

SCHOOL OF BASIC AND APPLIED SCIENCES								
UNDERGRADUATE COURSE STRUCTURE								
B.Sc. (Forensic Science) (4-year program)								
SEMESTER I								
Sl. No	Type of Course	Code	Title of the Course	Contact Hours Per Week				Remarks
				L	T	P	C	
1	Major	FRS100	Introduction to Forensic Science and Criminology	4	0	0	4	CC-1
2	Major	FRS101/ FRS102/ FRS103/ FRS104	Chemistry I/ Physics I/ Zoology I/ Botany I	3	0	1	4	CC-2/ CC-3/ CC-4/ CC-5
3	Minor		To be chosen from the given bucket				4	
4	MDC		To be chosen from the given bucket				3	
5	VAC		To be chosen from the given bucket				2	
6	AEC		English Communication I	2	0	0	2	
7			Foreign Language I	2	0	0	2	
8	SEC		AI for All				2	
Semester Credits							23	

SCHOOL OF BASIC AND APPLIED SCIENCES

UNDERGRADUATE COURSE STRUCTURE

B.Sc. (Forensic Science) (4-year program)	
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SEMESTER II	
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Sl. No	Type of Course	Code	Title of the Course	Contact Hours Per Week				Remarks
				L	T	P	C	
1	Major	FRS105	Scene of Crime Management	2	0	2	4	CC-6
2	Major	FRS106	Basics of Cyber Forensics	4	0	0	4	CC-7
3	Minor		To be chosen from the given bucket				4	
4	MDC		To be chosen from the given bucket				3	
5	VAC		To be chosen from the given bucket				2	
6	AEC		English Communication II	2	0	0	2	
7			Foreign Language II	2	0	0	2	
8	SEC		To be chosen from the given bucket				2	
9			Soft Skills and Aptitude Courses	1	0	0	1	
Semester Credits							24	

SCHOOL OF BASIC AND APPLIED SCIENCES

UNDERGRADUATE COURSE STRUCTURE

B.Sc. (Forensic Science) (4-year program)	
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SEMESTER III	
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Sl. No	Type of Course	Code	Title of the Course	Contact Hours Per Week				Remarks
				L	T	P	C	
1	Major	FRS200	Fingerprint Examination	2	0	2	4	CC-8
2	Major	FRS201/ FRS202/ FRS203/ FRS204	Chemistry II/ Physics II/ Zoology II/ Botany II	3	0	1	4	CC-9/ CC-10/ CC-11/ CC-12
3	Major	FRS205	Cyber Crime and related Laws	4	0	0	4	CC-13
4	Minor		To be chosen from the given bucket				4	
5	MDC		To be chosen from the given bucket				3	
6	VAC		To be chosen from the given bucket				2	
7	SEC		To be chosen from the given bucket				2	
8			Soft Skills and Aptitude Courses				1	
Semester Credits							24	

SCHOOL OF BASIC AND APPLIED SCIENCES

UNDERGRADUATE COURSE STRUCTURE

B.Sc. (Forensic Science) (4-year program)	
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SEMESTER IV

Sl. No	Type of Course	Code	Title of the Course	Contact Hours Per Week				Remarks
				L	T	P	C	
1	Major	FRS206	Questioned Document Examination	2	0	2	4	CC-14
2	Major	FRS207	Fundamentals of Forensic Toxicology	3	0	1	4	CC-15
3	Major	FRS208	Forensic Chemistry	3	0	1	4	CC-16
4	Minor		To be chosen from the given bucket				4	
5	VAC		To be chosen from the given bucket				2	
6	SEC		To be chosen from the given bucket				2	
7			Soft Skills and Aptitude Courses				1	
Semester Credits							21	

SCHOOL OF BASIC AND APPLIED SCIENCES								
UNDERGRADUATE COURSE STRUCTURE								
B.Sc. (Forensic Science) (4-year program)								
SEMESTER V								
Sl. No	Type of Course	Code	Title of the Course	Contact Hours Per Week				Remarks
				L	T	P	C	
1	Major	FRS300	Forensic Physics	2	0	2	4	CC-17
2	Major	FRS301/ FRS302/ FRS303/ FRS304	Chemistry III/ Physics III/ Zoology III/ Botany III	2	0	2	4	CC-18/ CC-19/ CC-20/ CC-21
3	Major	FRS305	Cyber Tools and Forensic investigation of cyber crime	2	0	2	4	CC-22
5	Minor		To be chosen from the given bucket				4	
6	SEC		To be chosen from the given bucket				2	
7			Soft Skills and Aptitude Courses				1	
8	INT		Internship				2	
Semester Credits							21	

SCHOOL OF BASIC AND APPLIED SCIENCES								
UNDERGRADUATE COURSE STRUCTURE								
B.Sc. (Forensic Science) (4-year program)								
SEMESTER VI								
Sl. No	Type of Course	Code	Title of the Course	Contact Hours Per Week				Remarks
				L	T	P	C	
1	Major	FRS306	Forensic Biology	2	0	2	4	CC-23
2	Major	FRS307	Forensic Ballistics	2	0	2	4	CC-24
3	Major	FRS308	Basics of Forensic Anthropology and Odontology	2	0	2	4	CC-25
4	Major	FRS309	Chromatographic and Spectroscopic Techniques in Forensic Science	1	0	1	2	CC-26
5	Minor		To be chosen from the given bucket				4	
6	SEC		To be chosen from the given bucket				2	
7			Soft Skills and Aptitude Courses				1	
Semester Credits							21	
Total Credits of the Program after 3 rd Year							134	

SCHOOL OF BASIC AND APPLIED SCIENCES								
UNDERGRADUATE COURSE STRUCTURE								
B.Sc. (Forensic Science) (4-year program)								
SEMESTER VII								
Sl. No	Type of Course	Code	Title of the Course	Contact Hours Per Week				Remarks
				L	T	P	C	
1	Major	FRS400	Forensic Medicine and Pathology	4	0	0	4	CC-27
2	Major	FRS401	Fundamentals of Forensic Serology	2	0	2	4	CC-28
3	Major	FRS402	Forensic Drug Chemistry	3	0	1	4	CC-29
4	Major (For With research)	FRS403	Research Methodology	4	0	0	4	CC-30 (With Research)
4A	Major (For Without research)	FRS404	Explosive analysis	3	0	1	4	CC-31 (without Research)
5	Minor		To be chosen from the given bucket				4	
6	SEC		Soft Skills and Aptitude Courses				1	
Total Semester Credit							21	

SCHOOL OF BASIC AND APPLIED SCIENCES								
UNDERGRADUATE COURSE STRUCTURE								
B.Sc. (Forensic Science) (4-year program)								
Semester VIII								
Sl. No	Type of Course	Code	Title of the Course	Contact Hours Per Week				Remarks
				L	T	P	C	
1	Major	FRS405	Instrumental Methods in Forensic Science	4	0	0	4	CC-23
2	Major (For Without research)	FRS406	Digital Forensics and Artificial Intelligence	4	0	0	4	CC-24 (without Research)
2A	Major (For Without Research)	FRS407	DNA Typing	3	0	1	4	CC-25 (without Research)
3	Minor (For with research)		To be chosen from the given bucket				4	
3A	Minor (For without research)		To be chosen from the given bucket				4	
4	Dissertation (For With Research)	FRS408	Project/Dissertation	12	0	0	12	
Total Semester Credit							20	
Total Credits of the Program after 4th Year							175	

Total credit attributed to Major = 98 (For with research)

= 94 (For without research)

List of MDC offered by Department of Forensic Science:

Sl. No	Code	Title of the Course	Contact Hours Per Week				Remarks
			L	T	P	C	
1.	FRS151	Forensic and Correctional Psychology	3	0	0	3	
2.	FRS152	Criminal Justice System and Law	3	0	0	3	
3.	FRS251	Criminalistics	3	0	0	3	

List of **Minor** offered by the Department of Forensic Science:

Sl. No	Code	Title of the Course	Contact Hours Per Week				Remarks
			L	T	P	C	
1.	FRS171	Introduction to Forensic Science	4	0	0	4	
2.	FRS172	Crime Scene Investigation	3	0	1	4	
3.	FRS271	Introduction to Fingerprints	3	0	1	4	
4.	FRS272	Introduction to Questioned Documents	3	0	1	4	
5.	FRS371	Introduction to Crime And Criminology	3	0	1	4	
6.	FRS372	Forensic Botany and Palynology	3	0	1	4	
7.	FRS421	Introduction to Forensic Medicine	4	0	0	4	
8.	FRS422	Criminal Psychology	4	0	0	4	
9.	FRS423	Wildlife Forensics and Entomological Evidences	3	0	1	4	

List of **SEC** offered by the Department of Forensic Science:

Sl. No	Code	Title of the Course	Contact Hours Per Week				Remarks
			L	T	P	C	
1.		Forensic Photography	1	0	0	1	
2.		Wildlife Forensic Investigation	1	0	0	1	
3.		Introduction to Biometry	1	0	0	1	
4.		Handwriting Identification and recognition	1	0	0	1	
5.		Accidental Investigation	1	0	0	1	

B.Sc. (Forensic Science) (4-year program)

SEMESTER IV

Course code	Course name	L	T	P	C
FRS207	Fundamentals of Forensic Toxicology	3	0	1	4

Course Objectives

1. To introduce the fundamentals, history, and scope of forensic toxicology.
2. To classify various poisons and understand their symptoms, actions, and medicolegal importance.
3. To explain the procedures for collection, preservation, and safe handling of toxicological samples.
4. To familiarize students with extraction and detection techniques for different types of poisons.
5. To develop practical skills for analyzing metallic poisons, pesticides, and drugs of abuse using classical and instrumental methods.

Course Outcomes

1. Understand the principles and significance of forensic toxicology in criminal investigations.
2. Classify poisons and explain their toxic effects and medicolegal aspects.
3. Demonstrate knowledge of proper collection and preservation techniques for toxicological samples.
4. Apply extraction and analytical techniques to detect various poisons in biological and non-biological samples.
5. Perform practical analysis of poisons and interpret toxicological findings using laboratory methods.

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	3	1	2	2	2	2	3	2
CO2	3	2	3	3	1	2	2	2	2	2	2
CO3	2	3	2	3	2	3	2	2	2	2	3
CO4	3	3	3	2	3	2	2	2	2	2	2
CO5	3	3	2	2	3	3	2	3	3	2	3

Module I: General concept of poisons**(Lecture hours : 10 hours)**

Introduction to toxicology, History of forensic toxicology, Role of toxicologist, significance of toxicological findings. Poisons: Classification on the basis of origin and mode of actions. Properties, symptoms and medicolegal aspects of metallic poisons (Arsenic, Lead and Mercury), animal poisons (Snake venom, Scorpion), Volatile poisons (Ethanol and methanol, chloroform) and Gaseous poison (Carbon monoxide, ammonia, hydrogen sulphide), pesticides (Organophosphate, organochloride, carbamates)

Module II: Collection and Preservation of Toxicological samples (Lecture hours : 10 hours)

Biological and non-biological samples, classes of matrices, guidelines of toxicological sample collection, post mortem examination, components of viscera, collection and preservation of viscera, urine and blood, safety measures of toxicological sample handling, Personnel Protective Equipment.

Module III: Extraction and Examination of poisons**(Lecture hours : 10 hours)**

Extraction and purification of Biological and non-biological samples, method of extraction, liquid-liquid extraction, extraction methods of acidic, basic and neutral poisons, extraction of volatile and non-volatile poisons, extraction of plant poisons, Common methods of poisons detection, chemical (colour tests) and instrumental methods (UV-Vis, TLC, HPLC, GC) for toxicological examination, challenges in forensic toxicological analysis.

Module IV: Heavy metals and drug of abuse**(Lecture hours : 10 hours)**

Heavy metals poisoning: Pb, Hg, As. Corrosive poisons: inorganic and organic acids, alkali, inorganic and organic solvents. Drugs of abuse: Introduction, Drug addiction, its problems, classification of Drugs of abuse – Narcotics, Depressants, Hallucinogens Stimulants, Volatile gases, Cannabis and Designer Drugs.

Module V: Practical**(Lecture hours : 30 hours)**

- Analysis of metallic poisons – Reinsch Test and Gudzeit method
- Identification of organophosphorus/organochloro and carbamate pesticide by TLC and UV-Vis spectroscopy
- Identification of sleep-inducing drugs (Diazepam, Lorazepam, Clonazepam, Nitrazepam and alprazolam) by UV-vis spectroscopy
- Identification of Cannabis by colour test and TLC

Reference Books:

1. Modi JS: Medical Jurisprudence and Toxicology
2. Taylor: Medical Jurisprudence
3. Parikh CK: Medical Jurisprudence and Toxicology
4. Keith Simpsen & Bernard Knight: Forensic Medicine
5. Poison, CJ, DJ Gee, B. Knight: Forensic Medicine
6. Reddy: Forensic Medicine
7. Laboratory Procedure Manual- Forensic Toxicology, DFS, MHA, New Delhi
8. Pharmacology and Therapeutics-Bhandarkar & Satoskar
9. Medical Pharmacology- Tripathy
10. Essentials of Toxicology- Ellenhorn
11. **Clark, M. A.** (Year). *Isolation and Identification of Drugs* (Edition).

SEMESTER VI

Course code	Course name	L	T	P	C
FRS309	Chromatographic and Spectroscopic Techniques in Forensic Science	1	0	1	2

Course Objectives

1. To provide foundational knowledge on electromagnetic radiation and its interaction with matter, relevant to forensic analysis.
2. To explain the principles and applications of absorption, emission, fluorescence, and phosphorescence spectroscopy.
3. To introduce theoretical concepts of separation and extraction techniques used in analytical toxicology.
4. To familiarize students with different types of chromatographic techniques, their principles, instrumentation, and forensic applications.
5. To develop hands-on skills in spectroscopic and chromatographic identification of forensic drug and poison samples.

Course Outcomes

1. Understand the principles of electromagnetic radiation and how they relate to molecular behavior in forensic spectroscopy.
2. Explain and apply various theories of extraction, including solid and liquid-phase techniques, in sample preparation.
3. Describe chromatographic principles, including stationary/mobile phase selection, and perform sample separation based on polarity.
4. Demonstrate working knowledge of TLC, GC-MS, HPLC-MS, and HPTLC instrumentation used in forensic analysis.
5. Perform and interpret practical experiments involving spectroscopic and chromatographic identification of drugs and pesticides.

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	2	2	2	1	2	2	2	1
CO2	3	3	3	2	2	2	2	2	2	2	2
CO3	3	3	3	2	2	2	2	2	2	2	2
CO4	3	3	3	2	3	3	2	3	2	2	3
CO5	2	3	2	2	3	3	2	2	2	2	3

Module 1 :Spectroscopy

(Lecture hours : 15 hours)

Electromagnetic Spectrum: Electromagnetic radiations, Absorption & Emission Spectra, General properties of electromagnetic radiations: Wave and Quantum mechanic properties, Atomic & molecular spectra, Florescence & Phosphorescence,

Theoretical Concepts of Separation and Extraction techniques: Adsorption Absorption & Partition, Partition co-efficient, Solvent extraction and Multiple extraction, Accelerated Solvent Extraction, Solid Phase Extraction & Solid Phase Micro Extraction, Plate theory and concept of theoretical plates with respect to peak width and peak intensity, Rate theory and van Deemter equation, Concept of Retention factor and Retention time.

Module II : Chromatography

(Lecture hours : 8 hours)

Concept of stationary and mobile phase (Polarity), normal and reverse phase separation, Retention and elution of samples

TLC, GC with HS/MS, HPLC with MS, HPTLC, GPC: Principle, Instrumentation and application in the Forensic field.

Module III : Practical

(Lecture hours : 10 hours)

1. Identification of sedative drugs : Diazepam, Lorazepam, Clonazepam, Nitrazepam, Alprazolam by UV-Vis Spectroscopy
2. Separation and identification of benzodiazepines group of drugs by TLC
3. Separation and identification of Organophosphorus by TLC

References:

- Patania, V. B. (2004). Spectroscopy, Campus Books International.
- Workman Jr, J., & Springsteen, A. (1998). Applied spectroscopy: a compact reference for practitioners. Academic Press.
- Subrahmanyam, N. (2012). A textbook of Optics. S. Chand Publishing.
- Chatwal, G. R. (2022). Instrumental methods of chemical analysis. Himalaya publishing house.
- Willard, H. H., Merritt Jr, L. L., Dean, J. A., & Settle Jr, F. A. (1988). Instrumental methods of

analysis.

- Dean, J. A. (1995). Analytical Chemistry Handbook, Tata McGraw Hill Inc.
- Thompson, K. C., & Reynolds, R. J. (1978). Atomic absorption, fluorescence and flame emission spectroscopy: a practical approach. (No Title).
- Webster, F. X., & Kiemle, D. J. (2005). Spectrometric identification of organic compounds. John Wiley & Sons

Course code	Course name	L	T	P	C
FRS405	Instrumental Methods in Forensic Science	4	0	0	4

Course Objectives

1. To introduce students to the fundamental principles and applications of various types of microscopes used in forensic analysis.
2. To provide an understanding of biochemical and biological analytical techniques such as buffer systems, centrifugation, and electrophoresis.
3. To develop theoretical knowledge of electromagnetic radiation and its role in spectroscopic and fluorescence-based detection.
4. To explain the foundational concepts of separation and extraction techniques used in forensic and analytical chemistry.
5. To familiarize students with chromatographic techniques and their instrumentation for separation and identification of compounds.

Course Outcomes

1. Understand the basic principles, working, and forensic applications of different types of microscopes including light and electron microscopes.
2. Apply knowledge of biochemical techniques such as centrifugation, electrophoresis, and buffer preparation in forensic examinations.
3. Interpret the behavior of electromagnetic radiation with matter and explain its use in forensic spectroscopic analysis.
4. Demonstrate theoretical understanding of extraction and separation techniques, including adsorption, partitioning, and solvent systems.
5. Operate and interpret results from various chromatographic methods such as TLC, HPLC, and GC in forensic investigations.

Course Outcomes \ Program Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1:	3	2	2	1	1	1	1	1	1	1	2
CO2:	3	3	2	1	2	2	1	2	2	1	2
CO3:	3	2	1	2	3	2	1	3	1	2	1
CO4:	3	2	2	2	3	1	1	3	1	1	1
CO5:	3	3	2	2	3	2	1	3	2	1	1

MODULE-1 Microscopy**(Lecture hours : 15 hours)**

Mirrors & Lenses, Basic principles of microscopy, Simple and Compound microscope, Study of different types of microscopes: Light Microscope & Electron Microscope: Comparison microscope, Phase contrast microscope, Stereoscopic microscope, Polarizing microscope, Fluorescence microscopy, IR microscopy, Scanning Electron Microscope (SEM), Transmission Electron Microscope (TEM).

MODULE-2 (Lecture hours : 15 hours)

Biological / Biochemical Analytical Techniques: Introduction to pH, Buffer systems and pH meter, Physiological solution, Theories of Precipitation, Coagulation, Sedimentation & Centrifugation, Different centrifugation techniques: Density Gradient Centrifugation, Differential Centrifugation & Preparative Centrifugation. Electrophoretic techniques: Zone electrophoresis (ZE), Paper electrophoresis (PE), Classical gel electrophoresis (CGE), Starch gel electrophoresis (SGE), Poly acrylamide gel electrophoresis (PAGE), SDS-PAGE, Isoelectric focusing (IEF) & Two dimensional SDS-PAGE.

Module-3 (Lecture hours : 15 hours)

Electromagnetic Spectrum: Electromagnetic radiations, Absorption & Emission Spectra, General properties of electromagnetic radiations: Wave and Quantum mechanical properties, Atomic & molecular spectra, Florescence & Phosphorescence, Jablonski Diagram.

Theoretical Concepts of Separation and Extraction techniques: Adsorption, Absorption & Partition, Partition co-efficient, Solvent extraction and Multiple extraction, Supercritical Fluid Extraction, Accelerated Solvent Extraction, Solid Phase Extraction & Solid Phase Micro Extraction, Plate theory and concept of theoretical plates with respect to peak width and peak intensity, Rate theory and van Deemter equation, Concept of Retention factor and Retention time.

Module-4 (Lecture hours : 15 hours)**Chromatographic Separation**

Principle of chromatography, Chromatography Techniques theory of separation techniques, Types of chromatography, applications and limitations; Paper chromatography, Column Chromatography, Thin layer chromatography; High Performance Liquid Chromatography: Principle, instrumentation and applications Gas Chromatography: Principle, instrumentation and applications, calibration of instruments, use of RM and CRM.

Reference Books:

1. D.A.Skoog, F.J.Holler and T.A.Neman, Harcoust Principles of Instrumental Analysis college publishers, Singapore
2. G.D.Christian and J.E.O'Reilly, Instrumental Analysis, Allyn and Bacon, Inc., Boston.
3. F.W.Fifield and D.Kealey, Principles and practice of Analytical Chemistry, International Textbook Company, London. SCHOOL OF FORENSIC SCIENCES M. Sc. Forensic Sciences
4. R.P.Bauman, Absorption Spectroscopy, John Wiely, New York.
5. M.Donhrow, Instrumental Methods in Analytical Chemistry; Their Principles and practice Vol.2, optical method, Pitaman, New York.
6. G.G.Guilbanlt, Practical Fluorensence: Theory, Methods and Practice, Marcel Dekker, New York.
7. S.Udenfriend, Fluorescence Assay in Biology and Medicine, Academic Press, New York.
8. W.J.Price, Spectrochemical Analysis by Atomic Absorption, Hyden, London.
9. R.S.Alger, Electron Paramagnetic Resonance: Techniques and Applications, Interscience, New York.
10. Analytical Chemistry by open Learning, John Wiley & Sons, New York.
11. J.C.Giddings, Dynamics of Chromatography, Marcel Dekker, New York.
12. R.C.Grob, Modern Techniques of Gas Chromatography, Marcel Dekker, New York.
13. J.A.Dean, Chemical Separation Methods, Ban Nostrand Reinhold Co., New York.
14. R.E.Smith, Ion Chromatography Applications, C.R.C. Press, Inc., Boca Raton.
15. R.E.Smith, Supercritical Fluid Technology, C.R.C. Press, Inc., Boca Raton.
16. G.Zweig and J.R.Whitaker, Paper Chromatography and Electrophoresis, Academic Press, New York.
17. Safferstein: Forensic Science Handbook Vol. I, II, III.
18. Lee Honry: An Introduction to Forensic Science
19. Egon Stahl: Thin Layer Chromatography

Course curriculum

SEMESTER IV

Course Code	Course Name	L	T	P	C
FRS206	Questioned Documents	2	0	2	4

Course Objectives:

- To introduce students to the fundamental concepts of questioned documents, including their classification, handling, and preliminary examination techniques.
- To develop an in-depth understanding of handwriting and signature analysis, emphasizing individual characteristics and methods for detecting forgeries.
- To equip students with knowledge and techniques for identifying various types of forgeries, including counterfeit documents, currency, and mechanical impressions.
- To train students in the examination of document alterations, such as erasures, overwriting, obliterations, secret writings, and ink analysis.
- To provide hands-on practical skills for analyzing handwriting, inks, and security features, using tools like Thin Layer Chromatography (TLC) and examination of security documents.

Course Outcomes:

CO1: Recognize and classify different types of questioned documents and apply proper procedures for their collection, preservation, and examination.

CO2: Compare handwriting and signature samples effectively, distinguishing between authentic, forged, and disguised writings based on scientific principles.

CO3: Identify and analyze forged documents, including fake currency, passports, stamps, and other fraudulent materials using standard forensic techniques.

CO4: Perform scientific examinations of document alterations, indented writings, and inks using appropriate instruments and methodologies.

CO5: Demonstrate practical proficiency in handwriting identification, deciphering secret writings, and conducting ink analysis, supporting forensic document investigations in real-world scenarios.

Mapping of CO-PO

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	2	1	2	1	2	1	2	2
CO2	3	3	1	3	2	2	1	3	2	2	2
CO3	3	3	2	3	3	3	1	3	2	2	2
CO4	3	3	2	3	3	2	1	2	2	2	2
CO5	3	3	2	3	3	2	1	2	3	3	-

Unit I: Nature and scope of Questioned Documents (3 hours)

Definition of documents questioned documents, Types of Questioned documents and the cases encountered; Preliminary examination of documents, collection, handling and transportation of documents, Adequacy of exemplars and standards, Determining the age of Documents.

Unit II: Handwriting and Signature Identification (4 hours)

Principle of handwriting, Comparison of handwriting, Individual and class handwriting characteristics. Request and Standard Documents, Signatures: Authentic signatures, forged signatures, disguised signatures and their characteristics. Anonymous Letters, Factors affecting the signature of individuals .

Unit III: Forgeries and it's detection (4 hours)

Definition of Forgery, Types and Examination and detection of forged documents. Examination of

Counterfeit of Indian currency notes, Examination of Passports and Plastic Money. Examination of Mechanical impressions (Seal, Stamp and Rubber).

Unit IV: Examination of Questioned Documents (4 hours)

Examination of alterations, erasures, overwriting, additions and obliterations. Indented and Secret writings. Charred Documents and its examination, Ink Examination, Composition of Ink and various types of writing inks (Carbon ink, Fountain pen ink, Ball point pen ink, Rolling ball marker ink, fiber or porous tips pen ink), Instruments and equipment used for examination of fraudulent documents; Typewriter, examination and identification of typescripts Examination of paper, Examination of photocopied documents.

Unit V: Practical (60 hours)

- To identify Handwriting Characters and study Natural variations .
- To Compare Handwriting Samples.
- Decipherment Of Secret writing.
- Identification of class and individual characteristics in handwriting.
- Identification of security features in currency notes.
- TLC of different ink samples .

References:

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. R.N. Morris, Forensic Handwriting Identification: Fundamental Concepts and Principles, Academic Press, London (2000).
4. E. David, The Scientific Examination of Documents – Methods and Techniques, 2nd Edition, Taylor & Francis, Hants (1997).

Minor Course

Course Code	Course Name	L	T	P	C
FRS171	Introduction to Forensic Science	4	0	0	4

Course Outcomes:

CO1: Understand the basic concepts, scope, and importance of forensic science in criminal investigations.

CO2: Describe the structure, roles, and services of forensic science laboratories at national and international levels.

CO3: Explain different types of crime scenes and demonstrate the process of crime scene investigation.

CO4: Analyze selected case studies to assess the role, challenges, and limitations of forensic science in real investigations.

CO–PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	0	0	2	0	0	0	0	2	2	2
CO2	3	2	0	2	0	0	2	0	2	2	2
CO3	3	3	3	2	0	2	2	0	2	2	3
CO4	3	0	3	2	0	2	2	2	2	2	2

Course Contents:

Unit I: Development and growth of Forensic Science (15 hours)

Introduction to Forensic science –Definition, nature, need and function; Principles of Forensic Science; Branches of Forensic Science, its utilization at the scene of crime and in the courts.

Unit II: Forensic Science Laboratory (15 hours)

Brief History & current scenario at National & International level, Role and Functions of DFSS, Services and functionalities provided by various FSLs, Structure of the FSLs, Various divisions in the FSL – General Analytical and Instrumentation, Ballistics, Biology, Chemistry Documents, Physics, Psychology, Serology, Toxicology, Cyber Forensic, Tape Authentication and Speaker Identification (TASI), DNA division. Mobile Forensic Science.

Unit III: Crime Scene (15 hours)

Defining a crime scene, Importance, location and processing of crime scene. Types of Crime Scene: Indoor and outdoor, Primary and secondary and crime scenes based on size of evidence.

Unit IV: Case Study (15 hours)

Aarushi Murder Case, Sheena Bora Murder Case, Ted Bundy serial murder case: role of forensic investigation, Problem associated with investigation, Limitations of forensic expert and judgement.

References:

1. Fisher, B., Techniques of Crime Scene Investigation (6thEdn.) CRC Press, Boca Raton, Florida, 2000.
2. James, S. H. And Nordby, J. J. (Eds) Forensic Science - An Introduction to Scientific and Investigative Techniques, CRC Press, London, 2003
3. DeForest, P., Gaensslen, R., and Lee, H., Forensic Science; An Introduction to Criminalistics, McGraw Hill, New York, 1983.

Course Code	Course Name	L	T	P	C
FRS172	Crime Scene Investigation	3	0	1	4

Course Outcomes:

CO1: Understand the concept of criminalistics and its role in identifying different types of evidences at crime scenes.

CO2: Demonstrate knowledge of crime scene management techniques, including securing, recording, documentation, and maintaining the chain of custody.

CO3: Identify and classify various types of physical evidences and explain their forensic relevance in criminal investigations.

CO4: Perform practical procedures for crime scene sketching, evidence collection, packaging, and forwarding in simulated forensic scenarios.

CO–PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	2	0	1	1	0	2	2	2
CO2	3	3	3	3	1	2	2	0	2	2	3
CO3	3	3	3	2	0	2	2	0	2	2	2
CO4	2	3	2	2	1	2	2	1	2	2	3

Course Contents:

Unit I: Basics of Criminalistics (15 hours)

Definition of Criminalistics, Role of Criminalistics in Forensic investigation. Different types of evidences at the crime scene and their Forensic significance. Identification and Importance of Corpus Delicti, Modus operandi, Signature, trophy on the crime scene, admissibility of evidences.

Unit II: Crime Scene Management (15 hours)

Crime scene Management – initial response, role of first responding officer, Securing and Recording the Crime Scene. Protecting a scene of crime – various steps involved, contamination issues. Search Patterns of a crime scene, Crime scene Documentation, Collection, Packaging, Labeling & Forwarding of exhibits to Forensic Laboratories., Preservation of evidence, Health & Safety Protocols. Crime Scene reconstruction and its utility; chain of custody.

Unit III: Evidences (15 hours)

Definition, importance and types of physical evidences. Crime Scene Evidences- Fingerprints and other prints, Blood, Semen & other Biological fluids, Viscera, Shoe impressions, Tool marks, Tyre marks, Bite Marks, Hair – Animal & Human, Fibers & Fabrics, Glass, Soil, Pollens, Paint, Establishment of Identity of Individuals, Fingerprints/Footprints, Forensic Anthropology – Skeletal Remains, Forensic Odontology.

Unit IV: Lab (30 hours)

1. Investigation and sketching of indoor and outdoor scene of crime
2. Collection, packing and forwarding of different types of evidence.

References:

1. Bodziak, W., Footwear Impression Evidence (2ndEdn.) CRC Press, Boca Raton, Florida, 2000.
2. DeForest, P., Gaensslen, R., and Lee, H., Forensic Science; an Introduction to Criminalistics, McGraw Hill, New York, 1983.
3. Fisher, B., Techniques of Crime Scene Investigation (6thEdn.) CRC Press, Boca Raton, Florida, 2000.
4. James, S. H. And Nordby, J. J. (Eds), Forensic Science - An Introduction to Scientific and Investigative Techniques, CRC Press, London, 2003.
5. James, S., and Esker, W., Interpretation of Blood Stain Evidence at Crime Scenes, (2ndEdn) CRC Press, Boca Raton, Florida, 1999.
6. Saferstein, Richard, Criminalistics, An Introduction to Forensic Science, 6th Ed. Prentice-Hall, New Jersey, 1998.
7. Sharma, B. R., Forensic Science in Criminal Investigation and Trials (3rdEdn) Universal Law Publishing Co. Ltd. New Delhi, 2001.

Course Code	Course Name	L	T	P	C
FRS271	Introduction to Fingerprints	3	0	1	4

Course Outcomes:

CO1: Understand the history, principles, and patterns of fingerprints, including general and individual ridge characteristics.

CO2: Describe and apply various fingerprint classification systems, particularly the Henry classification system.

CO3: Explain and demonstrate techniques for examination and development of latent fingerprints using physical, chemical, and modern methods.

CO4: Perform basic practical skills such as fingerprint recording, pattern identification, and development using standard physical techniques.

CO–PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	2	0	1	1	0	2	2	2
CO2	3	3	2	1	0	1	1	0	2	2	2
CO3	3	3	3	2	2	2	2	0	2	2	3
CO4	2	3	2	1	2	2	2	1	2	2	3

Course Contents:

Unit I: Introduction to Fingerprints and its Patterns (15 hours)

History and Principles of Fingerprints, Ridge formation, Composition of Sweat, Fingerprint patterns, General and Individual characteristics of fingerprints.

Unit II: Classification of Fingerprints (15 hours)

Various systems for FP classification; Henry classification system, numerical value, symbol, primary classification, secondary classification, sub-secondary classification and final classification.

Unit III: Examination of fingerprints (15 hours)

Ridge Counting and tracing, Latent fingerprint, development of fingerprints: physical and chemical methods, florescent method, laser method, lifting of latent fingerprints. Photography of latent traces and presentation of fingerprint evidence in court.

Unit IV: Lab (30 hours)

1. Making of fingerprints on fingerprint cards
2. Identifying of the Fingerprint pattern
3. Development of fingerprints using physical methods

References:

1. Bridges, B. C., Vollmar, A. Monir, M., Criminal Investigation, Practical Fingerprinting, Thumb Impression, Handwriting, Expert Testimony Opinion Evidence, The University Book Agency, Allahbad, 2000.
2. James F. Cowger; Friction Ridge skin CRC Press London.
3. Mehta, M.K: Identification of Thumb Impression & Cross Examination of Finger Prints, N .M. Tripathi (P) Ltd, Bombay.

Course Code	Course Name	L	T	P	C
FRS272	Introduction to Questioned Documents	3	0	1	4

Course Outcomes:

CO1: Understand the concept, importance, and handling procedures of questioned documents in forensic investigations.

CO2: Explain the principles of handwriting and signature identification, including types of forgeries and influencing factors.

CO3: Examine and interpret various types of forged documents such as alterations, overwriting, and obliterations.

CO4: Perform laboratory techniques for detecting fraudulent, invisible, and indented writings in questioned documents.

CO–PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	2	0	1	1	0	2	2	2
CO2	3	2	3	2	0	2	2	0	2	2	2
CO3	3	3	3	2	1	2	2	1	2	2	3
CO4	2	3	2	2	1	2	2	1	2	2	3

Course Contents:

Unit I: Introduction to Questioned Documents (15 hours)

Definition of documents, questioned documents and the type of cases encountered; Importance, nature and problems of documents, Location, collection, handling and presentation of documents, adequacy of exemplars and standards.

Unit II: Handwriting & Signature Identification (15 hours)

Principles of hand writing & signature identification, Forgeries & its types and their detections, Factors affecting the signature of individuals.

Unit III: Forged Documents (15 hours)

Examination of alterations, erasers, overwriting, addition and obliterations; Decipherment of secret, indented and charred documents.

Unit IV: Lab (30 hours)

1. Examination and detection of fraudulent documents
2. Identification of Invisible writing
3. Identification of Indented writing

References:

1. O'Hara & Osterburg: Introduction to Criminalistics, 1949, The MacMillan Co., 1964.
2. Katherine M Koppenhaver, Forensic Document Examination, Principles and Practice.
3. Charles C. Thomas, I.S.Q.D. Identification System for Questioned Documents; Billy Prior Bates Springfield, Illinois, USA
4. Wilson R. Harrison; Suspect Documents -Their Scientific Examination; Universal Law Publishing, Delhi

Course Code	Course Name	L	T	P	C
FRS371	Introduction to Crime and Criminology	3	0	1	4

Course Outcomes:

CO1: Understand the scope of criminology, elements of crime, and major criminological theories.

CO2: Identify and describe different crime typologies including organized, white collar, and serial crimes.

CO3: Analyze crimes against women, including causes, victimology, and the need for social awareness.

CO4: Conduct crime data analysis and case studies using qualitative and quantitative methods.

CO–PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	1	2	2	0	1	1	0	2	2	1
CO2	3	2	3	2	0	2	2	0	2	2	2
CO3	3	2	2	3	0	2	2	1	2	3	2
CO4	2	3	3	2	1	2	2	1	3	2	3

Course Contents:

Unit I: Introduction to Criminology (9 hours)

Definition & scope of crime and Criminology, elements of Crime, theories of Criminology.

Unit II: Crime Typologies (12 hours)

Economic offences, Organized crime, White collar crime, Occupational crime, Political crime, Habitual criminals, serial crimes and psychotic criminals.

Unit III: Crime against Women (15 hours)

Harassment & humiliation of women, female victims, motivation of crime against women, self-image, self- esteem and adjustment of the victims, creating awareness in the society.

Unit IV: Lab (30 hours)

1. Crime data Analysis of last 5 years.
2. Case Study on various types of crime.
3. Qualitative & Quantitative analysis of types of crime

References:

1. Bacon, M.K., Child, I.L and Barry, H., A Cross- cultural Study of Correlates of Crime, Journal of Abnormal and Social Psychology, 1963.
2. Bajpai, G.S., Development without Disorders, VishwavidyalayaPrakashan, Sagar (M. P.), 2002.
3. Ellis, L. and Walsh, Criminology – A Global Perspective, Allyn, and Bacon, Boston, 2000.
4. M. Meguire, R. Morgan & R. Reiner; Oxford Handbook of Criminology, 2nd ed. Biddles Ltd, Lyon, 1997.
5. Ram Ahuja, Criminology; Rewal Pub. Jaipur , 2000.

Course Code	Course Name	L	T	P	C
FRS372	Forensic Botany and Palynology	3	0	1	4

Course Outcomes:

CO1: Understand and identify various botanical evidences such as seeds, leaves, and timber types in forensic contexts.

CO2: Explain the morphology, types, and forensic relevance of diatoms, especially in drowning investigations.

CO3: Describe the role of spores, powdered minerals, and pollen grains in forensic palynology and their applications in investigations.

CO4: Perform practical identification and matching of diatoms, pollen grains, and botanical specimens in laboratory settings.

CO–PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	2	0	1	1	0	2	2	2
CO2	3	2	3	2	1	2	2	0	2	2	2
CO3	3	2	3	2	1	2	2	1	2	2	2
CO4	2	3	3	2	1	2	2	1	3	2	3

Course Contents:

Unit I: Forensic Botany (15 hours)

Different botanical evidences of forensic significance: Leaves, seeds, etc. Various types of wood, timber varieties, seeds and leaves– their identification and matching.

Unit II: Diatoms (15 hours)

Types and morphology, methods of isolation from different tissue and forensic importance of diatom, forensic significance in drowning cases.

Unit III: Palynology (15 hours)

Study of spore, powdered minerals and pollens of forensic importance, Use of pollen grains & spores in criminal or civil investigation, Applications of Forensic Palynology.

Unit IV: Lab (30 hours)

1. Identification of Diatoms
2. Identification and matching of various types of botanical evidence.
3. Study of pollen grains of forensic significance.

References:

1. Bruce Budowle, Steven E. Schutzer & Roger G. Breeze. Microbial Forensics (1st ed). Academic Press, 2005.
2. David O. Carter, Jeffery K. Tomberlin, M. Eric Benbow & Jessica L. Metcalf. Forensic Microbiology. Wiley, 2017.

Course Code	Course Name	L	T	P	C
FRS421	Introduction to Forensic Medicine	4	0	0	4

Course Outcomes:

- **CO1: Personal Identification** – Understanding key parameters for identifying individuals in forensic cases.
- **CO2: Mechanical Injuries and Death Analysis** – Assessing signs, causes, and postmortem changes to determine time and manner of death. Recognizing and differentiating types of wounds and their forensic significance.
- **CO3: Sexual Offences Examination** – Conducting forensic investigations of sexual offences, including victim and accused analysis.
- **CO4: Abortion & Infanticide** – Evaluating cases with postmortem techniques and determining causes of death in newborns.

CO–PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	2	0	1	1	0	2	2	2
CO2	3	2	3	2	1	2	2	0	2	2	2
CO3	3	2	3	2	1	2	2	1	2	2	2
CO4	2	3	3	2	1	2	2	1	3	2	3

Course Contents:

Unit I: Personal Identification (12 hours)

Personal Identification: parameters of personal identification- race, religion, sex, age, teeth.

Unit II: Death and its cause (12 hours)

Death and its causes, Signs of death, Post mortem changes, Determination of cause of death, manner of death, Estimation of time since death.

Unit III: Mechanical Injuries (12 hours)

Abrasions, Bruises, Lacerations, Incised wounds, Stab wounds, Self-inflicted wounds.

Unit IV: Sexual Offences (12 hours)

Natural sexual offences-Rape, Incest, Examination of the victim, examination of the accused. Unnatural sexual offences- sodomy, Buccal Coitus, Tribadism, Bestiality, Sexual perversions.

Unit V: Abortion and Infanticide (12 hours)

Definition, classification, Examination of the woman, Examination of the aborted material, developmental stages of a foetus, still-born & dead born child, Postmortem examinations, Cause of death in the new born, SIDS.

References:

1. Modi JS: Medical Jurisprudence and Toxicology
2. Taylor: Medical Jurisprudence
3. Parikh CK: Text book of Medical Jurisprudence and Toxicology
4. Keith Simpson & Bernard Knight: Forensic Medicine
5. C.M.V. Cox Medical Jurisprudence and Toxicology

Course Code	Course Name	L	T	P	C
FRS422	Criminal Psychology	4	0	0	4

Course Outcomes:

- **CO1: Understanding Polygraphy** – Gaining knowledge of polygraph history, principles, examination stages, questioning techniques, and legal admissibility.
- **CO2: Exploring Narco-analysis** – Learning the principles, drugs used, procedure, reliability, limitations, and Indian legal perspectives of narco-analysis.
- **CO3: Brain Fingerprinting Techniques** – Understanding the history, process, brain wave patterns, reliability, and forensic applications of brain mapping.
- **CO4: Ethical and Legal Aspects** – Evaluating the admissibility, limitations, and ethical concerns of forensic psychophysiological techniques in criminal investigations.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	3	1	2	2	1	2	2	2
CO2	3	2	3	3	1	2	2	1	2	2	2
CO3	3	2	3	3	2	2	2	1	2	2	2
CO4	2	3	3	2	2	3	3	2	3	3	3

Course Contents:

Unit I: Polygraphy (20 hours)

Polygraph/Lie Detector Test: History, Objectives, theoretical basis, parameters measured, stages of examination (Pre-test, In- test, post-test), Questioning techniques, Stim test, Limitations, Admissibility in the court of law, NHRC guidelines, case studies, etc.

Unit II: Narco-analysis (20 hours)

Principle, History, drugs used, procedure, reliability, admissibility, limitations, Indian scenario, case studies, etc.

Unit III: Brain Fingerprinting/Brain-Mapping (20 hours)

Principle, Importance, History, process, brain waves (P300, delta, theta, gamma, alpha), reliability, case studies, admissibility, etc.

References:

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

Course Code	Course Name	L	T	P	C
FRS423	Wildlife Forensics and Entomological Evidences	3	0	1	4

Course Outcomes:

- **CO1: Forensic Entomology Principles** – Understanding insect biology, life cycles, and their application in estimating time of death in forensic investigations.
- **CO2: Wildlife Protection and Forensic Techniques** – Learning the identification and examination methods for wildlife species, endangered species, and related forensic evidence.
- **CO3: Identification of Animal Traces and Products** – Developing skills in analyzing pugmarks, bear bile, ivory, and rhino horn for forensic applications.
- **CO4: Practical Case Analysis in Forensic Science** – Applying forensic entomology and wildlife forensic principles through case report preparation and evidence examination.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	3	3	1	2	2	1	2	2	2
CO2	3	2	3	3	2	2	2	1	3	2	3
CO3	3	2	3	3	2	2	2	1	2	2	2
CO4	2	3	3	3	2	3	3	2	3	3	3

Course Contents:

Unit I: Entomology (15 hours)

Basic Principle of Insect Biology, Life Cycle, Estimation of Time of Death, Preservation of Sample.

Unit II: Wildlife Forensics-I (15 hours)

Introduction and Importance of wild life, Protected and endangered species of Animals and Plants, Wild life species– Identification and examination of physical evidence by conventional and modern methods. Wildlife / Environment Protection Act.

Unit III: Wildlife Forensics-II (15 hours)

Identification of Pugmarks of various animals, Identification of Bear Bile, Elephant's Ivory and Rhino horn.

Unit IV: Lab (30 hours)

1. To prepare a case report on forensic entomology
2. To prepare a case report on problems of wildlife forensics.
3. Identification of Pug marks of various animals.

References:

1. Jan Bundschuh. Wildlife Forensic: Investigation, Principles & Practice, 2018.
2. Jane E. Huffman & John R. Wallace. Wildlife Forensics: Methods and Applications. Wiley, 2011.
3. Jason H. Byrd & James L. Castner. Forensic Entomology: The Utility of Arthropods in Legal Investigations. CRC Press, 2009.
4. Jeffery Keith Tomberlin & M. Eric Benbow. Forensic Entomology: International Dimensions and Frontiers. CRC Press, 2015.

Skill Enhancement Courses

Course Code	Course Name	L	T	P	C
	Forensic Photography	1	0	1	2

Course Outcomes:

- **CO1: Fundamentals of Photography** – Understanding the principles, techniques, and advancements in black & white and color photography, including camera functions and film processing.
- **CO2: Forensic Applications of Photography** – Learning crime scene photography techniques, including infrared, ultraviolet, and thermal imaging, along with digital forensic methods.
- **CO3: Practical Crime Scene Documentation** – Developing skills in crime scene photography, analyzing photographic evidence, and reviewing cases where photography played a crucial role in investigations.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	3	1	2	2	1	2	2	2
CO2	3	2	3	3	2	2	2	1	3	2	3
CO3	3	2	3	3	2	2	3	2	3	3	3

Course Contents:

Unit I: Basics of photography (15 hours)

Basic principles and techniques of Black & White and colour photography, cameras and lenses, exposing, developments and printing, Different kinds of developers and fixturs, modern developments in photography, linkage of cameras and film negatives.

Unit II: Photography in Crime Scene Investigation (15 hours)

Applications of photography in forensic science, 3D photography, Photographic evidence, Infrared, thermal and ultraviolet photography, Digital photography digital water marking and digital imaging, videography/high speed videography, Crime scene and laboratory photography.

Unit III: Lab (30 hours)

1. To study various parts of Camera.

2. Crime Scene Photography (Indoor & Outdoor).
3. To review Case where photography played significant role in investigation.

References:

- 1.Mancini, K. and J. Sidoriak (2017). Fundamentals of forensic photography: practical techniques for evidence documentation on location and in the laboratory, Taylor & Francis.
- 2.Marsh, N. (2014). Forensic photography: A Practitioner's guide, John Wiley & Sons.
- 3.Murgod, S., et al. (2018). "Forensic photography: Prospect through the lens." Journal of forensic dental sciences: 02-04.
- 4.Ozkalipci, O. and M. Volpellier (2010). "Photographic documentation, a practical guide for non professional forensic photography." Torture 20(1): 45-52.
- 5.Redsicker, D. R., et al. (2001). The practical methodology of forensic photography, CRC Press Boca Raton, FL.
- 6.Robinson, E. M. (2016). Crime scene photography, Academic Press.
- 7.Weiss, S. L. (2022). Handbook of Forensic Photography, CRC Press.

Course Code	Course Name	L	T	P	C
	Wildlife Forensic Investigation	1	0	1	2

Course Outcomes:

- **CO1: Wildlife Protection and Legal Framework** – Understanding the importance of wildlife conservation, identification of protected species, and the application of the Wildlife Protection Act.
- **CO2: Forensic Identification of Wildlife Evidence** – Developing expertise in identifying and examining physical evidence related to wildlife species using conventional and modern forensic techniques.
- **CO3: Practical Wildlife Forensics Applications** – Gaining hands-on experience in forensic analysis of wildlife evidence, including pugmark identification, case report preparation, and examination of wildlife-related forensic challenges.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	3	3	2	2	2	1	3	3	3
CO2	3	2	3	3	2	2	2	1	2	2	2
CO3	3	2	3	3	2	3	3	2	3	3	3

Course Contents:

Unit I: Wildlife Forensics-I (15 hours)

Introduction and Importance of wildlife, Protected and endangered species of Animals and Plants,
Wildlife species– Identification and examination of physical evidence by conventional and modern methods. Wildlife / Environment Protection Act.

Unit II: Wildlife Forensics-II (15 hours)

Identification of Pugmarks of various animals, Identification of Bear Bile, Elephant's Ivory and Rhino horn.

Unit III: Lab (30 hours)

1. To prepare a case report on problems of wildlife forensics.
2. Identification of Pug marks of various animals.

References:

1. Alacs, E. A., et al. (2010). "DNA detective: a review of molecular approaches to wildlife forensics." *Forensic science, medicine, and pathology* 6: 180-194.
2. Cooper, J. E. and M. E. Cooper (2013). *Wildlife forensic investigation: principles and practice*, CRC press.
3. Huffman, J. E. and J. R. Wallace (2012). *Wildlife forensics: methods and applications*, John Wiley & Sons.
4. Linacre, A. (2009). *Forensic science in wildlife investigations*, CRC press.
5. Gunn, A. (2019). *Essential forensic biology*, John Wiley & Sons.
6. Freckelton, I. (2021). *Forensic Analysis: Scientific and Medical Techniques and Evidence Under the Microscope*, BoD—Books on Demand.

Course Code	Course Name	L	T	P	C
	Introduction to Biometry	1	0	1	2

Course Outcomes:

- **CO1: Fundamentals of Biometric Systems** – Understanding biometric system definitions, classifications, operational principles, and key measures used in identification and verification.
- **CO2: Physiological and Behavioral Biometrics** – Developing knowledge of fingerprint, palm print, facial geometry, handwriting, signature recognition, and gait patterns for forensic and security applications.
- **CO3: Practical Applications in Biometric Identification** – Gaining hands-on experience in fingerprint and facial geometry analysis for biometric verification and forensic investigations.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	3	3	2	2	2	1	2	2	2
CO2	3	2	3	3	2	2	3	1	3	3	3
CO3	3	2	3	3	2	3	3	2	3	3	3

Course Contents:

Unit I: Basics of biometry (15 hours)

Definition, characteristics & operational biometry system, classification of biometric system, Biometric

process- enrolment, identification & verification.

Measures used in biometric system- FAR, FRR, GAR, FTA, FTE & ATV

Unit II: Physiological & Behavioural biometrics (15 hours)

Fingerprint, palm print, geometry of face, handwriting & signature recognition, gait pattern.

Unit III: Lab (30 hours)

1. Fingerprint characteristics for biometric identification.
2. Geometry of face for biometric identification.

References:

1. Jolicoeur, P. (2012). Introduction to biometry, Springer Science & Business Media.

2. Tistarelli, M. and C. Champod (2017). Handbook of biometrics for forensic science, Springer.
3. Tistarelli, M. and C. Champod (2017). Handbook of biometrics for forensic science, Springer.
4. Mallett, X., et al. (2014). Advances in forensic human identification, CRC Press.
5. Ho, A. T. and S. Li (2015). Handbook of digital forensics of multimedia data and devices, John Wiley & Sons.
6. Jain, A. K. and S. Z. Li (2011). Handbook of face recognition, Springer.

Course Code	Course Name	L	T	P	C
	Handwriting Identification and Recognition	1	0	1	2

Course Outcomes:

- **CO1: Fundamentals of Handwriting Identification** – Understanding handwriting characteristics, influencing factors, comparison techniques, and methods for forgery detection using forensic tools.
- **CO2: Principles of Handwriting Recognition** – Learning offline and online handwriting recognition, including preprocessing, feature extraction, classification, and forensic applications.
- **CO3: Practical Handwriting Examination** – Developing hands-on skills in detecting fraudulent documents and identifying class and individual handwriting characteristics.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	3	3	1	2	2	1	2	2	2
CO2	3	2	3	3	2	2	2	1	3	3	3
CO3	3	2	3	3	2	3	3	2	3	3	3

Course Contents:

Unit I: Handwriting Identification (15 hours)

Basis of Handwriting identification, Characteristics of handwriting, factors influencing handwriting, basis of handwriting comparison, collection of handwriting samples, Forgery detection, tools used in handwriting examination.

Unit II: Handwriting Recognition (15 hours)

Basis of handwriting recognition, offline and on-line handwriting recognition, steps involved in handwriting recognition-pre-processing, feature extraction and classification, application of handwriting recognition.

Unit III: Lab (30 hours)

1. Examination and detection of fraudulent documents
2. Identification of class and individual characteristics in handwriting.

References:

1. Huber, R. A. and A. M. Headrick (1999). Handwriting identification: facts and fundamentals, CRC press.
2. Harralson, H. H. and L. S. Miller (2017). Huber and Headrick's Handwriting Identification: Facts and Fundamentals, Crc Press.
3. Pandey, R. K., et al. (2018). "Forensic Investigation of Suspected Document for Alteration, Erasures & Obliteration." Galore International Journal of Applied Science and Humanities 2(1).
4. Allen, M. J. (2015). Foundations of forensic document analysis: theory and practice, John Wiley & Sons.
6. Sellers, C. (1959). "Albert Sherman Osborn: Questioned Document Pioneer." ABAJ 45: 1285.
7. Lee, S.-W. (1999). Advances in handwriting recognition, World Scientific.
8. Tappert, C. C. and S.-H. Cha (2007). "English language handwriting recognition interfaces." Text entry systems: Mobility, accessibility, universality: 123-137.

Course Code	Course Name	L	T	P	C
	Accidental Investigation	1	0	1	2

Course Outcomes:

- **CO1: Forensic Analysis of Automobile Accidents** – Understanding accident investigation principles, sources of information, surface markings, pedestrian impacts, vehicle speed, and forensic photography.
- **CO2: Investigation of Rail Accidents** – Developing skills in forensic examination of rail crashes, including inspection of technical systems, criminal and safety investigations, and necessary forensic equipment.
- **CO3: Practical Applications in Accident Analysis** – Gaining hands-on experience in identifying tyre marks, estimating vehicle speed from skid marks, and applying forensic methodologies to accident reconstruction.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	3	3	2	2	2	1	3	3	3
CO2	3	2	3	3	2	2	2	1	2	2	2
CO3	3	2	3	3	2	3	3	2	3	3	3

Course Contents:

Unit I: Automobile accidents (15 hours)

Introduction, sources of information, eyewitnesses, Surface Markings during RTA Cruses: Tire, skid marks, scuff marks etc, Pedestrian impacts and vehicle speed, vehicle condition, vehicle speed and damage, curved scuff marks, Time and distance, reaction time, Photography, and plans.

Unit II: Rail Accidents (15 hours)

Investigation of rail crash, criminal and safety investigation, Investigation principles, rail company tests, inspection of driving cab, examination of electrical/electronic/technological system and their failure. Necessary equipment's required for forensic examination.

Unit III: Lab (30 hours)

1. To identify the individuality of Tyre marks.
2. To estimate speed of vehicle from Skid mark

References:

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

Multidisciplinary Courses

Course Code	Course Name	L	T	P	C
FRS151	Forensic and Correctional Psychology	3	0	0	3

Course Contents:

CO1: Fundamentals of Forensic Psychology – Understanding core concepts, psychological assessments, mental disorders, and ethical considerations in forensic psychology.

CO2: Psychology and Criminal Behavior – Analyzing biological, social, and psychological factors influencing criminal behavior, juvenile delinquency, and child abuse cases.

CO3: Techniques for Detecting Deception – Developing expertise in deception detection methods, including interviews, polygraphy, voice stress analysis, narco-analysis, and their ethical/legal implications.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	3	3	1	2	2	1	2	2	2
CO2	3	2	3	3	2	2	2	1	3	3	3
CO3	3	2	3	3	2	3	3	2	3	3	3

Course Contents:

Unit I: Basics of Forensic Psychology (15 hours)

Definition and fundamental concepts of forensic psychology and forensic psychiatry. Psychology and law. Ethical issues in forensic psychology. Assessment of mental competency. Mental disorders and forensic psychology.

Unit II: Psychology and Criminal Behavior (15 hours)

Biological factors and crime – social learning theories, psycho-social factors, abuse. Juvenile delinquency – theories of offending (social cognition, moral reasoning), Child abuse (physical, sexual, emotional), juvenile sex offenders, legal controversies.

Unit III: Detection of Deception (15 hours)

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

References:

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

Course Code	Course Name	L	T	P	C
FRS152	Criminal Justice System and Law	3	0	0	3

Course Outcomes

- **CO1: Understanding the Criminal Justice System** – Gaining knowledge of the structure and functioning of the criminal justice system, including forensic scientists' roles and key legal provisions in criminal investigations.
- **CO2: Legal Frameworks in Criminal Law and Evidence** – Learning important provisions of the Indian Penal Code (IPC) and the Indian Evidence Act (IEA) relevant to forensic and criminal cases.
- **CO3: Forensic Examination of Sexual Offences** – Developing expertise in handling sexual offence cases, including victim and accused examinations, evidence collection, and understanding amendments in rape laws and the Medical Termination of Pregnancy Act.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	3	3	2	2	2	1	3	3	3
CO2	3	2	3	3	2	2	2	1	2	2	2
CO3	3	2	3	3	2	3	3	2	3	3	3

Course Contents:

Unit I: Criminal justice system (15 hours)

Introduction, Wings of criminal justice system- Police, prosecution & judicial officers. Role of Forensic scientists and medico-legal doctors in criminal investigation. Important Provisions of Code of Criminal Procedure- FIR, Complaint, Sec. 291, 292, 293, Cr PC 174. Framing of Charges, Bailable and Non-Bailable offence, cognizable and non-cognizable offence, summons, warrant, Investigation, inquiry and trial.

Unit II: Introduction to IPC and IEA and their laws (15 hours)

Indian Penal Code, 1860- Definitions, General Exceptions, Relevant provisions. IPC 302, 304, 306, 307, 309, 375, 376, 377, 498.

Indian Evidence Act, 1872- Section 32, 45, 46, 47, 57, 58, 60, 65, 65B, 73, 135, 136, 137, 159.

Unit III: Sexual offences and Law (15 hours)

Sexual Offences - Rape, Recent Amendments in Rape Laws, Examination of the victims of rape & the accused, Collection of evidence in cases of sexual assault. Medical Termination of Pregnancy Act 1971.

References:

1. Henry Lee's Crime Scene Handbook by Henry C Lee
2. Forensic Biology by Shrikant H. Lade
3. Crime Scene Processing and Laboratory Work Book by Patricia Jones
4. Forensic Science: An Introduction to Scientific and Investigative Techniques 3rd ed. by Stuart H. James
5. Criminalistics: An Introduction to Forensic Science, 9th ed. By Richard Saferstein
6. Computer Crime and Computer Forensics by Dr. R.K. Tiwari
7. Criminal Profiling: An Introduction to a Behavioral Evidence Analysis, 3rd ed. By Brent E. Turvey
8. Forensic Science in Criminal Investigation and Trial, 4th ed. By B.R. Sharma.

Course Code	Course Name	L	T	P	C
FRS251	Criminalistics	3	0	0	3

Course Outcomes:

- **CO1: Impression and Pattern Evidence Analysis** – Understanding the forensic significance of footprints, shoeprints, tire impressions, lip prints, and ear prints, along with their collection, preservation, and comparison techniques.
- **CO2: Examination of Tool Marks and Serial Number Restoration** – Developing expertise in forensic analysis of tool marks, obliteration methods, and restoration techniques for identifying altered serial numbers.
- **CO3: Trace Evidence and Crime Scene Reconstruction** – Applying forensic methods for analyzing trace evidence, interpreting microscopic and spectroscopic results, and reconstructing crime scenes using physical evidence.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	3	3	2	2	2	1	3	3	3
CO2	3	2	3	3	2	2	2	1	2	2	2
CO3	3	2	3	3	2	3	3	2	3	3	3

Course Contents:

Unit I: Impression and Pattern Evidence (12 hours)

Footprints and Shoeprints: Casting, lifting, and preservation techniques, Gait pattern analysis, Comparison with reference samples, Forensic significance and case studies. **Tire Impressions:** Collection and preservation methods, Analysis and comparison techniques.

Lip Prints and Ear Prints: Classification, development, and lifting techniques, Analysis and comparison with reference samples, Forensic relevance and case study.

Unit II: Tool Marks and Serial Number Restoration (12 hours)

Tool Marks: Classification and characteristics, Methods of collection and preservation, Comparative analysis techniques. **Serial Number Restoration:** Methods of obliteration, Restoration techniques: chemical etching and electrolytic methods, Application on various surfaces: metal, wood, polymer, Documentation and recording of restored marks.

Unit III: Trace Evidence Analysis (12 hours)

Types of Trace Evidence: Hair, fibers, glass, paint, soil. **Collection and Preservation:** Techniques for various types of trace evidence. **Analytical Techniques:** Microscopy, spectroscopy, chromatography. **Interpretation:** Significance in forensic investigations.

Unit IV: Crime Scene Reconstruction (12 hours)

Crime Scene Reconstruction: Principles and methodologies, Role of physical evidence in reconstruction. Types of reconstructions, Crime scene photography and sketching.

References:

1. Saferstein, R. (2015). *Criminalistics: An Introduction to Forensic Science*. Pearson Education.
2. James, S. H., & Nordby, J. J. (2009). *Forensic Science: An Introduction to Scientific and Investigative Techniques*. CRC Press.
3. O'Hara, C. E., & Osterburg, J. W. (1949). *Introduction to Criminalistics*. The MacMillan Co.
4. Inman, K., & Rudin, N. (2000). *Principles and practice of criminalistics: the profession of forensic science*. CRC Press.
5. Libal, A. (2014). *Fingerprints, bite marks, ear prints*. Simon and Schuster.

Course curriculum

SEMESTER IV

Course Code	Course Name	L	T	P	C
FRS207	Fundamentals of Forensic Toxicology	3	0	1	4

Course Objectives:

- To introduce students to the fundamental principles of toxicology, with an emphasis on forensic applications and the historical evolution of the field.
- To develop an understanding of different types of poisons, their sources, mechanisms of action, symptoms, and medico-legal importance.
- To equip students with knowledge on the proper methods of toxicological sample collection, preservation, and safety protocols.
- To train students in the techniques of extraction, identification, and instrumental analysis of poisons from various biological and non-biological matrices.
- To familiarize students with the analysis of heavy metals, corrosives, and drugs of abuse, along with their toxicological and forensic significance.

Course Outcomes:

CO1: Students will be able to explain the general concepts of toxicology and recognize the role of a forensic toxicologist in criminal investigations.

CO2: Students will be able to classify poisons based on origin and mode of action, and describe the symptoms and medico-legal relevance of various types of poisons.

CO3: Students will demonstrate the ability to collect and preserve toxicological samples effectively while adhering to safety protocols and guidelines.

CO4: Students will apply various chemical and instrumental techniques for the extraction, purification, and identification of poisons in forensic samples.

CO5: Students will acquire practical skills in the detection and analysis of heavy metals, pesticides, and drugs of abuse using standard forensic procedures such as TLC, UV-Vis, and color tests.

Unit I: General Concept of poisons (12 hours)

Introduction to toxicology, History of forensic toxicology, Role of toxicologist, significance of toxicological findings. Poisons: Classification on the basis of origin and mode of actions. Properties, symptoms and medicolegal aspects of metallic poisons (Arsenic, Lead and Mercury), animal poisons (Snake venom, Scorpion), Volatile poisons (Ethanol and methanol, chloroform) and Gaseous poison (Carbon monoxide, ammonia, hydrogen sulphide), pesticides (Organophosphate, organochloride, carbamates).

Unit II: Collection and preservation of Toxicological samples (09 hours)

Biological and non-biological samples, classes of matrices, guidelines of toxicological sample collection, post mortem examination, components of viscera, collection and preservation of viscera, urine and blood, safety measures of toxicological sample handling, Personnel Protective Equipment.

Unit III: Extraction and Examination of poisons (12 hours)

Extraction and purification of Biological and non-biological samples, method of extraction, liquid-liquid extraction, extraction methods of acidic, basic and neutral poisons, extraction of volatile and non-volatile poisons, extraction of plant poisons, Common methods of poisons detection, chemical (colour tests) and instrumental methods (UV-Vis, TLC, HPLC, GC) for toxicological examination, challenges in forensic toxicological analysis.

Unit IV: Heavy metals and Drug of Abuse (12 hours)

Heavy metals poisoning: Pb, Hg, As. Corrosive poisons: inorganic and organic acids, alkali, inorganic and organic solvents. Drugs of abuse: Introduction, Drug addiction, its problems, classification of Drugs of abuse – Narcotics, Depressants, Hallucinogens Stimulants, Volatile gases, Cannabis and Designer Drugs.

Unit V: Practical (30 hours)

- Analysis of metallic poisons – Reinsch Test and Gudzeit method.

- Identification of organophosphorus/organochloro and carbamate pesticide by TLC and UV-Vis spectroscopy.
- Identification of sleep-inducing drugs (Diazepam, Lorazepam, Clonazepam, Nitrazepam and alprazolam) by UV-vis spectroscopy.
- Identification of Cannabis by colour test and TLC.

References:

1. Modi JS: Medical Jurisprudence and Toxicology.
2. Taylor: Medical Jurisprudence.
3. Parikh CK: Medical Jurisprudence and Toxicology.
4. Keith Simpsen & Bernard Knight: Forensic Medicine.
5. Poison, CJ, DJ Gee, B. Knight: Forensic Medicine.
6. Reddy: Forensic Medicine.
7. Laboratory Procedure Manual- Forensic Toxicology, DFS, MHA, New Delhi.
8. Pharmacology and Therapeutics-Bhandarkar & Satoskar.
9. Medical Pharmacology- Tripathy.
10. . Essentials of Toxicology- Ellenhorn.

Course Code	Course Name	L	T	P	C
FRS403	Research Methodology	4	0	0	4

Course Objectives (COs):

CO1: To introduce students to the fundamental components of research, including paradigms, methodologies, hypotheses, and designs, and develop their ability to frame effective research questions and objectives.

CO2: To enable students to understand and apply various sampling techniques, measurement tools, scaling methods, and survey strategies for data collection in both quantitative and qualitative research.

CO3: To familiarize students with the key concepts and tools of biostatistics for data presentation, summarization, and descriptive statistical analysis such as frequency distributions, measures of central tendency, and variability.

CO4: To develop student competence in organizing and managing data files, cleaning data, and selecting appropriate statistical strategies based on study design and research hypotheses for accurate interpretation of results.

CO5: To promote ethical awareness in research practices by examining issues such as informed consent, confidentiality, plagiarism, authorship, and political influences in various research approaches.

CO6: To train students in the technical and stylistic aspects of academic writing and reporting, including chapterization, referencing, and distinguishing between qualitative and quantitative data analysis in scholarly publication.

Course Outcomes (CO):

CO1: Demonstrate an understanding of various components of research, including research design, methodology, sampling techniques, and construction of research instruments.

CO2: Apply bio-statistical concepts to present, summarize, and interpret research data using appropriate measures and graphical tools.

CO3: Critically evaluate ethical issues in research, including consent, privacy, plagiarism, authorship, and conflicts of interest, and apply ethical guidelines to research design and implementation.

CO4: Differentiate between quantitative, qualitative, and mixed research approaches and apply appropriate strategies in various research contexts.

CO5: Organize and present research findings in academic formats, including chapters, bibliographies, glossaries, appendices, and indexes, with attention to scholarly conventions.

CO6: Analyze and synthesize research data using appropriate analytical strategies and interpret findings considering the study design and research hypothesis.

CO-PO Mapping:

Course Outcomes (COs)	Unit(s)	PO1	PO2	PO3	PO4	PO5	PO6
CO1: Demonstrate an understanding of various components of research, including research design, methodology, sampling techniques, and construction of research instruments.	Unit I	1	2		3		
CO2: Apply bio-statistical concepts to present, summarize, and interpret research data using appropriate measures and graphical tools.	Unit II	1	2	3			4
CO3: Critically evaluate ethical issues in research, including consent, privacy, plagiarism, authorship, and conflicts of interest, and apply ethical guidelines to research design and implementation.	Unit III				1		2
CO4: Differentiate between quantitative, qualitative, and mixed research approaches and apply appropriate strategies in various research contexts.	Units I, III	1	2		3		4
CO5: Organize and present research findings in academic formats, including chapters, bibliographies, glossaries, appendices, and indexes, with attention to scholarly conventions.	Unit IV					1	2
CO6: Analyze and synthesize research data using appropriate analytical strategies and interpret findings in light of the study design and research hypothesis.	Units II, IV	1	2	3			4

Unit I: Components of research:

(20 lecture hours)

The issue is with the approach, methodology, paradigm, method, and technique. Research Design, Research hypothesis, Quantitative, Qualitative and Mixed Research, Research questions; Objectives and/or Purpose of Research; Sampling (random and non-random); measurement; scaling; questionnaire/schedule construction; Survey (Coverage, response, measurement, sampling, specification).

Unit II Bio-Statistics:

(20 lecture hours)

Types of variables, presentation, and summarization of data (tabulation and illustration). iii. Descriptive statistics- Frequency distribution, graphical presentation, Measures of Central Tendency, Measures of Dispersion, Skewness and Kurtosis, Normal distribution, Mean, Median, Mode, SD, SE. Analysis and interpretation of data, including data cleaning, data file construction, and management; implementation of analytic strategies appropriate for the type of data, study design and research hypothesis.

Unit III: Ethics and Politics of Research:

(20 lecture hours)

Ethical review of research, theories and concepts related to ethical decision-making; Ethical importance of consent, privacy and confidentiality in research; Issues of academic fraud and plagiarism, conflicts of interest, authorship and publication; Politics of quantitative, qualitative and mixed research.

Unit IV: Analysis and Writing:

(20 lecture hours)

Chapterization, preparing a text for submission and publication, concepts of preface, notes (end and footnotes), glossary, prologue and epilogue, appendix, bibliography (annotated), and references cited, review, and index. ii. Similarities and differences between qualitative and quantitative data analysis.

References:

1. Chambers E. G. (1964). Statistical Calculation for Beginners. Cambridge University Press. London.
2. Lancaster H. O. (1974). Statistics. New York : Jon Willy and Sons.
3. Madrigal L. Statistics for Anthropology. Cambridge: Cambridge University Press. 2012.
4. Rao, K. V. (2009). *Biostatistics: A Manual of Statistical Methods for Use in Health, Nutrition and Anthropology* (2nd ed.). New Delhi: Jaypee Brothers Medical Publishers. ISBN: 9788184480559. Zar JH. Biostatistical Analysis. Prentice Hall. 2010.

Course Code	Course Name	L	T	P	C
FRS100	Introduction to Forensic Science and Criminology	4	0	0	4

Course Objectives (COs):

CO1: To introduce students to the foundational principles, scope, and multidisciplinary nature of forensic science, including its major branches and their applications at crime scenes and in judicial proceedings.

CO2: To familiarize students with the structure, roles, and functions of forensic science laboratories at national and international levels, including divisions, services offered, and the impact of recent legal reforms such as BNS, BNSS, and BAS (2023).

CO3: To provide an in-depth understanding of the field of criminology, encompassing historical and contemporary theories of crime, types and causes of criminal behavior, and socio-cultural influences on criminality.

CO4: To critically examine modern criminological issues, including cybercrime, white-collar crime, organized crime, crimes against vulnerable populations, and global threats like terrorism and human trafficking.

CO5: To equip students with the knowledge and skills to identify, secure, and process various types of crime scenes (indoor, outdoor, primary, secondary), and understand the classification and relevance of physical evidence.

CO6: To analyze real-world forensic case studies to evaluate the investigative process, identify challenges and limitations of forensic practice, and appreciate the importance of forensic evidence in the justice delivery system.

Course Outcomes (CO):

CO1: Define the nature, scope, and fundamental principles of forensic science and its key branches, highlighting their interdisciplinary roles in criminal investigations and the courts.

CO2: Explain the organizational structure, roles, and services of Forensic Science Laboratories (FSLs) at national and international levels, including recent legal reforms (BNS, BNSS, BAS).

CO3: Analyze criminological theories, types and causes of crime, and the influence of social, economic, and cultural factors on criminal behavior.

CO4: Evaluate the functions of the criminal justice system and the roles of police, courts, corrections, and forensic experts in crime prevention and victimology.

CO5: Demonstrate the ability to process crime scenes, categorize crime scenes, and discuss the challenges and limitations of crime scene investigation using real case studies.

CO6: Integrate knowledge from various forensic disciplines to critically assess the problems, limitations, and evidentiary value of forensic investigations.

CO-PO Mapping:

Course Outcomes (COs)	Unit(s)	PO1	PO2	PO3	PO4	PO5	PO6
CO1: Define the nature, scope, and fundamental principles of forensic science and its key branches, highlighting their interdisciplinary roles.	Unit I	1					
CO2: Explain the organizational structure, roles, and services of FSLs, including recent legal reforms.	Unit II		1			2	
CO3: Analyze criminological theories, types and causes of crime, and the influence of social, economic, and cultural factors on criminal behavior.	Unit III			3			
CO4: Evaluate the criminal justice system and the roles of various stakeholders in crime prevention and victimology.	Unit III	1		2	3		
CO5: Demonstrate crime scene processing, categorization, and critical analysis using real case studies.	Unit IV				4		5
CO6: Integrate knowledge from various forensic disciplines to assess the problems, limitations, and evidentiary value of forensic investigations.	Units I–IV	1	2	3	4	5	6

Unit I: Development and growth of Forensic Science :**(20 lecture hours)**

Introduction to Forensic Science –Definition, nature, need, and function; Principles of Forensic Science; Branches of Forensic Science: Overview of major forensic disciplines: biology, chemistry, physics, digital forensics, odontology, anthropology, its utilization at the scene of crime and in the courts.

Unit II: Forensic Science Laboratory:**(20 lecture hours)**

Brief History & current scenario at National & International level, Role and Functions of DFSS, Services and functionalities provided by various FSLs, Structure of the FSLs, Various divisions in the FSL – General Analytical and Instrumentation, Ballistics, Biology, Anthropology, Odontology, Chemistry Documents, Physics, Psychology, Serology, Toxicology, Cyber Forensic, Tape Authentication and Speaker Identification (TASI), DNA division. Mobile Forensic Science. Recent legal reforms: Bharatiya Nyaya Sanhita (BNS), Bharatiya Nagarik Suraksha Sanhita (BNSS), Bharatiya Sakshya Adhiniyam (BAS), 2023.

Unit III: Criminology :

(20 lecture hours)

Definition and scope of criminology, the history and development of criminological theories, types and causes of crime, criminal behavior and psychology, the role of social, economic, and cultural factors in crime, crime prevention strategies, the criminal justice system including police, courts, and corrections, victimology, juvenile delinquency, and contemporary issues in criminology such as cybercrime and organized crime. Classical and neoclassical theories (Beccaria, Bentham), Biological theories (Lombroso, Sheldon), Psychological and psychiatric explanations (Freud, Eysenck), Sociological theories: Social disorganization, strain theory, labeling theory, differential association, control theory, Modern perspectives: Feminist criminology, cultural criminology, green criminology, cybercriminology. Violent crimes, property crimes, organized crime, White-collar and economic crime, Cybercrime and digital deviance, Crimes against women, children, and marginalized groups, Emerging global threats: terrorism, transnational crimes, human trafficking.

Unit IV: Crime Scene:

(20 lecture hours)

Defining a crime scene, its Importance, location, and processing of the crime scene. Types of Crime Scene: Indoor and outdoor, Primary, and secondary, and crime scenes based on size of evidence. Case Study: Chennai Group Clash, Iridium Trade Scam, Aarushi Murder Case, Sheena Bora Murder Case, Ted Bundy Serial Murder Case: The role of forensic Investigation, problems associated with investigation, Limitations of forensic experts, and judgment.

References:

1. Horswell, J. (Ed.). (2004). The practice of crime scene investigation. CRC Press.
2. Fish, J. T., Miller, L. S., Braswell, M. C., Fenoff, R., & Wallace, E. W. (2022). Crime scene investigation. Routledge.
3. DeForest, P., Gaensslen, R., and Lee, H., Forensic Science; An Introduction to Criminalistics, McGraw Hill, New York, 1983.
4. Pepper, I. (2010). Crime scene investigation: methods and procedures: methods and procedures. McGraw-Hill Education (UK).
5. Maloney, M. S., Housman, D., & Gardner, R. M. (2014). Crime Scene Investigation Procedural Guide. CRC Press.
6. Government of India (2023). *The Bharatiya Nyaya Sanhita (BNS)*, *The Bharatiya Nagarik Suraksha Sanhita (BNSS)*, and *The Bharatiya Sakshya Adhinyam (BAS)*.

Course Code	Course Name	L	T	P	C
FRS200	Fingerprint Examination	2	0	2	4

Course Objectives (COs):

CO1: To introduce the biological basis and forensic importance of skin ridge patterns, including the formation, classification, and general and individual characteristics of fingerprints.

CO2: To develop a foundational understanding of fingerprint patterns and the principles behind their classification, pattern areas, and ridge detail analysis.

CO3: To train students in the scientific techniques of recording fingerprints from both living and deceased individuals, and familiarize them with ridge counting, tracing, filing, and searching methods.

CO4: To explore the structure and forensic relevance of palmar and plantar dermatoglyphics, and their applications in anthropological, medical, and forensic domains.

CO5: To provide knowledge and hands-on training in the detection and development of latent and chance fingerprints using physical and chemical techniques, and understand their evidentiary value in legal contexts.

CO6: To impart practical skills in fingerprint pattern identification, classification, lifting, and comparison through laboratory-based exercises, enhancing students' competence in forensic fingerprint analysis.

Course Outcomes (CO):

CO1: Explain the biological basis and significance of skin patterns and fingerprint ridge formation, including classification and pattern areas.

CO2: Demonstrate techniques for recording fingerprints from living and deceased individuals, and describe the relevance of palmar and plantar dermatoglyphics.

CO3: Analyze the role and importance of latent and chance fingerprints in criminal investigations and differentiate between various development methods.

CO4: Apply physical and chemical methods for developing latent fingerprints in practical forensic contexts.

CO5: Classify fingerprints accurately using established classification systems and perform ridge counting and tracing effectively.

CO6: Present fingerprint evidence clearly and confidently in forensic reports and court proceedings.

CO-PO Mapping:

Course Outcomes (COs)	Unit(s)	PO1	PO2	PO3	PO4	PO5	PO6
CO1: Explain the biological basis and significance of skin patterns and fingerprint ridge formation, including classification and pattern areas.	Unit I	1				2	
CO2: Demonstrate techniques for recording fingerprints from living and deceased individuals, and describe the relevance of palmar and plantar dermatoglyphics.	Unit II		2			3	
CO3: Analyze the role and importance of latent and chance fingerprints in criminal	Unit III			4			

investigations and differentiate between various development methods.							
CO4: Apply physical and chemical methods for developing latent fingerprints in practical forensic contexts.	Units III & IV		1	2			3
CO5: Classify fingerprints accurately using established classification systems and perform ridge counting and tracing effectively.	Units I, II & IV	1	2				
CO6: Present fingerprint evidence clearly and confidently in forensic reports and court proceedings.	Units III & IV				5		6

Unit I: Introduction to Fingerprints and its Patterns

(10 lecture hours)

Biological significance of skin pattern, Ridge formation, Composition of Sweat, Fingerprint patterns, Pattern Areas, General and Individual characteristics of fingerprints, Classification of fingerprints.

Unit II: Recording and Examination of Fingerprints

(10 lecture hours)

Ridge Counting and tracing, filing, and searching. Taking fingerprints from living and dead persons. Introduction to Palmar and Plantar Dermatoglyphics: Structure and significance of dermatoglyphics on palms and soles; importance in anthropological, medical, and forensic studies; comparison with fingerprint patterns.

Unit III: Latent Fingerprints

(10 lecture hours)

Latent fingerprint and Chance Fingerprints in criminal investigation, investigating latent fingerprints, various methods of development of fingerprints: physical and chemical methods, presentation of fingerprint evidence in court.

Unit IV: Fingerprint Practical

(60 lecture hours)

1. Making of fingerprints on fingerprint cards and identifying the pattern
2. Identification of Hypothenar and Thenar patterns
3. Identification of patterns in the Halucal region.
4. Development of fingerprints using physical methods
5. Development of fingerprints using chemical methods
6. Classification of fingerprints
7. Lifting and identification of latent fingerprints

References:

1. Bridges, B. C., Vollmer, A., & Munir, M. (2000). Criminal Investigation, Practical Fingerprinting, Thumb Impressions, Hand Writing, Expert Testimony, Opinion Evidence. University Book Agency.

2. James, S. H., & Nordby, J. J. (2002). Forensic science: an introduction to scientific and investigative techniques. CRC press.
3. Nanda, B. B., and Tewari, R. K. (2001) Forensic Science in India. Select Publishers, New Delhi.
4. Hall, A. B., & Saferstein, R. (2020). Forensic Science Handbook, Volume I. CRC Press.
5. Sharma, B. R. (2001). Forensic Science in Criminal Investigation and Trials (3rdEdn) Universal Law Publishing Co. Ltd. New Delhi.
6. S. K. Chatterjee, S. K. (1981). Speculation in fingerprint identification. SK Chatterjee.
7. Cummins, H., & Midlo, C. (1961). *Finger Prints, Palms and Soles: An Introduction to Dermatoglyphics*. New York: Dover Publications. ISBN: 9780486207780.

Course Code	Course Name	L	T	P	C
FRS308	Basics of Forensic Anthropology and Odontology	2	0	2	4

Course Objectives (COs):

CO1: To provide comprehensive knowledge of forensic anthropology, including the study of the human skeleton, bone identification, and the estimation of age, sex, and stature for personal identification.

CO2: To train students in somatoscopic and somatometric techniques, including various body measurements and anthropometric indices, for effective identification and profiling in forensic contexts.

CO3: To introduce the scope and significance of forensic odontology, focusing on dental identification, bite mark analysis, age and sex estimation, and the role of dental evidence in both routine and mass disaster investigations.

CO4: To familiarize students with facial reconstruction techniques, including the Bertillon system, facial superimposition methods, and the role of genetic and congenital anomalies in forensic identification.

CO5: To develop practical skills in the analysis of skeletal and dental remains through laboratory-based exercises such as bone identification, stature estimation, cephalometric indexing, and dental record comparison.

CO6: To equip students with the ability to collect, preserve, analyze, and present anthropological and odontological evidence for forensic and legal purposes, including expert testimony and documentation.

Course Outcomes (CO):

CO1: Explain the scope and importance of forensic anthropology, focusing on skeletal analysis for personal identification, including age, sex, and stature estimation.

CO2: Apply somatoscopic and somatometric methods for human identification, including indices and measurements for various body parts.

CO3: Describe the role of forensic odontology in human identification, including dental analysis, bite mark analysis, and its application in mass disasters and court proceedings.

CO4: Explain facial reconstruction techniques (Portrait Parle, Photofit, Identity Kit) and superimposition methods, including their relevance in forensic casework.

CO5: Demonstrate practical skills in identifying human bones, performing skeletal and dental measurements, and applying relevant forensic indices.

CO6: Integrate knowledge from anthropology and odontology to analyze complex forensic cases, including genetic anomalies, mass disaster victim identification, and legal evidence presentation.

CO-PO Mapping:

Course Outcomes (COs)	Unit(s)	PO1	PO2	PO3	PO4	PO5	PO6
CO1: Explain the scope and importance of forensic anthropology, focusing on skeletal analysis for personal identification.	Unit I	✓	✓				
CO2: Apply somatoscopic and somatometric methods for human identification, including indices and measurements.	Units I & IV	✓	✓			✓	
CO3: Describe the role of forensic odontology in human identification,	Unit II	✓		✓			✓

including dental analysis and court presentation.							
CO4: Explain facial reconstruction techniques and superimposition methods, including their relevance in forensic casework.	Unit III	✓		✓	✓		
CO5: Demonstrate practical skills in identifying human bones, performing skeletal and dental measurements, and applying relevant forensic indices.	Unit IV	✓	✓			✓	✓
CO6: Integrate knowledge from anthropology and odontology to analyze complex forensic cases, including genetic anomalies and legal evidence presentation.	Units I–IV	✓	✓	✓	✓	✓	✓

Unit I: Significance of Forensic Anthropology (10 lecture hours)

Scope of forensic anthropology. Study of the human skeleton. Nature, formation, and identification of human bones. Determination of age, sex, and stature from skeletal material. **Personal Identification** – Somatoscopy – observation of hair on head, forehead, eyes, root of nose, nasal bridge, nasal tip, chin, supra-orbital ridges, circumference of head. Scar marks and occupational marks. **Somatometry** – measurements of head, face, nose, cheek, ear, hand, foot, body weight, and height. Indices - cephalic index, nasal index, cranial index, Facial Index, upper facial index, Sciatic Notch Index, Crural Index, Craniofacial Index, Body Mass Index (BMI), Intermembral Index, Torso Index, Pelvic Index.

Unit II: Forensic Odontology (10 lecture hours)

Definition and scope of forensic odontology, dental identification and the role of teeth in human identification, age estimation through dental analysis, bite mark analysis and its forensic significance, mass disaster victim identification, comparison of dental records, sex determination through dental characteristics, collection and preservation of dental evidence, dental anthropology and its forensic applications, and the presentation of dental evidence in court.

Unit III: Facial Reconstruction (10 lecture hours)

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

Unit IV: Practical (60 lecture hours)

1. To determine of age from skull and teeth.
2. To determine of sex from skull.
3. To determine sex from pelvis.
4. To study identification and description of bones and their measurements.
5. To perform somatometric measurements on living subjects.
6. To carry out craniometric measurements of human skull.
7. To estimate stature from long bone length.

8. Cephalic index, nasal index, cranial index, Facial Index, upper facial index, Sciatic Notch Index, Crural Index, Craniofacial Index, Body Mass Index (BMI), Intermembral Index, Torso Index, Pelvic Index.
9. Dental charting and dental record maintenance
10. Analysis of bite marks using impression and photography techniques.
11. Examination of dental prostheses

References:

- American Board of Forensic Odontology (ABFO). (2018). ABFO Diplomate Reference Manual.
- Bernitz, H., van Heerden, W. F. P., & Solheim, T. (2011). Forensic Dental Age Estimation: An Overview. In C. Cattaneo & T. Ritz-Timme (Eds.), *Age Estimation: A Multidisciplinary Approach* (pp. 123–138). CRC Press.
- İşcan, M. Y. (2001). Global forensic anthropology in the 21st century. *Forensic science international*, 117(1-2), 1-6.
- Mukherji, D., Mukherjee, D. P., Bharati, P., & Mukhopadhyay, A. (2018). *Laboratory Manual for Biological Anthropology* (Revised and Enlarged 2nd ed.). Kolkata: Scholar Publishers. ISBN: 978-9382435181.
- Senn, D. R., & Stimson, P. G. (Eds.). (2010). *Forensic Dentistry* (2nd ed.). CRC Press.
- Tersigni-Tarrant, M. A., & Shirley, N. R. (Eds.). (2012). *Forensic anthropology: an introduction*. CRC Press.
- Ubelaker, D. H. (2006). Introduction to forensic anthropology. *Forensic anthropology and medicine: complementary sciences from recovery to cause of death*, 3-12.

Course Code	Course Name	L	T	P	C
FRS300	FORENSIC PHYSICS	2	0	2	4

Course Objectives:

1. To provide foundational knowledge on the scope and significance of forensic physics in criminal investigations.
2. To develop students' ability to analyze physical trace evidence such as glass, paint, soil, and tool marks.
3. To train students in the systematic collection, preservation, and comparison of physical evidence.
4. To introduce techniques used in forensic speaker identification and audio-video signal authentication.
5. To provide hands-on practical experience in forensic physics methodologies and tools.

Course Outcomes (COs):

1. CO1: Explain the role and significance of forensic physics in forensic science.
2. CO2: Analyze and compare physical evidence such as glass, paint, and soil using scientific methods.
3. CO3: Examine and interpret tool marks, fiber evidence, and restoration of obliterated marks.
4. CO4: Apply principles of voice production and signal processing in forensic speaker identification and audio analysis.
5. CO5: Perform laboratory-based analysis and physical comparison of forensic physics evidence.

CO-PO Mapping Table

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	-	2	1	2	-
CO2	3	3	2	1	2	1	-
CO3	2	3	3	1	2	1	-
CO4	3	2	-	1	2	1	3
CO5	2	3	3	1	2	1	1

Unit 1: Forensic Physics (15 Hours)

Definition, scope, significance of forensic physics.

Glass evidence — collection, packaging, analysis. Matching of glass samples by mechanical fit and refractive index measurements, Fracture analysis and direction of impact.

Paint evidence — collection, packaging and preservation. Analysis by destructive and non-destructive methods. Importance of paint evidence in hit and run cases.

Soil evidence — importance, location, collection and comparison of soil samples
Soil and its composition, Classification of soil, Collection and preservation of soil,

Analysis of soil samples: Physical, chemical and instrumental, interpretation of soil evidence, Soil as a geomarker, Case Studies.

Unit 2: Examination of tool marks (7 Hours)

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. Physical, chemical and instrumental methods of examination of strings/ropes, fibers, threads and fabrics, wires/cables, seals, counterfeit coins, physical match of broken objects. Restoration of erased/obliterated marks in different surfaces.

Unit 3: Forensic Speaker Identification (8 Hours)

Forensic Speaker Identification: Speaker Identification and Tape Authentication: Voice Production Theory, Speech Signal Processing and Pattern Recognition, Acoustic Parameters of Sound, Fourier Analysis, Frequency and Time Domain Representation of Speech Signal, Analogue to Digital Conversion-Sampling and Quantization, Fast Fourier Transform, Speech Enhancement, Authentication of Audio-Video Signal.

Unit 4: Practical (60 Hours)

1. Density gradient analysis of soil samples.

2. Determination of density of glass by specific gravity bottle method
3. Comparison of broken glass bangles.
4. Physical matching of broken pieces of different objects.
5. Comparison of tool marks.
6. Physical examination of paint sample by microscopic methods

List of Books:

1. Siegel, J. A., & Saukko, P. J. (2012). Encyclopedia of forensic sciences. Academic Press.
2. Houck, M. M., & Siegel, J. A. (2009). Fundamentals of forensic science. Academic Press.
3. Fisher, B. A., Tilstone, W. J., & Woytowicz, C. (2009). Introduction to criminalistics: the foundation of forensic science. Academic Press.
4. Neustein, A., & Patil, H. A. (2012). Forensic speaker recognition (Vol. 1). New York, United States: Springer.
5. Maher, R. C. (2018). Principles of forensic audio analysis (Vol. 34). Springer International Publishing.

COURSE CODE	COURSE NAME	L	T	P	C
FRS307	FORENSIC BALLISTICS	2	0	2	4

Course Outcomes

1. Understand Ballistics Basics: Grasp the definition, branches, history, and classification of firearms and ammunition.
2. Explore Ballistics Principles: Learn the principles of internal and external ballistics, including propellant behavior and trajectory factors.
3. Examine Wound Effects: Study terminal and wound ballistics, focusing on projectile-tissue interaction and injury evaluation.
4. Master Identification Techniques: Gain skills in identifying firearms and ammunition through marks and gunshot residue analysis.
5. Apply Practical Knowledge: Develop hands-on expertise in studying ammunition, explosives, and firearm components.

Course Outcomes

CO1: Define Core Concepts: Explain ballistics branches, firearm types, and ammunition features.

CO2: Analyze Ballistics Processes: Describe internal and external ballistics principles and influencing factors.

CO3: Assess Firearm Injuries: Evaluate entry/exit wounds and distinguish ante-mortem from post-mortem injuries.

CO4: Identify Marks and Residue: Recognize firing marks on cartridges and bullets, and analyze gunshot residue.

CO5: Perform Practical Tasks: Conduct studies of ammunition, chemical analysis of explosives, and firearm components.

CO-PO Mapping Table

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	-	2	1	2	1
CO2	3	2	-	1	2	1	2
CO3	3	2	-	2	3	1	2
CO4	2	3	2	1	2	1	2
CO5	2	3	3	1	2	1	3

Unit I: Introduction to Ballistics (8 Hours)

Definition, branches of ballistics, history and background of firearms, classification characteristics and firing mechanism of smooth bored firearms and rifled firearms, country-made firearms. Ammunition: classification and constructional features of different types of cartridges, types of primers and priming composition, propellants and their compositions, various types of bullets and compositional aspects, arms and explosives act,

Unit II: Internal and External ballistics (8 Hours)

Internal ballistics: definition, General principles of internal ballistics - ignition of propellants, shape and size of propellants, manner of burning etc.

External ballistics: definition, vacuum trajectory, effect of air resistance on trajectory, base drag, yaw, shape of projectile and stability, coefficient of reduction and sectional density, recoil velocity, Ricochet and heat problem encountered.

Unit III: Terminal & Wound ballistics (7 Hours)

Definition, interaction and penetration of various types of projectiles in various tissues, factor affecting wound ballistics, Various aspects of wound ballistics, nature of wounds of entry & exit, Evaluation of firearm injuries caused due to shot-gun, and rifle firearms handguns and country made firearms, post-mortem and anti-mortem firearm injuries.

Unit IV: Identification of firearms and ammunition (7 Hours)

Principles and practice of identification of firearms, different types of marks produced during firing process on cartridge-firing pin marks, breech face marks, chamber marks, extractor and ejector marks, Different types of marks produced during firing process on bullet-number/direction of lands and grooves, striation marks on lands and grooves. GSR (Gun Shot Residue) and its analysis

Unit V: Practical (60 Hours)

1. Study of ammunitions (Bullet and cartridge)
2. Chemical analysis of explosive materials
3. Study of various parts of the firearms: - barrel, action, stock, caliber, choke etc.
4. Case Study

References:

- James, S. H., & Nordby, J. J. (2002). Forensic science: an introduction to scientific and investigative techniques. CRC press.
- Modi, A Text Book of Medical Jurisprudence & Toxicology.
- Biswas, G. (2009). Review of forensic medicine and toxicology. Indian Congress of Forensic Medicine & Toxicology.
- Karmakar, R. N. (2007). Forensic medicine and toxicology. Academic publishers.
- Heard, B. J. (2011). Handbook of firearms and ballistics: examining and interpreting forensic evidence (Vol. 1). John Wiley & Sons.
- Wallace, J. S. (2018). Chemical analysis of firearms, ammunition, and gunshot residue. Crc Press.

Course curriculum

Course Code	Course Name	L	T	P	C
FRS208	Forensic Chemistry	3	0	1	4

Course Outcomes:

CO1: Understand the scope and importance of forensic chemistry and chemical evidence types.

CO2: Use instrumental techniques to detect poisons, alcohols, and drugs.

CO3: Examine chemical evidence in arson, bribe traps, and explosions.

CO4: Apply quality assurance measures in forensic labs.

CO5: Perform practical analysis of forensic samples using modern methods.

CO-PO Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	0	2	0	0	0	0	0	2	2	0
CO2	0	3	3	0	3	0	0	0	2	0	2
CO3	3	3	3	2	3	0	2	0	0	2	2
CO4	0	3	2	3	0	0	0	0	2	2	0
CO5	3	3	3	2	3	2	2	0	2	0	3

Course Contents:

Unit I: Fundamentals of Forensic Chemistry (12 hours)

- Scope, significance and evolution of forensic chemistry.
- Classification and types of chemical evidence: inorganic, organic, and biochemical.
- Types of forensic cases involving chemical analysis.
- Bribe Trap Cases: Chemistry of phenolphthalein and its detection.
- Quality control and assurance in forensic chemistry laboratories.

Unit II: Volatile Poisons and Alcoholic Beverages (12 hours)

- Chemistry and toxicology of volatile compounds: methanol, acetone, chloroform, phenol.
- Analytical methods for detection in biological and non-biological matrices.
- Forensic examination of alcoholic and non-alcoholic beverages: illicit liquor, country-made liquor.
- Detection of alcohol and drugs in pharmaceutical and spurious preparations.
- Instrumental techniques: GC-MS, Headspace-GC, UV-Vis spectroscopy.

Unit III: Arson and Petroleum Product Analysis (12 hours)

- Chemistry of combustion and pyrolysis.
- Clue material in arson cases: fire debris, residues, accelerants.
- Collection, preservation, and analysis of arson-related evidence.
- Instrumental analysis of arson residues (GC-MS, FTIR).
- Petroleum product analysis: distillation, fractionation, adulteration detection.

Unit IV: Explosives and Post-Blast Analysis (12 hours)

- Classification and chemistry of explosives: low vs. high explosives, pyrotechnics, IEDs.
- Blast dynamics: propagation, fragmentation, pressure effects.
- Examination of explosion scenes: collection and evaluation of post-blast residues.
- Analytical techniques: Color test, TLC, GC-MS, FTIR, Raman spectroscopy.
- Case studies and international guidelines (e.g., UN Manual on Explosives).

Unit V: Practical (30 hours)

- Detection of phenolphthalein in bribe trap case samples.
- Identification of volatile poisons using instrumental methods.
- Analysis of methanol and ethanol in liquor samples
- Identification of fire accelerants using solvent extraction and TLC.
- Detection of adulterants in petroleum products.

References:

- Burger, A. (1970). Medicinal Chemistry, Vol. II. Wiley-Interscience, New York.
- Vogel, A. I. (1974). Practical Organic Chemistry. Longman Group Ltd, London.
- Boudreau, J. E. et al. (1977). Arson & Arson Investigation. US DOJ, US Govt. Printing Office.
- Kirk, P. L., & DeHaan, J. D. (2002). Kirk's Fire Investigation. Prentice Hall.
- Yinon, J., & Zitrin, S. (1996). Modern Methods and Applications in the Analysis of Explosives. Wiley.
- Akhavan, J. (2022). The Chemistry of Explosives. RSC Publishing.
- Working Procedure Manual – DFS, MHA, India.

Course Code	Course Name	L	T	P	C
FRS106	Basics of Cyber Forensics	3	1	0	4

Course Outcomes:

CO1: Describe the evolution and classification of computers, and identify key hardware and software components.

CO2: Explain the functions and features of various operating systems including Windows, Linux, Android, and iOS.

CO3: Demonstrate understanding of file systems, file structures, and basic file management techniques including compression, encryption, and hashing.

CO4: Identify different types of networks, topologies, and networking devices, and explain their relevance in a forensic context.

CO5: Interpret IP addressing, MAC addressing, and the OSI and TCP/IP models with a focus on their application in digital forensic investigations.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	1	2	1	1	1	2	1	1
CO2	3	2	2	1	3	1	1	1	2	1	1
CO3	3	3	3	2	3	2	1	2	2	1	2
CO4	3	3	3	2	3	2	2	2	2	2	2
CO5	3	3	3	2	3	2	2	2	2	2	2

Course Contents:

Unit 1: Fundamentals of Computer Systems

Evolution and classification of computers, Hardware components: CPU, RAM, Storage Devices, I/O Devices

Software: System Software vs Application Software

Unit 2: Operating Systems Basics

Role and functions of an OS, Introduction to Windows and Linux, File systems: FAT, NTFS, ext3/ext4 Android and IOS difference

Command-line basics (Windows CMD and Linux terminal)

Unit 3: Data Storage and File Management

File types and extensions, File metadata and timestamps, Compression, encryption, and hashing basics

Unit 4: Fundamentals of Networking

Types of networks: LAN, WAN, MAN, PAN, Network topologies and devices (router, switch, hub, firewall) IP addressing (IPv4/IPv6), MAC address

OSI and TCP/IP models (focus on layers relevant to forensic analysis)

References:

Unit	Recommended Book(s)
1. Computer Systems Fundamentals	Tanenbaum & Bos (2022); Kavrestad et al. (2023); Oettinger (2023)
2. Operating Systems Basics	Tanenbaum & Bos (2022); Oettinger (2023)
3. Data Storage & File Management	Kavrestad et al. (2023); Oettinger (2023); Kavrestad for metadata, hashing, compression
4. Networking Fundamentals	Forensic Focus (2025); Kavrestad et al. (2023); Network Forensics guide

Course Code	Course Name	L	T	P	C
FRS205	Cyber Crime and related Laws	3	1	0	4

Course Outcomes:

CO1: Define cyber forensics, explain its scope, and differentiate it from digital forensics.

CO2: Classify cybercrimes based on their targets (individual, property, government) and understand the legal and investigative frameworks involved.

CO3: Analyze cybercrimes against individuals such as identity theft, cyberstalking, and online harassment, and evaluate prevention and investigation strategies.

CO4: Examine cybercrimes against property like hacking, malware, and financial scams, and identify tools and techniques used for investigation.

CO5: Assess the threats posed by cybercrimes against governments and explore the impact of advanced threats like cyberterrorism, deepfakes, and dark web activities.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	2	3	1	1	1	2	2	2
CO2	3	2	3	3	3	2	2	2	2	2	2
CO3	3	2	3	3	3	2	2	2	2	3	2
CO4	3	3	3	2	3	2	2	2	2	2	2
CO5	3	2	3	3	3	2	2	2	2	3	2

Course Contents:

Unit 1: Introduction

Definition and scope of cyber forensics, Difference between digital and cyber forensics, History and evolution, Role of forensics in cybercrime investigation, Categories: Cybercrime against individuals, property, and government

Unit 2- Cybercrime against Individuals

Identity Theft, Phishing and Social Engineering, Cyberstalking and Online Harassment, Revenge Porn and Sextortion, Online Defamation and Trolling

Unit 3. Cybercrime against Property

Hacking and Unauthorized Access, Malware and Ransomware Attacks, Denial-of-Service (DoS/DDoS) Attacks, Intellectual Property Theft, Online Fraud and Financial Scams of different kinds

Unit 4. Cybercrime against Government and emerging trends

Cyberterrorism, Hacking Government Websites, Attacks on Critical Infrastructure (Power grids, Water systems), Espionage and Nation-State Attacks, recruitment of terrorist using Social media

Other types and emerging cybercrimes - Cryptocurrency-related crimes, Deep fake and AI-based attacks, Dark Web and illegal marketplaces, Child pornography and human trafficking networks

References:

Unit	Recommended Book(s)
<i>Unit 1 – Intro/Cybercrime Categories</i>	Holt et al. (2023); Goel & Nunes de Souza (2024)
<i>Unit 2 – Crimes against Individuals</i>	Holt et al. (2023); Dudley & Golden (2022)
<i>Unit 3 – Crimes against Property</i>	Holt et al. (2023); Jenkinson (2022); Dudley & Golden (2022)
<i>Unit 4 – Cybercrime against Government & Emerging Issues</i>	Montasari (2024); Montasari (2023); Goel & Nunes de Souza (2024)

Course Code	Course Name	L	T	P	C
FRS305	Cyber Tools and Forensic Investigation of Cyber Crime	3	1	0	4

Course Outcomes:

CO1: Differentiate between open-source and proprietary tools and explain their suitability based on forensic criteria such as admissibility and scalability.

CO2: Identify and describe tools used in various areas of cyber forensic investigation, including FTK Imager, write blockers, UFED, and hash value calculators.

CO3: Apply standard procedures for digital evidence handling including acquisition, chain of custody, documentation, and integrity verification using hash algorithms like SHA-256 and MD5.

CO4: Interpret and apply relevant sections of the Indian IT Act 2000, the Indian Evidence Act, and BNS sections related to cybercrime and digital evidence admissibility.

CO5: Demonstrate practical skills in digital forensic tasks such as IP tracing, data recovery, forensic imaging, and social media forensic analysis using contemporary tools and methods.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	3	3	3	2	1	1	2	2	2
CO2	3	3	3	2	3	2	1	1	2	2	2
CO3	3	3	3	3	3	2	2	2	2	2	3
CO4	3	2	2	3	2	2	2	1	2	2	2
CO5	3	3	3	2	3	2	2	2	2	2	3

Course Contents:

Unit 1- Tools for cybercrime investigation

Open-source vs proprietary, Criteria for tool selection (admissibility, scalability, accuracy)

Tools for different purpose like imaging, cloud forensics, Social media forensics, disk forensics mobile forensics, Computer forensics etc

Common Tools and their basic Introduction- write blockers, FTK IMAGER, UFED, IMAGING TOOLS, and HASH VALUE CALCULATOR ETC

Unit 2 - Digital evidence handling

Planning, acquisition, analysis, documentation, reporting, Chain of custody and documentation standards, Seizure protocols, evidence bagging, and field triage, Ensuring integrity using hash algorithms (SHA-256, MD5), Log analysis: Syslogs, firewall logs, email headers

Unit 3 - Legal Framework

Indian IT Act 2000, Evidence Act (65, 66, 66B, 66C, 66D, 66E, 67, 67A, 67B)

BNS SECTIONS: 66, 69 70, 71, 72, 73, 74. Admissibility of such Evidences in court

Unit 4 - Practical

1. IP address identification
2. Data recovery (Recuva)
3. Autopsy software demonstration
4. Prepare forensic image (using FTK)
5. Social media forensics- (reverse image search, hashtag analysis, and snap analysis)

References:

Unit	Recommended Source(s)
<i>Unit 1 – Cybercrime Tools</i>	Easttom, Johansen, Dehghantanha (tools, imaging, write blockers, UFED, hash calculators)
<i>Unit 2 – Evidence Handling</i>	Easttom, Johansen (chain of custody, documentation, logs), Dehghantanha (cloud context)
<i>Unit 3 – Legal Framework</i>	AbdEl-Latif et al. (cyberlaw), Narasimhan & Kala (legal compliance)
<i>Unit 4 – Practical Labs</i>	Easttom, Johansen, Dehghantanha (FTK, Autopsy, IP extraction, social media methods)

Course Code	Course Name	L	T	P	C
FRS406	Digital Forensics and Artificial Intelligence	4	0	0	4

Course Outcomes:

CO1: Explain the architecture of Android and iOS devices and apply tools for mobile data extraction and forensic analysis of apps, SIM/SD cards, emails, and internet activity.

CO2: Analyse network attacks, collect volatile data, and interpret logs using forensic tools and techniques like SPAN, network taps, and packet sniffers.

CO3: Identify different types of social media platforms, collect and preserve social media evidence using APIs, screenshots, and metadata, and apply OSINT techniques within legal bounds.

CO4: Distinguish between the Surface Web, Deep Web, and Dark Web; explain technologies like Tor and I2P; and evaluate case studies involving illicit use of the Dark Web and cryptocurrencies.

CO5: Describe the role of AI and ML in digital forensics, and apply AI techniques for log analysis, image/video forensics, mobile/cloud investigation, and deep fake detection.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3	2	3	2	1	1	2	2	3
CO2	3	3	3	2	3	2	2	2	2	2	3
CO3	3	3	3	3	3	2	2	2	2	3	3
CO4	3	2	3	2	3	2	2	2	2	3	2
CO5	3	3	3	2	3	2	2	3	2	2	3

Course Contents:

Unit 1- Mobile Device Forensics

Android and iOS architecture, Tools and techniques for mobile data extraction

SIM and SD card analysis, App data forensics (WhatsApp, Telegram, etc.), Windows and Linux artifacts (registry, logs, user activity), Email forensics, Browser and internet artifacts

Unit 2 - Network forensics

Types of network attacks, Legal issues in network monitoring Logging (syslogs, firewall logs, IDS logs), Network tap, SPAN, port mirroring, Volatile data collection, Intrusion detection and prevention, Data packets and Packet analysis

Unit 2 - Social media forensics

Types of social media platforms (Facebook, Twitter/X, Instagram, WhatsApp, YouTube) and their specific types of data

Methods of collecting social media data, Manual collection

APIs (Facebook Graph API, Twitter API)

Screenshots and metadata preservation

Open Source Intelligence (OSINT) techniques

Chain of custody and legal admissibility

Unit 3- Dark web

Definitions and differences: Surface Web, Deep Web, and Dark Web

How search engines index the web, Use cases of the Deep Web (e.g., academic databases, medical records), Onion routing and the Tor network, I2P (Invisible Internet Project), Freenet overview, Types of content: marketplaces, forums, whistleblower platforms

Cryptocurrency use (Bitcoin, Monero) in anonymous transactions, Case studies

Unit 4- AI in cyber and digital forensics

Basics of AI and Machine Learning (ML), Importance of AI in cybercrime investigation, AI for automated log analysis, Image and video analysis using AI, AI in mobile and cloud forensics, Detection of AI generated content and deep fakes.

References:

Unit	Recommended Book/Resource
<i>Mobile Forensics</i>	Oettinger (2022), Gogolin (2023), Kaushik et al. (2023)
<i>Network Forensics</i>	Oettinger (2022), IGI Global (2024), Springer (2025)
<i>Social Media</i>	Kaushik (2023), Springer (2025), 2023 AI-Social Media surveys
<i>Dark Web</i>	Springer (2025), publications on crypto & dark web forensics
<i>AI in Digital Forensics</i>	IGI Global (2024), Springer (2025), Kaushik et al. (2023)