SCHEME OF EXAMINATION

&

DETAILED SYLLABUS

For
Bachelor of Science (Forensic Science)
(BSFS)

Session-2022-23

Faculty of Science

Forensic Science Programme Details:

PROGRAM OUTCOMES (POs)
(BSc)

Program Outcomes (POs)	Description
PO1	Student will understand the fundamental knowledge & basic principles of forensic sciences
PO2	Upon completion of the 3-year B.Sc. Forensic Science program, students will be able to demonstrate an understanding of the theories of Forensic chemistry , physical science, biological science, Toxicology, computer science, Forensic Ballistics, Digital forensic and law.
PO3	Graduates may become crime scene investigators, responsible for meticulously collecting, preserving, and documenting physical evidence at crime scenes. CSIs play a critical role in ensuring that evidence is gathered properly and can be used effectively in court.
PO4	Depending on the curriculum and electives offered, students may have the opportunity to specialize in areas such as forensic chemistry, forensic biology, digital forensics, forensic toxicology, or ballistics.
PO5	To be able to use and apply modern tools, techniques and skills in forensic investigations.
PO6	The student will get understand the concepts involving the fundamental principles on which the science of fingerprinting is based, including methods of classification.
PO7	The student understand how to interpret important features in handwriting Identification and will be able to explain the basis of handwriting characteristics
PO8	To evaluate forensic investigation methods and laws relevant to forensic science.
PO9	To engage in continuous research and education to take part in lifelong learning of the subject.
PO10	Graduates may work as forensic scientists in various settings such as crime laboratories. They analyze and interpret evidence collected from crime scenes, such as DNA samples, fingerprints, ballistics, and other trace evidence

Programme Educational Objectives (PEOs):

The programs provides opportunity for learners to achieve the following objectives

- To develop the undergraduate level students with the specific knowledge of handling different types of evidences and their examinations.
- To develop the laboratory skills in examining different types of evidences found at the crime scene.
- To prepare the students to compete for employment in State and central level Organizations.

Programspecificoutcome of B.Sc. inForensic Science

PSO 1: Understand the concept of basic and applied sciences including psychology and its application in forensics
PSO 2: Anlayze the sample in filed and laboratory test of crime exhibits with the latest norms and standards
PSO 3: Understand the basic concepts and principles of Forensic Science
PSO 4: Analyse the different crime scenario and make decision regarding analysis of crime exhibits

SCHEME OF EVALUATION
Bachelor of Science (Forensic Science)
(BSFS)w.e.f-2022-23

Semester-I						
Paper Code	**Subjects**	**Paper Type**	**Credits**	**Internal Marks**	**External Marks**	**Total**
	Choose Any One 101A/101B	AECC	2	15	35	50
BSFS101A	English					
BSFS101B	NCC					
BSFS102	Introduction to Forensic Science	Core-I	4	30	70	100
BSFS103	Crime and Society	Core-II	4	30	70	100
BSFS104	Crime Scene Investigation (CSI)	Core-III	4	30	70	100
BSFS105	Conceptual Chemistry	GE-I	3	30	70	100
BSFS106P	Practical's Based on Introduction to Forensic Science	Practical Core-I	1	20	30	50
BSFS107P	Practical's Based on Crime and Society	Practical Core-II	1	20	30	50
BSFS108P	Practical's Based on Crime Scene Investigation (CSI)	Practical Core-III	1	20	30	50
BSFS109P	Practical's Based on Conceptual Chemistry	Practical GE-I	1	20	30	50
			21	**215**	**435**	**650**

Semester-II						
Paper Code	**Subjects**	**Paper Type**	**Credits**	**Internal Marks**	**External Marks**	**Total**
	Choose Any One 201A/201B	AECC	2	15	35	50
BSFS201A	EnvironmentalScience					
BSFS201B	NCC					
BSFS202	Criminal Law	Core-IV	4	30	70	100
BSFS203	Forensic Psychology	Core-V	4	30	70	100
BSFS204	Applied Forensic Science	Core -VI	4	30	70	100
BSFS205	Basics of Physics	GE-II	3	30	70	100
BSFS206P	Practical's Based on Preparing Schedules	Practical Core-IV	1	20	30	50
BSFS207P	Practical's Based on Forensic Psychology	Practical Core-V	1	20	30	50
BSFS208P	Practical's Based on Applied Forensic Science	Practical Core -VI	1	20	30	50

BSFS209P	Practical's Based on Basics of Physics	Practical GE-II	1	20	30	50
			21	**215**	**435**	**650**

Semester-III						
Paper Code	**Subjects**	**Paper Type**	**Credits**	**Internal Marks**	**External Marks**	**Total**
BSFS301	Forensic Dermatoglyphics	Core-VII	4	30	70	100
BSFS302	Technological Methods in Forensic Science	Core-VIII	4	30	70	100
BSFS303	Wild life forensics & Forensic Entomology	Core-IX	4	30	70	100
BSFS304	Forensic Physics	GE-III	3	30	70	100
BSFS305	Introduction to Biometry	SEC-I	3	30	70	100
BSFS306P	Practical's Based onFinger Prints	Practical Core-VII	1	20	30	50
BSFS307P	Practical's Based onTechnological Methods	Practical Core-VIII	1	20	30	50
BSFS308P	Practical Based on Wild Life Forensic and Forensic Entomology	Practical Core-IX	1	20	30	50
BSFS309P	Practical's Based on Forensic Physics	Practical GE-III	1	20	30	50
			22	**230**	**470**	**700**

Semester-IV						
Paper Code	**Subjects**	**Paper Type**	**Credits**	**Internal Marks**	**External Marks**	**Total**
BSFS401	Forensic Chemistry	Core-X	4	30	70	100
BSFS402	Questioned Documents	Core-XI	4	30	70	100
BSFS403	Forensic Biology	Core-XII	4	30	70	100
	Choose Any One404A/404B	GE-IV	3	30	70	100
BSFS404A	Advanced Forensic Science					
BSFS404B	Basic Concepts of Biology					
BSFS405	Handwriting Identification and Recognition	SEC-II	3	30	70	100
BSFS406P	Practical's Based on Forensic Chemistry	Practical Core-X	1	20	30	50
BSFS407P	Practical's Based on Questioned Documents	Practical Core-XI	1	20	30	50
BSFS408P	Practical's Based on Forensic Biology	Practical Core-XII	1	20	30	50
	Practical's Based on : 404A/404B	Practical GE-IV	1	20	30	50
BSFS409P (A)	Advanced Forensic Science					
BSFS409P (B)	Basic Concepts of Biology					
			22	**230**	**470**	**700**

Semester-V						
Paper Code	**Subjects**	**Paper Type**	**Credits**	**Internal Marks**	**External Marks**	**Total**
BSFS501	Forensic Ballistics	Core-XIII	4	30	70	100
BSFS502	Forensic Toxicology	Core-XIV	4	30	70	100
	Choose Any One 503A/503B	DSE-I	4	30	70	100
BSFS503A	Digital Forensics					
BSFS503B	Economic Offences					
	Choose Any One 504A/504B	DSE-II	4	30	70	100
BSFS504A	Forensic Serology					
BSFS504B	Accident Investigations					
BSFS505P	Practical's Based on Forensic Ballistics	Practical Core- XIII	1	20	30	50
BSFS506P	Practical's Based on Forensic Toxicological Analysis	Practical Core- XIV	1	20	30	50
	Choose Any One 507A(P)/507B(P)	Practical DSE-I	1	20	30	50
BSFS507A(P)	Practical's Based on Digital Forensics					
BSFS507B(P)	Practical's Based on Economic Offences					
	Choose Any One 508A(P)/508B(P)	Practical DSE-II	1	20	30	50
BSFS508A(P)	Practical's Based on Forensic Serology					
BSFS508B(P)	Practical's Based on Accident Investigations					
			20	**200**	**400**	**600**

Semester-VI						
Paper Code	**Subjects**	**Paper Type**	**Credits**	**Internal Marks**	**External Marks**	**Total**
BSFS601	Forensic Anthropology	Core-XV	4	30	70	100
BSFS602	Forensic Medicine	Core-XVI	4	30	70	100
	Choose Any One 603A/603B	DSE-III	4	30	70	100
BSFS603A	DNA Typing					
BSFS603B	Modern Forensic Toxicology					
BSFS604P	Practical's Based on Forensic Anthropology	Practical Core- XV	1	20	30	50
BSFS605P	Practical's Based on Forensic Medicine	Practical Core-XVI	1	20	30	50
	Choose Any One 606A(P)/606B(P)	Practical DSE-III	2	20	30	50
BSFS606A(P)	Practical's Based on DNA Typing					
BSFS606B(P)	Practical's Based on Modern Forensic Toxicology					
BSFS607P	Dissertation/Project Work	DSE-IV	6	50	150	200
			22	**200**	**450**	**650**

(Semester-I)
(AECC)
BSFS101A: English

Course Objective

This course aims to equip learners with a comprehensive understanding of effective communication using English as a global language. It explores various modes, mediums, and channels of communication, both verbal and non-verbal, across personal, social, and business contexts. Through the exploration of language varieties, historical influences, and social factors, students will develop essential speaking, reading, and writing skills while fostering critical analysis of texts. By examining linguistic aspects like accent, dialect, and colloquialism, the course aims to enhance both intra-personal and inter-personal communication competencies. The objective is to empower students to confidently engage in monologues, dialogues, group discussions, interviews, public speeches, and various forms of written expression. Additionally, the course highlights the importance of understanding cultural nuances, linguistic convergence, and divergence in communication. Through this course, learners will become adept at effective communication across diverse settings and audiences.

Course Outcomes:

CO1 Analyze various communication modes and barriers, showcasing understanding of language's role in global interaction.

CO2 Exhibit competence in spoken and written English through effective communication in personal, social, and professional contexts.

CO3 Demonstrate proficiency in critical reading and interpretation of texts, identifying themes, tones, and stylistic elements.

CO4 Create diverse written content, including reports, letters, articles, and stories, reflecting versatile writing skills.

CONTENTS

MODULE I: Introduction:

Theory of Communication, Types and modes of Communication, Mediums and channels of communication, barriers to communication, English as a Global language, the Lingua Franca, Social influences on English

MODULE II: Language of Communication:

Verbal and Non-verbal (Spoken and Written) Personal, Social and Business Barriers and Strategies Intra-personal, Inter-personal and Group communication, Varieties of English, Language, Accent, Dialect, Colloquialism, Historical influences on English

MODULE III: Speaking Skills:

Monologue Dialogue Group Discussion Effective Communication/ Mis- Communication Interview Public Speech, Regional influences on English, Convergence and divergence, Linguistic Imperialism,

MODULE IV: Reading and Understanding-

Close Reading, Reading analysis of a text - Audience and purpose, Content and theme, Tone and Mood, stylistic devices, structure Comprehension- Analysis and Interpretation Translation(from Indian language to English and vice-versa) Literary/Knowledge Texts

MODULE V: Writing Skills

Documenting Report Writing Making notes Letter writing, Writing tabloids, diary entry, open letters, essays, newsletter and magazine articles, skits, short stories, impersonating characters

Recommended Readings:

1. Fluency in English - Part II, Oxford University Press, 2006.
2. Business English, Pearson, 2008.
3. Language, Literature and Creativity, Orient Blackswan, 2013.
4. Language through Literature (forthcoming) ed. Dr. Gauri Mishra, DrRanjanaKaul, DrBrati Biswas

(AECC)
BSFS101B: NCC

(Core-I)

BSFS102:Introduction to Forensic Science

Course Objective:

This course aims to provide a comprehensive understanding of the history, functions, and scope of forensic science in India. It will cover the evolution of forensic science, its various branches, tools, and techniques, as well as the organizational setup of forensic laboratories. Additionally, it will delve into the roles of police science, its organizational structure, and the collaboration between law enforcement and forensic science. By the end of the course, students will be equipped with the knowledge to appreciate the significance of forensic science in criminal investigations, understand ethical considerations, and effectively communicate findings through reports and expert testimonies.

Course Outcomes:

CO1 Understand the historical development of forensic science, its functions, and its relevance in criminal investigations.

CO2 Identify and describe the branches of forensic science and their respective tools and techniques, both locally and globally.

CO3 Analyze the organizational structure of forensic science laboratories in India and their roles in supporting law enforcement agencies.

CO4 Evaluate the roles, responsibilities, and ethical considerations of forensic scientists and law enforcement personnel, enhancing awareness of code of conduct and expert testimony protocols.

CONTENTS

Unit 1: History of 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).

(Core-II)

BSFS103: Crime and Society

Course Objective:

This course aims to provide students with a comprehensive understanding of criminology, crime, and the criminal justice system. It delves into the various dimensions of criminal behavior, its causes, consequences, and the contemporary issues surrounding crimes. The course further explores recent advancements in the field, including the study of victimology, various types of crimes, and the evolving strategies for crime investigation. By the end of the course, students will have gained insights into the complexities of the criminal justice system and its interrelated components, as well as the societal implications of crime.

Course Outcomes:

CO1 Grasp the foundational concepts of criminology, including the nature of crime, criminal behavior theories, and criminal profiling.

CO2 Analyze the elements, classifications, and underlying causes of crimes, along with an understanding of deviant behavior and its impact.

CO3 Examine contemporary aspects of crimes, such as victimology, hate crimes, cybercrimes, and white-collar crimes, and their relevance in modern society.

CO4 Comprehend the structure and functioning of the criminal justice system, including policing principles, investigation techniques, correctional measures, and the relationship between human rights and the justice system in India.

CONTENTS

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, Cyber crimes 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.H.and 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.

(Core-III)

BSFS104: Crime Scene Investigation (CSI)

Course Objective:

This course aims to equip students with a comprehensive understanding of crime scene management and the collection, analysis, and interpretation of various types of physical and trace evidence. Students will learn the intricacies of securing and documenting crime scenes, evidence collection, preservation, and chain of custody. The course further delves into the analysis of physical evidence like glass, paint, and cloth, as well as trace evidence such as fibers, soil, hair, and tool marks. By the end of the course, students will possess the skills to effectively manage crime scenes, collect and preserve evidence, and contribute to the investigative process.

Course Outcomes:

CO1 Understand the methodologies and techniques for managing different types of crime scenes, securing evidence, and ensuring safety measures.

CO2 Learn the principles of evidence collection, labelling, and preservation, including the significance of the Locard principle and chain of custody.

CO3 Develop the ability to analyze and interpret physical evidence, including glass, paint, and cloth, and to apply methods like spectroscopy and fracture analysis.

CO4 Acquire the skills to identify, collect, and analyze trace evidence such as fibers, soil, hair, and tool marks, contributing to the reconstruction of crime scenes and investigative processes.

CONTENTS

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. Locard 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 gemmology.

Unit 4: Trace Evidences

Fibre evidence – artificial and man-made fibres.Collection of fibre evidence.Identification and comparison of fibres.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).

(GE-I)

BSFS105: Conceptual Chemistry

Course Objective:

This course aims to provide a comprehensive understanding of organic chemistry, focusing on stereochemistry, addition, substitution, elimination reactions, oxidation, and reduction processes. Through in-depth lectures and practical examples, students will grasp fundamental concepts, reaction mechanisms, and stereochemical considerations in organic molecules. By the end of the course, learners will be well-equipped to analyze and predict various organic reactions, enhancing their problem-solving skills and foundational knowledge in organic chemistry.

Course Outcomes:

CO1. Analyze diverse structural representations, conformations, and isomerism in organic molecules.

CO2. Predict and explain the outcomes of addition, substitution, elimination, and oxidation reactions.

CO3. Demonstrate understanding of stereochemistry's influence on reaction mechanisms and product formation.

CO4. Apply knowledge of oxidation and reduction processes to different functional groups, identifying suitable reagents and mechanisms.

CO5 Demonstrate proficiency in applying oxidation and reduction reactions to functional groups, showcasing mastery over reaction mechanisms and diverse reducing agents.

CONTENTS

Unit 1: Stereochemistry (18 Lectures)

Writing of Fischer projection, Newmann and Sawhorse projection and Wedge formulae.Interconversion of one type of structural representation into another type.

Conformations: Restricted rotation about single bonds, Various conformations of ethane, butane, ethane-1,2-diol and cyclohexane. Relative stability of different conformations in terms of energy difference is to be discussed for all these compounds.

Geometrical Isomerism: Requirements for a molecule to show geometrical isomerism, Cis-Trans and E/ Z notation along with CIP rules for geometrical isomers.

Optical Isomerism: Optical activity, specific and molar rotation, chirality, enantiomerism, diastereoisomerism, racemic mixtures and their resolution by salt formation method.

Relative and absolute configuration: D / L nomenclature system for configuration of carbohydrates (difference between d/l and D/L notations). Threo and Erythro designation.Rand S- configuration (upto two chiral centres).

Unit 2: Addition Reactions (10 Lectures)

Alkenes and Alkynes: Hydrogenation, addition of halogens, Hydrohalogenation (Markovnikov's and anti-Markovnikov's addition), hydration, hydroxylation (cis and trans), oxymercuration-demercuration, hydroboration-oxidation, ozonolysis. Reactivity of alkenes vs alkynes.

Aldehydes and ketones: (formaldehyde, acetaldehyde, benzaldehyde, acetone) Addition of sodium bisulphite, hydrogen cyanide and alcohols. Addition- elimination reactions with ammonia and its derivatives

Name reactions: Aldol, cross Aldol, Claisen, Knoevengel, Cannizzaro, cross Cannizzaro

Unit 3: Substitution Reactions (15 Lectures)
Free radical substitution reactions: Halogenation of alkanes, allylic compounds and alkyl benzenes.

Nucleophilic substitution reactions: Alkyl, allyl and benzyl halides – substitution of halogen by some common nucleophiles. Mechanism of SN1 and SN2 reactions (stereochemistry, nature of substrate, nucleophile and leaving group)

Benzene diazonium chloride: Replacement of diazo group
Alcohols, amines and phenols: Substitution of active hydrogen, replacement of hydroxyl group in alcohols (using PCl5, SOCl2 and HI)
Carboxylic acid derivatives: Hydrolysis **Ethers**: Cleavage by HI
Electrophilic Substitution Reactions (aromatic compounds): General mechanism of electrophilic substitution reactions (nitration, halogenation, sulphonation, Friedel Crafts alkylation and acylation), directive influence of substituents.

Unit 4: Elimination Reactions (6 Lectures)
Alkyl halides (dehydrohalogenation, Saytzeff's rule), vicinal dihalides (dehalogenation), alcohols (dehydration), Quaternary ammonium salts (Hofmann's elimination). Mechanism of E1 and E2 reactions (nature of substrate and base), elimination vs substitution

Unit 5: Oxidation (6 Lectures)
Aromatic side chain: Oxidation with potassium permanganate, potassium dichromate
Alcohols: Oxidation with potassium permanganate, potassium dichromate, catalytic dehydrogenation and Oppenauer oxidation. Oxidation of 1,2–diols with periodic acid and lead tetraacetate.
Aldehydes: Oxidation with potassium permanganate, chromic acid and Tollen's reagent
Ketones: Oxidation with potassium permanganate, sodium hypoiodite (iodoform reaction) and Baeyer–Villiger oxidation
Reductions (5 Lectures)
Aldeydes and Ketones: Catalytic hydrogenation, reduction with sodium borohydride, lithium aluminium hydride, Clemmensen, Wolff-Kishner
Carboxylic acids and their derivatives: Lithium aluminium hydride, sodium-ethanol and Rosenmund reduction.
Nitro compounds: Acidic, alkaline and neutral reducing agents, lithium aluminium hydride and electrolytic reduction.

Recommended Texts:
1. I. L. Finar: Organic Chemistry (Vol. I & II), E. L. B. S.
2. R. T. Morrison & R. N. Boyd: Organic Chemistry, Pearson Education.
3. ArunBahl and B. S. Bahl : Advanced Organic Chemistry, S. Chand
4. Peter Sykes: A Guide Book to Mechanism in Organic Chemistry, Orient Longman.
5. Eliel, E. L. &Wilen, S. H. Stereochemistry of Organic Compounds; Wiley: London, 1994.
6. T. W. Graham Solomon's Organic Chemistry, John Wiley and Sons.
7. P.S. Kalsi, Stereochemistry, Conformation and Mechanism, John Wiley and Sons.
8. D. Nasipuri, Stereochemistry of Organic Compounds, New Age International Publishers.

(Practical Core-I)

BSFS106P: Practical's based on Introduction to Forensic Science

Practical Exercise

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.

(Practical Core-II)
BSFS107P: Practical's based on Crime and Society

Practical Exercise

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 suggests improvements.
12. To prepare a report on interrogation cells and suggest improvements.

(Practical Core-III)

BSFS108P: Practical'sbasedonCrimeSceneInvestigation (CSI)

Practical Exercise

1. Sketching of Crime scene.
2. Photography of the scene of Crime.
3. Searching of physical evidence at crime scene.
4. Collection of Physical Evidence from scene of crime.
5. Collection, Packing, Labeling and forwarding of the physical evidences to the forensic laboratory.
6. Analysis of pattern -Blood, Foot Marks.

(Practical GE-I)

BSFS109P: Practical's based on Conceptual Chemistry

1. Purification of organic compounds by crystallization using the following solvents:
a. Water
b. Alcohol

2. Determination of the melting points of organic compounds (by Kjeldahl method and electrically heated melting point apparatus).

3. Determination of optical activity by using polarimeter

Organic preparations: Carry out the following preparations using 0.5 - 1 g of starting compound. Recrystallize the product and determine the melting point of the recrystallized sample.

4. To prepare acetanilide by the acetylation of aniline.
5. To prepare p-bromoacetanilide.
6. Benzolyation of aniline or β-naphthol by Schotten-Baumann reaction
7. Hydrolysis of benzamide or ethyl bezoate.
8. Semicarbazone derivative of one the following compounds: acetone, ethyl methyl ketone, diethylketone, cyclohexanone, benzaldehyde.
9. Nitration of nitrobenzene.
10. Oxidation of benzaldehyde by using alkaline potassium permanganate.

Recommended Texts:

1. Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. Practical Organic Chemistry, 5th Ed., Pearson (2012).
2. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Longman, London & New York.
3. Ahluwalia, V.K.; Dhingra, S. & Gulati, A. College Practical Chemistry, Universities Press.

(Semester-II)

(AECC)

BSFS201A: Environmental Science

Course Objectives:

1. To create and disseminate knowledge to the students about environmental problems at local, regional and global scale.
2. To provide practical training on modern instrumentation and analytical techniques for environmental analyses.
3. To sensitize students towards environmental concerns, issues, and impacts of climate change and related mitigation strategies.
4. To make the students to apply their knowledge for efficient environmental decision-making, management and sustainable development.
5. To prepare students for successful career in environmental departments, research institutes, industries, consultancy and NGOs, etc.

Course Outcomes:

1. Understand the fundamental principles and concepts of environmental science, including ecosystems, biodiversity, natural resources, pollution, and sustainability.
2. Recognize and analyze the impacts of human activities on the environment, including pollution, deforestation, climate change, and habitat destruction.
3. Evaluate and apply scientific methods and tools for studying and monitoring the environment, including data collection, analysis, and interpretation.
4. Develop an awareness of environmental laws, policies, and regulations, and their implications for environmental protection and sustainability.
5. Apply critical thinking skills to assess and propose solutions to environmental challenges, such as resource management, pollution control, and conservation.

Unit 1 : Introduction to Environmental Studies (6 Lecture)

- Multidisciplinary nature of environmental studies;
- Scope and importance; Concept of sustainability and sustainable development.

Ecosystems

- What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems :
  a) Forest ecosystem
  b) Grassland ecosystem
  c) Desert ecosystem
  d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit 2 : Natural Resources : Renewable and Non-•-renewable Resources (6 Lecture)

- Land resources and landuse change; Land degradation, soil erosion and desertification.
- Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.
- Water : Use and over-•-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-•-state).
- Energy resources : Renewable and non renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

Unit 3 : Biodiversity and Conservation (5 Lecture)

- Levels of biological diversity : genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots
- India as a mega-•-biodiversity nation; Endangered and endemic species of India
- Threats to biodiversity : Habitat loss, poaching of wildlife, man-•-wildlife conflicts, biological invasions; Conservation of biodiversity : In-•-situ and Ex-•-situ conservation of biodiversity.
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

Unit 4 : Environmental Pollution (9 Lecture)

- Environmental pollution : types, causes, effects and controls; Air, water, soil and noise pollution
- Nuclear hazards and human health risks
- Solid waste management : Control measures of urban and industrial waste.
- Pollution case studies.

Environmental Policies & Practices

- Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture
- Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).
- Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.

Unit 5 : Human Communities and the Environment (4 Lecture)

- Human population growth: Impacts on environment, human health and welfare.
- Resettlement and rehabilitation of project affected persons; case studies.
- Disaster management : floods, earthquake, cyclones and landslides.
- Environmental movements : Chipko, Silent valley, Bishnois of Rajasthan.
- Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.
- Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

Suggested Readings:

1. Carson, R. 2002. *Silent Spring.* Houghton Mifflin Harcourt.
2. Gadgil, M., & Guha, R.1993. *This Fissured Land: An Ecological History of India*. Univ. of California Press.
3. Gleeson, B. and Low, N. (eds.) 1999.*Global Ethics and Environment*, London, Routledge.
4. Gleick, P. H. 1993. *Water in Crisis*. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll.*Principles of Conservation Biology*. Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. *Science*, 339: 36-•-37.
7. McCully, P. 1996. *Rivers no more: the environmental effects of dams*(pp. 29-•-64). Zed Books.
8. McNeill, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.
9. Odum, E.P., Odum, H.T. & Andrews, J. 1971.*Fundamentals of Ecology*. Philadelphia: Saunders.
10. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.

11. Rao, M.N. & Datta, A.K. 1987. *Waste Water Treatment*. Oxford and IBH Publishing Co. Pvt. Ltd.
12. Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012.*Environment*. 8th edition. John Wiley & Sons.
13. Rosencranz, A., Divan, S., & Noble, M. L. 2001. *Environmental law and policy in India*. *Tripathi 1992*.
14. Sengupta, R. 2003. *Ecology and economics*: An approach to sustainable development. OUP.
15. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi.
16. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. *Conservation Biology*: *Voices from the Tropics*. John Wiley & Sons.
17. Thapar, V. 1998. *Land of the Tiger*: *A Natural History of the Indian Subcontinent*.
18. Warren, C. E. 1971. *Biology and Water Pollution Control*. WB Saunders.
19. Wilson, E. O. 2006.*The Creation: An appeal to save life on earth.* New York: Norton.
20. World Commission on Environment and Development. 1987.*Our Common Future*. Oxford University Press.
1.

(AECC)
BSFS201B: NCC

(Core-IV)
BSFS202: Criminal Law

Course Objective:
This course aims to provide students with a comprehensive understanding of the legal framework for combating crime in India. It covers the essential aspects of Indian Penal Code, Criminal Procedure Code, Indian Evidence Act, and relevant amendments. Additionally, it delves into the classification of cases, types of offenses, and the structure of criminal courts. The course also explores constitutional provisions, fundamental rights, and socio-economic and environmental legislations. By the end of the course, students will have a firm grasp of the legal intricacies governing crime and its consequences in India.

Course Outcomes:
CO1 Comprehend the foundational legal texts including IPC, CrPC, and IEA, and their applicability in criminal justice.
CO2 Recognize and classify cases, grasp essential elements of criminal law, and understand expert witness procedures.
CO3 Analyze Constitutional provisions, Fundamental Rights, and Directive Principles of State Policy for their impact on criminal justice.
CO4 Gain insights into socio-economic and environmental legislations, including NDPS Act, Dowry Prohibition Act, Prevention of Corruption Act, and Environment Protection Act.

CONTENTS

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, CrPC, 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. TripathiPvt 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.H.and 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,RamCriminology,RawatPublication,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,

(Core-V)

BSFS203: Forensic Psychology

Course Objective:

This course aims to provide students with a foundational understanding of the intersection between psychology and the legal system, focusing on forensic psychology. It covers topics ranging from ethical considerations to the application of psychological principles in legal contexts. Through the exploration of psychological disorders, juvenile delinquency, deception detection, and criminal profiling, students will gain insights into the role of psychology in criminal investigations and court proceedings. By the end of the course, students will be equipped to comprehend the complexities of psychological aspects in the realm of law, contributing to a deeper understanding of human behavior within legal contexts.

Course Outcomes:

CO1 Understand the fundamental concepts of forensic psychology and its application in legal settings.

CO2 Identify and analyze common psychological disorders, their impact on criminal behavior, and their relevance in the legal context.

CO3 Evaluate theories of juvenile offending, child abuse, and the legal implications surrounding juvenile delinquency.

CO4 Gain familiarity with deception detection tools, including interviews, non-verbal cues, polygraphy, narco analysis, and brain fingerprinting.

CONTENTS

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 analyser, 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).

(Core-VI)
BSFS204: AppliedForensicScience

Course Objective:

This course aims to provide students with a comprehensive understanding of forensic biology, medicine, chemistry, and ballistics. Students will learn about the examination and significance of various biological fluids, microscopic analysis of hair, and DNA fingerprinting. The course covers topics related to toxicology, including poisons, autopsy procedures, and isolation methods. It further delves into forensic chemistry, covering fire and arson examination, alcohol analysis, and drug classification. Lastly, the course explores forensic ballistics, including firearms, ammunition, and explosives. By the end of the course, students will possess knowledge and skills necessary to contribute effectively to various aspects of forensic science and investigation.

Course Outcomes:

CO1 Understand the forensic significance of biological fluids, microscopic analysis of hair, and DNA fingerprinting.

CO2 Analyze the scope of toxicology, including poison classifications, medico-legal autopsies, and preservation of viscera.

CO3 Gain proficiency in forensic chemistry, covering fire examination, analysis of alcoholic beverages, drug classification, and explosive materials.

CO4 Grasp the basics of forensic ballistics, including firearms, ammunition, and explosive materials, enhancing understanding of forensic investigations.

COTENTS

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.

Recommended Books

1. Richard Saferstein; Forensic Science Hand Book, Vol II Prentice Hall, Englewood Cliff, NJ.
2. GoutamShubhra. ; 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. Saferestein, 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.

(Core-VI)

BSFS205: Basics of Physics

Course Objective:

This course aims to provide a comprehensive understanding of fundamental concepts in physics, focusing on angular motions, conservation laws, gravitation, thermodynamics, surface tension, viscosity, and wave phenomena. Through theoretical explanations and derivations, students will develop the ability to analyze and apply these principles to real-world situations. By the end of the course, students will possess a solid foundation in classical physics, enabling them to comprehend complex physical phenomena and make informed observations and predictions.

Course Outcomes:

CO1 Analyze angular motion, circular paths, and the forces involved, comprehending the concepts of centripetal and centrifugal forces.

CO2 Apply the conservation laws of linear momentum, angular momentum, and energy to systems of particles, demonstrating an understanding of their implications.

CO3 Derive and comprehend Newton's law of gravitation, gravitational potential, and basic thermodynamic principles such as the first and second laws.

CO4 Examine surface tension, cohesive and adhesive forces, and their effects on curved surfaces, showcasing knowledge of pressure within curved surfaces.

CO5 Evaluate viscosity, differentiate between streamline and turbulent motion, and understand the concepts of sound, interference of light, diffraction, and polarization in wave phenomena.

CONTENTS

Unit-I: Angular Motions: -Motion along a circular path, centripetal and centrifugal force (with derivation). Motionalong a curved path: Expression for radial and transverse components of velocity andacceleration.

Unit-II: Conservation Laws:Linear momentum: Law of conservation of linear momentum for a system of particles.Angular momentum: Definition of angular momentum its relation of angular velocityand torque. Energy: Conservation of energy as a basic principle, Illustration with derivation.

Unit-III: Gravitation: Newton’s law of gravitation – statement and derivation. Gravitational potential. Thermodynamics: First law of thermodynamic and Second law of thermodynamics.

Unit-IV: Surface Tension:Cohesive and adhesive forces. Surface tension, angle of contact and surface energy.Effectof temperature and impurity. Pressure within a curved surface with example

Unit-V: Viscosity: Streamline and turbulent motion: Derivation of Poiseulle’s Equation, Stoke’s law. Effect oftemperature on viscosity.Sound and interference of light, types of fringes and Michelson’s interferometer, Diffraction and Polarization.

Suggested Readings:

1. Mechanics by D.S Mathur.
2. Mechanics by J.C. Upadhaya.
3. Properties of matter by D.S. Mathur
4. Properties of matter by Brijilal and Subramanyam.

(Practical Core-IV)
BSFS206P: Practical's based on Preparing Schedules

Practical Exercise

1. Toprepareascheduleoffivecognizableandfivenon-cognizableoffences.
2. TostudythepowersandlimitationsoftheCourtofJudicialMagistrateofFirstClass.
3. Toprepareascheduleoftheoffencesthismaybetriedunder Section260(2)ofCriminalProcedureCode.
4. Tostudyacrimecaseinwhichanaccusedwaspunishedonchargeofmurderunder Section302.
5. Tostudyacrimecaseinwhichanaccusedwaspunishedonchargeofrapeunder Section375.
6. TociteexampleofacaseinwhichtheopinionofanexpertwascalledforunderSection45oftheIndian EvidenceAct.
7. TociteacasewhereinapersonwasdetainedunderArticle22(5)oftheIndianConstitution.Expressyourviewswhethertherightsofthepersonasenlistedinthis Articleweretakencareof.
8. TociteacaseunderArticle14oftheConstitutionofIndiawhereintheRighttoEqualitybeforeLawwasallegedlyviolated.
9. TolisttherestrictionsimposedonRighttoFreedomofWorshipundertheConstitutionofIndia.
10. ToprepareascheduleofpersonsconvictedunderNarcotics,DrugsandPsychotropicActstatisticallyanalyzetheagegrouptowhichtheybelonged.
11. Tostudy acaseinwhichDrugsandCosmeticActwasinvoked.
12. TostudyacaseinwhichExplosiveSubstancesActwasinvoked.
13. TostudyacaseinwhichArmsActwasinvoked.
14. InlightofSection304BoftheIndianPenalCode,citeacaseinvolvingdowrydeath.
15. TostudyacasewhereintheUntouchabilityOffencesActwasinvokedonthebasisofArticle15oftheConstitutionofIndia.

(Practical Core-V)
BSFS207P: Practical's based on Forensic Psychology

Practical Exercise

1. To cite a crime case where legal procedure pertaining to psychic behaviour 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.

(Practical Core-VI)

BSFS208P: Practical's based on Applied Forensic Science

Practical Exercise

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.

(Practical GE-II)

BSFS209P: Practical's based on Basics of Physics

Practical Exercise

1. Bar pendulum L Vs T graph.
2. Bar pendulum L2 Vs LT2 graph.
3. Spiral spring – determination of 'g' and unknown mass.
4. Verification of Hook's law.
5. Co-efficient of viscosity by Stocke's method.
6. Surface tension by drop weight method.
7. Moment of inertia (M.I.) of an irregular body.

Suggested Readings:

1. Experimental physics - M.A. Hippargi.
2. Experimental physics – Gadad&Hiregoudar.
3. Practical physics - C. L. Arora.
4. Advanced practical physics – Worsnop and Flint.
5. Practical physics – Gupta & Kumar Vol I, Vol II.

(Semester-III)
(Core-VII)
BSFS301: Forensic Dermatoglyphics

Course Objective:

This course is designed to provide students with a comprehensive understanding of the basics of fingerprinting, latent fingerprint development, and other impression evidence in forensic science. It covers the historical context, formation, and classification of fingerprint patterns, including primary, secondary, and sub-secondary characteristics. Students will learn about various methods of developing latent fingerprints, both physical and chemical, on different surfaces, including skin. The course also introduces the application of light sources, digital imaging, and automated systems for fingerprint detection and enhancement. Additionally, it covers the significance of footprints, palm prints, lip prints, and ear prints as evidence. By the end of the course, students will have a strong foundation in fingerprint identification techniques and their importance in forensic investigations.

Course Outcomes:

CO1 Understand the history and formation of fingerprints, including the types of fingerprint patterns.
CO2 Learn techniques for developing latent fingerprints using physical and chemical methods.
CO3 Apply light sources, digital imaging, and automated systems for fingerprint enhancement.
CO4 Recognize the significance of other impression evidence, including footprints, palm prints, lip prints, and ear prints.

CONTENTS

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 an M. Stoilovic, Fingerprints and other Ridge Skin Impressions, CRC Press, Boca Raton (2004).
4. Lee and Gaensleen's, Advances in Fingerprint Technology, 3rd Edition, R.S. Ramotowski (Ed.), CRC Press, Boca Raton (2013).

(Core-VIII)

BSFS302: Technological Methods in Forensic Science

Course Objective:

This course aims to provide students with a comprehensive understanding of the instrumental techniques used in forensic science for evidence analysis. It covers sample preparation for chromatographic and spectroscopic methods, focusing on thin layer chromatography, gas chromatography, liquid chromatography, electrophoresis, and neutron activation analysis. Additionally, the course delves into the fundamental principles and applications of various spectroscopic methods, including UV-visible, infrared, atomic absorption, atomic emission, mass spectroscopy, and X-ray spectrometry. Students will also learn about microscopy, different types of microscopes, and their applications in forensic science. Furthermore, the course covers the principles and applications of forensic photography, including 3D photography, infrared, ultraviolet, digital photography, videography, and its relevance in crime scene and laboratory documentation.

Course Outcomes:

CO1 Understand the sample preparation techniques and applications of chromatographic methods, electrophoresis, and neutron activation analysis.

CO2 Comprehend the fundamental principles and applications of spectroscopic techniques, including UV-visible, infrared, atomic absorption, atomic emission, mass spectroscopy, and X-ray spectrometry.

CO3 Identify and differentiate various types of microscopes, and recognize their forensic applications.

CO4 Gain proficiency in forensic photography principles, including 3D photography, digital techniques, and its significance in crime scene documentation.

CONTENTS

Unit 1: Instrumentation

Sample preparation for chromatographic and spectroscopic evidence.Chromatographic methods.Fundamental principles and forensic applications of thin layer chromatography, gas chromatography and liquid chromatography. Electrophoresis – fundamental principles and forensic applications. Neutron activation analysis – fundamental principles and forensic applications.

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.

Unit 3: Microscopy

Fundamental principles. Different types of microscopes. Electron microscope. Comparison Microscope.Forensic applications of microscopy.

Unit 4: Forensic photography

Basic principles and applications of photography in forensic science.3D photography.Photographic evidence.Infrared and ultraviolet photography.Digital photography.Videography.Crime scene and laboratory photography.

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. D.R. Redsicker, The Practical Methodology of Forensic Photography, 2nd Edition, CRC Press, Boca Raton (2000).

(Core-IX)

BSFS303: Wild life forensics & Forensic Entomology

Course Objective:

This course aims to provide students with a comprehensive understanding of wildlife forensics, focusing on its significance in preserving biodiversity and combating wildlife crimes. Students will delve into protected and endangered species, gaining insight into the legal framework and exploring the role of national parks and sanctuaries in India. The course will cover various aspects of wildlife crimes, including motives, types, and investigations for live and deceased animals. Students will learn techniques for evidence collection, medico-legal necropsy, and site search approaches specific to wildlife crime scenes. The course further encompasses the identification of wildlife materials, both conventional and modern methods, including skin, fur, bones, horns, and pug marks. Additionally, students will gain knowledge of forensic entomology, its role in determining time since death, and the impact of ecological factors on insect development in the context of forensic investigations.

Course Outcomes:

CO1 Understand the significance of wildlife forensics and its role in protecting endangered species and biodiversity.

CO2 Analyze motives, types, and investigation approaches for live and deceased wildlife crime cases.

CO3 Identify wildlife materials using conventional and modern methods, including pug marks.

CO4 Apply principles of forensic entomology to estimate time since death and evaluate the ecological impact on insect development.

CONTENTS

UNIT I

Wildlife Forensics: Introduction and importance, Protected and endangered species of Animals and Plants. National Parks and Sanctuaries in India

UNIT II

Wild life crimes- introduction, motive, types of crime for live animal, dead animal, Investigations in wildlife crime: Site search approaches and Evidence collection, Forensic (medico-legal) necropsy of wildlife

UNIT III

Identification of wild life materials such as skin, fur, bones, nails, horn, teeth, flowers and plants, by conventional and modern methods, Identification of Pug marks of various animals.

UNIT IV

Forensic entomology: -Basic principle & significance of aquatic and terrestrial insects in forensic investigations and their role in crime detections. Introduction to Insect succession and its relationship to determine time since death of animal Impact of ecological factors on insect's development.

Suggested Readings

1. Catts E.P & Haskell NH; Entomology and death- A procedural guide , Joyce's Print Shop (1990)

2. Smith DGV; A manual of Forensic Entomology Ithaca NY Camstock Univ. Press, USA (1986)

3. Byrd J H &Castner J L; Forensic Entomology, The Utility of Arthropods in legal

Investigation, CRC Press, USA (2000)
4. Jorg T. Epplen Thomas Lubjuhin; DNA Profiling and DNA Fingerprinting ,BirkhauserVerlag, Basel
5. George V. Burns; The Science of Genetics - An Introduction to heredity, Macmillan (1980)
6. Vincent J. M. Di Maio, Suzanna E. Dana Handbook of forensic pathology CRC/Taylor & Francis,
7. Jane E. Huffman, John R.Wallace Wildlife Forensics: Methods and Applications, Wiley Blackwell.

(GE-III)

BSFS304: Forensic Physics

Course Objective:

This course is designed to equip students with a comprehensive understanding of forensic physics, covering areas such as tool marks, glass, paint, papers, footwear impressions, soil, fibers, and materials analysis. Through detailed exploration, students will comprehend the types, characteristics, and forensic significance of tool marks. They will gain insights into glass types, composition, and identification methods, as well as paint types, microchemical tests, and instrumental analysis. The course extends to paper and impression analysis, encompassing footwear, tire impressions, and soil. Moreover, students will delve into the complexities of speaker identification, tape authentication, voice production, speech signal processing, and pattern recognition. Additionally, the course includes the restoration of erased or obliterated marks, methods of marking, obliteration, restoration techniques, and examination of wire, cables, and counterfeit coins. By the end of the course, students will possess a comprehensive understanding of forensic physics and its applications in various investigative scenarios.

Course Outcomes:

CO1 Grasp the scope and importance of forensic physics in diverse cases/exhibits.

CO2 Analyze and interpret tool marks, glass fragments, and various materials for forensic evidence.

CO3 Understand the principles of speaker identification, voice production, and pattern recognition for audio-video authenticity.

CO4 Gain proficiency in restoration techniques, wire/cable examination, and counterfeit coin analysis for investigative purposes.

CONTENTS

UNIT I

Forensic Physics – Introduction, Area and scope; Types of the cases/ exhibits; Introduction, Types and Characteristics of Tool marks: Forensic significance. Glass: Types of glass and their composition, Identification of glass fragments Types of Glass fractures.

UNIT II

Paint: Types and their composition, Paint as evidence Forensic examination, Micro chemical tests and Polarized Light Microscopy; Instrumental methods of analysis and comparison; Examination of Papers; Examination of Foot /Foot wear and Tire Impression.Composition of soil; Methods of Analysis & Comparison techniques, Fibers - Classification and Characteristics examination of fibers, Photographic Superimposition; Physical matches of broken objects. Forensic analysis of Telegraph, Traction wires and cables

UNIT III

Speaker identification and tape authentication; Voice production theory- vocal anatomy, Speech signal processing & pattern recognition- basic factors of sound in speech, acoustic characteristics of speech signal, Fourier analysis, frequency & time domain representation of speech signal, analogue to digital signal and conversion, Fast Fourier transform, quantization, digitization and speech enhancement, analysis of audio-video signal for authenticity, Introduction to the techniques of pattern recognition and comparison .Legal aspects.

UNIT –III

Restoration of erased / obliterated marks; method of marking cast punch, engrave; methods of obliteration, Method of restoration etching (etchings for different metals), magnetic, electrolytic etc., Recording of restored marks- restoration of marks on cast iron, Aluminum, wood, leather, polymer etc. Examination of wire/ cables, counterfeit coins.

Recommended Books

1. C.E.O Hara and J.W. Osterburg; An Introduction to Criminalistic, Indiana University Press, Blomington.
2. Raymond C Murray & John C.F Tedrew; Forensic Geology, Prentice Hall NJ
3. Working Procedure Manual : Physics DFS, New Delhi Publication (2000)
4. B. Caddy; Forensic Examination of Glass and Paints Analysis and Interpretation ISBN
5. Goutam, S and Goutam, M.P..: Physical Evidences-Introduction & Bibliography on their Forensic Analysis. Shiv Shakti Book Traders, New Delh
6. James Michael Curran, TachiaNatilie Hicks and John S.Buckleton; Forensic Interpretation of Glass Evidence, CRC Press (2000)
7. David A. Crown; The Forensic Examination of Paints and Pigments, Toylor& Francis,
8. Jay A.Siegel, Pekka J Saukko and Geoffrey C. Kooupfer; Encyclopedia of Forensic Science, Academic Press (2000).
9. Robertson, J and Grieve, M, Forensic Examination of Fibers, CRC.
10. Philip Rose; Forensic Speaker Identification, Taylor and Francis, London.
11. Bengold& Nelson Moryson; Speech and Audio signal processing, John Wiley & Sons, USA (1999)

(SEC-I)

BSFS305: Introduction to Biometry

Course Objective:

This comprehensive course aims to provide students with a thorough understanding of biometrics and its pivotal role in modern identification and verification systems. Students will delve into the fundamental aspects of biometric technology, grasping its characteristics, operation, and classification into physiological and behavioral modalities. By exploring the strengths and weaknesses of different biometric modalities, students will comprehend their practical applications and limitations. The course further covers essential biometric processes, including enrollment, identification, and verification, along with the significance of positive and negative identification. Students will gain proficiency in evaluating biometric system performance, and will gain insight into how biometrics contrasts with traditional identification methods.

Course Outcomes:

CO1 Master the fundamental principles and operational mechanisms of biometric systems.

CO2 Categorize biometric modalities, recognizing their respective merits and drawbacks.

CO3 Analyze the intricacies of biometric processes for successful enrollment, identification, and verification.

CO4 Evaluate biometric system effectiveness, distinguishing it from conventional identification techniques.

CONTENTS

Unit 1: Fundamental Aspects

Definition, characteristics and operation of biometric system. Classification of biometric systems – physiological and behavioral. Strength and weakness of physiological and behavioral biometrics.Multimodal biometrics.Key biometric processes – enrollment, identification and verification.Positive and negative identification. Performance measures used in biometric systems – FAR, FRR, GAR, FTA, FTE and ATV. Biometric versus traditional technologies.

Unit 2: Physiological Biometrics

Fingerprints, palm prints, iris, retina, geometry of hand and face.

Unit 3: Behavioral Biometrics

Handwriting, signatures, keystrokes, gait and voice.

Suggested Readings

1. S. Nanavati, M. Thieme and R. Nanavati, Biometrics, Wiley India Pvt. Ltd. (2002).
2. P. Reid, Biometrics for Network Security, New Delhi (2004).
3. J.R. Vacca, Biometric Technologies and Verification Systems, Butterworth-Heinemann, Oxford (2007).

(Practical Core-VII)
BSFS306P: Practical's based on Finger Prints

Practical Exercise

1. Torecordplainandrolledfingerprints.
2. Tocarry outtendigitclassificationoffingerprints.
3. Toidentifydifferentfingerprintpatterns.
4. Tocarry outridgetracingandridgecounting.
5. Todeveloplatentfingerprintby physicalandchemicalmethod

(Practical Core-VIII)
BSFS307P: Practical's based on Technological Methods

Practical Exercise

1. To determine the concentration of a colored compound by colorimetry analysis.
2. To carry out thin layer chromatography of ink samples.
3. To carry out separation of organic compounds by paper chromatography.
4. To identify drug samples using UV-Visible spectroscopy.
5. To take photographs using different filters.
6. To take photographs of crime scene exhibits at different angles.
7. To record videography of a crime scene.

(Practical Core-IX)

BSFS308P: Practical based on Wild Life Forensic and Forensic Entomology

Practical Exercise

1. Crime Scene Investigation with reference to Wild life crime
2. Analysis of wood type
3. Identification of pollen grains
4. Identification of Pug marks of animals
5. Identification of Animal Skin andFur.
6. Study of insect's succession.

(Practical GE-III)

BSFS309P: Practical's based on Forensic Physics

Practical Exercise

1. Restoration of erased identification marks.
2. Comparison of soil samples by Density gradient method.
3. Matching of broken pieces of different objects.
4. Examination & comparison of broken Glass bangles.
5. Identity of small glass pieces by flotation method.
6. Determination of refractive index of glass and liquids.
7. Comparison of Tool marks.
8. Comparison of Fibers, threads and ropes.
9. Analysis and comparison of Paint samples.

(Semester-IV)
(Core-X)
BSFS401: Forensic Chemistry

Course Objective:

This course aims to provide students with a comprehensive understanding of forensic chemistry in relation to its applications in investigating various criminal cases. Students will delve into the definition and scope of forensic chemistry, focusing on narcotic drugs, depressants, stimulants, hallucinogens, designer drugs, and anabolic steroids. The course covers analytical methods for analyzing alcoholic beverages, illicit liquor, and denatured spirits. Additionally, students will explore the analysis of petroleum products, edible oils, and their adulterants. The course further encompasses the chemistry of fire and arson investigation, including fire scene patterns, ignition points, fire type recognition, and evidence collection. Students will learn about the classification of explosives, synthesis and characteristics of TNT, PETN, and RDX, explosion processes, bomb scene management, and post-blast residue analysis. By the end of the course, students will possess a comprehensive understanding of forensic chemistry's applications in analyzing narcotics, fire-related cases, and explosive materials.

Course Outcomes:

CO1 Grasp the scope and applications of forensic chemistry in analyzing narcotics and alcoholic beverages.

CO2 Analyze petroleum products, edible oils, and recognize their adulterants.

CO3 Understand fire chemistry and arson investigation techniques, including evidence collection and fire type recognition.

CO4 Gain proficiency in explosives classification, synthesis, post-blast analysis, and bomb scene management for investigative purposes.

CONTENTS

Unit1: Forensic Chemistry and Scope

Forensic chemistry: Definition and scope, Introduction to Narcotic drugs, Depressants, stimulants, Hallucinogens their Active components and method of analysis, 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.Analysis of traces of petroleum products in forensic exhibits.Comparison of petroleum products.Adulteration of petroleum products. Edible oil and their adulterants

Unit 3: Cases Involving Arson

Chemistry of fire.Fire scene patterns.Location of point of ignition.Recognition of type of fire.Searching the fire scene.Collection and preservation of arson evidence.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,

Unit 4: Explosives

Classification of explosives – low explosives and high explosives.Homemade explosives.Military explosives.Blasting agents.Pyrotechniques, Synthesis and characteristics of TNT, PETN and RDX. Explosion process.Bomb scene management.Searching the scene of explosion. Post blast residue

collection and analysis. Blast injuries. Detection of hidden explosives.

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,
6. D.H. Ubelaker (Ed.), Wiley-Blackwell, Chichester (2013).
7. Kennedy, Thomas J., Christian, Jr., Donnell Basic Principles of Forensic Chemistry,Springer
8. J.D. DeHaan, Kirk's Fire Investigation, 3rd Edition, Prentice Hall, New Jersey (1991)
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. Curry A.S; Analytical Methods in Human Toxicology, Part II, CRC Press Ohio
12. Clark, E.G.C.; Isolation and Identification of Drugs, Vol I&II, Academic Press,
13. Sunshine I; Year book of Toxicology, CRC Press Series, USA
14. Michael J. Deverlanko et al: Hand Book of Toxicology CRC Press, USA.
15. Parikh C.K; Text Book of Medical Jurisprudence Forensic Medicines and Toxicology. CBS Pub. New Delhi.
16. Balraj S. Parmar et al; Pesticide Formulation, CBS Publishers, New Delhi.

(Core-XI)
BSFS402: Questioned Documents

Course Objective:
This course aims to provide students with a comprehensive understanding of forensic document examination, covering various aspects related to questioned documents, handwriting analysis, forgeries, and the tools used in document examination. Students will learn about the definition and types of questioned documents, as well as the preliminary examination, collection, handling, and transportation of documents. The course delves into handwriting principles, natural variations, and fundamental divergences in handwritings, while also covering the examination of signatures, paper, and ink. Students will explore different types of forgeries, alterations in documents, indented and invisible writings, and the examination of counterfeit currency, passports, and other legal documents. Additionally, the course covers the basic tools and techniques used for examining documents, such as spectroscopy, photomicrography, video spectral comparators, and electrostatic detection apparatus. By the end of the course, students will have a solid foundation in the principles and methodologies of forensic document examination.

Course Outcomes:
CO1 Understand the nature and scope of forensic document examination.
CO2 Analyze handwriting principles, variations, and divergences in handwritings.
CO3 Examine various types of forgeries and altered documents.
CO4 Gain proficiency in using basic tools and techniques for document examination, including spectroscopy and photomicrography.

CONTENTS

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

(Core-XII)
BSFS403: Forensic Biology

Course Objective:
This course is designed to provide students with a comprehensive understanding of biological evidence analysis in forensic science. Students will explore the nature and importance of biological evidence, focusing on blood, semen, microbial organisms, and genetic markers. They will learn about the composition, functions, and identification of these substances, as well as techniques for blood stain grouping using ABO, Rh, and MN systems. Additionally, students will delve into the identification and examination of other biological evidences, including saliva, urine, hair, and various body fluids. The course covers the significance of hair evidence, the structure of human and animal hair, and the examination of different body fluids and stains. Students will also gain insights into the identification of wood, timber, seeds, leaves, diatoms, and pollen grains for forensic purposes. Furthermore, the course explores forensic serology, DNA profiling techniques, mtDNA, polymorphism, and methods of analyzing biological fluids. By the end of the course, students will possess a strong foundation in analyzing a wide range of biological evidence in forensic investigations.

Course Outcomes:
CO1 Understand the nature and significance of biological evidence in forensic science.
CO2 Analyze the composition, functions, and identification techniques for blood, semen, and microbial organisms.
CO3 Examine various body fluids, hair, and other biological evidences, and recognize their forensic importance.
CO4 Gain proficiency in DNA profiling, mtDNA analysis, polymorphism, and identification of wildlife materials and entomological evidence.

CONTENTS

Unit 1: Biological Evidences – Blood
Nature and importance of biological evidence.Composition and Functions of Blood and Semen.Types and identification of microbial organisms of forensic significance.Determination of species, Grouping of Blood stains and their techniques; ABO, Rh and MN system, Genetic markers and their classification.

Unit 2: Examinations of Biological Evidences
Identification of 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.Identification and examination of other body fluids/stains-vaginal, pus, vomit, milk, sweat and tears etc.

Unit 3: Other Biological Evidences
Various types of wood, timber varieties, seeds and leaves– their identification and matching. Diatoms - Types morphology, methods of isolation from different tissue and forensic importance of planktons-especially diatom, forensic significance in drowning cases, Study and identification of pollen grains and its forensic Importance.

Unit 4: Forensic Serology
DNA: Introduction, Source and Structure, DNA Profiling techniques, mt DNA and its forensic significance, Polymorphism in DNA, RFLP and PCR methods of biological fluid analysis; Identification

methods of wild life materials and Entomological evidences.

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).

(GE-IV)

BSFS404A: Advanced Forensic Science

Course Objective:

This comprehensive course aims to provide students with a deep understanding of various specialized fields within forensic science. Students will delve into the realm of forensic psychology, grasping its significance in civil and criminal cases, criminal profiling, investigative techniques, and tools like narco analysis, hypnosis, and brain fingerprinting. The course extends to wildlife forensics, covering protected species, wildlife material identification, necropsy procedures, and pollen grain identification. Additionally, students will explore forensic anthropology, understanding bone identification, age, and gender determination from skeletal remains, as well as techniques like somatoscopy and osteometry. The course concludes with forensic genetics, where students will learn about DNA extraction, PCR techniques, personal identification methods, DNA profiling, and its applications in various scenarios. By the end of the course, students will possess a comprehensive understanding of these diverse forensic disciplines and their respective roles in investigative processes.

Course Outcomes:

CO1 Master the role of forensic psychology in civil and criminal cases, including criminal profiling and investigative tools.

CO2 Analyze wildlife forensics, including the identification of protected species, necropsy procedures, and pollen grain identification.

CO3 Understand forensic anthropology, including bone identification and personal identification techniques.

CO4 Grasp the principles of forensic genetics, DNA extraction, PCR, and DNA profiling, with applications in disputed paternity, identity disputes, and missing person cases.

CONTENTS

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, Somatometery, Osteometery and Craniometery 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.

Recommended Books:

1. Encyclopedia of criminal and deviant behavior (2001) Cliffon D. Pryart, Editor in chief rout ledge, 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.

(GE-IV)

BSFS404B: Basic Concept of Biology

Course Objective:

This course aims to provide a comprehensive understanding of key concepts in biology, encompassing organismal biology, molecular basis of life, human physiology, eukaryotic cell biology, immunology, biochemistry, microbiology, molecular biology, and genetics. Through theoretical explanations and practical examples, students will develop a strong foundation in biological sciences. By the end of the course, students will possess the knowledge and skills to analyze cellular processes, physiological functions, immune responses, genetic principles, and biochemical pathways, enabling them to comprehend the complexity of living organisms and their molecular underpinnings.

Course Outcomes:

CO1 Analyze the cellular structure, organelles, and mechanisms of vesicle-mediated protein transport, endocytosis, and exocytosis.

CO2 Understand human physiology, focusing on internal environment control, renal physiology, hormonal regulation, and interactions within various systems.

CO3 Evaluate eukaryotic cell biology, cell membranes, and immune system components, including innate and adaptive immunity.

CO4 Comprehend the fundamental concepts of enzymes, enzyme kinetics, biosynthesis, and human metabolism.

CO5. Examine microbiology, molecular biology, and genetics, recognizing the diversity of microbes, molecular processes, Mendelian genetics, and genetic disorders.

CONTENTS

Unit-I:(Organismal Biology and the Molecular Basis ofLife)

Introduction to the world of living organisms, Cell as a unit of living organisms and cellular organelles, Vesicle-mediated protein transport, endocytosis and exocytosis, mitochondria and respiration.

Unit-II:(Human Physiology)

Basics of Human physiology: Introduction to physiology, internal environment, control of internal environment by feedback systems, renal physiology, body fluids and kidneys, urine formation by the kidneys, cell signaling and endocrine regulation, hormonal regulations. Brief introduction to various system of human body.

Unit-III:(Eukaryotic Cell Biology and Immunology)

Eukaryotic cells and organelles, cell membranes and cell function. Introduction to the immune system – the players and mechanisms, innate immunity, adaptive responses, B cell receptor and immunoglobulins, T cell activation and differentiation and Major Histocompatibility Complex encoded molecules.

Unit-IV: Biochemistry

Basic concepts of enzymes and enzyme kinetics, Basic concepts related to biosynthesis of micro and macro molecules and basics of human metabolism.

Unit-V: (Microbiology, Molecular Biology and Genetics)

Introduction to the microbial world and its diversity; importance of microbes in exploration of basic principles of biology, Basic concepts of Molecular biology, Mendelian genetics,Definitions of cytoplasmic inheritance; pedigrees, markers, mapping and genetic disorders; gene frequencies

and Hardy-Weinberg principle.

Suggested Readings:

1. Carson, R. Silent Spring, Fawcett World Library, New York, 1967.
2. Dawkins, R. The Blind Watchmaker, Longman Scientific & Technical, England, 1986.
3. R. Gadagkar, Survival Strategies – Cooperation and Conflict in Animal
4. Societies, Harvard University Press and Universities Press, Cambridge,Massachusetts, USA and Hyderabad, India, 1997, 1998.
5. D. Sadava, D. M. Hillis, H. Craig Heller, M. Berenbaum, Life, the science of biology, W. H. Freeman, 9th edition, 2009.
6. J. M. Berg, J. L. Tymoczko, L. Styrer, Biochemistry, W. H. Freeman & Co., 6th edition, 2006.
7. R. Y. Stanier, E. A. Adelberg, J. L. Ingraham, General Microbiology, MacMillan Press, 5
8. th edition, 2007.
9. M.W. Strickberger, Genetics, Prentice-Hall, India, 3rd edition, 2008.
10. Harvey Lodish, Arnold Berk, Chris A. Kaiser, Monty Krieger, Matthew P. Scott, Anthony Bretscher, HiddePloegh, Paul Matsudaira, Molecular Cell Biology, W.H. Freeman; 6th edition, 2007.
11. Bruce Alberts, Molecular Biology of the Cell, Garland Science, 5th edition, 2008
12. T. Kindt, R. Goldsby, B. A. Osborne, Kuby Immunology, W. H. Freeman, 6th edition, 2006.
    D. Voet, J. G. Voet, Biochemistry, Wiley, 4rd edition, 2010.
13. J. M. Berg, J. L. Tymoczko, L. Styrer, Biochemistry, W. H. Freeman & Co., 6th edition, 2006.
    A. Liljas, L. Liljas, J. Piskur, G. Lindblom, P. Nissen, M. Kjeldgaard, Textbook ofStructural Biology, World Scientific Publishing Company, 2009.
14. J. E. Hall, Guyton and Hall Textbook of Medical Physiology, Elsevier, 12th edition, 2011.
15. J. L. Jameson, L. J. De Groot, Endocrinology, Elsevier, 6th Edition, 2010.
16. L. Taiz, E. Zeiger, Plant Physiology, Sinauer Associates, 5th edition, 2010.

(SEC-II)

BSFS405: Handwriting Identification and Recognition

Course Objective:

This comprehensive course is designed to provide students with a thorough understanding of handwriting identification and examination. Students will delve into the fundamental basis of handwriting identification, exploring the characteristics that define handwriting and its scope of application. The course covers both class and individual characteristics of handwriting, encompassing aspects such as arrangement, alignment, margin, slant, speed, pressure, spacing, line quality, embellishments, movement, and pen lifts. Additionally, students will explore the factors influencing handwriting, including physical, mechanical, genetic, and physiological factors. The course extends to handwriting examination, including the collection of handwriting samples, forgery detection, counterfeiting, and the examination of altered and erased documents. Students will also gain insights into the tools used in handwriting examination. Furthermore, the course covers the basis of handwriting recognition, both off-line and on-line, as well as the steps involved in handwriting recognition, such as pre-processing, feature extraction, and classification. By the end of the course, students will possess a solid foundation in handwriting identification, examination, and recognition techniques.

Course Outcomes:

CO1. Master the basis of handwriting identification, exploring its characteristics and application scope.

CO2. Analyze class and individual characteristics of handwriting, including various influencing factors.

CO3. Understand handwriting examination techniques, including forgery detection and altered document examination.

CO4. Gain proficiency in the basis of handwriting recognition, both off-line and on-line, and comprehend the steps involved in handwriting recognition processes.

CONTENTS

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. Applications of handwriting recognition.

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. Z. Liu, J.H.Cai and R. Buse, Handwriting Recognition: Soft Computing and Probabilistic Approach (Volume 133), Springer Science and Business Media (2003).

(Practical Core-X)

BSFS406P: Practical's based on Forensic Chemistry

Practical Exercise

1. Tocarryoutanalysisofgasoline.
2. Tocarryoutanalysisofdiesel.
3. Tocarryoutanalysisofkeroseneoil.
4. Toanalyzearsonaccelerators.
5. Topreparеacasereportonacaseinvolvingarson.
6. Tocarryoutanalysisofexplosivesubstances.
7. Toseparateexplosivesubstancesusingthinlayerchromatography.
8. Topreparеacasereportonbombscenemanagement.

(Practical Core-XI)
BSFS407P: Practical's based on Questioned Documents

Practical Exercise

1. To identify handwriting characters.
2. To study natural variations in handwriting.
3. To compare handwriting samples.
4. To detect simulated forgery.
5. To detect traced forgery.
6. To study the line quality defects in handwriting samples.
7. To examine the security features of currency notes, passports and plastic money.
8. To study alterations, obliterations and erasures in handwriting samples.
9. To cite a case wherein Section 45 of Indian Evidence Act was invoked, seeking expert opinion for authentication of handwriting and/or signatures.
10. To cite a case wherein Section 489A of the Indian Penal Code was invoked in context of fake currency.
11. Examination of Secret and Indented writing.

(Practical Core-XII)
BSFS408P: Practical's based on Forensic Biology

Practical Exercise

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.

(Practical GE-IV)

BSFS409P (A): Practical's based on Advanced Forensic Science

Practical Exercise

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

(Practical GE-IV)

BSFS409P (B): Practical's based on Basics Concept of Biology

Practical Exercise

1. Demonstration of law of segregation, independent assortment and epistasis.
2. Inheritance of other human characteristics, ability to taste, PTC, Thiourea.
3. Gene frequency calculations and random mating.
4. Counting of WBC, RBC and DLC.
5. Estimation of Hemoglobin.
6. To determine titer of Antisera.
7. Demonstration of Electrophoresis.

(Semester-V)
(Core-XIII)
BSFS501: Forensic Ballistics

Course Objective:
This comprehensive course aims to provide students with an in-depth understanding of firearms, ammunition, and ballistic analysis in forensic science. Students will delve into the history, development, and classification of firearms, gaining insights into different weapon types and their firing mechanisms. The course extends to the intricacies of internal, external, and terminal ballistics. Students will comprehend factors affecting internal ballistics such as ignition time, barrel time, and erosion, as well as trajectory measurements, automated trajectory computation, and terminal ballistic effects. The course further covers ammunition types, constructional features of cartridges, bullets, primers, and projectiles. Students will learn about firearm evidence analysis, including matching bullets and cartridge cases, identifying marks produced during firing, and automated bullet and cartridge case comparison. Moreover, the course explores the determination of firing range, gunshot residue analysis, firearms injuries, and reconstruction techniques for accident, suicide, murder, and self-defense scenarios.

Course Outcomes:
CO1. Understand the history, classification, and operation of firearms, as well as their firing mechanisms.
CO2. Analyze internal, external, and terminal ballistics principles and their impact on trajectory and target effects.
CO3. Recognize different types of ammunition, including constructional features, projectiles, and primers.
CO4. Gain proficiency in firearm evidence analysis, including bullet and cartridge case matching, gunshot residue analysis, and injury identification.

CONTENTS

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, Head stamp 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 clothings. Identification and nature of firearms injuries.Reconstruction with respect to accident, suicide, murder and self defence.

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).

(Core-XIV)
BSFS502: Forensic Toxicology

Course Objective:
This comprehensive course is designed to provide students with a thorough understanding of toxicology, focusing on the definition, scope, and significance of toxicological findings. Students will explore the techniques used in toxicology, toxicological analysis, chemical intoxication tests, and the application of toxicology in various contexts such as postmortem and clinical cases. The course covers poison definition, classification, physico-chemical characteristics, mode of action, metabolism, excretion, and various types of poisonings. Students will learn about the signs, symptoms, and antidotes of common poisoning cases, as well as the collection, preservation, and extraction of poison from viscera. The course extends to the identification and analysis of biocides, heavy metals, animal and vegetable poisons, as well as alcoholic and non-alcoholic illicit liquors. Furthermore, students will explore the identification, classification, and analysis of drugs, including narcotics, stimulants, depressants, hallucinogens, and psychotropic substances. By the end of the course, students will possess a solid foundation in toxicology, poisons, and drug analysis techniques.

Course Outcomes:
CO1. Master the scope and significance of toxicological findings and techniques.
CO2. Analyze poison classification, physico-chemical characteristics, and modes of action.
CO3. Understand the identification and analysis of biocides, heavy metals, poisons, and various types of drugs.
CO4. Gain proficiency in toxicological analysis, identifying signs of poisoning, and analyzing illicit substances for their classification and effects.

CONTENTS

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. Saferestein, 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.

a. 9. 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. Clark, E.G.C.; Isolation and Identification of Drugs, Vol I&II, Academic Press,
11. Sunshine I; Year book of Toxicology, CRC Press Series, USA
12. Michael J. Deverlanko et al: Hand Book of Toxicology CRC Press, USA.
13. Parikh C.K; Text Book of Medical Jurisprudence Forensic Medicines and Toxicology. CBS Pub. New Delhi.
14. Robert J. Flanagan, Andrew A. Taylor, Ian D. Watson, Robin Whelpton Fundamentals of Analytical Toxicology, Wiley.
15. Bamford Frank. Poisons- their isolation and identification, J &.A Churchill Ltd

(DSE-I)
BSFS503A: Digital Forensics

Course Objective:
This comprehensive course aims to provide students with a solid foundation in computer forensics, covering fundamental concepts of computers, computer crimes, investigations, and networking. Students will delve into the fundamentals of computers, including hardware components, memory, processors, operating systems, and software. The course extends to the realm of computer crimes, distinguishing between computer crimes and conventional crimes, and exploring various types of cybercrimes such as hacking, viruses, worms, and intellectual property violations. Students will learn about computer forensics investigations, including the seizure of suspected computers, protocols for scene management, data extraction, treatment of exhibits, file restoration, and encryption methods. Moreover, the course covers the basics of networking, including LAN, WAN, MAN, TCP/IP protocol, OSI model, network security threats, and vulnerabilities. By the end of the course, students will possess a comprehensive understanding of computer forensics, cybercrimes, investigations, and networking principles.

Course Outcomes:
CO1. Understand the fundamentals of computers, hardware, memory, processors, operating systems, and software.
CO2. Analyze different types of computer crimes and their impact on security and privacy.
CO3. Gain proficiency in computer forensics investigations, including evidence seizure, data extraction, file restoration, and encryption techniques.
CO4. Recognize the basics of networking, including protocols, security threats, and vulnerabilities in the digital realm.

CONTENTS

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).

(DSE-I)

BSFS503B: Economic Offences

Course Objective:

This comprehensive course aims to equip students with a deep understanding of economic offences, their taxonomy, criminogenic factors, prevention, and legal recognition. Students will explore the fundamentals of economics in the context of economic offences, covering tax evasion, excise duty evasion, white-collar crime, corruption, money laundering, and more. The course delves into applied economics in processing evidence, including forensic accountancy, auditing, and valuation of economic losses. Students will also learn about legislations and enforcement agencies dealing with economic offences, such as the RBI Act, SEBI Act, and Competition Commission of India Act. Additionally, the course provides international perspectives by highlighting measures adopted by FBI and INTERPOL. Case histories of economic offences will further enhance students' understanding of real-world scenarios.

Course Outcomes:

CO1. Understand the taxonomy of economic offences and criminogenic factors influencing their occurrence.

CO2. Analyze the application of economics in processing evidence, including forensic accountancy and valuation of economic losses.

CO3. Gain proficiency in the prevention of economic offences through legislative measures and enforcement agencies.

CO4. Recognize the legal recognition of economic crimes, including relevant sections related to intellectual property crime, corruption, money laundering, and more.

CONTENTS

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

Relevent 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.

(DSE-II)

BSFS504A: Forensic Serology

Course Objective:

This comprehensive course aims to provide students with a deep understanding of the forensic importance of body fluids, their composition, functions, and analysis techniques. Students will explore the significance of common body fluids such as blood, semen, saliva, sweat, milk, and urine in forensic investigations. The course covers the composition and functions of these fluids, including the morphology of spermatozoa, and provides insights into the collection, evaluation, and identification tests for each fluid. Additionally, students will learn about the individualization potential of semen examination. The course extends to bloodstain pattern analysis, covering different bloodstain characteristics and patterns, including impact, cast-off, projected, and contact patterns. Students will also understand the drying times of bloodstains and the documentation of bloodstain pattern evidence for crime scene reconstruction. Furthermore, the course introduces students to biochemical markers analysis, including cellular antigens, ABO blood groups, extracellular proteins, intracellular enzymes, and their forensic significance for identification and individualization.

Course Outcomes:

CO1. Understand the forensic significance of body fluids, including blood, semen, saliva, sweat, milk, and urine.

CO2. Analyze the composition, functions, and morphology of body fluids and the techniques for their identification.

CO3. Gain proficiency in bloodstain pattern analysis, recognizing different patterns and their application in crime scene reconstruction.

CO4. Recognize the importance of biochemical markers analysis for individualization and identification purposes in forensic investigations.

CONTENTS

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.

(DSE-II)

BSFS504B: Accident Investigations

Course Objective:

This comprehensive course aims to provide students with a thorough understanding of motor vehicle accidents and their forensic analysis. Students will learn about accident scene investigation, sources of forensic information, and the importance of eyewitness accounts. The course covers the assessment of vehicle damage, visibility conditions, and the role of photographs in documenting accident sites. Additionally, students will explore surface markings during road traffic accidents (RTAs), including tire marks, skid marks, and scuff marks. The course delves into the maintenance of vehicles, the significance of airbags, and the analysis of abandoned and railway accidents. Students will gain insights into accident analysis, encompassing pre-crash and post-crash movement, collision models, driver reactions, occupant kinematics, types of injuries, and biomechanics of injuries. The course also addresses hit-and-run investigations and the importance of trace evidence at accident sites. Furthermore, students will learn about the forensic significance of tachograph data, tachograph charts, principles of chart analysis, and accuracy in speed recording. The course emphasizes the effects of tire slip, falsification, and diagnostic signals in tachograph data, along with route tracing techniques.

Course Outcomes:

CO1. Understand the processes and techniques for investigating motor vehicle accidents and gathering forensic information.

CO2. Analyze surface markings like tire marks and skid marks to determine the dynamics of road traffic accidents.

CO3. Gain proficiency in accident analysis, including collision models, driver reactions, occupant kinematics, and injury biomechanics.

CO4. Recognize the forensic significance of tachograph data and its analysis, along with the interpretation of tachograph charts for speed recording and route tracing.

CONTENTS

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).

(Practical Core-83)
BSFS505P: Practical'sbasedonForensicBallistics

Practical Exercise

1. Todescribe,withtheaidofdiagrams,thefiringmechanismsofdifferenttypesoffirearms.
2. Tocorrelatethevelocityofbulletwiththeimpactitproducesonthetarget.
3. Tocorrelatethestrikingangleofthebulletwiththeimpactonthetarget.
4. Toestimatetherangeoffiredbullets.
5. Tocarryoutthecomparisonoffiredbullets.
6. Tocarry outthecomparisonoffiredcartridge cases.
7. Toidentifygunshotresidue.
8. Tocorrelatethenatureofinjurieswithdistancefromwhichthebulletwasfired.
9. Todifferentiate,withtheaidofdiagram,contactwounds,closerangewoundsanddistantwounds.

(Practical Core-84)

BSFS506P: Practical's based on Forensic Toxicological Analysis

Practical Exercise

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.

(Practical DSE-I)

BSFS507A(P): Practical's based on Digital Forensics

Practical Exercise

1. Toidentify,seizeandpreservedigitalevidencefromcrimescenes.
2. Todetectdeletions,obliterationsandmodificationsoffilesusingencasesoftware.
3. Totraceroutesfollowedbye-mailsandchats.
4. ToidentifytheIPaddressofthesenderofe-mails.
5. Todemonstrateconcealmenttechniquesusingcryptographic PGP.
6. Toidentifyencryptedfiles.
7. Toidentify hiddenfiles.
8. Tousedigitalsignaturesforsecuringe-mailandonlinetransactions.
9. ToacquiredatafromPCs/laptops/HDDs/USBs,pendrives,memorycardsandSIMcards.
10. Tousesymmetricandasymmetrickeysforprotectionofdigitalrecord.
11. Tocarryoutimagingofharddisks.

(Practical DSE-I)
BSFS507B(P): Practical's based on Economic Offences

Practical Exercise

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 TELLY 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.

(Practical DSE-II)

BSFS508A(P): Practical's based on Forensic Serology

Practical Exercise

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.

(Practical DSE-II)

BSFS508B(P): Practical's based on Accident Investigations

Practical Exercise

1. To lift tire 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)
(Core-XV)
BSFS601: Forensic Anthropology

Course Objective:
This comprehensive course aims to provide students with a thorough understanding of forensic anthropology and its applications in personal identification. Students will learn about the scope of forensic anthropology, including osteometry, craniometry, and skeletal anatomy, and their role in identifying human remains. The course covers forensic odontology, focusing on dental structures, anomalies, and their significance in identification. Additionally, students will explore somatoscopy and somatometry for personal identification, including the observation of features like hair, scars, and measurements of various body parts. The course delves into facial reconstruction techniques, such as portrait parle, photofit, and craniofacial superimposition, using methods like photographic and roentgenographic superimposition. Students will also gain insights into genetic and congenital anomalies, their types, identification, and forensic significance.

Course Outcomes:
CO1. Understand the scope of forensic anthropology and its role in personal identification through osteometry and craniometry.
CO2. Analyze human skeletal anatomy for age, sex, stature, and side determination from skeletal remains.
CO3. Gain proficiency in forensic odontology, including tooth types, dental anomalies, and bite mark analysis for personal identification.
CO4. Apply somatoscopy and somatometry techniques to identify physical features and measurements for personal identification.

CONTENTS

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/identi kit.Facial superimposition techniques.Cranio facial super imposition techniques – photographic super imposition, videosuperimposition, 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).

(Core-XVI)
BSFS602: Forensic Medicine

Course Objective:
This comprehensive course aims to equip students with a solid understanding of medical jurisprudence, its fundamental concepts, and its application in legal proceedings. Students will learn about legal procedures in criminal court, the role of medical evidence and witnesses, and the legal aspects of medical practices, including medical negligence and consent. The course provides an in-depth exploration of autopsy procedures, including objectives, rules, and reporting. Students will gain knowledge of different types of autopsies, preservation methods, psychological autopsy, and handling of infected bodies.

Course Outcomes:
CO1. Understand the fundamental concepts and scope of medical jurisprudence and its relevance in legal cases.
CO2. Gain insights into autopsy procedures, different types of autopsies, and the preparation of autopsy reports.
CO3. Analyze the classification, mode, manner, and causes of death, as well as the investigation of specific types of deaths.
CO4. Develop proficiency in recognizing and classifying injuries, including those caused by burns, mechanical trauma, explosions, and more.

CONTENTS

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 verus 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)

(DSE-III)

BSFS603A: DNA Typing

Course Objective:

This course aims to provide students with a comprehensive understanding of DNA analysis techniques and their application in forensic science. Students will explore the fundamental principles of DNA as the blueprint of life, extraction methods, and quantitation techniques. The focus will then shift to forensic DNA typing, covering collection of specimens, polymerase chain reaction, short tandem repeats (STR), and restriction fragment length polymorphism (RFLP) techniques. The principles of parentage testing, including genetics of paternity, mathematical basis of identification, and application in missing body cases, will also be covered. Additionally, the course aims to equip students with effective report writing skills, focusing on the role of DNA typing in identifying unrecognizable bodies, allele frequency determination, and probability calculations within a population database.

Course Outcomes:

CO1. Apply DNA extraction methods and quantitation techniques for forensic analysis.

CO2. Demonstrate proficiency in DNA typing techniques, including STR and RFLP, for individualization of evidence.

CO3. Evaluate genetic principles of parentage testing, mathematical basis of identification, and their applications.

CO4. Develop report writing skills for effectively communicating DNA analysis results.

CONTENTS

Unit 1: Basic Principles

DNA as biological blueprint of life.Extraction of DNA for analysis. Quantitation of DNA – yield gel quantitation and slot blot quantitation. Mitochondrial DNA – sequence analysis.

Unit 2: Forensic DNA Typing

Collection of specimens.Polymerase chain reaction – historical perspective, sequence polymorphisms, individualization of evidence. Short tandem repeats (STR) – role of fluorescent dyes, nature of STR loci. Restriction fragment length polymorphism (RFLP) – genetic markers used in RFLP, typing procedure and interpretation of results. Touch DNA.

Unit 3: Parentage Testing

Principles of heredity.Genetics of paternity. DNA testing in disputed paternity. Mandelian laws of parentage testing. Mathematical basis of parentage identification.Missing body cases.Reference populations and databases.

Unit 4: Report writing

Report Writing: Role of DNA typing in identifying unrecognizable bodies.Allele frequency determination. Hardy-Weinberg law.Probability determination in a population database.

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).

(DSE-III)

BSFS603B: Modern Forensic Toxicology

Course Objective:

This comprehensive course aims to provide students with an in-depth understanding of environmental, industrial, household, and workplace forensic toxicology. It covers the concepts, definitions, scopes, and forensic significance of these fields. Students will explore toxic compounds' modes of action, sources, movement in the environment, and dose-response relationships. They will delve into the toxicology of industries, understanding types of pollution, industrial poisons, hygiene, and effluent management. The course also examines household poisoning, including legislations, common poisons, classifications, and effects on human health. Workplace poisoning will be extensively covered, encompassing regulations, occupational hazards, chemical dangers, and health impacts.

Course Outcomes:

CO1 Analyze the forensic significance and scope of environmental, industrial, household, and workplace toxicology.

CO2 Evaluate the modes of toxic action, dose-response relationships, and movement of toxic compounds in the environment.

CO2 Identify common industrial and household poisons, their classifications, and direct/indirect effects on health.

CO4 Interpret regulations, policies, and safety measures in managing toxic substances in various contexts.

CONTENTS

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 house hold 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 & R Sofield,-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 LT Fairhall,-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.

(Practical Core-XV)

BSFS604P: Practical's based on Forensic Anthropology

Practical Exercise

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.

(Practical Core-XVI)
BSFS605P: Practical's based on Forensic Medicine

Practical Exercise

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.

(Practical DSE-III)

BSFS606A(P): Practical's based on DNA Typing

Practical Exercise

1. To carry out the separation of amino acids by thin layer chromatography.
2. To carry out extraction of DNA from body fluids.
3. To preparation of gel plates for electrophoresis.
4. To carry out electrophoresis for separation of enzymes.
5. To prepare a report on the role of DNA typing in solving paternity disputes.

(Practical DSE-III)

BSFS606B(P): Practical's based on Modern Forensic Toxicology

Practical Exercise

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.

(DSE-IV)
BSFS607P: Dissertation/Project Work

The dissertationwillbebasedona researchtopicinForensicScience/Criminology.The topic willbeassignedinconsultationwithpoliceandforensicscienceestablishments,givingdue considerationtotheproblemareasfacedbytheseinstitutions.Thestudentswillbeexpected to undertakeextensive field work, in collaboration withmobile policelaboratories.