ಬೆಂಗಳೂರು ಉತ್ತರ ವಿಶ್ವವಿದ್ಯಾಲಯ

ಟಮಕ, ಕೋಲಾರ – 563103

CHOICE BASED CREDIT SYSTEM

(Semester Scheme with Multiple Entry and Exit Options for Under Graduate Course)

SYLLABUS AS PER NEP GUIDELINES

SUBJECT: FORENSIC SCIENCE

2021-22 onwards

SEMESTER:1 FORENSIC SCIENCE

Core Course I Content: INTRODUCTION TO FORENSIC SCIENCE (FS-101)

Credits: 3 **Hours: 45**

Course Title: Introduction to Forensic Science.	Course Code: FS-101
Course Type: Discipline Core Theory, L-T-P: 3-0-0	Course Credits: 3
Total Contact Hours: 45	Duration of ESA: 3 Hrs
Formative Assessment Marks: 30	Summative Assessment Marks:45

Unit 1: Concepts in forensic science 15 hours

Definition of forensic science; scope and need of forensic science; Functions of Forensic Science; Evidence; classification of evidence: according to Indian Evidence Act, based on nature of evidence, class and individual evidence; Principles of forensic science; Frye Rule; Daubert Standards; Terminologies in forensic science: First responder, chain of custody, mahazaar; Code of conduct for forensic scientists; Qualifications of forensic scientists; Duties of forensic scientists; Data depiction; Report writing. Ethics in Forensic Science.

Unit 2: History of Forensic Science 10 hours

Pioneers in Forensic Sciences: History and development of branches of forensic science: forensic biology, forensic chemistry and toxicology, forensic anthropology, fingerprints, questioned document examination, forensic ballistics, digital and cyber forensics, forensic audio analysis, forensic psychology; Contribution of Sir Edgar Hoover through the FBI.

Unit 3: Organization of Forensic Science Laboratory 10 hours

Forensic Science Laboratories in India: history, development and hierarchical set up; Directorate of Forensic Science Services, Central, State and Regional Forensic Science Laboratories; Mobile Crime Laboratories; Branches of Forensic Science Laboratories (definition and functions): Forensic Biology, DNA, Forensic Chemistry, Forensic Toxicology, Narcotics Unit, Forensic Physics, Forensic Ballistics, Forensic Psychology, Questioned Documents, Computer Forensics, Forensic Audio Analysis.

Unit 4: Agencies involved in crime detection and investigation 10 hours

Functions and hierarchical set up of Law enforcement agencies: civil police, reserve police; Government Examiners of Questioned Documents; Fingerprint Bureaus; National Crime Records Bureau; Police & Detective Training Schools; Bureau of Police Research&

Development; National and State Police Academies,; Police Training Schools/Colleges, Dog Squad, Bomb Detection and Defusal Squad;RAW, CBI, INTERPOL and FBI.

LAB CONTENT(FS-104)

Credits: 02 **Hours: 60**

Course Title: Forensic Science Lab	Course Credits: 02
Course Type: Core Practical, L-T-P: 0-0-4	Corse Code: FS-104
Total Contact Hours: 60	Duration of ESA: 4 Hours
Formative Assessment Marks: 25	Summative Assessment Marks: 25

1. Identifying and classifying evidence from a given case study.

2. Using the principle of probability on a case study with respect to one evidence 3. Tracing the use of forensic science from any one of the following:

a. Aarushi Talwar Case

b. Nirbhaya

4. Tracing the use of forensic science from any one of the following:

a. Ted Bundy

b. The Lindberg Kidnapping

5. Analysis of Daubert vs Merell Dow Pharmaceuticals case study

6. Identifying evidence and relating the branch of forensic science that it should be sent to from a case study.

7. Writing a forensic report on a crime case from a case study.

8. Using a case study identify the agencies that need to be involved in the process of investigation with proper justification.

9. Examine the latest report of NCRB and study the data pertaining to murder cases in India using digital pie charts and graphs for depiction.

10. Understanding the hierarchical set up of different forensic science establishments and suggest improvements.

REFERENCE

Brenner, J. C. (2004). Forensic Science: an Illustrated Dictionary. CRC Press.

Eckert, W. G. (1997). Introduction to Forensic Sciences (2nd Edition). CRC Press.

James, S. H., Nordby, J. J., Bell, S. (2014). Forensic Science: An Introduction to Scientific and Investigative Techniques (4th Edition). CRC Press.

Nabar, B. (2017). Forensic Science in Crime Investigation. Asia Law House.

S Nath, R. C. (2013). Forensic Science and Crime Investigation: Abhijeet Publications.

Saferstein, R. (2017). Criminalistics: An Introduction to Forensic Science. Pearson.

Sharma, B. R. (2019). Forensic Science in Criminal Investigation & Trails. Universal Law Publishing Company.

Yount, L. (2006). Forensic Science: From Fibers to Fingerprints (Milestones in Discovery and Invention). Chelsea House publications

BASIC FORENSIC CHEMISTRY (FS-102)

Credits: 3 **Hours: 45**

Course Title: Basic Forensic chemistry	Course Code: FS-102
Course Type: Discipline Core Theory, L-T-P: 3-0-0	Course Credits: 3
Total Contact Hours: 45	Duration of ESA: 3 Hrs.
Formative Assessment Marks: 30	Summative Assessment Marks:45

Unit 1: Concepts of Chemistry 15 hours

Matter; States of matter; Concept of atom, molecule, element and compound. Chemical compound formation, chemical bonding, ionic bonding; Covalent bonding; general characteristics, sigma and pi bonds, bond length, bond order, formal charge; Hydrogen bond (theories of hydrogen bonding, valence bond treatment); Metallic bond;. Molecular mass, mole concept, equivalent weight, normality, molality, percentage composition; Density; pH and buffers; Serial dilutions.

Unit 2: Inorganic Chemistry 12 hours

Periodic table; Chemistry of s, p, d, block elements: introduction, properties. Chemical properties of Noble gases, chemistry lanthanides and actinides. Thermochemistry: Enthalpy, Entropy, Internal Energy, Bond Energy and Kinetics; Simple chemical reactions, zero order, first order, second order, and pseudo-order reaction, Half-life and mean life. General characteristics of Isotopes, and its types & Property. Definitions of Isotones & Isobars. Corrosive acids and bases.

Unit 3: Organic Chemistry 8 hours

Tetravalency of Carbon; Hybridization molecules; Classification & nomenclature of organic compounds; Isomerism; Organic reactions; Hydrocarbons; Organic compounds containing halogens, oxygen and nitrogen; Polymers.

Unit 4: Basic Analytical Chemistry in Forensic Science 10 hours

Introduction to quantitative and qualitative analysis. Introduction to separation techniques: solvent extraction, solid phase extraction, ion exchange separation, crystallization and precipitation;titrimetric analysis: classification, neutralization, oxidation and reduction, complexation; gravimetric analysis: electrogravimetry, coulometry. Distillation and Fractional Distillation.

Lab Course Content (FS-105)

Credits: 2 **Hours: 60**

Course Title: Basic Forensic Chemistry Lab	Course Credits: 02
Course Type: Core Practical, L-T-P: 0-0-4 Course	Code: FS-105
Total Contact Hours: 60	Duration of ESA: 4 Hours
Formative Assessment Marks: 25	Summative Assessment Marks: 25

List of experiments to be conducted

1. Determination of boiling point of given liquid

2. Preparation of the Normal, Molar and Standard & buffer solutions.

3. Determine the density of alcohol by using pyknometer.

4. Separation of components of sample by liquid-liquid extraction.

5. Examination of various anions and cations.

6. Examination of corrosive chemicals in crime exhibits of acid/alkali in vitriolage cases.

7. To separate the dyes and inks/plant pigments.

8. Preliminary test for explosives by color test.

9. Examination of phenolphthalein in Trap Cases

10. Testing purity of water samples.

11. Determination of pH of a solution using pH meter.

12. To perform distillation of Organic Solvent.

REFERENCE

Bahl, B. S.,Bahl, A. (2017). A textbook of organic chemistry. S. Chand Publishing.
Glasstone, S. (2007). Thermodynamics For Chemists. Narahari Press.
Khopkar, S. M. (2008). Basic concepts of analytical chemistry. New Age International.
Lee, J. D. (2008). Concise inorganic chemistry. John Wiley & Sons. Chapman and Hall.
Prof. Radha Raman Gupta, D. M. (1997). Heterocyclic Chemistry: Volume II. Springer-VerlagBerelin Heidelberg.
Rosenberg, R. M. (1977). Principles of physical chemistry. Oxford and IBH Publishing.
Sherwood, D., Dalby, P. (2018). Modern thermodynamics for chemists and biochemists. Oxford University Press.

CRIMINOLOGY (FS-103)

Credits: 3 **Hours: 45**

Course Title/Code: CRIMINOLOGY	Course Credits: 3
Course Code: FS-103	L-T-P per week: 3-0-0
Total Contact Hours: 45	Duration of ESA: 3 Hours
Formative Assessment Marks: 30	Summative Assessment Marks:45

Unit 1: Concepts of Criminology 15 hours

Crime: definition, characteristics of crime, elements of crime, and crime triangle; Criminology – definitions, historical perspectives, nature, origin, and scope. Theories of Criminology: Pre-Classical, Classical, Neo-Classical, Positivist, Biological, Social Learning Theory, Differential Association theory, Labelling Theory, Containment theory and Routine Activity Theory

Unit 2: Causes and Types of Crime and Criminals 10 hours

Causes of crime: Social, Economic, Political and Psychological; Social Problems and crime: Juvenile Delinquency, Prostitution, Dowry, drug abuse, and child labour. Types of Crime: Crimes against persons, violent crimes, sexual offences, crimes against property, cyber-crime, hate crimes and public disorder, emerging crimes. Types of Criminals: Habitual, Professional and White-Collar criminals.

Unit 3: Penology 10 hours

Historical Development of Penology and definitions of punishment, Concepts of correctional administration and types of punishments, Theories of punishment: Retributive, Prevention, Deterrence and Reformative.Prisons: Historical development of Indian Prisons, Correctional Administration: Classification of Prisons and Prisoners, Non-Institutional Programmes-Probation, Parole, and After-Care. Unusual Problems in Correctional Institutions.

Unit 4: Victimology 10 hours

Introduction to victimology: Meaning of victimology, Historical Development of Victimology; Victim and Victimization: Concept, Nature and Related Issues. Key Concepts in Victimology: Victim - Crime victim - Victim genesis -Victim Precipitation- General Victim- Victimization Proneness, Victim Responsiveness. Victim Psychology, Psychodynamics of Victimization-Primary Victimization, Secondary Victimization, Tertiary Victimization, Victim Vulnerability and Victimless Crimes.

REFERENCE

Brown, S. E., Esbensen, F. A., Geis, G. (2015). Criminology: explaining crime and its context [8th Edition]. Elsevier Science;Routledge.

Clevenger, S., Higgins, G. E., Marcum, C. D., Navarro, J. N. (2020). Understanding Victimology : an Active-Learning Approach. Taylor and Francis.

Doerner, W. and Lab, S. (2012). Victimology. Amsterdam: Elsevier.

EI-Dakkak, P. D. (2014). Criminology and penology. Abu Dhabi: The Judicial Department.

Gillin, J. L. Criminology and Penology- Volume 1.

Lab, S. P. (2016). Crime Prevention: Approaches, Practices, and Evaluations. Routledge.

Pamela Davies, P. F. (2007). Victims, crime and society. SAGE. Paranjepe, N.V. (2016). Criminology and Penology. Central Law Publications, Allahabad.

Shahidullah, S. M. (2017). Crime, Criminal Justice, and the Evolving Science of Criminology in South Asia: India, Pakistan, and Bangladesh. Palgrave Macmillan UK.

Thilagaraj, R. (2013). Criminal Justice System in India. In J. Liu, B. Hebenton, S. Jou, Handbook of Asian Criminology (pp. 199-211). New York: Springer-Verlag.

Turvey, B. E. (2014). Forensic Victimology: Examining Violent Crime Victims in Investigative and Legal Contexts. Elsevier, Turvey and Furguson.

Williams, K. S. (2012). Textbook on criminology. Oxford University Press, USA.

SEMESTER-II

CRIME SCENE MANAGEMENT (FS-201)

Credits: 3 **Hours: 45**

Course Title: Crime Scene Management	Course Code: FS-201
Course Type: Discipline Core Theory, L-T-P: 3-0-0	Course Credits: 3
Total Contact Hours: 45	Duration of ESA: 3 Hrs.
Formative Assessment Marks: 30	Summative Assessment Marks: 45

Unit 1: Introduction to Crime Scene 15 hours

Crime scene: Definition; Types of crime scenes: Primary, Secondary, Indoor, Outdoor, based on manner of crime: homicide, suicide, accidental; Actions of first responding officer: emergency care, secure and control, Statements of victim, witness, suspects, databases and records, officer safety, release scene to appropriate authorities. Types of evidence found in the crime scene: physical evidence, biological evidence, digital evidence, individual evidence, class evidence. The evaluation of 5Ws (who?, what?, when?, where?, why?) and 1H (how). Role of different agencies involved in crime scene management: Police, Forensic Science Laboratories, Medico legal experts, Judicial officers.

Unit 2: Crime Scene Investigation 10 hours

Securing the crime scene; Evaluating the crime scene; Preliminary walk-through and documentation of the crime scene; Search and seizure of the crime scene Crime scene search patterns: strip method, grid method, zone/quadrant method, spiral method (inward and outward), wheel, and random; Documenting the crime scene: Photography of the crime scene: Wide range, mid-range and close up photography; Sketching: Rough and final sketch (Triangulation, Baseline, and polar coordinate methods), Videography, 3D Crime Scene Mapping, contemporaneous notes. Identifying and listing evidence along with their evidentiary value.

Unit 3: Collection and preservation of evidence 10 hours

Collection and preservation of evidence along with control samples and standards: blood, urine, saliva, semen, tissue, hair, soil, paint, glass, bullet, cartridge case, clothing, weapons (knife, firearm), documents, drugs, fingerprints, tool marks, explosive material, bite marks; General safety considerations while handling evidence in the crime scene; Forwarding evidence to the Forensic Science Laboratory; Chain of custody.

Unit 4: Special Crime Scenes and Crime Scene Reconstruction 10 hours

Arson, mass disasters, road traffic accidents, wildlife crime scene: their scene management and evidence collection for identification; Crime scene reconstruction: Introduction, importance, nature; Principles; Stages: data collection, conjecture, hypothesis formulation, testing, theory formation. Crime Scene Investigation Kit, Alternate Light Source, ABFO Scales, Placards, Finger Print Detection kit, Barricading Equipments, Evidence Tags, Sniffer Dogs, Packaging Equipments. ESDA, GPR (Ground Penetrating Radar), RUVIS HAZMAT Suits, Personal Protective Equipments. Product Safety Equipments.

LAB CONTENT (FS- 204)

Credits: 02 **Hours: 60**

Course Title: Crime Scene Management Practical	Course Credits: 02
Course Type: Core Practical, L-T-P: 0-0-4	Corse Code: FS-204
Total Contact Hours: 60	Duration of ESA: 4 Hours
Formative Assessment Marks: 25	Summative Assessment Marks: 25

1. Securing and evaluating indoor and outdoor scene of crime.
2. Searching indoor scene of crime using spiral technique and listing evidence.
3. Searching outdoor scene of crime using grid search technique .
4. Photographing scene of crime with at least five evidence.
5. Sketching of indoor crime scene using base line method.
6. Sketching of outdoor crime scene using triangulation method.
7. Making contemporaneous notes while investigating a scene of crime.
8. Collection, preservation, sealing and forwarding of soil sample from crime scene.
9. Collection, preservation, sealing and forwarding of blood sample from crime scene.
10. Crime scene reconstruction of a simulated scene of murder/burglary.

REFERENCE

Cooper, J. E., Cooper, M. E. (2013). Wildlife forensic investigation: principles and practice. CRC Press.

Everett, J. B. (2015). Complete Crime Scene Investigation Handbook. CRC Press. Fisher, B. A.,

Fisher, D. (2012). Techniques of Crime Scene Investigation, (8th Edition). CRC Press.

Huffman, J. E., Wallace, J. R. (2012). Wildlife forensics: methods and applications (Vol. 6). WileyBlackwell.

James, S. H., Nordby, J. J., Bell, S. (2014). Forensic Science: An Introduction to Scientific and Investigative Techniques (4th Edition). CRC Press.

Linacre, A. (2009). Forensic Science in Wildlife Investigations. Taylor & Francis.

Robert R. Ogle, S. L. (2017). Crime Scene Investigation and Reconstruction. Pearson.

Shaler, R. C. (2011). Crime Scene Forensics: A Scientific Method Approach. CRC Press.

BASIC FORENSIC BIOLOGY(FS-202)

Credits: 3 **Hours: 45**

Course Title: Basic Forensic Biology	Course Code: FS-202
Course Type: Discipline Core Theory, L-T-P: 3-0-0	Course Credits: 3
Total Contact Hours: 45	Duration of ESA: 3 Hrs
Formative Assessment Marks: 30	Summative Assessment Marks:45

Unit 1: Plant and Animal Biology 10 hours

Cell: Organelles and their Functions, Difference between Eukaryotic and Prokaryotic Cell, Difference between Plant and Animal Cell. Cell Division: Definition, Types, Difference between Somatic and Germinal Cell and Totipotency and Apoptosis. Meiosis and Mitosis. Plants: Algae, Bryophyta, Pteridophyta and Gymnospermae; Animals: Non-chordates, chordates; Forensic aspects of Botany: Palynology and Limnology; Forensic aspects of entomology; Post Mortem Interval.

Unit 2: Human Biology 15 hours

Elementary tissues of the body: epithelial, muscular; Integumentary System: definition and formation of skin. Layers of skin (overallanatomy), glands associated with skin; Organization of Organs and systems in the human body: Digestive, Circulatory, Respiratory, Excretory, Nervous, Skeletal and Reproductive systems.

Unit 3: Microbiology 10 hours

Microbes; Bacteria: Classification; gram staining; diseases and prevention; Antibiotics; Virus: Classification; diseases and prevention; Fungi: Classification; diseases and prevention; Parasites: Classification; diseases and prevention; Beneficial microbes; Forensic aspects of Microbiology; Biological warfare.

Unit 4: Genetics and Inheritance 10 hours

Heredity and variation; Mendelian inheritance; Chromosomes and genes; Karyotyping: Banding techniques; DNA and RNA Mt DNA: structure, types, replication and Eukaryotic Gene expressionCentral Dogma; Mutations- Polymorphism Significance in Forensic.

LAB CONTENT (FS-205)

Credits: 2 **Hours: 60**

Course Title: Basic Forensic Biology Practical Hours	Course Credits:2
Course Code: FS-205	L-T-P per week: 0-0-4
Total Contact Hours: 60	Duration of ESA: 4
Formative Assessment Marks: 25	Summative Assessment Marks:25

1. Microscopic examination of a Plant cell.

2. Microscopic examination of an Animal cell.

3. Examination of plant pollen.

4. Examination of bacteria using culture media.

5. Gram staining on various cultures.

6. Mounting and microscopic examination of human epithelial cell.

7. Mounting and microscopic examination of human hair.

8. Microscopic examination of blood cells.

9. Karyotype analysis using Ideograms.

10. Extraction and Examination of Diatoms.

11. Examination of plant products (flower, seed, bark, leaves)

REFERENCE

Agarwal (2018). Modern textbook of Botany, Universal Publication.

Ananthanarayanan (2017).A textbook of Microbiology, The Orient Blackswan.

Gennard, D. (2013). Forensic entomology: an introduction. Wiley.

Gunn. A (2006). Essentials of Forensic Biology, Chichester: John Wiley & Sons, Ltd. Gunn, A. (2011). Essential forensic biology. John Wiley & Sons.

CRIMINAL LAW (FS-203)

Credits: 3 **Hours: 45**

Course Title: Crime law.	Course Code: FS-203
Course Type: Discipline Core Theory, L-T-P: 3-0-0	Course Credits: 3
Total Contact Hours: 45	Duration of ESA: 3 Hrs
Formative Assessment Marks: 30	Summative Assessment Marks:45

Unit 1: Introduction to the Criminal Justice System 08 hours

Criminal Justice System (CJS): Meaning, Purpose and Social Relevance; Legislative Process in Criminal Justice System; Adversarial and Inquisitorial Systems of Criminal Justice System; Coordination in CJS; Reforms in CJS (Malimath Committee Report); Fundamental Elements in Judicial Functioning: Due Process, Speedy Trials and Access to Justice; Hierarchy of courts in India; Alternative Dispute Resolution System (ADRS): Arbitration, Mediation and Counselling, LokAdalats, Mahila courts; Restorative Justice

Unit 2: Salient Features of Indian Penal Code 12 hours

Elements of Crime: Actus Reus &Mens Rea; Elements of Criminal liability; Principles of group liability (Section 149, 34, 109, 120B IPC); General Exceptions (A): Excusable defences (Sec. 76-95); General Exceptions (B): Justifiable Defences (Sec. 96-106) Offences against Human body: Hurt, Grievous hurt, Culpable Homicide, Murder, Dowry Death, Kidnapping, Abduction, Rape and Acid attack (Sec. 302) Offence against property: Theft, Robbery, Dacoity, Cheating and Criminal Breach of Trust Criminal Amendment Act, 2013: IPC Sec 354, Sec 326 and Sec 376

Unit 3: Criminal Procedure Code 15 hours

Constitution of Criminal Courts and Functionaries under the Code; Arrest- Meaning and purpose, arrest with/ without a warrant, arrest of a woman, arrest by a private person; Search and Seizurewith/without a warrant and general provisions; F.I.R. and procedure after the recording of the F.I.R; Bail- Concept, Purpose & Constitutional Overtones; Anticipatory bail; Charge- Framing of Charge; Form and content of charge; Separate charges for distinct offence Trials- Trial before a court of session; of warrant cases; of summons cases; Summary trials; Judgment, Appeal, Reference, Revision and Transfer of cases. Chemical examiner's report.CrPC (1873) - 26, 27, 29, 31, 144, 154-158, 176, 291, 292, 293.

Unit 4: Law of Evidence and Minor Acts 10 hours

Indian Evidence Act: Introduction; Different types of Evidences; Burden of proof; Relevancy and admissibility of facts, admissions and confessions; Relevancy of confessions and dying declarations; Expert opinion: Appreciating expert evidence in court; Expert witness; Cross Examination and Reexamination of Witnesses, Sections - 32, 45, 46, 47, 57, 58, 60, 73, 114(A) 135, 136, 137, 138, 141. Protection of Children from Sexual Offences Act (POCSO Act), 2012; Protection of Women from Domestic Violence Act, 2005 and Juvenile Justice (Care and Protection of Children) Act, 2015.

REFERENCE

Report of the review committee on the recommendations of National Police Commission on Police reforms. (2005, March).

The Code of Criminal Procedure, 1973.

The Indian Evidence Act, 1872.

The Indian Penal Code, 1860. The Juvenile Justice (Care and Protection of Children) Act, 2015.

The Protection of Children from Sexual Offences Act, 2012.

The Protection of Women from Domestic Violence Act, 2005.

SEMESTER-III

Forensic Dermatoglyphics. (FS-301)

Course Title: Forensic Dermatoglyphics	Course Code: FS-301
Course Type: Core Theory, L-T-P: 3-0-0	Course Credits: 03
Total Contact Hours: 45	Duration of ESA: 3 Hours
Formative Assessment Marks: 30	Summative Assessment Marks: 45

Unit 1: Basics of Dermatoglyphics 10 hours

Introduction and history: with special reference to India; Biological basis of fingerprints, Structure of skin; Formation of ridges; Fundamental principles of fingerprinting; Plain and rolled fingerprints; Types of fingerprints: latent, patent and plastic; Fingerprint patterns: arches, loops and whorls; Fingerprint characters/minutiae; Poroscopy and edgeoscopy: concept and significance.

Unit 2: Classification of Fingerprints and its significance 10 hours

Introduction and history of classification systems; Dr. Henry Faulds' syllabic system; Purkinje classification; Galton's tripartite system; Vucetich Argentine system; Henry's classification system; Battley's Single Digit classification system.

Unit 3: Latent Fingerprints: Development, Preservation and Identification 15 hours

Latent prints: formation, constituent of sweat residue; Application of light sources in fingerprint detection; Development of latent prints: physical methods (powder and iodine fuming) and chemical methods (ninhydrin, cyanoacrylate, amido black and silver nitrate); Developing fingerprints on gloves; Fingerprinting the deceased; Preservation of developed fingerprints; Digital imaging for fingerprint enhancement; Introduction to Automated Fingerprint Identification System (AFIS).

Unit4: Additional Impressions 10 hours

Palm prints: collection, preservation, ATD angle and its significance; Footprint: types, location, preservation and significance; Collection of footprints: casting of footprints, electrostatic lifting of latent footprints; Lip prints: location, lifting, preservation, examination of lip prints using Suzuki and Tsuchihashi classification system, collection of standards and its significance; Ear prints: deposition and their significance.

LAB CONTENT (FS-304)

Credits: 2 **Hours: 60**

Course Title: Forensic Dermatoglyphics Practical	Course Code: FS-304
Couse Type: Core Practical L-T-P: 0-0-4	Course Credits: 02
Total Contact Hours: 60	Duration of ESA: 4 Hours
Formative Assessment Marks: 25	Summative Assessment Marks:25

1. Collection of rolled and plain prints on fingerprint recording slip.

2. Identification of fingerprint patterns.

3. Ridge counting and ridge tracing of fingerprints.

4. Classification of fingerprints using Henry's Classification from the fingerprint slip.

5. Development, collection and preservation of fingerprints on porous surfaces.

6. Development, collection and preservation of fingerprints on non-porous surfaces.

7. Comparison of disputed print with standard print.

8. Analysing the characteristics of palm prints.

9. Analysing the characteristics of footprints.

10. Casting of sunken foot prints.

REFERNCE

1. Sharma, B. R. (2019). Forensic science in criminal investigation and trials. Central Law Agency.

2. Ashbaugh, D.A. (2000). Quantitative-qualitative friction ridge analysis. Boca Raton, CRC Press.

3. Champod, C. Lennard, Margot, Stoilovic (2004), Fingerprints and other ridge skin Impressions. Boca Raton, CRC Press.

4. Champod, C., Lennard, C. J., Margot, P., & Stoilovic, M. (2017). Fingerprints and other ridge skin impressions. CRC Press.

5. Cowger, J.E. (1983). Friction ridge skin. Boca Raton, CRC Press.

6. Daluz, H. M. (2014). Fundamentals of fingerprint analysis. CRC Press.

7. Hawthorne, M. R. (2009). Fingerprints: analysis and understanding. CRC Press.

8. Lee, Gaensleen (2013). Advances in fingerprint technology, 3rd Edition, R.S. Ramotowski (Ed.). Boca Raton, CRC Press

Advanced Forensic Chemistry(FS-302)

Course Title: Advanced Forensic Chemistry	Course Code: FS-302
Course Type: Core Theory, L-T-P: 3-0-0	Course Credits: 03
Total Contact Hours: 45	Duration of ESA: 3 Hours
Formative Assessment Marks: 30	Summative Assessment Marks: 45

Unit 1: Basics of Forensic Chemistry 10 hours

Definition and introduction; Types of cases and exhibits in forensic chemistry; Cement: types, adulteration and analysis; Trap cases: types and chemistry of detective dyes, detection of phenolphthalein, instrumental analysis; Analysis of adulterants in cosmetics, paints, oils, fats, grease, gold, silver, tobacco, tea, sugars, salts; Salient features of Drug and Cosmetics Act, 1940.

Unit 2 : Introduction to Arson and Petroleum products 11 hours

Arson: introduction and motives; Fire: chemistry, behaviour, origin and cause; Arson scene investigation, collection and preservation of arson exhibits; Petroleum products: classification, commercial uses and adulteration; Analysis of petrol, kerosene, diesel and lubricants by Bureau Of International Standards (BIS) methods; Analysis and comparison of petroleum products as forensic exhibits: preliminary and confirmatory tests; Salient features of Petroleum Act, 1934.

Unit 3: Basic aspects of Explosives 12 hours

Introduction and classification of explosives; Process of explosion: deflagration and detonation; Improvised Explosive Devices (IEDs) and their characteristics; Collection and preservation of explosive residues from the scene of occurrence; Evaluation and reconstruction of sequence of events.

Unit 4: Alcohol analysis and its legal control 12 hours

Alcoholic beverages: types, country made liquors; Adulteration: types, methanol poisoning; Alcohol impaired driving: breath analyser, blood alcohol concentration, Widmark's equation; Identification and chemical analysis of methanol, ethanol, aldehyde, ester, chloral hydrate and furfural components by colour test; Instrumental techniques: headspace gas chromatography; Salient features of Excise Act.

LAB CONTENT (FS-305)

Credits: 2 **Hours: 60**

Course Title: Advanced Forensic Chemistry Practical	Course Code: FS-305
Course Type: Core Practical ,L-T-P : 0-0-4	Course Credits: 02
Total Contact Hours: 60	Duration of ESA: 4 Hours
Formative Assessment Marks: 25	Summative Assessment Marks:25

1. Detection of adulterant present in cement.

2. Detection of adulterant present in oil.

3. Detection of adulterant present in gasoline using filter paper and density test.

4. Analysis of density and flash point of diesel.

5. Analysis of density and flash point of kerosene oil.

6. Analysis of arson accelerators.

7. Analysis of explosive substances.

8. Separation of explosive substances using thin layer chromatography.

9. Qualitative analysis of ethanol.

10. Qualitative analysis of methanol.

11. Analysis of case studies.

REFERENCE

1. Aggrawal, A. (2017). Textbook of Forensic Medicine and Toxicology. APC Publisher.

2. Laboratory Procedure Manual Forensic Explosives (2005). Directorate of Forensic Science Ministry of Home affairs.

3. DeHaan, J.D (2013). Kirk's fire investigation; 3rd Edition. New Jersey; Prentice Hall.

4. Saferstein, R (2015). Criminalistics; 8th Edition. New Jersey; Prentice Hall.

5. Crippin, J. B. (2017). Explosives and Chemical Weapons Identification. Ukraine: Taylor & Francis.

6. Ford, J. (2014). Explosives & Arson Investigation. United States: Mason Crest.

7. Newton, D. E. (2007). Forensic Chemistry. United States: Facts On File, Incorporated.

8. Meyer, R., Köhler, J., & Homburg, A. (2016). Explosives. John Wiley & Sons.

9. Ford, J. (2014). Explosives & Arson Investigation. Simon and Schuster

Technological Methods in Forensic Science (FS-303)

Course Title: Technological Methods in Forensic Science	Course Code: FS-303
Course Type: Core Theory, L-T-P: 3-0-0	Course Credits: 03
Total Contact Hours: 45	Duration of ESA: 3 Hours
Formative Assessment Marks: 30	Summative Assessment Marks: 45

Unit I – Instrumentation and applications 10 hours

Principles of optics; Magnifying glass; Working principle, uses and forensic applications of compound microscope, fluorescence microscope, stereo microscope, phase-contrast microscope, comparison microscope, electron microscopes: SEM, TEM, STEM; Sample preparation for electron microscopy.

Unit II - Chromatography Techniques 12 hours

Chromatography: definition, Stahl's triangle, common applications; Working principle, uses and forensic applications of Paper chromatography, thin layer chromatography (TLC), column chromatography, high performance liquid chromatography (HPLC), gas chromatography (GC); Sample preparation for chromatography.

Unit III –Basics of Electrophoresis 08 hours

Electrophoresis: definition, factors affecting electrophoresis; Working principle, uses and forensic applications of agarose gel electrophoresis, Sodium Dodecyl-Sulfate Polyacrylamide Gel Electrophoresis.

Unit IV – Different Spectroscopic methods 15 hours

Beer-Lambert law; Working principle, uses and forensic applications of Colorimetry, UV-Vis spectrophotometer; Handheld spectroscope, IR spectroscopy, Atomic Absorption Spectroscopy (AAS), Atomic Emission Spectroscopy (AES), Mass Spectrometry (MS), X-Ray Spectrometer (XRS); Working principle, uses and forensic applications of Enzyme-Linked Immunoassay (ELISA), Radial Immuno Assay (RIA), Neutron Activation Analysis (NAA).

LAB CONTENT (FS-306)

Credits: 2 **Hours: 60**

Course Title: Technological Methods in Forensic Science Practical	Course Code: FS-306
Course Type: Core Practical, L-T-P: 0-0-4	Course Credits:2
Total Contact Hours: 60	Duration of ESA: 4 Hours
Formative Assessment Marks: 25	Summative Assessment Marks:25

1.Microscopic examination of blood smear under low, high and oil immersion objectives of compound microscope.

2. Preparation of a hair sample for compound microscopy – decolorization, mounting and observation. 3. Separation of plant pigments by paper chromatography.

4. Separation of ink using Thin Layer Chromatography.

5. Separation of amino acids using Thin Layer Chromatography.

6. Preparation of agarose gel.

7. Demonstration of Polyacrylamide Gel Electrophoresis.

8. Estimation of concentration of coloured substances using colorimeter.

9. Demonstration of analysis of a drug (Paracetamol) UV-Vis Spectrophotometer

10. Demonstration of Enzyme-Linked Immunoassay.

REFERENCE

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3. W. Kemp, Organic spectroscopy, CRC Press.

4. Introduction to Instrumental Analysis. By R.D.Broun, Mc.Graw Hill (1987)

5. Extraction Chromatography T.Braun, G. Ghersene, Elsevier Publications 1978

6. Shirley Bayne, M. C. (2010). Forensic Applications of High Performance Liquid Chromatography. CRC Press.

7. Stuart, S. A. (2013). Forensic analytical techniques. Wiley-Black.

8. Donald L. Pavia, G. M. (2014). Introduction to spectroscopy. Cengage Learning.

9. H.H. Willard, L.L. Merritt Jr. Dean, Settie. Instrumental Methods of Analysis, 7th Edition. (2004), CBS Publishers and Distributors.

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SEMESTER-IV

QUESTIONED DOCUMENTS (FS-401)

Course Title: Questioned document	Course Code: FS-401
Documents Course Type: Core Practical, L-T-P: 3-0-0	Course Credits: 03
Total Contact Hours: 45	Duration of ESA: 3 Hours
Formative Assessment Marks: 30	Summative Assessment Marks: 45

Unit 1: Basic Tools and Techniques of Questioned Documents 11 hours

Basic terminologies in questioned documents; Types of questioned documents; Care and handling of questioned documents; Preliminary examination of documents; Basic tools needed for forensic examination of questioned documents: measuring tools, magnification tools, Video Spectral Comparator (VSC), Electrostatic Detection Apparatus (ESDA); Light sources: ultraviolet, visible, infrared light; Photomicrography.

Unit 2: Examination of Handwriting and Signature 11 hours

Development of individuality in handwriting; Natural variations and fundamental divergences in handwritings; Factors affecting handwriting; Class and individual characteristics of handwriting and signature.

Unit 3: Context cases in Questioned Documents 11 hours

Alterations in documents: erasures, additions, over-writings, cutting and obliterations; Secret writing: methods and decipherment; Charred documents: collection, preservation and decipherment; Forgery and its types; Disguised writing and its methods; Analysis of forged and disguised documents; Anonymous letters: introduction and examination.

Unit 4: Comparison and analysis of Documents 12 hours

Exemplar: types (requested and non-requested), merits and demerits; Collection of standards for comparison of handwritings, signatures, printed documents, photocopied documents and typed documents; Process of comparison of handwriting and signature; Determining the age and relative age of documents; Examination of printed documents, typed documents and photocopied documents; Examination of counterfeit Indian currency notes, passports and stamp papers; Types of opinion.

LAB CONTENT(FS-404)

Credits: 2 **Hours: 60**

Course Title: Questioned document pratical	Course Code: FS-404
Documents Course Type: Core Practical, L-T-P: 0-0-4	Course Credits: 03
Total Contact Hours: 60	Duration of ESA: 4 Hours
Formative Assessment Marks: 25	Summative Assessment Marks: 25

1.Preliminary examination of questioned documents

2. Determination of sequence of strokes

3. Identification and comparison of handwriting

4. Identification and comparison of signature

5. Detection of forgeries (simulated and traced forgery)

6. Detection of erasures and obliterations.

7. Collection and preservation of charred documents

8. Identification of characteristics of printed documents .

9. Examination of security features of Indian currency notes

10. Examination of security features of Passport.

REFERENCE

1. Sharma, B. R. (2012). Treatise on handwriting forensic. Universal Law Publishing Company, New Delhi. 2. Sharma, B. R. (2016). Handwriting forensic. Universal Law Publishing Company, New Delhi.

3. Sharma, B. R. (2019). Forensic science in criminal investigation and trials. Central Law Agency.

4. Day, S. P., Ellen, D., & Davies, C. (2005). Scientific examination of documents: methods and techniques. CRC Press.

5. Huber, R. A. (1999). Handwriting Identification: Facts and Fundamentals. Ottawa, Canada 1999: CRC Press.

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7. Koppenhaver, K. M. (2007). Forensic document examination: principles and practice. Springer Science & Business Media.

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Advanced Forensic Biology (FS-402)

Course Title: Advanced foresic biology	Course Code: FS-402
Documents Course Type: Core Practical, L-T-P: 3-0-0	
Total Contact Hours: 45	Duration of ESA: 3 Hours
Formative Assessment Marks: 30	Summative Assessment Marks: 45

Unit 1: Botanical Evidence 10 hours

Leaves, seed, pollen, wood and plant juices as evidence; Transfer of botanical evidence and forensic significance; Collection and preservation of botanical evidence; Diatoms: general morphology; Significance in drowning cases.

Unit 2: Hair as Evidence 11 hours

Morphology; Microscopic morphology; Biochemistry; Growth cycle; Functions and characteristics of hair: scalp, axilla, facial and pubic; Sex differentiation, age estimation and race determination from hair; Disorders of hair; alopecia, hirsutism; Collection and preservation; Forensic examination: scale examination and morphometric analysis; Comparison of human and animal hair.

Unit 3: Blood and Body Fluids as Evidence 12hours

Blood: composition, functions; Haemopoiesis; Haemoglobin; Forensically relevant enzymes present in blood; Blood smear examination: Leishman stain; Collection and preservation of blood evidence; Presumptive and confirmatory testing of blood evidence; Collection, preservation and examination of body fluids: semen, saliva, urine, faeces, sweat, tear, milk, menstrual blood, fetal blood.

Unit 4: Blood Pattern Analysis 12 hours

Physical, dynamic and biological properties of human blood; Blood stain drying time; Terminologies and classification of blood patterns: impact, cast-off, projected, contact and blood trails; Convergence and point of origin; Documentation of blood patterns; Significance in crime scene reconstruction.

LAB CONTENT (FS-405)

Credits: 2 **Hours: 60**

Course Title: advanced forensic biology pratical	Course Code: FS-405
Documents Course Type: Core Practical, L-T-P: 0-0-4	Course Credits: 02
Total Contact Hours: 25	Duration of ESA: 4 Hours
Formative Assessment Marks: 25	Summative Assessment Marks: 25

1.Presumptive testing of dried blood stains

2. Confirmatory testing of dried blood stains

3. Leishman staining and microscopic examination of blood smear

4. Examination of saliva

5. Examination of seminal stains

6. Microscopic examination of hair - Transverse and cross sections

7. Microscopic examination of hair - scale examination

8. Examination of pollen

9. Documentation of blood splatter

10. Interpretation of blood patterns.

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● Abul K. Abbas, Andrew H. H. Lichtman, Shiv Pillai(2017):Cellular and Molecular Immunology. Elsevier

● Alan Gunn (2009):Essential Forensic Biology: Wiley

● J Thomas McClintock(2014):Forensic analysis of biological evidence : a Laboratory guide for serological and DNA typing: CRC Press

● Li, Richard (2015):Forensic Biology. CRC Press

● Kintz, Pascal, Salomone, Alberto, Vincenti, Marco (2015):Hair Analysis in Clinical and Forensic Toxicology: Academic Press

● Bruce Budowle, Steven Schutzer, Stephen Morse (eds.)(2020):Microbial Forensics: Academic Press

● Jane E. Huffman, John R. Wallace(2011):Wildlife Forensics: Methods and Applications: Wiley

● J E Cooper, Margaret E Cooper(2013):Wildlife forensic investigation : principles and practice: CRC Press

Forensic Psychology(FS-403)

Course Title: forensic psychology	Course Code: FS-403
Documents Course Type: Core Practical, L-T-P: 3-0-0	Course Credits: 03
Total Contact Hours: 45	Duration of ESA: 3 Hours
Formative Assessment Marks: 30	Summative Assessment Marks: 45

Unit 1: Basic aspects of Psychology 10 hours

Psychology: introduction, definition and goals; originating schools of psychology; Current psychological perspectives: biological, psychodynamic, behavioristic, humanistic, cognitive and cultural; Basic psychological processes: sensation- selection, sensory adaptation, analysis and coding; Perception: sensing, perceiving, classifying, Gestalt principles; States of Consciousness: altered states of consciousness, sleep, need for sleep, sleep stages, dream analysis-signs and symbols; Memory: information processing view, encoding, storage and retrieval, three memory systems: Sensory, short term memory (STM) and long term memory (LTM); Neurobiology of Memory.

Unit 2: Introduction to Forensic Psychology 10 hours

Definition and fundamental concepts of forensic psychology and forensic psychiatry. Psychology and law. Ethical issues in forensic psychology; Assessment of mental competency; Mental disorders and forensic psychology; Psychology of evidence: eyewitness testimony, confession evidence; Criminal profiling; Psychology in the courtroom (with special reference to Section 84 of IPC); Classification of mental disorders; Diagnostic and Statistical Manual of Mental Disorders (DSM IV); International Classification of Diseases (ICD) 10.

Unit 3: Criminal Behaviour and Psychology 10 hours

Psychopathology and personality disorder. Psychological assessment and its importance. Serial murderers. Psychology of terrorism. Biological factors and crime: social learning theories, psychosocial factors, abuse. Juvenile delinquency: theories of offending (social cognition, moral reasoning), Child abuse (physical, sexual, emotional), juvenile sex offenders, legal controversies.

Unit 4: Tools and Techniques in Forensic Psychology 15 hours

Tools for detection of deception: interviews, non-verbal detection, statement analysis, voice stress analyzer: Layered Voice Analysis (LVA); Hypnosis; Polygraph: operational and question formulation techniques, the guilty knowledge test; Brain electrical oscillation signature profiling (BEOS) and Narco-analysis: principle, theory and question formulation; Ethical and legal issues; Personality assessment inventories: Minnesota Multiphasic Personality Inventory (MMPI),

Personal Activity Intelligence (PAI); Projective techniques: Rorschach, Thematic Apperception Test (TAT).

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6. Weiten, W. (2002). Themes and variations: 5th edn. Brooks/Cole, Publishing Co.

7. Wrightsman, Lawrence S. & Fulero, S. (2008). Forensic Psychology. Wadsworth / Thomson Learning.

LAB CONTENT (FS 406)

Credits: 2 **Hours: 60**

Course Title: forensic psychology pratical	Course Code: FS-406
Documents Course Type: Core Practical, L-T-P: 0-0-4	Course Credits: 02
Total Contact Hours: 60	Duration of ESA: 4 Hours
Formative Assessment Marks: 25	Summative Assessment Marks: 25

1.Reliability of eyewitness testimony through a video.

2. Analysis of a crime case involving serial murders; Commenting on the psychological traits of the accused.

3. Analysis of a crime case involving a juvenile and argue for and against lowering the age for categorizing an individual as juvenile.

4. IQ test using Bhatia's Battery

5. Thematic Apperception Test

6. Demonstration of MMPI

7. Analysis of a criminal case in which Narco-analysis was used as a means to detect deception.

8. Question formulation for a simulated case with respect to Polygraph/ Brain Electrical Oscillation Signature Profiling (BEOS).