

CURRICULUM
B. Sc. (Life Science, Chemistry, Forensic Science)

B. Sc. LSCFS Semester –I

S.No	Course Code	Title of the Course	Total Credit	Credit Hrs.		
				L	T	P
1	FS-401	INTRODUCTION OF FORENSIC SCIENCE	2	2	0	0
2	FS-402	FORENSIC LAW	2	2	0	0
3	BIOL 319	CELL BIOLOGY	3	2	0	2
4	BIOL 302	INVERTEBRATE-I	3	2	0	2
5	BIOL 310	TECHNIQUES AND INSTRUMENTATION IN BIOLOGY	3	2	0	2
6	BIOL 307	INTRODUCTORY PARASITOLOGY	3	2	0	2
7	CHEM-414	INTRODUCTORY ORGANIC CHEMISTRY	3	2	0	2
8	CHEM-415	ATOMIC STRUCTURE & PERIODIC CLASSIFICATION	3	2	0	2
9	CHEM-416	CHEMICAL KINETICS & ELECTRO CHEMISTRY	3	2	0	2
10	GPT-301	MORAL & VALUE EDUCATION	2	2	0	0
11	PHY-309	BASIC PHYSICS	3	3	0	0

B.Sc. LSCFS Sem. –II

S.No	Course Code	Title of the Course	Total Credit	Credit Hrs.		
				L	T	P
1	CHEM - 423	HYDRO CARBONS	3	2	0	2
2	CHEM - 424	CHEMICAL BONDING & NUCLEAR CHEM	3	2	0	2
3	CHEM - 425	GASES, CHEMICAL EQUILIBRIUM & SURFACE CHEM.	3	2	0	2
4	MBFT 349	INTRODUCTION TO MICROBIOLOGY	3	2	0	2
5	BIOL 304	INVERTEBRATE - II	3	2	0	2
6	BIOL 309	GENETICS	3	2	0	2
7	FS-421	CRIME SCENE INVESTIGATION	3	2	0	2
8	FS-422	INSTRUMENTATION & ANALYTICAL TECHNIQUES	3	3	0	0
9	LNG-301	STRUCTURAL & SPOKEN ENGLISH	3	2	0	2

B.Sc. LSCFS Sem. –III

S.No	Course Code	Title of the Course	Total Credit	Credit Hrs.		
				L	T	P
1	CHEM-530	ALIPHATIC COMPOUNDS	3	2	0	2
2	CHEM-531	MAIN GROUP ELEMENTS	3	2	0	2
3	CHEM-532	THERMO DYNAMICS-I & IONIC EQUILIB.	3	2	0	2
4	FS- 431	FINGERPRINT EXAMINATION	3	2	0	2
5	FS- 432	DOCUMENT EXAMINATION	3	2	0	2
6	BIOL417	VERTEBRATE I	3	2	0	2
7	BIOL 408	MOLECULAR BIOLOGY	3	2	0	2
8	BIOL 415	ANIMAL TAXONOMY AND DISTRIBUTION	3	2	0	2
9	BIOL 416	ELEMENTARY BIOCHEMISTRY	3	2	0	2

B.Sc. LSCFS Sem. –IV

S.No	Course Code	Title of the Course	Total Credit	Credit Hrs.		
				L	T	P
1	CHEM -540	AROMATIC COMPOUNDS	3	2	0	2
2	CHEM - 541	<i>d & f</i> BLOCK ELEMENTS	3	2	0	2
3	CHEM - 542	THERMODYNAMIC – II, PHASE EQUILIB &RADIO CHEM.	3	2	0	2
4	BIOL 405	INTRODUCTORY ANIMAL PHYSIOLOGY	3	2	0	2
5	BIOL 418	VERTEBRATE II	3	2	0	2
6	BIOL 421	PLANT TAXONOMY AND MORPHOLOGY	3	2	0	2
7	BIOL 422	INTRODUCTORY BIOTECHNOLOGY	3	2	0	2
8	FS-441	BALLISTICS & PHOTOGRAPHY	2	2	0	0
9	FS-442	EXPLOSIVE	2	2	0	0

B.Sc. LSCFS Sem. –V

S.No	Course Code	Title of the Course	Total Credit	Credit Hrs.		
				L	T	P
1	CHEM - 551	COORDINATION CHEMISTRY & ISOMERISM.	3	2	0	2
2	CHEM - 552	SOLUTION CHEMISTRY & ADVANCED ELECTROCHEMISTRY	3	2	0	2
3	CHEM – 550	NATURAL PRODUCTS	3	2	0	2
4	BIOL 520	INTRODUCTORY PLANT PHYSIOLOGY	3	2	0	2
5	BIOL 530	PLANT EVOLUTION AND PALEOBOTANY	3	2	0	2
6	FS-451	FORENSIC CHEMISTRY & TOXICOLOGY	3	2	0	2
7	FS-452	SEROLOGY & DNA FINGERPRINTING	3	2	0	2
8	ENV-415	ENVIRONMENTAL STUDIES- I	2	2	0	0

B.Sc. LSCFS Sem. –VI

S.No	Course Code	Title of the Course	Total Credit	Credit Hrs.		
				L	T	P
1	CHEM - 560	ADVANCED ORGANIC CHEMISTRY	3	2	0	2
2	CHEM - 561	SPECTROSCOPY	3	2	0	2
3	CHEM-562	PHOTO CHEMISTRY & ADVANCED WAVE MECHANICS	3	2	0	2
4	BIOL 533	PLANT ANATOMY AND EMBRYOLOGY	3	2	0	2
5	BIOL 536	DEVELOPMENTAL BIOLOGY	3	2	0	2
6	BIOL 537	BIODIVERSITY AND CONSERVATION	3	2	0	2
7	FS-561	CYBER FORENSIC	3	2	0	2
8	FS-562	QUALITY & LABORATORY MANAGEMENT	3	3	0	0
9	ENV-416	ENVIRONMENTAL STUDIES -II	2	2	0	0

B.Sc (PCFS&LSCFS)

Semester-I

Paper I

Code:-FS-401

Credits:-2(2-0-0)

Introduction of Forensic Science

UNIT-I Bridge Course

UNIT-II Forensic Science: - Definition, Introduction , Basic Principles & Significance, History & Development of Forensic Science in India and World, Organizational Structure of Forensic Science laboratory ,Different divisions and units of Forensic Science Laboratory , Organizational Structure of Forensic Science teaching Institution.

UNIT-III Criminalistics- Definition, Introduction, Scope, Significance and use Coordination of Forensic Science activities and its use for court of Law.

UNIT-IV Forensic Statistics-Introduction Definition, Significance Basic concepts of frequency distribution, measure of central values ,Mean, Median Mode Probability Theory, Classical definition of Probability., Basic terms Events, Trials, Mutually exclusives events etc, Application of statistics to particular areas of forensic science.

UNIT-V Forensic Ethics- Introduction, Definition, Scope, Ethics in Forensic Science, Professionalism and ethics: Importance of professional ethics, the importance Of professional ethics to science practitioners, development of code of conduct and code of ethics for Forensic Science; Application of codes and ethics, How ethical requirements impact the daily work of a forensic scientist; Ethical dilemmas and their resolution.

Semester-I

Code:-FS-402

Credit:-2(2-0-0)

Course Title: Forensic Law

- UNIT-I** Definition of Law, Court, Judge, Crime and Criminal, Basic Terminology in Law, Introduction to Indian Penal Code, History and Background of Indian Penal Code,
- UNIT-II** Common Object, Common Intention, General Exception (Section 76-95), Right of Private Defense, (Section 96 to Section 106) brief introduction to offences affecting Human life and Property.
- UNIT III** Introduction to Criminal Procedure Code, FIR, Introduction to Indian Evidence Act, Expert Opinion. Case Studies regarding various crimes.

Course Title: Environmental Studies
Semester-I

Course Code: BIOL 305

Credit: 3 (2-0-2)

UNIT I Environmental pollution-such as air water, social & noise pollution. Their global, regional & local aspects. Air pollution, Water pollution, Noise pollution, Soil pollution –Their sources, effects on humans, plants & animals and their control.

UNIT II Deforestation and desertification, Chipko movement, overgrazing. Environmental hazards of radiation. Global warming, Acid rain, Ozone Layer depletion, Role of an individual in preventing pollution.

UNIT III Concept of Ecosystem, Producer, consumer, decomposers, Energy flow, Ecological succession, Food Chain, Food web, Ecological pyramid.

UNIT IV Introduction, types & characteristic features of (a) Forest (b) grass land (c) desert (d) pond.

Practical:

- Study of Biotic and Abiotic factors through project, charts and models.
- Study of aquatic ecosystem
 - a) Water temperature and pH
 - b) Turbidity using Sacchi disc
 - c) Determination of dissolved oxygen
 - d) Biotic components of pond ecosystem via chart
- Study of soil
 - a) composition,
 - b) pH
 - c) temperature
 - d) Moisture content
- Testing presence of carbonate in soil
- Testing presence of nitrate in soil
- Testing of inorganic salts in soil
- Minimum size of quadrat and species area curve of grassland vegetation
- To determine density abundance and frequency of grassland vegetation
- Basal cover of grassland vegetation

Course Title: Cell biology
Semester-I

Course Code: BIOL 306

Credit: 3 (2-0-2)

UNIT I Plant and animal cells, Eukaryotic and prokaryotic cell. Plasma membrane, structure & function of plasma membrane.

UNIT II Nucleus, Nuclear membrane & nucleolus. Chromosomes polytene & lampbrush chromosomes.

UNIT III Golgi apparatus, mitochondria, lysosomes, Endoplasmic reticulum & Ribosomes, cytoskeleton Cilia, Flagella, Microtubules & Microfilaments.

Practical:

- Study of plant cell.
- Study of animal cell.
- Study of blood cell.
- Study of mitosis and meiosis with the help of permanent slides.
- Study of polytene and lampbrush chromosomes with the help of permanent slides.

Semester – I
Course Title: INTRODUCTORY ORGANIC CHEMISTRY

Course Code-CHEM-414

Credit: 3(2-0-2)

Unit 1: IUPAC classification and Nomenclature.

Unit 2: Structure of Organic Molecules: Electronic theory of bonding. Wave mechanical model of Atom and Chemical bonding. Atomic Orbital theory, Nature and types of Covalent bond. Hybridization. Electro negativity Polarity Resonance. Hydrogen bonding.

Unit 3: Organic Reactions and their Mechanisms: Electron displacement effects. Bond fission, Carbonium ions Carbanions. Attacking reagent and their role. Types of reaction mechanisms and Organic reactions.

Unit 4: Isomerism: Introduction, Types of Isomerism, Asymmetric Carbon Atom, Chirality Absolute & Relative Configuration. R & S System. Optical isomerism, Racemic Mixtures.

Semester – I
Course Code: ATOMIC STRUCTURE & PERIODIC CLASSIFICATION

Course Code: CHEM-415

3(2-0-2)

Unit I: Structure of atom: Quantum and wave mechanical approaches to the structure of atom.

Unit II: Periodic classification and Properties: (a) Mendleef, Modern, Extended and long form.
(b) Periodic properties: Atomic and ionic radii, crystal co-ordination no., Radius ratio, factors influencing magnitude of ionic radii. Periodic variations of atomic and ionic radii.
Ionization energy, electron affinity and electronegativity.

Semester – I
Course Title: CHEMICAL KINETICS & ELECTROCHEMISTRY

Course Code: CHEM-416

3(2-0-2)

1. Chemical Kinetics:- Reaction rate, order and molecularity of reaction, zero, first, second and third order reaction (derivation included), methods for determining the order of reaction, complex reactions, opposing reactions, consecutive reactions and side reactions with reference to first order reactions. Effect of temperature on reaction on reaction velocity, Energy of activation and collision theory.

2. Electrochemistry:- Reversible and irreversible cells, EMF of a cell and free energy change, Nernst's equation, Equilibrium constant, standard electrode potential, types of reversible electrode, Application of EMF measurements (determination of solubility product, pH, dissociation constant of acids, hydrolysis constant, solubility of sparingly soluble salts.)

3. Colloidal State:- Lyophilic and Lyophobic solution, origin of charge, zeta potential, electrophoresis, electro-osmosis, Tyndall effect, coagulation, Hardy Schulze rule, Donnan membrane equilibrium.

BASIC PHYSICS

B.Sc. LSCFS

Semester-I

Course Code: PHY-309

Credit Hrs: (3-0-0)

Unit-I: Optics

Interference: Coherent sources, conditions of interference, Fresnel's bi-prism experiment, interference in thin films, wedge shaped film, Newton's ring.

Diffraction: Single slit and double slit diffraction, diffraction grating, Raleigh's criterion of limit resolution, resolving power of telescope and microscope.

Polarization: Polarization of light, Brewster's law, Malus law, phenomenon of double refraction, geometry of calcite crystal, optic axis, principal section, ordinary and extraordinary rays, construction and working of Nicol prism. Plane, circularly and elliptically polarized light. Their production and analysis. Retardation Plates, optical activity, specific rotation, polarimeters.

Unit-II: X-rays

Origin of X-rays, continuous and characteristic X-ray spectra, Mosley's law, absorption of X-rays, Diffraction of X-rays, Bragg's law, Bragg's spectrometer, practical applications of X-ray, X-ray Machine.

Unit-III: Laser

Spontaneous and stimulated emission of radiation, Einstein's Coefficients. Components of laser. Type of laser and their working and application. Classes of laser equipments.

Unit-IV: Electromagnetic Theory.

Gauss's law, Poisson and Laplace equation, Maxwell's equations, Basic concepts of Electromagnetic waves and its solution in free space. Para, dia, ferro, antiferro and ferri magnetic materials. Hysteresis and magnetic circuits.

Reference books:

1. Fundamentals of Optics
Jetkins & White.
2. Perspectives of Modern Physics
Beiser
3. Electrodynamics
David Griffith.
4. Laser – Theory & Applications
Thyagranjan / Ghatak
5. Fundamentals Of Physics
Resnick & Halliday.
6. Engineering Physics
Uma Mukherjee.
7. Text book of Engineering Physics
Navneet Gupta & Kumar.

Semester-I
Course Title: MORAL & VALUE EDUCATION
B. Sc. (PCM/ PCFS/ PMCS/ LSCFS/ ZBC)

Course Code: GPT-301

Credit Hrs.2-0-0

OBJECTIVES

- To explicitly discuss that is implicitly communicated through Academic disciplines.
- To inculcate Life affirming values based on 'Fear of God as the beginning of wisdom'.
- To focus on specific values in decision making process.

Section I – BASICS

- Integrating 'Heart-Head-Hand' – Story of Sam Higginbottom.
- 'Contextual – Dialogical – Praxiological' character of value education.
- Different Values: Academic – Economic – Social – Material – Moral – Spiritual.

Section II – Biblical Foundation

- Proverbs Chapter 2 – 4
- Ten Commandments Exodus 20: 1 – 17
- Two Commandments of Jesus Mark 12: 29 – 31
- Sermon on Mount Matthew chapter 5 – 7
- Lord's Prayer Matthew 6: 9 – 13, Luke 11: 1 – 4
- Parable of Good Samaritan Luke 10: 29 – 37
- Parable of Two Brothers Luke 15: 11 – 32

Section III – Formation of Character

- Voice of Conscience
- Virtues Prudence – Justice – Courage – Discipline – Success – Faith – Hope – Love
- Values of Life Marriage – No same-sex marriage – Divorce – Abortion
- Values of Belonging Family - Friends – Faith Community – Nation – World

Section IV – God – Human – Plants – Animals

- Stewardship of Creation
- Biotechnological Advancement
- Exploitation of Animals & Plants & Micro-Organisms
- Environmental Hazards

Section V – Our Constitution

- Fundamental Rights
- Directive Principles of State Policy
- Fundamental Duties
- Enlightened Citizenship: Ten points of Dr. A. P. J. Kalam

Section VI – Interactive Sessions

- Sexual Harassment
- Corruption
- Substance Abuse
- Violence
- Communalism
- Cyber crime

Course Title: HYDROCARBONS
Semester-II

Course Code-CHEM-423

Credit: 3(2-0-2)

Unit-1: Alkanes: Structure, Nomenclature, Isomerism, Preparation, Properties.

Unit 2: Cycloalkanes: Nomenclature Preparation Properties stability of cyclohexanes-Baeyer strain theory. Sachse-Mohr Concept of Strain less Rings. Conformations of Cyclohexane and its derivatives.

Unit 3: Alkenes: Structure, Nomenclature, Isomerism, Preparation, Properties.

Unit4: Petroleum and Petrochemicals: Composition of Petroleum, Cracking, Octane Number. Synthesis of Pure Chemicals

Unit 5: Alkyl Halids: Structure, Nomenclature, Isomerism, Preparation, Properties.

Unit 6: Organo metallic compounds: Grignard Reagent Structure, Preparation, Properties.

Unit 7: Alcohols: Introduction, Classification. Structure, Nomenclature, Isomerism Preparation, Properties

Course Title: CHEMICAL BONDING & NUCLEAR CHEMISTRY
Semester-II

Course Code: CHEM-424

Credit: 3(2-0-2)

Unit I: Chemical Bonding: Co-valent, Ionic, Metallic, Hydrogen, Vander Waals, Lattice energy, Hydration energy, Fajan's rule, Co-ordinate bond.

Unit II: Nuclear and Radiochemistry.

Course Title: GASES, CHEMICAL EQUILIBRIUM & SURFACE CHEMISTRY
Semester-II

Course Code: CHEM-425

Credit: 3(2-0-2)

1. **Gases:-** Gas laws and kinetic theory of gases, Critical constants and their determination, specific heat ratio, Vander waals equation of state, other equations of state e.g. Berthelot and Dieterici principles of corresponding states. Qualitative treatment of Maxwell law Distribution of velocities.

2. **Chemical Equilibrium:-** Law of mass action, Significance of equilibrium constant, Relation between K_p and K_c , application in homogeneous and heterogeneous equilibria, Le-chatier's principle and its application to chemical equilibrium.

3. **Surface Phenomenon:-** Physical and chemical adsorption, Freundlich, Langmuir and Gibbs Adsorption isotherm, B.E.T. Theory.

Semester-II
Course Title: History of Botany, Algae and Bryophyte

Course Code: BIOL 303

Credit: 3 (2-0-2)

- Unit I Scope of Botany, Phylogenetic trends in botany, contribution of some India Scientist like B. Sahni, M.O.P. Iyengar, P. Maheswari, S. R. Kashyap
- Unit II General Description, classification & economic importance of Algae. Important feature of at least two members of each: Cyanophyceae, Chlorophyceae, Xanthrophyceae, Bacillariophyceae, Phaeophyceae & Rodophyceae.
- Unit III General description, classification & economic importance of Bryophytes. External morphology, Anatomy & reproduction & life cycle of thalloid & leafy bryophytes with special reference to alternation of generation.

Course Title: Invertebrate – II
Semester-II

Course Code: BIOL 304

Credit: 3 (2-0-2)

- Unit I Phylum Annelida: General characters, classification, structure, habit & habitat, metamerism in Annelida, Economic importance of Earthworm.
- Unit II Phylum: Arthropoda: General characters, classification, Insects metamorphosis, Palaemon, Economic importance of Arthropods.
- Unit III Phylum Mollusca: General characters, classification, Torsion & Desertion in Gastropoda, Economic importance of mollusca.
- Unit IV Phylum Echinodermata: General characters, classification, water vascular system in star fish, Regeneration & Autonomy.

PRACTICAL

- Study of morphology of the preserved invertebrate animals in the laboratory.
- Dissection-Cockroach, Grasshopper, Prawn.

Course Title: Molecular biology

Semester-II

Course Code: BIOL 408

Credit: 3 (2-0-2)

UNIT I Basic introduction to molecular biology, Structural aspects of nucleic acids and proteins

UNIT II Replication and transcription in eukaryotes and prokaryotes; regulation and post transcriptional modification; concept of *lac & trp operon*

UNIT III Concept of genetic codon and modern concept of gene

UNIT IV Translation and post translational modification

UNIT V Transposons and extra nuclear inheritance

Practical:

- Basic methodology to molecular biology
- Preparation of reagent
- Protein isolation and quantization
- DNA isolation and agarose gel electrophoresis
- DNA purification

Course Title: Biological Techniques and Instrumentation

Semester-II

Course Code: BIOL 409

Credit: 3(2-0-2)

UNIT I Herbaria Techniques, Microtomy staining techniques, Preparation of permanent mount, specimen preservation techniques

UNIT II Sterilization techniques, culture techniques & cryopreservation

UNIT III Principles, types working and maintenance of: Microscopes, centrifuge, incubator, colorimeter, Spectrophotometer, Electrophoresis and Chromatography

PRACTICAL

- Study of different parts of simple and compound microscopes
- Preparation of Solutions and buffers
- Study of different parts of centrifuge and types of rotors
- Study of electrophoretic apparatus

Semester-II

Course Code:-FS-421

Credit:-3(2-0-2)

Course Title: Crime Scene Investigation

- UNIT-I** **Crime:** - Definition & causation, crime scene, types of crime, processing of crime scene, protection and recording of crime scene, search of physical clues, collection and preservation, packing and forwarding of physical clues to Forensic Science Laboratory.
- UNIT-II** **Protection, Sketching and Photography:** Collecting and Packing of physical clues from the scene of crime in case of Hit and Run, Burglary, House breaking, Road accident, Theft and Dacoity, arson and shooting. Reconstruction and evaluation of scene of crime.
- UNIT-III** **Investigative Techniques:** - Criminals, Criminal behavior, modus operandi, criminal profiling, Portrait parley, Polygraph analysis, Narco analysis, Brain Fingerprinting, Voice stress analysis & Speaker profiling.
- UNIT-IV** **Blood spattering / Pattern analysis** - Introduction, Scope , Significance, Use, its analysis and interpretation in respect of crime scene investigation.

Semester-II

Course Code:-FS-422

Credit:-3(3-0-0)

Course Title: Instrumental and Analytical Technique

UNIT- I Introduction to Instrumental methods of Chemical analysis

General introduction, classification of instrumental method, spectroscopy, properties, of electromagnetic radiation, introduction of electromagnetic radiation with matter origin of spectrum.

UNIT-II Visible spectrophotometry & Colorimetry

Introduction, theory of spectrophotometry & colorimetry, deviation from Beer's law, instrumentation, application of Colorimetry & spectrophotometry.

UNIT-III Emission Spectroscopy

Introductory, theory, instrumentation, spectrograph, application, of emission spectroscopy, advantages and disadvantages of emission spectroscopy.

UNIT – I V Microscopy

Basic principles of simple microscope, phase contrast microscope, stereoscopic microscopic and compound microscope, comparison microscope, polarizing microscope, fluorescent microscope.

UNIT-V Centrifugation Techniques:

Basic principles of sedimentation, various types of centrifuges, Density gradient centrifugation, Preparative centrifugation, Analysis of sub- cellular fractions, Ultra- centrifuge- Refrigerated Centrifuges.

Electrophoretic Technique: - General principles, Factors affecting electrophoresis, Low voltage thin sheet electrophoresis, High voltage electrophoresis, Sodium dodecylsulphate (SDS) polyacrylamide gel electrophoresis, Isoelectric focusing (IEF), Isoelectrophoresis, Preparative electrophoresis, Horizontal and Vertical electrophoresis.

Semester-II
Course Title: STRUCTURAL & SPOKEN ENGLISH
B. Sc. (PCM/ PCFS/ PMCS/ LSCFS/ ZBC)

Course Code: LNG-301

Credit Hours: (2-0-2)

Structure:

- a. Word enrichment (Antonyms, Synonyms, Homophones, Homonyms, Acronyms)
- b. Inflections – Noun
- c. Tenses
- d. Syntax- (SVO Pattern)
- e. Modifiers (Adjective, Adverb, Participle)
- f. Preposition (Usage)
- g. Concord
- h. Determiners (Central Specific)

Spoken English:

- a. Accent and Stress
- b. Rhythm
- c. Self Introduction
- d. Conversation in different Situations
- e. Group Discussions

Speech Techniques:

- a. Organizing
- b. Delivering

Written Communication:

- a. Organizing
- b. Writing (Process)
- c. Resume
- d. Curriculum Vitae
- e. Letter (Components, Request and orders)
- f. Other Communications (Advertisements, Circulars, Invitation, Reports, Proposals)
- g. Usage of Visual Aids in Technical writing.

Books Prescribed:

- Gerson, Sharon J. and Gerson, Steven M. Technical Writing-Process and product, I ed.2000, Pearson Education INC, New Delhi.
- Dickson, Grisalda J.S. Higgin's Technical writing 2004, Godwin Publication, Allahabad.
- Martinet A.V. and Thomason A.J.A Practical English Grammar, IV ed. 1986, Oxford University Press, Delhi
- Agarwal, Malti: Krishnan's Professional Communication, KRISHNA Prakashan Media (P) Ltd. Meerut.

Semester-III

Course Code:-FS-431

Credit-3(2-0-2)

Course Title: Fingerprints Examination

- UNIT-I** Introduction definition ,scope, History and development of Fingerprint Science, formation of ridges, different type of ridge characteristics, classification of fingerprints – Henry system of classification, Single digital classification.
- UNIT-II** Search and collection of Fingerprint, development of latent fingerprints, conventional methods of development of fingerprints – fluorescent method, magnetic power method, fuming method, chemical method etc.
- UNIT-III** Taking of finger prints preserving and lifting of fingerprints, photography of fingerprints, comparison of fingerprints, and basis of comparison, class characteristics, and individual characteristics.
- UNIT-IV** Introduction of Foot prints: Tyre mark, Lip prints, Bite marks and Ear prints.

Semester-III

Course Code:-FS-432

Credit:-3(2-0-2)

Course Title: Document Examination

- UNIT-I** **Introduction & Definition:** Introduction to Document, Classification and types of Document, Nature and problems of document. Procurement of standard admitted / specimen writings, handling and marking of documents, preliminary examination of documents,
- UNIT-II** **Handwriting** Principles and basics of handwriting identification individuality of handwriting, natural variations, process of comparison, various types of documents genuine and forged documents, various writing features and their estimation, general characteristics of handwriting, individual characteristics of handwriting, basic tools needed for forensic documents examination and their use.
- UNIT-III** **Disguised writing and anonymous letters:-** Identification of written, examination of signatures characteristics of genuine and forged signatures, examination of alterations, erasers overwriting, additions and obliterations decipherment of secret, indented and charred documents,

Course Title: Introductory Biochemistry

Semester-III

Course Code: BCBT- 401

Credit: 3(2-0-1)

Unit I: Chemical structure of proteins and their properties, cellular membrane and transport phenomenon.

Unit II: Intermediary metabolism- concept of anabolism and catabolism, metabolism of carbohydrates, lipids and amino acids and their interrelationship.

Unit III: Biological oxidation, electron transport system, oxidative phosphorylation, free energy changes in biochemical reactions, energy changes in biochemical reactions, energy rich compounds.

Unit IV: Metabolism of nucleic acids and proteins.

Unit V: Hormones: regulation of metabolism by various hormones.

Practicals:

1. Specific group tests for carbohydrates
2. Specific group tests for amino acids.
3. Specific tests for lipids.
4. Determination of mil protein, fat and lactose.
5. Determination of acidity in sample.

Course Title: Introductory Microbiology

Semester-III

Course Code: MBFT-349

Credit: 3(2-0-2)

Theory

- Definition, Scope and History of Microbiology
- Cellular organization of prokaryotic and eukaryotic cells
- Difference between prokaryotic and eukaryotic cells
- General characteristics and nature of Bacteria, Mycoplasma, Rickettsiae, Chlamydiae, Actinomycetes, Protozoa, Algae & Viruses

Practical

- Familiarity with equipment to be used in Microbiology Laboratory.
- Cleaning, washing and sterilization of glass wares
- Observation of permanent slides to study the structural characteristics of common bacteria, Fungi, Algae & Protozoa.

Semester-III
Course Title: ALIPHATIC COMPOUNDS

Course Code: CHEM-530

Credit: 3(2-0-2)

Unit 1: Ethers: Structure, Preparation, Properties and uses.

Unit 2: Carbonyl Compounds: Structure, Preparation and properties of Aldehydes and Ketones.

Unit 3: Carboxylic Acid: Classification, Structure, Preparation, Properties.

Unit 4: Di- Carboxylic Acid: Classification, Structure, Preparation, and Properties.

Unit 5: Esters: Structure, Preparation, Properties.

Unit 6: Urea: Structure, Preparation, Properties.

Unit 7: Fats and Oils: Structure and Composition, Properties and Analysis of fats & oils.

Unit 8: Aliphatic Amines: Structure, Preparation, and Properties.

Course Title: MAIN GROUP ELEMENTS
Semester – III

Code-CHEM-531

Credit: 3(2-0-2)

Unit I: Main group elements: Alkali and Alkaline earth metals and p- block elements.

Unit II: Inter halogen compound and pseudo halogens.

Course Title: THERMODYNAMICS –I & IONIC EQUILIBRIUM
Semester – III

CHEM-532

Credit: 3(2-0-2)

1st Law of Thermodynamics- Thermodynamics terms, statement of law, thermodynamics reversibility and maximum work, enthalpy of the system, heat capacity at constant volume and as constant pressure, Extensive and intensive properties, state functions cyclic rule, temperature and volume, enthalpy as a function of temperature and pressure, Joule-Thomson effect.

Thermchemistry- Heat of reaction, formation, combustion and neutralization, Hess's law and its application, Kirchoff's equation, bond energy and resonance energy.

Kinetics of Catalysed Reaction- Kinetics of homogenous acid-base catalysis, enzyme catalysis, negative catalysis and inhibition, Kinetics of gaseous reaction on solid surface, Uni and bimolecular surface reaction, Effect of temperature on surface reaction. Primary salt effect.

Ionic Equilibrium- Concept of acids and bases and their relative strength. Bronsted and Lewis acids and bases, pH and pKa, acid-base concept in non aqueous media, buffer solutions, Theory of acid-base indicators, Salt hydrolysis, Solubility product.

Semester-IV

Course Code:-FS-441

Credit:-2(2-0-0)

Course Title: Ballistics and Photography

- UNIT – I** **History and background of firearms:-** Their classification and characteristics, various component of small arms, smooth bore and class characteristics, purpose of rifling, types of rifling trigger and firing mechanism, improvised / country-made / imitative firearm and their constructional features.
- UNIT-II** **Ammunition:** Definition, History and Classification, constructional features of different types of cartridges, types of primers and priming composition, propellants and their compositions, various types of bullet and compositional aspects.
- UNIT-II** **Introduction to Ballistics:-** Definition, and types, Internal Ballistics, External Ballistics, Terminal Ballistics, Hydro Ballistics & Forensic Ballistics. Various components of Internal, External and Terminal Ballistics, and factors affecting them.
- UNIT- III** **Photography:** History and Development of Photography, Basic principles and techniques of Black & White and colour photography, cameras and lenses, exposing, development and printing, different kinds of developers and fixtures, modern developments in photography, linkage of cameras and film negatives, digital photography. Types of Lighting Used in Photography, Introduction to Crime Scene Photography.

Semester-IV

Course Code:-FS-442

Credit:-2(2-0-0)

Course Title: Explosive

- UNIT-I** Introduction, Definition, Scope, Classification, composition and characteristics of explosives,
- UNIT-II** Explosion, type of explosion, process and effects, types of hazard, effect of blast wave on structures, human etc. specific approach to scene of explosion, post-blast residue collection, preservation and packing
- UNIT-III** Reconstruction of sequence of events, evaluation and assessment of scene of explosion,
- UNIT-IV** Systematic examination of explosives and explosion residues in the laboratory using chemical and instrumental techniques and interpretation of results,
- UNIT-V** Explosives Act. Pyrotechnics, IEDs,

Course Title: Physiology
Semester-IV

Course Code: BIOL 513

Credit: 3(2-0-2)

Unit I Introduction to physiology, Basic understanding to physiological processes with special reference to Human

Unit II Blood circulation system, Nervous system, Digestive system and respiratory system

Unit III Water relation-Movement of water across membranes Ascent of sap, Transpiration,

Unit IV Study of macro & microelements nutrition. Mechanism of photosynthesis, factors regulating photosynthesis. Carbon fixation in C₃, C₄ plants. CAM, structure & function of chloroplast.

Unit V Mechanism of respiration, respiratory substrates & ETC (electron transport chain).

Unit VI Nitrogen metabolism & assimilation. Vernalisation & Photoperiodism. Elementary knowledge of stress physiology.

Practical:

- To determine the bleeding time and clotting time
- Determination of blood groups
- Demonstration of osmosis
- Demonstration of osmotic potential of a cell
- Stomatal studies
- Measurement of rate of transpiration
- Nutrients deficiency symptoms in plants

Course Title: Parasitology
Semester-IV

Course Code: BIOL 514

Credit: 3(2-0-2)

Unit-I Introduction about parasites, types, hosts, types of hosts, schematic steps in parasitological analysis.

Unit-II Habit, habitat, life cycle, pathogenicity, diagnosis, treatment and prophylaxis of *Leishmania donovani* and *Giardia intestinalis* and *Trypanosoma gambiense*.

Unit-III Habit, habitat, life cycle, pathogenicity, diagnosis, treatment and prophylaxis of *Fasciola hepatica*, *Diphyllobothrium latum*, *Paragonimus westermanii* and *Hymenolepis nana* and *Taenia solium*.

Unit-IV Habit, habitat, life cycle, pathogenicity, diagnosis, treatment and prophylaxis of *Ancylostoma dodenale*, *Dracunculus mediansis* and *Wuchereria bancrofti* and *Ascaris lumbricoides*.

Practical:

- Study of museum specimens of Platyhelminthes and Aschelminthes.
- Study of morphology of parasites by means of charts.

Semester-IV
Course Title: AROMATIC COMPOUNDS

Code-CHEM-540

Credit: 3 (2-0-2)

Unit 1: Chlorobenzene: Structure, Preparation, Properties and uses.

Unit 2: Nitrobenzene: Structure, Preparation, Properties and uses.

Unit 3: Aniline: Structure, Preparation, Properties and uses.

Unit 4: Phenols: Structure, Preparation, Properties and uses.

Unit 5: Benzaldehyde: Structure, Preparation, Properties and uses.

Unit 6: Benzophenone: Structure, Preparation, Properties and uses.

Unit 7: Benzoic Acid: Structure, Preparation, Properties and uses.

Course Title: *d* & *f* BLOCK ELEMENTS
Semester-IV

Code-CHEM-541

Credit: 3(2-0-2)

Unit I: *d*-block elements.

Unit II: Platinum metals.

Unit III: *f*- block elements.

Course Title: THERMODYNAMICS-II, PHASE EQUILIBRIUM & RADIO CHEM.
Semester-IV

CHEM-542

Credit 3(2-0-2)

Thermodynamics II: Spontaneous processes, carnot cycle, statement of second law, concept of entropy, combined form of the first and second law of Thermodynamics, enthalpy and entropy. Thermodynamics equation of state (energy as a function of V, & T, enthalpy as a function of T & P), entropy in isolated system, variation of entropy with temperature & volume, variation of entropy with temperature and pressure, Entropy change in chemical reaction. Helmholtz and Gibbs free energies. Properties of Gibbs-Helmoltz equation.

Phase Rule: Phase, component and degree of freedom. Phase rule and its application to one component (water and Sulpher), biocomponent system (Ag + Pb), KI + H₂O).

Radiochemistry: Definition and measurement of radioactivity, rate of atomic disintegration radioactive equilibrium, theory of radioactivity artificial transmutation of elements, induced radioactivity and nuclear energy, nuclear fission and fission, radioactive isotopes.

Semester-V

Course Code:-FS-451

Credit:-3(3-0-0)

Course Title: Forensic Chemistry & Toxicology

- UNIT-I** Forensic Chemistry Introduction, types of cases / exhibits, preliminary screening, presumptive test, inorganic analysis, micro-chemical methods of analysis, examination procedures involving standard methods and instrumental techniques.
- UNIT-II** Analysis of beverages: alcoholic and non-alcoholic, country made liquor, illicit liquor and medicinal preparations containing alcohol and drugs as constituents.
- UNIT-III** Drugs of abuse: introduction, classification of drugs of abuse, drug of abuse in sports, narcotics drugs and psychotropic substances, designer drug and their forensic examination, Drugs and Cosmetic Act, Excise Act, NDPS Act.
- UNIT-IV** Quantitative and qualitative forensic analysis of organic and inorganic industrial products, chemical fertilizers, insecticides, metallic and non metallic products, consumer items such as gold, silver, tobacco, tea, sugar, salts, acids, and alkalis etc.
- UNIT-V** Poison-Administration, action of poison, classification, collection, evaluation, isolation, classical identification techniques, modern technique Chromatography, mass spectroscopy, spectrophotometry, x-ray diffraction.)
- UNIT -VI** Individual Poison- Barbiturate, Arsenic, Organophosphorus Compound, classification, nature, administration, symptoms, detection, Post mortem finding, estimation, toxicological material.
- UNIT-VII** Vegetable poison- Dhatura, oleander, madar (Aak, Akdo) Nature, use, system, fatal dose, fatal period, Post mortem finding, isolation, detection, estimation.

Semester-V

Course Code:-FS-452

Credit:-3(3-0-0)

Course Title: Forensic Serology and DNA Profiling

- UNIT-I Introduction to Serology:** Definition, Types of Body Fluids,(Blood, Semen, Saliva, Sweat, Urine) their properties, Significance, collection, preservation, preliminary and confirmatory tests.
- UNIT- II Introduction to Immunology:-** Definition of Immunology, Immune system, Immune response, Innate & Acquired Immune System, Antigens, Haptens and Adjuvant, Immunoglobulin – Structure, types, physiochemical properties and functions.
- UNIT-III Determination of Origin of Species:-** Determination of human and animal origin from body fluids / stains viz. blood, semen, saliva, sweat, through immuno- diffusion and immuno – electrophoresis techniques.
- UNIT IV Serogenetic markers:-** Blood groups – biochemistry and genetics of ABO, Rh, Mn systems, methods of ABO blood grouping from blood stains and other fluids / stains semen, saliva, sweat, their forensic significance.
- UNIT-V DNA Profiling Structure & Analysis:-** Introduction to Genetics, Genotypes, Phenotypes, Structure and History of DNA, Molecular Biology of DNA, Variations, Polymorphism DNA system. Introduction to DNA Fingerprinting RELP analysis, and PCR amplifications. Application and Forensic Significance of DNA Profiling.

Semester-V
Course Title: CO-ORDINATION CHEMISTRY & ISOMERISM

Course Code-CHEM-551

Credit: 3(2-0-2)

Unit I: Co-ordination Chemistry: Introduction, Nomenclature, Crystal field theory, Valence-shell electron pair theory.

Unit II: Isomerism

Unit III: Non aqueous solvent

Course Title: SOLUTION CHEM. & ADVANCED ELECTROCHEMISTRY
Semester-V

Course Code: CHEM-552

Credit: 3(2-0-2)

Conductance and Transference: Electrolytic conductance and measurement of specific/equivalent. Molecular conductance. Effect of dilution on specific and equivalent conductance. Kohlrausch's law and its applications. Transport number and its determination.

Physical Properties and Chemical Constitution: Molar volume, Parachor, Molecular refraction and polarization, Dipole moment, Delye and Clausius-Mossottic equation (Derivation not required).

Electrochemical Cell: E.M.F. determination, concentration cells with and without transference, liquid junction potential, Chemical cells without transference, fuel cells and their applications.

Course Title: NATURAL PRODUCTS
Semester-V

Course Code-CHEM-550

Credit: 3(2-0-2)

Unit 1: Heterocyclic Compounds: Five membered rings Pyrrole: Structure, Preparation, Properties Furan structure, preparation, properties. Thiophene: structure, preparation, properties. Six membered rings: structure, preparation, properties. Pyridine: structure preparation, properties.

Unit 2: Alkaloids: Classification, Determination of Structure Coniine, Nicotine, Atropine Structure and Properties.

Unit 3: Terpenoids: Isoprene rule, Classification, Structure and Properties of Myrcene, Citral, Camphor.

Unit 4: Polymers: Addition Polymers, Copolymers, condensation Polymers, Thermoplastic and Thermo setting Polymers, Natural and Synthetic Rubber.

Unit 5: Introduction to Spectroscopy: Ultraviolet and Visible Spectroscopy (UV), Infrared Spectroscopy (IS), Nuclear Magnetic Resonance Spectroscopy (NMR), Mass Spectroscopy (MS).

Books Recommended:

1. Reaction Mechanism: S.M.Mukherjee & S.P.Singh.
2. Advanced Organic Chemistry: B.S.Bahl & Arun Bahl.
3. Advanced Organic Chemistry: P.L.Soni & H.M.Chawla
4. Advanced Organic Chemistry: M.K.Jain.
5. Chemistry of Natural Products: O.P.Agarwal.
6. Chemistry of Natural Products: I.L.Finar.

Course Title: Genetics
Semester-V

Course Code: BIOL 523

Credit: 3(2-0-2)

UNIT I Mitosis and Meiosis, Elements of Heredity and Variations. Mendel's experiments and Laws, Principles of segregation and independent assortment, test and back cross.

UNIT II Linkage and crossing over, mutation and mutagens. Human Chromosomes and Human chromosomal abnormalities.

Practical:

- Different types fossils.
- Study of plant specimens used by ethnic groups.

Course Title: Evolutionary Biology
Semester-V

Course Code: BIOL 524

Credit: 3 (2-0-2)

UNIT I Introduction and importance of evolutionary biology. A short history of evolutionary biology.

UNIT II Evolutionary Genetics and diversity.

UNIT III Species Concepts and Intraspecific Geographic variation, genetic drift.

UNIT IV Macroevolution the History of Life Fossils as evidence of evolution, The origin of life, The origin of cells, The origin of multicellular life Evolutionary Genomics and horizontal gene transfer. Evolutionary Developmental Biology. Rates of Evolution Coevolution and coadaptation. Extinction and Radiation

Practical:

- Study of adaptive modification of feet/claws in birds
- Study of adaptive modification in mouth parts in insects
- Study of connecting links during the period of evolution

Semester-V
Course Title: ENVIRONMENTAL STUDIES – I
B. Sc. (PCM/ PCFS/ PMCS/ LSCFS/ ZBC)

Course Code: ENV-415

Credit: (2-0-0)

1: The Multidisciplinary Nature of Environmental Studies
Definition, Scope and Importance

(i) Ecosystems

- Concept of an ecosystem
- Structure and function of an ecosystem
- Producers, consumers and decomposes
- Energy flow in the ecosystem
- Ecological succession
- Food chains, types, Characteristics features, structures and function of the following ecosystem:
 - (a) Forest Ecosystem
 - (b) Grassland Ecosystem
 - (c) Desert Ecosystem
 - (d) Aquatic ecosystem (Ponds, streams, lakes, river, oceans, estuaries.)

(ii) Social Issues and the Environment

- From Unsustainable of sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, water shed management
- Rescurement and rehabilitation of people; Its problems and concerns Case studies
- Environmental ethics, Issues and possible solutions
- Climate change, global warming, and rain ozone layer depletion, nuclear accidents and holocaust, Case studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of pollution) Act.
- Visit to local polluted site-Urban/ Rural/ Industrial/ Agricultural
- Study of Common plants, insects, birds
- Study of simple ecosystems-Ponds, river, Hills/ Pocs etc (Field work equal to 5 lecture hours).
- Issues involved in enforcement of environmental legislation, Public awareness.

Semester-VI

Course Title: ADVANCED ORGANIC CHEMISTRY

Course Code: CHEM-560

Credit: 3(2-0-2)

Unit-1 Organic Photochemistry:- Heterocyclic, Nomenclature, synthesis & reaction of following compounds containing one heteroatom – Structure, preparation & properties.

- (i) Five membered ring system:- Furan, pyrrole, thiophene.
- (ii) Six membered ring:- Pyridine

Unit 2:Polymers: Addition Polymers, Copolymers, condensation Polymers, Thermoplastic and Thermo setting Polymers, Natural and Synthetic Rubber, polyethene & PVC.

Unit-3 Introduction to Spectroscopy:- UV & Visible, IR, NMR, Mass Spectroscopy.

Unit-4 Some reactions of Industrial Importance:- Hoffman, Diel's Alder, Skraup, Bechmann, Cannizaro and Riemann Teimann.

Course Title: SPECTROSCOPY

Semester-VI

Course Code-CHEM-561

Credit: 3(3-0-0)

Unit I: Spectroscopy

- (a) UV
- (b) IR
- (c) NMR
- (d) Raman
- (e) Mass

Books Recommended:

1. Advanced Inorganic Chemistry: Gurdeep Raj, Goel publications Meerut.
2. Text-Book of Inorganic Chemistry: PL.Soni, S.Chand & Sons.
3. Inorganic Chemistry: Satya Prakash Tuli, Basu & Sons, S.Chand & Co.
4. Advanced Inorganic Chemistry: S.K.Agarwala & Keeti Lal, Pragati Prakasan.
5. Inorganic Chemistry: Cotton & Wilkinson.

Course Title: PHOTOCHEMISTRY & ADVANCED WAVE MECHANICS

Semester-VI

Course Code: CHEM-562

Credit: 3(2-0-2)

Photochemistry: Photochemistry and thermal reactions, Chain reaction, free radical chains, thermal decomposition of acetaldehyde and ethane, Lambert and Beer's law, Grothus Draper's law, Elinstin law of decomposition of hydrogen-iodide, hydrogen-bromine etc, Fluoescence, Photosensitization, Phosphorescence Chemiluminescence.

Thermodynamics: Law of mass action (thermodynamic derivation, reaction isotherm and Vant Hoff equation (influence of temperature on equilibrium constant), Partial molar quantities, Chemical potential, Gibbs Duhem equation, Effect of temperature and pressure on chemical potential, Chemical potential of real gases and fugacity, Thermodynamic treatment of colligative properties (lowering vapour pressure, elevation of boiling point, depression of freezing point, osmotic pressure).

Atomic Structure & Wave Mechanic: Bohr's theory, Sommerfeld's model, dual nature of electron, De Broglies concept of the dual nature of the electron, de-Broglies equation, experimental verification (Davisson and Germer's experiment), Heisenbergs uncertainty principle and its derivation-Schrodinger wave equation (derivation), Schrodinger equation with respect to time, Eigen values and functions, Operators (Addition and Substraction of operators, Multiplication, Linear, Hamiltonian, Hermitian), Postuates of Quantum mechanisim, free particle, particles in potential barrier, Particle in one dimensional box, Particle in 3 dimentional box, Simple Harmonic Oscillator, Hydrogen Atom.

Semester-VI

Course Code:-FS-561

Credit:-3(3-0-0)

Course Title: Cyber Forensic

UNIT-I Introduction & Fundamental Concepts: Fundamentals of computers, History of and generation of computers, hardware and accessories, operating system, software. Introduction to networking, LAN, MAN and WAN, types of topology, introduction to internet and its application.

UNIT II Introduction to Computer & Cyber Crimes- Definition, Motives, Mode and manner and types of Computer and cyber crime. Difference between computer crime and cyber crimes

UNIT-III Introduction to Cyber Forensic Search and Seizures of Evidence, Investigation of cyber crimes and tools for analysis. Introduction to Cyber laws and IT security.

Course Title: Quality & Laboratory Management
Semester-VI

Course Code: FS-462

Credit: 3(3-0-0)

- UNIT-II** 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.
- UNIT-II** Laboratory Management, Laboratory information management system, validation and safety equipments.
- UNIT-III** Report Writing and Evidence Evaluation, Components of reports and Report formants in respect of Crime Scene and Laboratory findings. Court Testimony- admissibility of expert testimony, per Court preparations & Court appearance, Examination in chief, cross examination and re-examination, Ethics in Forensic Science.
- UNIT-IV** Cases of Special Importance, Pertaining to forensic examination (Biology, serology, chemistry, toxicology) documents, fingerprints, ballistics, photography and physics, Voice identifications, Tape authentication & Computer frauds pertaining to forensic examination of cases

Course Title: Biodiversity and Taxonomy
Semester-VI

Course Code: BIOL 528

Credit: 3 (2-0-2)

UNIT I Definition and explanation of biodiversity, alpha and beta biodiversity and methods of their study present level of biodiversity and the rate of loss of biodiversity Extent of biodiversity in different groups of animal, plants and microbes Red data books and endangered plant and species *In situ* and *ex situ* conservation, Biodiversity prospecting for pharmaceuticals and agriculture

UNIT-II Animal Taxonomy: Binomial classification Meaning, various systems of classification of animals, its scope and usefulness in zoology.

UNIT III Plant Taxonomy: Types of taxonomy Meaning, various systems of classification of plants, its scope and usefulness in Botany.

Practical:

- Study of floral parts and role of different flower parts
- Study of inflorescence
- Study of different plant families eg. Brassicaceae, Poaceae, Solanaceae Leguminosae.
- Field visit for the concept of Biodiversity

Course Title: Biotechnology
Semester-VI

Course Code: BIOL 529

Credit: 3 (2-0-2)

UNIT I Basic concepts & scope of genetic engineering: significance of genetic engineering in different life forms, Mile stones in genetic engineering. Tools of Genetic Engineering: Cloning vehicles, Restriction enzymes, and other Modifying enzymes, DNA and RNA markers etc.

UNIT II Construction and use of cloning vectors: transposons as vectors. Modes of gene transfer: gene transfer methods in human

UNIT III Molecular markers: Molecular markers in genome analysis with special reference to RAPD, RFLP, AFLP, VNTR, SSR, SNP and their roles in forensic science, genetic counseling and diversity analysis. Gene libraries - Construction and screening of Genomic DNA library and cDNA library,

UNIT IV Modifying Genes: Basic concept of genomics, proteomics, transcriptomics and metabolomics

UNIT V Application of Biotechnology, Biosafety, bioethics and IPR issues

Practical:

- Basic methodology to molecular biology
- Preparation of reagent
- Protein isolation and quantization

Semester-VI
Course Title: ENVIRONMENTAL STUDIES-II
B. Sc. (PCM/ PCFS/ PMCS/ LSCFS/ ZBC)

Course Code: ENV-416

Credit: (2-0-0)

1) Natural Resources

- (a) Forest resources
- (b) Water resources
- (c) Mineral resources
- (d) Food resources
- (e) Energy resources
- (f) Land resources

Role of an individual in conservation of natural resources.

Equitable use of resources for sustainable life style.

2) Biodiversity and its conservation

- (a) introduction- Definition genetic, species and ecosystem diversity
- (b) Bio geographical classification of India.
- (c) Value of diversity consumptive use, productive use, social, ethical aesthet and option values.
- (d) Biodiversity at global, National and local levels.
- (e) India as mega-diversity nation
- (f) Hot – Spots of biodiversity
- (g) Threats to biodiversity habitat loss, poaching of wild life, man-wild life conflicts.
- (h) Endangered and endemic species of India
- (i) Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

3) Environment Pollution

Definition

Causes effect and control measures of

- (a) Air Pollution
- (b) Water Pollution
- (c) Soil Pollution
- (d) Marine Pollution
- (e) Noise Pollution
- (f) Thermal Pollution
- (g) Nuclear hazards

Solid waste Management; Causes, effect and control measures of urban and industrial wastes.

Role of an individual in prevention of pollution

Pollution case studies

Disaster Management: floods, earthquake, cyclone and landslides.