

BHARTI VISHWAVIDYALAYA

DURG (C.G)

Website - www.bhartiuniversity.org, Email–bhartiuniversity.in@gmail.com



**SCHEME OF EXAMINATION
&
SYLLABUS
OF
BACHELOR OF SCIENCE(HONORS) FORENSIC SCIENCE
UNDER
FACULTY OF SCIENCE
Session: 2022-2023
(Approved by Board of Studies)**

EXAMINATION SCHEME

B. Sc. FORENSIC SCIENCE (HONORS)

B. Sc. (Honors) examination will be conducted in six SEMESTER

SEMESTER– I

THEORY

PAPER CODE	SUBJECT	CREDITS	THEORY MARKS	TEACHER ASSESSMENT	TOTAL MARKS
BSHFS-101	Introduction to Forensic Science	4	70	30	100
BSHFS -102	Crime and Society	4	70	30	100
GE-I	1 Chemistry- I 2 Botany - I 3 Zoology - I	4	35	15	50
AECC	English Communication / MIL	2	35	15	50
ECA	Introduction to Biometry	2	35	15	50

PRACTICAL

PAPER CODE	SUBJECT	CREDITS	PRACTICAL MARKS	TEACHER ASSESSMENT	TOTAL MARKS
BSHFS-L101	Crime Scene	2	35	15	50
BSHFS-L102	Crime and Society	2	35	15	50
GEL-I	Generic Elective - Lab-I	2	35	15	50

**B. Sc. FORENSIC SCIENCE (HONORS)
SEMESTER-II**

THEORY

PAPER	COURSE	CREDITS	THEORY MARKS	TEACHER ASSESSMENT	TOTAL MARKS
BSHFS-201	Criminal Law	4	70	30	100
BSHFS -202	Forensic Psychology	4	70	30	100
GE-II	1 Chemistry-II 2 Botany-II 3 Zoology -II	4	35	15	50
AECC	Environmental Science	2	35	15	50
ECA	ECA-Extracurricular activity/ Tour, Industrial training/ Field visit, NSS/ Swachhta/ vocational Training/ Sports/ others	2	35	15	50

PRACTICAL

PAPER	COURSE	CREDITS	PRACTICAL MARKS	TEACHER ASSESSMENT	TOTAL MARKS
BSHFS-L201	Preparing schedules	2	35	15	50
BSHFS-L202	Forensic Psychology	2	35	15	50
GEL-II	Generic Elective - Lab-II	2	35	15	50

B. Sc. FORENSIC SCIENCE (HONORS)**SEMESTER-III****THEORY**

PAPER	COURSE	CREDITS	THEORY MARKS	TEACHER ASSESSMENT	TOTAL MARKS
BSHFS-301	Forensic Dermatoglyphics	4	70	30	100
BSHFS-302	Technological Methods in Forensic Science	4	70	30	100
BSHFS-303	Criminalistics	4	70	30	100
GE-III	1 *Chemistry-III 2 Botany -III 3 Zoology -III	4	35	15	50
SEC – 1	Select one from the pool of SEC courses offered by different department	2	35	15	50

PRACTICAL

PAPER	COURSE	CREDITS	PRACTICAL MARKS	TEACHER ASSESSMENT	TOTAL MARKS
BSHFS-L301	Finger Prints	2	35	15	50
BSHFS-L302	Technological Methods	2	35	15	50
BSHFS-L303	Crime scene samples	2	35	15	50
GEL-III	Generic Elective Lab-III	2	35	15	50

***Students may Opt any one GE-III Chemistry as mention in syllabus**

B. Sc. FORENSIC SCIENCE (HONORS)

SEMESTER-IV

THEORY

PAPER	COURSE	CREDITS	THEORY MARKS	TEACHER ASSESSMENT	TOTAL MARKS
BSHFS-401	Forensic Chemistry	4	70	30	100
BSHFS-402	Questioned Documents	4	70	30	100
BSHFS-403	Forensic Biology	4	70	30	100
GE-IV	1 *Chemistry-IV 2 Botany-IV 3 Zoology-IV	4	35	15	50
SEC -2	Select one from the pool of SEC courses offered by different department	2	35	15	50

PRACTICAL

PAPER	COURSE	CREDITS	PRACTICAL MARKS	TEACHER ASSESSMENT	TOTAL MARKS
BSHFS-L401	Forensic Chemistry	2	35	15	50
BSHFS-L402	Questioned Documents	2	35	15	50
BSHFS-L403	Forensic Biology	2	35	15	50
GEL-IV	Generic Elective - Lab-IV	2	35	15	50

***Students may Opt any one GE-IV Chemistry as mention in syllabus**

B. Sc. FORENSIC SCIENCE (HONORS)**SEMESTER-V****THEORY**

PAPER	COURSE	CREDITS	THEORY MARKS	TEACHER ASSESSMENT	TOTAL MARKS
BSHFS-501	Forensic Ballistics	4	70	30	100
BSHFS -502	Forensic Toxicology	4	70	30	100
DSE-1	DSE-1- Theory	4	70	30	100
DSE-2	DSE-2- Theory	4	70	30	100

PRACTICAL

PAPER	COURSE	CREDITS	PRACTICAL MARKS	TEACHER ASSESSMENT	TOTAL MARKS
BSHFSL-501	Forensic Ballistics	2	35	15	50
BSHFSL-502	Forensic Toxicological analysis	2	35	15	50
DSEL-1	DSE-1- Lab	2	35	15	50
DSEL-2	DSE-2- Lab	2	35	15	50

B. Sc. FORENSIC SCIENCE (HONORS)

SEMESTER-VI

THEORY

PAPER	COURSE	CREDITS	THEORY MARKS	TEACHER ASSESSMENT	TOTAL MARKS
BSHFS-601	Forensic Anthropology	4	70	30	100
BSHFS - 602	Forensic Medicine	4	70	30	100
DSE-3	DSE-3- Theory	4	70	30	100
DSE-4	DSE-4- Theory	4	70	30	100

PRACTICAL

PAPER	COURSE	CREDITS	PRACTICAL MARKS	TEACHER ASSESSMENT	TOTAL MARKS
BSHFS-L601	Forensic Anthropology	2	35	15	50
BSHFS-L602	Forensic Medicine	2	35	15	50
DSEL-3	DSE-3- Lab	2	35	15	50
DSE-4-Project	Dissertation/ Project work followed by seminar	2	35	15	50

* As per UGC CBCS guidelines, University / departments have liberty to offer GE and SEC courses offered by one department to students of other departments. The No. of GE course is four. One GE course is compulsory in first 4 semesters each Minimum One Skill Enhancement course shall be proposed by each department (4 credits) [4 L or 2 L+ 2 P or 1 L+3 P or 3L+ 1 T] 1P = 2 hours.

*Credit= $L+T+P/2$

Where, **L**-Lecture, **T**-Tutorial and **P**- Practical

Total Credits=144

SCHEME FOR PRACTICAL EXAMINATION

EXPERIMENT	MARKS
Experiment	25
Viva-voce	10
Teacher Assessment	15
TOTALMARKS	50

FORENSIC SCIENCE DSE: I-VI (ELECTIVES)

- DSE-1: DIGITAL FORENSICS
DSE-2: ECONOMIC OFFENCES
DSE-3: FORENSIC SEROLOGY
DSE-4: ACCIDENT INVESTIGATION
DSE-5: DNA TYPING
DSE-6: MODERN FORENSIC TOXICOLOGY

SKILL ENHANCEMENT COURSE

- SEC-1: HANDWRITING IDENTIFICATION AND RECOGNITION
SEC-2: FORENSIC SCIENCE AND SOCIETY

CORE SUBJECTS (HONORS IN FORENSIC SCIENCE)
Semester I
INTRODUCTION TO FORENSIC SCIENCE (BSHFS-101)

CREDITS- 4

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.

Unit 5: Role of Police

Role of Police in crime investigations. State criminal investigation departments , FIR, Police dogs. Services of crime laboratories. Basic services and optional services.

Reference Books:

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).

CRIME SCENE (BSHFS-L-101)

CREDITS-2

1. 1.To study the history of crime cases from forensic science perspective.
2. 2.To cite examples of crime cases in which apprehensions arose because of Daubert standards
3. 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

Reference Books:

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).

CRIME AND SOCIETY (BSHFS-102)

CREDITS: 4

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.

Unit 2: Criminal profiling

Criminal profiling, Understanding the basics of Corpus delicti and Modus operandi.

Unit 3: 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 4: 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 5: 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.

Reference Books:

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.

CRIME AND SOCIETY LAB (BSHFS-L102)

CREDITS-2

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

Reference Books:

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).

GE-I: CHEMISTRY: INORGANIC CHEMISTRY-I (BSHCY-101)

CREDITS: 4

UNIT– I: Atomic Structure

Bohr,s theory, its limitations and atomic spectrum of hydrogen atom. Wave mechanics: de Broglie equation, Heisenberg’s Uncertainty Principle and its significance, Schrödinger’s wave equation, significance of ψ and ψ^2 . Quantum numbers and their significance. Normalized and orthogonal wave functions. Shapes of *s*, *p*, *d* and *f* orbitals. Pauli's Exclusion Principle, Hund's rule of maximum multiplicity, Aufbau's principle and its limitations, Variation of orbital energy with atomic number.

UNIT –II: Periodicity of Elements

s, *p*, *d*, *f* block elements, the long form of periodic table. Detailed discussion of the following properties of the elements, with reference to *s* & *p*-block'

(a) Effective nuclear charge, shielding or screening effect, Slater rules, variation of effective nuclear charge in periodic table.

(b) Atomic radii (van der Waals)

(c) Ionic and crystal radii.

(d) Covalent radii (octahedral and tetrahedral)

(e) Ionization enthalpy, Successive ionization enthalpies and factors affecting ionization energy. Applications of ionization enthalpy.

(f) Electron gain enthalpy, trends of electron gain enthalpy.

(g) Electro negativity, Pauling's/ Mulliken's/ Allred Rachow's/ and Mulliken-Jaffe's electro negativity scales. Variation of electro negativity with bond order, partial charge, hybridization, group electro negativity. Sanderson's electron density ratio.

UNIT –III: Chemical Bonding

Ionic bond- General characteristics, types of *ions*, size effects, radius ratio rule and its limitations. Packing of ions in crystals. Bonn-Landé equation with derivation and importance of Kapustinskii expression for lattice energy. Madelung constant, Bonn-Haber cycle and its application, Solvation energy.

Covalent bond- Lewis structure, Valence Bond theory (Heitler-London approach). Energetics of hybridization, equivalent and non-equivalent hybrid orbitals. Bent's rule, Resonance and resonance energy, Molecular orbital theory. Molecular orbital diagrams of diatomic and simple polyatomic molecules N₂, O₂, C₂, B₂, F₂, CO, NO, and their ions; HCl, BeF₂, CO₂, (idea of *s-p* mixing and orbital interaction to be given). Formal charge, Valence shell electron pair repulsion theory (VSEPR), shapes of simple molecules and ions containing lone pairs and bond pairs of electrons.

UNIT –IV: Chemical Bonding-II

Covalent character in ionic compounds, polarizing power and polarizability. Fajan's rules and consequences of polarization. Ionic character in covalent compounds: Bond moment and dipole moment. Percentage ionic character from dipole moment and electro-negativity difference.

Metallic Bond: Qualitative idea of valence bond and band theories. Semi-conductors and insulators, defects in solids.

Weak Chemical Forces. van der Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interactions, Instantaneous dipole-induced dipole interactions. Repulsive forces, Hydrogen bonding (theories of hydrogen bonding, valence bond treatment) Effects of chemical force, melting and boiling points, solubility energetic of dissolution process.

UNIT- V: Oxidation-Reduction

Redox equations, Standard Electrode Potential and its application to inorganic reactions. Principles involved in volumetric analysis to be carried out in class.

Reference Books:

1. Lee, J.D. Concise Inorganic Chemistry, ELBS, 1991.
2. Douglas, B.E. and Mc Daniel, D.H., Concepts & Models of Inorganic Chemistry, Oxford, 1970
3. Atkins, P.W. & Paula, J. Physical Chemistry, Oxford Press, 2006.

**GEL- I: CHEMISTRY: INORGANIC CHEMISTRY-I LAB
(BSHCYL-101)**

CREDITS: 2

1. Titrimetric Analysis

(i) Calibration and use of apparatus

(ii) Preparation of solutions of different Polarity/Normality of titrants

2. Acid-Base Titrations

(iii) Estimation of carbonate and hydroxide present together in a mixture.

(iv) Estimation of carbonate and bicarbonate present together in a mixture.

(v) Estimation of free alkali present in different soaps/detergents

3. Oxidation-Reduction Titrimetry

(vi) Estimation of Fe (II) and oxalic acid using standardized KMnO_4 solution.

(vii) Estimation of oxalic acid and sodium oxalate in a given mixture.

(viii) Estimation of Fe (II) with $\text{K}_2\text{Cr}_2\text{O}_7$ using internal (diphenylamine, anthranilic acid) and external indicator.

Reference text:

1. Voggl, A.I. A Textbook of Quantitative Inorganic Analysis, ELBS.

GE-I: PLANT DIVERSITY-I (BSHB-101)
(VIRUS, BACTERIA, ALGAE & FUNGI)

CREDITS- 4

UNIT-I

Discovery, general characteristics; Types-archaeobacteria, eubacteria, wall-less forms (mycoplasma and spheroplasts); Cell structure; Nutritional types; Reproduction-vegetative, asexual and recombination (conjugation, transformation and transduction).

UNIT-II

Viruses: General characteristics, general account of Retrovirus, TMV; General characteristics, general structure with special reference to viroids and prions; replication (general account),

UNIT-III

Cyanobacteria: General characteristics; heterocyst and akinetes; General account of Nostoc, Oscillatoria and Scytonema; Economic importance of cyanobacteria. General account of actinomycetes.

UNIT-IV

Algae: General characteristics; Chlorophyceae: Volvox, Xanthophyceae: Vaucheria; Phaeophyceae: Sargassum; Rhodophyceae: Polysiphonia; Single cell protein, Economic importance of algae.

UNIT-V

Fungi: General characteristics; Mastigomycotina: Phytophthora; Zygomycotina: Rhizopus; Ascomycotina: Peziza; Basidiomycotina: Puccinia; Deuteromycotina: Alternaria.

Reference Books:

1. Ananthanarayan and Paniker: 7th Edition. A text book of Microbiology, Orient Blackswan Publisher, Delhi
2. Kumar HD, 1990. Introductory Phycology. East-west Press, India
3. Lee R E. 2008. Introduction to Algae. Cambridge University Press, UK.
4. Pelczar M J., Chan, E. C. S., Krieg, N R., 1972. Microbiology, McGraw-Hill publisher, Columbus, OH

GEL-I: PLANT DIVERSITY-I LAB (BSHB-L101)

CREDITS- 2

1. Micropreparation observation of bacteria and viruses.
2. Gram staining of bacteria
3. Identification of cyanobacterial specimens
4. Identification of algal specimens
5. Identification of fungal specimens
6. Albugo: Study of symptom of plants infected with Albugo
7. Specimen of different stage of mushroom (Agaricus)

Reference Books:

1. Ananthanarayan and Paniker: 7th Edition. A text book of Microbiology, Orient Blackswan Publisher, Delhi
2. Kumar H D, 1990. Introductory Phycology. East-west Press, India
3. Lee R E. 2008. Introduction to Algae. Cambridge University Press, U K.

GE-I: B.Sc. (Hon's) Zoology (BSHZO-101) Animal Diversity– I (Non-Chordates)

CREDITS: 4

UNIT-I

Taxonomy: definition, taxonomic procedure, classification, systemic, taxonomic levels, taxa, hierarchy, species concepts, Zoological nomenclature: kinds of taxonomic characters (morphological, embryological, cytogenetic, and numerical characters).

UNIT -II

Classification of multicellular animals: symmetry and early development (spiral and radial cleavage). Protostomes and Deuterostomes; body cavities: acoelomates, pseudocoelomates, coelomates.

UNIT- III

General characters and classification up to classes with examples showing distinctive and adaptive features:

1. Protozoans (locomotion)
2. Poriferans (canal system and skeleton),
3. Platyhelminthes and Nematodes (parasitic adaptations),
4. Annelids (metamerism),
5. Arthropods (mouthparts),
6. Molluscs (modification of foot),
7. Echinodermata (water vascular system and larval forms).

UNIT- IV

Overview of different patterns:

1. Digestion- intracellular, extracellular, feeding mechanisms (suspension, deposit, cropping, sucking, herbivorous and raptorial carnivorous)
2. Gas exchange and internal transport (structure and function of gills, trachea, book lungs)

UNIT- V

Overview of different patterns:

1. Excretory organs - open tubular (metanephridia) and closed saccular (protonephridia and Malpighian tubules)
2. Pattern of nervous system in non-chordates.

3.Types of asexual reproduction: fission, regeneration and parthenogenesis; sexual reproduction: primary and accessory sex organs in non- chordates.

Reference Books:

1. Kotpal Series on Non-chordates (Rastogi Publications)
2. Nigam: Biology of Non-Chordates (1997, S. Chand)
3. Barnes: The invertebrate (3rd ed. 2001, Wiley-Blackwell)
4. Moore: An introduction to the invertebrates (2006, Cambridge)
5. Kotpal, Agarwal and Khetrapal: Modern Text Book of Zoology; Invertebrates. Edition, 6. Publisher, Rastogi Publications, 1990

GEL-I Lab: Zoology-Animal Diversity–I (Non-Chordates)(BSHZO-L101)

CREDITS-2

1. Study of transverse sections/chart of the following: Sycon, Hydra, Fasciola, Ascaris, Hirudinaria.
2. Study of salient features and classification up to classes of the following non-chordates: Amoeba, Euglena, Plasmodium, Paramecium, Euplectella, Physalia, Taenia, Ascaris (male and female), Nereis, Chiton, Mytilus, Octopus, Limulus, Sacculina, Asterias, Echinus, Holothuria.
3. External features of Earthworm.
4. Dissection of Earthworm showing alimentary canal, nervous system, reproductive system.
5. Dissection of snail showing radula, nervous system, Osphradium.
6. Culture of amoeba and paramecium.

Reference Books:

1. Kotpal Series on Non-chordates (Rastogi Publications)
2. Nigam: Biology of Non-Chordates (1997, S. Chand)

AECC- ENGLISH LANGUAGE

CREDITS- 2

UNIT- I COMMUNICATION

Theory of Communication, Types and modes of Communication Verbal and Non-verbal (Spoken and Written) Personal, Social and Business Barriers and Strategies Intra-personal, Inter-personal and Group communication

UNIT- II SPEAKING SKILLS

Monologue Dialogue Group Discussion Effective Communication/ Mis-Communication, Interview Public Speech.

UNIT- III READING AND UNDERSTANDING

Close Reading Comprehension Summary Paraphrasing Analysis and Interpretation Translation (from Indian language to English and vice-versa) Literary/Knowledge Texts.

UNIT- IV WRITING SKILLS

Documenting Report Writing Making notes Letter writing .

UNIT-V FUNCTIONAL GRAMMAR

Parts of Speech, Word order / Types of Sentences, Questions (Affirmative and Negative), Present Perfect – Simple & Continuous, Present Perfect and Past Simple, Future Tense, Articles, Prepositions, Modals, Conjunctions, Quantifiers and Voice.

Reference Books:

1. English Language and Indian Culture - Published by M.P. Hindi Grant Academy Bhopal.

ECA – INTRODUCTION TO BIOMETRY

CREDITS- 2

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

- a. The basis of biometry.*
- b. The classification of biometric processes.*
- c. The importance of behavioral biometry.*

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.

Unit 2: Key biometric processes

Key biometric processes – enrollment, identification and verification. Positive and negative identification.

Unit 3: Measures used in biometric systems

Performance measures used in biometric systems – FAR, FRR, GAR, FTA, FTE and ATV. Biometric versus traditional technologies.

Unit 4: Physiological Biometrics

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

Unit 5: Behavioral Biometrics

Handwriting, signatures, keystrokes, gait and voice.

REFERENCE BOOK:

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).

Semester II

CRIMINAL LAW (BSHFS-201)

CREDIT- 4

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 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,

Unit 5: Acts Pertaining to Environmental Crimes

Wildlife Protection Act.I.T. Act 2000, Environment Protection Act, Untouchability Offences Act.

Reference Books:

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

PREPAIRING SCHEDULES LAB (BSHFS-L201)

CREDITS-2

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

Reference Books:

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).

FORENSIC PSYCHOLOGY (BSHFS-202)

CREDIT- 4

Unit 1: Basics of Forensic Psychology

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

Unit 2: Psychological Disorders

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

Unit 3: Juvenile Delinquency

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

Unit 4: Deception Detection Tools

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

Unit 5: Brain Fingerprinting

Narco analysis and Brain Fingerprinting – principle and theory, ethical and legal issues. (Deception Detection Tools)

REFERENCE BOOK:

- 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).

FORENSIC PSYCHOLOGYLAB (BSHFS-L202)

CREDITS-2

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.

REFERENCE BOOK:

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).

GE-II: CHEMISTRY: ORGANIC CHEMISTRY I (BSHCY-201)

CREDITS: 4

UNIT- I: Structure and Bonding

Classification, *nomenclature* and general structure of organic compounds. Hybridization. orbital representation of methane, ethane, ethylene, acetylene and benzene. Bond energy, bond length and bond angles. Polarity of covalent bonds-Inductive, resonance, hyper-conjugation and steric inhibition in resonance and its influence on acidity and basicity of organic compounds.

UNIT- II: Mechanism of Organic reactions

Curved arrow notation, drawing electron movements with arrows, half-headed and double headed arrows. Homolysis and heterolysis of carbon-carbon bonds; Reactive species e.g. Carbocations, carbanions, free radicals and their stability. Nucleophiles and electrophiles.

UNIT- III: Alkanes and cycloalkanes

Preparation and general reactions of alkanes and cycloalkanes, Bayer Strain theory of strain less ring; Conformation of ethane, *n*-butane and cyclohexane, chlorination of methane and side chain chlorination of toluene.

UNIT-IV: Alkenes

General methods for preparation of alkenes, Reactions of alkenes: Addition reactions (Electrophilic and free radical), Halogenation, Hydrohalogenation, Hydration, Hydroxylation, Hydroboration-oxidation, Mercuration-demercuration, Epoxidation and Ozonolysis.

Dienes: Conjugated and isolated Dienes; 1,2- versus 1,4-addition. Diels-Alder reaction of dienes: Mechanism.

UNIT-V: Alkynes

Preparation of alkynes, acidity and metal acetylides, Electrophilic addition reactions viz., Halogenation, Hydrohalogenation, Hydration. Hydroboration-oxidation, Mercuration-demercuration and Ozonolysis.

Reference Books:

1. "Organic Chemistry", R. T. Morrison and R. N. Boyd, 6th Edition (1992), Prentice-Hall of India (P)Ltd., New Delhi.

2. "*Organic Chemistry*", S. M. Mukherjee, S. P. Singh, and R. P. Kapoor, 1st Edition (1985), New Age International (P) Ltd. Publishers, New Delhi.
3. "*Organic Chemistry*", I. L. Finar, [Vol. 1, 6th Edition (1973), Reprinted in 1980 & Vol. II, 5th Edition (1975), Reprinted in 1996], ELBS and Longman Ltd., New Delhi.
4. "*Organic Chemistry - Structure and Reactivity*", Seyhan N' Ege, 3rd Edition (1998), AITBS Publishers and Distributors, Delhi
5. "*Organic Chemistry*", Paula Y. Bruice, 2nd Edition, Prentice-Hall, International Edition (1998).
6. "*Organic Chemistry*", G. Solomon, Wiley India, Paper Back, 9th Edition.
7. "*Modern Organic Chemistry*", M. K. Jain and S. C. Sharma, Vishal Publishing CO. Jalandhar, India. 4th Edition (2012).

**GEL-II: CHEMISTRY: ORGANIC CHEMISTRY-I LAB
(BSHCYL-201)**

CREDITS: 2

1. Calibration of the thermometer
2. Purification of *organic* compounds by crystallization using the following solvents: a. Water b. Alcohol, c. Alcohol-Water
3. Determination of the melting points of unknown organic compounds (Kjeldahl method and electrically heated melting point apparatus)
4. Effect of impurities on the melting point-mixed melting point of two unknown organic compounds.
5. Detection of special elements (N, S, Cl, Br, I).

Reference Books

- Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry*, Pearson Education (2009)
- Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. *Practical Organic Chemistry, 5th Ed.*, Pearson (2012)

GE-II: Botany–II(BSHB-201)
TAXONOMY AND EMBRYOLOGY OF ANGIOSPERMS
CREDITS-4

UNIT-I

Structure and Development of Plant Body Internal organization of plant body: The three tissue systems, types of cells and tissues. Development of plant body: Polarity, Cyto differentiation and organogenesis during embryogenic development. Induction of flowering; flower as a modified determinate shoot. Flower development: genetic and molecular aspect

UNIT-II

General feature and classification of Angiosperms, merits and demerits (Bentham and Hooker, Takhtajan); Modern trends in plants taxonomy.

UNIT-III

General features of the following families: Ranunculaceae, Malvaceae, Brassicaceae, Asclepiadaceae, Solanaceae, Asteraceae, Euphorbiaceae, Poaceae.

UNIT-IV

Embryology: structure of angiosperms flower, Androecium (stamens), pollen morphology only, Gynoecium (Ovary, style and Stigma). Types of ovary, ovules and placentation, structure and main types.

UNIT-V

Pollination types, Double fertilization and triple fusion, Monocot and dicot embryo. Types of embryo sacs, organization and ultrastructure of mature embryo sac. Embryo endosperm relationship

Reference Books:

1. Bhojwani S S and Bhatnagar SP, 2009. Embryology of Angiosperm, Vikas Publication House, New Delhi.
2. Eames, A.J, 1961: Morphology of Angiosperms, McGraw Hill publication, New Delhi.
3. Pandey B P, 2001: Plant Anatomy, S Chand and Company, New Delhi.
4. Sharma OP, 2005. Plant Taxonomy, Tata Mc Graw Hill, New Delhi.

**GEL-IILAB:
TAXONOMY AND EMBRYOLOGY OF ANGIOSPERMS (BSHB-
L201)**

CREDITS-2

1. Study of Floral characters and Floral diagram of representative member of some families: Malvaceae, Brassicaceae, Asclepiadaceae, Solanaceae, Euphorbiaceae, Poaceae
2. Study of type of ovary,
3. Study of type ovules, placentation types,
4. Study of type types of pollen grains and stages of dicot embryo.

Fieldtrips: for habitat study & collection of samples.

Reference Books:

1. Lawrence, G. H. M 1951. Taxonomy of Vascular Plants. N. Y.
2. Pande B. P 1997. Taxonomy of Angiosperms. S. Chand Publication.
3. Takhtajan A. 1969. Flowering Plants; Origin and Dispersion.

**GE-II: ZOOLOGY: ANIMAL DIVERSITY–II (CHORDATES)
(BSHZO-201)**

CREDITS: 4

UNIT I

Hemichordates: General characters and classification up to the order, Protochordates: Urochordates, Cephalochordates, Cyclostomes: General characters, Comparative account of Petromyzon and myxine.

UNIT II

General characters and classification of Pisces and Amphibians up to orders, Fishes: migration, Parental care, Amphibian: Parental care, Neoteny.

UNIT III

General characters and classification of Reptiles up to orders, Difference between poisonous and non-poisonous snakes with examples, Poison apparatus and biting mechanism of poisonous snakes. Snake venom, its uses and antivenin.

UNIT IV

General characters and classification of Aves up to orders, Migration and flight adaptation, Beaks and claws in birds, Ratitae, Archaeopteryx.

UNIT V

General characters and classification of Mammals up to orders, Receptors and Sense organs: Phonoreception and Photoreception, Oviparity, Ovoviviparity, Viviparity, Aquatic and Flying mammals.

Books Recommended

1. Cambell and Reece: Biology (7th ed. 2005, Pearson)
2. Nigam: Biology of Chordates (1997, Chand)
3. Kotpal Series of Chordates (Rastogi Publications)

**GEL-II: ZOOLOGY: ANIMAL DIVERSITY– II -PRACTICAL
(BSHZOL-201)**

CREDITS: 2

Chordates

1. Study of museum specimens relevant to theory paper.
2. Study of models relevant to theory paper.
3. Dissection of fish showing digestive system.
4. Mounting of scales.
5. Fish dissection showing afferent and efferent cranial nerves.
6. Fish internal ear.

Books Recommended

1. Cambell and Reece: Biology (7th ed. 2005, Pearson)
2. Nigam: Biology of Chordates (1997, Chand)

AECC- ENVIRONMENTAL SCIENCE

CREDITS-2

UNIT – I

General: Environmental segments, environmental degradation, environmental impact assessment. Concept of Ecosystem: Fundamental of Ecology and Ecosystem, components of ecosystem, food-chain, foodweb, trophic levels, energy flow, cycling of nutrients, major ecosystem types (forest, grass land and aquatic ecosystem).

UNIT – II

Air Pollution: Atmospheric composition, energy balance, classification of air pollutants, source and effect of pollutants – Primary (CO, SO_x, NO_x, particulates, hydrocarbons), Secondary [photochemical smog, acid rain, ozone, PAN (Peroxy Acetyl Nitrate)], green house effect, ozone depletion, atmospheric stability and temperature inversion, Techniques used to control gaseous and particulate pollution, ambient air quality standards.

UNIT – III

Water Pollution: Hydrosphere, natural water, classification of water pollutants, trace element contamination of water, sources and effect of water pollution, types of pollutants, determination and significance of D.O., B.O.D., C.O.D. in waste water, Eutrophication, methods and equipment used in waste water treatment preliminary, secondary and tertiary.

UNIT – IV

Land Pollution & Noise Pollution: Lithosphere, pollutants (agricultural, industrial, urban waste, hazardous waste), their origin and effect, collection of solid waste, solid waste management, recycling and reuse of solid waste and their disposal techniques (open dumping, sanitary land filling, thermal, composting). Noise Pollution: Sources, effect, standards and control.

UNIT – V

Environmental Biotechnology: Definition, current status of biotechnology in environmental protection, bio-fuels, bio-fertilize, bio-surfactants, bio-sensor, bio-chips, bio-reactors. Pollution Prevention through Biotechnology: Tannery industry, paper and pulp industry, pesticide industry, food and allied industry.

Text Books:

1. Environment and Ecology by Piyush Kant Pandey and Dipti Gupta (Sum India Publication)
2. A Textbook of Environmental Chemistry and Pollution Control by S.S. Dara (S. Chand and Company)

Reference Books:

1. Masters, G.M. Introduction to Environment Engineering and Science (Prentice Hall of India).
2. Environmental Chemistry by A.K. Dey (Eastern Ltd.).
3. Environmental Chemistry by B.K. Sharma (Krishna Prakashan).
4. Nebel B.J. Environmental Science (Prentice Hall of India-1987).
5. Environmental Biotechnology by S.N. Jogdand (Himalaya Publishing House).
6. Introduction to Environmental Biotechnology by A.K. Chatterji (Prentice Hall of India).

Semester III
FORENSIC DERMATOGLYPHICS (BSHFS-301) CREDITS 04

Unit 1: Basics of fingerprinting

Fingerprint, History of fingerprint. Development of fingerprints. Formation of ridges. Types of fingerprint patterns.

Unit 2: Classification of fingerprint

Classification of fingerprint : Primary, Secondary, Sub secondary, Major, Final and Key.

Unit 3: 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 4: 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 5: 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.

Reference Books

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

FORENSIC DERMATOGLYPHICS LAB (BSHFS-L301)

CREDITS 02

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

Reference Books

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).

TECHNOLOGICAL METHODS IN FORENSIC SCIENCE (BSHFS-302)

CREDITS 04

Learning Objectives: After studying this paper the students will know – a. The importance of chromatographic and spectroscopic techniques in processing crime scene evidence. b. The utility of colorimetry, electrophoresis and neutron activation analysis in identifying chemical and biological materials. c. The significance of microscopy in visualizing trace evidence and comparing it with control samples. d. The usefulness of photography and videography for recording the crime scenes.

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.

Unit 2: Electrophoresis

Electrophoresis –fundamental principles and forensic applications. Neutron activation analysis – fundamental principles and forensic applications.

Unit 3: 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 4: Microscopy

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

Unit 5: 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.

Reference Book

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).

**TECHNOLOGICAL METHODS IN FORENSIC SCIENCE LAB
(BSHFS-L302)**

CREDITS- 2

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.

Reference Book

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).

CRIMINALISTICS (BSHFS-303)

CREDITS: 4

Learning Objectives: After studying this paper the students will know – a. The methods of securing, searching and documenting crime scenes. b. The art of collecting, packaging and preserving different types of physical and trace evidence at crime scenes. c. The legal importance of chain of custody. d. The tools and techniques for analysis of different types of crime scene evidence.

Unit 1: Crime Scene Management

Types of crime scenes – indoor and outdoor. Securing and isolating the crime scene. Crime scene search methods. Safety measures at crime scenes. Legal considerations at crime scenes.

Unit 2: Documentation of 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 3: 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 4: 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 5: 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.

Reference Books

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 Saferstein, 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).

CRIME SCENE SAMPLES LAB (BSHFS-L303)

CREDITS: 2

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

Reference Books

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 Saferstein, Criminalistics: An Introduction to Forensic Science Hall INC, USA.

***GE-III: CHEMISTRY: Choose from scheme**

CREDITS: 4

***GEL-III: CHEMISTRY: Choose from scheme**

CREDITS: 2

GE-III: Botany-III (BSHB 301)
PLANTPHYSIOLOGY (BSHB-301)

CREDITS: 4

UNIT-I

Water Potential and its components, water absorption by roots, aquaporins, pathway of water movement, symplast, apoplast, transmembrane pathways, root pressure, guttation. Ascent of sap– cohesion-tension theory. Transpiration and factors affecting transpiration, antitranspirants, mechanism of stomatal movement.

UNIT-II

Nutrient Uptake: Soil as a nutrient reservoir, transport of ions across cell membrane, passive absorption, Electrochemical gradient, facilitated diffusion, active absorption, role of ATP, carrier systems, proton ATPase pump and ion flux, uniport, co-transport, symport, antiport.

UNIT-III

Photosynthesis: role of photosynthetic pigments (chlorophylls and accessory pigments), antenna molecules and reaction centres, photochemical reactions, photosynthetic electron transport, PSI, PSII, Q cycle, CO₂ reduction photophosphorylation, C₃, C₄ and CAM pathways of carbon fixation, photorespiration.

UNIT-IV

Respiration: Glycolysis, TCA cycle, electron transport, oxidative phosphorylation, alpha and beta oxidation of fatty acid.

UNIT-V

Plant growth hormones: Physiological role of auxins, gibberellins, cytokinins, abscisic acid and ethylene, Phytochrome: Structure and function; Photoperiodism; Vernalization; Seed dormancy

Reference Books:

1. Devlin Robert M. 1983. Plant Physiology, Prindle Weber and Schmidt Publisher; 4th edition. UK
2. Hopkins, W.G. 1995. Introduction to Plant Physiology, John Wiley & Sons. Inc., New York, USA.
3. Moore, T.C. 1989. Biochemistry and Physiology of Plant Hormones. Springer Verlag, New York, USA.
4. Pandey S N and Sinha B K. 2009. Plant physiology: Vikas Publishing, New Delhi
Singh G S, Renger G, Sopory, SK, Irrganag KD, Govindjee; 1999.

GEL-III: BOTANY: PLANT PHYSIOLOGY LAB (BSHB- L301)

CREDITS: 4

1. Determination of diffusion pressure deficit (DPD)
2. Study of transpiration rate
3. Transpiration rate by Ganong's potometer
4. Study of effect of different light on photosynthetic rate
5. Separation of plant pigments by paper chromatography
6. Demonstration of osmosis phenomenon
7. Role of plant growth hormones

Reference Books:

1. Salisbury F. B and Ross C.W 1992. Plant physiology (Fourth Edition) Wadsworth Publishing Company, California, USA.
2. Singhal G. S., Renger G., Sopory, S. K. Irrgang K. D and Govindjee 1999. Concept in Photobiology; Photosynthesis and Photomorphogenesis. Narosa Publishing House, New Delhi.
3. Taiz L. and Zeiger E. 1998. Plant Physiology (Second Edition). Sinauer Associates, Inc. Publishes, Massachusetts, USA.

GEL-III: B.Sc. (HON'S) ZOOLOGY (BSHZO301)

GENETICS AND EVOLUTION

CREDITS-4

UNIT- I

Elements of heredity and variation: Mendel's laws of inheritance; Chromosomal basis of inheritance. Extension of Mendelism: dominance relationships, Multipleallelism, Leathalalleles', Pleiotropy, Epistasis, Complementary, Supplementary inheritance; Cytoplasmic inheritance.

UNIT- II

Linkage and crossing-over, Sex-linkage; Sex chromosome systems, Sex determination; Structural and numerical alterations of chromosomes, Pedigree analysis: symbols of pedigree, Pedigrees of sex linked and autosomal inheritance.

UNIT- III

Human genetics: Karyotype, banding, nomenclature of chromosome subdivisions and genetic map. Genetic disorders: Chromosomal aneuploidy (Down, Turner and Klinefelter syndromes), Chromosome translocation (chronic myeloid leukemia) and deletion ("cry of cat" syndrome), Gene mutation (cystic fibrosis); Genetic counselling.

UNIT- IV

Concept of organic evolution, Evidences of organic evolution from comparative anatomy, embryology, palaeontology, Theories of organic evolution: Lamarckism, Darwinism, Modern synthetic theory, natural selection in action.

UNIT- V

Gene frequency in Mendelian population, Hardy-Weinberg equilibrium; major evolutionary forces; isolating mechanisms, modes of speciation (allopatric and sympatric).

Reference Books:

Genetics

1. Gardner et al: Principles of Genetics (2006, John Wiley)
2. Griffith et al: An Introduction to Genetic Analysis (2008, Freeman)
3. Hartl & Jones: Essential Genetics - A Genomic Perspective (2009, Jones & Bartlett)
4. Pierce: Genetics – A Conceptual Approach (W. H. Freeman, 12-Apr-2011)
5. Russell: iGenetics (2009, Benjamin Cummings)
6. Snustad & Simmons: Principles of Genetics (2012, John Wiley)

Evolution

1. P A Moody: Introduction to Evolution
2. Rastogi: Organic Evolution (2007, Kedarnath&Ramnath)
3. Strickberger: Evolution

GEL-III: GENETICS AND EVOLUTION LAB (BSHZO-L301)

CREDITS: 2

1. Application of probability in the law of segregation with the coin tossing
2. Frequency of following genetic trait in human attached ear lobe, widow's peak, dimple in chin mid-digital Hair, Thumb, hypertrichosis, color blindness, PTC (phenyl thiocarbamide)
3. Study of mode of inheritance of the following traits by pedigree charts – attached ear lobe, widow's peak
4. Familiarization with techniques of handling *Drosophila*, identifying males and females; observing wild type and mutant (white eye, wing less) flies, and setting up cultures.
- 5 Study of structural chromosome aberrations (dicentric, ring chromosomes and inversions in polytene chromosomes) from prepared slides/photographs.
6. Study of human karyotypes and numerical alterations (Down, Klinefelter and Turner syndrome).
7. Preparation of temporary slide of Barr body by own cheek epithelium or hair root.

Reference Books:

1. Gardner et al: Principles of Genetics (2006, John Wiley) Griffith et

GE-III: CRIME SCENE MANAGEMENT (BSHFS- 301)

CREDITS: 4

Unit I: Crime Scene Management

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

Unit II: Processing a Crime Scene

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

Unit III: Searching the Crime Scene

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

Unit IV: Collection and Packaging of evidence

Physical Evidences: Collection, Packaging and Forwarding of different types of evidences to the laboratories

Unit V: Techniques for Handling Evidence

Techniques for Handling Evidence, Biological evidence, Impression Evidence, Firearms and Ballistic Evidence, Drug Evidence, Toxicological Evidences.

Reference Books:

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

GEL-III: CRIME SCENE MANAGEMENT (BSHFS- L301)

CREDITS: 2

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

Reference Books:

1. Sharma, B.R.: Forensic Science in Criminal Investigation and Trials, Central Law Agency, Allahabad, 1974.
2. Saferstein: Forensic Science Handbook, Vol I, II & III, Prentice Hall Inc. USA.

Semester IV
FORENSIC CHEMISTRY (BSHFS-401)

CREDITS: 4

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.

Unit2:Liquor

Analytical methods of analysis of IMFL, Country made and Illicit liquor, Denatured spirits and their analysis.

Unit3: 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 4: 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 5: 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.

Reference Books

1. Khan, JaVed I., Ho, Mat H. Analytical Methods in Forensic Chemistry. New York: Working Procedure Manua Chemistry/Toxicology/Explosives/Narcotics, DFS Pub. New Delhi
2. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, Scientific Evidence in Civil and Criminal Cases, 4th Edition, The Foundation Press, Inc., New York (1995).
3. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).
4. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013).
5. S. Ballou, M. Houck, J.A. Siegel, C.A. Crouse, J.J. Lentini and S. Palenik in Forensic Science, D.H. Ubelaker (Ed.), Wiley-Blackwell, Chichester (2013).

FORENSIC CHEMISTRY LAB (BSHFS-L401)

CREDITS: 2

1. To carry out analysis of gasoline.
2. To carry out analysis of diesel.
3. To carry out analysis of kerosene oil.
4. To analyze arson accelerators.
5. To prepare a case report on a case involving arson.
6. To carry out analysis of explosive substances.
7. To separate explosive substances using thin layer chromatography.
8. To prepare a case report on bomb scene management.

Reference Books

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).

QUESTIONED DOCUMENTS (BSHFS-402)

CREDITS: 4

Unit 1: Nature and Scope of Questioned Documents

Definition of questioned documents. Types of questioned documents. Preliminary examination.

Unit 2: Collection, Handling and Transportation of document.

Collection, Handling and Transportation of document. Examination of computer generated, typed and Xeroxed documents. Determining the age of documents.

Unit 3: 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 4: 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 5: 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.

Reference Books

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.

QUESTIONED DOCUMENTS LAB (BSHFS-L402)

CREDITS: 2

1. To identify handwriting characters.
2. To study natural variations in handwriting.
3. To compare handwriting samples and Examination of Secret and Indented writing.
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.

Reference Books

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).

FORENSIC BIOLOGY (BSHFS-403)

CREDITS: 4

Unit 1: Biological Evidence

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

Unit 2: Diatoms

Importance of diatoms and their forensic significance.

Unit 3: Examinations of Biological Evidences

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

Unit 4: Wildlife Forensics

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

Unit 5: Forensic Entomology

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

Reference Books

1. L. Stryer, Biochemistry, 3rd Edition, W.H. Freeman and Company, New York (1988).
2. S. Chowdhuri, Forensic Biology, BPRD, New Delhi (1971).
3. R. Saferstein, Forensic Science Handbook, Vol. III, Prentice Hall, New Jersey (1993).

FORENSIC BIOLOGY LAB (BSHFS-L403)

CREDITS: 2

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

***GE-IV: CHEMISTRY: Choose from scheme**

CREDITS: 4

***GEL-IV: Choose from scheme**

CREDITS: 2

GE-IV: BOTANY: PLANTPATHOLOGY (BSHB-401)

CREDITS- 4

UNIT-I

History of plant pathology, classification of plant diseases, general symptoms of plant diseases.

UNIT-II

Mode of infection and role of enzymes and toxins in plant disease, defense mechanisms of plants against infection: Pre-existing structural and chemical defense, Host pathogen interactions and PRproteins.

UNIT-III

Control of plant diseases: biological, chemical, physical; bio-pesticides, plant quarantine, integrate dpest management.

UNIT-IV

General account of some plant diseases: Late blight of Potato, Tikka disease of groundnut, Blackrustof wheat, Redrot of sugarcane, leaf spot of rice, Citruscanker; Yellowveinmosaic of bhindi.

UNIT-V

Terms and concepts; General symptoms; Geographical distribution of diseases; Etiology; Symptomology; Host-Pathogen relationships; Disease cycle and environmental relation; prevention and control of plant diseases, and role of quarantine. Bacterial diseases – Citrus canker and angular leaf spot of cotton. Viral diseases – Tobacco Mosaic viruses, vein clearing. Fungal diseases – Early blight of potato, Black stem rust of wheat, White rust of crucifers.

Reference Books:

1. Agrios GN, 2000. Plant Pathology, Academic Press, London
2. Bilgrami K.H. & Dube H.C., 1976. A text book of Modern Plant Pathology. International Book Distributing Co. Lucknow.
3. Dubey H.C. 2009. An introduction to Fungi, Vikas Publisher New Delhi
4. R.S. Mehrotra and A. Agrawal, 2005. Plant Pathology, Tata McGraw New Delhi
5. Sharma P.D. 2004. Plant Pathology, Rastogi Publishers, Meerut.

GE-IV: BOTANY: PLANT PATHOLOGY (BSHB-L401)

CREDITS- 2

1. To demonstrate control of plant diseases.
2. Symptomology of some viral disease specimens: Yellow vein mosaic of bhindi
3. Symptomology of some bacterial disease specimens: Bacterial blight of rice, Citrus cancer
4. Symptomology of some fungal disease specimens: Late blight of Potato,
5. Study of Tikka disease of groundnut, Black rust of wheat, Red rot of sugarcane.

Reference Books:

1. Crop plant Disease Colender- IARI-India.
2. K. S. Bilgrami and H. S. Dubey 2000 A text book of Modern Plant Pathology
3. R.S. Mehrotra and A. Agrawal, 2005. Plant Pathology, Tata McGraw New Delhi
4. R. S. Singh Plant Pathology
5. Sharma P.D. 2004. Plant Pathology, Rastogi Publishers, Meerut.

GE-IV: B.Sc. (HON'S) ZOOLOGY
COMPARATIVE ANATOMY OF VERTEBRATES (BSHZO-401)

CREDITS-4

UNIT- I

Origin of vertebrates, Integument and its derivatives, Structure of integument, scales, feathers, hair, beak, claw, nail, hoof, horn, antler, gland, Endoskeleton: Pectoral, Pelvic, Hindlimb, Forelimb.

UNIT- II

Digestive system: Modifications in relation to feeding habits, digestive glands, Oesophagus, Stomach; Dentition, dental formula in mammals.

UNIT- III

Respiratory System: Aquatic respiration, Aerial respiration, Circulatory system: Heart, Aortic arches,

UNIT- IV

Nervous system: Brain, Chemoreceptors, Photoreceptors, Photoreceptors of vertebrates, Cranial and spinal nerve.

UNIT- V

Urinogenital system: Excretory system- Types and evolution of kidney tubules, Urinary duct and bladder. Reproductive system- General plan of gonads, Accessory reproductive organs.

Reference Books:

1. Hildebrand: Analysis of Vertebrate Structure (1995, John Wiley)
2. Kotpal: Modern Text Book of Zoology Vertebrates (2003, Rastogi)
3. Nigam: Biology of Chordates (1983, S Chand)

**GEL- IV:ZOOLOGY:COMPARATIVE ANATOMY OF VERTEBRATES LAB
(BSHZO-L401)**

CREDITS-2

1. Study of histological slides of Pisces.
2. Study of histological slides of Amphibians.
3. Study of histological slides of Reptiles.
4. Study of histological slides of Aves.
5. Study of histological slides of Mammals.
6. Dissection of Afferent and efferent arteries of available fish/ amphibia
7. Dissection of Cranial nerve of fish

Reference Book:

1. Kotpal: Modern Text Book of Zoology Vertebrates (2003, Rastogi).
2. Nigam: Biology of Chordates (1983, S Chand)

Semester-V
FORENSIC BALLISTICS (BSHFS-501)

CREDITS-4

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.

Unit 5: Firearms Injuries

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

Reference Book

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).

FORENSIC BALLISTICS LAB (BSHFS-L501)

CREDITS-2

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

Reference Book

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).

FORENSIC TOXICOLOGY (BSHFS-502)

CREDITS-4

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,

Unit 3: Collection and preservation

Collection and preservation of viscera, blood and urine for various poison cases, Extraction and isolation of poison from viscera

Unit 4: 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 5: 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.

Reference Book

1. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).
2. F.G. Hofmann, A Handbook on Drug and Alcohol Abuse, 2nd Edition, Oxford University Press, New York (1983).
3. S.B. Karch, The Pathology of Drug Abuse, CRC Press, Boca Raton (1996).
4. A.W. Jones, Enforcement of drink-driving laws by use of per se legal alcohol limits: Blood and/or breath concentration as evidence of impairment, Alcohol, Drug and Driving, 4, 99 (1988).
5. Kennedy, Thomas J., Christian, Jr., Donnell Basic Principles of Forensic Chemistry, Springer
6. Saferstein, Criminalistics: An Introduction to Forensic Science. Prentice Hall

7. John D. DeHaan ; Kirk's Fire Investigation, Prentice Hall Eaglewood Cliffs, N.J
8. Yinon J; Modern Methods & Application in Analysis of Explosives, John Wiley.
9. Goutam, M. P. and Goutam S Analysis of Plant Poison, Selective & Scientific Books, New Delhi.
10. Feigl; Spot Test in Organic Analysis, Elsevier Pub., New Delhi.
11. Clark, E.G.C.; Isolation and Identification of Drugs, Vol I&II, Academic Press,
12. Sunshine I; Year book of Toxicology, CRC Press Series, USA
13. Michael J. Deverlanko et al: Hand Book of Toxicology CRC Press, USA.
14. Parikh C.K; Text Book of Medical Jurisprudence Forensic Medicines and Toxicology. CBS Pub. New Delhi.

**FORENSIC TOXICOLOGY LAB
(BSHFS-L502)**

CREDITS-2

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

Reference Book

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).

Semester-VI

FORENSIC ANTHROPOLOGY (BSHFS-601)

CREDITS-4

Unit 1: Significance of Forensic Anthropology Scope of forensic anthropology. Introduction and forensic significance of osteometry and craniometry in personal identification

Unit 2: Human Skeleton

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 3: 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 4: 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 5: Facial Reconstruction Portrait Parle/ Bertillon system. Photofit/identi kit. Facial superimposition techniques. Cranio facial super imposition techniques – photographic super imposition, videoperimposition, 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.

Reference Book

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).

FORENSIC ANTHROPOLOGY LAB (BSHFS-L601)

CREDITS-2

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

Reference Book

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).

FORENSIC MEDICINE (BSHFS-602)

CREDITS-4

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 versus Hospital Autopsy, Autopsy report, Procedure of Autopsy: laboratory procedure, Second Autopsy, obscure Autopsy

Unit 3: Preservation and Handling

Preservation of dead bodies, Handling of highly infected bodies, Psychological Autopsy, Artifacts.

Unit 4: 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 5: 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.

Reference Book

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).

FORENSIC MEDICINE LAB (BSHFS-L602)

CREDITS-2

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

Reference Book

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).

FORENSIC SCIENCE -DSE I-IV (ELECTIVES)
DSE-I: DIGITAL FORENSICS

CREDITS-4

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.

Unit 3: Types of computer crimes

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 4: 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 5 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.

Reference Book

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).

DSEL-I: DIGITAL FORENSICS LAB

CREDITS-2

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

Reference Book

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).

DSE-II ECONOMIC OFFENSES

CREDITS-4

Unit 1: Taxonomy of Economic Offences/Criminogenic Factors Fundamentals of economics in economic offences. Tax evasion. Excise duty evasion. Fraudulent bankruptcy. White collar crime. Economic exclusion. Black money. Corruption and bribery of public servants. Money laundering and hawala transactions. Insurance frauds. Corporate frauds. Bank frauds. Ponzi scheme. Pyramid scheme.

Unit 2: Illicit trafficking

Illicit trafficking in contraband goods. Illicit trafficking in arms. Illicit trafficking in explosives. Illicit drug trafficking. Trafficking in human organs. Cultural objects trafficking. Racketeering in employment. Racketeering in false travel documents.

Unit 3: Applied Economics in Processing Evidence Forensic accountancy and forensic auditing. Valuation of economic losses. Violation of Intellectual Property Rights.

Unit 4: 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 5: Legal recognition of Economic Crimes Relevant Section related to Economic Crimes: Intellectual property crime, Corruption and bribery of public servants. Money laundering and hawala transactions. Insurance frauds. Corporate frauds. Bank frauds. Illicit trafficking in contraband goods.

Reference Book

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.

DSEL-II: ECONOMIC OFFENCES LAB

CREDITS-2

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

Reference Book

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).

DSE-III: FORENSIC SEROLOGY

CREDITS-4

Learning Objectives: After studying this paper the students will know – a. The significance of serological evidence. b. The importance of biological fluids – blood, urine, semen, saliva, sweat and milk – in crime investigations. c. The usefulness of genetic markers in forensic investigations. d. The forensic importance of bloodstain patterns

Unit 1: Forensic Importance of Body fluids

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

Unit 2: Composition and Functions of Body fluids.

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

Unit 3: Bloodstain Pattern Analysis

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

Unit 4: Biochemical Markers Analysis

Cellular antigens, ABO blood groups, Extracellular proteins and intracellular enzymes, Typing of Biochemical Markers,

Unit 5: Forensic Significance of Biochemical markers

Forensic Significance of Biochemical markers for identification and individualization.

Reference Book

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

DSEL-III: FORENSIC SEROLOGY LAB

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.

Reference Book

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).

DSE-IV: ACCIDENT INVESTIGATION

CREDITS-4

Learning Objectives: After studying this paper the students will know a. The significance of photographs in accident cases. b. The importance of trace evidences c. The consequences of Accident analysis

Unit 1: Motor Vehicle Accidents

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

Unit 2: Surface Markings during RTA Cruses

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

Unit 3: Accident Analysis

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

Unit 4: Accidental Injuries

Types of injuries resulting from accident, Biomechanics of injuries,

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.

Reference Book

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).

DSEL-IV: ACCIDENT INVESTIGATION LAB

CREDITS-2

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.

Reference Book

1. T.S. Ferry, Modern Accident Investigation and Analysis, Wiley, New York (1988).
2. D. Lowe, The Tachograph, 2nd Edition, Kogan Page, London (1989).

DSE-V: DNA TYPING

CREDITS-4

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. Mandolin 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.

Unit 5: Hardy-Weinberg law

Define Hardy-Weinberg law, and their forensic significance.

Reference Book

1. J.M. Butler, Forensic DNA Typing, Elsevier, Burlington (2005).
2. K. Inman and N. Rodin, 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, Gentle Corporation, Washington (1994).
4. W.J. Tinstone, M.L. Bastrop and C. Held, Fisher's, Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013).

DSEL-V: DNA TYPING LAB

CREDITS-2

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 prepare 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.

Reference Book

1. J.M. Butler, Forensic DNA Typing, Elsevier, Burlington (2005).
2. K. Inman and N. Rodin, 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, Gentle Corporation, Washington (1994).

DSE-VI MODERN FORENSIC TOXICOLOGY

CREDITS-4

Unit-1 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-2 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,

Unit-3 Management of Industrial effluents

Management of Industrial effluents, Safety and applications at workplace.

Unit-4 Household Poisoning

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

Unit-5 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.

Reference Book

1. Environmental toxicology: biological and health effects of pollutants MH Yu, H Tsumada,- 2000
2. PAHs: an ecotoxicological perspective: PET Douben,-2003.
3. Handbook of industrial toxicology: by ER Plunkett,-1976.
4. Industrial Toxicology: by LT Fairhall,-1949.

DSEL-VI MODERN FORENSIC TOXICOLOGY LAB

CREDITS-2

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

Reference Book

1. Environmental toxicology: biological and health effects of pollutants MH Yu, H Tsoumada,- 2000
2. PAHs: an ecotoxicological perspective: PET Douben,-2003.

DSEL-PROJECT: BASED ON SUBJECT

CREDITS-2

DISSERTATION/ PROJECT WORK FOLLOWED BY SEMINAR
(DSEL-IV-Project)

ECA-I: INTRODUCTION TO BIOMETRY

CREDITS-2

Unit 1: Fundamental Aspects

Definition, characteristics and operation of biometric system.

Unit 2: Classification of biometric systems

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.

Unit 3: Measures used in biometric systems

Performance measures used in biometric systems – FAR, FRR, GAR, FTA, FTE and ATV. Biometric versus traditional technologies.

Unit 4: Physiological Biometrics

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

Unit 5: Behavioral Biometrics

Handwriting, signatures, keystrokes, gait and voice.

Reference Books

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).

SEC 1: HANDWRITING IDENTIFICATION AND RECOGNITION

CREDITS 2

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.

Unit 2: Factors influencing handwriting

Factors influencing handwriting – physical, mechanical, genetic and physiological.

Unit 3: 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 4: Handwriting Recognition

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

Unit 5: Applications of handwriting recognition.

Applications of handwriting recognition in forensic science.

Reference Books

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).

SEC 2: FORENSIC SCIENCE AND SOCIETY

CREDITS 2

Unit 1: Forensic Engineering

Role of mechanical, electronics and computer engineers in forensic science, Accident investigations. Failure of signaling and control systems, Ergonomics.

Unit 2: Forensic Significance of Technology

Applications of animations, simulations and digital imaging in solving crime cases. Episodes involving fire engineering.

Unit 2: Forensic Archeology

Role of forensic archeology. Searching the archeological site. Methods of digging the burial site. Recovery of remains. Documenting the recovered material. Preservation of remains.

Unit 4: Forensic Intelligence

Role of forensic intelligence in crime analysis. Methods of crime analysis. Databases in forensic intelligence.

Unit 5: Management of serial crimes

Management of serial crimes by application of forensic intelligence.

Reference Books

1. J.F. Brown and K.S. Obenski, Forensic Engineering – Reconstruction of Accidents, C.C. Thomas, Springfield (1990).
2. E.W. Killam, The Detection of Human Remains, C.C. Thomas, Springfield (1990).
3. R.K. Noon, Introduction to Forensic Engineering, CRC Press, Boca Raton (1992).
4. O. Ribaux and P. Margot in Encyclopedia of Forensic Sciences, Volume 1, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Ed.), Academic Press, London (2000).