***SCHEME OF EXAMINATION***

***&***

# *SYLLABI*

***OF***

# *BACHELOR OF SCIENCE*

## *(FORENSIC SCIENCE)*

***(Three Years Programme)***

**Batch : 2018-21**

*Department of Forensic Science School of Allied Health Sciences Sharda University,*

*Greater Noida – 201306*

# *Forensic Science- Course overview*

***Forensic science is the application of scientific knowledge and methodology to criminal investigations and legal problems. Forensic Science is a multidisciplinary subject, it encompasses various fields of science such as chemistry, biology, physics, geology, psychology, social science, engineering, etc.***

*Forensic Science is the application of a wide spectrum of Sciences to aide Criminal Investigations. Traditionally, it is a subject run for Government -owned Forensic Science Laboratories which aide the state police services to carry out routine crime scene processing. It is finding a wider scope however, as lately sectors like banks and insurance find heavy reliability on forensic experts- for testing bank and insurance frauds. The field of cyber security also has its roots in classic digital forensics. Our courses are designed to provide industry-ready scholars to government labs. Special focus is given on hands-on training of the students. The course is conducted in close collaboration with prominent state forensic science laboratories and students are given industrial internships at these labs-so as to enable them to be complete forensic professionals.*

*B.Sc. Forensic Sciences or Bachelor of Science in Forensic Sciences is an undergraduate Forensic Science course deals with the most scientific ways in which various kinds of crimes or activities can be proved. Forensic Science is essentially a crime and laboratory-based profession. But the expertise of a forensic professional is also used in civil cases for issues like proving the validity of a signature on a will, to a claim of the products liability, to and out whether an industry is complying with environmental rules or not. Forensic Science is broadly grouped into three Types: Medical, laboratory and field science. Medical/Data medicine includes forensic pathology, psychiatry, psychology, forensic medicine and odontology (dentistry).*

*Laboratory Sciences include chemistry, biology, toxicology, ballistics, fingerprints, questioned documents and marks & impressions.*

*Field Sciences include crime scene investigation which incorporates areas such as fire and Explosion scenes and clandestine drug laboratories.*

***Eligibility Criteria: -***

*The basic criterion of eligibility needed to be met for admission to the course is a Higher Secondary (10+2) or equivalent qualification from a recognized educational Board, with Physics, Chemistry and Biology and/ or Math as main subjects and a minimum aggregate score of 55%.*

***Examination pattern for theory and Practical: -***

*The course of study for the B.Sc. Forensic Science examination is divided in six semesters. Each semester will have theory courses and each paper will be scored for 100 marks. There will be one practical course completed in a Semester and each course has 60 marks.*

*1. Theory examination of 3 Hrs Duration would be conducted after each semester.*

*2. Practical examination of 4 Hrs Duration would be conducted only after completion of even semester.*

***Faculty Qualification: -***

*As per the U.G.C/State Government Norms and Experts from Forensic Science field and Related Industry with Minimum 3 years of Experience.*

*Assistant Professor: Essential Qualification:  Good academic record with at least 55% marks (or an equivalent grade in a point scale wherever grading system is followed) at the Master's Degree level in Forensic Sciences from an Indian University, or an equivalent degree from an accredited foreign university.  The candidate must have cleared the National Eligibility Test (NET) conducted by the UGC, CSIR or similar test accredited by the UGC like SLET/SET etc. or completed M. Phil on or before 2009  An eminent scholar with a doctoral degree (Ph.D.) In the concerned or relevant discipline is desirable.*

## Scheme of Examination and Course Structure for B.Sc. Forensic Science
## B.Sc. Forensic Science First Year (semester I & Semester II)

| *SR. No* | *Paper* | *Title of Paper* | *Marks (Semester Wise)* | | | | | | | | *Credit for semester* | *Work load Period/ Week* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | *Theory* | | | | *Practical* | | | | | *Theory* | *Practical* |
| | | | *CA* | *MSE* | *ESE* | *Total* | *CA* | *MSE* | *ESE* | *Total* | | 15 | *20* |
| *YEAR-I* | *SEMESTER-I* | *Forensic Science-* ***I,II&III*** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | *5* | *3* | 4 |
| | | *Chemistry-* ***I,II&III*** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | *5* | *3* | 4 |
| | | *Physics-* ***I,II&III*** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | *5* | *3* | 4 |
| | | *Botany-* ***I,II&III*** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | *5* | *3* | 4 |
| | | *Zoology-* ***I,II&III*** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | *5* | *3* | 4 |
| | | English | - | - | - | - | - | - | - | - | - | - | - |
| | | Physiology | - | - | - | - | - | - | - | - | - | - | - |
| | *SEMESTER-II* | *Forensic Science-* ***IV,V & VI*** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | *5* | *3* | 4 |
| | | *Chemistry-* ***IV,V & VI*** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | *5* | *3* | 4 |
| | | *Physics-* ***IV,V & VI*** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | *5* | *3* | 4 |
| | | *Botany-* ***IV,V & VI*** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | *5* | *3* | 4 |
| | | *Zoology-* ***IV,V & VI*** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | *5* | *3* | 4 |
| | | English | - | - | - | - | - | - | - | - | - | - | - |
| | | Project (Summer) | - | - | - | - | - | - | - | - | *2* | - | - |

## B.Sc. Forensic Science Second Year (Semester III & Semester IV)

| SR. No | Paper | Title of Paper | Marks (Semester Wise) | | | | | | | | Credit for semester | Work load Period/ Week | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Theory | | | | Practical | | | | | Theory | Practical |
| | | | CA | MSE | ESE | Total | CA | MSE | ESE | Total | | 15 | 20 |
| YEAR-II | SEMESTER-III | Forensic Science- **I,II&III** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | 5 | 3 | 4 |
| | | Chemistry- **I,II&III** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | 5 | 3 | 4 |
| | | Physics- **I,II&III** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | 5 | 3 | 4 |
| | | Botany- **I,II&III** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | 5 | 3 | 4 |
| | | Zoology - **I,II&III** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | 5 | 3 | 4 |
| | | Psychology - **I,II&III** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | 2 | 1 | 2 |
| | | English | - | - | - | - | - | - | - | - | - | - | - |
| | | Internship | - | - | - | - | - | - | - | - | 1 | - | - |
| | SEMESTER-IV | Forensic Science- **IV,V & VI** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | 5 | 3 | 4 |
| | | Chemistry- **IV,V & VI** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | 5 | 3 | 4 |
| | | Physics- **IV,V & VI** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | 5 | 3 | 4 |
| | | Botany- **IV,V & VI** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | 5 | 3 | 4 |
| | | Zoology- **IV,V & VI** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | 5 | 3 | 4 |
| | | English | - | - | - | - | - | - | - | - | - | - | - |
| | | Project | - | - | - | - | - | - | - | - | 2 | - | - |

# B.Sc Forensic Science Syllabus (Semester V and VI)

| *SR. No* | *Paper* | *Title of Paper* | *Marks (Semester Wise)* | | | | | | | | *Credit for semester* | *Work load Period/ Week* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | *Theory* | | | | *Practical* | | | | | *Theory* | *Practical* |
| | | | *CA* | *MSE* | *ESE* | *Total* | *CA* | *MSE* | *ESE* | *Total* | | *15* | *20* |
| *YEAR-III* | *SEMESTER-V* | *Forensic Science* ***I, II, III*** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | 5 | *3* | 4 |
| | | *Chemistry-* ***I,II&III*** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | 5 | *3* | 4 |
| | | *Physics-* ***I,II&III*** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | 5 | *3* | 4 |
| | | *Botany-* ***I,II&III*** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | 5 | *3* | 4 |
| | | *Zoology-* ***I, II & III*** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | 5 | *3* | 4 |
| | | *Applied Digital and Cyber Forensic-* ***I,II&III*** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | 2 | *1* | 2 |
| | | English | - | - | - | - | - | - | - | - | - | - | - |
| | *SEMESTER-VI* | *Forensic Science* ***IV,V & VI*** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | 5 | *3* | 4 |
| | | *Chemistry-* ***IV,V & VI*** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | 5 | *3* | 4 |
| | | *Physics-* ***IV,V & VI*** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | 5 | *3* | 4 |
| | | *Botany-* ***IV,V & VI*** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | 5 | *3* | 4 |
| | | *Zoology-* ***IV,V & VI*** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | 5 | *3* | 4 |
| | | *Applied Digital and Cyber Forensic-* ***IV,V & VI*** | 30 | 20 | 50 | 100 | 60 | - | 40 | 100 | 2 | *1* | 2 |
| | | English | - | - | - | - | - | - | - | - | - | - | - |

## Syllabus: B.Sc. Forensic Science - Forensic Science, Semester 1

## Theory:

| UNIT: I – CRIME SCENARIO IN INDIA |
|---|
| Introduction to crime and history<br>Sociological aspects of crime and criminals in society<br>Definition of crime, characteristics of crime, A brief ideas about White collar crime, professional crime, organized crime, present scenario of crime in India.<br>Types of crime and its causes – property crimes, public order crimes, violent crimes, cyber crimes, juvenile delinquency<br>Society-Criminal interaction and various types of crimes in India |
| |
| **UNIT: II – CRIME SCENE INVESTIGATION** |
| Definition of Crime Scene. Classification of crime Scene: indoor & outdoor, primary & secondary, macroscopic & microscopic crime scene, protection of crime scene and its importance. Significance of crime scene, argument and ethics of crime scene, initial response, role of first responding officer,duty management<br>Forensic Scientists, Investigating officers and their assigned role and duties.<br>Role of the Police and Judiciaries, Fire Brigade, Medico-legal officers and other experts<br>Physical evidence, Definition, classification of physical evidence, types of physical evidences, sources of physical evidence, signification and value of physical evidence, handling and packaging of physical evidences, linkage between crime scene, victim and criminal, study of some special crime scene such as mass disaster, terror attack, geological scene and explosive etc. |
| |
| **UNIT: III – BASIC DEVELOPMENT OF FORENSIC SCIENCE** |
| Introduction Global History and Scope, Need and Development,<br>Principles, emphasizing on Specific contribution of Scientists in the field of Forensic Science.<br>Branches of Forensic Science, Police officers, Prosecution,<br>Judicial Officers and Medico legal expert etc. Role and Qualifications of forensic scientists.<br>Code of conduct for forensic scientists, Ethical issue in Forensic Science, professional Structure and function of State and regional Forensic Science Laboratory, Central Forensic Science Laboratory and facility provided, Mobile Forensic Science Laboratory. Directorate of Forensic Science Service.<br>Police and Forensic scientist relationship, role of FSL in criminal investigation, relationship between forensic expert and judiciary officer, Importance of FSL, National and International scenario of FSL, facilities provided in forensic science laboratory. |

## Practical:

1. To collect, pack and forward the given evidence using Druggist fold method.
2. To take the photography of out-door crime scene and physical evidence.
3. To take the photography of in-door crime scene and physical evidence.
4. To draw the sketch map of crime scene by 'base line' method.
5. To perform all the steps of crime scene in 'Bomb Blast case'.
6. To collect & preserve the physical evidences in 'Hanging Case'.

## Syllabus: B.Sc. Forensic Science - Physics, Semester 1

### Theory:

**UNIT: I – NEWTON'S LAW OF MOTION, ENERGY AND MOMENTUM**

- Units of measurement, Vectors, component notation, unit vectors, magnitude of vectors, dot product, cross product
- Kinematics: Linear motion, projectile motion, uniform circular motion
- Dynamics: Newton's laws of motion, free body diagrams, static and kinetic friction
- Work and energy, Energy and momentum conservation, kinetic energy, gravitational potential energy, spring force and spring potential energy
- Elastic and non-elastic collisions, impact of a force

**UNIT: II –FLUID MECHANICS**

- Fluid statics: pressure in a fluid, measurement of pressure using open tube manometer and mercury barometer, variation of pressure with depth, hydraulic machines, Pascal's law, buoyancy and Archimedes principle
- Fluid dynamics: Equation of continuity, streamlines and streamlined flow, incompressible and ideal fluids, Bernoulli's equation, Venturi meter, Pitot tube, aerodynamic lift
- Viscosity, Newton's law of viscosity, Real fluids, Poiseuille's equation, fluid drag, Stokes formula, turbulence and Reynolds number.

**UNIT: III – ELASTICITY, GRAVITATION, OSCILLATIONS, SURFACE TENSION**

- Elasticity, stress and strain, Hooke's Law, Young's modulus, Shear modulus, Bulk modulus
- Newton's law of Gravitation, gravitational potential energy, escape velocity, circular and elliptical orbits, Kepler's Laws
- Oscillations, Simple harmonic motion, damped and forced oscillations, Resonance
- Surface tension, capillarity

### Practical:

1. To determine the wavelength of monochromatic light by Newton's Ring method
2. To determine the wavelength of prominent lines of mercury by plane diffraction grating
3. To determine the focal length of the combination of two thin convergent lenses separated by a distance with the help of a nodal-slide and verify the formula
4. To determine the specific rotation of cane sugar solution with the help of a polarimeter
5. To verify Stefan's law of radiation
6. To study Hall effect and determine the Hall coefficient, carrier density and the mobility of a semiconductor material

## Syllabus: B.Sc. Forensic Science - Chemistry, Semester 1

## Theory:

**UNIT: I – State of Matters**

- Gaseous States: Postulates of kinetic theory of gases, Gas Laws, deviation from ideal behavior, van der Waals equation of state. Relationship between critical constants and van der Waals constants, the law of corresponding states. Molecular Velocities : Root mean square, average and most probable velocities. Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter. Liquefaction of gases.
- Liquid State: Intermolecular forces, structure of liquids (a qualitative description). Structural differences between solids, liquids and gases. Liquid crystals: Difference between liquid crystal, solid and liquid. Classification, structure of nematic, smectic and cholesteric phases and applications.
- Solid State: Definition of space lattice and unit cell. Laws of crystallography: (i) Law of constancy of interfacial angles (ii) Law of rationality of indices (iii) Law of symmetry - Symmetry elements in crystals. X-ray diffraction: Derivation of Bragg's equation. Determination of crystal structure of NaCl and KCl. A brief introduction to point defects in crystals, semiconductors, superconductors and nanomaterials (only qualitative idea).

**UNIT: II – Atomic Structure**

Bohr's theory and its limitations, dual behavior of matter and radiation, de Broglie relation, Heisenberg Uncertainty principle. Hydrogen atom spectra. Radial and angular parts of the hydrogenic wavefunctions (atomic orbitals) and their variations for 1s, 2s, 2p, 3s, 3p and 3d orbitals (Only graphical representation). Significance of quantum numbers, orbital angular momentum and quantum numbers ml and ms. Shapes of s, p and d atomic orbitals, nodal planes. Spin quantum number (s) and magnetic spin quantum number (ms). Rules for filling electrons in various orbitals, Electronic configurations of the atoms. Stability of half-filled and completely filled orbitals, Anomalous electronic configurations.

**UNIT: III – Fundamentals of Organic Chemistry Physical Effects, Electronic Displacements**

- Classification of hydrocarbons. Nomenclature, methods of preparations, physical characteristics and chemical reactions of alkanes, cycloalkanes, alkenes and alkynes. Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis. Structure, shape and reactivity of organic molecules: Nucleophiles and electrophiles. Reactive Intermediates: Carbocations, Carbanions and free radicals. Strength of organic acids and bases: Comparative study with emphasis on factors affecting pK values. Aromaticity: Benzenoids and Hückel's rule. Stereochemistry Conformations: Ethane, butane and cyclohexane. Interconversion
  of Wedge Formula, Newmann, Sawhorse and Fischer representations. Concept of chirality (up to two carbon atoms).
  Configuration: Geometrical and Optical isomerism; Enantiomerism, Diastereomerism and Meso compounds.
  Threo and erythro; D and L; cis – trans nomenclature; CIP Rules: R/ S (for upto 2 chiral carbon atoms) and E / Z Nomenclature (for up to two C=C systems).

## Practical:

1. Preparation of solution with different morality, specially NaOH and standardization of NaOH using an indicator.
2. Estimation of Fe(II) ions by titrating it with $K_2Cr_2O_7$ using internal indicator.
3. Purification of organic compound by crystallization (from Water).
4. Detection of extra elements in Inorganic Compound.
5. Determine relative and absolute viscosity of Benzene.
6. To determine the end point of HCl by titration it with NaOH volumetrically.

## Syllabus: B.Sc. Forensic Science - Zoology, Semester 1

## Theory:

**UNIT: I – Cell Biology**

- Ultra structure of different cell organelles of animal cell: Prokaryotic and Eukaryotic cells, Virus, Viroids, Mycoplasma, Prions
- Plasma Membrane: Fluid mosaic model, various modes of transport across the membrane, mechanism of active and passive transport, endocytosis and exocytosis.
- Endoplasmic reticulum (ER): types, role of ER in protein synthesis and transportation in animal cell.
- Golgi complex: Structure, Associated enzymes and role of Golgi-complex in animal cell.
- Mitochondria: Mitochondrial DNA; as semiautonomous body, biogenesis, mitochondrial enzymes (only names), role of mitochondria.
- Lysosomes: Structure, enzyme and their role; polymorphism

**UNIT: II –Cell Biology & Cell Division**

- Ribosomes: Types, biogenesis and role in protein synthesis.
- Cytoskeleton: Microtubules, microfilaments, centriole and basal body.
- Cilia and Flagella
- Cytoskeleton Structure and Functions: Microtubules, Microfilaments and Intermediate filaments
- Nucleus Structure of Nucleus: Nuclear envelope, Nuclear pore complex, Nucleolus Chromatin: Euchromatin and Hetrochromatin, lampbrush chromosomes and polytene chromosomes.
- Cell Division: Mitosis, Meiosis, Cell cycle and its regulation
- Cell Signaling GPCR and Role of second messenger (cAMP)

**UNIT: III – Developmental Biology**

- **DEVELOPMENTAL BIOLOGY:** Historical perspective and basic concepts: stages of development, Cell-Cell interaction, Differentiation and growth.
- Gametogenesis, Spermatogenesis, Oogenesis; Types of eggs, Egg membranes; Fertilization (External and Internal): Changes in gametes, Blocks to polyspermy; General account of cleavage division: Planes and patterns of cleavage; Types of Blastula; Implantation of embryo in humans, Placenta (Structure, types and functions of placenta).
  Regeneration: Modes of regeneration, In vitro fertilization, Stem cell (ESC).

## Practical:

1. To study different parts, working and care of different types of microscopes.
2. To study Prokaryotic & Eukaryotic cell.
3. Preparation of temporary stain of onion root tip to study various stages of mitosis.
4. Preparation of temporary stain of onion root tip to study various stages of meiosis.
5. To comment upon the slides or microphotographs showing ultra structures of some cell types and cell organelles:
   a) Animal cell

b) Endoplasmic Reticulum
c) Mitochondria
d) Golgi apparatus
e) Nucleus
f) Chloroplast

6. Study of the permanent slides of the chick embryos (whole mounts).

## Syllabus: B.Sc. Forensic Science - Botany, Semester 1

## Theory:

| **UNIT: I - Microbiology** |
|---|
| **Microbiology:** Introduction to microbial world: Microbial nutrition, growth and metabolism. Economic importance of viruses with reference to vaccine production, role in medicine and diagnostics, as causal organisms of plant diseases. Economic importance of bacteria with reference to their role in agriculture and industry (fermentation and medicine).<br>**Bacteria:** General characteristics; Types-archaebacteria, eubacteria, wall-less forms (mycoplasma); Cell structure; Nutritional types; Reproduction-vegetative, asexual and recombination (conjugation, transformation and transduction).<br>**Viruses:** Physiochemical and biological characteristics; general structure; replication (general account), DNA virus (T-phage), RNA virus (TMV). |
| |
| **UNIT: II - Mycology & phycology** |
| **Algae:** General characteristics; Ecology and distribution; range of thallus organization; Cell structure and components; cell wall, pigment system, flagella; methods of reproduction. Role of algae in the environment, agriculture, biotechnology and industry.<br>**Fungi**: Introduction- General characteristics, ecology and significance, range of thallus organization, cell wall composition, nutrition, reproduction and classification; True Fungi- General characteristics, ecology and significance, Symbiotic Associations-<br>Lichens: General account, reproduction and significance; Mycorrhiza: ectomycorrhiza and endomycorrhiza and their significance. |
| |
| **UNIT: III - Biomolecules** |

**Biomolecules:** Types and significance of chemical bonds; Structure and properties of water; pH and buffers.

**Carbohydrates:** Nomenclature and classification; Monosaccharides; Disaccharides; Oligosaccharides and polysaccharides.

**Lipids:** Definition and major classes of storage and structural lipids; Fatty acids structure and functions; Essential fatty acids.

**Proteins:** Structure of amino acids; Levels of protein structure-primary, secondary, tertiary and quarternary; Protein de-naturation and biological roles of proteins.

**Nucleic acids:** Structure of nitrogenous bases; Structure and function of nucleotides; Types of nucleic acids.

## Practical:

1. Knowledge of equipments used in microbiology; spirit lamp, hot air oven, Autoclave, Incubator.
2. Preparation of liquid and solid media for culturing of microbes (demonstration).
3. Preparation of temporary mount and identification of Algae.
4. Bacteria Gram staining.
5. Preparation of temporary mount and identification of Fungi.
6. Qualitative test of carbohydrates, proteins or amino acids.

# BFS I YEAR - SYLLABUS (PHYSIOLOGY)
## HUMAN PHYSIOLOGY

**SUBJECT DESCRIPTION**:
The course in Physiology cover the first year is designed to give the students a depth knowledge of fundamental functions of different systems of human body. The major topics to be covered include the following: the cell, muscle& nervous tissue; blood; lymphoid tissues; respiratory system; blood vessels; circulation; heart; gastro intestinal tract; endocrine & Reproductive system, excretory system, central nervous system and special senses.

# THEORY :-

## UNIT-I - GENERAL & NERVE MUSCLE PHYSIOLOGY

Ia – Components of cell, functions of cell organelles, transport across cell membrane, homeostasis & membrane potential.
Ib – Structure , functions of nerve tissues.
Ic – neuromuscular junction, Difference between skeletal muscle, smooth muscle & cardiac muscle.

## UNIT-II - BLOOD & CVS

IIa— composition & functions of blood, plasma proteins & haemoglobin, Erythrocytes, leucocytes & platelets, blood coagulation, blood groups & immunity
IIb – physiological anatomy of the heart & blood vessels, cardiac cycle.
IIc – Heart sounds & ECG graph , Heart Rate, Cardiac Output, Blood Pressure & Pulse.

## UNIT – III – THE RESPIRATORY SYSTEM

IIIa – physiological anatomy & functions of respiratory system.
IIIb – Transport of Gases.
IIIc – Regulation of respiration & Hypoxia.

## UNIT -- IV – DIGESTIVE SYSTEM AND EXCRETORY SYSTEM

IVa – physiological anatomy and functions of GIT,Composition and functions of different dijestive juices , Digestion and Absorption in GIT.
IVb – Physiological anatomy of kidney, structure and functions of excretory system, structure of nephron.
IVc- Physiology of micturition and Regulation of Body Temperature in Humans.

## UNIT-V - ENDOCRINE AND REPRODUCTIVE SYSTEM

Va—General principles of endocrinology, Different endocrine glands and their functions .
Vb – Puberty, Spermatogenesis & semen.
VC – mensturation, ovulation and contraception.

(**P.S- Curriculum Outline, Credit Hours and evaluation/ assessment criteria will be same as specified previously.**)

| School: SBSR | | Batch : | |
|---|---|---|---|
| Program: B.Sc | | Current Academic Year: | |
| Branch: All | | Semester: | |
| 1 | Course Code | ENG101 | |
| 2 | Course Title | English 1 | |
| 3 | Credits | | |
| 4 | Contact Hours (L-T-P) | 2-0-0 | |
| | Course Status | **Compulsory** | |
| 5 | Course Objective | 1. To equip students to minimize the linguistic barriers emerging in a different environment.<br>2. Help students to understand different accents and standardise their existing English<br>3. Guide the students to hone the basic communication skills, listening, speaking and reading. | |
| 6 | Course Outcomes | CO1: Develop writing skills<br>CO2: Learn to use correct sentence structure and punctuation<br>CO3: Develop Impressive Speaking Skills.<br>CO4:Recognise stress patterns in pronunciation of the English sentences<br>CO5: To be able to speak confidently in the English language<br>CO6: Listen and interpret main ideas to differentiate between opinions and facts<br>CO7: Cultivate and develop reading habits | |
| 7 | Course Description | | |
| 8 | Outline syllabus | | CO Mapping |
| | **Unit 1** | **Basic elements of grammar** | **CO1, CO2** |
| | A | Parts of speech | CO1, CO2 |
| | B | Articles: A, An , The | CO1, CO2 |
| | C | Tenses | CO1, CO2 |
| | | | |
| | **Unit 2** | **Vocabulary enhancement** | |
| | A | Antonyms & Synonyms | CO1, CO2, CO3 |
| | B | Homophones | CO1, CO2, CO3 |
| | C | Homonyms | CO1, CO2, CO3 |
| | **Unit 3** | **Reading comprehension** | |

| | | | | | |
|---|---|---|---|---|---|
| | A | Reading comprehension passage 1 | | | CO7 |
| | B | The Thief by Ruskin Bond | | | CO7 |
| | C | Discussions Based on the text | | | CO7 |
| | Mode of examination | | | | |
| | Weightage Distribution | CA | MTE | ETE | |
| | | 30% | 20% | 50% | |
| | Text book/s* | Workbook for Beginners | | | |
| | Other References | • Kumar, Sanjay and PushpLata. *Communication Skills*, Oxford University Press: New Delhi.<br>• Comfort, Jeremy(et.al). *Speaking Effectively*. Cambridge University Press | | | |

## Syllabus: B.Sc. Forensic Science - Forensic Science, Semester II

### Theory:

**UNIT: I – CRIMINOLOGY & POLICE ORGANIZATION**

Definition of Law, Court, Judge, Introduction to Criminal Procedure Code, FIR, Object of Punishment, Kinds of Punishment, Primary and Sanctioning Rights.

Classification – civil, criminal cases. Essential elements of criminal law. Constitution and hierarchy of criminal courts . Cognizable and non-cognizable offences. Bailable and non-bailable offences. Sentences which the court of Chief Judicial Magistrate may pass.

Definition and scope ----Police organization under central government: general information about their structure and function BPR&D, CBI, IB, RAW, NCRB, NICFS, NPA, UT Police Force, International Police Organization: INTERPOLE- history, structure general and special notices State Police organization: general organization of police at state and range level. Police organization at district level

**UNIT: II – LAWS AND ACTS**

Laws specific to Forensic Science: Indian Penal Code pertaining to offences against persons – Sections 121A, 299, 300, 302, 304A, 304B, 307, 309, 319, 320, 324, 326, 351, 354, 359, 362.Sections 375 & 377 and their amendments. Indian Evidence Act – Evidence and rules of relevancy in brief. Expert witness. Cross examination and re-examination of witnesses, Sections 32, 45, 46, 47, 57, 58, 60, 73, 135, 136, 137, 138, 141. CrPC – Sections 291,291A, 292 & 293 in the code of criminal procedure.

Acts Pertaining to Socio-economic and Environmental Crimes- Dowry Prohibition Act, Immoral Traffic Prevention Act, Wildlife Protection Act, Environment Protection Act, Untouchability Offences Act.

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**UNIT: III – QUALITY MANAGEMENT**

Quality Management (ISO/IEC 17025) General requirements for the competence of testing and calibration laboratories, Introduction, Scope, Management requirements: organization, Quality System, Document Control, Test and calibration methods and methods validation, Equipment, measurement traceability, Sampling, Handling of test and calibration items, Assuring the quality of test calibration results and reporting the results.

Accreditation and certification bodies- NABL, ISO, IEC, BIS, ASCLD/LAB, ABC, IAI.

## Practical:

1. To review past criminal cases and illucidate which theory best explain the criminal behavior of the accused.
2. To review crime cases where criminal profiling assisted the police to apprehend the accused.

3. To prepare a schedule of five cognizable and five non cognizable offences.
4. To study the power and limitation of the court of judicial magistrate of the first class.
5. To study a crime case in which an accused was punished on charge of murder under section 302.
6. To site example of a case in which the opinion of an expert was called for under section 45 of I.E.A

## Syllabus: B.Sc. Forensic Science - Physics, Semester II

## Theory:

**UNIT: I – ROTATIONAL MOTION, RIGID BODY DYNAMICS**

- Rotational kinematics: angular displacement, angular velocity, angular acceleration, rotation with constant angular acceleration
- Rotational motion of a particle: torque on a particle, angular momentum of a particle
- Rigid bodies: angular momentum of a rigid body, moment of inertia, parallel axis theorem, perpendicular axis theorem, center of mass
- Rigid body dynamics: Equations of motion of a rigid body, combined translation and rotation of a rigid body, rolling
- Rotational work and rotational kinetic energy, conservation of energy and angular momentum

**UNIT: II –WAVE MOTION, SOUND, ULTRASOUND**

- Transverse and longitudinal waves, superposition of waves, beats, standing waves, normal modes in organ pipes and strings
- Sound waves: speed of sound in solids, liquids and gases, sound intensity and decibel scale, resonance and natural frequency, sound spectrum, pitch and timbre of musical sound
- Doppler effect, shock waves, echo, reverberation, acoustics of buildings

**UNIT: III – THERMODYNAMICS**

- Temperature, zeroth law of thermodynamics, heat capacity, specific heat, molar heat capacity, heats of fusion and evaporation
- Mechanisms of heat transfer: conduction, convection, and radiation, Stefan's law of radiation
- First law of thermodynamics, internal energy, work and heat, equilibrium, state variables, isothermal, isobaric and adiabatic processes.
- Second law of thermodynamics, entropy, carnot cycle, heat engines, refrigerators
- Kinetic theory of gases, Maxwell distribution

## Practical:

1. To measure the acceleration due to gravity using a simple pendulum.
2. (i) To determine the acceleration due to gravity (g) by means of a compound pendulum.
   (ii) To determine radius of gyration about an axis through the center of gravity for the compound pendulum.
3. To determine the moment of inertia of Flywheel about its axis of rotation.
4. To determine the coefficient of viscosity of water by Poiseuille's method.
5. To determine the height of a building by the help of a Sextant.
6. To determine Young's modulus of a material by the bending of abeam clamped at one end and loaded at one of its end by cantilever method.

7. To determine the modulus of rigidity of a material of a given wire with an inertia table (torsion pendulum) by dynamical method.
8. To calculate Moment of inertia of different irregular shapes.

## Syllabus: B.Sc. Forensic Science - Chemistry, Semester II

## Theory:

| **UNIT: I – Chemical Thermodynamics** |
|---|
| What is thermodynamics? State of a system, state variables, intensive and extensive variables, concept of heat and work, thermodynamic equilibrium, thermodynamic properties, various types of systems and processes. First Law of thermodynamics. Calculation of work (*w*), heat (*q*), changes in internal energy (QU) and enthalpy (Q*H*) for expansion or compression of ideal gases under isothermal and adiabatic conditions for both reversible and<br>irreversible processes. Calculation of *w*, *q*, QU and Q*H* for processes involving changes in physical states. Various statements of Second Law of thermodynamics, concept of entropy, Gibbs free energy and Helmholtz energy, Calculations of entropy change and free energy change for reversible and irreversible processes under isothermal and adiabatic conditions. Criteria of spontaneity. Gibbs – Helmholtz equation. Maxwell's relations. Statement of Third Law of thermodynamics and calculation of absolute entropies of substances. |
| |
| **UNIT: II – Compounds of *s*- and *p*- Block Elements** |
| Hydrides and their classification (ionic, covalent and interstitial), structure and properties with respect to stability of hydrides of p- block elements. Concept of multicentre bonding (diborane). Structure, bonding and their important properties like oxidation/reduction, acidic/basic nature of the following compounds and their applications in industrial, organic and environmental chemistry. Hydrides of nitrogen (NH3, N2H4, N3H, NH2OH). Oxoacids of P, S and Cl Halides and oxohalides: PCl3, PCl5, SOCl2 and SO2Cl2 |
| |
| **UNIT: III – Aromatic hydrocarbons** |

*Preparation* (Case benzene): from phenol, by decarboxylation, from acetylene, from benzene
sulphonic acid. *Reactions* : (Case benzene) : Electrophilic substitution: nitration, halogenation and sulphonation. Friedel-Craft's reaction (alkylation and acylation). (Upto 4 carbons on benzene). Side chain oxidation of alkyl benzenes (Upto 4 carbons on benzene).

## Practical:

1. Purification of organic compounds by crystallization (from water and alcohol) and distillation.
2. Semi-micro qualitative analysis using H2S of mixtures not more than four ionic species (two anions and two cations and excluding insoluble salts) out of the following: Cations : Al3+, Ca2+, K+, Anions : Cl–, Br–, I–, F
3. Estimation of sodium carbonate using standardized HCl.
4. Estimation of carbonate and hydroxide present together in a mixture.
5. Estimation of carbonate and bicarbonate present together in a mixture.
6. Estimation of Fe (II) and oxalic acid using standardized $KMnO_4$ solution.

## Syllabus: B.Sc. Forensic Science - Zoology, Semester II

## Theory:

**UNIT: I – GENETICS**

- **MENDELIAN GENETICS, EXTENSION AND MODIFICATIONS**: Concept of Dominance (Complete, Incomplete, and Co-dominance); Laws of Heredity: Segregation, Independent Assortment, Molecular biology of wrinkled seed; Test Cross, Back Cross; Modifications in Mendelian Di-hybrid Ratio; Epistasis, Pleiotropy, Multiple Allelism in Human Blood System, Human Mendelian Traits.

- **SEX DETERMINATION AND EXTRANUCLEAR INHERITANCE**: Sex determination in *Drosophila*: Chromosomal theory, origin of Gynanders and Intersexes, Genetic balance. Sex chromosome system and sex determination: XX/XO, XX/XY, ZZ/ZW and haploidy/ dipolidy type. Sex determination in human: Gene Dosage Compensation and Molecular basis of X-chromosome inactivation. Cytoplasmic inheritance: Sigma factor in *Drosophila*, Kappa particle inheritance. Chromosomal aneuploidy in human beings.

**UNIT: II – GENETICS**

- **CHROMOSOME, DNA AND REPLICATION**: Composition of chromatin and structural organization, Nucleosome model. Giant chromosomes: Lampbrush chromosomes and Polytene chromosomes. Chemistry of nucleic acids, DNA as genetic materials and Structural variants of DNA, DNA replication: Process, origin of replication, unwinding of DNA helix, role of primers, elongation, DNA repair mechanisms.

- **GENE EXPRESSION AND rDNA TECHNOLOGY**: Transcription and Translation in Prokaryotes. Post transcriptional modifications. Regulation of gene expression, Lac Operon and Tryp Operon. rDNA Technology: Introduction, Cloning Vectors, Restriction Enzymes and Cloning Methods, PCR, Gene Transfer Methods, Microarray. Ethical Issues in Genetics and Molecular Biology.

- **Mutation:** Point Mutation, Single gene disorder, Genetic Anomaly /Disorders/syndrome:- Down Syndrome, Turner's syndrome, Klinefelter syndromes chronic myeloid leukemia and "cri -du -chat" syndrome.

**UNIT: III – BIOCHEMISTRY**

- Elementary knowledge of functional groups (alcohols, thioalcohols acids, aldehydes, ketones, and amines) and their reaction; Hydrogen ion concentration and buffering mechanism
- Classification of carbohydrates; Characteristics of monosaccharides; Chemical classification of amino acids; Peptide Linkage; Types of Lipids; Hydrolysis of fats
- Enzymes: Types of enzymes; Conditions for enzymatic activity
- Vitamins: Types of vitamins and micronutrients.

## Practical:

1. Simulation of principles of segregation and independent assortment using coloured beads. Application of law of probability and chi-square test.
2. Study of pattern of inheritance in human population of the traits Rolling of tongue and interlocking.
3. Study of the sex-influenced trait long vs. short second finger in relation to the Fourth finger (apply Hardy-Weinberg law).
4. Study of mutants in Drosophila (Bar eye, white eye, yellow body, sepia eye, curled wing, Dumpy wing, vestigial wing and sepia eye-curled wing and curled wing-ebony body-sepia Eye.
5. Genotype analysis in the pedigree chart of the Victorian family affected with haemophilia.
6. Identify the presence of Barr body in the female buccal cavity.

## Syllabus: B.Sc. Forensic Science - Botany, Semester II

## Theory:

| **UNIT: I - Phytopathology** |
|---|
| **Phytopathology:** 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,<br>**Bacterial diseases:** Citrus canker and angular leaf spot of cotton.<br>**Viral diseases:** Tobacco Mosaic viruses, vein clearing.<br>**Fungal diseases:** Early blight of potato, Black stem rust of wheat, White rust of crucifers.<br>**Mycology:** Role of fungi in biotechnology; Application of fungi in food industry (Flavour & texture, Fermentation, Baking, Organic acids, Enzymes, Mycoproteins); Secondary metabolites (Pharmaceutical preparations); Agriculture (Biofertilizers); Mycotoxins; Biological control (Mycofungicides, Mycoherbicides, Mycoinsecticides, Myconematicides); Medical mycology. |
| |
| **UNIT: II – Bioenergenetics and Enzymes** |
| **Bioenergenetics:** Laws of thermodynamics, concept of free energy, endergonic and exergonic reactions, coupled reactions, redox reactions. ATP: structure, its role as an energy currency molecule.<br>**Enzymes:** Structure of enzyme: holoenzyme, apoenzyme, cofactors, coenzymes and prosthetic group; Classification of enzymes; Features of active site, substrate specificity, mechanism of action (activation energy, lock and key hypothesis, induced - fit theroy), Michaelis – Menten equation, enzyme inhibition and factors affecting enzyme activity. |
| |

**UNIT: III - Bryophytes and Pteridophytes**

**Bryophytes:** General characteristics, adaptations to land habit, Classification, Range of thallus organization. Classification (up to family), morphology, anatomy and reproduction of *Marchantia* and *Funaria*. (Developmental details not to be included). Ecology and economic importance of bryophytes with special mention of *Sphagnum*.

**Pteridophytes:** General characteristics, classification, Early land plants (*Cooksonia* and *Rhynia*). Classification (up to family), morphology, anatomy and reproduction of *Selaginella*, *Equisetum* and *Pteris*. (Developmental details not to be included). Heterospory and seed habit, stelar evolution. Ecological and economical importance of Pteridophytes.

## Practical:

1. **Riccia** – Morphology of thallus.
2. **Equisetum-** Morphology, transverse section of internode, longitudinal section of strobilus.
3. **Gnetum-** Morphology (stem, male & female cones), transverse section of stem
4. Introduction to the world of fungi (Unicellular, coenocytic/septate mycelium, ascocarps &basidiocarps).
5. Temporary slide preparation and identification of pteridophytes.
6. Temporary mount and identification of Bryophytes.

| School: SBSR | | Batch : | |
|---|---|---|---|
| Program: B.Sc | | Current Academic Year: | |
| Branch: All | | Semester: | |
| 1 | Course Code | ENG102 | |
| 2 | Course Title | English 2 | |
| 3 | Credits | | |
| 4 | Contact Hours (L-T-P) | 2-0-0 | |
| | Course Status | **Compulsory** | |
| 5 | Course Objective | 1. To equip students to minimize the linguistic barriers emerging in a different environment.<br>2. Help students to understand different accents and standardise their existing English<br>3. Guide the students to hone the basic communication skills, listening, speaking and reading. | |
| 6 | Course Outcomes | CO1: Develop writing skills<br>CO2: Learn to use correct sentence structure and punctuation<br>CO3: Develop Impressive Speaking Skills.<br>CO4:Recognise stress patterns in pronunciation of the English sentences<br>CO5: To be able to speak confidently in the English language<br>CO6: Listen and interpret main ideas to differentiate between opinions and facts<br>CO7: Cultivate and develop reading habits | |
| 7 | Course Description | | |
| 8 | Outline syllabus | | CO Mapping |
| | **Unit 1** | **Basic elements of grammar** | **CO1, CO2** |
| | A | Subject verb agreement | CO1, CO2 |
| | B | Active and passive voice | CO1, CO2 |
| | C | Question Tags | CO1, CO2 |
| | | | |
| | **Unit 2** | **Vocabulary enhancement** | |
| | A | One word substitutes | CO1, CO2, CO3 |
| | B | Phrasal verbs | CO1, CO2, CO3 |
| | C | Formation of words: suffixes and prefixes | CO1, CO2, CO3 |
| | **Unit 3** | **Reading comprehension** | |

| | | | | | |
|---|---|---|---|---|---|
| | A | The Last Leaf by O Henry : Reading text and discussions | | | CO7 |
| | B | Where the mind is without fear by Rabindranath Tagore : Critical appreciation and discussions | | | CO7 |
| | C | Comprehension and vocabulary based exercise | | | CO7 |
| | Mode of examination | | | | |
| | Weightage Distribution | CA | MTE | ETE | |
| | | 30% | 20% | 50% | |
| | Text book/s* | Workbook for Beginners | | | |
| | Other References | • Kumar, Sanjay and PushpLata. *Communication Skills*, Oxford University Press: New Delhi.<br>• Comfort, Jeremy(et.al). *Speaking Effectively*. Cambridge University Press | | | |

## Syllabus: B.Sc. Forensic Science - Forensic Science, Semester III

## Theory:

| UNIT: I – FORENSIC BIOLOGY & SEROLOGY |
| --- |
| Analysis of Biological Fluid, Saliva, Semen, Vaginal Fluid, Urine, Sweat, Serological Concepts, Antigen / Antibodies, Polyclonal antibodies, Monoclonal antibodies, Antiglobulins, Serological Techniques, Electrophoretic Methods – Agarose gel, SDS, Natured/Denatured, Identification of Blood, Properties, Blood Grouping – Human & Non-human, Presumptive & Confirmatory Tests, Human & Animal Hair morphology.Determination of human and animal origin from bones, hairs, nails, skin,body tissue, fluids / strains viz. blood, menstrual blood, semen, saliva, sweat, pus, vomit, etc., through immunediffusion and immune – electrophoresis. Serogenetic markers:- Blood groups – biochemistry and genetics of ABO, Rh, Mn systems, stains and other fluids / stains viz. menstrual blood, semen, saliva, sweat, tear, pus, vomit, hair, bone, nail blood specific ABH substances, determination of secretor / non secretor Lewis antigen, Bombay Blood group, Polymorphic enzymes typing – PGM,GLO, ESD, EAP, AK, ADA, etc., and their forensic significance, HLAtyping, role serogenetic markers in individualization, paternity disputes etc. |
| |
| **UNIT: II – GENETICS & DNA** |

Structural & definitive properties of Chromosomes

Human Genome

Deoxyribose Nucleic Acid – Structural properties

Sources of DNA evidence

- DNA Extraction

  Basic Principles

  Method of DNA extraction

- DNA Quantification

  Slot Blot Assay

  Southern /Northern Blotting

- DNA Amplification by Polymerase Chain Reaction
- DNA Electrophoresis

- DNA databasing

History of DNA fingerprinting, Human genetics – Heredity, Alleles, Mutations & Population Genetic, Molecular Biology of DNA. Forensic Application of recombinant DNAtechnology/ Forensic Biotechnology, Human Genome Project, Variations, Polymorphism in DNA system – DNA markers RELP, RAPD, VNTRs, SNP, Autosomal – STR, Y-STR, Mitochondrial DNA. Forensic Significance of DNA Profiling: - Application in disputed paternity cases, child swapping, Missing person's identity – immigration, veterinary & wild life and Agriculture cases, legal perspectives – legal standards for admissibility of DNA profiling, procedural and ethical concerns, status of development of DNA profiling in India and abroad. New and future technologies: DNA chips, SNPs and limitations of DNA Profiling..

**UNIT: III – ANTHROPOLOGY**

Introduction & History of Anthropology, Physical Anthropology & Human Variability, Understanding Archeology & Osteology, Scene Processing, Examining remains – Human or Animal / Old or New, Issues involved in development of biological profile, Issues in Identification, Age estimation in childhood and adulthood, Sexual Dimorphism, Population Ancestry, Stature estimation, Individualization & Identification, Evidence for cause and manner of death from bones, Documentation & Expert Witness Testimony. Portrait Parle, Bertillon system, Facial reconstruction, Super- imposition techniques, Reconstruction based on craniometric and somatoscopic methods. Importance of tissue depth to reconstruct various facial features.
Introduction & History of Odontology, Dental Training required, Expert Witness Testimony, Body Identification by Dental Records, Post Mortem Examination & Records, Antemortem examination & records, Record Analysis & Processing, Forensic Dentistry in Mass Disasters, Bite Mark, Collection of Bite mark evidence & comparison. Analysis – Time of Death, Response of Assailant or Victim.

## Practical:

1. To determine the age from skull and teeth.
2. To determine of sex from skull.
3. To determine sex from pelvis bone.
4. To study identification and description of bones and their measurements.
5. To estimate stature from long bones.
6. To conduct portrait parley using photo fit identification kit.

## Forensic Science –Physics, Year 2 Semester 1, Basics of Physics III

## Theory:

| **UNIT: I – ELECTRICITY & MAGNETISM I** |
|---|
| • Electric charge, Coulomb's law, electric field, Gauss law<br>• Electric potential, capacitance and dielectrics<br>• Electric current, resistance, electromotive force, Ohm's law<br>• DC circuits, Kirchhoff's rules<br>• Magnetic field due to a magnet, terrestrial magnetism<br>• Force on a charge in electric and magnetic fields |
| |
| **UNIT: II – ELECTRICITY & MAGNETISM II** |

- Biot-Savart law, Ampere's law,
- Faraday's law, Lenz's Law, Electromagnetic induction, Inductors, Self and mutual inductance
- AC circuits, phasor diagrams
- Electric machines: Transformers, electric motors and generators
- Maxwell's equations, displacement current
- Electromagnetic waves

**UNIT: III – OPTICS**

- Reflection, refraction, total internal reflection, polarization
- Thin lens, thick lens and lens combinations, aberrations
- Interference and diffraction, interference in thin films, Young's double slit experiment, single slit diffraction
- Diffraction gratings, spectra, simple spectrophotometer
- Laser physics: types, properties, production and applications of Lasers
- Optical fibers, angle of acceptance and numerical aperture, losses, applications of optical fibers

## Practical:

1. To determine the variation of magnetic field along the axis of a current carrying coil and estimate the radius of the coil.
2. To draw hysteresis curve (B-H curve) of a specimen in the form of a transformer on a C.R.O. And to determine its hysteresis loss.
3. To determine the specific resistance of the material of a given wire using Carey Foster's bridge.
4. To determine wavelength of monochromatic light source ($\lambda$) by Fresnel's biprism.
5. To determine the dispersive power of a material of the prism and its angle using spectrometer. Also calculate speed of light in the given prism.
6. Find the speed of light using Michelson-Morley experiment.

## Syllabus: B.Sc. Forensic Science - Chemistry, Semester III

## Theory:

| UNIT: I – Thermochemistry and Chemical Equilibrium |
|---|
| • Important principles and definitions of thermochemistry. Concept of standard state and standard enthalpies of formations, integral and differential enthalpies of solution and dilution. Calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data. Variation of enthalpy of a reaction with temperature – Kirchhoff's equation.<br>• Free energy change in a chemical reaction. Thermodynamic derivation of the law of chemical<br>• equilibrium. Distinction between Q*G* and Q*G*ɵ, Le Chatelier's principle. Relationships between *Kp, Kc* and *Kx* for reactions involving ideal gases. |
| |
| **UNIT: II – Transition Elements (3d series)** |
| General group trends with special reference to electronic configuration, variable valency, colour, magnetic and catalytic properties, ability to form complexes and stability of various oxidation states (Latimer diagrams) for Mn, Fe and Cu.<br>**Lanthanides and actinides:** Electronic configurations, Oxidation states, colour, magnetic properties, lanthanide contraction, separation of lanthanides (ion-exchange method only). |
| |
| **UNIT: III – Alkyl and Aryl Halides** |
| • **Alkyl Halides** (Upto 5 Carbons) Types of Nucleophilic Substitution (SN2, SN1 and SNi) reactions. *Preparation:* from alkenes *and* alcohols. *Reactions:* hydrolysis, nitrite & nitro formation, nitrile & iso-nitrile formation. Williamson's ether synthesis: Elimination vs substitution.<br>• **Aryl Halides** *Preparation:* (Chloro, bromo and iodo-benzene case): from phenol, Sandmeyer & Gattermann reactions. *Reactions (Chlorobenzene):* Aromatic nucleophilic substitution (replacement by –OH group) and effect of nitro substituent. Benzyne Mechanism: KNH2/NH3 (or NaNH2/NH3). Reactivity and Relative strength of C-Halogen bond in alkyl, allyl, benzyl, vinyl and aryl halides. |

## Practical:

(1) Determination of heat capacity of calorimeter for different volumes.
(2) Determination of enthalpy of neutralization of hydrochloric acid with sodium hydroxide.

(3) Preparations: Mechanism of various reactions involved to be discussed. Recrystallisation, determination of melting point and calculation of quantitative yields to be done.
(a) Bromination of Phenol/Aniline
(b) Benzoylation of amines/phenols
(c) Oxime and 2,4 dinitrophenylhydrazone of aldehyde/ketone

(4) Estimation of the amount of nickel present in a given solution as

Bis(dimethylglyoximato) nickel(II) or aluminium as oxinate in a given solution gravimetrically.
(5) Estimation of (i) Mg2+ or (ii) Zn2+ by complexometric titrations using EDTA.
(6) Estimation of total hardness of a given sample of water by complexometric titration.

## Syllabus: B.Sc. Forensic Science - Zoology, Semester III

## Theory:

**UNIT: I – Anatomy of Vertebrates**

- Integumentary System; Derivatives of integument w.r.t. glands and digital tips; Skeletal System; Evolution of visceral arches, Digestive System, Brief account of alimentary canal and digestive glands, Respiratory System
- Brief account of Gills, lungs, air sacs and swim bladder, Circulatory System; Evolution of heart and aortic arches, Urinogenital System; Succession of kidney, Evolution of urinogenital ducts, Nervous System
- Comparative account of brain, Sense Organs; Types of receptors, Control of Development– Gene activation, determination, induction, Differentiation, morphogenesis, intercellular communication, cell movements and cell death.

**UNIT: II – Environmental Toxicology**

- Introduction and scope of toxicology. Survey of environmental toxicants and their biological and ecological ill-effects. Dose-response relationship: Graded, quantal and cumulative responses.
- Outline of toxicological testing methods: Mortality tests (LC50/LD50 and safety margins/ Limits); Acute, subacute and chronic testing of local and systemic effects ( Skin; Eye; Behavioural; Biochemical; Physiological; Histopathological; Haematological; Reproductive; Teratogenic; Carcinogenic).
- Translocation of chemicals: Membrane barriers; Storage depots; Biotransformation sites; mixed multifunction oxidases. Selective toxicity in relation to translocation and biotransformation factors. Outline of antidotal procedures.

**UNIT: III – ENVIRONMENTAL BIOLOGY**

- Ecosystem: General organization; Trophic structure; Energy flow; Ecological Pyramids; Basic types of biogeochemical cycles (chiefly nitrogen, phosphorus and sulphur). Community: Basic structure; Species diversity, dominance, distribution and succession. Population: Interspecific and intraspecific relations.
- Population in relation to public health. Conservation of natural resources with particular reference to wild Life conservation in India (chief endangered species and concept of wild Life reserves).

## Practical:

1. Study of placoid, cyclooid and ctenoid scales through permanent slides.
2. Disarticulated skeleton of frog.
3. Investigation used in diagnosis and management of toxicity.
4. Drug abuse schedules and control prescription.
5. Induction of organophosphorus poisoning.

## Syllabus: B.Sc. Forensic Science - Botany, Semester III

## Theory:

| **UNIT: I - Plant Ecology** |
|---|
| Introduction, Ecological factors; Soil: Origin, formation, composition, soil profile. Water: States of water in the environment, precipitation types. Light and temperature: Variation Optimal and limiting factors. Adaptation of hydrophytes and xerophytes. Plant communities; Characters; Ecotone and edge effect; Succession; Processes and types, Ecosystem; Structure; energy flow trophic organisation; Food chains and food webs, Ecological pyramids production and productivity; Biogeochemical cycling; Cycling of carbon, nitrogen and Phosphorous, Phytogeography; Principle biogeographical zones; Endemism. |
| |
| **UNIT: II - Plant Taxonomy** |
| Introduction to plant taxonomy; Identification, Classification, Nomenclature. Identification; Functions of Herbarium, important herbaria and botanical gardens of the world and India; Documentation: Flora, Keys: single access and multi-access, Taxonomic evidences from palynology, cytology, phytochemistry and molecular data. Taxonomic hierarchy; Ranks, categories and taxonomic groups Botanical nomenclature; Principles and rules (ICN); ranks and names; binominal system, typification, author citation, valid publication, rejection of names, principle of priority and its limitations. Classification; Types of classification-artificial, natural and phylogenetic. Bentham and Hooker (upto series), Engler and Prantl (upto series). Biometrics, numerical taxonomy and cladistics; Characters; variations; character weighting and coding; cluster analysis; phenograms, cladograms (definitions and differences). |
| |
| **UNIT: III – Gymnosperms and Angiosperms** |

- **Gymnosperms:** General characteristics, classification. Classification (up to family), morphology, anatomy and reproduction of *Cycas* and *Pinus*. (Developmental details not to be included). Ecological and economical importance.
- **Angiosperms:** Vegetative, Floral and Fruit morphology; Root: Different regions and general functions, types of root systems, Stem: Various parts, normal functions (Different types of buds, vegetative and reproductive), forms of stem. Leaf: Structure and normal functions. Simple and compound leaves, Seed: Definition, structure and types, Bracts, peduncle and inflorescence: Basic types and functions, Flower: Structure of a typical flower, definition and examples of different types of flowers. Introduction to the floral whorls, Fruits: Definitions of true, false and parthenocarpic fruits. Major types of fruits. Angiosperms: Unique features of angiosperms and diversity; identification, nomenclature and classification (Bentham & Hooker's system); primitive and advanced features; the international code of botanical nomenclature. Families: Major angiosperm families.

## Practical:

1. Study of instruments used to measure microclimatic variables: Soil Thermometer, anemometer, psychomotor/hygrometer, rain gauge and lux meter.
2. Determination of pH of various soil and water sample.
3. Temporary slide preparation and identification of gymnosperms.
4. Description, identification and classification of several angiosperms.
5. Pinus- Morphology (long and dwarf shoots, whole mount of dwarf shoot, male and female cones), transverse section of Needle, transverse section of stem, longitudinal section of / transverse section of male cone, whole mount of microsporophyll, whole mount of Microspores (temporary slides), longitudinal section of female cone, tangential longitudinal section &radial longitudinal sections stem (permanent slide).
6. Cycas- Morphology (coralloid roots, bulbil, leaf), whole mount of microsporophyll, transverse section of coralloid root, transverse section of rachis, vertical section of leaflet, vertical section of microsporophyll, whole mount of spores (temporary slides), longitudinal section of ovule, transverse section of root (permanent slide).

# Psychology
## Semester - III

**UNIT- I Basics of Psychology**

- History of psychology- Development of psychology, role of psychologist,
- Concept of psychology- Definition of psychology, goals of psychology, Different perspectives of psychology- Modern perspectives, Humanistic, cognitive, psychodynamic. The science and research method - Interview, observation, case study method. Professional and Ethical issues in psychology - APA code of conduct for psychologist.

**UNIT - II Consciousness & Perception**

- Consciousness- Definition of consciousness, state of consciouness, Altered state of consciousness - Dreams, awake states including day dreaming.
- Sleep - Stages of sleep, Dreams - content, REM sleep and non - REM sleep. Altered state - Hypnosis, Meaning, Hypnotic Phenomena, Hypnotic stages. Attention and Awareness - Attention: Definition, characterstics. Sensation and perception - Basic concept in perception, problems in attention and perception, assesstment attention and perception.

**UNIT - III Psychology and Law**

- Application of psychology in civil and legal proceedings - civil proceedings - assesstment of civil competency, criminal proceedings, Mc Naughten rule insanity - nature of insanity, competency to stand trial.
- Investigative Psychology - Criminal profiling, Polygraph test, Narco analysis, BEOS
- Assesstment of personality - Questionnaires, Rating scales and Projectives tests, Biological model assesstment of Personality.

## Practicals
## Semester III

1.To review a crime case involving serial murders. Comment on the psychological trail of the accused.

2. To study a criminal case in which hypnosis was used as a means to detect deception.

3. To prepare a case report on thematic appreciation test.

4. To prepare a case report on Minnesota multiphase personality inventory test.

5. To prepare a case report on thematic appreciation test.

6. To prepare a case report on word association 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.

| School: SBSR | | Batch : | |
|---|---|---|---|
| Program: B.Sc | | Current Academic Year: | |
| Branch: All | | Semester: | |
| 1 | Course Code | ENG103 | |
| 2 | Course Title | English 3 | |
| 3 | Credits | | |
| 4 | Contact Hours (L-T-P) | 2-0-0 | |
| | Course Status | **Compulsory** | |
| 5 | Course Objective | 1. To equip students to minimize the linguistic barriers emerging in a different environment.<br>2. Help students to understand different accents and standardise their existing English<br>3. Guide the students to hone the basic communication skills, listening, speaking and reading. | |
| 6 | Course Outcomes | CO1: Develop writing skills<br>CO2: Learn to use correct sentence structure and punctuation<br>CO3: Develop Impressive Speaking Skills.<br>CO4:Recognise stress patterns in pronunciation of the English sentences<br>CO5: To be able to speak confidently in the English language<br>CO6: Listen and interpret main ideas to differentiate between opinions and facts<br>CO7: Cultivate and develop reading habits | |
| 7 | Course Description | | |
| 8 | Outline syllabus | | CO Mapping |
| | **Unit 1** | **Basic elements of grammar** | **CO1, CO2** |
| | A | Reported speech | CO1, CO2 |
| | B | Conditional sentences: Type 1,2 &3 | CO1, CO2 |
| | C | Spotting the errors | CO1, CO2 |
| | | | |
| | **Unit 2** | **Writing Skills** | |
| | A | Paragraph writing | CO1, CO2, CO3 |
| | B | Summary writing | CO1, CO2, CO3 |
| | C | Note making | CO1, CO2, CO3 |
| | **Unit 3** | **Reading comprehension** | |

| | | | | | |
|---|---|---|---|---|---|
| | A | Short story : The Tiger in the Tunnel by Ruskin Bond | | | CO7 |
| | B | An Astrologer's Day by R.K. Narayan from Malgudi Days | | | CO7 |
| | C | Discussions and Text based activities on gerund, participle and infinitives | | | CO7 |
| | Mode of examination | | | | |
| | Weightage Distribution | CA | MTE | ETE | |
| | | 30% | 20% | 50% | |
| | Text book/s* | Workbook for Beginners | | | |
| | Other References | • Kumar, Sanjay and PushpLata. *Communication Skills*, Oxford University Press: New Delhi.<br>• Comfort, Jeremy(et.al). *Speaking Effectively*. Cambridge University Press | | | |

## Syllabus: B.Sc. Forensic Science - Forensic Science, Semester IV

## Theory:

**UNIT: I – TOXICOLOGY**

Basics of Toxicology—Toxicology Introduction, Classification of Toxicology, Forensic toxicology. significance of toxicological findings. Techniques used in toxicology. Toxicological analysis and chemical intoxication tests. Postmortem Toxicology.
Poisons-- Classification of poisons. Plant poisons, Animal poisons, Metallic Poisons. Physico-chemical Characteristics and mode of action of poisons. Accidental, suicidal and homicidal poisonings Signs and Symptoms of common poisoning and their antidotes. Metabolism and excretion of poisons.
Narcotics, Drugs and Psychotropic Substances-Definition of narcotics, drugs and psychotropic substances. Broad classification – Narcotics, stimulants, depressants and hallucinogens. General characteristics and common example of each classification. Drugs and psychotropic substances. Designer drugs. Tolerance, addiction and withdrawal symptoms of narcotics, drugs and psychotropic substance.
Collection Preservation and analysis , Collection and preservation of viscera, blood and urine for various poison and drug cases. Introduction of Screening and Presumptive , chemical and instrumental analysis of drugs and poisons.

**UNIT: II – CHEMISTRY & EXPLOSIVE**

Introduction to Forensic chemistry
Chemical analysis of evidences:
a) Screening, sampling-methods of collection, , different standard methods
b) Inorganic analysis
c) Micro-chemical method
Chromatography-
Basic principle and types
1. TLC- Principle, Theory, instrumentation and applications.
2. Ion exchange, Gel Permeation Chromatography, Adsorption chromatography
General idea and basic principle of distillation, various types of distillation techniques
Sample treatment techniques – Centrifuge, Filtration, Evaporation, Crystallization
Distribution Law ,Solvent extraction technique like LLE, SPE, SPME.
Petroleum and Petroleum Products- Commercial uses of different petroleum fractions. Analysis of traces of petroleum products in forensic exhibits. Adulteration of petroleum products .
Arson and Fire: Chemistry of fire, difference between Arson and Fire, cause of fire and origin of fire Material and Chemicals use in initiating fire and arson Examination of scene of fire/arson, recognition and collection of evidence, packing labelling and forwarding of exhibits, and forensic detection of arson cases.
Study of Analysis of Beverages
Introduction, Definition of alcohol and illicit liquor, Alcoholic and non-alcoholic beverages and their composition, Proof spirit, absorption, detoxication and excretion of alcohol, problems in alcohol cases and difficulties in diagnosis, Alcohol and prohibition, Consequences of drunken driving, Analytical techniques used for the analysis of alcohol.
Food adulteration : Introduction, Prevention of food adulteration, Analytical techniques for analysis of exhibits involved in food and other material.
Characteristics, examination and legal aspects of gold, silver, sugar, salts, fertilizers, Detective dyes- cases and importance in trap cases.

**UNIT: III – INSTRUMENTATION**

**GC:** Theoretical principles, instrumentations and technique, columns, stationary phases, detectors,
Forensic applications.
**HPLC :** theory, Instrumentation, Technique, column, detectors, LC-MS, Forensic applications.
**Microscopy-** Stereomicroscope, Comparison microscope, Electron Microscopy TEM, SEM and their
forensic Application.
**Electrophoresis Technique:** General principles, Factors affecting electrophoresis, Sodium dodecylsulphate (SDS) polyacrylamide gel electrophoresis, Agrose gel electrophoresis , Gel immune-
diffusion, Immuno- electrophoresis.
**Basic Spectroscopy**- Introduction, electromagnetic radiations, full range,
**UV-Visible –** principal absorbance, transmittance, Beer-Lambert's laws and its applications of
UV-Visible

## Practical:

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.
9. To identify drugs of abuse by spot tests.
10. To perform color tests for barbiturates.
11. To separate drugs of abuse by thin layer chromatography.

## Syllabus: B.Sc. Forensic Science - Physics, Semester IV

## Theory:

**UNIT: I – MODERN PHYSICS**

- Black body radiation and Plank's quantum hypothesis
- Einstein's photon hypothesis, photoelectric effect
- Bohr model of hydrogen atom, quantization of angular momentum, explanation of discrete spectrum
- De Broglie's hypothesis, dual nature of matter
- Qualitative outline of Einstein's special and general theories of relativity, time dilation, length contraction, relativity of simultaneity, curved space-time, expanding universe, cosmology

| UNIT: II – SOLID STATE PHYSICS |
|---|
| • Crystal structure<br>• Bragg diffraction, X-ray crystallography<br>• Semiconductor physics, band theory of solids, conduction and valence bands, p and n type semiconductors, diodes, photodiodes, light emitting diodes (LED), Zener diodes, NPN, PNP and FET transistors<br>• Magnetic materials: Paramagnetism, Diamagnetism, Ferromagnetism, Curie temperature, hysteresis<br>• Superconductivity, type 1 and type 2 superconductors, BCS theory and Cooper pairs<br>• Piezoelectricity |
| |
| **UNIT: III – MATHEMATICAL PHYSICS I** |
| • First order differential equations<br>• Series method of solving second order ordinary differential equations<br>• Legendre functions, Bessel functions<br>• Periodic functions and Fourier Series |

## Practical:

1. To determine the Planck's constant by measuring radiation in a fixed spectral range.
2. To measure the excitation potential of mercury using the Franck-Hertz method.
3. To determine the value of the ratio of charge to mass (e/m) of an electron by Thomson's method using a cathode-ray tube.
4. To study Solar cell characteristics.
5. Study of damping a bar pendulum and determination of coefficient of damping, relaxation time, and quality factor of a damped simple harmonic motion.
6. To determine the frequency of an electrically maintained tuning fork using Melde's Apparatus. (i). Transverse mode of vibration (ii). Longitudinal mode of vibration
7. Calculate the speed of ultrasonic waves in kerosene oil.
8. To determine unknown frequency or to compare the frequencies of two unknown signals with the method of Lissajous figures by using C.R.O.
9. To measure the phase difference between current and voltage in R-C and L-R circuits with the method of Lissajous figures by using a CRO
10. To determine the velocity of sound using resonance tube.

## Syllabus: B.Sc. Forensic Science - Chemistry, Semester IV

## Theory:

**UNIT: I – Solutions and Ionic Equilibria**

Thermodynamics of ideal solutions: Ideal solutions and Raoult's law, deviations from Raoult's law – non-ideal solutions. Vapor pressure-composition and temperature-composition curves of ideal and non-ideal solutions. Distillation of solutions. Lever rule. Azeotropes. Partial miscibility of liquids: Critical solution temperature; effect of impurity on partial miscibility of liquids. Immiscibility of liquids. Principle of steam distillation. Nernst distribution law and its applications, solvent extraction.

Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect, Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions. Solubility and solubility product of sparingly soluble salts – applications of solubility product principle.

**UNIT: II – Coordination Chemistry and Crystal Field Theory**

Valency Bond Theory (VBT): Inner and outer orbital complexes of Cr, Fe, Co, Ni and Cu (coordination numbers 4 and 6). Structural and stereoisomerism in complexes with coordination numbers 4 and 6.
Drawbacks of VBT. IUPAC system of Nomenclature.
**Crystal Field Theory**
Crystal field effect, Octahedra symmetry. Crystal field stabilization energy (CFSE), Crystal field effects for weak and strong fields. Tetrahedral symmetry. Factors affecting the magnitude of _. Spectrochemical series. Comparison of CFSE for Oh and Td complexes, Tetragonal distortion of octahedral geometry. Jahn-Teller distortion. Square planar coordination.

**UNIT: III – Alcohols, Phenols and Ethers**

**Alcohols:** *Preparation:* Preparation of 1 3 alcohols: using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters. *Reactions:* With sodium, HX (Lucas test), esterification, oxidation (with PCC, alk. KMnO4, acid. dichromate, con. HNO3). Oppeneauer oxidation *Diols:* (Upto 6 Carbons) oxidation of diols. Pinacol-Pinacolone rearrangement.
**Phenols:** (Phenol case) *Preparation:* Cumene hydroperoxide method, from diazonium salts.
*Reactions:* Electrophilic substitution: Nitration, halogenation and sulphonation. Reimer – Tiemann Reaction, Gattermann-Koch Reaction, Houben – Hoesch Condensation, Schotten – Baumann Reaction
**Ethers:** aliphatic and aromatic Ethers and Cleavage of ethers with HI.

## Practical:

(1) Measurement of pH of different solutions, like aerated drinks, fruit juices, shampoos and soaps (use dilute solutions of soaps and shampoos to prevent damage to the glass electrode) using pH-meter.

(2) Preparation of buffer solutions, and Measurement of the pH of buffer solutions and comparison of the values with theoretical values.

(i) Sodium acetate-acetic acid

(ii) Ammonium chloride-ammonium hydroxide

(3) Estimation of (i) Mg2+ or (ii) Zn2+ by complexometric titrations using EDTA.

(4) Estimation of total hardness of a given sample of water by complexometric titration.

(5) Functional group tests for alcohols, phenols.

(6) Acetylation of one of the following compounds: phenols (β -naphthol, vanillin, salicylic acid) by any one method:

a. Using conventional method.

b. Using green approach

## Syllabus: B.Sc. Forensic Science - Zoology, Semester IV

## Theory:

| **UNIT: I – Animal Physiology** |
|---|
| • Tissues Structure, location, classification and functions of epithelial tissue, connective tissue, muscular tissue and nervous tissue.<br>• Bone and Cartilage Structure and types of bones and cartilages, Ossification, bone growth and resorption.<br>• Nervous System Structure of neuron, resting membrane potential, Origin of action potential and its propagation across the myelinated and unmyelinated nerve fibers; Types of synapse, Synaptic transmission and, Neuromuscular junction; Reflex action and its types - reflex arc; Physiology of hearing and vision.<br>• Muscle: Histology of different types of muscle; Ultra structure of skeletal muscle; Molecular and chemical basis of muscle contraction; Characteristics of muscle twitch; Motor unit, summation and tetanus. |
| |
| **UNIT: II – Animal Physiology** |
| • Reproductive System: Histology of testis and ovary; Physiology of male and female reproduction; Puberty, Methods of contraception in male and female.<br>• Endocrine System: Histology of endocrine glands - pineal, pituitary, thyroid, parathyroid, pancreas, adrenal; hormones secreted by them and their mechanism of action.<br>• Classification of hormones; Regulation of their secretion; Mode of hormone action, Signal transduction pathways for steroidal and non-steroidal hormones; Hypothalamus (neuroendocrine gland) - principal nuclei involved in neuroendocrine control of anterior pituitary and endocrine system; Placental hormones |
| |
| **UNIT: III – Medical and applied Zoology** |

- **Life Cycle, Pathogenicity , clinical features, prophylaxis and control of pathogenic protozoan:** Plasmodium, Entamoeba histolytica, Leishmania donovani
- **Pathogenic Helminthes parasites, clinical Features, Control and prophylaxis:** Fasciola sp., Wuchereria, Ascaries
- **Vector Biology:** Mosquito (Anopheles Female), Yellow Fever, Dengue Fever,(Aedes)Filariasis (Culex Female), Japanese encephalitis, Plague
- **Non Vector Diseases:** Typhoid, Cholera, Small pox
- **General Account of Vaccine & Vaccination, Eradication Programme , drug Therapy**

## Practical:

**1.** Study of permanent slide of endocrine gland: Thyroid, Adrenal, Pitutiary, Testis, Ovary.

**2.** To understand the scientific method and its application to the gaining of knowledge in animal physiology.

**3.** RBCs in different vertebrates and in different physiological condition.

**4.** To determine bleeding time and clotting time of human blood.

**5.** Study of nitrogenous waste product of animal from different habitats.

**6.** Estimation of sugar in human blood.

## Syllabus: B.Sc. Forensic Science - Botany, Semester IV

## Theory:

**UNIT: I - Plant Anatomy and Embryology:**

- Meristematic and permanent tissues; Root and shoot apical meristems Organs; Structure of dicot and monocot root stem and leaf.
- Adaptive and protective systems; Epidermis, cuticle, stomata; General account of adaptations in xerophytes and hydrophytes.
- Structural organization of flower; Structure of anther and pollen; Structure and types of ovules; Types of embryo sacs
- Pollination and fertilization; Pollination mechanisms, Double fertilization.
- Embryo and endosperm; Endosperm types, structure and functions; Dicot and monocot embryo

**UNIT: II - Plant Physiology and Metabolism**

- Plant-water relations; Importance of water, water potential; Transpiration and its significance; Factors affecting transpiration; Root pressure and guttation.
- Mineral nutrition; Essential elements, macro and micronutrients; Transport of ions across cell membrane, active and passive transport.
- Photosynthesis; Photosynthetic Pigments (Chlorophyll a, b, xanthophylls, carotene); Photosystem I and II, Electron transport and mechanism of ATP synthesis; C3, C4; Photorespiration.
- Respiration; Glycolysis, anaerobic respiration
- Enzymes; Structure and properties; Mechanism of enzyme catalysis and enzyme inhibition.
- Nitrogen metabolism; Biological nitrogen fixation; Nitrate and ammonia assimilation.
- Plant growth regulators; Physiological roles of auxins, gibberellins, cytokinins

**UNIT: III – Biotechnology**

- Introduction to biotechnology, Plant tissue culture; Micropropagation ; haploid production through androgenesis and gynogenesis; brief account of embryo & endosperm culture with their applications, Recombinant DNA Techniques; Blotting techniques: Northern, Southern and Western Blotting, DNA Fingerprinting; Molecular DNA markers i.e. RAPD, RFLP, SNPs; DNA sequencing, PCR and Reverse Transcriptase-PCR. Hybridoma and monoclonal antibodies, ELISA and Immunodetection. Molecular diagnosis of human disease, Human gene Therapy.

## Practical:

1. Study of vegetative and floral characters of the following families.
2. Study of meristems through permanent slides and photographs.
3. Tissues (parenchyma, collenchyma and sclerenchyma); Macerated xylary elements, Phloem (Permanent slides, photographs).
4. Stem: Monocot: Zea mays; Dicot: Helianthus; Secondary: Helianthus (only Permanent slides).
5. Root: Monocot: Zea mays; Dicot: Helianthus; Secondary: Helianthus (only Permanent slides).
6. Pollination types and seed dispersal mechanisms (including appendages, aril, caruncle) (Photographs and specimens).
7. Dissection of embryo/endosperm from developing seeds.

| **School: SBSR** | | **Batch :** |
|---|---|---|
| **Program: B.Sc** | | **Current Academic Year:** |
| **Branch: All** | | **Semester:** |
| 1 | Course Code | ENG104 |
| 2 | Course Title | English IV |
| 3 | Credits | |
| 4 | Contact Hours (L-T-P) | 2-0-0 |
| | Course Status | **Compulsory** |
| 5 | Course Objective | 1. To equip students to minimize the linguistic barriers emerging in a different environment.<br>2. Help students to understand different accents and standardise their existing English<br>3. Guide the students to hone the basic communication skills, listening, speaking and reading. |
| 6 | Course Outcomes | CO1: Develop writing skills<br>CO2: Learn to use correct sentence structure and punctuation<br>CO3: Develop Impressive Speaking Skills.<br>CO4: Recognise stress patterns in pronunciation of the English sentences<br>CO5: To be able to speak confidently in the English language<br>CO6: Listen and interpret main ideas to differentiate between opinions and facts<br>CO7: Cultivate and develop reading habits |
| 7 | Course | |

| | | | | | |
|---|---|---|---|---|---|
| | Description | | | | |
| 8 | Outline syllabus | | | | CO Mapping |
| | **Unit 1** | Paragraph Writing | | | |
| | A | Structure of a Paragraph | | | CO1, CO2 |
| | B | Features of a Paragraph: Unity, Coherence and Expansion | | | CO1, CO2 |
| | C | Construction of a Paragraph | | | CO1, CO2 |
| | **Unit 2** | **Public Speaking** | | | |
| | A | Choosing an Appropriate Pattern: Chronological, cause and Effect, Problem and Solution, Spatial, Deductive and Inductive | | | CO3, CO4, CO5, CO6 |
| | B | Selecting an Appropriate Method: Memorization, Extemporaneous, Impromptu, Manuscript | | | CO3, CO4, CO5, CO6, CO3 |
| | C | Making Speeches Interesting:<br>• Making Beginnings Catchy: Using Wit and Humour, Questions, Quotations, Anecdotes<br>• Non-Verbal Communication: Body Language, Paralinguistic | | | CO3, CO4, CO5, CO6 |
| | D | Public Speaking Sessions | | | CO3, CO4, CO5, CO6 |
| | **Unit 3** | **Reading Skills** | | | |
| | A | Gift of the Magi (O.Henry) | | | CO7 |
| | B | Idgah (Munshi Premchand) | | | CO7 |
| | C | Discussions based on the tests | | | CO7 |
| | Mode of examination | Theory/Jury/Practical/Viva | | | |
| | Weightage Distribution | CA | MTE | ETE | |
| | | 30% | 20% | 50% | |
| | Text book/s* | Workbook for Beginners | | | |
| | Other References | • Kumar, Sanjay and Pushp Lata. *Communication Skills*, Oxford University Press: New Delhi.<br>• Comfort, Jeremy(et.al). *Speaking Effectively*. Cambridge University Press | | | |

## Syllabus: B.Sc. Forensic Science - Forensic Science, Semester V

## Theory:

| UNIT: I – FORENSIC PHYSICS |
|---|
| **Footprints**: Importance, Gait Pattern, Casting of footprints in Different medium, Taking Control samples.<br>**Tire Marks/**prints and Skid marks, taking control samples, Forensic Significance.<br>**Paint** - Types of paint and their composition, cases involve, collection and preservation of paint evidences .microscopic analysis of paint pigments, micro-chemical analysis-solubility test, chemical and instrumental analysis of paint evidences.<br>**Glass** -Types of glass and their composition. Matching and comparison. Forensic examinations of glass fractures- rib marks, hackle marks, cone fracture, wavy, backward fragmentation, concentric and radial fractures. Colour, fluorescence, physical measurements, refractive index, density gradient, becke-line, specific gravity examination and elemental analysis of glass evidence.<br>**Soil**- Types and composition of soil, sample preparation, removal of contaminants, colour, molecular particle size distribution, turbidity test, pH measurements, microscopic examination, density gradient analysis, ignition-loss test, elemental analysis, interpretation of soil evidence.<br>**Fibres-** Types of fibres, forensic aspects of fibre examination- fluorescence, optical properties, refractive index, birefringence, dye analysis. Physical fit and chemical testing. TLC, IR-micro spectroscopy, Py-MS. Difference between natural and man-made fibres. Fibre comparison of dye Component .<br>**TOOL MARKS**- Types of tool marks- compression marks, striated marks, combination of compression and striated marks, repeated marks, class characteristics and individual characteristics, tracing and lifting of marks, Photographic examination of tool marks and cut marks on clothes and walls etc.<br>**Restoration of erased / obliterated marks-** Method of making-cast, punch, engrave; methods of obliteration, method of restoration- etching (etchings for different metals), magnetic, electrolytic etc., recording of restored marks – restoration of marks on wood, leather, polymer etc. |
| |
| **UNIT: II – BALLISTICS** |

Firearms-History and development of firearms. Classification of firearms. Weapon types and their operation. Firing mechanisms of different firearms.
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 – Vacuum trajectory, effect of air resistance on trajectory, base drag, drop, drift, yaw, shape of projectile and stability, trajectory computation, ballistics coefficient and limiting velocity, 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, effect of instability of bullet, effect of intermediate targets, and influence of range. Ricochet and its effects, stopping power.
Ammunition - Types of ammunition characteristics of different types of cartridges and bullets. Primers and priming compounds. Projectiles. Headstamp markings on ammunitions. Different types of marks produced during firing process on cartridge – firing pin marks, breech face marks, chamber marks, extractor and ejector marks.
Firearm Evidence - Matching of bullets and cartridge cases in regular firearms. Identification of bullets, pellets and wads fired from improvised, country made firearms. Automated method of bullet and cartridge case comparison. Determination of range of fire and time of fire.Mechanisms of formation of gunshot residues. Methods of analysis of gunshot residues from shooting hands and targets, with special reference to clothings.Identification and nature of firearms injuries.

**UNIT: III – CRIME SCENE PHOTOGRAPHY**

Forensic Photography-Basic principles of Photography, Techniques of black & white and color photography, cameras, lenses, shutters, depth of field, film; exposing, development and printing techniques; Different kinds of developers and fixers; UV, IR, fluorescence illumination guided photography; Modern development in photography- digital photography,
working and basic principles of digital photography; Surveillance photography. Videography and Crime Scene &laboratory photography.

## Practical:

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.
10. To study the gait pattern.
11. To determine the footprint.

## Syllabus: B.Sc. Forensic Science - Physics, Semester V

## Theory:

| UNIT: I – MATHEMATICAL PHYSICS II |
|---|
| • Linear algebra: linear vector spaces, matrices, linear transformations, eigenvectors and eigenvalues<br>• Elementary review of multivariate calculus, partial derivatives<br>• Second order linear partial differential equations, separation of variables method |
| |
| **UNIT: II – QUANTUM PHYSICS** |
| • Quantum states and observables, Hilbert space<br>• Schrodinger equation, Heisenberg uncertainty principle<br>• Particle in a box, harmonic oscillator<br>• Discussion of solution of Schrodinger equation for Hydrogen atom |
| |
| **UNIT: III – NUCLEAR & PARTICLE PHYSICS** |
| • Nuclear composition, nuclear binding energy, fission and fusion<br>• Radioactive decay, half-life, applications of Radio Isotopes, Radiometric dating, Radiation Detection, Geiger Mueller counter<br>• Fermions and bosons, Standard model of fundamental particles, leptons and quarks, baryons and mesons<br>• Fundamental forces of nature, weak nuclear force and strong nuclear force |

## Practical:

1. Experiments of fiber optic communication systems.
   (i) Establish a fiber optic analog link.
   (ii) Establish a fiber optic digital link.
   (iii) Study of Bending Loss.
   (iv) Study of Propagation loss in optical fiber.
2. To determine the diameter of thin wire by diffraction using laser.
3. To determine the wavelength of laser light by diffraction at a single slit.
4. To determine slit width of single and double slit by using Laser.
5. To determine wavelength of laser light using measuring scale.
6. Make transistor as a switch.

## Syllabus: B.Sc. Forensic Science - Chemistry, Semester V

### Theory:

**UNIT: I – Phase Equilibrium and Conductance**

- Phases, components and degrees of freedom of a system, criteria of phase equilibrium. Gibbs Phase Rule and its thermodynamic derivation. Derivation of Clausius – Clapeyron equation and its importance in phase equilibria. Phase diagrams of one-component systems (water and sulphur) and two component systems involving eutectics, congruent and incongruent melting points (lead-silver, FeCl3-H2O and Na-K only).
- **Conductance**
- Conductivity, equivalent and molar conductivity and their variation with dilution for weak and strong electrolytes. Kohlrausch law of independent migration of ions. Transference number and its experimental determination using Hittorf and Moving boundary methods. Ionic mobility. Applications of conductance measurements: determination of degree of ionization of weak electrolyte, solubility and solubility products of sparingly soluble salts, ionic product of water, hydrolysis constant of a salt. Conductometric titrations (only acid-base).

**UNIT: II – Organometallic Compounds**

Definition and Classification with appropriate examples based on nature of metal-carbon bond (ionic, σ ,π and multicentre bonds). Structures of methyl lithium, Zeiss salt and ferrocene. EAN rule as applied to carbonyls. Preparation, structure, bonding and properties of mononuclear and polynuclear carbonyls of 3d metals. π - acceptorbehaviour of carbon monoxide. Synergic effects (VB approach). (MO diagram of CO can be referred to for synergic effect to IR frequencies).

**UNIT: III – Aldehydes and ketones (aliphatic and aromatic)**

(Formaldehye, acetaldehyde , acetone and benzaldehyde) *Preparation:* from acid chlorides and from nitriles. *Reactions* – Reaction with HCN, ROH, NaHSO3, NH2-G derivatives. Iodoform test. Aldol Condensation, Cannizzaro's reaction, Wittig reaction, Benzoin condensation. Clemensen reduction and Wolff Kishner reduction. Meerwein-Pondorff Verley reduction.

### Practical:

(1) Preparation of any two of the following complexes and measurement of their conductivity:

(i) tetraamminecarbonatocobalt (III) nitrate

(ii) tetraamminecopper (II) sulphate

(iii) Potassium trioxalatoferrate (III) trihydrate

(2) Compare the conductance of the complexes with that of M/1000 solution of NaCl, MgCl2 and LiCl3.

(3) Semicarbazone of any one of the following compounds: acetone, ethyl methyl ketone, cyclohexanone, benzaldehyde.

(4) Aldol condensation using either conventional or green method.

(5) Determination of critical solution temperature and composition at CST of the phenolwater system and to study the effect of impurities of sodium chloride and succinic acid on it.

(6) Phase equilibria: Construction of the phase diagram using cooling curves or ignition tube method: a. simple eutectic and b. congruently melting systems.

## Syllabus: B.Sc. Forensic Science - Zoology, Semester V

## Theory:

| **UNIT: I – Evolution and Animal behavior** |
|---|
| • **History of diversified life:** Geological Time Scale and Geological Era, Zoogeographical regions (Oriental, Australian and Ethiopian Regions/Realms<br>• **Introductions to evolutionary Theories:** Lamarkism, Darwinism, Neo Darwinism<br>• **Source of heredity variation and evolution:** Isolation, Natural Selection, types, Speciation, Evolution of Man and Horse<br>• **Hardy Weinberg law of Equilibrium:** Genetic Drift, Founder effect<br>• **Concepts and pattern of Behaviors:** Innate Behaviors, learned behavior<br>• **Social organization in insects:** Honey Bee, Migration in Birds, Parental Care in fishes and Amphibian |
| |
| **UNIT: II –Public Health and Hygiene** |
| • Introduction to public health and hygiene. Determinants and factors affecting health and hygiene. Pollution and associated hazards; water and air borne diseases. Prevention of diseases through health education and environment improvements.<br>• Classification of foods (micro and macro nutrients). Balanced diet and malnutrition. Diseases caused by deficiency of proteins, vitamins and minerals.<br>• Infectious agents responsible for diseases in humans. Communicable diseases such as measles, polio, chickungunya, rabies, leprosy, tuberculosis, AIDS, hepatitis and their preventive measures.<br>• Non-communicable diseases such as hypertension, coronary heart disease, stroke, diabetes, obesity, mental ill-health, cancer and their preventive measures. |
| |

**UNIT: III – Immunology**

- Introduction to Immunity: Innate immunity, Adaptive immunity. Cell mediated and humoral immune responses Cell and organs of the Immune System.
- Cell and organs of immune system: Types of immune cells, lymphoid and myeloid, Primary and secondary lymphoid organs.
- Humoral immunity: Antigen, Function of B cell
- Cell mediated immunity: Function of T-Cells
- **Antigens:** Antigenicity andimmunogenicity,Immunogens,Adjuvantsandhaptens,Factors influencingimmunogenicity, Band T-Cell epitopes.
- **Immunoglobulins:** Antibody structure and function, antibody isotypes, Applications Monoclonal antibodies.
- **Hypersensitivity:** Type-I hypersensitivity- allergens, mast cell degranulation, mediators of type-I reaction, Type-II-antibody mediated cytotoxic, Type-III and Type IV hypersensitivity.

## Practical:

**1.** Demonstration of DNA seperation on gel.
**2.** Protein estimation by colorimeter.
**3.** Test of biomolecules: carbihydrate, protein and lipids.
**4.** Actions of salivary amylase under optimum condition.
**5.** Preparation of stained blood film to study various type blood cells
**6.** ABO blood group determination.

## Syllabus: B.Sc. Forensic Science - Botany, Semester V

## Theory:

**UNIT: I – Environmental botany and plant pathology**

- Ecology: Enviromental factors, Ecological adaptations, Plant Succession, Ecosystem (Structure and functions).
- Environmental pollution : air, water, soil, radioactive, thermal and noise pollutions, their sources, effects and control. (greenhouse effect, ozone depletion and acid rain). $CO_2$ enrichment and climate change.
- Biodiversity and Phytogeography : biotic communities and populations, their characteristics and population dynamics. Natural vegetation of India, static and dynamic plant geography, basic principles governing geographical distribution of plants, endemism.
- Etiology of viral, bacterial and fungal diseases: mosaic diseases on tobacco, yellow vein mosaic of bhindi; citrus canker, little leaf of brinjal; damping off of seedlings late blight of potato, red rot of sugarcane, white rust of crucifers, Wheat rust and linseed rust.
- Integrated pest disease management

**UNIT: II - Applied Botany**

- **Forestry : Silviculture –** General silvicultural practices, special approaches; Silviculture of important trees *Acacia nilotica, Albizzia lebbeck, Butea monosperma,Dalbergia sisoo, Emblica officinalis, Tectona grandis*
- **Agroforesrty –** scope and necessity; agro-forestry systems under different agro-ecological zones; role of multipurpose trees and NTFPs
- **JFM:** principles, objectives, methodology, scope, benefits and role of NGOs.

**UNIT: III - Plant Breeding**

**Plant Breeding;** Introduction and objectives, Breeding systems: modes of reproduction in crop plants.

**Methods of crop improvement:** Introduction: Centers of origin and domestication of crop plants, plant genetic resources; Acclimatization; Selection methods: For self pollinated, cross pollinated and vegetatively propagated plants; Hybridization: For self, cross and vegetatively propagated plants Procedure, advantages and limitations.

**Quantitative inheritance:** Concept, mechanism, examples. Monogenic vs polygenic Inheritance.

**Inbreeding depression and heterosis;** Genetic basis of inbreeding depression and heterosis; Applications.

**Crop improvement and breeding;** Role of mutations; Polyploidy; Distant hybridization and role of biotechnology in crop improvement.

## Practical:

1. Mendel's laws through seed ratios. Laboratory exercises in probability and chi-square.
2. Chromosome mapping using point test cross data.
3. Pedigree analysis for dominant and recessive autosomal and sex linked traits.
4. Incomplete dominance and gene interaction through seed ratios (9:7, 9:6:1, 13:3, 15:1, 12:3:1, 9:3:4).
5. Blood Typing: ABO groups & Rh factor.
6. Study of aneuploidy: Down's, Klinefelter's and Turner's syndromes.

**Cyber**
**Semster - V**

**UNIT - I Basics of Computer**

- Computer organization, Components of computer - Input & Output devices, CPU. Memory Hiearchy and types of Memory ( RAM and ROM and their types ) external storage devices. Application software and system software
- Data Representation - Integers, real, binary, octal, hexadecimal & their conversations. Legal gates - Negation, OR, AND, XOR etc and their combinations.
- Operating System - Basics of operating system, memory structure, concurrency, scheduling, synchronization and memory management, process description and control. Introduction to operating system ( Batch oprating system, Distributed operating system etc).

**UNIT - II File System and Networking**

- Introduction to file systems - FAT12, FAT16, FAT32, NTFS, EXT2, EXT3 & HFS.
- Structure of file system, inode etc.
- Basics of networking - Introduction to Networking types of topologies LAN, MAN, WAN and related terminologies, Networking Devices ( Switches, Hub, bridge) .

**UNIT - III Introduction to Internet**

- World Wide Web, E-mail, chat, Search Engine, Network security-Threats Introduction to Security and Security model (CIAtriad), Vulnerabilities, Introduction to security and security model.
- Incident Response - Introduction, computer security incident, goal of incident response, who is involved in incident response process, incident response methodology, formulate a response strategy, investigate the incident, preparing for incident response, overview of pre incident preparation.

## Practical
## Semester - V

1. Finding results of different logics gates and their combinations.
2. Working with windows files ( creation, modification, deletion, attributes) folders( creation, nesting, attributes).
3. Working with Linux file ( creation, modification, deletion, attributes) folder ( creation, nesting attributes)
4. Working with external storage device using windows - reading and writing data on floppy, CD, DVD, USB Thumb drive
5. Working with external storage device using Linux - reading writing data on floppy , CD, DVD, USB thum drive.
6. Understanding LAN - client / server , user creation, password protection.

| School: SBSR | | Batch : | |
|---|---|---|---|
| **Program: B.Sc** | | **Current Academic Year:** | |
| **Branch: All** | | **Semester:** | |
| 1 | Course Code | ENG105 | |
| 2 | Course Title | English V | |
| 3 | Credits | | |
| 4 | Contact Hours (L-T-P) | 2-0-0 | |
| | Course Status | **Compulsory** | |
| 5 | Course Objective | 1. To equip students to minimize the linguistic barriers emerging in a different environment.<br>2. Help students to understand different accents and standardise their existing English<br>3. Guide the students to hone the basic communication skills, listening, speaking and reading. | |
| 6 | Course Outcomes | CO1: Develop writing skills<br>CO2: Learn to use correct sentence structure and punctuation<br>CO3: Develop Impressive Speaking Skills.<br>CO4: Recognise stress patterns in pronunciation of the English sentences<br>CO5: To be able to speak confidently in the English language<br>CO6: Listen and interpret main ideas to differentiate between opinions and facts<br>CO7: Cultivate and develop reading habits | |
| 7 | Course Description | | |
| 8 | Outline syllabus | | CO Mapping |
| | **Unit 1** | **Creative Writing** | **CO1, CO2** |
| | A | Dialogue Writing: | CO1, CO2 |
| | B | Short Story Writing:<br>• Elements of a Short Story: Setting, Characterization, Plot, Conflict, Climax, Resolution<br>• Writing a Story Tasks: Complete the story, Change the resolution of the story, write a story on a given theme | |
| | C | Essay Writing | CO1, CO2 |
| | D | Movie Review: | CO1, CO2 |

| | | | |
|---|---|---|---|
| | | • Discussing the themes, Script, Dialogues and Characterization,<br>• Appraising the Elements of the Movie: Setting and Location, Props and Colours, Camera Work, Acting, Background Music | |
| | **Unit 2** | **Speaking Skills** | |
| | A | Group Discussion:<br>• Objective of a GD,<br>• Types of GD,<br>• Dos and Don'ts of a GD,<br>• Effective Body Language in a GD,<br>• Leadership Skills in GD | CO3. CO4. CO5, CO6 |
| | B | Extempore:<br>• Purpose<br>• Features of a Good Extempore<br>• Dos and Don'ts<br>• Extempore Session | CO3. CO4. CO5, CO6 |
| | C | Debates:<br>• Purpose<br>• Features of a Good Debate<br>• Preparing for a Debate<br>• Dos and Don'ts<br>• The Three Minute Debate Planner<br>• Debate Session | CO3. CO4. CO5, CO6 |
| | **Unit 3** | **Reading Texts and Movie Review** | |
| | A | The Refund by Fritz Karinthy | CO7 |
| | B | The Kid by Charles Chaplin (Movie Review) | CO7 |
| | C | Discussions Based on the text | CO7 |
| | Mode of examination | | |
| | Weightage Distribution | CA / MTE / ETE<br>30% / 20% / 50% | |
| | Text book/s* | Workbook for Beginners | |
| | Other References | • Kumar, Sanjay and Pushp Lata. *Communication Skills*, Oxford University Press: New Delhi.<br>• Comfort, Jeremy(et.al). *Speaking Effectively*. Cambridge University Press | |

## Syllabus: B.Sc. Forensic Science - Forensic Science, Semester VI

## Theory:

**UNIT: I – QUESTIONED DOCUMENTS**

Functions of a Forensic Document Examiner: - Required training and education. Collection protocols of writing standards and process of comparison. Various writing features and their estimation. General and individual characteristics of handwriting. Identification of writer of anonymous writings. Application of Forensic Stylistics/Linguistics in the identification of writer.

Examination of built-up documents and determination of sequence of strokes. Determination of age of documents by examining various factors. Identification and comparison of typescripts: -

Identification of typist, various types of printing processes, printing and machine defects, and alterations in typed text. Various types of typewriting devices: - examination of typewriters with proportional letter spacing,

electronic typewriters, dot matrix, inkjet & laser printers, machines used for printing security documents, cheques, and currency notes, etc.

Photocopy & photocopier examination: - photocopier identification, visual photocopy examination, photocopy forgery. Paper & watermark examination: - Paper size and thickness, paper opacity, colour and brightness, understanding watermarks.

Examination of alterations, erasures, overwriting, additions and obliterations. Decipherment of secret writings, indentations & charred documents. Physical comparison of documents, examination of seal rubber & other mechanical impressions.

Examination of counterfeit currency notes, Indian Passports/Visas, Stamp Papers, Postal Stamps etc. Examination of fake credit cards and electronic documents.

**UNIT: II – FINGERPRINTS**

Basics of Fingerprints- Introduction and history, with special reference to India. Biological basis of fingerprints. Formation of ridges. Fundamental principles of fingerprinting.

Types of fingerprints. Types of Fingerprint patterns. Fingerprint characteristics/minutiae. Plain and rolled fingerprints. Ridge counting. Significance of poroscopy and edgeoscopy.

Development of Fingerprints - Constituents of sweat residue.Latent fingerprints' detection by physical and chemical techniques. Mechanism of detection of fingerprints by different developing reagents.

Application of light sources in fingerprint detection. Preservation of developed fingerprints. Digital imaging for fingerprint enhancement. Fingerprinting the deceased.

**UNIT: III – FORENSIC MEDICINE**

Global Medical Jurisprudence, Legal Procedure in India: - Police inquest, Magistrate's inquest, Coroner's inquest, Oath and affirmation.
Documentary evidence: - Medical certificates, medical reports, dying declaration.
Understanding laws and ethics of medical practice.
Medico legal aspects of death: - Diagnosis of death- somatic & molecular,
early and intermediate changes following death, late changes after death- putrefaction, autolysis, bacterial action, factors affecting these changes. Determination of time since death, including by histopathological methods.
Medico legal investigation of sexual offences, including examination of victims and suspects.
Medico legal aspects of death:- causes of death such as asphyxia,
electrocution, thermal trauma, heat burns, starvation, natural death, sudden death, death by accident. Medico legal aspects of wounds: - medical and legal definition of wounds, types of mechanical and regional injuries, aging
of wounds, difference between suicidal, homicidal and accidental wounds.

## Practical:

1. To record plain and rolled fingerprints.
2. To carry out ten digit classification of fingerprints.
3. To identify different fingerprint patterns.
4. To identify core and delta.
5. To carry out ridge tracing and ridge counting.
6. To investigate physical methods of fingerprint detection.
7. To design a questionnaire for the first responder to the death scene.
8. To design a protocol to deal with the media at the crime scene.
9. To design a checklist for the forensic scientists at the death scene.
10. To identify handwriting characters
11. To study natural variation in handwriting.
12. To compare handwriting samples.

## Syllabus: B.Sc. Forensic Science - Physics, Semester VI

## Theory:

| UNIT: I – ELECTRONICS CIRCUITS |
|---|
| • Basics of LR, RC, LCR circuits<br>• Diode and Transistor characteristics<br>• Rectification using diodes, Timer circuits<br>• Amplification using an Operational amplifier (OPAMP)<br>• Logic gates AND, OR, NOT, NAND, NOR, XOR gates<br>• Flip- flops and counters.<br>• Printed circuit board and IC manufacturing |
| |
| **UNIT: II – SENSORS AND SIGNALS** |
| • Types of sensors:<br>o Temperature sensors: Thermistors, thermocouples, RTD's, Infrared sensors<br>o Pressure sensors: Piezoelectric<br>o Proximity and displacement sensors: LVDT, capacitive, magnetic, ultrasonic<br>o Acceleration sensors: Gyroscopes, accelerometers.<br>o Light sensors (photodiode, photo multiplier tube)<br>o Sound sensors (microphone)<br>o Touch sensors (capacitive)<br>• Analog signals generated by sensors<br>• Analog to Digital (AtoD) and Digital to Analog (DtoA) convertors<br>Uses of Amplitude modulated (AM) and Frequency Modulated (FM) signals |
| |
| **UNIT: III – DIGITAL SIGNAL PROCESSING** |
| • Digital signals from analog signals<br>• Sampling, audio as 1D signal, image as 2D signal<br>• Fourier transforms, Fast Fourier Transform (FFT)<br>• Frequency domain filtering: spectrum, power spectrum, low pass, band pass, high pass filters |

## Practical:

1. To study the frequency response of a common emitter amplifier stage and to experimentally verify theoretical results.
2. Measurement of Operational amplifier parameters- Common Mode Gain, Differential Mode Gain, and CMMR.
3. To sketch the following basic op-amp circuits and explain the operation of each:
    a. Positive and negative Feedback
    b. Summing and Differential amplifier
    c. Integrator and differentiator
4. Draw the waveform and study the circuit of op-amp for getting full gain.
5. To study the V-I characteristics of S.C.R. and determine the break over voltage
6. To design a 6.2 volts D.C.. power supply using zener diode and to study its ripple factor and load regulation.
7. Study of charging and discharging of series RC circuit and determine the time constant.

8. Study of charging and discharging of series RL circuit and determine the time constant.

## Syllabus: B.Sc. Forensic Science - Chemistry, Semester VI

## Theory:

| **UNIT: I – Chemical Kinetics** |
|---|
| The concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates. Order and molecularity of a reaction. Derivation of integrated rate equations for zero, first and second order reactions (both for equal and unequal concentrations of reactants). Half–life of a reaction. General methods for determination of order of a reaction. Concept of activation energy and its calculation from Arrhenius equation. Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions. Comparison of the two theories (qualitative treatment only). |
| **UNIT: II – Bio-Inorganic Chemistry** |
| A brief introduction to bio-inorganic chemistry. Role of metal ions present in biological systems with special reference to Na+, K+ and Mg2+ ions: Na/K pump; Role of Mg2+ ions in energy production and chlorophyll. Role of Ca2+ in blood clotting, stabilization of protein structures and structural role (bones). |
| **UNIT: III – Carbohydrates and Amino Acids, Peptides and Proteins:** |
| • Classification, and General Properties, Glucose and Fructose (open chain and cyclic structure), Determination of configuration of monosaccharides, absolute configuration of Glucose and Fructose, Mutarotation, ascending and descending in monosaccharides. Structure of disacharrides (sucrose, cellobiose, maltose, lactose) and polysacharrides (starch and cellulose) excluding their structure elucidation.<br>• **Amino Acids, Peptides and Proteins:**<br>• *Preparation of Amino Acids:* Strecker synthesis, using Gabriel's phthalimide synthesis. Zwitter ion, Isoelectric point and Electrophoresis. *Reactions of Amino acids*: ester of –COOH group, acetylation of –NH2 group, complexation with Cu2+ ions, ninhydrin test. Overview of Primary, Secondary, Tertiary and Quaternary Structure of proteins. Determination of Primary structure of Peptides by degradation Edmann degradation (N-terminal) and C–terminal (thiohydantoin and with carboxypeptidase enzyme). Synthesis of simple peptides (upto dipeptides) by N-protection (t-butyloxycarbonyl and phthaloyl) & C-activating groups and Merrifield solidphase synthesis. |

## Practical:

Kinetic studies
Study of the kinetics of the following reactions by integrated rate method:
(1) Acid hydrolysis of methyl acetate with hydrochloric acid, volumetrically or conducto-metrically

(2) lodide-persulphate reaction.

Separation of mixtures by Chromatography: Measure the Rf value in each case (combination of two compounds to be given)
(3) Identify and separate the components of a given mixture of 2 amino acids (glycine, aspartic
acid, glutamic acid, tyrosine or any other amino acid) by paper chromatography
(4) Identify and separate the sugars present in the given mixture by paper chromatography.

(5) Saponification of ethyl acetate.
(6) Comparison of the strengths of HCl and $H_2SO_4$ by studying kinetics of hydrolysis of methyl acetate.

## Syllabus: B.Sc. Forensic Science - Zoology, Semester VI

## Theory:

| **UNIT: I – Biostatics** |
|---|
| • **Data: P**rimary Data, Secondary data, Frequency distribution and tally marks<br>• **Data presentation:** Diagrammatic: Histogram and Pie Diagram, Graphical<br>• **Measurement of central tendency:** Mean, Median, Mode<br>• **Measurment of Variation:** Standard deviation, Standard error<br>• **Test of Significance:** Student 't 'test |
| |
| **UNIT: II – Economic Zoology** |
| • **Bee-keeping and Bee Economy (Apiculture):** Varieties of honey bees and Bee pasturage; Setting up an apiary, Rearing equipments, handling of bees, artificial diet; Diseases of honey bee, American and Honey extraction techniques; Physico-chemical analysis of honey; Other beneficial products from bee;<br>• **Silk and Silk Production (Sericulture):** Different types of silk and silkworms in India; Rearing of Bombyx mori – Rearing racks and trays, disinfectants, rearing appliances, black boxing, Chawki rearing, bed cleaning, mountages, harvesting of cocoons; Silkworm pests and parasites: Uzi fly, Dermestid beetles, and their management; Silk reeling techniques; Quality assessment of silk fibre. |
| |
| **UNIT: III – Economic Zoology** |
| • Aquaculture Brood stock management; Induced breeding of fish and prawn; Management of hatchery of fish; Management of nursery, rearing and stocking ponds; Preparation and maintenance of fish aquarium; Preparation of compound diets for fish; Role of water quality in aquaculture; Fish diseases: Bacterial, viral and parasitic; Preservation and processing of harvested fish; Fishery by-products<br>• Dairy/Poultry Farming: Introduction; Indigenous and exotic breeds; Rearing, housing, feed and rationing; Commercial importance of dairy and poultry farming; Dairy/poultry farm management; Visit to any Dairy farm/Poultry farm |

## Practical:

**1.** Study of paddy pests, pest of sugar cane.

2. Study of some economically important fishes.
3. Determination of mean, median, mode.
4. Determination of deviation.
5. Graphical representation of statistical data.

## Syllabus: B.Sc. Forensic Science - Botany, Semester VI

## Theory:

| UNIT: I – Analytical Techniques |
| --- |
| **Imaging and related techniques**<br>Principles of microscopy; Light microscopy; Fluorescence microscopy; Confocal microscopy; Use of fluorochromes: (a) Flow cytometry (FACS); (b) Applications of fluorescence microscopy: Chromosome banding, FISH, chromosome painting; Transmission and Scanning electron microscopy – sample preparation for electron microscopy, cryofixation, negative staining, shadow casting, freeze fracture, freeze etching.<br>**Cell fractionation**<br>Centrifugation: Differential and density gradient centrifugation, sucrose density gradient, $CsCl_2$ gradient, analytical centrifugation, ultracentrifugation, marker enzymes. |
| |
| **UNIT: II – Analytical Techniques** |

Radioisotopes: Use in biological research, auto-radiography, pulse chase experiment.

Spectrophotometry: Principle and its application in biological research.

Chromatography: Principle; Paper chromatography; Column chromatography, TLC, GLC, HPLC, Ionexchange chromatography; Molecular sieve chromatography; Affinity chromatography.

Characterization of proteins and nucleic acids: Mass spectrometry; X-ray diffraction; X-ray crystallography; Characterization of proteins and nucleic acids; Electrophoresis: AGE, PAGE, SDS-PAGE

**UNIT: III – Soil Science**

**Soil Science:** Lithosphere, Soil forming rocks and minerals, weathering of parent rocks, major processes of soil formation, Different types of soil degradation, Soil conservation and reclamation problem of soil.

**Environmental Pollution:** Earth environmental biosphere, Atmosphere pollution, $CO_2$ and ecosystems, Ozone depletion, water pollution, BOD, Pesticides pollution, radioactive pollution, Problem of soil wastes, Monitoring and control of pollution.

**Conservation:** Major India biomass, conservation of renewable resources, causes of extinction, Endangered Indian flora, natural reserves and germ plasm bank.

## Practical:

1. Study of Blotting techniques: Southern, Northern and Western, DNA fingerprinting, DNA sequencing, PCR through photographs.
2. Demonstration of ELISA.
3. To separate nitrogenous bases by paper chromatography.
4. To separate sugars by thin layer chromatography.
5. Isolation of chloroplasts by differential centrifugation.
6. To separate chloroplast pigments by column chromatography.

## Cyber
## Semester - VI

## UNIT - I Computer Science

- Introduction to computer /Cyber forensic, cyber forensic steps( identification, seizure, acquisition, authentication, presentation, preservation) Who is computer forensic expert, cyber forensic investigation process, the goal of the forensic investigation, why investigate, using email inapporiately, useof internet, email, or Pc in a non work related properly infraction, auditing vs/ cyber forensic.

- What is Biometric, Use of Biometric, Model of Biometric system. Various types of Biometric Method, User acceptance, Evaluating accuracy, Advantages and disadvantages of biometric. General biometric

system( identification and verification), general architecture, comparison of different biometric technologies, what make biometric difficult.

**UNIT - II Evidence Collection and Analysis Tools**

- Volatile ana Non volatile Evidences collection ( safeback,gettime, filet, and excel, getfree swapfile and getswap, getslack, temporary files), Detailed procedure for obtaining a bit stream backup of hard drive, file system( details of file system, data structure of file system, data recovery in different file system)
- Concealment technique : Introduction to cryptography, types of cryptogrphic algorithms ( secret key cryptography, public key cryptography,hash function), electronic signature, stenography, reversing the stenographic process, cloaking techniques ( data hide and seek), remaming files, manipulating file system, data hiding on NTFS with alternate data stream.

**UNIT - III Cyber Forensic tools and Utilities**

- Introduction, examining a breadth of product, cyber tools good, better, best : what the right incident response tool for your organization, tool review forensic toolkit, encase, cyber check suites, what is disk imaging etc, specification for forensic tool tested.

**Practical**
**Semester - VI**

1. Identification, Seizure, Search of Digital media.

2. Evidence Collection.

3. Demonstration of various Forensic tools like Partition magic, Encase etc.

4. Data Recovery, Deleted File Recovery viewing small Disk.

5. Viewing small disk MBR.

6. Demonstration of Concealment Techniques (Cryptography PGP).

| | | |
|---|---|---|
| **School: SBSR** | | **Batch :** |
| **Program: B.Sc** | | **Current Academic Year:** |
| **Branch: All** | | **Semester:** |
| 1 | Course Code | ENG106 |
| 2 | Course Title | English VI |
| 3 | Credits | |
| 4 | Contact Hours (L-T-P) | 2-0-0 |
| | Course Status | **Compulsory** |
| 5 | Course Objective | 1. To equip students to minimize the linguistic barriers emerging in a different environment.<br>2. Help students to understand different accents and standardise their existing English<br>3. Guide the students to hone the basic communication skills, listening, |

| | | | |
|---|---|---|---|
| | | speaking and reading. | |
| 6 | Course Outcomes | CO1: Understand the Importance of Communication<br>CO2: Develop writing skills and Learn to use correct sentence structure and punctuation<br>CO3: Develop Impressive Speaking Skills.<br>CO4: Recognise stress patterns in pronunciation of the English sentences<br>CO5: To be able to speak confidently in the English language<br>CO6: Listen and interpret main ideas to differentiate between opinions and facts<br>CO7: Cultivate and develop reading habits | |
| 7 | Course Description | | |
| 8 | Outline syllabus | | CO Mapping |
| | **Unit 1** | **Fundamentals of Communication** | |
| | A | Communication: Process of Communication,<br>• Technical and General Communication, Importance of Professional Communication,<br>• Different Forms of Communication: Verbal, Non-Verbal, Intrapersonal, Interpersonal<br>• Flow of Communication in an Organization: Upwards, Downwards, Diagonal and Horizontal | CO1 |
| | B | The Basics of Communication: Accuracy, Brevity and Clarity | CO1 |
| | C | Indianisms | |
| | **Unit 2** | **Formal Writing** | |
| | A | Formal Letter Writing:<br>• Elements of structure,<br>• Elements of style,<br>• Types of letter: Inquiry letter, Order letter, Complaint letter, Invitation letter, and Application | CO2 |
| | B | Email Writing<br>• Advantages and Disadvantages<br>• Email Etiquette<br>• Dos and Don'ts | CO2 |
| | C | Interoffice Memorandum | CO2 |

| | | | | | |
|---|---|---|---|---|---|
| | **Unit 3** | **Speaking Skills** | | | |
| | A | Presentation Skills:<br>• Team Presentation,<br>• Making PowerPoint Presentation<br>• Importance of Visual Aids<br>• Body Language<br>• Paralinguistic | | | CO3, CO4, CO5, CO6 |
| | B | Job Interviews<br>• Process<br>• Stages in Job Interviews<br>• Types: Telephonic, Video Conferencing, Technical, Behavioural, Stress, Aptitude Test<br>• Desirable Qualities<br>• Use Proper Verbal and Non-Verbal Cues<br>• Preparation: Know the company, Know yourself, Review Common Interview Questions<br>• Interview Sessions | | | CO3, CO4, CO5, CO6 |
| | C | Impromptu:<br>• Introduction<br>• Difference between an extempore and Impromptu<br>• Delivering a Good Impromptu speech<br>• Impromptu Session | | | CO3, CO4, CO5, CO6<br>CO3, CO4, CO5, CO6 |
| | Mode of examination | | | | |
| | Weightage Distribution | CA | MTE | ETE | |
| | | 30% | 20% | 50% | |
| | Text book/s* | Workbook for Beginners | | | |
| | Other References | • Kumar, Sanjay and Pushp Lata. *Communication Skills*, Oxford University Press:New Delhi.<br>• Comfort, Jeremy(et.al). *Speaking Effectively*. Cambridge University Press | | | |

## Summer Projects

Project has been given in each summer vacation related to forensic science which is of 2 credits and two times it will be given in the whole session of B.Sc.

## Internship

Students will go for lab visit in 3rd sem for 1week which is of 1 credit and they will make report on it. In 5th sem they will go for lab internship for 2 weeks in their choice of division and its also of 1 credit, they have to make report on it.

**Shalvi Upadhyay (Co-ordinator)**
**Asst. Professor , Forensic Science**
**SAHS, Sharda University**

**Dr. Dalip Kakru (Dean)**
**Professor**
**SAHS, Sharda University**