Serology	L-T-P-C	3-1-0-4
Type of Course	Major/Core	Credits Assigned	4
Paper Code	FSC142M702	Level of the Course	400

Course objective: This course provides comprehensive knowledge of the scientific principles and practical applications for identifying, analyzing, and interpreting physiological fluids in forensic investigations. It covers the evolution from classical serology to modern DNA analysis, emphasizing serology's role in characterizing biological evidence, quality assurance, and ethical responsibilities.[1]

Course Outcome : After successful completion of the course, student will be able to

CO	Course Outcome	Bloom's Taxonomy Level
CO1	Define forensic serology and describe the composition and functions of various human physiological fluids relevant to forensic science.	BT1
CO2	Understand and explain the principles of presumptive and confirmatory tests for the identification of blood, semen, saliva, and other body fluids.	BT2
CO3	Apply knowledge of classical blood grouping techniques and interpret basic bloodstain patterns.	BT3
CO4	Analyze the importance of quality assurance and ethical considerations in forensic serology and discuss the transition to DNA typing.	BT4

Module	Course content	Lectures
I	**Fundamentals of Forensic Serology and Blood Analysis:** Forensic Serology: Definition, history, scope, significance in criminal investigations, role in detecting/identifying bodily fluids; Nature/Composition of Blood: Components (plasma, serum, cells) and functions. Presumptive Blood Tests: Principles, methods, advantages, limitations (Kastle-Meyer, LMG, Luminol, Hemastix), false positives; Confirmatory Blood Tests: Principles, procedures (Takayama, Teichmann), immunochromatographic assays, precipitin test for species ID.	22
II	**Bloodstain Pattern Analysis and Classical Blood Grouping:** Bloodstain Pattern Analysis (BPA): Classification (passive, transfer, spatter), information derived; Spatter Pattern Analysis: Directionality, angle of impact, point of convergence, area of origin for crime scene reconstruction; Blood Grouping Systems: ABO, Rh systems, antigens, antibodies, agglutination principles; Determination of ABO/Rh Types: Procedures, interpretation; Secretor Status: Concept, determination methods, forensic significance.	23
III	**Forensic Analysis of Other Physiological Fluids:** Semen: Composition, spermatozoa morphology. Presumptive (Acid Phosphatase test). Confirmatory (microscopy, PSA, Semenogelin); Saliva: Composition (amylase). Presumptive (Phadebas, starch-iodine). Confirmatory (RSID™-Saliva). Buccal cells for DNA; Urine: Composition, detection (urea, creatinine), identification challenges; Sweat & Other Fluids: Composition, identification challenges, drug metabolite detection; Collection & Preservation of Serological Evidence: Techniques for maintaining evidence integrity.	22
IV	**DNA Typing and the Modern Serology Context:** Transition to DNA Typing: Historical context, limitations of classical methods, impact of DNA discovery (Avery-MacLeod-McCarty experiment); Role of Serology in DNA Era: Essential screening to locate, identify, characterize stains for DNA analysis; QA/QC in Serology: SOPs, calibration, controls, proficiency testing, accreditation (ISO 17025); Forensic Serologist as Expert Witness: Report writing, courtroom testimony, ethics, presenting scientific evidence; Case studies.	23
	Total	**90**

Notional Credit Hours for the course: 30 x 4 = 120 NCH

Distribution of Credits

Lecture/ Tutorial	Practicum	Experiential Learning
90	0	30 Laboratory Visit, Field Trips, Group Work, Discussions, Presentations and Quiz

Textbooks:

1. Li, R. (Ed.). (Relevant Current Edition). *Forensic Biology*.
2. Saferstein, R., & Hall, A. B. (Eds.). (Relevant Current Edition). *Forensic Science Handbook, Volume I*.
3. James, S. H., Kish, P. E., & Sutton, T. P. (Relevant Current Edition). *Principles of Bloodstain Pattern Analysis: Theory and Practice*.

Reference Books:

1. Houck, M. M. (Ed.). (Relevant Current Edition). *Encyclopedia of Forensic Sciences*.
2. Gunn, A. (Relevant Current Edition). *Essential Forensic Biology*.
3. Katz, E., & Halámek, J. (Eds.). (Relevant Current Edition). *Forensic Science: A Multidisciplinary Approach*.
4. Judd, W. J., & Rolih, S. D. (Eds.). (Relevant Current Edition). *Serological Methods in Forensic Science*.

SEMESTER – VII

Paper Sl. No.	Paper - 3	Scheme of Evaluation	Theory
Name of the Course	Forensic Accounting and Auditing	**L-T-P-C**	3-1-0-4
Type of Course	Major/Core	**Credits Assigned**	4
Paper Code	FSC142M703	**Level of the Course**	400

Course objective: This course is designed to provide a comprehensive understanding of the principles and practices of forensic accounting and auditing within the Indian context. It aims to equip students with the necessary knowledge and skills to identify, investigate, prevent, and report on financial fraud and misrepresentation, with a focus on Indian laws and regulations. The curriculum will cover common fraud schemes, investigative techniques, forensic auditing procedures, evidence gathering and interpretation under the Indian Evidence Act, data

analytics, and the legal and ethical framework governing forensic accounting and auditing engagements in India.

Course Outcome : After successful completion of the course, student will be able to

CO	Course Outcome	Bloom's Taxonomy Level
CO1	Define forensic accounting and auditing, and explain the common types of fraud and reasons for their occurrence, with reference to Indian corporate scenarios.	BT1
CO2	Evaluate the legal, regulatory, and ethical principles relevant to forensic accounting and auditing engagements in India.	BT2
CO3	Apply forensic investigative and auditing techniques, including the use of data analytics and digital forensic tools, to gather, analyze, and interpret evidence in fraud examinations in compliance with Indian legal standards.	BT3
CO4	Analyze financial statements and business operations to detect misrepresentations, irregularities, and various fraud schemes as per Indian accounting and auditing standards.	BT4

Module	Course content	Lectures
I	**Introduction to Forensic Accounting, Auditing, and the Indian Legal Framework:** Nature, scope, and principles of forensic accounting and auditing. Historical development of forensic accounting and auditing in India. Types of fraud. The Indian legal system and the forensic accounting and auditing legal environment. Ethical principles, professional responsibilities, and standards for forensic accountants and auditors in India. Overview of relevant Indian legislation: Companies Act, 2013; SEBI Act, 1992; Prevention of Money Laundering Act, 2002; Information Technology Act, 2000.	22
II	**Fraud Schemes, Prevention, Detection, and Investigation in India:** Understanding the fraud triangle (pressure, opportunity, rationalization) and fraud diamond in the Indian context. Fraud prevention strategies and internal controls. Fraud detection techniques and red flags. Common investigative techniques: interviewing, evidence collection and handling (as per Indian Evidence Act), surveillance. The auditing environment and the role of forensic auditing in fraud detection and investigation in India. Specific fraud schemes: employee fraud, vendor fraud,	23

		management fraud, bank frauds, and frauds under various Indian corporate laws.	
III	**Financial Statement Fraud, Forensic Auditing Procedures, and Data Analysis (Indian Perspective):** Financial statement misrepresentations and common fraud schemes under Indian accounting standards. Forensic auditing procedures for detecting financial statement fraud as per Standards on Auditing (SAs) issued by ICAI. Introduction to data analytics in forensic accounting and auditing: identifying patterns, anomalies, and trends using tools like MS Excel, Benford's Law. Application of Computer-Assisted Audit Tools (CAATs) and digital forensic techniques in investigations. Information security, cybercrime, and their intersection with forensic accounting under the Information Technology Act, 2000.	22
IV	**Advanced Forensic Topics, Litigation Support, and Reporting in India:** Business valuation in forensic contexts as per Indian valuation standards. Calculation of economic damages for businesses and individuals. Specialized forensic engagements: family law, intellectual property infringement. Planning and managing forensic accounting and auditing engagements. Reporting forensic findings: structure, content, and legal considerations under Indian law. Litigation support services: role of the forensic accountant/auditor as an expert witness, deposition, and courtroom testimony in Indian courts. Case studies of Indian corporate frauds.	23
	Total	**90**

Notional Credit Hours for the course: 30 x 4 = 120 NCH

Distribution of Credits		
Lecture/ Tutorial	Practicum	Experiential Learning
90	0	30 Laboratory Visit, Field Trips, Group Work, Discussions, Presentations and Quiz

Textbooks:

1. Kranacher, M.J., & Riley, R. (2023). *Forensic Accounting and Fraud Examination* (3rd ed.).

2. Crumbley, D. L., Fenton, E. D., Jr., Smith, G. S., & Heitger, L. E. (Relevant Current Edition). *Forensic and Investigative Accounting*.

3. Singleton, T. W., & Singleton, A. J. (Relevant Current Edition). *Fraud Auditing and Forensic Accounting*. (e.g., 4th ed.)
4. Joshi, Apurva. (Relevant Current Edition). *Students Handbook on Forensic Accounting*.
5. Pandey, Durgesh. (2024). *Forensic Foresight | Case-Based Perspective on Forensic Accounting Standards*.

Reference Books:

1. AICPA. (Relevant Current Edition). *Essentials of Forensic Accounting*.
2. Jennings, W. L. (2022). *Fraud Investigation and Forensic Accounting in the Real World*.
3. Wells, J. T. (Relevant Current Edition). *Principles of Fraud Examination*.

SEMESTER – VIII

Paper Sl. No.	Paper - 4	Scheme of Evaluation	T&P
Name of the Course	Forensic Entomology and Serology (Practical)	**L-T-P-C**	0-0-8-4
Type of Course	Major/Core	**Credits Assigned**	4
Paper Code	FSC142M814	**Level of the Course**	200

Course Objective: This course aims to impart comprehensive knowledge and practical skills to students regarding the principles and applications of forensic serology and entomology. It focuses on the identification, collection, preservation, and analysis of biological and entomological evidence encountered at crime scenes, emphasizing the interpretation of findings for legal investigations. Students will develop proficiency in standard laboratory techniques and an understanding of their significance in reconstructing events and contributing to the criminal justice process.

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

CO	Course Outcome	Bloom's Taxonomy Level
CO1	Identify and classify forensically important biological fluids (blood, semen, saliva, urine) and insects (Diptera, Coleoptera).	BT2

CO2	Apply standard procedures for the meticulous collection, preservation, and documentation of serological and entomological evidence from simulated crime scenes.	BT3
CO3	Perform and interpret results from presumptive and confirmatory tests for blood, semen, and saliva, including understanding their limitations and significance.	BT3, BT4
CO4	Analyze entomological evidence, including insect life cycles and succession patterns, to estimate minimum Post-Mortem Interval (minPMI) and recognize factors influencing insect colonization and development.	BT4

Module	Course content	Lectures
I	1. Laboratory safety protocols, evidence handling, and documentation of biological evidence from a mock crime scene. 2. Performance and interpretation of presumptive tests for blood. 3. Performance and interpretation of confirmatory tests for blood.	22
II	4. Microscopic examination of blood cells. 5. Performance and interpretation of presumptive tests for semen and confirmatory tests for semen. 6. Performance and interpretation of presumptive tests for saliva and confirmatory tests for human saliva.	23
III	7. Classical ABO blood grouping techniques and introduction to basic bloodstain pattern analysis. 8. Collection and preservation of entomological evidence (eggs, larvae, pupae, adults) from a simulated outdoor crime scene. 9. Rearing of insect larvae to adult stage and morphological identification of common forensically important adult flies and their larval instars using taxonomic keys and microscopy.	22
IV	10. Morphological identification of common forensically important adult beetles using taxonomic keys and microscopy. 11. Estimation of minimum Post-Mortem Interval using entomological data, including calculation of Accumulated Degree Days/Hours and analysis of insect succession patterns from provided datasets. 12. Integrated mock case study involving the analysis of combined serological and entomological evidence, interpretation of findings, comprehensive report writing, and preparation for mock courtroom testimony.	23

	Total	90

Notional Credit Hours for the course: 30 x 4 = 120 NCH

Distribution of Credits		
Lecture/ Tutorial	Practicum	Experiential Learning
00	90	30 Laboratory Visit, Field Trips, Group Work, Discussions, Presentations and Quiz

Textbooks:

1. Rivers, D. B., & Dahlem, G. A. (2022). *The Science of Forensic Entomology* (2nd ed.). Wiley.
2. Saferstein, R. (2021). *Criminalistics: An Introduction to Forensic Science* (13th ed.). Pearson.
3. McClintock, J. T. (2014). *Forensic Analysis of Biological Evidence: A Laboratory Guide for Serological and DNA Typing*. CRC Press.
4. Gennard, D. (2012). *Forensic Entomology: An Introduction* (2nd ed.). Wiley.
5. James, S. H., Nordby, J. J., & Bell, S. (2019). *Forensic Science: An Introduction to Scientific and Investigative Techniques* (5th ed.). CRC Press.

Reference Books:

1. Byrd, J. H., & Castner, J. L. (Eds.). (2009). *Forensic Entomology: The Utility of Arthropods in Legal Investigations* (3rd ed.). CRC Press.
2. Li, R. (2018). *Forensic Biology* (2nd ed.). CRC Press.
3. Houck, M. M. (Ed.). (2022). *Encyclopedia of Forensic Sciences* (3rd ed.). Elsevier.
4. Adam, A. B., & Saferstein, R. (Eds.). (2020). *Forensic Science Handbook, Volume I* (3rd ed.). CRC Press.
5. Tobe, S. S., & Linacre, A. (Eds.). (2010). *Forensic Serology*. Academic Press.
6. Catts, E. P., & Haskell, N. H. (1990). *Entomology & Death: A Procedural Guide*. Joyce's Print Shop.
7. Kashyap, V. K., & Pillay, V. V. (1989). *A Manual of Forensic Entomology*.

SEMESTER – VII

Paper Sl. No.	Paper - 5	**Scheme of Evaluation**	Theory
Name of the Course	Forensic Pharmacology	**L-T-P-C**	4-0-0-4

Type of Course	Minor	Credits Assigned	4
Paper Code	FSC142N701	Level of the Course	400

Course objective: This course provides a comprehensive understanding of pharmacological principles relevant to forensic science. It covers pharmacokinetics, pharmacodynamics, metabolism, and mechanisms of action for common drugs, including those of abuse and therapeutic substances. Analytical techniques for drug detection and quantification in various samples, along with the interpretation of findings in legal investigations, are emphasized.

Course Outcome : After successful completion of the course, student will be able to

CO	Course Outcome	Bloom's Taxonomy Level
CO1	Describe the fundamental principles of pharmacokinetics (absorption, distribution, metabolism, excretion) and pharmacodynamics for various classes of drugs.	BT2
CO2	Classify different drugs of abuse (e.g., opioids, stimulants, depressants, hallucinogens) based on their chemical nature, effects, and legal status under acts like the NDPS Act.	BT2
CO3	Apply appropriate analytical techniques for the extraction, isolation, purification, and identification of drugs and their metabolites from biological and non-biological samples.	BT3
CO4	Analyze and interpret toxicological data, including postmortem findings and results from drug-facilitated crime investigations, considering factors like postmortem redistribution and drug interactions.	BT4

Module	Course content	Lecture
I	**Fundamentals of Forensic Pharmacology:** Pharmacology & Forensic Toxicology: Definitions, scope, history, interrelation; Pharmacokinetics: Absorption (routes, factors, first-pass, bioavailability); Distribution (factors, Vd, blood-brain barrier); Metabolism (Phase I & II reactions, CYP450, factors); Excretion	22

	(routes, half-life, clearance); Pharmacodynamics: Mechanisms (receptors, enzymes, etc.); Dose-response, therapeutic index, agonists/antagonists; Pharmacogenetics: Genetic influence on drug response/metabolism.	
II	**Major Drug Classes and Legal Aspects:** Classification: NDPS Act. Opioids: Natural, semi-synthetic, synthetic; pharmacology, metabolism, effects, detection. CNS Depressants: Alcohol (ethanol, methanol); Barbiturates, Benzodiazepines; chemistry, pharmacology, effects, detection. CNS Stimulants: Amphetamines; Cocaine; pharmacology, metabolism, effects, detection; Nicotine, Caffeine. Hallucinogens: Cannabis (THC); LSD, Psilocybin, Mescaline; effects, analysis; Novel Psychoactive Substances (NPS); The rise of NPS challenges detection and legal frameworks.	23
III	**Analytical Techniques in Forensic Pharmacology:** Sample Collection/Preparation: Biological & non-biological samples; Chain of custody. Extraction/Purification: Solvent extraction (Stas-Otto, etc.); SPE, SPME; LPME, SFE; Distillation (alcohols); Presumptive/Confirmatory Tests; Chromatographic Techniques: TLC; GC (FID, NPD), Headspace-GC; HPLC (UV, DAD, Fluorescence); Spectroscopic/Spectrometric: UV-Vis; IR/FTIR; MS (EI, quadrupole); Hyphenated: GC-MS, LC-MS; Immunoassays. HPLC-MS/GC-MS data interpretation; Derivatization.	22
IV	**Interpretation, Specialized Topics, and Quality Assurance:** Postmortem Toxicology: Specimen selection (peripheral vs. central blood, etc.); Postmortem Redistribution (PMR) - mechanisms, factors, interpretation; Interpreting postmortem concentrations; Postmortem substance formation; Drug-Facilitated Crimes (DFC): Common drugs, analytical challenges, specimen collection; Human Performance Toxicology: DUID, workplace testing. Oral fluid testing; Drugs in embalmed specimens; Measurement uncertainty/traceability; Statistics; QA/QC: Accreditation, validation, proficiency testing, SOPs, documentation; Expert Witness: Reports, testimony.	23
	Total	**90**

Notional Credit Hours for the course: 30 x 4 = 120 NCH

Distribution of Credits		
Lecture/ Tutorial	Practicum	Experiential Learning

90	0	30 Laboratory Visit, Field Trips, Group Work, Discussions, Presentations and Quiz

Textbooks:

1. Levine, B. (Ed.). (2022). *Principles of Forensic Toxicology* (5th ed.).
2. Katzung, B. G., Masters, S. B., & Vanderah, T.W. (2023). *Katzung's Basic and Clinical Pharmacology* (16th ed.).
3. Klaassen, C. D. (Ed.). (2019). *Casarett & Doull's Toxicology: The Basic Science of Poisons* (9th ed.).

Reference Books:

1. Moffat, A. C., Osselton, M. D., & Widdop, B. (Eds.). (2011). *Clarke's Analysis of Drugs and Poisons* (4th ed.).
2. Saferstein, R. (Ed.). (Various Years). *Forensic Science Handbook, Volumes I, II, & III*.
3. Aggrawal, A. (Latest Edition). *Textbook of Forensic Medicine and Toxicology*.
4. Society of Forensic Toxicologists (SOFT) and The International Association of Forensic Toxicologists (TIAFT) publications, guidelines, and online resources.

SEMESTER – VIII

Paper Sl. No.	Paper - 1	**Scheme of Evaluation**	Theory

Name of the Course	Research Methodology	L-T-P-C	4-0-0-4
Type of Course	Major/Core	Credits Assigned	4
Paper Code	FSC142M801	Level of the Course	400

Course objective: This course aims to provide students with a comprehensive understanding of the fundamental principles and practices of research. It will equip students with the knowledge and skills necessary to identify research problems, design appropriate methodologies, collect and analyze data effectively, and ethically report research findings. The course emphasizes the development of critical thinking and analytical skills essential for conducting scholarly inquiry and contributing to knowledge in their respective fields.

Course Outcome : After successful completion of the course, student will be able to

CO	Course Outcome	Bloom's Taxonomy Level
CO1	Define and explain the fundamental concepts, types, and ethical considerations of research.	BT1, BT2
CO2	Formulate clear research questions, develop testable hypotheses, and select appropriate research designs.	BT3, BT6
CO3	Apply various data collection techniques and sampling strategies suitable for different research problems.	BT3
CO4	Analyze and interpret quantitative and qualitative data using appropriate statistical and analytical methods.	BT4

Module	Course content	Lectures
I	**Foundations of Research & Problem Formulation:** Meaning, Objectives, Motivation, and Utility of Research. Types of Research: Exploratory, Descriptive, Experimental; Qualitative and Quantitative approaches. The Scientific Method: Concepts, Constructs, Variables, Theory (deductive, inductive), Empiricism. The Research Process Overview. Literature Review: Importance, sources, techniques. Problem Identification and Formulation: Defining research questions, investigation questions. Hypothesis: Qualities of a good hypothesis, Null and	22

	Alternative hypotheses, Hypothesis testing logic. Ethical considerations in problem selection and literature review.	
II	**Research Design, Sampling, and Measurement:** Research Design: Concept and Importance, Features of a good research design. Exploratory, Descriptive, and Experimental Research Designs: Concepts, types, and uses. Qualitative vs. Quantitative Research Approaches: Measurement, causality, generalization, replication; Merging approaches. Measurement: Concept, what is measured, problems in measurement. Validity and Reliability in Research. Sampling: Concept, Importance, and Process. Types of Sampling: Probability Sampling and Non-Probability Sampling; Determining Sample Size.	23
III	**Data Collection Methods & Tools:** Sources of Data: Primary and Secondary Data. Methods of Data Collection: Surveys (Questionnaire construction, administration); Interviews (Types, techniques, ethical considerations); Observation (Types, recording methods). Use of Encyclopedias, Research Guides, Handbooks, Academic Databases. Data Collection Tools: Construction of Schedules and Questionnaires. Ethical Considerations in Data Collection: Informed consent, privacy, confidentiality. Introduction to Data Processing: Editing, Coding, Tabulation.	22
IV	**Data Analysis, Interpretation, Report Writing, and Research Ethics:** Data Analysis: Descriptive Statistics (Mean, Median, Mode, Dispersion); Analytical Statistics (Correlation, Regression). Introduction to Statistical Software. Interpretation of Data. Research Report Writing: Structure of a Research Paper. Layout of a Research Report, Stages of Writing, Precautions. Citations, Footnotes, Endnotes, Bibliography; Use of reference management software. Ethical Issues in Research: Plagiarism and Self-Plagiarism, Fabrication and Falsification of Data, Conflicts of Interest and Bias, Ethical approvals, Ethical issues related to publishing.	23
	Total	**90**

Notional Credit Hours for the course: 30 x 4 = 120 NCH

Distribution of Credits

Lecture/ Tutorial	Practicum	Experiential Learning
90	0	30 Laboratory Visit, Field Trips, Group Work, Discussions, Presentations and Quiz

Textbooks:

1. Kothari, C.R. & Garg, G. (2019). *Research Methodology: Methods and Techniques* (4th ed.). New Age International Publishers.
2. Creswell, J.W. & Creswell, J.D. (2018). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (5th ed.). Sage Publications.
3. Dubey, Umesh Kumar B., & Kothari, D.P. (2022). *Research Methodology: Techniques and Trends*. Chapman and Hall/CRC.

Reference books:

1. Goode, W.J. & Hatt, P.K. (2022). *Methods in Social Research*. McGraw Hill.
2. Bhandarkar, P.L. & Wilkinson, T.S. (2016). *Methodology and Techniques of Social Research*. Himalaya Publishing House.
3. American Psychological Association. (2020). *Publication Manual of the American Psychological Association* (7th ed.).
4. Kumar, R. (2019). *Research Methodology: A Step-by-Step Guide for Beginners* (5th ed.). Sage Publications.

SEMESTER – VIII

Paper Sl. No.	Paper - 2	Scheme of Evaluation	Theory
Name of the Course	Incident Response and Management	**L-T-P-C**	4-0-0-4
Type of Course	Minor	**Credits Assigned**	4
Paper Code	FSC142N801	**Level of the Course**	400

Course objective: This course aims to provide students with a comprehensive understanding of the principles, processes, and best practices for effectively responding to and managing cybersecurity incidents. Students will learn about the incident response lifecycle, including preparation, detection, analysis, containment, eradication, recovery, and post-incident activities, with a focus on minimizing damage and recovery time. The course will also cover

the development of incident response plans, playbooks, communication strategies, and the integration of frameworks like NIST and the Incident Command System (ICS).

Course Outcome : After successful completion of the course, student will be able to

CO	Course Outcome	Bloom's Taxonomy Level
CO1	Define and explain the core concepts of incident response, common attack techniques, and the incident response lifecycle.	BT1, BT2
CO2	Develop and evaluate incident response plans, communication plans, and understand the roles and responsibilities within an incident response team.	BT3, BT5
CO3	Apply techniques for incident detection, analysis, initial impact assessment, and evidence handling in simulated scenarios.	BT3
CO4	Analyze and implement strategies for incident containment, eradication, and recovery from various types of cybersecurity incidents.	BT4

Module	Course content	Lectures
I	**Fundamentals of Incident Response & Preparation:** Introduction to Incident Response (IR): Defining cyber incidents, common types of incidents. Importance of IR. Incident Response Frameworks: The Incident Response Lifecycle: Preparation, Identification/Detection & Analysis, Containment, Eradication, Recovery, and Post-Incident Activity/Lessons Learned. Preparation Phase: Developing IR policies, plans, and procedures; Assembling and training the Incident Response Team (IRT); Roles and responsibilities; Establishing communication plans; Asset inventory and risk assessment; Investing in IR tools and technologies; Integrating IR with the Incident Command System (ICS).	22
II	**Incident Detection, Analysis, and Initial Assessment:** Detection and Identification Phase: Methods for detecting incidents; Recognizing Indicators of Compromise (IOCs) and	23

III	**Containment, Eradication, and Recovery:** Containment Phase: Strategies for containing incidents to prevent further spread and damage. Eradication Phase: Identifying and eliminating the root cause of the incident; Removing malicious software and artifacts; Closing exploited vulnerabilities; Resetting compromised accounts. Recovery Phase: Restoring affected systems and data from backups; Verifying system integrity and functionality; Monitoring systems post-recovery to ensure no recurrence of the incident; Strategies for timely and effective recovery.	22	
IV	**Post-Incident Activities, Management, and Advanced Topics:** Post-Incident Activity Phase: Conducting post-incident reviews and debriefings; Root cause analysis; Impact and damage assessment; Documenting lessons learned; Updating IR plans, policies, and procedures based on findings. Incident Response Case Management: Creating and managing incident cases; Documentation and reporting. Testing the IR Framework: Tabletop exercises, simulations, and mock drills. Managing a Multi-faceted Cybersecurity Incident. Legal and Ethical Considerations in Incident Response. Current Trends and Future Directions in Incident Response.	23	
	Total	**90**	

attack chains; Differentiating false positives from actual incidents. Analysis Phase: Initial impact assessment; Understanding the nature and scope of an incident; Collecting and analyzing logs, network traffic, and forensic data. Common Attack Techniques: Opportunistic vs. targeted attacks; Understanding attacker methodologies. Introduction to Digital Forensics for Incident Responders: Fundamentals of digital evidence handling; Overview of forensic tools and techniques.

Notional Credit Hours for the course: 30 x 4 = 120 NCH

Distribution of Credits

Lecture/ Tutorial	Practicum	Experiential Learning
90	0	30 Laboratory Visit, Field Trips, Group Work, Discussions, Presentations and Quiz

Textbooks:

1. Johansen, G. (Relevant Current Edition). *Digital Forensics and Incident Response*. Packt Publishing.
2. Luttgens, J. T., Pepe, M., & Mandia, K. (Relevant Current Edition). *Incident Response & Computer Forensics*. McGraw-Hill.
3. NIST. (Current Version). *Special Publication 800-61 Rev. 2: Computer Security Incident Handling Guide*.

Reference Books:

1. Van Wyk, K. R. (Relevant Current Edition). *Incident Response*. O'Reilly Media.
2. Schnepp, R. (Relevant Current Edition). *Incident Management for Operations*. O'Reilly Media.
3. Nelson, B., Phillips, A., & Steuart, C. (Relevant Current Edition). *Guide to Computer Forensics and Investigations*. Cengage Learning.
4. Coleman, J. (Relevant Current Edition). *Incident Management for the Street-Smart Fire Officer*. Fire Engineering Books.