

Matsyodari Shikshan Sanstha's  
**Ankushrao Tope College, Jalna (M.S.)**

Science Faculty

**B.Sc. F.Y./S.Y./T.Y.**

**Department of Physics**

**Department of Chemistry**

**Department of Mathematics**

**Department of Botany**

**Department of Zoology**

**Department of Computer Science**

F. Y. B. Sc.

**COs: Physics**

**101- Paper No I: Mechanics, properties of matter & sound:**

On successful completion of the course the student will be able to-

CO1: To familiarize students with basic concepts of mechanics.

CO2: To have deep understanding of Newton's laws of gravitation and their applications.

CO3: To understand the concepts of viscosity and elasticity thoroughly.

CO4: To understand the phenomena of surface tension and its applications.

CO5: To understand the concept of ultrasonic and acoustics effectively.

CO6: To enable students to solve numerical problems.

**Paper No II: Heat and Thermodynamics**

On successful completion of the course the student will be able to-

CO1: To understand the concept of thermal conductivity and its application.

CO2: To understand the concept of real gases and transform phenomena.

CO3: To enable students to understand the laws of thermodynamics and thermodynamic processes.

CO4: To study the concept of entropy thoroughly.

CO5: To study heat engines and their efficiency.

CO6: To enable students to solve numerical problems.

### **Semester II 104- Paper No IV: Geometrical and Physical Optics**

On successful completion of the course the student will be able to-

CO1: To familiarize students with basic concepts of optics.

CO2: To have deep understanding of cardinal points of optical system.

CO3: To understand the concept of interference thoroughly.

CO4: To enable students to summarize phenomena of diffraction and polarization.

CO5: To enable to solve numerical problems.

### **Paper No V: Electricity and Magnetism**

On successful completion of the course the student will be able to-

CO1: To understand the basic concepts and laws in electrostatics.

CO2: To study the basic concepts and laws in dielectrics.

CO3: To get knowledge of the basic concepts and laws of magnetism.

CO4: To understand the basic concepts of transient current.

CO5: To enable students to solve numerical problems involving topics covered.

### **S. Y. B. Sc. Physics Semester III**

#### **201- Paper No VII : Mathematical, Statistical Physics and Relativity**

On successful completion of the course the student will be able to-

CO1: To familiarize students with the mathematical methods used in physics.

CO2: To familiarize students with the vector algebra.

CO3: To get acquaintance with the differential equations.

CO4: To familiarize students with partial differential equations.

CO5: To familiarize students with classical and quantum statistics.

CO6: To understand the concepts of special theory of relativity.

CO7: To apply mathematical methods to solve problems in physics.

#### **202- Paper No VIII: Modern and Nuclear Physics**

On successful completion of the course the student will be able to-

CO1: To familiarize learners with basic properties of nucleus.

CO2: To have deep understanding of radioactivity and its applications.

CO3: To familiarize students with nuclear forces and elementary particles.

CO4: To understand construction and working of various particle accelerators and detectors.

CO5: To understand photoelectric effect.

CO6: To study different photoelectric cells.

CO7: To enable students to solve numerical problems.

### **Semester IV**

#### **205- Paper No XI: General Electronics**

On successful completion of the course the student will be able to-

CO1: To familiarize students with basic electronic components.

CO2: To understand semiconductors.

CO3: To have deep knowledge of semiconductor devices.

CO4: To familiarize learners with transistor circuits and their characteristics.

CO5: To understand oscillators and multi vibrators.

CO6: To understand the process of modulation and demodulation.

CO7: To solve numerical problems.

#### **206- Paper No XII: Solid state Physics**

On successful completion of the course the student will be able to-

CO1: To familiarize students with basic concepts of structure of solids.

CO2: To familiarize students with characterization techniques.

CO3: To understand bonding and band theory of solids deeply.

CO4: To understand transport properties thoroughly.

CO5: To enable students to solve numerical problems.

## **T. Y. B.Sc. Semester V**

### **54 301- Paper No XV: Classical and Quantum Mechanics**

On successful completion of the course the student will be able to-

CO1: To understand the mechanics of the system of particles.

CO2: To understand d'Albert, principle, Langranges equation and its application.

CO3: To familiarize students with historical background of quantum mechanics.

CO4: To understand wave function and its physical interpretations.

CO5: To familiarize learners with time dependent and time independent

Schrodinger equations and their applications.

CO6: To familiarize students with various operators used in quantum mechanics.

CO7: To enable students to solve numerical problems.

### **Paper No XVI: Electrodynamics**

On successful completion of the course the student will be able to-

CO1: To familiarize students with various differential operators to study the Gauss law.

CO2: To familiarize learners with basic concepts and equations related to time varying fields such as Faradays law, Len's law etc.

CO3: To write expression for pointing vectors for electromagnetic waves.

CO4: To enable to write wave equations.

CO5: To solve numerical problems.

## **Semester VI**

### **305- Paper No XIX: Atomic, Molecular Physics and LASER**

On successful completion of the course the student will be able to-

CO1: To familiarize students with conceptual development of atomic model.

CO2: To understand one and two valence electron systems deeply.

CO3: To understand Zeeman Effect, Paschen back effect, Stark effect etc.

CO4: To understand Molecular Raman Spectroscopy.

CO5: To have deep introduction to lasers.

CO6: To familiarize students with different types of LASERS.

CO7: To understand construction and working of various types of LASERS.

CO8: To be aware with various applications of LASERS.

CO9: To enable students to solve numerical problems.

### **Paper No XX: Non-conventional Energy sources and Optical Fibers**

On successful completion of the course the student will be able to-

CO1: To introduce students with various types of renewable energy sources.

CO2: To familiarize students with applications of solar energy.

- CO3: To familiarize students with applications of biomass energy.
- CO4: To familiarize students with wind mechanics.
- CO5: To create awareness among students about energy conservation.
- CO6: To familiarize students with optical fibers.
- CO7: To familiarize students with applications of optical fibers.
- CO8: To enable students to solve numerical problems.



## **COs of Instrumentation Practice**

### **F. Y. B. Sc.**

#### **Instrumentation I**

On successful completion of the course the student will be able to-

- CO1: To familiarize students with deep knowledge of atom.
- CO2: To have deep understanding of insulators and conductors.
- CO3: To understand the concepts of color code to find the value of resistance.
- CO4: To understand the phenomena of series, parallel combination of resistance and its applications.
- CO5: To understand the concept of Kirchhoff's law of current and voltage.
- CO6: To understand the concept of magnetism.
- CO7: To understand the concept of transformer.
- CO8: To enable students to solve numerical problems involving topics covered.

#### **Paper No II: Instrumentation II**

On successful completion of the course the student will be able to-

- CO1: To understand the concept of instrument.
- CO2: To enable learners to find average measurement.
- CO3: To understand the logarithmic representations.
- CO4: To enable students to understand the basic measurement theory.

CO5: To study the concept of DC measurements.

CO6: To study analog AC measurement.

CO7: To enable the students to solve numerical problems involving topics covered.

### **Paper No IV: Instrumentation III**

On successful completion of the course the student will be able to-

CO1: To familiarize students with basic concepts of n and p type semiconductors and diodes.

CO2: To have deep understanding of LCD.

CO3: To understand the concept of PNP and NPN transistor and their characteristics.

CO4: To enable students to transistor amplifier.

CO5: To understand OP –amplifiers.

CO6: To familiarize students with Timer IC 555.

CO7: To enable students to solve numerical problems. 78

### **Paper No V: Instrumentation IV**

On successful completion of the course the student will be able to-

CO1: To understand the concepts of bridge circuits.

CO2: To study the MultiMate's.

CO3: To get knowledge of cathode ray oscilloscope.

CO4: To enable students to solve numerical problems.

### **Semester III**

#### **Paper No VII: Instrumentation V**

On successful completion of the course the student will be able to-

CO1: To familiarize students with digital numbering systems.

CO2: To familiarize students with binary code system inter-conversions.

CO3: To get acquaintance with Boolean algebra and Logic Gate Operation.

CO4: To familiarize students with partial differential equations.

CO5: To familiarize students with adders and subtractors.

CO6: To apply mathematical methods to solve problems in physics.

#### **Paper No VIII: Instrumentation VI**

On successful completion of the course the student will be able to-

CO1: To familiarize students with OP-amplifiers with their applications.

CO2: To have deep understanding of voltage regulators such as LM 105, LM 723, LM7805, LM 7905 and LM 317.

CO3: To familiarize students with basic low pass and high pass filters.

CO4: To enable students to solve numerical problems.

### **Paper No XI: Instrumentation VII**

On successful completion of the course the student will be able to-

CO1: To familiarize students with basic data controller devices.

CO2: To understand Flip-flops and Sequential Logics.

CO3: To have deep knowledge of J-K Flip flop, Flip flop timing parameters.

CO4: To be familiar with Counter Circuits and Shift Registers.

CO5: To understand Binary ripple counter, Decade counter, BCD counter, Shift register.

CO6: To understand the process of Digital to analog representations.

CO7: To solve numerical problems.

### **Paper No XII: Instrumentation VIII**

On successful completion of the course the student will be able to-

CO1: To familiarize students with signal generators.

CO2: To familiarize learners with XR-2240 timer/counter, XR-2242 timer/counter.

CO3: To understand IC such as IC-556, IC-8038, XR-2206.

CO4: To understand LED and LCD.

CO5: To enable students to solve numerical problems.

## **Semester V**

### **Paper No XV: Instrumentation IX**

On successful completion of the course the student will be able to-

CO1: To understand the mechanics of oscillators such as Sinusoidal,

Colpitte's, Hartley Oscillators etc.

CO2: To understand multi vibrators such as transistorized, mono-stable, bi-stable Schmitt trigger etc.

CO3: To familiarize students with field effect transistors and its characterization.

CO4: To understand the instrumentation amplifiers such as multistage, power amplifiers etc.

CO5: To enable students to solve numerical problems.

### **Paper No XVI: Instrumentation X**

On successful completion of the course the student will be able to-

CO1: To familiarize students with typical applications of instrument systems.

CO2: To familiarize learners with functional element of measurement systems.

CO3: To be able to write expression transducer and it's characteristics.

CO4: To be able to understand microcontroller systems.

CO5: To enable to select proper instrument for measurement.

CO6: To be able to solve numerical problems.

## **Semester VI**

### **Paper No XIX: Instrumentation XI**

On successful completion of the course the student will be able to-

- CO1: To familiarize students with medical instrumentation.
- CO2: To understand biomedical recorder such as ECG, EEG, EOG etc.
- CO3: To understand biological stimulation and controllers.
- CO4: To understand LASER.
- CO5: To familiarize students with applications of LASER.
- CO6: To understand construction and working of different type of LASER.
- CO7: To enable students to solve numerical problems.

### **Paper No XX: Instrumentation XII**

On successful completion of the course the student will be able to-

- CO1: To introduce students with transducers.
- CO2: To familiarize students with different type transducers.
- CO3: To familiarize students with intermediate elements.
- CO4: To familiarize students with A/D and D/A converters.
- CO5: To create awareness among students about indicating, recording, display instruments.
- CO6: To familiarize students with calibration of instruments.
- CO7: To enable students to solve numerical problems.

## **Seminars and Tutorial**

On successful completion of the course the student will be able to-

CO1: To provide scientific and transferable skills through modular lecture courses, research projects, written work, and seminars.

## **COs: Chemistry**

### **B. Sc. Chemistry**

#### **Paper I Inorganic Chemistry**

On successful completion of the course the student will be able to-

CO1: To study the basics of atomic structure - Atomic orbitals, Quantum numbers, Heisenberg uncertainty, Aufbau and Pauli exclusion principles, Hund's multiplicity rule. Electronic configurations of the elements, Bohr's atomic model.

CO2: To understand some periodic properties - atomic and ionic radii, ionization energy, electron affinity and electro negativity with reference to trends in periodic table and application in predicting chemical behavior.

CO3: To study s- and p- block elements.

#### **Paper No. II Organic Chemistry**

On successful completion of the course the student will be able to-

CO1: To understand the basic concepts in organic chemistry- reactions, reagents and mechanisms of organic reactions.

CO2: To study stereochemistry and its importance.

CO3: To familiarize open chain compounds like alkanes, alkenes and aromatic compounds chemistry and their importance.



## **Paper V Physical Chemistry**

On successful completion of the course the student will be able to-

CO1: To understand basic mathematical concepts - logarithmic relations, curve sketching, linear graphs and calculation of slopes, differentiation of functions simple mathematical functions, maxima and minima, partial differentiation.

CO2: To understand kinetic theory of gases, kinetic gas equation, and gas laws - Boyles Law, Charles Law, Grahams Law of diffusion, Avogadro's hypothesis, deviation from ideal behavior, van der Waals equation of state.

CO3: Critical Phenomena: PV isotherms of real gases.

CO4: To study chemical kinetics: Factors influencing the rate of reaction, rate law and characteristics of simple chemical reactions - zero order, first order, second order, Pseudo order, half-life. Arrhenius equation, concept of activation energy. Catalysis: Definition, types, and characteristics, Enzyme catalysis.

CO5: To understand basics of liquid and solid state - Intermolecular forces, structures, liquid crystals: Classification, structure of nematic and cholestric phases.

CO6: To study solids, Miller Indices, laws of crystallography, X-ray diffraction by crystals. Derivation of Bragg equation.

CO7: To familiarize learners with colloidal state.

## **Paper VI Inorganic Chemistry - II**

On successful completion of the course the student will be able to-

CO1: To understand chemical properties of the noble gases, chemistry of xenon, structure and bonding in xenon compounds.

CO2: To understand types of bonds- ionic, covalent and coordinate, Hydrogen bonding, Van-der-Waals forces, Metallic bond Theories of bonding - VBT, VSEPR, MOT with formation and shapes of molecules.

CO3: To understand the basics of nuclear chemistry - Isotopes, Isobars mass, Binding Energy, Packing fraction  $N/Z$  ratio, Radio activity, properties of fundamental particles, Artificial transmutation. Applications with respect to trans-uranic elements, carbon dating.

CO4: To study theory of volumetric analysis - Types of titrations, volumetric apparatus, calibration of pipette and burette, indicators used in pH - titrations, oxidizing agents used in titrations. Theory of internal, external and self-indicators for redox titration.

## **(Organic Chemistry) Paper IX**

On successful completion of the course the student will be able to-

CO1: To understand structure, reactivity, methods of preparation and chemical reactions of different types of compounds - alcohols, Phenols,

aldehydes-ketones, amines and carboxylic acids.

CO2: To study named reactions- Pinacol-Pinacolone rearrangement, Fries Rearrangement, Claisen Rearrangement, Gatterman Synthesis and Reimer Tiemann Reaction, Baeyer-Villiger Oxidation, Benzoin, Aldol Knoevenagel condensations, Mannich Reactions. Hoffmann Bromamide Reactions, Gattermann Koch synthesis, Hell-Volhard-Zelinsky Reaction. Regents in organic chemistry –  $\text{LiAlH}_4$ , LTA, PTC.

CO3: To understand the basic functional group transformations, aromatic electrophilic substitution reactions, nucleophilic additions.

### **(Physical Chemistry-I) Paper X**

On successful completion of the course the student will be able to-

CO1: To understand the basic concepts in thermodynamics.

CO2: To understand the laws of thermodynamics and terms like  $W$ ,  $q$ ,  $du$  and  $dH$  for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process, Hess's law.

CO3: To study Carnot cycle, its applications, concept of entropy, Gibbs and Helmholtz Functions, Criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation  $A$  with  $P$ ,  $V$  and  $T$ .

CO4: To understand equilibrium constant and free energy - law of mass action,

Le Chatelier's principle, Reaction isotherm and reaction isochore, Clapeyron equation, Clausius-Clapeyron equation.

### **(Physical Chemistry-II) Paper XIV**

On successful completion of the course the student will be able to-

CO1: To study the basic terms and laws- Henry law, Raoult's law in phase equilibrium and their applications.

CO2: To understand different systems- Water, Pb-Ag, Mg-Zn, FeCl<sub>3</sub>-H<sub>2</sub>O, phenol-water, trimethyl amine - water, nicotine- water system, acetone-dry ice.

CO3: To understand the concept of ideal behavior and deviations from ideality.

CO4: To understand the concept of conductivity and its types, Kohlrausch's law, Arrhenius Theory of Electrolyte Dissociation, Ostwald's dilution law, Transport number: and its determination, Conductometric titrations.

CO5: To familiarize with types of reversible electrodes, Nernst Equation, Cell E.M.F., single electrode potential, Reference electrodes, Electro-chemical series, Electrolytic and galvanic cells, types of cells, Thermodynamic quantities of cell reactions, Concepts - pH, pK<sub>a</sub> and their determination, Buffers- types, and mechanism of action, Henderson- Hasselbalch equation. Corrosion: Concept, types and electrochemical theory.

### **(Inorganic Chemistry) Paper XIII**

On successful completion of the course the student will be able to-

CO1: To familiarize students with transition elements, lanthanides and actinides with reference to characteristics, position in periodic table and variation in periodic properties.

CO2: To understand concepts and theories in coordination compounds - Werner's co-ordination theory, EAN rule, VBT, isomerism, chelates.

CO3: To understand the concepts of acids and bases - Arrhenius, Bronsted-Lawry, Lux-Flood, Solvent System and Lewis Concept of Acids and Bases

CO4: To study chemical reaction in non-aqueous solvents.

### **Paper XVII Physical Chemistry**

On successful completion of the course the student will be able to-

CO1: To understand concepts in Quantum Mechanics - Black body radiation, Planck's radiation law, photoelectric effect, Bohr's modes of hydrogen atom, Compton Effect. De Broglie Hypothesis, Heisenberg's uncertainty principle, Hamiltonian operator, Schrödinger wave equation postulates of quantum mechanics. Schrödinger wave equation for H-atom.

CO2: To study the basics of spectroscopy - Electromagnetic radiation, regions of the spectrum, Born-Oppenheimer approximation, Rotational Spectrum

- Diatomic molecules, energy levels of a rigid rotor (semi classical principles), selection rule, rotational spectra of rigid diatomic molecule, determination of bond length.

CO3: To understand photochemistry - Photochemical processes, laws of photochemistry, Grothus - Drapper law, Stark-Einstein law, Jablonski diagram qualitative description of fluorescence, phosphorescence, nonradiative processes, quantum yield and photosensitized reactions.

CO4: To study some physical properties and their relation with the assignment of molecular structure- Optical activity, dipole moment, magnetic property.

CO5: To introduce nano-materials - Properties, methods of synthesis and applications.

CO6: To enable students to solve numerical problems.

### **Paper XVIII Organic Chemistry**

On successful completion of the course the student will be able to-

CO1: To introduce learners to organic spectroscopy -  $^1\text{H}$  NMR, shielding and deshielding, chemical shifts, interpretation of PMR spectra of simple organic molecules, combined problems on UV, IR and PMR spectroscopic techniques.

CO2: To familiarize students with organometallic compounds - Structure,

methods of synthesis and synthetic applications of Grignard reagents,

Organozinc and organolithium compounds.

CO3: To understand organic synthesis via enolates - Active methylene compounds, Claisen condensation, Acidity of alpha hydrogen and its synthetic applications.

CO4: To introduce fats, oils and detergents - Saponification value, iodine value, and acid value. Detergents preparation of sodium alkyl sulphonate, alkyl benzene sulphonate, and amide sulphonate, cleansing action of detergent.

### **Paper XIX Organic Chemistry**

On successful completion of the course the student will be able to-

CO1: To understand nature of metal-ligand bonding in transition metal complexes - crystal field theory with respect to octahedral, tetrahedral and square planer complex.

CO2: To familiarize with electronic spectra of transition metal complexes.

CO3: To introduce organo metallic compounds - classification, nomenclature, synthesis and reactions.

CO4: To study the roles and biological functions of metals in biological systems.

CO5: To introduce chromatography - types, classification and applications.

### **Paper No. XVII Organic Chemistry**

On successful completion of the course the student will be able to-

CO1: Curriculum benefits to study the heterocyclic compounds in details, their aromatic characters and importance in medicinal chemistry, structure elucidation of five and six member heterocyclic compounds using molecular orbital theory.

CO2: To understand synthesis and properties of some five and six member heterocyclic compounds.

CO3: To study carbohydrate chemistry and its importance.

CO4: To understand synthesis and properties of some polymers, polymerization reactions.

CO5: To know constitution, classification, synthesis and properties of some dyes.

CO6: To understand constitution, classification, synthesis, properties and applications of some drugs.

### **Seminars and Tutorial**

On successful completion of the course the student will be able to-

CO1: To provide scientific and transferable skills through modular lecture courses, research projects, written work, and seminars.



## **COs: Mathematics**

### **B. Sc.F.Y.**

#### **Mathematics Differential Equations**

On successful completion of the course the student will be able to-

CO1: To understand homogeneous and separable first order differentialequations.

CO2: To understand the exact differential equations.

CO3: To understand homogenous linear equations with constant coefficient and variable coefficients.

CO4: To find the solution of non-homogenous first order differential equations.

CO5: To find the solution of Bernoulli's equation.

#### **Geometry**

On successful completion of the course the student will be able to-

CO1: To understand geometrical terminology for plane, right line, sphere, cylinder and cone.

CO2: To know the geometrical results to find center and radius of the circle.

CO3: Students will be able to find equation of lines and planes in space.

CO4: Student will be able to find angle between two planes and length of perpendicular from a given point to a given line.

CO5: Students will be able to identify parallel and perpendicular lines.

## **Differential and Integral Calculus**

On successful completion of the course the student will be able to-

CO1: To develop the concepts of limit, function, continuity, discontinuity and derivative.

CO2: Students become familiar with hyperbolic functions, inverse hyperbolic functions, derivatives, and higher order differentiation.

CO3: Students understand the consequences of Rolle's Theorem and mean value theorem for differentiable function.

CO4: Students understand definite integrals as the limit of a sum.

CO5: Student will be able to understand the concept of divergence, curl, gradient and its applications.

## **Number Theory**

On successful completion of the course the student will be able to-

CO1: Students will be able to find quotient and remainders from integer division.

CO2: Students apply Euclid's algorithm and backward substitutions.

CO3: Students understand the concept of congruence, residue classes and least residue.

CO4: Student will know the concepts - addition and multiplication of integers modulo.

CO5: Students will be able to solve linear congruence.

## **Numerical Methods**

On successful completion of the course the student will be able to-

CO1: Student becomes familiar with numerical solutions of nonlinear equations in a single variable.

CO2: Students will know the concepts - numerical interpolation and approximation of functions.

CO3: Student can solve first order initial value problem using Euler's method.

CO4: Student can solve first order initial value problem using a second order Runge- Kutta Method.

CO5: Students will be able to find numerical solution of ordinary differential equations. Integral Transform and Partial differential Equations

CO1: Students understand the concept of beta and gamma functions and their applications.

CO2: Students are able use to Laplace transform to solve ordinary and partial differential equations.

CO3: Students can apply properties of Laplace transform to solve examples.

CO4: Students will know the difference between linear and nonlinear partial differential equations.

CO5: Student will be able to solve the linear and nonlinear partial differential equation by various methods like Lagrange's, Charpit's, Jacobi's, Monge's method.

## **Mechanics (I & II)**

On successful completion of the course the student will be able to-

CO1: Students understand the concepts - particle, rigid body, force, equilibrium etc.

CO2: Students can find the components of velocity & acceleration in a given direction.

CO3: Students follow the concepts momentum, angular momentum, work, energy and points functions in mechanics.

CO4: Students will know the concept of projectile and motion of projectile.

CO5: Students will know differential and pedal equations of central orbits and their applications.

## **Abstract Algebra (I & II)**

On successful completion of the course the student will be able to-

CO1: Students will understand the number systems and algebraic structures.

CO2: Students will understand the concept of ring and special types of rings.

CO3: Students can identify the difference between homomorphism and isomorphism of a group.

CO4: Students will know and apply the concepts of linear dependence and linear independence of vectors.

CO5: Students will be able to give the examples of inner product space.

## **Ordinary Differential Equations (I & II)**

On successful completion of the course the student will be able to-

CO1: Students will know the difference between equation and differential equation.

CO2: Students will be able to find the solution of linear differential equation of first and second order.

CO3: Students will understand the initial value problem and its solutions.

CO4: Students will be able to understand the concept Wronskian of solution.

CO5: Students can find singular point and regular singular points of the differential equation.

## **Real Analysis (I & II)**

On successful completion of the course the student will be able to-

CO1: Students become familiar with terminology sets, elements, operations on sets, functions, operations on functions.

CO2: Students can define & recognize basic properties of field of real numbers.

CO3: Students can understand the concept of series of real numbers, convergence and Divergence.

CO4: Students can understand metric space, continuous function on metric space and difference between open sets and closed sets.

CO5: Students will be able to define Riemann integral, Fourier series and their applications.

## **Seminars and Tutorial**

On successful completion of the course the student will be able to-

CO1: To provide scientific and transferable skills through modular lecture courses, research projects, written work, and seminars.

## **COs: Botany**

B. Sc.

### **Botany Diversity of Cryptogams-I**

On successful completion of the course the student will be able to-

CO1: Introduction about basic plant groups like Algae and Fungi.

CO2: To equip the learners with all life science fundamental practical skills.

CO3: To aware learners about the economic and medicinal value of cryptogrammic plants.

### **Morphology of Angiosperms**

On successful completion of the course the student will be able to-

CO1: To introduce to basic structure of plants.

CO2: To develop practical knowledge of Angiosperm plants.

### **Diversity of Cryptogams-II**

On successful completion of the course the student will be able to-

CO1: To understand categories of plants with morphological features of Bryophytes and Pteridophytes.

CO2: To analyze the peculiar characteristic features of plant groups in relation with its internal characteristics.

CO3: To aware learners about economic and medicinal value of cryptogrammic plants.

### **Histology, Anatomy and Embryology**

On successful completion of the course the student will be able to-

CO1: To understand internal structure of plant parts.

CO2: To apply theoretical knowledge in wood industry, forensic science.

CO3: To understand the development of seed and seed certification.

### **Taxonomy of Angiosperm**

On successful completion of the course the student will be able to-

CO1: To familiarize with basic terminology, plant systematic and its different classification.

CO2: To identify angiosperm plants and their use.

### **Plant Ecology**

On successful completion of the course the student will be able to-

CO1: Understanding of anatomical characterization of plants.

CO2: Study of eco-friendly conservation and sustainable utilization.



CO3: Students cope up with the ecosystem mechanism, analyzing plants ecosystem.

CO4: Understanding of ecological adaptations.

### **Gymnosperms and Utilization of plants**

On successful completion of the course the student will be able to-

CO1: To make aware of economic and medicinal value of Gymnosperms and Angiosperms.

CO2: To understand important terminology in industrially and economically important higher plant species.

### **Plant Physiology**

On successful completion of the course the student will be able to-

CO1: To understand plant physiology, life process, plant genetics and plant biotechnology.

CO2: To use the theoretical knowledge for advance study in plant sciences.

### **Cell and Molecular Biology**

On successful completion of the course the student will be able to-

CO1: To create innovative approaches to aware the students in basic terminology of plant cells.

CO2: To understand cell at molecular level.

CO3: To apply theoretical understanding to the development of humankind.

### **Diversity of Angiosperms-I**

On successful completion of the course the student will be able to-

CO1: to create awareness about the plant resources.

CO2: To classify plants on the basis of morphological aspects.

CO3: To participate in laboratory experiments for understanding the basic principles of life sciences and helpful for gaining primary information.

### **Genetics and Biotechnology**

On successful completion of the course the student will be able to-

CO1: To study basic terms in Mendelian and non-Mendelian genetics.

CO2: To focus on biotechnological importance for improvement and satisfaction of all needs of human kind.

CO3: To understand plant biotechnology and its application in agriculture, horticulture, medicinal and industrial crops.

## **Diversity of Angiosperms-II**

On successful completion of the course the student will be able to-

CO1: To study eco-friendly conservation and sustainable utilization of plants.

CO2: To understand flora.

## **Biology and Diversity of Bryophytes, Pteridophytes and Gymnosperms**

CO1: To create the foundation of all plant life cycles of cryptogammic plant species and it correlate with experimental techniques.

CO2: To understand characteristics of non-flowering primitive plants.

CO3: To aware the students about economic and medicinal values of cryptogammic and gymnosperm plant.

## **Ecology and Conservation**

On successful completion of the course the student will be able to-

CO1: To understand plant kingdom system and its ecology.

CO2: To distribute various biomes content for future higher environmental studies.

## **Biodiversity I**

On successful completion of the course the student will be able to-

CO1: To study the major hotspots in world.

CO2: To increase confidence in students and percolate in research field.

CO3: To inculcate botanical techniques among the learners.

## **Biodiversity II**

On successful completion of the course the student will be able to-

CO1: To demonstrate utility for different plant products.

CO2: To study numerical taxonomy, and modern methods of taxonomy.

## **Seminars and Tutorial**

On successful completion of the course the student will be able to-

CO1: To provide scientific and transferable skills through modular lecture courses, research projects, written work, and seminars.

## **COs: Zoology**

### **B. Sc.**

#### **Zoology Protozoa to Annelida**

On successful completion of the course the student will be able to-

CO1: To create awareness about fundamentals of invertebrate animals.

CO2: To understand the nature, classification of phylum system anatomy and development.

CO3: To equip students with life science fundamental practical skills.

#### **Cell biology I**

On successful completion of the course the student will be able to-

CO1: To understand structure and functions of cell organelles in animal cells.

CO2: To study cell structure and the process of cell division.

#### **Protochordata**

On successful completion of the course the student will be able to-

CO1: To introduce learners to higher invertebrates, morphological features, evolutionary development and connecting links and adaptations.

CO2: To analyze peculiar characteristics of animal groups in relation with internal characteristics.

## **Genetics-I**

On successful completion of the course the student will be able to-

CO1: To understand important terminology in genetics, laws, & its applications.

CO2: To observe and calculate probabilities in cross, heredity and variations in genetics.

## **Vertebrate Zoology**

On successful completion of the course the student will be able to-

CO1: To familiarize students with basic terminology and animal systematics.

CO2: To understand classification, anatomy and development of vertebrates.

CO3: To understand classification, morphological structures, identification of specimens and anatomy of some vertebrate animals.

CO4: To understand embryological process of development.

## **Genetics-II**

On successful completion of the course the student will be able to-

CO1: To create awareness of mechanism of protein synthesis, DNA fingerprinting, recombinant DNA technology and rDNA.

CO2: To understand mechanism of protein synthesis and solve problems in genetics.

### **Animal physiology**

On successful completion of the course the student will be able to-

CO1: To study animal processes.

CO2: To understand life processes through experiments.

### **Biochemistry & Endocrinology**

On successful completion of the course the student will be able to-

CO1: To focus on biochemical processes - metabolism and catabolism process.

CO2: To inculcate advance study in biochemical reactions, principle, functioning and & uses of instruments.

### **Ecology**

On successful completion of the course the student will be able to-

CO1: To study basic terms and subject applications in life sciences.

CO2: To understand basic information of types of ecosystems, role of living things in ecosystems and basic ecological concepts.

CO3: To analyze biotic, abiotic factors and animal interactions.

### **Entomology-I**

On successful completion of the course the student will be able to-

CO1: To familiarize students with basic terminology of insects, biodiversity of insects, and their classification.

CO2: To understand morphology, economic importance and anatomy of insects.

CO3: To understand usefulness of insect and their role in agro based industries.

CO4: To enable students to participate in field collection and their identification to understand insect ecology.

## **Evolution**

On successful completion of the course the student will be able to-

CO1: To study basic terms and subject applications in life sciences.

CO2: To participate in laboratory experiments for understanding the basic principles of evolution through models and helpful for gaining primary information.

## **Entomology-II**

On successful completion of the course the student will be able to-

CO1: To understand the useful and harmful insects.

CO2: To familiarize students with basic terminology and damage caused by pest.

CO3: To identify and classify pest and life cycles for their management.

CO4: To know plant protection appliances and its application.



### **Seminars and Tutorial**

On successful completion of the course the student will be able to-

CO1: To provide scientific and transferable skills through modular lecture courses, research projects, written work, and seminars.

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## **COs: Computer Science**

### **Computer Fundamental Course code: CSO1**

On successful completion of the course the student will be able to-

CO1: To make the students familiar with computer environment.

CO2: To familiarize with the basics of Operating System and business communication tools

CO3: To identify parts of a computer system.

CO4: To explain adequately the functioning of computer components.

CO5: To understand problem solving using computers.

CO6: To design an algorithmic solution for a given problem.

### **Digital Electronics: Course code: CSO2**

On successful completion of the course the student will be able to-

CO1: To familiarize with basic concepts of digital electronics.

CO2: To learn number systems and their representation.

CO3: To understand the basic logic gates, Boolean algebra and K-maps.

CO4: To study arithmetic circuits, combinational circuits and sequential circuits.

CO5: Study comparative aspects of logic families.

## **Operating System (CSO4)**

On successful completion of the course the student will be able to-

CO1: To understand structures, functions and history of operating systems.

CO2: To understand designs and issues associated with operating systems.

CO3: To understand process management concepts including scheduling, synchronization, and deadlocks.

CO4: To familiarize learners with multi-threading.

CO5: To study master concepts of memory management including virtual memory.

CO6: To understand master system resources sharing among the users.

CO7: To understand issues related with system interface, implementation, disk management.

CO8: To familiarize with protection and security mechanisms.

## **Programming in C (CSO5):**

On successful completion of the course the student will be able to-

CO1: To understand a programming language.

CO2: To apply problem solving techniques.

CO3: To enable learners to write programs in C-programming and to solve problems.

CO4: To read, understand and trace the execution of programs written in C language.

CO5: to write the C code for a given algorithm.

CO6: To implement programs with arrays and functions.

**Course code: CS07: Advance C-Programming.**

After completing the course, learning will be able .....

CO1: To create user defined functions for specific task in C language.

CO2: To understand the functions, types and working in C programming.

CO3: To understand use of user defined data types such as structures & unions.

CO4: Students will be able to deal with memory using pointers.

CO5: To understand library functions and storage classes in C language.

CO6: To learn pre-processor directives and operators in C language.

CO7: To study files stored on computer memory using file handling.

**Course code: CS08 - Data Structure:**

On successful completion of the course the student will be able to-

CO1: Student will be able to choose appropriate data structure as applied to specified problem definition.

CO2: Student will be able to handle operations like searching, insertion,

deletion and traversing mechanism on various data structures.

CO3: Students will be able to apply concepts learned in various domains like DBMS, compiler construction etc.

CO4: Students will be able to use linear and non-linear data structures like stacks, queues, linked list etc.

### **Course Code: CS011 - Programming in CPP:**

On successful completion of the course the student will be able to-

CO1: To understand basic object oriented concepts & issues involved in effective class design.

CO2: To write C++ programs involving the use object oriented concepts such as information hiding, constructors, destructors, inheritance etc.

### **Course Code: CS012 - DBMS Using SQL:**

On successful completion of the course the student will be able to-

CO1: Understanding the database system basic concepts, architecture, features, purpose, and advantage of DBMS.

CO2: Learning about the component of a DBMS: Users, facilities & structure.

CO3: Learning about data modeling & design.

CO4: Learning about entity-relationship and data model.

CO5: Understanding the basics of relational model, normalization, relational algebra.

CO6: Introduction to oracle.

CO7: Student will be able to deal with database system using SQL to manipulate data.

CO8: Understanding of physical storage of data. 123

**CO9: Learning architecture of database system.**

**CO10: Learning about transaction processing and concurrency control.**

**CSO15- Software Engineering:**

On successful completion of the course the student will be able to-

CO1: To manage selection and initiation of individual projects and of portfolios of projects in enterprise.

CO2: To conduct project planning activities that accurately forecast project costs, timelines, and quality.

CO3: To implement processes for successful resource, communication, risk and change management.

CO4: To demonstrate effective project execution and control techniques that result in successful projects.

CO5: To conduct project closure activities and obtain formal project acceptance.

CO6: To demonstrate a strong working knowledge of ethics and professional responsibility.

CO7: To demonstrate effective organizational leadership and change skills for managing projects, project teams, and stakeholders.

### **CSO16-VB .Net:**

On successful completion of the course the student will be able to-

CO1: To understand the structure and model of programming language VB .Net

CO2: To use the programming language VB.Net for programming technologies.

CO3: To develop software in VB .Net.

CO4: To evaluate user requirements for software functionality required to decide whether the programming language VB .Net can meet user requirements.

CO5: To solve the given problem by applying technologies using implementation of VB.Net programming language.

CO6: To choose an engineering approach for solving problems, starting from acquired knowledge of programming and operating systems. 124

### **CSO19 -Data Communication and Networking:**

On successful completion of the course the student will be able to-

CO1: Understand types of networks, technologies and application of networks.

CO2: Understand types of addresses and data communication.

CO3: Understand the concept of networking models, protocols and functionality of each layer.

CO4: Learn basic networking hardware and tools.

CO5: Understand wired and wireless networks, its types, functionality of layer.

### **CSO20- Ethics and Cyber Law:**

On successful completion of the course the student will be able to-

CO1: To describe laws governing cyberspace and analyze the role of internet governance in framing policies for internet security.

CO2: To discuss different types of cybercrimes and analyze legal frameworks of different countries to deal with these cybercrimes.

CO3: To explain the importance of jurisdictional boundaries and identify the measures to overcome cross jurisdictional cyber-crimes.

CO4: To illustrate the importance of ethics in legal profession and determine the appropriate ethical and legal behavior according to legal frameworks.

CO5: To identify intellectual property right issues in cyberspace and design strategies to protect intellectual property.



CO6: To assess legal issues with online trading, analyze applicable e- contracting and taxation regulations.

CO7: To create security policy to comply with laws governing privacy and develop policies to ensure secure communication.

## **COs: Microbiology**

### **B.Sc. Microbiology B. Sc. I year- Semester I Paper I.**

#### **Fundamentals of Microbiology**

On successful completion of the course the student will be able to-

CO1: To familiarize students with the basic concepts related with viruses and prokaryotic cells.

CO2: To understand the fundamental concepts of microbiology.

CO3: To study molecular and structural unity of microbial life.

#### **Paper II. Microbiological Techniques and General Microbiology**

On successful completion of the course the student will be able to-

CO1: To understand different microbes and microbial techniques.

CO2: To exploit useful microorganisms and the control the harmful ones.

CO3: To isolate microorganisms in pure form and understand the significance of pure culture.

CO4: To understand the methods of cultivation and preservation of microbial cultures.

CO5: To understand and use methods of visualizing microorganisms and practical aspects of sterilizing techniques.

### **Paper V. Cytology and General Microbiology**

On successful completion of the course the student will be able to-

CO1: To identify and describe the parts of a bacterial cell.

CO2: To demonstrate the function of each bacterial cell structure.

CO3: To understand the types of nutrients used by microorganisms for growth and metabolism.

### **Semester II Paper VI. Basic Biochemistry**

On successful completion of the course the student will be able to-

CO1: To study microorganisms.

CO2: To understand the basic concepts of biochemistry.

CO3: To understand carbohydrates, lipids, proteins, nucleic acids, pH and buffers.

### **Semester III Paper VII. Environmental Microbiology.**

On successful completion of the course the student will be able to-

CO1: To understand the significance of air pollution, air sanitation, air as carrier of microorganism and significance of air flora in human health, hospitals and industries.

CO2: To determine the sanitary quality of water.

CO3: To understand the indicators of fecal pollution and methods to sanitize potable water.

CO4: To understand sewage treatment and disposal. 200

### **Semester III Paper VIII. Immunology**

On successful completion of the course the student will be able to-

CO1: To study the significance of normal flora, normal defensive mechanism of host, virulence factors of microorganisms and process of infection.

CO2: To understand the types of immunity and their mechanism, general methods of prophylaxis.

CO3: To understand the immunological concepts with reference to antigens, antibody and antigen- antibody reaction.

### **Paper XI. Applied Microbiology.**

On successful completion of the course the student will be able to-

CO1: To understand the composition of milk, sources of microorganisms in milk, desirable and undesirable changes brought by microorganisms in milk, diseases spread by milk, microbiological examination of milk.

CO2: To understand sterilization and pasteurization of milk.

CO3: To understand the groups of microorganisms in food, principles of food

preservation, microbial spoilage of canned and non- canned foods, food borne diseases, intoxication, fermented foods and probiotics.

#### **Semester IV Paper XII.Clinical Microbiology.**

On successful completion of the course the student will be able to-

CO1: To understand concepts in etiology, pathogenesis laboratory diagnosis, epidemiology, prophylaxis, chemotherapy of human diseases caused by bacteria, viruses, fungus and protozoa.

CO2: To understand diseases caused by microbes such as tuberculosis, syphilis, malaria, typhus fever, candidiasis, typhoid, and cholera, infection caused by Staphylococcus aureus, Streptococcus pneumoniae, HIV, Hepatitis virus, and oncogenic viruses.

#### **B.Sc. III year-**

#### **Semester V Paper XV. Microbial Genetics**

On successful completion of the course the student will be able to-

CO1: To understand and apply the principles and techniques of molecular biology which prepares students for further education and employment in teaching, basic research, or the health professions.

CO2: To study core molecular genetics and concepts including molecular

biology, genetics, cell biology and physiology.

### **Semester V Paper XVI. Microbial Metabolism.**

On successful completion of the course the student will be able to-

CO1: To understand the basic concepts of metabolism and free energy.

CO2: To introduce learners with types of energy yielding metabolism, comparative account of fermentation, respiration and photosynthesis.

CO3: To aware the students of pathways of carbohydrate fermentation.

CO4: To familiarize students with basic concepts of action, functioning and inhibition of enzymes.

CO5: To understand the aspects of aerobic respiration, biosynthesis of nucleotides, catabolism of unsaturated fatty acids and nucleic acids.

### **B.Sc. III year-**

### **Semester VI Paper XIX. Recombinant DNA technology**

On successful completion of the course the student will be able to-

CO1: To understand core molecular genetics concepts including molecular biology, genetics, cell biology and physiology.

CO2: To demonstrate working knowledge in a defined skill set of molecular biology and biotechnology protocols including PCR, plasmid isolation,

gene isolation, cloning and DNA sequencing.

**Semester VI Paper XX.Industrial Microbiology.**

On successful completion of the course the student will be able to-

CO1: To acquaint with historical events in industrial microbiology, design of a fermenter, IP and WHO standards of sterility.

CO2: To familiarize learners with screening methods, preservation of industrial strain, strain improvement methods, inoculum and fermentation medium development.

CO3: To make aware of different typical fermentations such as penicillin, vitamin B12, L-Lysin, ethyl alcohol, citric acid, amylase and Baker's yeast.