Appendix-69
Resolution No. 24-17

First Year PG Curricular Structure for Two years PG Programme Forensic Science (3+2)							
Year-1				**Year-1**			
		Paper	**Credits**			**Paper**	**Credits**
Semester-1	**DSC-1**	Criminology and Crime Ethnographies in India	3+1	**Semester-2**	**DSC-4**	Forensic Physics	3+1
	DSC-2	Forensic Serology and DNA Profiling	3+1		**DSC-5**	Forensic Anthropology	3+1
	DSC-3	Forensic Dermatoglyphics and other Impressions	3+1		**DSC-6**	Forensic Chemistry and Toxicology	3+1
			12				**12**
	OPT for either 2 DSEs OR 1 DSE & 1 GE				**OPT for either 2 DSEs OR 1 DSE & 1 GE**		
	DSE	Fundamentals of Cyber Security and Penetration Testing	3+1		**DSE**	Women, violence and Crimes in India	3+1
		Information Security Audit and Compliance				Forensic Photography and Visuals	
		Criminal Law and Forensic Implications	3+1			Forensic Entomology and Wildlife Forensics	3+1
		Police Administration and Law Enforcement Agencies				CBRNE Forensics	
						Forensic Ballistics	
	GE	Quality Management and Laboratory Management systems	3+1		**GE**	Criminology and Forensic Psychology	3+1
		Techniques of Research in Forensic Science				Statistics and Ethics in Forensic Research	
			8				**8**
	Skill Based/Workshop/Specialized Laboratory/Hands on Learning				**Skill Based/Workshop/Specialized Laboratory/Hands on Learning**		
	Paper-1	Crime Scene Documentation with Laboratory training	**2**		**Paper-1**	Chemical Evidence Analysis with Laboratory training	**2**
	Paper-2	Biological Evidence Analysis with Laboratory training			**Paper-2**	Pattern Evidence Analysis with Laboratory training	
		Total	**22**			**Total**	**22**

DSC-1: CRIMINOLOGY AND ETHNOGRAPHIES OF CRIME IN INDIA

Credit distribution, eligibility and pre-requisites of the course

Paper	Total Credit	Lecture	Practical/ Practice	Tutorials	Pre-requisite of the course
Criminology and Ethnographies of Crime in India	04	03	01	0	Bachelors in Forensic science, Anthropology and allied sciences

(Teaching hours required - Theory: 45 hours; Practical: 30 hours)

Course objectives:

- Provide forensic science students with a culturally nuanced and context-specific understanding of crime in India.
- Integrate forensic science with criminology and ethnographic methodology to understand crime and criminal behavior in India.
- Understand the theoretical perspectives in criminology and their application in understanding of crimes in India.
- Critically understand the nature, form and typologies of crimeand their prevalence in India, including traditional and emerging forms.

Learning outcomes:

By the end of this course, students will be able to:

- Describe the evolution of criminological thought, including ancient texts and recent legislative changes.
- Analyse crime as a socio-cultural construct influenced by law, economy, psychology, and anthropology.
- Identify and compare various crime typologies and apply relevant criminological theories to real-world contexts.
- Apply ethnographic methods to understand criminal behaviour, justice systems, and forensic processes, particularly in rural, tribal, and marginalized communities.
- Evaluate organized, socio-economic, gender-based, and transnational crimes using interdisciplinary and ethnographic perspectives in forensic investigations.

Unit 1: Foundations of Criminology and Crime in the Indian context (12 Hrs)

Foundation of criminology and crimes in Indian context, Ancient Indian perspectives on Crime and Justice (*Dharmashastra, Arthashastra*), Colonial Impact: *Bhartiya Nyaya Sanhita (2023), Bhartiya Nagrik SurakshaSanhita (2023),* and *Bhartiya Sakshya Adhiniyam (2023).*

Unit 2: Perspectives on Crime (12 Hrs)

Anthropological perspective on crime and its relationship to law, sociology, economics and psychology, Key Concepts of evidence, justice, crime, deviance, delinquency in the Indian context, Traditional crimes, Socio-economic offenses, Cybercrime, Left-wing extremism, Insurgency, Cross-border terrorism, and Forensic investigation.

Unit 3: Crime typologies and Criminological theories (9 Hrs)

Crime typology: Class, rural, urban and tribal communities, Crime scenario: Catalysts of criminal behavior: traditional and emerging factors, Theories of crime causation: Pre-classical and Neo- classical, constitutional, geographical, economic, psychological, sociological, multiple-causation, and biological approach, Subculture theory of crime, Feminist, rural, and environmental criminology, Forensic Science and community.

Unit 4: Ethnographic approaches to Crime and their Forensic applications (12 Hrs)

Ethnographic method and its application in criminal investigation, Ethnography in criminal profiling: Socio-cultural factors influencing criminal behavior,Cross-cultural ethnographies of crime including the study of customary law, dispute resolution, and restorative justice in tribal and rural societies, Ethnographic case studies of ex criminals and denotified tribes and their applications in Indian forensic science, focusing on organized, socio-economic, gender-based, and transnational crimes. Classical ethnographies in crime and custom in indigenous societies

Practical (30 Hrs)

1. Designing and implementing ethnographic research proposals relevant to Indian crime phenomena
2. Writing ethnographic reports based on empirical observations and data collection

Keywords: Ethnographic methods, Criminal profiling, Customary law, Restorative justice, Tribal justice systems, Organized crime, Transnational crime, Gender-based violence

Essential readings

- Kapoor AK, Dhall M, Mayank Singh, Kaur J. 2024.Handbook of Forensic Criminology and Criminal Anthropology. SSB Publications
- Adler PA, Adler P (1998) Foreword: Moving backward. In: Ferrell J, Hamm MS (eds) *Ethnography at the Edge: Crime, Deviance, and Field Research*. London: Northeastern University Press, pp. xii–xvi.
- Bare Act of *BharatiyaNyayaSanhita* (2023)
- Bare Act of *BhartiyaNagrikSurakshaSanhita*(2023)
- Bare Act of *BhartiyaSakshyaAdhiniyam*(2023)
- Crime in India Reports (Annual) by the National Crime Records Bureau (NCRB)
- Ferrell J, Hayward K, Young J (2015) *Cultural Criminology: An Invitation*. London: SAGE.
- Haggerty KD (2004) Ethics creep: Governing social science research in the name of ethics. *Qualitative Sociology* 27(4): 391–414.
- Malinowski B.(1989) Crime and custom in savage society. Elix Books
- Meena radha Krishnan (2008). Dishonoured by History: 'Criminal Tribes' and British Colonial Policy. Orient BlackSwan

Suggested readings

- Karandikar, Sharvari, et al. 2013. A qualitative examination of women involved in prostitution in Mumbai, India: The role of family and acquaintances. *Int Soc Work* 56: 496–515.
- Hall S, Winlow S (2012) The need for ‘new directions’ in criminological theory. In: Hall S, Winlow S (eds) *New Directions in Criminological Theory*. London: Routledge, pp. 1–15.
- Hall S, Winlow S (2015) *Revitalizing Criminological Theory: Towards a New Ultra-Realism*. London: Routledge.
- The Oxford Handbook of Ethnographies of Crime and Criminal Justice
- Hillyard P, Tombs S (2004) Beyond criminology? In: Hillyard P, Pantazis C, Tombs S, et al. (eds) *Beyond Criminology: Taking Harm Seriously*. London: Pluto Press, pp. 10–29
- Malinowski. B. 1928. *Crime and customs in Savage society.* London, K. Paul, Trench, Trubner& co., ltd.
- Treadwell, James. "Criminological ethnography: An introduction." (2019): 1-240.
- Vashishtha Sanjay. 2024 (8^{th} Edition). *Ahmad Siddique's Criminology, Penology and Victimology*. Eastern Book Company

DSC-2: FORENSIC SEROLOGY AND DNA PROFILING

Credit distribution, eligibility and pre-requisites of the course

Paper	Total Credit	Lecture	Practical/ Practice	Tutorials	Pre-requisite of the course
Forensic Serology and DNA profiling	04	03	01	0	Bachelors in Forensic science, Anthropology and allied sciences

(Teaching hours required - Theory: 45 hours; Practical: 30 hours)

Course objectives:

- Student will be introduce the principles and forensic relevance of serology, including blood composition, blood group systems, and biological fluid identification.
- Explain the basics of immunology, species determination, and blood pattern analysis.
- Provide foundational knowledge of the biochemical composition of biomolecules and cellular structures.
- Develop understanding of DNA structure, genome organization, and its role in forensic investigations.
- Familiarize students with various DNA polymorphisms, molecular techniques, and the legal aspects of DNA profiling.

Course outcomes:

By the end of the course, students will be able to:

- Identify and analyze blood and biological fluids using serological, immunological, and spectroscopic methods.
- Differentiate between human and animal blood and determine secretor status.
- Apply knowledge of biomolecules and cell organelles in forensic sample analysis.
- Explain the structural and functional aspects of DNA, RNA, and the human genome.
- Perform and interpret DNA profiling techniques such as PCR, STR, RFLP, and assess their forensic and legal significance.

Unit 1: Basic Serology and Immunology (12 Hrs)

Blood and its composition, Blood Typing/Grouping – 'ABO' system and its significance in forensic investigation, Various blood group antigens, Lutheran and Bombay blood group, Methods of ABO blood grouping from fresh blood and biological stains, Determination of origin of species, Determination of secretor status, Blood pattern analysis, Ageing of bloodstains, Difference between human and animal bloodstains, Spectroscopic analysis, Identification of other biological fluids and their forensic significance, Basics of immunology, immune response, antigens, haptens and antibodies, Function of antisera, Lectins.

Unit 2: Biochemistry and Cell Biology (12 Hrs)

Chemistry of Carbohydrates - Definition, classification and their importance in forensic investigation. Chemistry of Lipids - Definition, classification and their importance in forensic investigation. Types and properties of amino acids, structure of proteins and their importance in forensic investigation. Introduction of plant and animal cells. Different eukaryotic cellular organelles, Plasma membrane, Transport across membrane, Endoplasmic Reticulum, Golgi complex, Mitochondria, Chloroplast and Lysosomes. Organization of Nucleus and nuclear transport, Cell division - Mitosis and Meiosis; Barr bodies and their importance in forensic investigation.

Unit 3: DNA Profiling **(10 Hrs)**

History of DNA fingerprinting, Double helical structure of DNA, Alternate forms of DNA double helix, Denaturation and renaturation of DNA, DNA binding proteins, Factors affecting DNA stability, Types and structure of RNA. Chemical nature of DNA and RNA. Nature and structure of human genome and its diversity, Mitochondrial DNA, Y-Chromosome, Forensic DNA profiling and its application in criminal and civil investigations, Important case studies of DNA fingerprinting.

Unit 4: DNA Polymorphism **(11 Hrs)**

Concept of gene – Conventional and modern views, Concept of sequence variation - VNTRs, STRs, Mini STRs, SNPs, Detection techniques - RFLP, PCR, Amp-FLP, sequence polymorphism, Y-STR, Mitochondrial DNA, Disputed paternity cases, Legal admissibility of DNA evidence,Techniques and equipment for DNA extraction and purification, Different methods of DNA quantitation, DNA separation and detection techniques, Polymerase Chain Reaction (PCR).

Practical **(30 Hrs)**

- Physical, biochemical and spectrophotometric examination of blood stains.
- Blood group typing of biological fluid stains by mixed agglutination techniques.
- Biochemical and microscopic examination of Saliva, Semen stain and Urine
- Microscopic examination of mitotic and meiotic cell division
- Staining and visualization of Barr Bodies.
- Extraction and quantification of DNA from blood sample.
- Extraction of DNA using FTA card.

Keywords: Biological fluids, Secretor status, Blood pattern analysis, Immunology, Carbohydrates, Lipids, Proteins, Cell organelles, Polymorphism, DNA quantification, Legal admissibility

Essential Readings

- The examination and Typing of Blood Stains in the crime laboratory-BJ Culliford, U.S.Dept.of Justice, Washington D. C. (1971)
- Blood Group Serology - Boorman KE, Dodd BE and LOncoln PJ, ChuchillLivingstoneInc. New York (2018).
- Laboratory Procedure Manual - Forensic Serology (2005), Directorate of Forensic Science, MHA, New Delhi
- Lehninger Principles of Biochemistry 6th Edition (2012) – Nelson and Cox, W.H. Freeman, ISBN: 978-142923414
- Laboratory Procedure Manual - DNA Profiling (2005), Directorate of Forensic Science,MHA, New Delhi.
- Molecular Biology of the Cell, 6th Edition (2014) - Bruce Alberts, et al., Garland Science, ISBN: 978-0815341055

Suggested readings

Genes XI (2012) - Benjamin Lewin, Jones & Bartlett Learning, ISBN: 978-1449659851

Kuby Immunology6th Edition-Kindt, Goldsby and Osborne, W.H. Freeman and Co. ISBN: 978-0716767640

Lehninger Principles of Biochemistry 6th Edition (2012) - Nelson and Cox, W.H. Freeman, ISBN: 978-1429234146

Microbiology 5th Edition - Pelczaret. al., McGraw-Hill Inc., ISBN: 978-0074623206

Prescott's Microbiology 9th Edition (2013) - Joanne Willey, Linda Sherwood, Christopher J. Woolverton, McGraw-Hill Education, ISBN: 978-0073402406

An Introduction to Forensic Genetics 2nd Edition (2010) - William Goodwin, Adrian Linacre and SibteHadi, Wiley-Blackwell, ISBN: 978-0470710197

DSC-3:FORENSIC DERMATOGLYPHICS AND OTHER IMPRESSIONS

Credit distribution, eligibility and pre-requisites of the course

Paper	Total Credit	Lecture	Practical/ Practice	Tutorials	Pre-requisite of the course
Forensic Dermatoglyphics and Other impressions	04	03	01	0	Bachelors in Forensic science, Anthropology and allied sciences

(Teaching hours required - Theory: 45 hours; Practical: 30 hours)

Course objectives:

- Introduce the principles, history, and scope of fingerprint science.
- Explain fingerprint types, development, classification, and comparison techniques.
- Provide knowledge on the forensic significance, collection, and analysis of lip prints, bite marks, and ear prints.
- Develop skills in recording, developing, and comparing palm prints and foot/footwear impressions.
- Highlight the application of pattern evidence in criminal investigations through case studies.

Course outcomes:

By the end of the course, students will be able to:

- Demonstrate understanding of fingerprint science and its forensic applications.
- Classify and compare fingerprints using manual and automated systems.
- Analyze lip prints, bite marks, and ear prints for forensic identification.
- Record, develop, and compare palm prints and foot/footwear impressions.
- Apply pattern evidence analysis in crime scene reconstruction and case evaluation.

Unit 1: Introduction to Fingerprint science (10 Hrs)

Definition, History, Development, Scope of Fingerprint science, Composition of sweat, Skin structure: Friction ridges and volar pads, Types of crime scene prints, Introduction to chance prints: search, development (physical, chemical, fuming methods etc.) and collection procedure, Maintaining the fingerprint slips: rolled and plain prints, Identification of fingerprints: poroscopy, pattern analysis, ridge characteristics, comparison of fingerprints, Ridge tracing, Ridge counting, Photography of fingerprint exhibits.

Unit 2: Fingerprint classification techniques (9 Hrs)

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 FACTS and AFIS, Comparison and individualization of fingerprints.

Unit 3: Forensic analysis of Lip prints, Bite marks, and Ear prints (14 Hrs)

Introduction to Cheiloscopy and history of lip prints, Classification of lip prints, Collection, Development, Identification and Comparison of lip prints. 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 and casting of bite marks, Identification and comparison of bite marks, Case studies. Ear prints: Introduction to the history of ear prints, Morphology of the ear, Procedure of taking standards from the suspects, Identification and comparison of ear prints.

Unit 4: Forensic analysis of Palm prints and Foot prints/Footwear impressions (12 Hrs)

Forensic importance of palm prints, Anatomy of the palm, Classification of palm prints, Class and Individual characters, Development of latent palm prints, Powder and chemical development techniques, Identification of palm prints, Comparison of ridge characteristics and crease patterns, Digital and 3D methods of palm print recording, Case studies.

Introduction to footprints & footwear impressions, Anatomy of the foot and sole ridge patterns, Locating impressions at the scene of crime, Evidence collection: Collection, Lifting/Casting and Preservation of foot/footwear impressions, Gait pattern analysis, Case studies.

Keywords: Fingerprint, Friction ridges, Ridge characteristics, Fingerprint classification, Gait analysis, Pattern comparison

Practical (30 Hrs)

- Take plain and rolled fingerprints and to identify the patterns
- Perform ridge tracing and ridge counting.
- Identify ridge characteristics
- Classify and compare the fingerprints
- Develop latent fingerprints with powders, fuming and chemical methods
- Analysis of fingerprints with microscopic techniques for the ridge and pore dimensions with the complete identification profiling
- Comparison of males and female’s fingerprints with the specific reference to the ridge dimensions.

Essential readings

- C.E. O 'Hara al d .J.W. Osterburg; An Introduction to Criminalistics: Indiana University Press, Blomington.
- R. Saferstein; Forensic Science Handbook, Vols. I, II; (Ed); Prentice Hall, Eaglewood Cliffs,NJ;
- David R. Ashbaugh; Quantitative and Qualitative Friction Ridge Analysis, CRCPress
- E. Roland Menzel; Fingerprint Detection, with Lasers, Second edition; Marcel, Dekker,Inc. USA.
- James F. Cowger; Friction Ridge skin CRC PressLondon.
- Mehta, M.K: Identification of Thumb Impression & Cross Examination of Finger Prints, N.M. Tripathi (P) Ltd,Bombay
- Kaur, J., &Dhall, M. (2023).Useless or used less?Poroscopy: The evidence of sweat pores. Heliyon, 9(7).
- Moenssens: Finger Prints Techniques, Chitton Book Co. Philadelphia, NewYork.

Suggested readings

- Kaur, J., &Dhall, M. (2022). Reproducibility and reliability of fingerprint microfeatures: effect of immersing hand in water at different temperatures. Journal of Forensic and Legal Medicine, 91, 102424.
- Kaur, J., &Dhall, M. (2022).Reproducibility of fingerprint microfeatures. Egyptian Journal of Forensic Sciences, 12(1), 7.
- Kaur, J., &Dhall, M. (2024). Epidermal ridge sweat pore density: A forensic approach to sex determination. Forensic Science International: Reports, 10, 100378.
- Chatterjee S.K., Speculation in Finger print identification, Jantralekha, Printing Works,Kolkata.
- Cowger, James F: Friction ridge skin: Comparison and Identification of Fingerprints; CRCPress, Boca Raton, NewYork.
- Cook Nancy: Classifying fingerprints -Innovative learning publication MentoPark
- Cossidy, M. J. Footwear Identification, Royal Canadian Mounted Police, Ontario,Canada.
- J A Seigel, P.J Saukoo and G C Knupfer; Encyclopedia of Forensic Sciences Vol. I, II andIII, Acad.Press

DSE FUNDAMENTALS OF CYBER SECURITY AND PENETRATION TESTING

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Paper	Total Credit	Lecture	Practical/ Practice	Tutorials	Pre-requisite of the course
FUNDAMENTALS OF CYBER SECURITY AND PENETRATION TESTING	**4**	**3**	**1**	**0**	Bachelors in Forensic science, Anthropology and allied sciences

Course Objectives:

- Introduce the fundamental concepts of cyber security and its relevance in digital forensic investigations.
- Familiarize students with the types of cyber threats, vulnerabilities, and attack vectors.
- Impart knowledge of basic tools and techniques used in penetration testing.
- Develop practical understanding of cyber laws and ethical responsibilities in forensic contexts.

Learning Outcomes:

- Understand core concepts of cyber security, network vulnerabilities, and threat mitigation.
- They will acquire foundational skills in ethical hacking, penetration testing, and digital defense mechanisms, preparing them to identify, assess, and prevent cyberattacks in forensic and investigative contexts.

Unit I: Introduction to Cyber Security and Digital Threat Landscape (10 Hrs)

Definitions and scope of cyber security; Relevance of cyber security in forensic science and anthropology; Types of cyber threats: malware, phishing, social engineering, insider threats; Network and information system vulnerabilities; Introduction to risk management and cyber hygiene; Case studies of cybercrimes in forensic investigations

Unit II: Cyber Security Mechanisms and Defense Strategies (11 Hrs)

Principles of secure system design; Authentication, authorization, and access control mechanisms; Cryptography: basic concepts, symmetric and asymmetric encryption, hashing; Firewalls, intrusion detection and prevention systems (IDS/IPS); Endpoint security and antivirus technologies; Basics of secure browsing, email security, and data backup protocols

Unit III: Fundamentals of Penetration Testing (12 Hrs)

Introduction to ethical hacking and penetration testing; Methodologies: reconnaissance, scanning, gaining access, maintaining access, covering tracks; Common penetration testing tools

(e.g., Nmap, Metasploit, Wireshark, Burp Suite); Web application testing and vulnerability scanning; Reporting and documentation of penetration testing findings; Legal and ethical considerations in penetration testing

Unit IV: Cyber Forensics and Legal Framework (12 Hrs)

Role of cyber forensics in criminal investigations; Forensic acquisition and preservation of digital evidence; Chain of custody and admissibility in court; Overview of Indian cyber laws: IT Act, 2000 and its amendments; International conventions on cybercrime; Responsibilities of forensic experts in digital investigations

Keywords: cyber security, pen testing, chain of custody, Indian cyber laws, defense strategies

Practical/ Tutorials (30 Hrs)

- Explore and list the steps required to type in an Indian language using UNICODE.
- Encode the word 'COMPUTER' using ASCII and convert the encode value into binary values.
- To study about ports and protocols of networks and the DNS information.
- Recording, editing, processing, and conversion of audio files
- Speech acquisition and Spectrographic analysis of Voice
- Detection of tampering in audio & video files
- Audio restoration and speech enhancement
- Analysis and enhancement of video/image/CTV Footages

Essential Readings

1. Wilhelm, T. (2025). *Professional penetration testing: Creating and learning in a hacking lab*. Elsevier.
2. Dhall M, Dimpal, Kaur J, Kapoor AK, 2024. Handbook of Digital Forensics and Cyber Crime. SSB Publications
3. Formosa, P., Wilson, M., & Richards, D. (2021). A principlist framework for cybersecurity ethics. *Computers & Security*, *109*, 102382.
4. Crumpler, W., & Lewis, J. A. (2022). *Cybersecurity workforce gap* (p. 10). Center for Strategic and International Studies (CSIS).
5. Javaid, M., Haleem, A., Singh, R. P., &Suman, R. (2023). Towards insightingcybersecurity for healthcare domains: A comprehensive review of recent practices and trends. *Cyber Security and Applications*, *1*, 100016.

Suggested Readings

1. Easttom II, W. (2018). *Penetration testing fundamentals: A hands-on guide to reliable security audits*. Pearson IT Certification.
2. Oriyano, S. P. (2016). *Penetration testing essentials*. John Wiley & Sons.

3. Paráda, I. (2018). BASIC OF CYBERSECURITY PENETRATION TEST. *Military Engineer/Hadmérnök*, *13*(3).
4. Firmansyah, B. (2024). Cybersecurity Fundamentals. In *Challenges in Large Language Model Development and AI Ethics* (pp. 280-320). IGI Global.
5. Kaur, G., Bharathiraja, N., Singh, K. D., Veeramanickam, M. R. M., Rodriguez, C. R., &Pradeepa, K. (2024). Emerging Trends in Cybersecurity Challenges with Reference to Pen Testing Tools in Society 5.0. *Artificial Intelligence and Society 5.0*, 196-212.

DSE INFORMATION SECURITY AUDIT AND COMPLIANCE

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Paper	Total Credit	Lecture	Practical/ Practice	Tutorials	Pre-requisite of the course
INFORMATION SECURITY AUDIT AND COMPLIANCE	**4**	**3**	**0**	**1**	Bachelors in Forensic science, Anthropology and allied sciences

Course Objectives:

- To provide a foundational understanding of information security policies, procedures, and audit processes.
- To enable students to evaluate the effectiveness of security controls through structured audits.
- To introduce national and international standards related to information security compliance.
- To explore the role of audits in forensic investigations and digital risk management.

Learning Outcomes:

- Recognize principles of information security frameworks,auditing processes, and legal compliance standards
- Apply frameworks to assess security risks and controls.
- Evaluate compliance with national and international standards.

Unit I: Introduction to Information Security and Governance (10 Hrs)

Principles of information security: confidentiality, integrity, availability (CIA triad); Organizational roles and responsibilities in security governance; Introduction to Information

Security Management Systems (ISMS); Security policies, standards, guidelines, and procedures; Risk assessment and risk treatment plans; Overview of security controls and control objectives

Unit II: Security Auditing Fundamentals (12 Hrs)

Purpose and types of security audits: internal, external, compliance, and risk-based audits; Audit planning: scope, objectives, and resources; Audit process: preparation, fieldwork, evidence collection, reporting; Techniques and tools for security auditing; Common findings and audit responses; Role of audits in forensic documentation and digital evidence handling

Unit III: Compliance Standards and Regulatory Frameworks (12 Hrs)

Overview of major security and privacy standards:ISO/IEC 27001 and 27002, NIST Cybersecurity Framework, GDPR (General Data Protection Regulation), HIPAA (Health Insurance Portability and Accountability Act), PCI-DSS (Payment Card Industry – Data Security Standard); Indian regulatory environment:IT Act, 2000 (and amendments), Data Protection Bill (as applicable), Sector-specific compliance (e.g., healthcare, banking)

Unit IV: Audit Reporting and Incident Management (11 Hrs.)

Structuring an audit report: findings, recommendations, and risk ratings; Communicating results to stakeholders; Security incident reporting and management procedures; Role of audits in incident response and business continuity; Follow-up audits and remediation tracking; Ethics, accountability, and professional conduct in audit practice

Keywords: audit reporting, security auditing, compliance standards

Tutorial (30 Hrs)

Prepare a project on Information security audit and compliance

Essential Readings

1. Ilori, O., Lawal, C. I., Friday, S. C., Isibor, N. J., &Chukwuma-Eke, E. C. (2022). Cybersecurity auditing in the digital age: A review of methodologies and regulatory implications. *Journal of Frontiers in Multidisciplinary Research*, *3*(1), 174-187.
2. Folorunso, A., Wada, I., Samuel, B., & Mohammed, V. (2024). Security compliance and its implication for cybersecurity. *World Journal of Advanced Research and Reviews*, *24*(01), 2105-2121.
3. Alassaf, M., &Alkhalifah, A. (2021). Exploring the influence of direct and indirect factors on information security policy compliance: a systematic literature review. *IEEE Access*, *9*, 162687-162705.
4. Deshmukh, K. (2022). Indian Cyber Law Regime and Significance of IT Audit. *Issue 1 Indian JL & Legal Rsch.*, *4*, 1.
5. Singh, R., Pandiya, B., Upadhyay, C. K., & Singh, M. K. (2020). IT-governance framework considering service quality and information security in banks in

India. *International Journal of Human Capital and Information Technology Professionals (IJHCITP)*, *11*(1), 64-91.

6. Grima, S., Thalassinos, E., Cristea, M., Kadłubek, M., Maditinos, D., &Peiseniece, L. (Eds.). (2023). *Digital transformation, strategic resilience, cyber security and risk management*. Emerald Publishing Limited.

Suggested Readings

1. Henriques, J., Caldeira, F., Cruz, T., &Simões, P. (2024). A survey on forensics and compliance auditing for critical infrastructure protection. *IEEE Access*, *12*, 2409-2444.
2. Iipumbu, E., Nhamu, I., &Chitauro, M. (2023). A Comparative Analysis of Information Systems Audit and Digital Forensics Processes. *Available at SSRN 4648699*.
3. Stafford, T., Deitz, G., & Li, Y. (2018). The role of internal audit and user training in information security policy compliance. *Managerial Auditing Journal*, *33*(4), 410-424.
4. Vroom, C., & Von Solms, R. (2004). Towards information security behavioural compliance. *Computers & security*, *23*(3), 191-198.
5. Longley, D., Branagan, M., Caelli, W. J., & Kwok, L. F. (2008, September). Feasibility of automated information security compliance auditing. In *IFIP International Information Security Conference* (pp. 493-508). Boston, MA: Springer US.

DSE CRIMINAL LAW AND FORENSIC IMPLICATIONS

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Paper	Total Credit	Lecture	Practical/ Practice	Tutorials	Pre-requisite of the course
CRIMINAL LAW AND FORENSIC IMPLICATIONS	**4**	**3**	**1**	**0**	Bachelors in Forensic science, Anthropology and allied sciences

Course Objectives:

- Understand the BNS, BNSS, and BSA in everday life
- Explore legal admissibility and expert testimony.
- Apply legal reasoning in evidence handling and reporting.
- Discuss case laws and landmark judgments in forensic science.

Learning Outcomes:

- Describe the structure of the Indian legal system relevant to forensics.
- Interpret forensic evidence within the framework of law.
- Analyze the legal responsibilities of forensic experts.

Unit I: Introduction to Indian Criminal Law (10 Hrs)

Overview of the Indian legal system and its components; Nature and scope of criminal law; Classification of offences: cognizable and non-cognizable, bailable and non-bailable; Definitions and general exceptions under the Bharatiya Nyaya Sanhita (BNS); Elements of crime: actusreus and mensrea; Relevance of criminal law to forensic investigations

Unit II: Bharatiya Nyaya Sanhita (BNS) and Forensic Relevance (12 Hrs)

Key sections of BNS relevant to forensic experts, including: Homicide (Section 299–304) Hurt and grievous hurt (Section 319–326) Sexual offences (Section 375–376D) Dowry deaths and cruelty (Section 304B, 498A) Forgery and counterfeiting (Section 463–477A) Criminal negligence and medical malpractice; Case studies involving forensic applications in BNS offences

Unit III: Bharatiya Nagarik Suraksha Sanhita (BNSS) and Law of Evidence (14 Hrs)

Stages of a criminal case: FIR, arrest, investigation, charge-sheet, trial; Role of police, magistrate, and court during criminal proceedings; Powers and duties of investigating officers; Relevant sections of BNSS for forensic scientists: Search and seizure (Section 100, 165) Medical examination and post-mortem (Section 53, 174); Bharatiya Sakshya Adhiniyam: Definitions: evidence, fact, expert opinion Relevance and admissibility of forensic evidence (Section 45, 46) Examination and cross-examination of expert witnesses Documentary and electronic evidence

Unit IV: Responsibilities, Ethics, and Legal Challenges for Forensic Experts (9 Hrs)

Legal and ethical duties of forensic professionals; Courtroom demeanor and preparation of expert reports; Perjury, professional misconduct, and liability; Protection of human rights in forensic practice; Emerging legal issues: data privacy, cyber laws, and digital evidence; National and international guidelines on forensic ethics (e.g., NHRC, UN guidelines)

Keywords: Indian Penal Code, professional misconduct, stages of cases

Practical (30 Hrs)

- To study about Sys-Internals, windows Logs and filter logs based on scenarios.
- To study and implement any SIEM (Security Information & Event Management) tool.
- To study real-time visibility across an organization's information security systems using any SIEM tool.
- To perform acquisition of any drive (HDD, SSD, USB) using FTK Imager.
- To perform primary level analysis using HxDEditor and manipulating Data by Using HxD.
- To perform detailed analysis of Forensic Image using Forensic Toolkit.

Essential Readings

1. Kothari, P. (2023). Exploring the Role of Forensic Science in Indian Criminal Justice System. *Available at SSRN 4565177*.
2. Banerjee, S. (2023). Forensic Science and Its Applicability in the Indian Criminal Justice System. *Issue 1 Indian JL & Legal Rsch.*, *5*, 1.
3. Srivastava, A., Harshey, A., Das, T., Kumar, A., Yadav, M. M., &Shrivastava, P. (2022). Impact of DNA evidence in criminal justice system: Indian legislative perspectives. *Egyptian Journal of Forensic Sciences*, *12*(1), 51.
4. Chapman, B., Keatley, D., Oatley, G., Coumbaros, J., & Maker, G. (2020). A review and recommendations for the integration of forensic expertise within police cold case reviews. *Journal of Criminal Psychology*, *10*(2), 79-91.

Suggested Readings

1. Shali, S. K. (2018). Applicability of Forensic Science in Criminal Justice System in India With Special Emphasis on Crime Scene Investigation. *Medico-Legal Desire Media and Publications, Medico-Legal Reporter, Inaugural Issue*.

2. Grover, N., &Tyagi, I. (1910). Development of Forensic Science and Criminal Prosecution-India. *Nature*, *23*(578), 76.
3. Mack, S., &Chatterjee, I. (2021). Role of forensic evidence in criminal justice delivery system in India.
4. Khrystov, O., &Lipynskyi, V. (2019). Comparative analysis of forensic expert activity: an administrative, criminal, criminalistic, economic approach. *Baltic journal of economic studies*, *5*(2), 242-248.

DSE POLICE ADMINISTRATION AND LAW ENFORCEMENT AGENCIES

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Paper	Total Credit	Lecture	Practical/ Practice	Tutorials	Pre-requisite of the course
POLICE ADMINISTRATION AND LAW ENFORCEMENT AGENCIES	**4**	**3**	**1**	**0**	Bachelors in Forensic science, Anthropology and allied sciences

Course Objectives:

- Describe the evolution and role of police in India.
- Classify various law enforcement agencies and their mandates.
- Analyze inter-agency coordination in criminal justice.
- Summarize administrative and operational challenges.

Learning Outcomes:

- Identify the organizational structure of Indian police and law enforcement agencies.
- Compare the functions of central and state law enforcement bodies.
- Evaluate challenges in modern policing and law enforcement.

Unit I: Introduction to Police Administration (9 Hrs)

History and evolution of policing in India; Organization and structure of police at state and central levels; Police hierarchy, recruitment, training, and responsibilities; Role of police in crime prevention, investigation, and public order; Police reforms and recommendations of major commissions (e.g., NPC, Malimath Committee)

Unit II: Investigation and Policing Practices (12 Hrs)

Registration of FIR and preliminary inquiry; Arrest, interrogation, and search/seizure procedures; Crime mapping, patrolling, and beat systems; Role of forensic science in police investigations; Use of technology in policing: CCTNS, facial recognition, e-FIR systems; Community policing and citizen participation

Unit III: Central and Specialized Law Enforcement Agencies (12 Hrs)

Overview of central agencies and their mandates:CBI (Central Bureau of Investigation), NIA (National Investigation Agency), NCRB (National Crime Records Bureau), IB (Intelligence Bureau), RAW (Research & Analysis Wing), FBI, SSB, BSF, CRPF, ITBP, and others; Coordination among central and state police forces; Challenges in multi-agency investigations

Unit IV: International Law Enforcement and Modern Challenges (12 Hrs)

Role of INTERPOL and its functions; Cross-border crime control and extradition procedures; Cooperation under treaties and mutual legal assistance treaties (MLATs); Law enforcement and terrorism, cybercrime, drug trafficking; Human rights and accountability in policing; Ethical policing, custodial violence, and public trust

Practical (30 Hrs)

Visit to NCRB and other Police stations, CBI office and other concerned agencies and prepare a report.

To examine the strategies and methods adapted by police and other agencies in crime detection analysis and legal follow up.

Essential Readings

1. Cordner, G. W. (2023). *Police administration*. Routledge.
2. Schnurr, E. (2022). Local law enforcement and public administration. In *Global Encyclopedia of Public Administration, Public Policy, and Governance* (pp. 7856-7860). Springer, Cham.
3. Dempsey, J. S., Forst, L. S., & Carter, S. B. (2022). *An Introduction to Policing (2019)*. Cengage SUPPLEMENTARY MATERIALS.

Suggested Readings

1. Sood, A., &Kashyap, S. (2018). Administration Of Criminal Justice And Role Of Forensics In India: A Study. *International Journal of Innovative Research and Advanced Studies*, *5*(4), 69-73.
2. Kathane, P., Singh, A., Gaur, J. R., &Krishan, K. (2021). The development, status and future of forensics in India. *Forensic Science International: Reports*, *3*, 100215.
3. Tripathi, U. M. The Role of Forensic Science in Strengthening Criminal Investigations: Challenges and Future Prospects in India.

4. Khan, G. F., &Ahad, S. (2018). Role of Forensic Science in Criminal Investigation: Admissibility in Indian Legal System and Future Perspective. *International Journal of Advance Research in Science and Engineering*, *7*(4), 220-234.
5. Strom, K. J., & Hickman, M. J. (2010). Unanalyzed evidence in law-enforcement agencies: A national examination of forensic processing in police departments. *Criminology & Public Policy*, *9*(2), 381-404.
6. Naumenko, S. M. (2020). The system of law enforcement agencies interacting with forensic science institutes. *Theory and practice of forensic science and criminalistics*, (22), 211-225.
7. Williams, R. (2012). Policing and forensic science. In *Handbook of policing* (pp. 788-821). Willan.

GE QUALITY MANAGEMENT AND LABORATORY MANAGEMENT SYSTEMS

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Paper	Total Credit	Lecture	Practical/ Practice	Tutorials	Pre-requisite of the course
QUALITY MANAGEMENT AND LABORATORY MANAGEMENT SYSTEMS	**4**	**3**	**0**	**1**	Bachelors in Forensic science, Anthropology and allied sciences.

Course Objectives:

- Define ISO/IEC standards relevant to forensic science labs.
- Demonstrate planning and auditing of laboratory processes.
- Apply principles of quality management in case analysis.
- Compare national and international quality benchmarks.

Learning Outcomes:

- Recognize principles of quality assurance and control in forensic labs.
- Analyze laboratory accreditation and documentation systems.
- Evaluate implementation of management systems in forensic settings.

Unit I: Fundamentals of Quality Management (10 Hrs)

Concepts and importance of quality in forensic science' Definitions: Quality Assurance (QA), Quality Control (QC), and Total Quality Management (TQM); Quality indicators and performance metrics; Role of quality management in evidence handling and analysis; Elements of a quality manual and quality policy; Overview of Six Sigma and Lean principles in lab settings

Unit II: Laboratory Management Systems and Standards (11 Hrs.)

Introduction to laboratory management systems**;** Structure and elements of ISO/IEC 17025:2017 (General requirements for the competence of testing and calibration laboratories)**;** ISO 15189 and ISO 17020: relevance to forensic and medical labs**;** NABL (National Accreditation Board for Testing and Calibration Laboratories) guidelines and procedures**;** Proficiency testing, inter-laboratory comparisons, and traceability of measurements**;** Documentation: SOPs, technical records, validation, and verification

Unit III: Internal Audits, Accreditation and Compliance (12 Hrs)

Internal audits: planning, conducting, reporting, and follow-up; Management review and continual improvement process; Corrective and preventive actions (CAPA); Non-conformance identification and resolution; Accreditation process and audit checklists; Case studies on accreditation of forensic laboratories in India and abroad

Unit IV: Laboratory Operations, Safety, and Ethics (12 Hrs)

Laboratory organization and personnel management; Resource allocation, infrastructure, and equipment maintenance; Waste management and biohazard control; Occupational health and safety (OHS) in forensic labs; Ethical responsibilities and legal implications in laboratory practices; Confidentiality, integrity, and impartiality in reporting

Tutorials (30 Hrs)

Visit Forensic science laboratory and understand the management system. Prepare a project on the visit.

Essential Readings

1. Ross, A., &Neuteboom, W. (2021). Implementation of quality management from a historical perspective: the forensic science odyssey. *Australian Journal of Forensic Sciences*, *53*(3), 359-371.
2. Kumar, S., Chhabra, G., Sehrawat, K. S., & Singh, M. (2024). Developing a competency assessment framework for medical laboratory technologists in primary healthcare settings in India. *Plos one*, *19*(4), e0294939.
3. Aswal, D. K. (2020). Quality infrastructure of India and its importance for inclusive national growth. *Mapan*, *35*(2), 139-150.

4. Weyermann, C., Willis, S., Margot, P., & Roux, C. (2023). Towards more relevance in forensic science research and development. *Forensic Science International*, *348*, 111592.

Suggested Readings

1. Doyle, S. (2018). *Quality management in forensic science*. Academic Press.
2. Milosevic, M., Bjelovuk, I., &Kesic, T. (2009). Quality management system in forensic laboratories. *NBP. Nauka, bezbednost, policija*, *14*, 1.
3. Venter, C. H. (2010). *International benchmarking of quality management in forensic science drug laboratories* (Doctoral dissertation, North-West University).
4. Tilstone, W. J. (2010). Quality in the Forensic Science Laboratory. In *The Forensic Laboratory Handbook Procedures and Practice* (pp. 335-367). Totowa, NJ: Humana Press.
5. Arican, H. İ., &Yalçın, N. (2025). ISO 17025 and ISO 9001: A Review on Quality Management in Digital Forensics Laboratories. *The Journal of International Scientific Researches*, *10*(1), 18-28.

GE TECHNIQUES OF RESEARCH IN FORENSIC SCIENCE

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Paper	Total Credit	Lecture	Practical/ Practice	Tutorials	Pre-requisite of the course
TECHNIQUES OF RESEARCH IN FORENSIC SCIENCE	**4**	**3**	**1**	**0**	Bachelors in Forensic science, Anthropology and allied sciences

Course Objectives:

- Define the steps of research design and hypothesis formulation.
- Apply data collection and interpretation techniques.
- Evaluate sources of error and bias in research.
- Illustrate the structure and writing of scientific reports.

Learning Outcomes:

- Describe types of research and sampling techniques and understand the principles of scientific research design.
- Formulate research question, Interpret research data using appropriate tools.
- Analyze the components of a scientific research processand conduct ethical and systematic research relevant to forensic science and interdisciplinary investigations.

Unit I: Foundations of Research (12 Hrs)

Meaning, objectives, and importance of research in forensic science; Types of research: basic, applied, qualitative, quantitative, and mixed methods; Research problem identification and formulation; Hypothesis: types, formulation, and testing; Review of literature: sources, referencing styles, use of online databases and indexing; Research questions and objectives

Unit II: Research Design and Sampling (11 Hrs)

Research design: exploratory, descriptive, experimental, cross-sectional, longitudinal; Variables: independent, dependent, confounding, control; Sampling techniques: probability and non-probability sampling; Sample size determination and power analysis; Tools of data collection: questionnaires, interviews, observations, case studies; Designing and pretesting research instruments

Unit III: Data Analysis and Interpretation (12 Hrs)

Types of data: nominal, ordinal, interval, ratio; Descriptive statistics: measures of central tendency and dispersion; Inferential statistics: t-tests, chi-square, ANOVA, correlation, regression (basic concepts); Introduction to statistical software (e.g., SPSS, R); Data interpretation, tabulation, and graphical presentation; Common errors in data analysis and reporting

Unit IV: Ethics, Reporting, and Scientific Writing (10 Hrs)

Research ethics: informed consent, confidentiality, plagiarism, fabrication/falsification; Institutional Ethics Committees and approval process; Structure of a research report, dissertation, and thesis; Writing scientific papers: abstract, introduction, methodology, results, discussion, references; Referencing styles: APA, MLA, Vancouver, and referencing tools (Zotero, Mendeley); Publication process: peer-review, impact factor, predatory journals

Keywords:hypothesis, ethics, scientific writing, study design, data analysis

Practical (30 Hrs)

Prepare a research proposal related to topic of Forensic science

Essential Readings

1. Bell, S. (2019). *Forensic science: an introduction to scientific and investigative techniques*. CRC press.
2. Houck, M. M., & Siegel, J. A. (2009). *Fundamentals of forensic science*. Academic Press.
3. Tilstone, W. J. (2006). *Forensic science: An encyclopedia of history, methods, and techniques*. Bloomsbury Publishing USA.
4. Bhattacharyya, D. K. (2006). *Research methodology*. Excel Books India.

Suggested Readings

1. Rajasekar, D., &Verma, R. (2013). *Research methodology*. Archers & Elevators Publishing House.
2. Kumar, A., &Praveenakumar, S. G. (2025). *Research methodology*. Authors Click Publishing.
3. Gupta, A., & Gupta, N. (2022). *Research methodology*. SBPD publications.
4. Nickell, J., & Fischer, J. F. (2014). *Crime science: methods of forensic detection*. University Press of Kentucky.
5. Cooper, G. S., &Meterko, V. (2019). Cognitive bias research in forensic science: A systematic review. *Forensic science international*, *297*, 35-46.
6. Illes, M., & Wilson, P. (2020). Forensic epistemology: exploring case-specific research in forensic science. *Canadian Society of Forensic Science Journal*, *53*(1), 26-40.
7. Noon, R. K. (2009). *Scientific method: applications in failure investigation and forensic science*. CRC Press.

SKILL BASED PAPER - CRIME SCENE DOCUMENTATION WITH LABORATORY TRAINING

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Paper	Total Credit	Lecture	Practical/ Practice	Tutorials	Pre-requisite of the course
CRIME SCENE DOCUMENTATION WITH LABORATORY TRAINING	**2**	**1**	**1**	**0**	Bachelors in Forensic science, Anthropology and allied sciences

Course Objectives:

- Explain principles of systematic crime scene recording.
- Apply appropriate documentation tools in case scenarios.
- Analyze reconstruction methods from documented evidence.
- Discuss the legal value of scene documentation.

Learning Outcomes:

- Identify types of documentation at crime scenes.
- Demonstrate techniques of sketching, note-making, and photography.
- Evaluate crime scene documentation in forensic analysis**.**

Unit I: Fundamentals and methods of Crime Scene Analysis and documentation (10 Hrs)

The idea of 'evidence' in Forensic Science and their legal admissibility, Introduction to crime scene investigation; Types of crime scenes; Securing and protecting the scene; Chain of custody and evidence integrity; Role and responsibilities of forensic experts and crime scene investigators; Legal and ethical considerations in crime scene handling; Principles and objectives of documentation; Note-taking: essentials, format, and terminology; Photography, Sketching, measurement methods; Video recording and its forensic value; Use of evidence markers and log sheets

Unit II: Advanced Documentation of specific crimes using various Techniques (13 Hrs)

3D crime scene reconstruction; Computer-aided drawing (CAD) in forensic sketching; Geographic Information Systems (GIS) in crime mapping; Drones and aerial imaging for scene documentation; Laser scanning and virtual walkthroughs; Digital data storage, preservation, and security. Homicide and violent crime scenes; Sexual assault and domestic violence scenes; Arson and fire scenes; Vehicular accidents and hit-and-run cases; Mass disaster scenes and identification challenges; Case study discussions: crime scene documentation errors and lessons learned

Practical

- To carry out photography of indoor and outdoor crime scenes
- Crime scene photographic processing and development in different light sources and using different filters.
- To carry out digital photography of various forensic evidences
- Mock crime scene investigation and writing a report on evaluation of crime scene.
- Interpretation of crime scene notes, photos, sketches and reconstruction of crime scene
- Microscopy of various physical evidences
- Portrait parley

Keywords:crime scene, GIS, sketching, aerial imaging, chain of custody

Essential Readings

1. Kothari, P. (2023). Exploring the Role of Forensic Science in Indian Criminal Justice System. *Available at SSRN 4565177*.
2. Kumari, A. (2023). Admissibility and Evidentiary Value of Forensic Evidence in India. *Issue 2 Indian JL & Legal Rsch.*, *5*, 1.
3. Ranga, P. D., & Singh, Y. (2021). Expert Opinion at Crime Scene: An Overview. *Indian Journal of Forensic Medicine & Toxicology*, *15*(3).
4. Singh, H. N. (2021). Crime scene investigation. *International Journal of Science and Research (IJSR)*, *10*(11), 642-648.
5. Jayaprakash, P. T. (2022). *Crime Scene Investigation and Reconstruction: An Illustrated Manual and Field Guide*. CRC Press.

6. Galvin, R. (2020). *Crime Scene Documentation: Preserving the Evidence and the Growing Role of 3D Laser Scanning*. CRC Press.
7. James et al (2015). Forensic Science: An Introduction to Scientific and Investigative Techniques

Suggested Readings

1. deLeeuwe, R. (2017). The hiatus in crime scene documentation: Visualisation of the location of evidence. *Journal of Forensic Radiology and Imaging*, *8*, 13-16.
2. Meghwal, T. (2025). CRIME SCENE INVESTIGATION IN INDIA: LEGAL FRAMEWORK, PROCEDURES & CHALLENGES. *PROCEDURES & CHALLENGES (April 17, 2025)*.
3. Gupta, S., & Jain, I. B. (2023). Crime Scene Investigation And Forensic Evidence: Forensic Analysis And Tools. *Journal of Pharmaceutical Negative Results*, *14*(2).
4. Barbaro, A., & Mishra, A. (Eds.). (2022). *Manual of Crime Scene Investigation*. CRC Press.
5. Borah, U. (2021). Role of Law Enforcement Agencies and Police in Crime Scene Investigation. *Indian JL & Legal Rsch.*, *3*, 1.

SKILL BASED PAPER - BIOLOGICAL EVIDENCE ANALYSIS WITH LABORATORY TRAINING

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Paper	Total Credit	Lecture	Practical/ Practice	Tutorials	Pre-requisite of the course
BIOLOGICAL EVIDENCE ANALYSIS WITH LABORATORY TRAINING	**2**	**1**	**1**	**0**	Bachelors in Forensic science, Anthropology and allied sciences

Course Objectives:

- Explain biochemical and microscopic analysis techniques.
- Apply serological and presumptive tests.
- Interpret patterns and conditions affecting biological samples.
- Discuss contamination control and preservation of evidence

Learning Outcomes:

- Recognize types of biological evidence and their forensic value.
- Demonstrate testing methods for blood, semen, saliva, and tissues.
- Analyze the results of biological evidence examination.

Unit I: Introduction to Biological Evidence and its analysis (13Hrs.)

Definition, classification, and significance of biological evidence; Types of biological materials: blood, semen, saliva, urine, sweat, hair, bones, tissues; Crime scene protocols: identification, collection, packaging, labeling, and preservation; Contamination prevention and chain of custody maintenance; Legal and ethical considerations in handling biological evidence. Presumptive and confirmatory tests for: Blood, Semen, Saliva and urine; Species determination and ABO blood group typing; Enzyme markers and protein polymorphisms; Degradation and stability of biological materials

Unit IV: Specialized Biological Evidence technologies and Interpretation (10 Hrs)

Introduction to forensic DNA analysis: nuclear and mitochondrial DNA; DNA extraction, quantification, amplification (PCR); STR (Short Tandem Repeat) analysis, Y-STR, mtDNA typing; DNA fingerprinting, electrophoresis, and capillary electrophoresis; Interpretation of DNA profiles and statistical evaluation; DNA databases and privacy concerns. Analysis of bones, age,

sex, stature, ancestry; Forensic odontology; Hair and fiber examination, Wildlife forensics and plant material identification; Challenges in mixed samples, degraded evidence, and trace quantities; Report writing, court presentation, and expert testimony

Keywords:biological fluids, serological analysis, DNA, STR, court presentation, expert testimony

Practical **(15 Hrs)**

- Protocol of handling different biological sample and maintaining their chain of custody
- Karyotyping, different banding patterns of chromosome
- Examination of Diatoms and Pollen grains
- Examination of hair characteristics for identification of species
- Anthropometry - Identification of individuals (in living)

Essential Readings

1. Pal, S. K., Kumari, V., & Devi, N. (2023). Impact of biological evidences on DNA profiling of sexual assault cases. *Indian journal of forensic and community medicine*, *10*(1), 11-21.
2. Kumar, N., Gautam, A. K., Prajapati, P. K., Paul, S., Gupta, S. K., Sharma, A., &Verma, D. (2023). Biological Evidence Management at the Crime Scene: An Overview. *Indian Journal of Forensic Medicine & Toxicology*, *17*(3).
3. Rao, P. K., Pandey, G., &Tharmavaram, M. (2020). Biological evidence and their handling. *Technology in Forensic Science: Sampling, Analysis, Data and Regulations*, 35-53.
4. De Silva, K. B. N., Dharmasiri, K. S., Buddhadasa, M. P. A. A., &Ranaweera, K. G. N. U. (2021). Criminal Investigation: A Brief Review of Importance of Biological Evidence. *European Scholar Journal*, *2*(8), 8-12.

Suggested Readings

1. Magalhães, T., Dinis-Oliveira, R. J., Silva, B., Corte-Real, F., &Nuno Vieira, D. (2015). Biological evidence management for DNA analysis in cases of sexual assault. *The Scientific World Journal*, *2015*(1), 365674.
2. McClintock, J. T. (2017). *Forensic analysis of biological evidence: a laboratory guide for serological and DNA typing*. CRC Press.
3. Byne, W. (1994). The biological evidence challenged. *Scientific American*, *270*(5), 50-55.
4. Li, R. (2008). *Forensic biology: identification and DNA analysis of biological evidence*. CRC press.
5. Schaapveld, T. E., Opperman, S. L., &Harbison, S. (2019). Bayesian networks for the interpretation of biological evidence. *Wiley Interdisciplinary Reviews: Forensic Science*, *1*(3), e1325.

SEMESTER II

DSC-4 FORENSIC PHYSICS

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Paper	Total Credit	Lecture	Practical/ Practice	Tutorials	Pre-requisite of the course
FORENSIC PHYSICS	**4**	**3**	**1**	**0**	Bachelors in Forensic science, Anthropology and allied sciences.

Course Objectives:

- Describe the concept of forensic examination of various evidences like soil, cement, fiber, glass etc. at crime scene.
- Evaluate specific techniques to be used for the examination of forensic evidences especially paint, fibre, soil, glasses and tool marks involved with the crime.

Learning Outcome

- Identify types and composition of soil, microscopic examination, Mortar and concrete analysis.
- Analyse types of paint and fibres, their composition, their macroscopic and microscopic analysis.
- Demonstrate about the different types of glass and their composition.
- Identify the use of tool marks their restoration and method of recording those restored marks.

Unit 1 Soil, Cement and Concrete (12 Hrs.)

Types and composition of soil, sample preparation, removal of contaminants, colour, molecular particle size distribution, turbidity test, pH measurements, microscopic examination, density gradient analysis, ignition-loss test, elemental analysis, interpretation of soil evidence. Spectroscopic methods for organic materials of soil, XRD analysis. Cement bromoform test, fineness test, ignition-loss test. Identification of adulterated cement. Mortar and concrete analysis.

Unit 2 Paint and Fibre (10 Hrs)

Types of paint and their composition, macroscopic and microscopic analysis, pigment distribution, micro-chemical analysis using various techniques, interpretation of paint evidence. Types of fibres, forensic aspects of fibre examination- fluorescence, optical properties, refractive index, birefringence, dye analysis. TLC, IR-micro spectroscopy, Py-GCMS. Difference between

natural and man-made fibres. Chemical compositions of papers, examination of wood and paper fibers, elemental analysis.

Unit 3 Glass (9 Hrs)

Types of glass and their composition-soda. Matching and comparison. Forensic examinations of glass fractures- rib marks, hackle marks, cone fracture, wavy, backward fragmentation, concentric and radial fractures. Colour, fluorescence, physical measurements, refractive index, density gradient, becke-line, specific gravity examination and elemental analysis of glass evidence.

Unit 4 Tool marks (14 Hrs)

Tool marks and compression marks, striated marks, combination of compression and striated marks, repeated marks, class and individual characteristics, tracing and lifting of marks, skid marks and their analysis, Photographic examination of tool marks and cut marks on clothes and wall etc. Restoration of erased / obliterated marks- Method of making-cast, punch, engrave; methods of obliteration, restoration, recording of restored marks – restoration of marks on wood, leather, polymer etc.

Practical (30 Hrs)

- Preliminary examination of glass, soil, fibre, paint and cloth evidences.
- Examination of physical properties of glass, soil, fibre and paint evidences.
- Restoration techniques of tool mark impressions and casting footprints.

Keywords:terminal ballistics, projectile velocity, toolmarks, soil, paint, glass, spectrscopy

Essential Readings

- Mathews, J.H; Firearms Identification, Vol I, II and III, Charles C. Thomas, USA, 1977.
- Kaur J, Dhall M, Tyagi R, Kapoor AK, 2024 Handbook of Forensic Physics. SSB Publications
- Warlow, T.A.; Firearms, The Law and Forensic Ballistics, Taylor and Francis, London,1996.
- Schooeble, A.J. and Exline, L.D; Current methods in Forensic Gunshot Residue Analysis, CRC Press, New York, 2000.
- Wilber; Ballistic Science for the Law Enforcement Officer, Charles C. Thomas, USA, 1977

Suggested Readings

- Caddy, B; Forensic Examination of Glass and Paint Analysis and Interpretation, CRC Press, New York, 2001.
- Shaw, D; Physics in the Prevention and Detection of Crime, Contem Phys. Vol.17, 1976.
- Saferstein, R; Forensic Science Handbook. Vol. I,II, (Ed.), Prentice Hall, New Jersey, 1988.

- Working Procedure Manual; Physics BPR&D Publication, 2000.
- Sharma, B.R; Forensic Science in Criminal Investigation and Trials (3rd Ed.), Universal Law Publishing Co., New Delhi, 2001.
- Working Procedure Manual- Physics, BPR&D Publication. 2000
- Hess, K.P; Textile Fibers and their Use, 6th Edn, Oxford and IBH Publishing Co., 1974.
- Sharma, B.R.; Firearms in Criminal Investigation & Trials, 4th Ed, Universal LawPublishing Co Pvt Ltd, New Delhi, 2011.

DSC FORENSIC ANTHROPOLOGY

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Paper	Total Credit	Lecture	Practical/ Practice	Tutorials	Pre-requisite of the course
FORENSIC ANTHROPOLOGY	**4**	**3**	**1**	**0**	Bachelors in Forensic science, Anthropology and allied sciences

Course Objectives:

- Define osteological and anthropometric techniques.
- Apply methods of forensic facial reconstruction.
- Evaluate skeletal evidence in medicolegal investigations.
- Compare human and non-human remains.

Learning Outcomes:

- Recognize human skeletal remains and biological characteristics.
- Classify bones based on age, sex, and ancestry.
- Analyze skeletal trauma and pathology.

Unit 1 Personal Identification (14 Hrs)

Genesis and development of forensic anthropology. Personal identification of living persons Identification through somatometric and somatoscopic observation, nails, occupation marks, scars, tattoo marks and deformities; handwriting and mannerisms. Genetic traits of forensic significance: Colour blindness, ear lobe, brachydactyly, polydachtyly, widow's peak, eye colour, hair colour, face form, frontal eminences, nasal profile, nasal tip, lips, chin form. Identification of the recently dead and decomposed bodies.

Unit 2 Human Growth and Development (8 hrs)

Major stages of human growth and development- Prenatal growth, Postnatal growth and their characteristics, Factor affecting growth- Genetic and Environmental. Methods of studying Human Growth, Significance of age in growth studies Methods of assessing age-chronological age, dental age, skeletal age, secondary sex character age and morphological age.

Unit 3 Forensic Morphometry of Skeletal Remains (13 Hrs)

Techniques for recovering skeletonised human remains. Laboratory analysis of skeletal and decomposing remains; maceration, skeletal analysis. Human and Animal remains. Bone fragments, Attribution of sex, estimation of age and reconstruction of stature from skeletal remains. Trauma analysis and identifying skeletal pathology. Antimortem, perimortem, post-mortem and pseudo mortem trauma. Pathological changes in bone. Establishment of partial and complete identity of skeletal material and dead bodies-morphometric techniques.

Unit 4 Forensic Odontology **(10 Hrs)**

Tooth structure and growth. Estimation of age from odontological evidences. Population differences in size and morphology. Individualisation of tooth pulp. Bite marks and its forensic significance. Photography, lifting and preservation of bite marks. Comparison and evaluation of bite mark evidences.

Practical **(30 Hrs)**

- Examination of original skeletal remains- Long bones and skull
- Identification by original long bones
- Stature estimation of individuals by long bones
- Determination of sex from Skull with mandible
- Determination of age from Skull with mandible
- Determination of sex from pelvis and sacrum.
- Identification of individuals by dental examination
- Anthropometry - Identification of individuals (in living)

Keywords: Forensic Morphometry, odontology, significance of age, personal identification

Essential Readings

1. James, R; Forensic examination of hair, Taylor & Francis, 2ND Ed. London, 1999.
2. Kaur J, Dhall M, Tyagi R, Kapoor AK, 2024 Handbook of Forensic Anthropology. SSB Publications
3. Byers, S. N., & Juarez, C. A. (2023). *Introduction to forensic anthropology*. Routledge.
4. Passalacqua, N. V., &Pilloud, M. A. (2021). The need to professionalize forensic anthropology. *European Journal of Anatomy*, *25*(S2), 35-47.
5. Jayaprakash, P. T., Alarmelmangai, S., &Pushparani, C. (2021). Past progress and future needs of forensic anthropology in India. *Med. Sci. & L.*, *61*, 163.
6. Shrivastava, P., Lorente, J. A., Srivastava, A., Badiye, A., &Kapoor, N. (Eds.). (2023). *Textbook of forensic science*. Springer.
7. Shubhra, G; Introduction to forensic examination, Selective Scientific Books, New Delhi, 2008
8. Michael, W. Haney, H.A. &Freas, L.E; The Forensic Anthropology Laboratory, CRC Press, 2008.

Suggested Readings

1. Obertová, Z., Stewart, A., &Cattaneo, C. (Eds.). (2020). *Statistics and probability in forensic anthropology*. Academic Press.
2. Reddy,V.R; Dental Anthropology, Inter-India Publication, New Delhi, 1985.
3. Singh, I.P. &Bhasin M.K; A manual of biological Anthropology, Kamla Raj Enterprises, New Delhi, 2004.
4. Kroeber; Anthropology, Oxford & IBH Publishing Company, New Delhi, 1972.
5. Pickering, R. & Bachman D; The use of Forensic Anthropology, CRC Press, Costa Rica, 2009.
6. Bose, N K; Anthropology, Narayana Press, Denmark, 1972.
7. Eveleth, P.B. & Tanner, J.M; Worldwide Variation in Human Growth, Cambridge University Press, London, 1976.

DSC- FORENSIC CHEMISTRY AND TOXICOLOGY

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Paper	Total Credit	Lecture	Practical/ Practice	Tutorials	Pre-requisite of the course
FORENSIC CHEMISTRY AND TOXICOLOGY	**4**	**3**	**1**	**0**	Bachelors in Forensic science, Anthropology and allied sciences

Course Objectives:

- Understand the effect of toxic substance on body physiology
- Identify routes of exposure and effects of toxins.
- Understand the dynamics of chromatography, spectrometry, and wet tests.
- Interpret toxicological data in forensic reports.
- Classify poisons, drugs and other chemical substances having implication on crime.

Learning Outcomes:

- Demonstrate analytical techniques for toxicological samples.
- Describe common poisons and chemical evidences in crimes.

- Analyze toxic substances in biological and environmental samples.

Unit 1 Forensic Chemistry **(13 Hrs)**

Introduction to Forensic chemistry, understand the effect of toxic substance on body physiology sampling of chemical evidences, presumptive, screening (colour/ spot test), inorganic analysis. Detective dyes- cases and importance in trap cases. Arson Chemistry of fire, searching of fire scene, collection, preservation and examination of arson evidences. Adulteration in Petroleum products. Analysis of beverages. Significance of alcohol in breath and breath screening devices. Forensic analysis of Fertilizers/ insecticides/ pesticides/ biocides.

Unit 2 Explosives **(11 Hrs)**

Classification of explosives, synthesis and characteristics of Tri-nitro toluene (TNT), Pentaerythritoltetranitrate (PETN) and Research and Development Explosives (RDX). Explosion process, blast waves, searching of scene of explosion. Post blast residue collection and analysis, blast injuries and detection of hidden explosives. Improvised explosive devices.

Unit 3 Forensic Toxicology and Pharmacology **(10 Hrs)**

Definition, classification of poisons- organic, inorganic, metallic, non-metallic etc. Acute and chronic poisoning, Accidental, homicidal and suicidal poisoning, Extraction and identification of commonly used poisons. Dosage, Frequency, Route of administration, Absorption, distribution and metabolism and factors affecting metabolism and excretion. Toxicological techniques.

Unit 4 Drugs of Abuse **(11 Hrs)**

Natural and synthetic drugs of abuse. Drug dependence, classification of drugs- Narcotics, Hallucinogens, Depressants, Stimulants, Anabolic steroids. Psychotropic and Psychedelic drugs of abuse. Field and laboratory tests of drugs of abuse. Instrumental methods of analysis, collection, preservation and transportation of drug evidences. Comparative understanding of youth behavior and substance abuse

Keywords:drugs, poisoning, explosives, chemical evidences, chromatography, toxic substances, spectrometry

Practical **(30 Hrs)**

- TLC and spot test of alkaloids of drugs of abuse and toxic substances.
- Isolation and instrumental analysis of different toxic substances and drugs.
- Thin layer chromatography of explosive substances
- Examination of petroleum products as per BIS standards.
- Examination procedures involving standard methods and instrumental techniques

- Detection and identification of doping drugs from- hair, blood, saliva, urine and other body fluid and estimation of alcohol from breath, urine and blood.
- UV-Visible Spectroscopic analysis of Drugs

Essential Readings

1. Bell, S. (2022). *Forensic chemistry*. CRC Press.
2. Flanagan, R. J., Cuypers, E., Maurer, H. H., &Whelpton, R. (2020). *Fundamentals of analytical toxicology: Clinical and forensic*. John Wiley & Sons.
3. Lappas, N. T., &Lappas, C. M. (2021). Forensic toxicology: Principles and concepts.
4. Malaca, S., Carlier, J., &Busardò, F. P. (2020). Advances in forensic toxicology. *Curr Pharm Des*, *26*(31), 3779-80.
5. Dawidowska, J., Krzyżanowska, M., Markuszewski, M. J., &Kaliszan, M. (2021). The application of metabolomics in forensic science with focus on forensic toxicology and time-of-death estimation. *Metabolites*, *11*(12), 801.
6. Nisbet, L. A., DiEmma, G. E., & Scott, K. S. (2023). Drug stability in forensic toxicology. *Wiley Interdisciplinary Reviews: Forensic Science*, *5*(4), e1481.

Suggested Readings

1. Niesink, RJM; Toxicology- Principles and Applications, CRC Press,1996
2. Modi, JP, Textbook of Medical Jurisprudence & Toxicology, N.M. Tripathi Pub,2001
3. Chadha, PV; Handbook of Forensic Medicine & Toxicology, Jaypee Brothers, New Delhi,2004
4. Parikh, C.K; Text Book of Medical Jurisprudence, Forensic Medicine & Toxicology, CBS Pub. New Delhi,1999
5. Morrison R.T and Boyd R. N;Organic Chemistry 6th Ed Prentice Hall, 2003
6. Laboratory Procedure Manual : Petroleum Products ,Directorate of Forensic Science, MHA, Govt. of India, 2005
7. Working Procedure Manual on Chemistry ; Directorate of Forensic Science MHA Govt. of India
8. Bureau of Indian Standard Specifications related to Alcohols and Petroleum Products.
9. Welcher F; Standard Methods of Chemical Analysis, 6th Ed.VanNostrand Reinhold, New York, 1969
10. Watson C. A; Official and Standardised Methods of Analysis, Royal Society of Chemistry, UK,1994.
11. Central Excise Act ; Universal Law Publication.
12. Essential Commodity Act, 1955
13. Feigl, F; Spot Test in Inorganic Analysis , Elsevier Publ. New Delhi, 2005.
14. Curry A.S ; Analytical Methods in Human Toxicology : Part II ,CRC Press Ohio, 1986.
15. Curry, A.S : Poison Detection in Human Organs, C Thomas Spring field, CRC Press, Costa Rica, 1976

DSE- WOMEN, VIOLENCE AND CRIMES IN INDIA

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Paper	Total Credit	Lecture	Practical/ Practice	Tutorials	Pre-requisite of the course
Women, Violence and Crimesin India	**4**	**3**	**1**	**0**	Bachelors in Forensic science, Anthropology and allied sciences

(Teaching hours required: Theory, 45 hours; Practical, 30 hours)

Course Objectives:

- Define crimes such as domestic violence, trafficking, and dowry death.
- Analyze case studies and legal interventions.
- Explore psychological and forensic profiling of perpetrators.
- Discuss the role of NGOs and policy reforms.

Learning Outcomes:

- Describe gender-based violence and legal provisions in India.
- Interpret the sociological implications of violence against women.
- Evaluate preventive measures and support systems.

Unit 1 **(10 Hrs)**

Basic concepts of gender, sex, violence against women and intersectionality; historical and contemporary perspective on the status of women in India; socio-cultural context of violence against women in India patriarchy, power imbalances, and gender inequality; Feminist criminology and their relevance to India; Critique of mainstream criminology for its male-centric bias.

Unit 2 **(12Hrs)**

Forms, typology and pattern of Crimes directed against women in India: Institutional and Legal framework for protection and safety of India and their shortcoming: Bhartiya Nyaya Sanhita and Bhartiya Nagarik Suraksha Sanhita, 2023, Chapter 5 Sec 63-92. Special Laws and Acts protection of Women in India; Policing and women, Women in court: Women as offenders in correctional homes: Gender sensitization in criminal Justice system.

Unit 3 **(14 Hrs)**

Forensic Science and Gender; Forensic science in investigation of crime against women: Gender sensitive approach to crime scene management and collection of evidence; different types of

evidence including biological, chemical, physical (fingerprint, hair, fiber, footwear impression): digital forensic and investigation of crimes against women Ethnographies of Social and Gender-Based Crimes in India including**,** sexual violence, honour killings and domestic violence, dowry deaths and forensic investigations

Unit 4 **(9Hrs)**

Forensic Psychology: Role in victim profiling, offender profiling (where relevant and ethically sound), Psychological trauma of victims and victimology in India; Secondary victimization. Professional responsibility and gender sensitization of forensic professionals; Contemporary research in forensic science and crimes against women in India

Practical **(30 Hrs)**

Forensic case Studies: Students will collect and analyze cases from India involving women as victims or perpetrators, with a strong emphasis on the role of forensic science. This involves reviewing case files (if accessible and anonymized), court judgments, news reports, and forensic expert opinions.

Hands on experience and Module development for interacting with female victims especially related to sexual assault, Role playing and Mock interviews with victims. Demonstrating of Forensic kits.

Keywords: Crime against Women, determinant factors, Women, crime and Society, Forensic Investigation in crimes against women

Essential Readings

Belknap, J. (2020). *The invisible woman: Gender, crime, and justice*. Sage Publications.

DeKeseredy, W. S. (2020). *Woman abuse in rural places*.Routledge.

Edwards, S. S. (2025). *Policing'domestic'violence: Women, the law and the state*. Taylor & Francis.

Amaral, S., Bhalotra, S. R., &Prakash, N. (2021). *Gender, crime and punishment: Evidence from women police stations in India* (No. 14250). IZA Discussion Papers.

Jassal, N. (2020). Gender, law enforcement, and access to justice: Evidence from all-women police stations in India. *American Political Science Review*, *114*(4), 1035-1054.

Suggested Readings

Adler, Freda. (1975). *Sisters in Crime: The Rise of the New Female Criminal*. McGraw-Hill

Ahmad, J., Khan, N., &Mozumdar, A. (2021). Spousal violence against women in India: A social–ecological analysis using data from the National Family Health Survey 2015 to 2016. *Journal of interpersonal violence*, *36*(21-22), 10147-10181.

Daly, Kathleen. (1994). *Gender, Crime, and Punishment*.Yale University Press.

Government of India, Ministry of Law and Justice. *The Protection of Women from Domestic*

Heidensohn, Frances. (1996). *Women and Crime* (2nd ed.). Macmillan *Violence Act, 2005*

Justice Verma Committee Report. 2012-13

The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013.

The Immoral Traffic (Prevention) Act, 1956.

DSE- FORENSIC PHOTOGRAPHY AND VISUALS

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Paper	Total Credit	Lecture	Practical/ Practice	Tutorials	Pre-requisite of the course
Forensic Photography and Visuals	**4**	**3**	**1**	**0**	Bachelors in Forensic science, Anthropology and allied sciences

(Teaching hours required: Theory, 45 hours; Practical, 30 hours)

Course Objectives:

- Explain principles of photography and lighting.
- Apply image processing and enhancement methods.
- Illustrate digital imaging workflows in forensic labs.
- Discuss ethical handling and archiving of visual evidence.

Learning Outcomes

- Describe key principles of forensic photography and its role in crime scene investigation.
- Demonstrate the ability to capture, process, and present photographic evidence.
- Evaluate the admissibility and accuracy of photographic documentation in legal settings.
- Recognize photographic techniques used in forensic documentation.

Unit I: Fundamentals of Forensic Photography (10 Hrs)

History and evolution of forensic photography; Basics of camera operations: ISO, aperture, shutter speed; Types of Camera and lenses, photographic instruments: light sources, optical filters, fundamentals of light and vision, Spectral sensitivity of photographic materials, Camera exposure determination. Basic principles and techniques of Black & White and colour photography, Concepts of coloured photography, Linkage of cameras and film negatives

Unit II: Techniques in Crime Scene Photography (5 Hrs)

Photography of indoor and outdoor crime scenes; Photographing physical evidence: bloodstains, footprints, weapons; Use of scale and reference markers

Unit III: Forensic video examination (14 hrs)

Definition, scope and significance in crime investigation, technical aspects of the video, collection, handling and preservation of video files, video analysis: frame extraction, frame by frame analysis, shot by shot analysis. Video processing and enhancement, Video authentication, Metadata analysis, hash value generation. Biometric Analysis for personal identification, facial biometrics, related case studies

Unit IV: Legal and Ethical Aspects (6 Hrs)

Chain of custody and image authentication; Courtroom presentation and admissibility of photographic evidence; Ethical handling and storage of forensic images; Explain principles of photography and lighting; Apply image processing and enhancement methods; Illustrate digital imaging workflows in forensic labs; Discuss ethical handling and archiving of visual evidence.

Practical (30 Hrs)

- Identification of parts of Camera
- Study the Depth of Field using photography
- Evidences photography
- Crime scene photography-long shot, medium and close ups
- Photomicrography & Macro-photography
- Analysis and enhancement of video/image/CTV Footages
- Detection of tampering in video files.

Essential Readings

1. Hill, T. (2020). CCTV Handbook: Buying, Installing, Configuring, & Troubleshooting: A User's Guide to CCTV Security. Independently published.
2. Weiss, S. (2021). *Handbook of forensic photography*. CRC Press.
3. Damjanovski, V. (2005). CCTV: Networking and Digital Technology (2nd ed.). ButterworthHeinemann.
4. Kroener, I. (2014). CCTV: A Technology under the Radar? (1st ed.). Routledge.

5. G. (2020, March 18). Types of CCTV Cameras – The Complete Guide. Business Watch. https://www.businesswatchgroup.co.uk/types-of-cctv-cameras-the-complete-guide

Suggested Readings

1. Telyatitskaya, T. (2021). Digital photography of crime scenes in the production in forensic examinations. *Forensic Examinations–Terms and Techniques*.
2. Fatima, F. (2019). Forensic photography: a visual and legal record of crime scene. *International Journal for Electronic Crime Investigation*, *3*(2), 10-10.
3. Dey, A., Rao, P. K., &Rawtani, D. (2023). Forensic Photography. *Modern Forensic Tools and Devices: Trends in Criminal Investigation*, 315-334.
4. Gouse, S., Karnam, S., Girish, H. C., &Murgod, S. (2018). Forensic photography: Prospect through the lens. *Journal of forensic dental sciences*, *10*(1), 2-4.
5. Leone, M. (2021). From fingers to faces: Visual semiotics and digital forensics. *International Journal for the Semiotics of Law-Revue internationale de Sémiotiquejuridique*, *34*(2), 579-599.

DSE- FORENSIC ENTOMOLOGY AND WILDLIFE FORENSICS

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Paper	Total Credit	Lecture	Practical/ Practice	Tutorials	Pre-requisite of the course
FORENSIC ENTOMOLOGY AND WILDLIFE FORENSICS	**4**	**3**	**0**	**1**	Bachelors in Forensic science, Anthropology and allied sciences

Course Objectives:

- Classify entomological stages of decomposition.
- Apply techniques for species identification and age estimation.
- Evaluate evidence from poaching and illegal trade.
- Discuss laws and protocols in wildlife forensics.

Learning Outcomes:

- Identify insect species relevant to death investigations.
- Interpret entomological evidence in postmortem interval estimation.

- Analyze wildlife crime evidence.

Unit I: Introduction to Forensic Entomology (10 Hrs)

Definition, scope, and historical development of forensic entomology; Types of forensic entomology: urban, stored-product, and medico-legal; Role of insects in estimating post-mortem interval (PMI); Insect succession on decomposing remains; Factors affecting insect colonization: temperature, environment, body concealment; Collection, preservation, and documentation of entomological evidence

Unit II: Insect Taxonomy and Analysis Techniques (12 Hrs)

Identification of major insect orders of forensic importance: Diptera, Coleoptera, Hymenoptera; Morphological characteristics of larvae, pupae, and adults; Developmental stages and growth rate calculations; Rearing techniques for laboratory analysis; Molecular methods for species identification (DNA barcoding); Case studies involving forensic entomology in crime scene investigation

Unit III: Introduction to Wildlife Forensics (13 Hrs)

Definition, scope, and significance in biodiversity and conservation; Common wildlife crimes: poaching, illegal trade, trafficking, habitat destruction; Key wildlife species and body parts commonly trafficked in India; Overview of national and international wildlife protection laws: Wildlife (Protection) Act, 1972 (India) CITES (Convention on International Trade in Endangered Species) Role of forensic science in wildlife law enforcement

Unit IV: Techniques and Applications in Wildlife Forensics (10 Hrs)

Identification of species from biological samples: hair, feathers, bones, teeth, skin Morphological and anatomical markers for species determination Genetic analysis: mitochondrial DNA analysis, STR profiling, DNA barcoding Analysis of wildlife products: ivory, bile, meat, leather, traditional medicine Chain of custody and evidence handling in wildlife crimes National and international case studies in wildlife forensics

Keywords: wildlife trafficking, habitat deconstruction, wildlife crime and wildlife protection act, CITES, insect colonization

Tutorials (30 Hrs)

Visit to laboratory, Bio Diversity Park and forests and make a report on the data collected.

Essential Readings

1. Singh, R., Kumawat, R. K., Singh, G., Jangir, S. S., Kushwaha, P., &Rana, M. (2022). Forensic entomology: A novel approach in crime investigation. *GSC Biol Pharm Sci*, *19*(2), 165-174.
2. Gouda, S., Kerry, R. G., Das, A., &Chauhan, N. S. (2020). Wildlife forensics: a boon for species identification and conservation implications. *Forensic Science International*, *317*, 110530.
3. Singh, K., Rajput, N., Singh, K. P., Jadav, K. K., Bhandari, R., & Sharma, J. (2020). Application of forensic entomology in carcass examination of royal Bengal tigers (Pantheratigristigris) in Madhya Pradesh.
4. Bhuyan, P. R., Borah, B. K., Rajkumari, P., Borah, N., Bora, B., &Chaya, S. Forensic entomology: Unraveling the secrets of insect evidence.
5. Puri, A., Mahalakshmi, N., Chauhan, T., Mishra, A., &Bhatnagar, P. (Eds.). (2024). *Fundamentals of Forensic Biology*. Springer Nature Singapore.

Suggested Readings

1. Tomberlin, J. K., & Sanford, M. R. (2011). Forensic entomology and wildlife. *Wildlife forensics: methods and applications*, 81-107.
2. Rolo, E. A., Oliveira, A. R., Dourado, C. G., Farinha, A., Rebelo, M. T., & Dias, D. (2013). Identification of sarcosaprophagousDiptera species through DNA barcoding in wildlife forensics. *Forensic Science International*, *228*(1-3), 160-164.
3. Anderson, G. S. (1999). Wildlife forensic entomology: determining time of death in two illegally killed black bear cubs. *Journal of Forensic Sciences*, *44*(4), 856-859.
4. Anderson, G. S., & Byrd, J. H. (2019). Wildlife forensic entomology. In *Forensic Entomology* (pp. 475-483). CRC Press.
5. Rivers, D. B., &Dahlem, G. A. (2022). *The science of forensic entomology*. John Wiley & Sons.

DSE CBRNE FORENSICS

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Paper	Total Credit	Lecture	Practical/ Practice	Tutorials	Pre-requisite of the course
CBRNE FORENSICS	**4**	**3**	**1**	**0**	Bachelors in Forensic science, Anthropology and allied sciences

Course Objectives:

- Describe types and impacts of CBRNE materials.
- Apply decontamination and detection techniques.
- Evaluate forensic protocols in mass disaster scenes.
- Summarize safety and legal issues in CBRNE investigations**.**

Learning Outcomes:

- Recognize threats from chemical, biological, radiological, nuclear, and explosive agents.
- Demonstrate response and sampling procedures in CBRNE scenarios.
- Analyze evidence from hazardous incidents.

Unit I: Introduction to CBRNE Threats and Forensic Relevance (10 Hrs)

Definitions and classification of CBRNE agents Historical overview and case studies of CBRNE incidents National and international frameworks for CBRNE response Role of forensic science in CBRNE investigationsLegal and ethical considerations in hazardous material forensics First responder protocols and decontamination procedures

Unit II: Chemical and Biological Forensics (13 Hrs)

Types of chemical warfare agents (CWAs) and toxic industrial chemicals (TICs) Detection and analysis techniques for chemical agents (GC-MS, FTIR, Raman) Forensic microbiology: collection and identification of biological agents Biosafety levels and laboratory protocols Toxins and bioterrorism: ricin, anthrax, botulinum Sample preservation and contamination prevention

Unit III: Radiological and Nuclear Forensics (14 Hrs)

Radiological and nuclear materials: types, sources, threats; Detection and measurement of radiation (Geiger-Müller counter, scintillation detectors); Radiological dispersal devices (RDDs)

and "dirty bombs"; Radioisotope identification and source attribution; Health risks and protective measures; Chain of custody and evidentiary challenges in radiological incidents

Unit IV: Explosive Forensics and Scene Management (8 Hrs)

Classification of explosives: low vs. high, military, improvised explosive devices (IEDs); Collection and analysis of explosive residues (TLC, HPLC, XRD); Post-blast investigation and crater analysis; Bomb scene management, safety, and evidence recovery; Trace analysis of detonators, wiring, and packaging materials; Role of forensic laboratories in counter-terrorism

Keywords:frameworks for CBRNE, chemical warfare agents, biosafety, bioterrorism, RDDs

Practical (30 Hrs)

Learn various techniques included in CBRNE inForensic laboratory

Essential Readings

1. Suryawanshi, D. M., Surekha, A., Divya, R., Gunasekaran, K., &Malini, I. (2022). Awareness and preparedness of first responders regarding chemical, biological, radiological, nuclear and explosive (CBRNE) disaster management of a tertiary medical institute in South India: A mixed methods study. *Journal of Family Medicine and Primary Care*, *11*(10), 6115-6120.
2. Barry, A., Thomson, S., Dimayuga, I., Chaudhuri, A., & Do, T. (2022). Isotope ratio method: state-of-the-art of forensic applications to CBRNE materials. *Canadian Society of Forensic Science Journal*, *55*(3), 115-141.
3. Guicheteau, J. A., Howle, C. R., & Myers, T. L. (2025). Chemical, Biological, Radiological, Nuclear, and Explosives (CBRNE) Sensing XXVI. In *Proc. of SPIE Vol* (Vol. 13478, pp. 1347801-1).
4. Lessig, R., &Prinz, M. (2022). Mass Disaster Victim Identification. *Handbook of Forensic Medicine*, *1*, 291-309.
5. Mishra, S., & Jacob, H. (2020). *Nuclear security Governance in India: institutions, instruments, and culture (2019)* (No. SAND-2020-10916). Sandia National Lab.(SNL-NM), Albuquerque, NM (United States); PanditDeendayal Petroleum Univ., Gujarat (India); Jawaharlal Nehru Univ., New Delhi (India).

Suggested Readings

1. Barry, A., Thomson, S., Dimayuga, I., Chaudhuri, A., & Do, T. (2022). Isotope ratio method: state-of-the-art of forensic applications to CBRNE materials. *Canadian Society of Forensic Science Journal*, *55*(3), 115-141.
2. Ludovici, G. M., Cenciarelli, O., Carestia, M., Malizia, A., Tamburrini, A., Gabbarini, V., ...&Rinaldi, T. (2015). The importance of forensic microbiology in CBRNe investigations. *Technol. Res. Inst. Def*, *8*, 153-161.

3. Regal, G., Murtinger, M., &Schrom-Feiertag, H. (2022, May). Augmented CBRNE responder-directions for future research. In *13th Augmented Human International Conference* (pp. 1-4).
4. Barchett, P. (2023). A Manual for the Recovery of CBRNE (Chemical, Biological, Radiological, Nuclear, and Explosive) Contaminated Human Remains.

DSE FORENSIC BALLISTICS

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Paper	Total Credit	Lecture	Practical/ Practice	Tutorials	Pre-requisite of the course
FORENSIC PHYSICS AND BALLISTICS	**4**	**3**	**1**	**0**	Bachelors in Forensic science, Anthropology and allied sciences

Course Objectives:

- Describe internal, external, and terminal ballistics.
- Apply methods to examine firearms, bullets, and cartridge cases.
- Analyze shooting reconstruction scenarios.
- Evaluate firearm identification systems.

Learning Outcomes:

- Identify physical principles behind forensic tools and techniques.
- Demonstrate ballistic examination procedures.
- Analyze firearm evidence in forensic casework.

Unit 1 Forensic ballistics (12 Hrs)

History and background of Firearms, their classification and characteristics, rifling – various class characteristics, types and methods to produce rifling. Mechanism of rifling. Projectile velocity determination.Techniques of dismantling/assembling of firearm. Types of ammunitions, classification and constructional features of different types of cartridges, types of primers and priming composition, propellants and their compositions, velocity and pressure characteristics under different conditions, various types of bullets and compositional aspects, latest trends in their manufacturing and design, smooth bore firearm projectile, identification of origin, improvised ammunition and safety. Identification of origin, improvised/ country made/ imitative firearms and their constructional features.

Unit 2 Internal and External Ballistics (10 Hrs)

Definition, ignition of propellants, shape and size of propellants, manner of burning, various factors affecting the internal ballistics, equation of motion of projectile, principal problems of exterior ballistics, vacuum trajectory, effect of air resistance on trajectory, base drag, yaw, shape of projectile and stability, trajectory computation, ballistics coefficient and limiting velocity, Ballistics tables, measurements of trajectory parameters, introduction to automated system of trajectory computation and automated management of ballistics data.

Unit 3Terminal Ballistics (8 Hrs)

Effect of projectile on hitting the target, Tumbling of bullets, effect of instability of bullet, effect of intermediate targets, influence of range, Cavitation, Ricochet and its effects, stopping power, Wound Ballistics; Threshold velocity for penetration of skin/flesh/bones, preparation of gel block, penetration of projectiles in gel block and other targets, nature of wounds and velocities with various types of projectiles, explosive wounds, evaluation of injuries caused due to shot-gun, rifle, handguns and country made firearms, methods of measurements of wound ballistics parameters, post-mortem and anti-mortem firearm injuries.

Unit 4 Examination and identification (15 Hrs)

Firearms, ammunition and their components identification and examination, different types of marks produced during firing process on cartridge, identification of various parts of firearms, techniques for obtaining test material from various types of weapons and their linkage with fired ammunition, class and individual characteristics, GSR analysis: Mechanism of formation of GSR, source and collection, spot test, chemical test, identification of shooter and instrumental methods of GSR Analysis, Management and reconstruction of crime scene; suicide, murder and accidental and self-defence cases.

Practical

- Linkage of suspected bullet and cartridge case with the firearm on the basis of class and individual characteristics.
- Classification and designation of ammunition using physical measurements
- GSR collection and analysis of various components of GSR.
- Estimation of Range.
- Determination of velocity and energy of projectiles.

Keywords:terminal ballistics, GSR, projectile velocity

Essential Readings

1. Mathews, J.H; Firearms Identification, Vol I, II and III, Charles C. Thomas, USA, 1977.
2. Kaur J, Dhall M, Tyagi R, Puri, Kapoor AK, 2024 Handbook of Forensic Ballistics. SSB Publications

3. Hatcher, Jury and Weller; Firearms Investigation, Identification and Evidence, StackpoleBooks, Harrisburg, Pennsylvania,1997.
4. Heard, B.J; Handbook of Firearms and Ballistics, John Wiley, England, 1997.
5. Warlow, T.A.; Firearms, The Law and Forensic Ballistics, Taylor and Francis, London,1996.
6. Schooeble, A.J. and Exline, L.D; Current methods in Forensic Gunshot Residue Analysis, CRC Press, New York, 2000.
7. Wilber; Ballistic Science for the Law Enforcement Officer, Charles C. Thomas, USA, 1977

Suggested Readings

1. Saferstein, R; Forensic Science Handbook. Vol. I,II, (Ed.), Prentice Hall, New Jersey, 1988.
2. Sharma, B.R; Forensic Science in Criminal Investigation and Trials (3rd Ed.), Universal Law Publishing Co., New Delhi, 2001.
3. Sharma, B.R.; Firearms in Criminal Investigation & Trials, 4th Ed, Universal LawPublishing Co Pvt Ltd, New Delhi, 2011.

GE CRIMINOLOGY AND FORENSIC PSYCHOLOGY

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Paper	Total Credit	Lecture	Practical/ Practice	Tutorials	Pre-requisite of the course
CRIMINOLOGY AND FORENSIC PSYCHOLOGY	**4**	**3**	**1**	**0**	Bachelors in Forensic science, Anthropology and allied sciences

Course Objectives:

- Define forensic psychology and its applications.
- Apply psychometric tools and interviews.
- Evaluate case studies using psychological theories.
- Explore rehabilitation and risk assessment models**.**

Learning Outcomes:

- Describe psychological theories of criminal behavior.
- Interpret offender profiling techniques.
- Analyze criminal motives and behavioral patterns**.**

Unit I: Foundations of Criminology (12 Hrs)

Definition, scope, and objectives of criminology; Historical development and schools of criminological thought; Classical and positivist theories of crime; Sociological theories: strain theory, differential association, labelling theory; Types of crime: violent, property, white-collar, organized, and cybercrime; Crime statistics and patterns in India

Unit II: Biological and Psychological Theories of Crime (12 Hrs)

Biological predispositions to criminal behavior: genetics, neuroanatomy, hormones; Psychological perspectives: Freud's psychoanalysis, behaviorism, cognitive theories; Mental disorders and their relationship with criminality; Psychopathy and antisocial personality disorder; Developmental and family influences on offending behavior; Case studies and forensic implications

Unit III: Forensic Psychology and Criminal Profiling (12 hrs)

Definition and scope of forensic psychology; Role of forensic psychologists in criminal investigations and courtrooms; Criminal profiling: techniques, typologies, and limitations; Behavioral analysis and modus operandi; Psychological autopsy; Interviewing and interrogation techniques: cognitive interview, Reid technique

Unit IV: Applications and Legal Interface (9 Hrs)

Psychological assessment and testing in forensic settings; Assessment of competency, insanity, and risk of reoffending; Juvenile delinquency: causes, assessment, and interventions; Victimology: psychological impact on victims, victim profiling; Ethical and legal considerations in forensic psychology practice; Role of forensic psychologists in correctional and rehabilitative settings

Practical (30 Hrs)

- To prepare a case study on the case specific to Forensic psychology
- Introduction to different kits used for crime scene investigation.
- Polygraph (Lie-detection), Narco analysis, Brain mapping

Essential Readings

1. Sahni, S. P., &Bhadra, P. (Eds.). (2021). *Criminal psychology and the criminal justice system in India and beyond* (Vol. 328). Springer.
2. Kacker, P., &Pandya, A. (2020). Forensic psychology for prevention of crime and rehabilitation of offenders: public health perspectives. *GAP Indian Journal Of Forensics And Behavioural Sciences*, *1*, 5-7.
3. Tiwari, A., &Kusum, S. (2024). Role of Forensic Criminology in Access to Justice—A Critical Analysis. In *Forensic Justice* (pp. 42-67). Routledge.
4. Tanuj. (2024). The Psychology of Criminal Behavior in India-Sociological and Psychological Perspectives. *Legal Lock J.*, *4*, 226.
5. Sahni, S. P., &Phakey, N. (2021). Criminal psychology: Understanding criminal behaviour. *Criminal Psychology and the Criminal Justice System in India and Beyond*, 21-30.
6. Jamal, F., Walia, M., Sharma, B. K., & Sharma, S. C. (2022). Forensic Psychology: In Pursuit for Better Justice System. *Bulletin of Environment, Pharmacology and Life Sciences*, *5*, 39-42.
7. Sarraf, S. (2021). The Holistic Approach Of Criminology.

Suggested Readings

1. Hollin, C. R. (2019). Forensic (criminological) psychology. In *Companion encyclopedia of psychology* (pp. 1231-1253). Routledge.
2. Gavin, H. (2024). Criminological and forensic psychology.

3. Bartol, C. R., &Bartol, A. M. (Eds.). (2011). Current perspectives in forensic psychology and criminal behavior.
4. Petherick, W., Turvey, B. E., & Ferguson, C. E. (Eds.). (2009). *Forensic criminology*. Academic Press.
5. Gudjonsson, G. H. (2003). Psychology brings justice: The science of forensic psychology. *Criminal Behaviour and Mental Health*, *13*(3), 159-167.

GE- STATISTICS AND ETHICS IN FORENSIC RESEARCH

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Paper	Total Credit	Lecture	Practical/ Practice	Tutorials	Pre-requisite of the course
STATISTICS AND ETHICS IN RESEARCH	**4**	**3**	**1**	**0**	Bachelors in Forensic science, Anthropology and allied sciences

Course Objectives:

- Apply hypothesis testing and regression analysis.
- Classify types of data and variables.
- Discuss research misconduct and ethical frameworks.
- Analyze case examples of ethical dilemmas.

Learning Outcomes:

- Recognize statistical methods in forensic research.
- Interpret data using descriptive and inferential tools.
- Evaluate ethical considerations in scientific investigations.

Unit I: Basics of Statistics and Data Types (7Hrs)

Introduction to statistics: importance in forensic science research; Types of data: qualitative vs. quantitative; discrete vs. continuous; Scales of measurement: nominal, ordinal, interval, ratio; Frequency distribution, tabulation, and graphical representation (bar charts, histograms, pie charts); Measures of central tendency: mean, median, mode; Measures of dispersion: range, variance, standard deviation

Unit II: Inferential Statistics and Hypothesis Testing (12 Hrs)

Sampling techniques and sampling distributions; Normal distribution and standard scores; Formulation of hypotheses (null and alternative); Parametric and non-parametric tests:t-test, chi-square test, ANOVA, Mann–Whitney U test; Correlation and regression: concepts and applications; Introduction to statistical software (e.g., SPSS, R)

Unit III: Scientific Integrity and Research Ethics (14 Hrs)

Principles of research ethics: honesty, objectivity, confidentiality, and accountability; Ethical issues in human and animal research; Informed consent and voluntary participation; Plagiarism, fabrication, falsification, and authorship misconduct; Role of Institutional Ethics Committees and Institutional Review Boards; Publication ethics and guidelines (COPE, ICMJE, UGC regulations)

Unit IV: Ethical Practices in Forensic and Applied Research (12 Hrs)

Ethics in forensic casework and expert testimony; Handling sensitive and personal data; Legal frameworks for research with vulnerable populations; Data sharing, transparency, and reproducibility; Ethical challenges in collaborative, interdisciplinary, or field-based research; Case studies in ethical lapses and lessons learned

Practical (30 Hrs)

Learning of various software for quantitative and qualitative data

Analysis and interpretation of primary data

Essential Readings

1. Balakumar, P., Sellappans, R., Nagarkar, S., Hazra, A., &Jagadeesh, G. (2024). Research Planning, Statistical Analysis, Ethics, and Successful Publishing. *Indian Journal of Pharmaceutical Education and Research*, *58*(4s), s1102-s1107.
2. Kambhampati, S. B., Menon, J., &Maini, L. (2023). Ethics in research and publications. *Indian Journal of Orthopaedics*, *57*(11), 1722-1734.
3. Khan, F., &Mer, A. (2024). The Ethical Considerations of DNA Profiling for Resilience in a Forensic Setting in India: A Comparative Study with International Guidelines. In *The Framework for Resilient Industry: A Holistic Approach for Developing Economies* (pp. 121-134). Emerald Publishing Limited.
4. Bhalshankar, A. D. S. The Ethics of forensic Science in Criminal Trials: Balancing Justice and Privacy. *Worldwide International Inter Disciplinary Research*, 15.

Suggested Readings

1. Wassertheil-Smoller, S., Smoller, J., Wassertheil-Smoller, S., &Smoller, J. (2015). Research Ethics and Statistics. *Biostatistics and Epidemiology: A Primer for Health and Biomedical Professionals*, 217-224.

2. Gelman, A. (2011). Ethics and statistics: Open data and open methods. *Chance*, *24*(4), 51-53.
3. DeMets, D. L. (1999). Statistics and ethics in medical research. *Science and Engineering Ethics*, *5*, 97-117.
4. Bonsu, D. O., Afoakwah, C. B., Abedi, M., Higgins, D., & Austin, J. J. (2022). Ethics reporting in forensic science research publications–A review. *Forensic science international*, *335*, 111290.
5. Bowen, R. T. (2017). *Ethics and the practice of forensic science*. CRC Press.

SKILL BASED PAPER - CHEMICAL EVIDENCE ANALYSIS WITH LABORATORY TRAINING

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Paper	Total Credit	Lecture	Practical/ Practice	Tutorials	Pre-requisite of the course
CHEMICAL EVIDENCE ANALYSIS	**2**	**1**	**1**	**0**	Bachelors in Forensic science, Anthropology and allied sciences

Course Objectives:

- Describe sample collection and preparation procedures.
- Apply spectroscopy, chromatography, and microscopy.
- Interpret analytical results and report findings.
- Evaluate limitations of chemical analysis in forensics.

Learning Outcomes:

- Identify chemical residues and trace materials in forensic cases.
- Demonstrate analytical techniques for chemical analysis.
- Analyze chemical evidence to reconstruct crime scenes.

Unit I: Fundamentals of Chemical Evidence and Analysis of Drugs and Toxic Substances

(11 Hrs)

Definition, classification, and forensic significance of chemical evidence, types of chemical evidence, Collection, labeling, preservation, and transportation protocols, Safety measures and handling of hazardous materials, Chain of custody and admissibility in court. Classification of drugs, hallucinogens, Analysis of controlled substances using various techniques, Forensic toxicology: classification of poisons, routes of administration, Extraction techniques: liquid-liquid and solid-phase extraction, Detection of common poisons in biological and non-biological matrices

Unit II: Explosives and Fire Debris Analysis & Trace and Environmental Chemical Evidence (12 Hrs)

Types of explosives, Sampling and preservation of explosive residues, Screening and confirmatory tests, Chemical tests for nitrate, nitrite, chlorate, and perchlorate, Analysis of fire debris: accelerants and their identification, Interpretation and reporting in explosive and arson cases. analysis of paint, glass, soil, and metals, Layer comparison, refractive index, elemental analysis, Forensic analysis of inks, dyes, and pigments, Chemical profiling in environmental forensics, Use of spectroscopy and microscopy in trace evidence analysis, Case studies and challenges in chemical evidence interpretation

Practical (15 Hrs)

- Multicomponent Quantitative estimation of drug by UV-VIS
- Detection of anabolic agents in supplements by GCMS
- Concept & Parts identification of GC, GCMS, HPLC
- Extraction and identification of organochlorine pesticides from biological matrices by TLC and GC-MS
- Extraction of heavy metals by conventional methods and analysis by color tests.

Essential Readings

1. Kumari, A. (2023). Admissibility and Evidentiary Value of Forensic Evidence in India. *Issue 2 Indian JL & Legal Rsch.*, *5*, 1.
2. Gupta, S., & Jain, I. B. (2023). Crime Scene Investigation And Forensic Evidence: Forensic Analysis And Tools. *Journal of Pharmaceutical Negative Results*, *14*(2).
3. AchathuparambilGopalakrishnan, B., & Varghese, G. K. (2025). Chemical Speciation of Particulate Matter as a Tool in Air Pollution Forensics: A Case Study. *Environmental Forensics*, *26*(2), 261-275.
4. Sood, A., &Kashyap, S. (2018). Administration Of Criminal Justice And Role Of Forensics In India: A Study. *International Journal of Innovative Research and Advanced Studies*, *5*(4), 69-73.

Suggested Readings

1. Van Asten, A. (2022). *Chemical analysis for forensic evidence*. Elsevier.
2. Woodman, P. A., Spiranovic, C., Julian, R., Ballantyne, K. N., &Kelty, S. F. (2020). The impact of chemical trace evidence on justice outcomes: Exploring the additive value of forensic science disciplines. *Forensic science international*, *307*, 110121.
3. Rendle, D. F. (2005). Advances in chemistry applied to forensic science. *Chemical Society Reviews*, *34*(12), 1021-1030.
4. Kumar, R., & Sharma, V. (2018). Chemometrics in forensic science. *TrAC Trends in Analytical Chemistry*, *105*, 191-201.
5. Mistek, E., Fikiet, M. A., Khandasammy, S. R., &Lednev, I. K. (2018). Toward Locard's exchange principle: Recent developments in forensic trace evidence analysis. *Analytical chemistry*, *91*(1), 637-654.

SKILL BASED PAPER - PATTERN EVIDENCE ANALYSIS WITH LABORATORY TRAINING

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Paper	Total Credit	Lecture	Practical/ Practice	Tutorials	Pre-requisite of the course
PATTERN EVIDENCE ANALYSIS	**2**	**1**	**1**	**0**	Bachelors in Forensic science, Anthropology and allied sciences

Course Objectives:

- Define classification systems for pattern evidence.
- Apply documentation and lifting techniques.
- Analyze patterns for identification and reconstruction.
- Discuss the admissibility of pattern evidence in courts.

Learning Outcomes:

- Recognize types of pattern evidence such as tool marks, shoe prints, and tire impressions.
- Demonstrate comparative analysis methods.
- Evaluate the reliability and significance of pattern evidence.

Unit I: Fundamentals of Pattern Evidence (5 Hrs)

Definition, scope, and types of pattern evidence, Class and individual characteristics in pattern comparison, Scientific basis of pattern recognition and its forensic value, Methods of documentation and preservation of pattern evidence, Legal standards for admissibility of pattern evidence in court

Unit II: Fingerprint and Impression Evidence (7 Hrs)

Fingerprint types: latent, patent, and plastic, Classification: loops, whorls, arches; ridge characteristics, Techniques for development and lifting of latent fingerprints,Comparison and identification using AFIS (Automated Fingerprint Identification System), Footwear and tire impressions: recovery, casting, and comparison, Examination of tool marks and striation analysis

Unit III: Bloodstain Pattern Analysis (BPA) (6 Hrs)

Nature and types of bloodstain patterns: passive, transfer, and projected, Impact angle, directionality, and point of origin determination, Pattern reconstruction techniques in violent crimes, Differentiation between high, medium, and low-velocity impact stains, Documentation of bloodstain patterns: photography, sketches, and mapping, Limitations and interpretation challenges in BPA

Unit IV: Advanced Methods and Case Applications (5 Hrs)

Use of digital tools in pattern evidence comparison (e.g., image enhancement software),3D scanning and virtual reconstruction in impression analysis, Pattern evidence in wildlife forensics and environmental crimes, Case studies involving fingerprint, footwear, and bloodstain evidence, Expert testimony and cross-examination of pattern evidence in court, Emerging technologies and research trends in pattern forensics

Keywords: AFIS, BPA, digital tools, bloodstain patterns, impression evidence

Practical (15 Hrs)

- Physical, biochemical and spectrophotometric examination of blood stains.
- Gait Pattern Analysis
- Facial Recognition System
- Facial Geometry
- Reconstruction and evaluation of scene of crime
- To develop latent fingerprints with powders, fuming and chemical methods.

Essential Readings

1. Kumari, A. (2023). Admissibility and Evidentiary Value of Forensic Evidence in India. *Issue 2 Indian JL & Legal Rsch.*, *5*, 1.
2. Gupta, S., & Jain, I. B. (2023). Crime Scene Investigation And Forensic Evidence: Forensic Analysis and Tools. *Journal of Pharmaceutical Negative Results*, *14*(2).
3. Banerjee, S. (2023). Forensic Science and Its Applicability in the Indian Criminal Justice System. *Issue 1 Indian JL & Legal Rsch.*, *5*, 1.
4. Mack, S., &Chatterjee, I. (2021). Forensic Evidence Relevance in Police Procedure And Criminal Justice Procedure. *Turkish Online Journal of Qualitative Inquiry*, *12*(10).
5. Teotia, D., &Pokhriyal, S. (2024). Using Forensic Science in the Analysis of Homicidal Crimes. *Issue 3 Int'l JL Mgmt. & Human.*, *7*, 919.

Suggested readings

1. Jayaprakash, P. T. (2013). Practical relevance of pattern uniqueness in forensic science. *Forensic science international*, *231*(1-3), 403-e1.
2. Redmayne, M., Roberts, P., Aitken, C., & Jackson, G. (2011). Forensic science evidence in question. *Criminal Law Review*, *5*, 347-356.
3. Heizmann, M., & Leon, F. P. (2001, February). Model-based analysis of striation patterns in forensic science. In *Enabling Technologies for Law Enforcement and Security* (Vol. 4232, pp. 533-544). SPIE.
4. Findley, K. A. (2020). The absence or misuse of statistics in forensic science as a contributor to wrongful convictions: From pattern matching to medical opinions about child abuse. *Dickinson L. Rev.*, *125*, 615.