THE ASSAM
ROYAL GLOBAL UNIVERSITY
GUWAHATI

ROYAL SCHOOL OF LIFE SCIENCES (RSLSC)

Department of Forensic Science

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

For Postgraduate Programme

M.Sc. IN FORENSIC SCIENCE
(2 Years)

WEF AY 2025-26

STRUCTURE OF THE SYLLABUS FOR 2 YEAR PG PROGRAMME

SCHOOL NAME - Royal School of Life Sciences

DEPARTMENT NAME - Department of Forensic Science

PROGRAMME NAME - M.Sc. Forensic Science

1st SEMESTER				
COURSE CODE	**COURSE TITLE**	**LEVEL**	**CREDIT**	**L-T-P**
FSC144C101	Forensic Science and Crime Scene Management	400	4	3-1-0
FSC144C102	Criminology and Law	400	4	3-1-0
FSC144C103	Instrumental Methods	400	4	3-1-0
FSC144C104	Forensic Physics and Ballistics	400	4	3-1-0
FSC144C115	Forensic Science and Criminalistics (Practical)	400	4	0-0-8
FSC144C116	Forensic Physics and Ballistics (Practical)	400	4	0-0-8
MOOCs - I	*MOOCs/online courses will be identified by the department from the list of courses available on the MOOCs online platform/SWAYAM portal	400	4	
TOTAL CREDIT FOR 1st SEMESTER			**24**	
2nd SEMESTER				
COURSE CODE	**COURSE TITLE**	**LEVEL**	**CREDIT**	**L-T-P**
FSC144C201	Forensic Chemistry and Toxicology	500	4	3-1-0
FSC144C202	Questioned Document and Dermatoglyphics	500	4	3-1-0
FSC144C213	Forensic Chemistry and Toxicology (Practical)	500	4	0-0-8
FSC144C214	Questioned Document and Dermatoglyphics (Practical)	500	4	0-0-8
MOOCs - II	*MOOCs/online courses will be identified by the department from the list of courses available on the MOOCs online platform/SWAYAM portal	500	4	
TOTAL CREDIT FOR 2nd SEMESTER			**24**	
TOTAL CREDIT FOR 1st YEAR = 48				
3rd SEMESTER				
COURSE CODE	**COURSE TITLE**	**LEVEL**	**CREDIT**	**L-T-P**
FSC144C301	Forensic Biology and Wildlife Forensics	500	4	3-1-0
FSC144C302	Digital Forensics	500	4	3-1-0
FSC144C313	Forensic Biology (Practical)	500	4	0-0-8
FSC144C324	Project Dissertation/Internship - I	500	8	0-0-16
OR 3rd SEMESTER (For students with 3rd and 4th Semester Research)				

FSC144R321	Project Dissertation/Internship - I	500	20	0-0-40
TOTAL CREDIT FOR 3rd SEMESTER			**20**	
4th SEMESTER				
COURSE CODE	**COURSE TITLE**	**LEVEL**	**CREDIT**	**L-T-P**
FSC144C401	Forensic Medicine and Anthropology	500	4	3-1-0
FSC144C402	Forensic Psychology	500	4	3-1-0
FSC144C423	Project Dissertation/Internship - II	500	12	0-0-24
OR 4th SEMESTER (For students with 3rd and 4th Semester Research)				
FSC144R421	Project Dissertation/Internship - II	500	20	0-0-40
TOTAL CREDIT FOR 4th SEMESTER			**20**	
TOTAL CREDIT FOR 2nd YEAR = 40				

SEMESTER - I

Paper Sl. No.	Paper - 1	**Scheme of Evaluation**	L&T
Name of the Course	Forensic Science and Crime Scene Management	**L-T-P-C**	3-1-0-4
Type of Course	Core	**Credits Assigned**	4
Paper Code	FSC144C101	**Level of the Course**	400

Course objective: The objective of this course is to introduce the students to Forensic Science and its role in the criminal investigation system. The students would be appraised about the function & principles of Forensic Science & its historical background. This course shall provide the students necessary information to understand the role of Forensic Laboratories in crime scene investigation, handling of evidence and their examination. Additionally, students will also learn about Indian Police system and various techniques used in criminal profiling.

Course Outcome : After successful completion of the course, student will be able to		
Sl.No.	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**recall** the core definitions, historical developments, legal frameworks, branches, and organizational structure of forensic science.	BT1
CO2	**explain** the systematic procedures of crime scene management.	BT2
CO3	**apply** knowledge of forensic report components, legal standards for evidence admissibility.	BT3
CO4	**analyze** physical patterns to differentiate between identification, individualization, and reconstruction processes.	BT4

Module	**Course content**	**Lecture**
I	**Introduction to Forensic Science**: Definition, Need, Scope, Concepts and Significance of Forensic Science, History and Development of Forensic Science, Laws and Basic principles of Forensic Science, Branches of forensic science, Organizational set-up of a Forensic Science Laboratories. Investigative strategies, Expert testimony and eye-witness report.	**22**
II	**Crime Scene Management:** Crime Scene: Introduction, Types, Significance, Role of Investigator, Steps of Crime Scene Management: Protection, Searching Methods, Documentation of the Crime Scene; Collection, Preservation, Packaging, Chain of Custody: Types, Significance and Evaluation, Reconstruction of scene of crime, Report writing.	**23**

III	**Report and Evidence Evaluation:** Components of reports and Report formats in Crime Scene and findings. Constitutional validity of Forensic Evidence, Expert Testimony: Admissibility in court of law, Pre-Court preparations & Court appearance, FIR and its types.	**22**
IV	**Importance of Physical patterns:** Physical patterns in identification, individualization and reconstruction. Pattern due to blood, Pattern on glass, firearms related patterns, patterns in arson and fires served articles and physical matches, comparison of imprints, indentation, striation, typical presentations, Gait patterns, Bite patterns. Modus operandi, portrait parley.	**23**
Total		**90**

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

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

Reference Books:

1. Hess, A.K. and Weiner, I.B. Handbook of Forensic Psychology 2nd ed. Jhon Wiley & Sons (1999)
2. James, S.H Scientific and Legal Application of Bloodstain Pattern Interpretation, CRC Press, Boca Raton, (1998)
3. James, S.H. and Nordby, J.J. Forensic Science: An Introduction to Scientific and Investigative Techniques, CRC press, USA (2003)
4. Kleiner, M. Handbook of Polygraph Testing, Academic Press (2002)
5. Lyman, M.D. Criminal Investigation- The Art and the Science, Prentice Hall (2002)

SEMESTER - I

Paper Sl. No.	Paper - 2	**Scheme of Evaluation**	L&T
Name of the Course	Criminology and Law	**L-T-P-C**	3-1-0-4
Type of Course	Core	**Credits Assigned**	4
Paper Code	FSC144C102	**Level of the Course**	400

Course objective: The objective of this course is to introduce students about the concepts of Crime, Criminology and the factors that contribute to a person becoming antisocial. The students gain knowledge regarding Police Administration, Indian Judiciary & Criminal

Justice System. To introduce the different sections of IPC, CrPC and the Indian Evidence Act& the Acts pertaining to Forensic Science.

Course Outcome : After successful completion of the course, student will be able to		
Sl.No.	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**define** concept of Criminology	BT1
CO2	**illustrate** legal provisions focusing on different types of crimes	BT2
CO3	**apply** various IPC, CrPC, IEA & Acts pertaining to Forensic Science.	BT3
CO4	the detailed **analysis** & significance of Criminal Profiling for the purpose of justice	BT4

Module	**Course content**	**Lecture**
I	**Crime and Society**: Concept and Definition of Crime, Causes and Elements of Crime, Social Change and Crime, Control and Prevention of Crime, Hate Crime, Organized Crime, Cyber Crime, Industrialization, Criminal Behavior: Theories and Significance, Characteristics of crime (Actus Reus, Mens Rea, Prohibited Act & Punishments) Modus Operandi and Criminal Psychology, Crime Rate in India and in World, NCRB.	**22**
II	**Indian Judiciary and Criminal Justice System**: Criminal Justice System: Introduction, Structure, Components and Working. Indian Judiciary: Introduction, Courts: Hierarchy, Types, Procedure, Power and Jurisdiction, Prosecution and defence. Lok Adalat, Lokpal, Lokayukta, Juvenile Court Evidence, Enquiry, Investigation, Trial, FIR, Panchnama Inquest Charge Sheet, Dying Declaration and Dying deposition. A subpoena (summons).	**23**
III	**Laws and Legal Framework:** Bhartiya Nyaya Sanhita (BNS), 2023; Key Changes from IPC to BNS; Forensic Relevance; Bhartiya Sakshya Adhiniyam (BSA), 2023; Key Changes from IEA to BSA; Recent Updates: Supreme Court guidelines on the admissibility of modern forensic tools; Bhartiya Nagarik Suraksha Sanhita (BNSS), 2023; Key Provisions for Forensic Investigations; Key Changes from CrPC to BNS; Bailable and Non Bailable Offences. Cognizable and Non Cognizable Offences.	**23**
IV	**Act Pertaining to Forensic Science:** Narcotic Drugs and Psychotropic Substances Act, Drugs and Cosmetics Act, Explosive Substances Act, Dowry Prohibition Act, Arms Act, Wild Life Protection Act 1972, Environmental Protection Act, 1986; Forensic investigations in environmental crimes (e.g., illegal dumping, air/water pollution); I.T. Act (Information Technology Act- 2000); POCSO Act; The Criminal Procedure (Identification) Act-2022.	**22**

Total	**90**

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

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

Text Books:

1. Adler, F.: Mueller, G.O.W. and Laufer, W.S. (2006) Criminology 5th ed. McGraw Hill.
2. Arrigo, B.A. (2002): Introduction to Forensic Psychology,Academic Press Inc.
3. Barak, G. (1998): Integrative Criminology, Dartmouth Publishing Co. Ltd.
4. Biderman, A.D. and Zimmer, H. (1961): The Manipulation of Human Behavior, Wiley, New York.

SEMESTER - I

Paper Sl. No.	Paper - 3	**Scheme of Evaluation**	L&T
Name of the Course	Instrumental Methods	**L-T-P-C**	3-1-0-4
Type of Course	Core	**Credits Assigned**	4
Paper Code	FSC144C103	**Level of the Course**	400

Course objective: This course aims to establish a comprehensive understanding of electromagnetic radiation (EMR), wave-quantum mechanics (including Bohr theory, De Broglie hypothesis, and Heisenberg uncertainty principle), and EMR-matter interactions, underpinning analytical techniques. Students will master the principles, instrumentation, and forensic applications of spectroscopy (UV-Vis, IR, Raman, AAS, NMR, Mass), chromatography (HPLC, GC, hyphenated methods), centrifugation, and microscopy. The curriculum emphasizes hands-on proficiency in operating advanced instruments for molecular analysis, spectral interpretation, and separation of complex mixtures in scientific and forensic contexts.

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

Sl.No.	Course Outcome	Blooms Taxonomy Level
CO1	**recall** foundational theories and principles of electromagnetic radiation (EMR).	BT1
CO2	**explain** the fundamental principles, instrumentation components, and analytical applications of spectroscopic techniques.	BT2
CO3	**apply** chromatographic separation techniques and hyphenated methods to solve forensic and analytical problems.	BT3
CO4	**analyze** the principles and operational parameters of centrifugation and microscopy techniques.	BT4

Module	Course content	Lecture
I	**Fundamentals of Instrumentation:** Electromagnetic radiations (EMR) their properties and parameters on the basis of wave and quantum mechanics, interaction of EMR with matter, electronic spectra and molecular structure, photoelectric effect, wave and quantum mechanics, De Broglie hypothesis, Bohr atomic theory, Heisenberg uncertainty principle, Planck's Quantum theory, Davisson and Germer Experiment.	**22**
II	**Spectroscopy:** Ultraviolet and visible spectroscopy: Instrumentation and Applications, Infrared Spectroscopy: Molecular vibration, Theory of IR absorption, Instrumentation and Applications, Raman Spectroscopy: Theory of Raman, Instrumentation, Applications, Atomic absorption spectrometry: Instrumentation and Applications of Flame emission, Mass Spectroscopy: Theory, Instrumentation and Applications, Proton NMR: Theory and principle, Instrumentation and Applications.	**23**
III	**Chromatography :** Theory of separation techniques, Types of chromatography and their Forensic Applications; Thin layer chromatography; High Performance Liquid Chromatography: Principle, instrumentation and applications; Gas Chromatography: Principle, instrumentation and applications; Hyphenated techniques: LC-MS-MS (Tandem); GC-MS, GC-MS-MS (Tandem).	**22**
IV	**Centrifugation techniques:** Basic principle of centrifugation and sedimentation, various types of centrifuges, density gradient centrifugation, preparative centrifugation, analysis of sub-cellular fractions, ultra-centrifuge, refrigerated centrifuges. **Microscopy:** Basic principles of microscopy, simple and compound microscope, comparison microscope, phase contrast microscope, stereoscopic microscope, polarizing microscope, fluorescence microscope.	**23**
Total		**90**

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

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

Suggested Readings:

1. G.D.Christian and J.E.O'Reilly, Instrumental Analysis, Allyn and Bacon, Inc., Boston.
2. F.W.Fifield and D.Kealey, Principles and practice of Analytical Chemistry, International Textbook Company, London.
3. R.P.Bauman, Absorption Spectroscopy, John Wiely, New York.
4. M.Donhrow, Instrumental Methods in Analytical Chemistry; Their Principles and practice Vol.2, optical method, Pitaman, New York.
5. G.G.Guilbanlt, Practical Fluorenscence: Theory, Methods and Practice, Marcel Dekker, New York.
6. S.Udenfriend, Fluorescence Assay in Biology and Medicine, Academic Press, New York.
7. W.J.Price, Spectrochemical Analysis by Atomic Absorption, Hyden, London.
8. R.S.Alger, Electron Paramagnetic Resonance: Techniques and Applications, Interscience, New York.

SEMESTER - I

Paper Sl. No.	Paper - 4	**Scheme of Evaluation**	L&T
Name of the Course	Forensic Physics and Ballistics	**L-T-P-C**	3-1-0-4
Type of Course	Core	**Credits Assigned**	4
Paper Code	FSC144C104	**Level of the Course**	400

Course objective: This course aims to equip students with the technical expertise to analyze tool marks, fibers, erased/bite marks, ammunition, and firearms through forensic methodologies. It covers principles of tool mark identification, fiber comparison, restoration of obliterated marks, bite mark morphology, ammunition construction, firearm classification, and ballistic evidence analysis (e.g., GSR, microscopy). The curriculum emphasizes practical skills in evidence collection, preservation, and legal compliance (e.g., Indian Firearm Act) to support criminal investigations and courtroom testimony.

Course Outcome : After successful completion of the course, student will be able to		
Sl.No.	**Course Outcome**	**Blooms Taxonomy Level**

CO1	**recall** foundational concepts of tool marks (types, class/individual characteristics, collection/preservation) and fiber/cloth evidence.	BT1
CO2	**explain** the principles, techniques, and forensic protocols for restoring erased/obliterated marks.	BT2
CO3	**apply** knowledge of ammunition construction, classification,and safety protocols to handle, disassemble, and classify firearm components.	BT3
CO4	**analyze** class and individual characteristics on cartridge cases and projectiles, along with GSR composition and distribution.	BT4

Module	**Course content**	**Lecture**
I	**Tool Mark & Fiber Evidence:** Introduction to tool marks, Types of tool marks, Class characteristics and individual characteristics of tool marks, Collection and Preservation of tool marks, Forensic examination of tool marks, Case Studies, Fibre evidence: artificial and man-made fibres. Collection of fibre evidence. Identification and comparison of fibres. Cloth evidence: importance, collection, analysis of adhering material. Matching of pieces.	**22**
II	**Erased marks & Bite marks:** Principle of restoration of erased marks, Techniques involved for alteration of individual markings, Restoration of erased and obliterated marks on various surfaces, Photography and Forensic assessment of methods for restoration of obliterated marks, Objectives and forensic importance of bite-mark examination, the typical bite marks morphology, types of bite marks, Evidence collection from victims and suspects, Photography, lifting, preservation of bite marks, casting of bite marks, Identification and comparison of bite marks.	**23**
III	**Ammunition:** Definition, Ammunition & its constructional parts, Introduction to Shotgun ammunition and Rifle Ammunition, Classifications of Ammunition on basis of constructional features, Functional assembly of different types of ammunition & their types, Safety aspects for handling firearms and ammunition, cartridge-firing mechanism. Bullet and its types, Case studies related to firearm cases, Indian Firearm Act: Introduction to Act, Basic concepts of chapters describe in Act, Prohibited & Non-Prohibited Firearms calibres.	**22**
IV	**Firearms:** Identification of firearms, ammunition and their components: Principles, Processing of Firearm Exhibits involved, Class characteristics & Individual characteristics (Identifiable marks) produced during firing process on cartridge cases & projectiles and their linkage with firearms, Analysis of GSR: Composition of GSR, Location & Collection, Mechanism of formation, Techniques involved in ballistic studies, Stereo and comparison microscopy, BDAS, IBIS.	**23**
Total		**90**

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

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

Reference books:

1. Forensic Science Evidence: Can the Law Keep Up With Science (Criminal Justice: Recent Scholarship by Donald E. Shelton
2. M. Byrd, Crime Scene Evidence: A Guide to the Recovery and Collection of Physical Evidence, CRC Press, Boca Raton (2001).
3. T.J. Gardener and T.M. Anderson, Criminal Evidence, 4th Ed., Wadsworth, Belmont (2001).
4. S.H. James and J.J. Nordby, Forensic Science: An Introduction to Scientific and Investigative Techniques, 2nd Edition, CRC Press, Boca Raton (2005).
5. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013).
6. Brain J. Heard; Hand Book Of Firearms And Ballistics; John Willey, England.
7. TA, Warlow; Firearms, The Law And Forensic Ballistics; Taylor And Francis, Landon.
8. Karl G. Sellier et al ; Wound Ballistics And The Scientific Background; Elsevier, London.

SEMESTER - I

Paper Sl. No.	Paper - 5	**Scheme of Evaluation**	Practical
Name of the Course	Forensic Science and Criminalistics (Practical)	**L-T-P-C**	0-0-8-4
Type of Course	Core	**Credits Assigned**	4
Paper Code	FSC144C115	**Level of the Course**	400

Course objective: The objective of the course is to develop practical approach among the students in different types of crime scenes, their management and reconstruction. They will also learn about collection, packaging, forwarding and examination of various types of physical evidences found at crime scene.

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

Sl.No.	Course Outcome	Blooms Taxonomy Level
CO1	**list** different reports of NCRB, CrPC, etc.	BT1
CO2	**understand** the nature of various tools & techniques used in Forensic Examination	BT2
CO3	**develop** the art of collection, packaging, preservation & analysis of trace evidences.	BT3
CO4	**distinguish** the types of scene of crime and evidence types.	BT4

Module	Course content	Lecture
I	1. To study the history of crime cases from forensic science perspective. 2. To cite examples of crime cases in which apprehensions arose because of Daubert standards. 3. To study the annual reports of National Crime Records Bureau and depict the data on different type of crime cases by way of smart art/templates. 4. To write report on different type of crime cases.	22
II	5. To review how the Central Fingerprint Bureau, New Delhi, coordinates the working of State Fingerprint Bureaus. 6. To examine the hierarchical set up of different forensic science establishments and suggest improvements. 7. The use of searching methods for crime scene (Outdoor and Indoor SOC). 8. Fingerprints lifting from the scene of crime. (latent, patent).	23
III	9. Physical matching of Cloth piece and/or rope piece and /or garments or broken pieces of different objects. 10. Physical and microscopic studies of affected electric wires, panel boards due to electrical overload and short-circuit. 11. Outdoor crime scene investigation (Accident). 12. Indoor crime scene investigation (Murder).	22
IV	13. Collection of evidence –with proper equipment and tools. 14. Packing, Labelling and Sealing of evidences from crime scene. 15. Sketching and photography of crime scenes. 16. Physical and microscopic studies of gems and fibers.	23
Total		

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

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

Textbooks:

1. Forensic Science: Fundamentals and Investigations by Anthony J. Bertino.
2. Criminalistics: An Introduction to Forensic Science by Richard Saferstein.
3. Forensic Science: From the Crime Scene to the Crime Lab by Richard Saferstein.
4. Crime Scene Investigation: Methods and Procedures by Ian Pepper.
5. Forensic Fingerprints by Allan Gaw and Jim Fraser.

SEMESTER - I

Paper Sl. No.	Paper - 6	**Scheme of Evaluation**	Practical
Name of the Course	Forensic Physics and Ballistics (Practical)	**L-T-P-C**	0-0-8-4
Type of Course	Core	**Credits Assigned**	4
Paper Code	FSC144M116	**Level of the Course**	400

Course objective: This course aims to equip students with expertise in firearms examination (caliber, rifling, GSR analysis), ballistic dynamics (velocity, angle/direction of fire), and tool/impression evidence analysis (tool marks, cloth matching, foot/tyre/bite prints). It integrates chemical, microscopic, and instrumental techniques (BDAS, casting methods) to link suspects to crimes, reconstruct shooting incidents, and validate forensic evidence for legal proceedings..

Course Outcome : After successful completion of the course, student will be able to		
Sl.No.	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**identify** the characteristics of firearms and methods for determining shot numbers.	BT1
CO2	**explain** the principles of propellant identification.	BT2
CO3	**apply** ballistic software (BDAS) to determine bullet velocity.	BT3
CO4	**analyze** cast foot/tyre impressions and latent foot marks.	BT4

Module	Course content	Lecture
I	1. Characteristics of Firearms-Caliber, Choke, Trigger pull, and Proof marks. 2. Examination and comparison of fired bullet with reference to caliber, rifling characteristics, and identification of firearm. 3. Examination and comparison of fired cartridge case with reference to caliber, firing pin, breech face, chamber indentations, extraction, and ejector marks by comparison microscope. 4. Determination of shot numbers from size and weight of shots.	22
II	5. Identification of propellants. 6. Chemical tests for powder residue and barrel wash. 7. Instrumental examination of Gunshot Residues. 8. Study on Deformed bullets.	23
III	9. Determination of velocity using BDAS. 10. Determination of angle and direction of fire on different surfaces. 11. To identify and compare tool marks. 12. To compare cut or torn cloth samples by physical matching.	22
IV	13. Casting of foot and tyre impressions. 14. Identification and comparison of ear prints and lip prints. 15. Casting of bite marks. 16. Development of latent foot marks.	23
Total		**90**

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

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

Suggested Readings:

1. E.R.Mengel; Forensic Physics in 2002 year book, McGraw hill Encyclopedia of Science & Technology.
2. Dennis Shaw; Physics in the Prevention and Detection of Crime, Contem Phys. Vol 7.
3. Brain J. Heard., Hand Book Of Firearms And Ballistics; John Willey, England.

SEMESTER - II

Paper Sl. No.	Paper - 1	**Scheme of Evaluation**	L&T
Name of the Course	Forensic Chemistry and Toxicology	**L-T-P-C**	3-1-0-4
Type of Course	Core	**Credits Assigned**	4
Paper Code	FSC144C201	**Level of the Course**	500

Course objective: This course aims to integrate principles of chemical forensics (bribe traps, ink/polymer analysis, food adulteration), explosives/petroleum analysis (post-blast residue, arson dynamics), and drug toxicology (NDPS Act compliance, addiction mechanisms) with hands-on skills in analytical techniques (GC-MS, TLC, color tests). It emphasizes quality assurance (ISO, GLP) and crime scene protocols to prepare students for forensic casework, ensuring legal admissibility and scientific rigor in criminal investigations and courtroom testimony.

Course Outcome : After successful completion of the course, student will be able to		
Sl.No.	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**define** the fundamental principles of chemical forensics, including phenolphthalein analysis in bribe traps, ink/polymer dating protocols.	BT1
CO2	**classify** explosives into organic and inorganic categories.	BT2
CO3	**apply** the NDPS Act (1985) to classify controlled substances.	BT3
CO4	**analyze** the roles of accreditation systems (ISO, ILAC/APLAC) and quality protocols in forensic chemical analysis.	BT4

Module	**Course content**	**Lecture**
I	**Chemical Forensics:** Introduction to Forensic Chemistry, Bribe Traps: Phenolphthalein analysis. Inks & Polymers: Dating/aging of inks, plastic/adhesive examination, Food Adulteration: Lipid analysis, Crime Scene Protocols: Narcotics evidence collection, clandestine lab investigation, isolation/purification techniques, Presumptive tests: Marquis reagent for opioids.	**15**
II	**Explosives, Fire Dynamics & Petroleum Analysis:** Explosives: Classification (organic/inorganic), post-blast residue analysis (TLC, color tests). Case studies (e.g., terrorism, industrial accidents), Fire & Arson: Thermodynamics, fire debris analysis (GC-MS), arson investigation protocols, Petroleum Products: Forensic analysis of petrol, diesel, kerosene (BIS standards), adulteration detection.	**15**

III	**Drug Analysis & Toxicology:** NDPS Act & Controlled Substances: Legal frameworks (NDPS Act 1985), precursor chemicals, clandestine labs, drug raids, Drug classification (narcotics, psychotropics), designer drugs, addiction mechanisms, Analytical Techniques: Presumptive tests (color tests, TLC), microcrystalline assays for opioids, cannabinoids, etc., Toxicology: Drug dependence, tolerance, and forensic case studies (e.g., overdose deaths).	**15**
IV	**Quality Systems & Accreditation in Forensic Chemistry:** Introduction to Quality: Quality Assurance (QA), Quality Control (QC), Total Quality Management (TQM). Accreditation: Definitions, ISO history, ILAC/APLAC/ASCLD roles. Quality Protocols: Traceability, method validation, measurement uncertainty, equipment calibration/maintenance, Proficiency testing, internal/external audits, training (MRM).	**15**
Total		**90**

Notional Credit Hours for the course = 30 x 4 = 90

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

Suggested Readings:

1. Klaassen, C. D.,: Casarett and Doull's Toxicology: The Basic Science of Poisons, 5th ed,McGraw-Hill, 1995.
2. Budhiraja, R.D.: Elementary Pharmacology and Toxicology, Popular Prakashan, 2nd ed.,1999.
3. Brean S. Furniss Etal; A.I. Vogel Textbook of Practical Organic Chemistry, Addison Wesley Longman, Edinburg.
4. Working Procedure Manual – Chemistry, Explosives and Narcotics, BPR&D Pub.
5. Silverman; Organic Chemistry of Drug Design & Drug Action, Elsevier Pub. New Delhi.
6. Verma, R. M: Analytical Chemistry – Theory and Practice, CBS Pub., 1994.

SEMESTER - II

Paper Sl. No.	Paper - 2	**Scheme of Evaluation**	L&T
Name of the Course	Questioned Document and Dermatoglyphics	**L-T-P-C**	3-1-0-4
Type of Course	Core	**Credits Assigned**	4
Paper Code	FSC144C202	**Level of the Course**	500

Course objective: This course aims to develop expertise in analyzing questioned documents (e.g., forgery detection, handwriting analysis, tampering identification) and fingerprint evidence (pattern classification, ridge analysis, AFIS integration) through theoretical principles and practical techniques. Students will master forensic protocols for document examination, counterfeit detection, and fingerprint identification to support criminal investigations and legal proceedings with scientific accuracy.

Course Outcome : After successful completion of the course, student will be able to		
Sl.No.	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**recall** the foundational definitions, types of forgeries, principles of handwriting examination, and protocols for handling, packaging, and photographing questioned documents.	BT1
CO2	**explain** the methodologies for physical document matching, examination of secret writings/charred documents, and detection of counterfeit currency/passports/mechanical impressions.	BT2
CO3	**apply** fingerprint collection techniques and analytical methods to identify individuals.	BT3
CO4	**analyze** fingerprint classification systems to differentiate their structural frameworks, hierarchical patterns, and application in forensic databases.	BT4

Module	**Course content**	**Lecture**
I	**Questioned Document:** Definition, scope, nature and problems, care, handling and packaging of document evidence. Collection of writing standards: specimen and admitted. Forgeries and its types, Principles of handwriting examination, authorship identification, detection of alterations/tampering in documents, Photography of document exhibits.	**24**
II	**Document Examination:** Physical matching of Documents, Examination of secret writings and charred documents, Examination of counterfeit currency notes, passport, visa and other mechanical impressions.	**21**
III	**Fingerprint science:** Definition, History, development, Scope of Fingerprint science, Composition of sweat, Introduction to chanced prints: their search, development and collection procedure, Maintaining the fingerprint slips: rolled and plain prints. Identification of fingerprints: pattern analysis, ridge characteristics, comparison of fingerprints. Ridge tracing, Ridge counting, Photography of fingerprint exhibits.	**24**
IV	**Fingerprint classification techniques:** Single digit, 10-digit Henry classification, numerical value, symbol, primary classification, secondary classification, sub-secondary classification, final classification, key classification and major classification. NCIC classification. Introduction to	**21**

	FACTS and AFIS.	
Total		**90**

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

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

Suggested Readings:

1. Chatterjee S.K., Speculation in Finger print identification, Jantralekha, Printing Works, Kolkata.
2. Cowger, James F: Friction ridge skin: Comparison and Identification of Fingerprints; CRC Press, Boca Raton, NewYork.
3. Cook Nancy: Classifying fingerprints -Innovative learning publication MentoPark
4. Cossidy, M. J. Footwear Identification, Royal Canadian Mounted Police, Ontario,Canada.
5. J A Seigel, P.J Saukoo and G C Knupfer; Encyclopedia of Forensic Sciences Vol. I, II and III, Acad.Press
6. Hillison, S; Dental Anthropology, Cambridge Univ. Press,UK.
7. Albert S. Osborn; Questioned Documents, Second Ed.; Universal Law Publishing, Delhi
8. Koppenhaver, K. (2010). Forensic Document Examination: Principles and Practice (1st Ed.).

SEMESTER - II

Paper Sl. No.	Paper - 3	**Scheme of Evaluation**	Practical
Name of the Course	Forensic Chemistry and Toxicology (Practical)	**L-T-P-C**	0-0-8-4
Type of Course	Core	**Credits Assigned**	4
Paper Code	FSC144C213	**Level of the Course**	500

Course objective: This course aims to equip students with practical skills in analyzing explosives, ignitable residues, alcohols, petroleum products, plant/animal toxins, heavy metals, and narcotics using analytical techniques (TLC, UV-Vis, FTIR, color tests, microcrystalline assays). It emphasizes hands-on training in extraction, separation, and forensic identification of adulterants, toxins, and illicit substances for applications in criminal investigations, quality control, and regulatory compliance.

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

Sl.No.	Course Outcome	Blooms Taxonomy Level
CO1	**identify** the procedural steps for analyzing high explosives.	BT1
CO2	**understand** the principles of color tests.	BT2
CO3	**apply** analytical methods to identify plant poisons.	BT3
CO4	**analyze** chromatographic, spectroscopic, and chemical methods to differentiate Cannabis components and metallic poisons.	BT4

Modules	Course content	Lecture Hours
I	1. Analysis of high explosives by TLC, UV, FTIR. 2. Extraction of ignitable liquid residues from various matrices. 3. Qualitative analysis of fire residues by TLC. 4. Preliminary & confirmatory examination of chemicals used in trap cases.	**22**
II	5. Analysis of methanol using colour test and TLC. 6. Analysis of ethanol using colour test and TLC. 7. Analysis of petroleum products using TLC 8. Detection of adulteration in petroleum using various methods.	**23**
III	9. Identification of common plant poisons oleander, dhatura, calotropis and ricin etc. by various analytical methods. 10. Extraction of heavy metals by conventional methods and analysis by color tests. 11. Extraction and identification of drugs/ toxicants from biological matrix and their detection. 12. Microcrystalline tests for narcotic drugs.	**22**
IV	13. Separation of Cannabis by TLC. 14. Separation of Cannabis by UV-Vis spectroscopy. 15. Separation of Cannabis by FTIR spectroscopy. 16. Extraction and identification of metallic poisons from viscera using Dry Ashing Method followed by Reinsch's test.	**23**
Total		**90**

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

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

Suggested Readings:

1. Curry: Analytical Methods in Human Toxicology, Part II, 1986.
2. Gupta, P.K. Fundamentals of Toxicology: Essential Concepts and Applications. India, Elsevier Science, 2016.
3. Casarett & Doll Toxicology: The Basic Science of poisons.
4. Clark, E.G.C.: Isolation and identification of Drugs, 1966.
5. Curry, A.S.: Poison Detection in Human Organs, 1976.
6. Curry, A.S.: Advances in Forensic Chemical Toxicology, 1972.
7. Holfmann, F.G.: Handbook of Drug and Alcohol Abuse.

SEMESTER - II

Paper Sl. No.	Paper - 4	**Scheme of Evaluation**	Practical
Name of the Course	Questioned Document and Dermatoglyphics (Practical)	**L-T-P-C**	0-0-8-4
Type of Course	Core	**Credits Assigned**	4
Paper Code	FSC144C214	**Level of the Course**	500

Course objective: This course aims to equip students with advanced skills in forensic document examination (handwriting analysis, signature forgery detection, ink/alteration identification) and fingerprint analysis (ridge characteristics, classification, latent print development). It emphasizes practical application of techniques (TLC, GC-MS, chemical methods) to authenticate currency, passports, and seals, ensuring compliance with legal and ethical standards in criminal investigations.

Course Outcome : After successful completion of the course, student will be able to		
Sl. No.	**Course Outcome**	**Blooms Taxonomy Level**
CO1	**define** the principles of handwriting analysis and document examination.	BT1
CO2	**explain** the procedures for detecting mechanical/chemical erasures and analyzing intersecting stroke sequences.	BT2
CO3	**apply** fingerprint analysis techniques and latent print development methods to authenticate currency notes.	BT3
CO4	**analyze** security features in passports, seals/stamps, and ink composition.	BT4

Module	Course content	Lecture
I	1. Identification of Handwriting-general characteristics, fundamental divergences and individual characteristics. 2. Examination and Identification of Signature Forgeries. 3. To study the natural variations in handwriting written in different circumstances. 4. Examination of additions, alterations, and obliterations in the documents.	**22**
II	5. Examination of mechanical and chemical use of erasers on the documents. 6. Examination of sequence of intersecting strokes. 7. To take plain and rolled fingerprints and to identify the patterns. 8. To perform ridge tracing and ridge counting.	**23**
III	9. To identify ridge characteristics. 10. To classify and compare the fingerprints. 11. To develop latent fingerprints with powders, fuming and chemical methods. 12. Examination of currency notes.	**22**
IV	13. Examination of Passport. 14. Examination of Seals and Stamps Impressions. 15. Examination of ink by TLC. 16. Examination of ink by GCMS.	**23**
Total		**90**

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

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

Suggested Readings:

1. Albert S. Osborn; Questioned Documents, Second Ed.; Universal Law Publishing, Delhi.

2. Koppenhaver, K. (2010). Forensic Document Examination: Principles and Practice (1st Ed.).

3. Hilton, O. (1993). Scientific examination of questioned documents (1st ed.). Boca Raton: CRC Press.

4. Kelly, J., & Lindblom, B. (2006). Scientific examination of questioned documents. Boca Raton, FL: CRC/Taylor & Francis.

5. Ellen, D. (2006). Scientific examination of documents. Boca Raton, FL: Taylor & Francis.

6. Huber, R., & Headrick, A. (1999). Handwriting identification (1st ed.). Boca Raton: CRC Press.