

3 Years UG Programme

In

Forensic Science

2021-22

Forensic Science

School of Interdisciplinary Research and Education

Department of Forensic Science

Guru Ghasidas Vishwavidyalaya

Bilaspur (C. G)-495009

UG COURSE IN FORENSIC SCIENCE
(THREE YEARS / SIXSEMESTERS)

Semester	Course Opted	Course Code	Name of the course	Credit	Hour / week
B.ScIst Semester	Core-1	FSUATT1	Introduction to Forensic Science	3	3
	Core -1 Practical	FSUALT1	Practical's based on Crime Scene	2	4
	Core -2	FSUATT2	Crime and Society	3	3
	Core -2 Practical	FSUALT2	Practical's based on Crime and Society	2	4
	Generic Elective - 1 (GE- I)	FSUATG1	Elementary Forensic Science	3	3
	Generic Elective - Practical	FSUALG1	Practical's based on Crime Scene Investigation	2	4
	AEC(Ability Enhancement Course) 01	FSUATA1	Introduction to criminalistics	2	2
	SEC(Skill Enhancement Course) 01	FSUATL1	Handwriting Identification and Recognition	2	2
			Total Credits	19	
B.ScIInd Semester	Core-3	FSUBTT1	Criminal Law	3	3
	Core -3 Practical	FSUBLT1	Practical's based on preparing schedules	2	4
	Core -4	FSUBTT2	Forensic Psychology	3	3
	Core -4 Practical	FSUBLT2	Practical's based on Forensic Psychology	2	4
	Generic Elective -2 (GE-2)	FSUBTG1	Applied Forensic Science	3	3
	Generic Elective - Practical	FSUBLG1	Practical's based on Applied Forensic Science	2	4
	AEC(Ability Enhancement Course) 02	FSUBTA2	English/Hindi	2	2
	SEC(Skill Enhancement Course) 02	FSUBTL1	Introduction to Biometry	2	2

			Total Credits	19	
B.ScIIIrd Semester	Core -5	FSUCTT1	Forensic Dermatoglyphics	3	3
	Core -5 Practical	FSUCLT1	Practical's based on Finger Prints	2	4
	Core -6	FSUCTT2	Technological Methods in Forensic Science	3	3
	Core -6 Practical	FSUCLT2	Practical's based on Technological Methods	2	4
	Core - 7	FSUCTT3	Criminalistics	3	3
	Core -7 Practical	FSUCLT3	Practical's based on Crime scene samples	2	4
	Generic Elective -3 (GE-3)	FSUCTG1	Crime Scene Management	3	3
	Generic Elective - Practical	FSUCLG1	Practical's based on Crime Scene Management	2	4
	AEC(Ability Enhancement Course) 03	FSUCTA3	Environmental Science	2	2
		Total Credits	22		
B.ScIVth Semester	Core-8	FSUDTT1	Forensic Chemistry	3	3
	Core -8 Practical	FSUDLT1	Practical's based on Forensic Chemistry	2	4
	Core -9	FSUDTT2	Questioned Documents	3	3
	Core -9 Practical	FSUDLT2	Practical's based on Questioned Documents	2	4
	Core - 10	FSUDTT3	Forensic Biology	3	3
	Core -10 Practical	FSUDLT3	Practical's based on Forensic Biology	2	4
	Generic Elective -4 (GE-4)	FSUDTG1	Advanced Forensic Science	3	3
	Generic Elective - Practical	FSUDLG1	Practical's based on Advanced Forensic Science	2	4
	AEC(Ability Enhancement Course) 04	FSUDTA4	Wildlife Forensics	2	2
		FSUDECI	Summer Internship	6	

			Total Credits	22+6	
B.Sc. Vth Semester	Core-11	FSUETT1	Forensic Ballistics	3	3
	Core -11 Practical	FSUFLT1	Practical's based on Forensic Ballistics	2	4
	Core -12	FSUETT2	Forensic Toxicology	3	3
	Core -12 Practical	FSUFLT2	Practical's based on Forensic Toxicological analysis	2	4
	Discipline Specific Elective-1	FSUETD1	Digital Forensics/	3	3
	Discipline Specific Elective-2	FSUETD2	Economic Offences	3	3
	Discipline Specific Elective Practical's-1	FSUELD1	Practical's based on Digital Forensics/ Practical's based on Economic offences	2	4
	Discipline Specific Elective Practical's-2	FSUELD2	Practical's based on Economic offences	2	4
	Discipline Specific Elective -3	FSUETD3	Forensic Serology	3	3
	Discipline Specific Elective -4	FSUETD4	Accident Investigations	3	3
	Discipline Specific Elective Practical's-3	FSUELD3	Practical's based on Forensic Serology /	2	4
	Discipline Specific Elective Practical's-4	FSUELD4	Practical's based on Accident Investigations	2	4
	AEC(Ability Enhancement Course) 05	FSUETA5	Introduction to Firearms and Explosives	2	2
			Total Credits	22	
B.Sc. VIth Semester	Core-13	FSUFTT1	Forensic Anthropology	3	3
	Core -13 Practical	FSUFLT1	Practical's based on Forensic Anthropology	2	4
	Core-14	FSUFTT2	Forensic Medicine	3	3

	Core -14 Practical	FSUFLT2	Practical's based on Forensic Medicine	2	4
	Discipline Specific Elective -5	FSUFTD5	DNA Typing	3	3
	Discipline Specific Elective -6	FSUFTD6	Modern Forensic Toxicology		
	Discipline Specific Elective Practical's-5	FSUFLD5	Practical's based on DNA Typing	2	4
	Discipline Specific Elective -6	FSUFLD6	Practical's based on Modern Forensic Toxicology		
			Seminar	2	
		FSUFDT1	Mini Project work	7	
			Total Credits	17+7	
			Overall Total Credits		

As per UGC CBCS guidelines, University / Departments have liberty to offer GE and SEC courses offered by any department to students of other departments. The No. of GE course is four. One GE course is compulsory in first 4 semesters each. In present scheme it is proposed to have minimum two GE courses (from one subject) in first two semester after which student can change two GE for another subject in IIIrd and IVth semester, so that all the student can have exposure of one additional subject. Compulsory Skill Enhancement Course proposed in semester III and IV which can be opted either in department or other department offering this course. There are Total Five Ability Enhancement Course (AEC) offered by Department.

Evaluation Scheme:

Evaluation of students will be done on the basis of scheme given below

Sr. No.	Examination	Duration	Marks
1.	Internal Assessment	1 hours	15
2.	Formative Assessment	1 hours	15
3.	End Semester	3 hours	70

All student will go for 3-4-week summer internship/Apprentice/ Industrial Training in semester IV after the completion of End semester examination.

In semester VI student should take Dissertation/ Project work under supervision of departmental faculty which will be evaluated on the basis of submitted work followed by oral presentation.

Sl. No.	Core Papers (Theory)	Core Papers (Practical)
1	Introduction to Forensic Science	Practicals based on Crime Scene
2	Crime and Society	Practicals based on Crime and Society
3	Criminal Law	Practicals based on preparing schedules
4	Forensic Psychology	Practicals based on Forensic Psychology
5	Forensic Dermatoglyphics	Practicals based on Finger Prints
6	Technological Methods in Forensic Science	Practicals based on Technological Methods
7	Criminalistics	Practicals based on Crime scene samples
8	Forensic Chemistry	Practicals based on Forensic Chemistry
9	Questioned Documents	Practicals based on Questioned Documents
10	Forensic Biology	Practicals based on Forensic Biology
11	Forensic Ballistics	Practicals based on Forensic Ballistics
12	Forensic Toxicology	Practicals based on Forensic Toxicological analysis
13	Forensic Anthropology	Practicals based on Forensic Anthropology
14	Forensic Medicine	Practicals based on Forensic Medicine

Sl. No.	Generic Elective Papers (Theory)	Generic Elective Papers (Practical)
1	Elementary Forensic Science	Practicals based on Crime Scene Investigation
2	Applied Forensic Science	Practicals based on Applied Forensic Science
3	Crime Scene Management	Practicals based on Crime Scene Management
4	Advanced Forensic Science	Practicals based on Advanced Forensic Science

Sl. No.	Skill Enhancement Course (SEC)
1.	Handwriting Identification and Recognition
2.	Introduction to Biometry

SL No.	Ability Enhancement Course (AEC)
1	Introduction to Criminalistics
2	English/Hindi
3	Environmental Science
4	Forensic Wildlife Investigation
5	Firearms and Explosives

Sl. No.	Discipline Specific Elective Papers (Theory)	Discipline Specific Elective Papers (Practical)
1	A. Digital Forensics	A. Practicals based on Digital Forensics
2	B. Economic Offences	B. Practicals based on Economic offences
3	A. Forensic Serology	A. Practicals based on Forensic Serology
4	B. Accident Investigations	B. Practicals based on Accident Investigations
5	A. DNA Typing	A. Practicals based on DNA Typing
6	B. Modern Forensic Toxicology	B. Practicals based on Modern Forensic Toxicology

Three-year UG Course in Forensic Science
Semester – IFSUATT1
Core-1
Introduction to Forensic Science

Credits: 3

Learning Objectives: After studying this paper the students will know:

- a. The significance of forensic science to human society.*
- b. The fundamental principles and functions of forensic science.*
- c. The divisions in a forensic science laboratory.*
- d. The working of the forensic establishments in India and abroad.*

Unit 1: History and Development of Forensic Science in India

History and development of forensic science. Functions of forensic science. Nature and scope of Forensic science. Definitions and concepts in forensic science. Scope of forensic science. Need of forensic science. Basic principles of forensic science. Frye case and Daubert standard.

Unit 2: Tools and Techniques in Forensic Science

Branches of forensic science. Forensic science in international perspectives, including set up of INTERPOL and FBI, RAW and CBI. Duties of forensic scientists. Ethics in forensic science. Code of conduct for forensic scientists. Qualifications of forensic scientists. Data depiction. Report writing. Expert testimony.

Unit 3: Organizational set up of Forensic Science Laboratories in India

Hierarchical set up of Central Forensic Science Laboratories, State Forensic Science Laboratories, Government Examiners of Questioned Documents, Fingerprint Bureaus, National Crime Records Bureau, Police & Detective Training Schools, Bureau of Police Research & Development, Directorate of Forensic Science and Mobile Crime Laboratories.

Unit 4: Police Science

Definition and scope, Organizational set up of Police at State, Range and District level. State armed forces and home guards. Role of Police in crime investigations. State criminal investigation departments, FIR, Police dogs. Services of crime laboratories. Basic services and optional services.

Suggested Readings

1. B.B. Nanda and R.K. Tiwari, Forensic Science in India: A Vision for the Twenty First Century, Select Publishers, New Delhi (2001).
2. M.K. Bhasin and S. Nath, Role of Forensic Science in the New Millennium, University of Delhi, Delhi (2002).
3. S.H. James and J.J. Nordby, Forensic Science: An Introduction to Scientific and Investigative Techniques, 2nd Edition, CRC Press, Boca Raton (2005).
4. W.G. Eckert and R.K. Wright in Introduction to Forensic Sciences, 2nd Edition, W.G. Eckert (ED.), CRC Press, Boca Raton (1997).
5. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).
6. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013).

**Three-year UG Course in Forensic Science
Semester – IFSUALT1**

Core -1

Practicals based on Crime Scene Investigation

Credits: 3

1. To study the history of crime cases from forensic science perspective.
2. To cite examples of crime cases in which apprehensions arose because of Daubert standards.
3. To review the sections of forensic science at INTERPOL and compare with those in Central Forensic Science Laboratories in India. Include suggestions for improvements if any.
4. To study the annual reports of National Crime Records Bureau and depict the data on different type of crime cases by way of smart art/templates.
5. To write report on different type of crime cases.
6. To review how the Central Fingerprint Bureau, New Delhi, coordinates the working of State Fingerprint Bureaus.
7. To examine the hierarchical set up of different forensic science establishments and suggest improvements.
8. To examine the list of projects undertaken by the Bureau of Police Research and Development and suggest the thrust areas of research in Police Science.
9. To compare and contrast the role of a Police Academy and a Police Training School.
10. To compare the code of conduct prescribed by different establishments for forensic scientists.

Three-year UG Course in Forensic Science

Semester – I

FSUATT2

Core-2

Crime and Society

Credits: 3

Learning Objectives: After studying this paper the students will know:

- a. The importance of criminology.*
- b. The causes of criminal behavior.*
- c. The significance of criminal profiling to mitigate crime.*
- d. The consequences of crime in society.*
- e. The elements of criminal justice system.*

Unit 1: Basics of Criminology

Criminology: Definition, aims, nature and scope, Concept of Crime, Brief Introduction of Theories of criminal behavior such as classical, positivist, sociological etc.; Criminal profiling, Understanding *Corpus delicti* and *Modus operandi*.

Unit 2: Crime

Crime: Elements, nature, causations and consequences of crime, Classification of crime and criminals, Deviant behavior, public disorders, domestic violence and workplace violence, Psychological Disorders and Criminality.

Unit 3: Recent Advancements in Crimes

Brief Introduction towards: Victimology, Juvenile delinquency, Hate crimes, Organized crimes, Situational crime, Economic crime, Sexual Offences, Crime due to intoxication, Cybercrimes and White-collar crimes, Modern Approaches towards Investigative strategy and Role of Media in the solution of crime.

Unit 4: Criminal Justice System

Broad Components of criminal justice system, Policing styles and principles, Police's power of investigation, filing of criminal charges, Community policing, Policing a heterogeneous society, Correctional measures and rehabilitation of offenders, Human rights and criminal justice system in India.

Suggested Readings:

1. S.H. James and J.J. Nordby, Forensic Science: An Introduction to Scientific and Investigative Techniques, 2nd Edition, CRC Press, Boca Raton (2005).
2. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey(2004).
3. J.L. Jackson and E. Barkley, Offender Profiling: Theory, Research and Practice,Wiley, Chichester(1997).
4. R. Gupta, Sexual Harassment at Workplace, LexisNexis, Gurgaon(2014).
5. Paranjape, N.V. Criminology and Penology, Central Law Publication, Allahabad.
6. William Bailey,The Encyclopedia of Police Science, Second Edition Garland publishing, INC, London.
7. Suderland,E.Hand Donald R. Cressy; The Principals of Criminology, The Times of India Press, Bombay,1968
8. Ahuja,RamCriminology,RawatPublication,Jaipur
9. Wayne Petherick, Brent Turvey, Claire Ferguson, Forensic Criminology, Academic Press
Donald, J. (1992), The Police Photographer's Guide, Photo Test Books, Arlington Heights.

Three-year UG Course in Forensic Science
Semester – IFSUALT2
Core -2
Practical based on Crime and Society

Credit: 2

1. To review past criminal cases and elucidate which theory best explains the criminal behavior of the accused.
2. To review crime cases where criminal profiling assisted the police to apprehend the accused.
3. To cite examples of crime cases in which the media acted as a pressure group.
4. To evaluate the post-trauma stress amongst victims of racial discrimination.
5. To correlate deviant behavior of the accused with criminality (take a specific example).
6. To evaluate Victimology in a heinous crime.
7. To examine a case of juvenile delinquency and suggest remedial measures.
8. To evaluate how rising standards of living affect crime rate.
9. To review the recommendations on modernization of police stations and evaluate how far these have been carried out in different police stations.
10. To visit a 'Model Police Station' and examine the amenities vis-à-vis conventional police stations.
11. To examine steps being taken for rehabilitation of former convicts and suggest improvements.
12. To prepare a report on interrogation cells and suggest improvements.

Three-year UG Course in Forensic Science
Semester – II -FSUBTT1
Core - 3
Criminal Law

Credits: 3

Learning Objectives: After studying this paper the students will know:

- a. Elements of Criminal Procedure Code related to forensic science.*
- b. Acts and provisions of the Constitution of India related to forensic science.*
- c. Acts governing socio-economic crimes.*
- d. Acts governing environmental crimes.*

Unit 1: Law to Combat Crime

Introduction towards Indian Penal Code, Criminal Procedure Code and Indian Evidence Act, Relevant sections of IPC pertaining to offences against persons, property, Cr.PC, IEA and their Amendments.

Unit 2: Crime and Criminology

Classification of cases, Types of offences, Essential elements of criminal law, Constitution and hierarchy of criminal courts, Legal procedure pertaining to expert witness testimony, Expert witness.

Unit 3: Constitution of India

Preamble, Fundamental Rights, Directive Principles of State Policy– Articles 14, 15, 20, 21, 22, 51A, summary trial-Section 260 (2) and Judgments in abridged forms-Section 355.

Unit 4: Acts Pertaining to Socio-economic and Environmental Crimes

Detail description of Narcotic, Drugs and Psychotropic Substances (NDPS) Act, Essential Commodity Act, Drugs and Cosmetics Act, Explosive Substances Act, Arms Act. Dowry Prohibition Act, Prevention of Food Adulteration Act, Prevention of Corruption Act, Wildlife Protection Act. I.T.Act 2000, Environment Protection Act, Untouchability Offences Act.

Suggested Readings:

- 1.D.A. Bronstein, Law for the Expert Witness, CRC Press, Boca Raton (1999).
- 2.Vipa P. Sarthi, Law of Evidence, 6th Edition, Eastern Book Co., Lucknow (2006).
- 3.A.S. Pillia, Criminal Law, 6th Edition, N.M. Tripathi Pvt Ltd., Mumbai (1983).
- 4.R.C. Nigam, Law of Crimes in India, Volume I, Asia Publishing House, New Delhi (1965).
- 5.(Chief Justice) M. Monir, Law of Evidence, 6th Edition, Universal Law Publishing Co. Pvt. Ltd., New Delhi (2002).
- 6.Bayer Acts of Indian Penal Code, Criminal Procedure Code and Indian Evidence Act.
- 7.Turrey B; Criminal Profiling - An Introduction to Behavioral Evidence Analysis, Acad. Press Lond
- 8.Paranjape, N.V. Criminology and Penology, Central Law Publication, Allahabad.
9. William Bailey, The Encyclopedia of Police Science, Second Edition Garland publishing, INC, London.
10. Suderland, E. Hand Donald R. Cressy; The Principals of Criminology, The Times of India Press, Bombay, 1968
11. Reid, Sue Titus, Crime and Criminology, The Dryden Press, Illions
12. Ahuja, Ram Criminology, Rawat Publication, Jaipur
13. Suderland, E.H.; White Collar Crime, The Dryden Press, Newyork
14. Wayne Petherick, Brent Turvey, Claire Ferguson, Forensic Criminology, Academic Press
15. Donald, J. (1992), The Police Photographer's Guide, Photo Test Books, Arlington Heights,

Three-year UG Course in Forensic Science
Semester – II FSUBLT1
Core - 3 Practical
Practical based on preparing schedules

Credit: 2

1. To prepare a schedule of five cognizable and five non-cognizable offences.
2. To study the powers and limitations of the Court of Judicial Magistrate of First Class.
3. To prepare a schedule of the offences this may be tried under Section 260(2) of Criminal Procedure Code.
4. To study a crime case in which an accused was punished on charge of murder under Section 302.
5. To study a crime case in which an accused was punished on charge of rape under Section 375.
6. To cite example of a case in which the opinion of an expert was called for under Section 45 of the Indian Evidence Act.
7. To cite a case wherein a person was detained under Article 22(5) of the Indian Constitution. Express your views whether the rights of the person as enlisted in this Article were taken care of.
8. To cite a case under Article 14 of the Constitution of India wherein the Right to Equality before Law was allegedly violated.
9. To list the restrictions imposed on Right to Freedom of Worship under the Constitution of India.
10. To prepare a schedule of persons convicted under Narcotics, Drugs and Psychotropic Act statistically analyze the age group to which they belonged.
11. To study a case in which Drugs and Cosmetic Act was invoked.
12. To study a case in which Explosive Substances Act was invoked.
13. To study a case in which Arms Act was invoked.
14. In light of Section 304B of the Indian Penal Code, cite a case involving dowry death.
15. To study a case where in the Untouchability Offences Act was invoked on the basis of Article 15 of the Constitution of India.

Three-year UG Course in Forensic Science
Semester – II FSUBTT2
Core- 4

Credits: 3 Forensic Psychology

Learning Objectives: After studying this paper the students will know –

- a. The overview of forensic psychology and its applications.*
- b. The legal aspects of forensic psychology.*
- c. The significance of criminal profiling.*
- d. The importance of psychological assessment in gauging criminal behavior.*

Unit 1: Basics of Forensic Psychology

Definition and fundamental concepts, Forensic psychiatry, Psychology and law. Ethical issues in forensic psychology. Mental disorders and forensic psychology. Psychology of evidence – eyewitness testimony, confession evidence. Criminal profiling. Psychology in the courtroom, with special reference to Section 84 IPC (McNaughton's Rule), Durham Rule of Insanity.

Unit 2: Psychological Disorders

Classification of psychiatric disorders- Common Psychiatric Disorders- Schizophrenia, Bipolar Disorders, Anxiety Disorders, Phobia, Personality Disorder, Attention Deficit Hyperactive Disorder, Psychology of Serial murderers, terrorism. Use of Media and Intelligence for Commission of Crime. Gender Justice and Crime.

Unit 3: Juvenile delinquency

Theories of offending (social cognition, moral reasoning), Child abuse (physical, sexual, emotional), Juvenile Sex Offenders, legal controversies. Laws Related to Forensic Psychology & Competency to Stand Trial, Criminal and Civil Responsibilities.

Unit 4: Deception Detection Tools

Interviews, non-verbal detection, statement analysis, Voice stress analyzer, Hypnosis, Polygraphy – operational and question formulation techniques, ethical and legal aspects, the guilty knowledge test. Narco analysis and Brain Fingerprinting – principle and theory, ethical and legal issues.

Suggested Readings

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

Semester – II FSUBLT2
Core - 4 Practical
Practical based on Forensic Psychology

Credits: 2

1. To cite a crime case where legal procedure pertaining to psychic behavior had to be invoked.
2. To prepare a report on relationship between mental disorders and forensic psychology.
3. To review a crime case involving serial murders. Comment on the psychological traits of the accused.
4. To cite a crime case involving a juvenile and argue for and against lowering the age for categorizing an individual as juvenile.
5. To study a criminal case in which hypnosis was used as a means to detect deception.
6. To prepare a case report on Minnesota multiphasic personality inventory test.
7. To prepare a case report on Bhatia's battery of performance test of intelligence.
8. To cite a criminal case in which narco analysis was used as a means to detect deception.

Semester – III FSUCTT1
Core - 5
Forensic Dermatoglyphics

Credit: 3

Learning Objectives: After studying this paper the students will know –

- a. The fundamental principles on which the science of fingerprinting is based.*
- b. Fingerprints are the most infallible means of identification.*
- c. The world's first fingerprint bureau was established in India.*
- d. The method of classifying criminal record by fingerprints was worked out in India, and by Indians.*
- e. The physical and chemical techniques of developing fingerprints on crime scene evidence.*
- f. The significance of foot, palm, ear and lip prints.*

Unit 1: Basics of fingerprinting

Fingerprint, History of fingerprint. Development of fingerprints. Formation of ridges. Types of fingerprint patterns. Classification of fingerprint: Primary, Secondary, Sub secondary, Major, Final and Key.

Unit 2: Types of fingerprint evidences

Development of Latent fingerprint: Physical and Chemical method. Development of latent print on human skin, Constituents of sweat residue. Preservation of developed fingerprints.

Unit 3: Development of latent fingerprints

Application of light sources in fingerprint detection. Digital imaging for fingerprint enhancement, Developing fingerprints on gloves. Metal deposition method, Automated Fingerprint Identification System.

Unit 4: Other Impressions

Importance of footprints, Casting of foot prints, Electrostatic lifting of foot prints. Palm prints, Lip prints - Nature, location, collection and examination of lip prints. Ear prints and their significance.

Suggested Readings:

1. J.E. Cowger, Friction Ridge Skin, CRC Press, Boca Raton (1983).
2. D.A. Ashbaugh, Quantitative-Qualitative Friction Ridge Analysis, CRC Press, Boca Raton (2000).
3. C. Champod, C. Lennard, P. Margot and M. Stoilovic, Fingerprints and other Ridge Skin Impressions, CRC Press, Boca Raton (2004).
4. Lee and Gaenslen's, Advances in Fingerprint Technology, 3rd Edition, R.S. Ramotowski (Ed.), CRC Press, Boca Raton (2013).

Semester – III **FSUCLT1**

Core - 5 Practical

Practical based on Finger Prints

Credits: 2

1. To record plain and rolled fingerprints.
2. To carry out ten-digit classification of fingerprints.
3. To identify different fingerprint patterns.
4. To carry out ridge tracing and ridge counting.
5. To develop latent fingerprint by physical and chemical method

Credits: 3

Three year UG Course in Forensic Science
Semester – III LS/FSC/C-306 L
Core - 6
Technological Methods in Forensic Science

Learning Objectives: After studying this paper the students will know –

- a. The importance of chromatographic and spectroscopic techniques in processing crime scene evidence.*
- b. The utility of colorimetry, electrophoresis and neutron activation analysis in identifying chemical and biological materials.*
- c. The significance of microscopy in visualizing trace evidence and comparing it with control samples.*

Unit 1: Instrumentation

Sample preparation for chromatographic and spectroscopic evidence. Measurement of pH, Concept of buffer solution preparation and its application in various forensic analysis methods. Chromatographic methods. Fundamental principles and forensic applications of thin layer chromatography, Paper chromatography, Gas chromatography and liquid chromatography including High Performance liquid Chromatography (HPLC), Affinity Chromatography, Gel Exclusion Chromatography, Ion Exchange Chromatography.

Unit 2: Spectroscopic methods

Fundamental principles and forensic applications of Ultraviolet-visible spectroscopy, infrared spectroscopy, atomic absorption spectroscopy, atomic emission spectroscopy and mass spectroscopy. X-ray spectrometry. Colorimetric analysis and Lambert-Beer law. Neutron activation analysis – fundamental principles and forensic applications.

Unit 3: Microscopy and Centrifugation

Fundamental principles of Microscopy. Different types of microscopes including light microscope, Polarization microscope, Comparison Microscope. Electron microscope- Scanning Electron Microscope (SEM) and Transmission Microscope (TEM), Forensic applications of microscopy. Principle of Sedimentation, Types of Centrifuges- Preparative centrifuges including Differential centrifuge, Density Gradient Centrifuge, Clinical Centrifuges.

Unit 4: Methods in DNA Forensics

DNA isolation from various sources (Semen, Blood, Saliva, Hair etc.), Electrophoresis- fundamental principles of Agarose Gel, SDS PAGE (Native and Denaturing) and its forensic applications. Genome content and its analysis.

Repetitive and Non repetitive DNA and its application in DNA forensics.

Suggested Readings:

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

Three year UG Course in Forensic Science
Semester – III FSUCLT2
Core - 6 Practical
Practicals based on Technological Methods

1. Measurement of pH and preparation of Buffers of various pH.
2. DNA isolation from body fluid.
3. Perform the Agarose Gel Electrophoresis for separation of forensic DNA sample.
4. To determine the concentration of a colored compound by colorimetry analysis.
5. To carry out thin layer chromatography of ink samples.
6. To carry out separation of organic compounds by paper chromatography.
7. To identify drug samples using UV-Visible spectroscopy.
8. Preparation of Gel exclusion column and analysis of proteins.

Three-year UG Course in Forensic science
Semester – III **FSUCTT3**

Core- 7
Criminalistics

Credits: 3

Learning Objectives: After studying this paper the students will know –

- a. The methods of securing, searching and documenting crime scenes.*
- b. The art of collecting, packaging and preserving different types of physical and trace evidence at crime scenes.*
- c. The legal importance of chain of custody.*
- d. The tools and techniques for analysis of different types of crime scene evidence.*

Unit 1: Crime Scene Management

Types of crime scenes – indoor and outdoor. Securing and isolating the crime scene. Crime scene search methods. Safety measures at crime scenes. Legal considerations at crime scenes. Documentation of crime scenes – photography, videography, sketching and recording notes. Duties of first responders at crime scenes. Coordination between police personnel and forensic scientists at crime scenes. The evaluation of 5Ws (who? what? when? where? why?) and 1H (how?). Crime scene logs.

Unit 2: Crime Scene Evidence

Classification of crime scene evidence – physical and trace evidence. Lockard's principle. Collection, labelling, sealing of evidence. Hazardous evidence. Preservation of evidence. Chain of custody. Reconstruction of crime scene. Nature of Examination of Physical Evidences (Instrumental and Chemical).

Unit 3: Physical Evidences

Glass evidence – collection, packaging, analysis. Matching of glass samples by mechanical fit and refractive index measurements. Analysis by spectroscopic methods. Fracture analysis and direction of impact. Paint evidence – collection, packaging and preservation. Analysis by destructive and non-destructive methods. Importance of paint evidence in hit and run cases. Cloth evidence- importance, location, collection and comparison of cloth samples. Forensic gemology.

Unit 4: Trace Evidences

Fiber evidence – artificial and man-made fibers. Collection of fiber evidence. Identification and comparison of fibers. Soil evidence – importance, location, collection and comparison of soil samples. Hair evidence – importance, collection, analysis of adhering material. Matching of pieces. Tool mark evidence. Classification of tool marks. Forensic importance of tool marks. Collection, preservation and matching of tool marks. Restoration of erased serial numbers and engraved marks.

Suggested Readings

1. A.J. Barry, Techniques of Crime Scene Investigation, 6th Edition Ed, CRC Press NY (2003).
2. M. Byrd, Crime Scene Evidence: A Guide to the Recovery and Collection of Physical Evidence, CRC Press, Boca Raton (2001).
3. P.L Kirk, Criminal Investigation, Inter Science Publisher Inc, New York.
4. Richard Saferestein, Criminalistics: An Introduction to Forensic Science Hall INC, USA.
5. S. Goutam and M.P. Goutam. Physical Evidences- Introduction & Bibliography on their Forensic Analysis. Shiv Shakti Book Traders, New Delhi.
6. S.H. James and J.J. Nordby. Forensic Science: An Introduction to Scientific and Investigative Techniques, CRC Press, USA.
7. T.J. Gardener and T.M. Anderson, Criminal Evidence, 4th Ed., Wadsworth, Belmont (2001).
8. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013).

Three-year UG Course in Forensic Science
Semester – III - FSUCLT3
Core - 7 Practical
Practical based on Crime scene samples

Credits: 2

1. To prepare a report on evaluation of crime scene.
2. To reconstruct a crime scene (outdoor and indoor).
3. To compare soil samples by density gradient method.
4. To compare paint samples by physical matching method.
5. To compare paint samples by thin layer chromatography method.
6. To compare glass samples by refractive index method.
7. To identify and compare tool marks.
8. To compare cloth samples by physical matching.

Three-year UG Course in Forensic Science

Semester – IV FSUDDT1

Core - 8

Forensic Chemistry

Credits: 3

Learning Objectives: After studying this paper the students will know

a. The methods of analyzing trace amounts of petroleum products in crime scene evidence. b. The methods of analyzing contaminants in petroleum products.

c. The method of searching, collecting, preserving and analyzing arson evidence. d. The significance of bomb scene management.

f. The classification and characteristics of the narcotics, drugs and psychotropic substances.

Unit1: Drugs of Abuse and Alcohols

Forensic chemistry: Definition and scope, Introduction to Narcotic drugs, Source of Narcotic Drug, Illicit Drugs- its classification, Cannabinoid, cannabidiol oil and its chemistry, Depressants, stimulants, Hallucinogens their Active components and method of analysis, Method of detection of illicit drugs, Benzodiazepines drugs and its abuse, Designer Drugs & Anabolic steroids, Analytical methods of analysis of IMFL, Country made and Illicit liquor, Denatured spirits and their analysis.

Unit2: Petroleum Products and Edible oil

Analysis of petroleum products Diesel, Petrol and Kerosene. Analysis of traces of petroleum products in forensic exhibits. Comparison of petroleum products. Adulteration of petroleum products. Edible oil and their adulterants. Argemone oil adulteration and its effect on human health, Mineral oil adulteration, Karanja Oil adulteration, Analytical methods to detect adulteration.

Unit 3: Arson and Explosives

Chemistry of fire. Fire scene patterns. Location of point of ignition. Recognition of type of fire. Searching the fire scene. Analysis of fire debris. Analysis of ignitable liquid residue. Scientific investigation and evaluation of clue materials. Information from smoke staining. Identification of corrosive acid in Vitriol Throwing (Vitriolage) cases, Classification of explosives – low explosives and high explosives. Homemade explosives. Military explosives. Blasting agents. Pyro techniques, Synthesis and characteristics of TNT, PETN and RDX. Explosion process. Post blast residue collection and analysis. Detection of hidden explosives.

Unit 4: Paint, Soil and Glass

Paint Analysis: Paint manufacturing, analysis of paint sample, Soil analysis- physical and chemical properties, Glass manufacturing, forensic examination of glass, Identification, preliminary test, Density, Refractive index, Elemental analysis of glass.

Suggested Readings:

1. Khan, JaVed I., Ho, Mat H. Analytical Methods in Forensic Chemistry. New York: Working Procedure Manua Chemistry/Toxicology/Explosives/Narcotics, DFS Pub. New Delhi
2. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, Scientific Evidence in Civil and Criminal Cases, 4th Edition, The Foundation Press, Inc., New York (1995).
3. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).
4. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013).
5. S. Ballou, M. Houck, J.A. Siegel, C.A. Crouse, J.J. Lentini and S. Palenik in Forensic Science, D.H. Ubelaker (Ed.), Wiley-Blackwell, Chichester (2013).
6. Kennedy, Thomas J., Christian, Jr., Donnell Basic Principles of Forensic Chemistry, Springer
7. J.D. De Haan, Kirk's Fire Investigation, 3rd Edition, Prentice Hall, New Jersey (1991)
8. Goutam, M. P. and Goutam S Analysis of Plant Poison, Selective & Scientific Books, New Delhi.
9. Feigl; Spot Test in Organic Analysis, Elsevier Pub., New Delhi.
10. Curry A.S; Analytical Methods in Human Toxicology, Part II, CRC Press Ohio
11. Clark, E.G.C.; Isolation and Identification of Drugs, Vol I&II, Academic Press,
12. Sunshine I; Year book of Toxicology, CRC Press Series, USA
13. Michael J. Deverlanko et al: Hand Book of Toxicology CRC Press, USA.
14. Parikh C.K; Text Book of Medical Jurisprudence Forensic Medicines and Toxicology. CBS Pub. New Delhi.
15. Balraj S. Parmar et al; Pesticide Formulation, CBS Publishers, New Delhi.

Three year UG Course in Forensic Science
Semester – IV FSUDLT1
Core - 8 Practical
Practicals based on Forensic Chemistry

1. To carry out analysis of diesel, Petrol and Kerosene oil.
2. Detection of cannabinoid drug using TLC.
3. To analyze arson accelerators.
4. Detection of argemone oil adulteration in edible oil.
5. To carry out analysis of explosive substances.
6. To separate explosive substances using thin layer chromatography.
7. Analysis of physical and chemical properties of Soil.

Semester – IV

FSUDDT2

Core- 9

Questioned Documents

Credits: 3

Learning Objectives: After studying this paper the students will know –

- a. The importance of examining questioned documents in crime cases.*
- b. The tools required for examination of questioned documents.*
- c. The significance of comparing hand writing samples.*
- d. The importance of detecting frauds and forgeries by analyzing questioned documents.*

Unit 1: Nature and Scope of Questioned Documents

Definition of Questioned documents. Types of questioned documents. Preliminary examination, Collection, Handling and Transportation of document. Examination of computer generated, typed and Xeroxed documents. Determining the age of documents.

Unit 2: Handwriting and its Comparison

Handwriting and its Principles. Comparison of handwriting, Natural variations and fundamental divergences in handwritings. Class and individual characteristics. Request and Standard Documents. Examination of signatures characteristics, Examination of paper and ink.

Unit 3: Forgeries

Types of Forgery and its examination. Alterations in documents. Indented and invisible writings. Charred documents. Disguised writing and anonymous letters. Examination of counterfeit Indian currency notes, passports, VISAs and stamp papers, seal, rubber & other mechanical impressions.

Unit 4: Basic tools for examination of Documents

Basic tools needed for forensic documents' examination. Ultraviolet, Visible and Fluorescence, Spectroscopy. Photomicrography, Microphotography. Video Spectral Comparator, Electrostatic Detection Apparatus.

Suggested Readings:

- 1.O. Hilton, Scientific Examination of Questioned Documents, CRC Press, Boca Raton (1982).
- 2.A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, Scientific Evidence in Civil and Criminal Cases, 4th Edition, Foundation Press, New York (1995).
- 3.R.N. Morris, Forensic Handwriting Identification: Fundamental Concepts and Principles, Academic Press, London (2000).
- 4.E. David, The Scientific Examination of Documents – Methods and Techniques, 2nd Edition, Taylor & Francis, Hants (1997).
- 5.Albert S. Osborn; Questioned Documents, 2nd Ed., Universal Law Pub., Delhi.
- 6.Wilson R. Harrison; Suspect Documents Their Scientific Examination.
- 7.Saferestein, Criminalistics: An Introduction to Forensic Science. Prentice, Hall.
- 8.Sharma, B.R.: Forensic Science in Criminal Investigation and Trials, Central Law Agency, Allahabad, 1974.
9. Roy A Huber, A.M. Headrick; Handwriting Identification- Facts and
- 10.Laboratory working procedure manual, Documents DFS, New Delhi,2005
- 11.Fundamental, CRC Press identification, profusely illustrated, Law Book, Allahabad
Universal Law Pub. Delhi Indian

Three-year UG Course in Forensic Science
Semester – IV **FSUDDT3**

Core- 10
Forensic Biology

Credits: 3

Learning Objectives: After studying this paper the students will know –

- a. The significance of biological and serological evidence.*
- b. The forensic importance of hair evidence.*
- c. The importance of biological fluids – blood, urine, semen, saliva, sweat and milk – in crime investigations.*
- d. How wildlife forensics aid in conserving natural resources.*
- e. How forensic entomology assists in death investigations.*

Unit 1: Biological Evidence

Nature and importance of biological evidence. Composition and Functions of Blood and Semen. Types and identification of microbial organisms of forensic significance. Diatoms and their forensic significance.

Unit 2: Examinations of Biological Evidences

Identification of Blood, Semen, Saliva and Urine through preliminary and confirmatory crystal examinations. Morphology and biochemistry of human hair. Significance of hair evidences. Transfer, persistence and recovery of hair evidence. Structure and comparison of human and Animal hair.

Unit 3: Wildlife Forensics

Fundamentals of wildlife forensic. Significance of wildlife forensic. Protected and endangered species of animals and plants. Illegal trading in wildlife items, such as skin, fur, bone, horn, teeth, flowers and plants. Identification of physical evidence pertaining to wildlife forensics. Identification of pug marks of various animals.

Unit 4: Forensic Entomology

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

Suggested Readings:

1. L. Stryer, Biochemistry, 3rd Edition, W.H. Freeman and Company, New York (1988).
2. R.K. Murray, D.K. Granner, P.A. Mayes and V.W. Rodwell, Harper's Biochemistry, APPLETON & Lange, Norwalk (1993).
3. S. Chowdhuri, Forensic Biology, BPRD, New Delhi (1971).
4. R. Saferstein, Forensic Science Handbook, Vol. III, Prentice Hall, New Jersey (1993).
5. G.T. Duncan and M.I. Tracey, Serology and DNA typing in, Introduction to Forensic Sciences, 2nd Edition, W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).

Three-year UG Course in Forensic Science
Semester – IV **FSUDLT3**
Core - 10 Practical
Practical based on Forensic Biology

Credits: 2

1. To examine hair morphology and determine the species to which the hair belongs.
2. To prepare slides of scale pattern of human hair.
3. To examine human hair for cortex and medulla.
4. To carry out microscopic examination of pollen grains.
5. To carry out microscopic examination of diatoms.
6. To cite a crime case in which diatoms have served as forensic evidence.
7. To prepare a case report on forensic entomology.
8. To prepare a case report on problems of wildlife forensics.

Three-year UG Course in Forensic Science
Semester – V **FSUETT1**
Core- 11
Forensic Ballistics

Credits: 3

Learning Objectives: After studying this paper the students will know –

- a. The classification of firearms and their firing mechanisms.*
- b. The methods of identifying firearms.*
- c. The characteristics of ammunition.*
- d. The importance of firearm evidence.*
- e. The nature of firearm injuries.*
- f. The methods for characterization of gunshot residue.*

Unit 1: Introduction to Firearm

History and development of firearms. Classification of firearms. Weapon types and their operation. Firing mechanisms of different firearms.

Unit 2: Internal/External/Terminal Ballistic

Internal ballistics – Definition, ignition of propellants, shape and size of propellants, manner of burning, and various factors affecting the internal ballistics: lock time, ignition time, barrel time, erosion, corrosion and gas cutting. External Ballistics – Measurements of trajectory parameters, introduction to automated system of trajectory computation and automated management of ballistic data. Terminal Ballistics – Effect of projectile on hitting the target: function of bullet shape, striking velocity, striking angle and nature of target, tumbling of bullets, Ricochet and its effects, stopping power.

Unit 3: Ammunition

Types of ammunition. Constructional features and characteristics of different types of cartridges and bullets. Primers and priming compounds. Projectiles, Headstamp markings on ammunitions. Different types of marks produced during firing process on cartridge – firing pin marks, breech face marks, chamber marks, extractor and ejector marks.

Unit 4: Firearm Evidence

Matching of bullets and cartridge cases in regular firearms. Identification of bullets, pellets and wads fired from improvised, country made firearms. Automated method of bullet and cartridge case comparison. Determination of range of fire and time of fire. Mechanisms of formation of gunshot residues. Methods of analysis of gunshot residues from shooting hands and targets, with special reference to clothing. Identification and nature of firearms injuries. Reconstruction with respect to accident, suicide, murder and self-defense.

Suggested Readings:

1. B.J. Heard, Handbook of Firearms and Ballistics, Wiley and Sons, Chichester (1997).
2. W.F. Rowe, Firearms identification, Forensic Science Handbook, Vol. 2, R. Saferstein (Ed.), Prentice Hall, New Jersey (1988).
3. A.J. Schwoeble and D.L. Exline, Current Methods in Forensic Gunshot Residue Analysis, CRC Press, Boca Raton (2000).
4. E. Elaad in Encyclopedia of Forensic Science, Volume 2, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).

Three-year UG Course in Forensic Science
Semester –V **FSUFLT1**
Core - 11 Practical
Practical based on Forensic Ballistics

Credits: 2

1. To describe, with the aid of diagrams, the firing mechanisms of different types of firearms.
2. To correlate the velocity of bullet with the impact it produces on the target.
3. To correlate the striking angle of the bullet with the impact on the target.
4. To estimate the range of fired bullets.
5. To carry out the comparison of fired bullets.
6. To carry out the comparison of fired cartridge cases.
7. To identify gunshot residue.
8. To correlate the nature of injuries with distance from which the bullet was fired.
9. To differentiate, with the aid of diagram, contact wounds, close range wounds and distant wounds.

Three-year UG Course in Forensic Science
Semester –V **FSUETT2**
Core- 12
Forensic Toxicology

Credits: 3

Learning Objectives: After studying this paper the students will know:

- a. The significance of toxicological studies in forensic science.*
- b. The classification of poisons and their modes of actions.*
- c. The absorption of poisons in body fluids.*
- d. The forensic identification of illicit liquors.*
- e. The classification and characteristics of the narcotics, drugs and psychotropic substances.*

Unit 1: Basics of Toxicology

Toxicology: Definition and Scope, Significance of toxicological findings, Techniques used in toxicology, Toxicological analysis and chemical intoxication tests, Postmortem Toxicology, Clinical toxicology, Dose-response relationship, Lethal dose 50, Lethal concentration 50 and Effective dose 50.

Unit 2: Poisons

Poison: Definition, Classification, Physico-chemical characteristics and mode of action of poisons, Metabolism and excretion, Accidental, Suicidal and Homicidal poisonings and relevant Sections, Signs and symptoms of common poisoning and their antidotes, Collection and preservation of viscera, blood and urine for various poison cases, Extraction and isolation of poison from viscera.

Unit 3: Identification and Analysis of Poisons

Identification and Analysis of Biocides and Heavy metals in body fluids, General Introduction to Animal poisons, Vegetable poisons, Poisonous seeds, fruits, roots and mushrooms, Alcoholic and non-alcoholic illicit liquors, Analysis and identification of ethyl alcohol, Estimation of ethyl alcohol in blood and urine.

Unit 4: Identification and Analysis of Drugs

Drug: Definition, Classification and Identification of NDPS, Narcotics, stimulants, depressants and hallucinogens, General characteristics and common example of natural, synthetic and semi-synthetic narcotics, drugs and psychotropic substances, Designer drugs, Drugs and driving. Dope tests.

Suggested Readings:

- 1.R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).
- 2.F.G. Hofmann, A Handbook on Drug and Alcohol Abuse, 2nd Edition, Oxford University Press, New York (1983).
- 3.S.B. Karch, The Pathology of Drug Abuse, CRC Press, Boca Raton (1996).
- 4.A.W. Jones, Enforcement of drink-driving laws by use of per se legal alcohol limits: Blood and/or breath concentration as evidence of impairment, Alcohol, Drug and Driving, 4, 99 (1988).
- 5.Kennedy, Thomas J., Christian, Jr., Donnell Basic Principles of Forensic Chemistry, Springer
- 6.Saferstein, Criminalistics: An Introduction to Forensic Science. Prentice Hall
- 7.John D. DeHaan; Kirk's Fire Investigation, Prentice Hall Eaglewood Cliffs, N.J
- 8.Yinon J; Modern Methods & Application in Analysis of Explosives, John Wiley.
- 9.Goutam, M. P. and Goutam S Analysis of Plant Poison, Selective & Scientific Books, New Delhi.
- 10.Feigl; Spot Test in Organic Analysis, Elsevier Pub., New Delhi.
- 11.Clark, E.G.C.; Isolation and Identification of Drugs, Vol I&II, Academic Press,
- 12.Sunshine I; Year book of Toxicology, CRC Press Series, USA
13. Michael J. Deverlanko et al: Hand Book of Toxicology CRC Press, USA.
- 14.Parikh C.K; Text Book of Medical Jurisprudence Forensic Medicines and Toxicology. CBS Pub. New Delhi.
15. Robert J. Flanagan, Andrew A. Taylor, Ian D. Watson, Robin Whelpton Fundamentals of Analytical Toxicology, Wiley.
16. Bamford Frank. Poisons- their isolation and identification, J &A Churchill Ltd

Three-year UG Course in Forensic Science
Semester –V **FSUELT2**

Core - 12 Practical

Practical based on Forensic Toxicological analysis

Credits: 2

- 1.To identify biocides.
- 2.To identify metallic poisons.
- 3.To identify organic poisons.
- 4.To identify ethyl alcohol.
- 5.To identify methyl alcohol.
- 6.To carry out quantitative estimation of ethyl alcohol.
- 7.To prepare iodoform.
- 8.To identify drugs of abuse by spot tests.
- 9.To perform color tests for barbiturates.
10. To separate drugs of abuse by thin layer chromatography.

Three-year UG Course in Forensic Science
Semester – VI **FSUFTT1**
Core- 13
Forensic Anthropology

Credits: 3

Learning Objectives: After studying this paper the students will know –

- a. Importance of forensic anthropology in identification of persons.*
- b. Different techniques of facial reconstruction and their forensic importance.*
- c. Significance of somatoscopy and somatometry.*

Unit 1: Significance of Forensic Anthropology

Scope of forensic anthropology. Introduction and forensic significance of osteometry and craniometry in personal identification Study of human skeleton. Nature, formation, types and identification of human bones. Comparative skeletal anatomy of human and non human bones. Determination of age, sex, stature and side (long bones) from skeletal material.

Unit 2: Forensic Odontology

Development and scope. Role in mass disaster and personal identification. Types of teeth and their functions. Structural variation in human and non-human teeth. Dental anomalies and their importance in personal identification. Eruption sequence, Gustafson's method. Age and sex determination from teeth. Bite marks its forensic significance and role in personal identification.

Unit 3: Personal Identification – Somatoscopy and Somatometry

Somatoscopy – Introduction and forensic significance in personal identification. Observation of hair on head, forehead, eyes, root of nose, nasal bridge, nasal tip, chin, Darwin's tubercle, ear lobes, supra-orbital ridges, physiognomic ear breadth, circumference of head. Scar marks and occupational marks. Somatometry – Introduction and forensic significance in personal identification. Measurements of head, face, nose, cheek, ear, hand and foot, body weight, height. Indices - cephalic index, nasal index, cranial index, upper facial index.

Unit 4: Facial Reconstruction

Portrait Parle/ Bertillon system. Photofit/identity kit. Facial superimposition techniques. Cranio facial super imposition techniques – photographic super imposition, video superimposition, Roentgenographic superimposition. Use of somatoscopic and

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

Suggested Readings:

1. M.Y. Iscan and S.R. Loth, The scope of forensic anthropology in, Introduction to Forensic Sciences, 2nd Ed., W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
2. D. Ubelaker and H. Scammell, Bones, M. Evans & Co., New York (2000).
3. S.Rhine, Bone Voyage: A Journey in Forensic Anthropology, University of Mexico Press, Mexico (1998).

Three year UG Course in Forensic Science
Semester –VI **FSUFLT1**
Core - 13 Practical
Practical based on Forensic Anthropology

Credit: 2

1. To determine age from skull and teeth.
2. To determine of sex from skull.
3. To determine sex from pelvis.
4. To study identification and description of bones and their measurements.
5. To investigate the differences between animal and human bones.
6. To perform somatometric measurements on living subjects.
7. To carry out craniometric measurements of human skull.
8. To estimate stature from long bone length.
9. To conduct portrait parley using photo fit identification kit.

Three-year UG Course in Forensic Science
Semester –VI **FSUFTT2**
Core- 14
Forensic Medicine

Credits: 3

Learning Objectives: After studying this paper the students will know –

- a. The duties of the first responding officer who receives a call on homicide or suicide case.*
- b. The steps involved in processing the death scene.*
- c. The importance of ascertaining whether the crime was staged to appear as suicide or accident.*
- d. The importance of bloodstain patterns in reconstructing the crime scene.*
- e. The importance of autopsy.*
- f. The importance of forensic odontology*

Unit 1: Medical Jurisprudence

Definition, aims, concept, fundamental aspects and scope of medical Jurisprudence, Legal procedure in criminal court, Medical evidence and medical witness, Legal aspects of medical practices, Medical negligence, Consent in medical practices.

Unit 2: Autopsy

Objectives of Autopsy, Rules for medico-legal Autopsies, Medico-legal vs. Hospital Autopsy, Autopsy report, Procedure of Autopsy: laboratory procedure, Second Autopsy, obscure Autopsy, Preservation of dead bodies, Handling of highly infected bodies, Psychological Autopsy, Artifacts.

Unit 3: Death and its Investigation

Death: definition, classification, mode, manner and causes of death, Exhumation, Determination of time since death, Investigation of Asphyxial death, Death due to drowning. Investigation of sexual offences.

Unit 4: Injuries and its Examination

Injuries: Definition, types and classification, Injuries due to burns and scald, lightning and electricity, Radiation Injuries, Mechanical injuries, Bomb blast and explosion injuries, Traffic injuries and Regional injuries, Ante mortem and post mortem injuries, Aging of injuries, Artificial injuries.

Suggested Readings:

- 1.K. Smyth, *The Cause of Death*, Van Nostrand and Company, New York (1982).
- 2.M. Bernstein, Forensic odontology in, *Introduction to Forensic Sciences*, 2nd Ed., W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
- 3.J. Dix, *Handbook for Death Scene Investigations*, CRC Press, Boca Raton (1999).
- 4.H.B. Baldwin and C.P. May in, *Encyclopedia in Forensic Science*, Volume 1, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).
- 5.V.J. Geberth, *Practical Homicide Investigation*, CRC Press, Boca Raton (2006).
- 6.T. Bevel and R.M. Gardner, *Bloodstain Pattern Analysis*, 3rd Edition, CRC Press, Boca Raton (2008).
- 7.W.J. Tilstone, M.L. Hastrup and C. Hald, *Fisher's, Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013)

Semester –VI **FSUFLT2**
Core - 14 Practical
Practical based on Forensic Medicine

Credits: 2

- 1.To design a questionnaire for the first responder to the death scene.
- 2.To design a protocol to deal with the media at the crime scene.
- 3.To design a checklist for the forensic scientists at the death scene.
- 4.To design a canvass form giving description of an unidentified victim.
- 5.To analyze and preserve bite marks.

Semester – IFSUATG1
Generic Elective-1
Elementary Forensic Science

Credits: 3

Unit I: Elementary Forensic Science

Forensic Science and its branches, Principles of Forensic Science; Scene of Crime – Types, Sketching and Searching methods, Chain of custody; Collection, packing and forwarding of Physical evidences; Forensic Experts; Introduction to IPC, IEA, Cr.PC.

Unit II: Criminology and Police Science

Crime and Criminal, Criminology and Penology; Classification of Offences under IPC; Police Science and Organizational structure of Police; State Armed Force (SAF), Home Guard, Research and Analysis Wing (RAW), CID, CBI, BPR&D and Interpol.

Unit III: Finger Prints and Questioned Documents

Questioned Documents: Definition, Classification Types, Principles of Hand writing Identification and its Characteristics Fingerprints: History, Classification, Development, Pattern, Types and characteristics for personal identification.

Unit IV: Cyber Forensics

Cyber Forensic, Cyberspace, Computer crime, LAN,WAN, MAN, IT ACT 2000, OSI Model, Basic principle of security, Active attack, Passive attack, Basic of Forensic Speaker Identification, Hacking and Types of Hackers, Basic of Cryptography and Steganography.

Suggested Readings:

1. Hilton; O. Scientific Examination of Questioned Documents, Elsevier, NY.
2. Albert S. Osborn; Questioned Documents, 2nd Ed., Universal Law Pub., Delhi.
3. Wilson R. Harrison; Suspect Documents Their Scientific Examination.
4. Saferstein, Criminalistics: An Introduction to Forensic Science. Prentice, Hall.
5. Sharma, B.R.: Forensic Science in Criminal Investigation and Trials, Central Law Agency, Allahabad, 1974.
6. Relevant sections of Information technology Act 2000.
7. Esharenana, Adoni, Frame works for ICT Policy Government, Social and Legal Issues. Information Science Reference, Harsey, New YORK.
8. Robert C. Newman, Computer Forensics: Evidence Collection and Management Auerbach Publications.
9. Eoghan Casey, Handbook of Computer Crime Investigation: Forensic Tools and Technology Academic Press
10. Clark, Franklin, and Diliberto, Ken, (1996). Investigating computer Crime, CRC Press, Boca Raton, Florida, USA

Semester – IFSUALG1
Generic Elective -1 Practical
Practical based on Crime Scene Investigation

Credits: 2

1. Sketching and Photography of Crime scene.
2. Searching and collection of physical evidence at crime scene.
3. Recording and Identification of Fingerprints.
4. Development of latent finger print on glass, paper, polished surface.
5. Examination of Erasures on Questioned document
6. Comparison of Handwriting and Signatures.
7. Imaging of hard disc, restoration of deleted file.
8. Password cracking and e-mail tracking.

Semester – II **FSUBTG1**
Generic Elective-2
Applied Forensic Science

Credits: 3

Unit I: Forensic Biology

Preliminary and Confirmatory examination of Blood, Saliva, Semen, Urine and its Forensic Significance. Microscopic examination of Human and Animal Hair, Importance of Wild Life Forensics and Identification of Pug marks of various animals. DNA Fingerprinting in Forensic Science.

Unit II: Forensic Medicine and Toxicology:

Poisons–Definition, Scope, Classification, Legislations concern to poisoning in India, Medico-legal Autopsy, Medico-legal Report, P M Findings in unnatural death, Introduction to methods of isolation of poison from Viscera, Collection and Preservation of viscera in fatal cases.

Unit III: Forensic Chemistry

Definition and Scope, Examination of Fire and Arson, Country made and Illicit liquor, Vitriolage cases, Analysis of Petrol and Diesel, Drugs: Definition, Classification and legislations, Introduction to Narcotic, Depressants, stimulants, and Hallucinogens, Designer Drugs & Nootropics.

Unit IV: Forensic Ballistics

Ballistics: Definition and scope, Firearms: Definition, Classification and Characteristics, Ammunition: Definition as per Indian Arms Act and classification, General Introduction to explosives.

Suggested Readings:

1. Richard Saferstein; Forensic Science Hand Book, Vol II Prentice Hall, Englewood Cliff, NJ.
2. Goutam Shubhra; An Introduction to Forensic Hair Examination; Selective and Scientific Book, New Delhi
3. Saferstein R. – Criminalistics Prentice Hall, Inc, New York.
4. Working procedure manual: Biology/ Serology; DFS, New Delhi
5. Saferstein, Criminalistics: An Introduction to Forensic Science. Prentice Hall
6. Goutam, M. P. and Goutam S Analysis of Plant Poison, Selective & Scientific Books, New Delhi.
7. Michael J. Deverlanko et al: Hand Book of Toxicology CRC Press, USA.
8. Parikh C.K; Text Book of Medical Jurisprudence Forensic Medicines and Toxicology. CBS Pub. New Delhi.
9. Arms Acts, 1959 and Arms Rule, 1962.
10. Working procedure Manual: Ballistics, DFS New Delhi, Publication, 2005.
11. Sharma, B.R.: Forensic Science in Criminal Investigation and Trials, Central Law Agency, Allahabad, 1974.

Semester – II **FSUBLG1**
Generic Elective -2 Practical
Practical based on Applied Forensic Science

Credits: 2

1. Characterization of blood by Presumptive test and Crystallization assay
2. Identification of Saliva, Semen, Urine by Preliminary tests.
3. Analysis of narcotic drugs.
4. Identification of Dhatura alkaloids by TLC.
5. Determination of methanol and ethanol in liquor sample.
6. Detection of adulterant in vegetable oil.
7. Identification of firearms, cartridges, bullets, gunpowder, etc.
8. Matching bullets and cartridge cases by comparison microscope.

Semester – III **FSUCTG1**
Generic Elective-3
Crime Scene Management

Credits: 3

Unit I: Crime Scene Management

Introduction to Crime scene investigation, Types of Crime scene, Lockard's Exchange Principle, Expert's Team composition, Methodological Approach to processing the Crime scene, Sketching and mapping, Role of First responding Officer.

Unit II: Processing a Crime Scene

History and Development of Forensic Science, Basic Principles of Forensic Science, Organizational structure of Forensic Science Laboratories at State and Central level, White Collar crime, Organized Crimes, Economic crimes, Cybercrimes, Crime against children and Women.

Unit III: Searching the Crime Scene

Searching the Crime scene, Types of Searches, Zone Search: Ever Widening, Circle Strip Search, and Grid Search, Indoor searches and outdoor searches, searching of pattern and marks, Collection.

Unit IV: Collection and Packaging of evidence

Physical Evidences: Collection, Packaging and Forwarding of different types of evidences to the laboratories, Techniques for Handling Evidence, Biological evidence, Impression Evidence, Firearms and Ballistic Evidence, Drug Evidence, Toxicological Evidences.

Suggested Readings:

1. Sharma, B.R.: Forensic Science in Criminal Investigation and Trials, Central Law Agency, Allahabad, 1974.
2. Saferstein: Forensic Science Handbook, Vol I, II & III, Prentice Hall Inc. USA.
3. Saferstein: Criminalistics, 1976, Prentice Hall Inc. USA.
4. Siegel, J. A., Saukko, P. J. And Knupfer, G.C., Encyclopedia of Forensic Sciences, Academic Publishers, London
5. Barry,A.J.Fisher.; Techniques of Crime Scene Investigation,6th Edition Ed, C.R.C Press NY(2003)
6. Nordby, J Deed Reckoning; The Art of Forensic Detection, CRC Pre LLC(2000)
7. Eckett, W.G & James S.H; Interpretation of Bloodstains, Evidence of Crime Scene, Elsevier Pub. NY (1989)

Three-year UG Course in Forensic Science
Semester – III **FSUCLG1**
Generic Elective -3 Practical
Practical based on Crime Scene Management

Credits: 2

1. Reconstruction of crime scene.
2. Searching of physical evidence at crime scene.
3. Collection, packing and preservation of Physical evidences
4. Lifting of prints and impressions by caste and replicas.
5. Evaluation of Crime scene and photographs.
6. Sole prints comparison and their lifting from the scene of crime.

Three-year UG Course in Forensic Science
Semester – IV **FSU DTG1**
Generic Elective-4
Advanced Forensic Science

Credits: 3

Unit I: Forensic psychology

Forensic psychology, Importance of forensic psychology, Role of forensic psychology in Civil and Criminal cases, Modus Operandi and its role in criminal investigations, criminal profiling, methods of investigations, Narco analysis, Hypnosis, Brain Fingerprinting.

Unit II: Wildlife Forensics

Introduction to Wild life Forensics, Protected and endangered species of Animals and Plants, Identification of wild life materials, Identification of Pug marks of various animals, Forensic (medico-legal) necropsy of wildlife, Identification of Pollen grains.

Unit III: Forensic Anthropology

Definition and Scope, Identification of different types of bones, Age and gender determination from skull, Pelvis, and skeletal remains, Significance of Somatoscopy, Somatometry, Osteometry and Craniometry in Personal Identification.

Unit IV: Forensic Genetics

General principles of DNA extraction and PCR, Personal identification techniques - PCR, RFLP, Y-STR, Mitochondrial DNA, DNA profiling applications in disputed paternity cases, child swapping, missing person's identity.

Suggested Readings:

1. Encyclopedia of criminal and deviant behavior (2001) Clifton D. Pryor, Editor in chief Routledge, Taylor and Francis group.
2. David Canter, Forensic Psychology, Oxford University Press.
3. Irving B. Weiner, Allen K. Hess. The Handbook of Forensic Psychology. John Wiley & Sons.
4. Denis Howitt. Introduction to forensic and criminal psychology. Pearson Education, Ltd.
5. Jane E. Huffman, John R. Wallace Wildlife Forensics: Methods and Applications, Wiley Blackwell.
6. Vincent J. M. Di Maio, Suzanna E. Dana Handbook of forensic pathology CRC/Taylor & Francis.
7. Krogman, W.M. And Iscan, M. (1987): Human Skeleton in Forensic Medicine Charles & Thomas, U.S.A.
8. Nath, S An Introduction to Forensic Anthropology. Gian Publishing House, New Delhi.
9. A Seigel, P.J Saukoo and G C Knupfer; Encyclopedia of Forensic Sciences Vol. I, II and III, Acad. Press (2000)
10. Beals, R.L. and Hoizer, H. (1985): An introduction to Anthropology, Macmillan, New Delhi.
11. Saferstein, Richard, Handbook of Forensic Science, Vol. I, II, (Ed.) Prentice Hall, Eaglewood Cliffs, NJ.
12. William Goodwin, Adrian Linacre, SibteHadi; An introduction to forensic genetics John Wiley &son's ltd, UK.
13. John M. Butler. Forensic DNA Typing, Second Edition: Biology, Technology, and Genetics of STR Markers Elsevier Academic Press.
14. Siegel, J.A., Saukko, P.J., Knupfer, G. C., Encyclopedia of Forensic Science, Academic Press, London, 2000.
15. Evett, I.W. & Weir, B.S. 1998 Interpreting DNA Evidence: Statistical Genetics for Forensic Scientists. Sunderland Mass: Sinauer.

Three-year UG Course in Forensic Science
Semester – IV **FSUDLG1**
Generic Elective -4 Practical
Practical based on Advanced Forensic Science

Credits: 2

1. Identification of pollen grains.
2. Identification of Pug marks of animals.
3. Determination of sex from Skull Sutures & Pelvis.
4. Determination of age from teeth & Skull.
5. DNA extraction of conventional method.
6. DNA typing by PCR.

Three-year UG Course in Forensic Science
Semester –V FSUETD1
Discipline Specific Elective-1
Digital Forensics

Credits: 3

Learning Objectives: After studying this paper the students will know –

- a. The basics of digital forensics.*
- b. The cases which fall under the purview of digital crimes.*
- c. The types of digital crimes.*
- d. The elements involved in investigation of digital crimes.*

Unit 1: Fundamentals and Concepts

Fundamentals of computers Hardware and accessories – development of hard disk, physical construction, CHS and LBA addressing, encoding methods and formats. Memory and processor. Methods of storing data. Operating system. Software. .

Unit 2: Computer Crimes

Definition and types of computer crimes. Distinction between computer crimes and conventional crimes. Reasons for commission of computer crimes. Breaching security and operation of digital systems. Computer virus, and computer worm – Trojan horse, trap door, super zapping, logic bombs. Types of computer crimes – computer stalking, pornography, hacking, crimes related to intellectual property rights, computer terrorism, hate speech, private and national security in cyber space. An overview of hacking, spamming, phishing and stalking.

Unit 3: Computer Forensics Investigations

Seizure of suspected computer. Preparation required prior to seizure. Protocol to be taken at the scene. Extraction of information from the hard disk. Treatment of exhibits. Creating bit-stream of the original media. Collection and seizure of magnetic media. Examining forensically sterile media. Restoration of deleted files. Encryption and decryption methods.

Unit 4: Fundamentals of Networking

Introduction to network, LAN, WAN and MAN, TCP/IP Protocol, OSI Model, Relevant Section of IT Act 2000, Networking Protocols, Password cracking and E-mail tracking, File system, Network Security Threats, Vulnerabilities.

Suggested Readings:

1. R.K. Tiwari, P.K. Sastry and K.V. Ravikumar, *Computer Crimes and Computer Forensics*, Select Publishers, New Delhi (2003).
2. C.B. Leshin, *Internet Investigations in Criminal Justice*, Prentice Hall, New Jersey (1997).
3. R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).
4. E. Casey, *Digital Evidence and Computer Crime*, Academic Press, London (2000).
5. Andrew S. Tanenbaum, *Computer Networks*, 5th edition Library of Congress Cataloging-in-Publication Data, (1981).

Three-year UG Course in Forensic Science
Semester – V **FSUELD1**
Discipline Specific Elective Practical
Practical based on Digital Forensics-1

Credits: 2

1. To identify, seize and preserve digital evidence from crime scenes.
2. To detect deletions, obliterations and modifications of files using encase software.
3. To trace routes followed by e-mails and chats.
4. To identify the IP address of the sender of e-mails.
5. To demonstrate concealment techniques using cryptographic PGP.
6. To identify encrypted files.
7. To identify hidden files.
8. To use digital signatures for securing e-mail and online transactions.
9. To acquire data from PCs/laptops/HDDs/USBs, pen drives, memory cards and SIM cards.
10. To use symmetric and asymmetric keys for protection of digital record.
11. To carry out imaging of hard disks.

Three-year UG Course in Forensic Science
Semester – V **FSUETD2**
Discipline Specific Elective -2
Economic offences-2

Credits: 3

Unit 1: Taxonomy of Economic Offences/Criminogenic Factors

Fundamentals of economics in economic offences. Tax evasion. Excise duty evasion. Fraudulent bankruptcy. White collar crime. Economic exclusion. Black money. Corruption and bribery of public servants. Money laundering and hawala transactions. Insurance frauds. Corporate frauds. Bank frauds. Ponzi scheme. Pyramid scheme. Illicit trafficking in contraband goods. Illicit trafficking in arms. Illicit trafficking in explosives. Illicit drug trafficking. Trafficking in human organs. Cultural objects trafficking. Racketeering in employment. Racketeering in false travel documents.

Unit 2: Applied Economics in Processing Evidence

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

Unit 3: Prevention of Economic Offences

Legislations to deal with different forms of economic offences. RBI Act. SEBI Act. Competition Commission of India Act. Credit card frauds. Enforcement agencies to deal with different forms of economic offences. International perspectives – measures adopted by FBI and INTERPOL. Case histories of economic offences.

Unit 4: Legal recognition of Economic Crimes

Relevant Section related to Economic Crimes: Intellectual property crime, Corruption and bribery of public servants. Money laundering and hawala transactions. Insurance frauds. Corporate frauds. Bank frauds. Illicit trafficking in contraband goods.

Suggested Readings:

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

Three-year UG Course in Forensic Science

Semester – V

FSUELD2

Discipline Specific Elective Practical-2

Practical based on Economic offences

Credits: 2

1. To prepare a draft on fraudulent bankruptcy.
2. To cite a case of money laundering and hawala transactions in India and prepare a note on it.
3. To cite a case involving bank fraud and suggest measures to prevent such crimes.
4. To study a case involving illicit drug trafficking and trace the route by which the item was being smuggled.
5. To prepare a report on trafficking of heritage artefacts, including religious deities in India.
6. To study the applications of accounting software.
7. To study the applications of TALLY software.
8. To review the legislative measures to deal with a particular economic offence, identifying the loopholes and suggesting ways to plug the loopholes.
9. To prepare a schedule of national agencies involved in curbing economic offences. Outline their specific duties.

Three-year UG Course in Forensic Science

Semester –V

FSUETD3

Discipline Specific Elective

Forensic Serology

Credits: 3

Learning Objectives: After studying this paper the students will know –

a. The significance of serological evidence.

b. The importance of biological fluids – blood, urine, semen, saliva, sweat and milk – in crime investigations.

c. The usefulness of genetic markers in forensic investigations. d. The forensic importance of bloodstain patterns

Unit 1: Forensic Importance of Body fluids

Common body fluids. Composition and functions of blood. Collection and preservation of blood evidence. Distinction between human and non-human blood. Determination of blood groups. Antigens and antibodies. Forensic characterization of bloodstains. Typing of dried stains.

Unit 2: Composition and Functions of Body fluids.

Semen. Forensic significance of semen. Composition, functions and morphology of spermatozoa. Collection, evaluation and tests for identification of semen. Individualization on the basis of semen examination. Composition, functions and forensic significance of saliva, sweat, milk and urine. Tests for their identifications.

Unit 3: Bloodstain Pattern Analysis

Bloodstain characteristics. Impact bloodstain patterns. Cast-off bloodstain patterns. Projected bloodstain patterns. Contact bloodstain patterns. Blood trails. Bloodstain drying times. Documentation of bloodstain pattern evidence. Crime scene reconstruction with the aid of bloodstain pattern analysis.

Unit 4: Biochemical Markers Analysis

Cellular antigens, ABO blood groups, Extracellular proteins and intracellular enzymes, Typing of Biochemical Markers, Forensic Significance of Biochemical markers for identification and individualization.

Suggested Readings:

1. W.G. Eckert and S.H. James, Interpretation of Bloodstain Evidence at Crime Scenes, CRC Press, Boca Raton (1989).
2. G.T. Duncan and M.I. Tracey in Introduction to Forensic Sciences, 2nd Edition, W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
3. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).
4. T. Bevel and R.M. Gardner, Bloodstain Pattern Analysis, 3rd Edition, CRC Press, Boca Raton (2008).
5. Anita Y. Wonder. Bloodstain Pattern. Elsevier, London.

Three-year UG Course in Forensic Science

Semester –V

FSUELD3

Discipline Specific Elective Practical-3

Practical based on Forensic Serology

Credits: 2

1. To determine blood group from fresh blood samples.
2. To determine blood group from dried blood sample.
3. To carry out the crystal test on a blood sample.
4. To identify blood samples by chemical tests.
5. To identify the given stain as saliva.
6. To identify the given stain as urine.
7. To carry out cross-over electrophoresis.
8. To study the Blood Pattern Analysis.

Three-year UG Course in Forensic Science

Semester –V

FSUETD4

Discipline Specific Elective -4

Accident Investigations

Credit: 3

Learning Objectives: After studying this paper the students will know

a. The significance of photographs in accident cases.

b. The importance of trace evidences

c. The consequences of Accident analysis

Unit 1: Motor Vehicle Accidents

Accident scene, Sources of forensic information, Eyewitness accounts, Extent of vehicle damage, Visibility conditions, Photographs of accident site.

Unit 2: Surface Markings during RTA Cruses

Tire marks, skid marks, scuff marks etc., Maintenance of vehicles, abandoned vehicles, Importance of air bags, Railway accidents, Estimation of speed.

Unit 3: Accident Analysis

Pre-crash movement, Post-crash movement, Collision model, gauging driver's reaction, Occupants's kinematics, Types of injuries resulting from accident, Biomechanics of injuries, Hit and run investigations, Trace evidence at accident sites.

Unit 4: Tachographs

Forensic significance of tachograph data, Tachograph charts, Principles of chart analysis, Accuracy of speed record, Tire slip effects, Falsification and diagnostic signals, Route tracing.

Suggested Readings:

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

Three-year UG Course in Forensic Science

Semester –V

FSUELD4

Discipline Specific Elective Practical-4

B. Practical based on Accident Investigations

1. To lift tyre marks.
2. To study the pattern of skid marks.
3. To study the pattern of scuff marks.
4. To estimate the speed of the vehicle from skid marks.
5. To prepare a report on a major road accident.
6. To prepare a report on a major train accident.

Semester –VI

FSUFTD5

Discipline Specific Elective -5

A. DNA Typing

Credit: 3

Three year UG Course in Forensic Science

Semester – VI

LS/FSC/DSE-603(A)-L

Discipline Specific Elective (DSE 2 - A)

A. DNA Typing

Learning Objectives: After studying this paper the students will know –

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

Unit 1: Basic Principles

DNA as biological blueprint of life. DNA as carrier of genetic information, DNA denaturation and renaturation kinetics, Cot plot, Molecular Structure of Chromosomes, DNA packaging in chromosome, Centromeres and Telomeres, Physical map of Chromosome, Human genome content and analysis, Extraction of DNA for forensic

analysis. Quantitation of DNA – Spectrophotometric method, yield gel quantitation and slot blot quantitation.

Unit 2: Forensic DNA Typing

Collection of specimens. Polymerase chain reaction – historical perspective, Designing of PCR primers, Multiplex PCR, Sequence Polymorphisms, Individualization of evidence. Restriction fragment length polymorphism (RFLP) – genetic markers used in RFLP, typing procedure and interpretation of results. Role of fluorescent dyes, Short tandem repeats (STR), Core and 23 commonly used STR loci, nature of STR loci. Gender identification with Amelogenin, Mitochondrial DNA – sequence analysis, Touch DNA.

Unit 3: Parentage Testing

Principles of heredity. Genetics of paternity. DNA testing in disputed paternity. Mendelian laws of parentage testing. Mathematical basis of parentage identification. Missing body cases. Reference populations and databases. Role of DNA typing in identifying unrecognizable bodies. Allele frequency determination. Hardy-Weinberg law. Probability determination in a population database.

Unit 4: Non-Human DNA identification

Domestic animal testing, Species identification, Wildlife DNA testing, Identification through human parasite, Challenges with non-human DNA presentation in court room,

Suggested Readings

1. J.M. Butler, Forensic DNA Typing, Elsevier, Burlington (2005).
2. K. Inman and N. Rudin, An Introduction to Forensic DNA Analysis, CRC Press, Boca Raton (1997).
3. H. Coleman and E. Swenson, DNA in the Courtroom: A Trial Watcher's Guide, GeneLex Corporation, Washington (1994).
4. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013).

Three-year UG Course in Forensic Science
Semester – VI **LS/FSC/DSE-603(A)-P**

Discipline Specific Elective Practical A.

Practical's based on DNA Typing

1. Designing PCR primers for DNA amplification.
2. To carry out extraction of DNA from body fluids.
3. Perform the Amplified Fragment Length Polymorphism (AFLP) of given allele.
4. To carry out bacterial species identification.
5. To prepare a report on the role of DNA typing in solving paternity disputes.
6. Gender identification using amelogenin gene PCR amplification.

Semester –VI

FSUFTD6

Discipline Specific Elective

Modern Forensic Toxicology

Credit: 3

Learning Objectives: After studying this paper the students will know:

- a. The significance of various fundamental approaches of toxicology in forensic science.*
- b. The importance of an assortment of environmental issues concerning with the field of toxicology.*
- c. The implications of different aspects of industrial forensic toxicology.*
- d. The forensic identification of various types of household poisons and its forensic utility.*
- e. The different forensic episodic events concern with work place coincidences such as Laboratory, hospital's OT, Clinics, OPDs and medico-legal Autopsy center etc.*

Unit-I: Environmental Forensic Toxicology:

Concept, Definition, Scope and Forensic Significance, Forensic laws and policies Modes of toxic action, Measurement of toxicants and toxicity, Chemical use classes, Dose Response Relationship, Sources of toxic compounds, Movement of toxic compounds in the Environment.

Unit-II: Industrial Forensic Toxicology:

Concept, Definition, Scope and Forensic Significance, Forensic laws and policies, types of pollution and pollutants, Common industrial poisons, Industrial hygiene and toxicity, Management of Industrial effluents, Safety and applications at workplace.

Unit-III: Household Poisoning:

Concept, Definition, Scope and Forensic Significance, existing legislations, common household poisons: properties, Classification and mode of action, direct and indirect effects on human health.

Unit-IV: Workplace Poisoning:

Concept, Definition, Scope and Forensic Significance, Important regulations and policies, Common occupational poison and hazards, Chemical hazards of work place, direct and indirect effects on human health.

Suggested readings:

1. Environmental toxicology: biological and health effects of pollutants MH Yu, H Tsunoda,2000.
2. Introduction to environmental toxicology: impacts of chemicals upon ecological systems: W Landis&RSofield,2003.
3. PAHs: an ecotoxicological perspective: PET Douben,2003.
4. Environmental toxicology and risk assessment of pharmaceuticals from hospital wastewater: BI Escher & R Baumgartner,2011.
5. Handbook of industrial toxicology: by ER Plunkett,1976.
6. Industrial Toxicology: by LTFairhall,1949.
7. Industrial Toxicology: Safety and health applications in the workplace: by PL Williams& JL Burson,1985.
8. Hamilton and Hardy's industrial toxicology: by AJ Finkel,1983.
9. Patty's industrial hygiene and toxicology: Vol. III. Theory and rationale of industrial hygiene practice. by LV Cralley& LJ Cralley,1979.
10. Earth house hold: by G Snyder,1969.
11. Poison centers, poison prevention, and the pediatrician: by FH Lovejoy &WO Robertson,1994.
12. Unintentional household poisoning in children: by S Meyer&B Bailey,-2007.
13. House and hand dust as a potential source of childhood lead exposure: by JW Sayre & E Charney,1974.
14. Pesticides in household dust and soil: exposure pathways for children of agricultural families. by NJ Simcox& RA Fenske,1995.
15. Proctor and Hughes' chemical hazards of the workplace: by NH Proctor & JP Hughes,2004.
16. Plant micro-technique and microscopy: by SE Ruzin,1999.

Three-year UG Course in Forensic Science

Semester –VI

FSUFLD6

Discipline Specific Elective Practical

A. Practical based on Modern Forensic Toxicology

Credit: 2

1. Analysis of liquor as per BIS specifications.
2. Analysis of gasoline as per BIS specifications.
3. Analysis of explosive residues (Qualitative only).
4. Identification of vegetable poisons through microscopy.
5. M.P, B.P and flash point Determination.
6. Color/spot tests for common drugs of abuse.
7. TLC separation of drugs of abuse.

Three-year UG Course in Forensic Science
Semester –IFSUATL1
Skill Enhancement Course (SEC)
Handwriting Identification and Recognition

Credits: 2

Learning Objectives: After studying this paper the students will know

- a. The importance of examining questioned documents in criminal cases.*
- b. The tools required for examination of questioned documents.*
- c. The significance of comparing handwriting samples.*
- d. The importance of detecting frauds and forgeries by analyzing questioned documents.*

Unit 1: Handwriting Identification

Basis of handwriting identification, Characteristics of handwriting – scope and application, class and individual characteristics. Arrangement, alignment, margin, slant, speed, pressure, spacing, line quality, embellishments, movement and pen lifts. Factors influencing handwriting – physical, mechanical, genetic and physiological.

Unit 2: Handwriting Examination

Basis of handwriting comparison, Collection of handwriting samples, Forgery detection, Counterfeiting, Examination of altered and erased documents. Tools used in handwriting examination.

Unit 3: Handwriting Recognition

Basis of handwriting recognition, off-line and on-line handwriting recognition. Steps involved in handwriting recognition – pre-processing, feature extraction and classification. Application of handwriting recognition.

Unit 4: Basic tools for examination of Documents

Application of basic tools for the examination of Questioned Document, Ultraviolet, Visible and Fluorescence Spectroscopy. Photomicrography, Video Spectral Comparator, Electrostatic Detection Apparatus.

Suggested Readings:

1. O. Hilton, Scientific Examination of Questioned Documents, CRC Press, Boca Raton (1982)
2. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, Scientific Evidence in Civil and Criminal Cases, 4th Edition, Foundation Press, New York (1995)
3. Albert S. Osborn; Questioned Documents, 2nd Edition, Universal Law Pub., Delhi.
4. Wilson R. Harrison; Suspected Documents and their Scientific Examination.
5. Saferstein, Criminalistics: An Introduction to Forensic Science. Prentice, Hall.
6. Sharma, B.R.: Forensic Science in Criminal Investigation and Trials, Central Law Agency, Allahabad, 1974.

Three-year UG Course in Forensic Science
Semester – II FSUBTL1
Skill Enhancement Course (SEC)
Introduction to Biometry

Credit: 2

Learning Objectives: After studying this paper the students will know

- a. The importance of biometrics systems in criminal cases.*
- b. Knowledge and awareness regarding current and advanced biometric identification systems.*
- c. Use of biometrics in personal identification.*
- d. To provide information regarding the applications of biometric parameters and technologies.*

Unit 1: Introduction to Biometrics

Definition of Biometrics, Features and function of biometric system, working of biometrics, Classification of biometric systems – physical and behavioral, Strength and weakness of physical and behavioral biometrics.

Unit 2: Physical Biometrics

Physical biometrics: Fingerprints, Iris, Retina, Facial recognition, Hand geometry, DNA.

Unit 3: Behavioral Biometrics

Behavioral Biometrics: Speaker recognition, Signature, Gait biometrics

Unit 4: Biometric Parameters

Biometric parameters: FM, FNM, FTC, FTE, FAR, FRR, EER, ROC, DET; Emerging Biometric Technologies.

Suggested readings:

1. Ross, Jain, Nandakumar, Introduction to Biometrics, Springer (2011)
2. Jucheng Yang, Biometrics, InTech, (2014)
3. Midori Albert, Biometrics - Unique and Diverse Applications in Nature, Science, and Technology, InTech (2014)

Three-year UG Course in Forensic Science
Semester – I FSUATA1
Ability Enhancement Course (AEC)
Introduction to Criminalistics

Credits: 2

Learning Objectives: After studying this paper the students will know

- a. The importance of criminology.*
- b. The causes of criminal behavior.*
- c. The significance of criminal profiling to mitigate crime.*
- d. The consequences of crime in society.*
- e. The elements of criminal justice system.*

Unit 1: Introduction to Crime and Criminology

Nature and Scope, Concept of Crime, Criminals and Criminology, Classification of Crime and Criminals, Methods and Techniques in Criminology, Introduction to IPC, CrPC, IEA and their relevant sections.

Unit 2: Organised Crime and Police Administration

Crime Against Women and Children, Crime Against Property, Juvenile Delinquency, Cyber Crimes, Economic Crimes, Inquest, INTERPOL

Unit 3: White Collar Crime

History and Definition, Elements of White-Collar Crime, Types of White-Collar Crime, White Collar Crime in India.

Unit 4: Punishment and Prison System

Concept and Types of Punishment, Theories of Punishment, Probation and Parole, Criminal Behavior, Recidivism.

Suggested readings:

1. Ahuja, Ram, Criminology, Rawat Publication, Jaipur
2. Paranjape, N.V. Criminology and Penology, Central Law Publication, Allahabad.
3. R. Saferestein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).
4. Payne, B, White Collar Crime, 2nd Edition SAGE Publications, New Delhi (2017)
5. S.S Shrivastava, Criminology, Penology &Victimology, 4th Edition, Central Law Agency, Allahabad (2012)
6. Bayer Acts of Indian Penal Code, Criminal Procedure Code and Indian Evidence Act.

Three-year UG Course in Forensic Science
Semester – IV FSUDTA4
Ability Enhancement Course (AEC)
Wildlife Forensics

Credits: 2

Learning Objectives: After studying this paper the students will know

- a. The significance of wildlife forensics in cases of poaching and trafficking.*
- b. The forensic importance of animal hair evidence.*
- c. How wildlife forensics aid in conserving natural resources.*
- d. How wildlife forensics assist in species identification.*

Unit I: Introduction to Wildlife Forensics

Introduction and importance of wildlife, Protected and Endangered species of animals and plants, Sanctuaries and their importance, Wildlife crime case studies.

Unit 2: Wildlife Crimes and its Investigation

Introduction to Wildlife Crimes and its types, Investigation of a wildlife crime scene, Different methods of killing and poaching of wildlife animals, Techniques of Species identification.

Unit 3: Wildlife Crime Evidence

Illegal wildlife trade, Identification techniques for wildlife evidences encountered at crime scene, Identification of pug marks of different animals, various forensic protocols for species identification, Molecular markers used in wildlife forensics; Wildlife Protection Act, 1972.

Unit 4: Wildlife Conservation Agencies

Introduction to Wildlife conservation agencies-WWF, IUCN, CITES, WCCB, Wildlife conservation society, Defenders of Wildlife, Big lite Foundation, International fund for Animal welfare, National wildlife federation, Red Data Book.

Suggested Readings:

1. Huffman J.E. & Wallace J.R. (2012). *Wildlife Forensics: Methods and Applications*. USA, John Wiley & Sons
2. Hosetti, B.B; “Concept in Wildlife Management”, Daya Publishing House, 2005.
3. Linares, Adrian; “Forensic Science in Wildlife Investigation”, CRC Press, Taylor & Francis, 2009.
4. Baalu, T.R.; “The Wildlife Protection Act, 1972”, Nataraj Publication, 2001.

Three-year UG Course in Forensic Science
Semester – V FSUETA5
Ability Enhancement Course (AEC)
Introduction to Firearms and Explosives

Credits: 2

Learning Objectives: After studying this paper the students will know

- a. The classification of firearms and their firing mechanisms.*
- b. The methods of identifying firearms.*
- c. The characteristics of ammunition.*
- d. The importance of firearm evidence.*
- e. The nature of firearm injuries.*
- f. The methods for characterization of gunshot residue.*

Unit- 1: Introduction to Forensic Ballistics

Definition of forensic ballistics and firearms, History and development of firearms, and characteristics of firearms. Examination and identification of fire arms. Identification of origin, improvised/ country-made.

Unit- 2: GSR and its Examination

Gunshot residue (GSR) introduction, nature- black powder, smokeless powder residues, location, detection, collection- dry methods, wet method and collection of organic residues. Evaluation – visible examination, infra-red photography, dermal nitrate test and other instrumental methods.

Unit- 3: Internal, External and Terminal Ballistics

Introduction to internal, external and terminal ballistics, direction of fire, time of fire, range of fire, close range firing effect- muzzle pattern, scorching, blackening and tattooing, powder residues and metal particles. Principles for identification of firearm, Matching of bullets and cartridge cases in regular firearms.

Unit- 4: Explosives

Explosives: Definition & Classification, military explosives, homemade explosives, detection of explosives by dogs. Primary explosives and secondary explosives.

Suggested Readings:

1. B.J. Heard, Handbook of Firearms and Ballistics, Wiley and Sons, Chichester (1997).
2. W.F. Rowe, Firearms identification, Forensic Science Handbook, Vol. 2, R. Saferstein (Ed.), Prentice Hall, New Jersey (1988).
3. A.J. Schwoeble and D.L. Exline, Current Methods in Forensic Gunshot Residue Analysis, CRC Press, Boca Raton (2000).
4. E. Elaad in Encyclopedia of Forensic Science, Volume 2, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).