

SCIENCE DEPARTMENT

Bachelor of Science (B. Sc.) 2013 Pattern

Faculty : Science
Department : Physics
Programme Name : B.Sc. Physics
Pattern : 2013

Programme Outcomes:

By the end of this Programme, student will be able :

- PO1 : To develop Scientific attitude.
- PO2 : To acquire basic Theoretical, Practical and Technical knowledge of different subjects in the science stream.
- PO3 : To possess subject knowledge required for higher studies, professional and applied courses like Pure Sciences, Applied Sciences, Management Studies, Law etc.
- PO4 : To avail different career opportunities in different fields like Education, Research and Development, IT, Data Analysis ,etc.
- PO5 : To develop solution oriented approach towards various Social and Environmental issues and work towards inculcating and spreading its awareness.

Programme Specific Outcomes:

By the end of this Programme, student will be able:

- PSO1 : To apply the basic principles of Physics to the events occurring around in real life.
- PSO2 : To find out and logically analyse scientific reasoning for various phenomena.
- PSO3 : To communicate scientific information in a précised manner both orally and in writing.
- PSO4 : To skilfully handle practical work, experiments and laboratory in Physics.
- PSO5 : To work independently and to collaborate effectively in team work and team building.

Programme year and Pattern: F.Y.B.Sc. (2013 Pattern)
Semester : 1
Course/Paper Name : Physics Paper 1 : Mechanics
Paper Code : PHY111

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To apply Newton's laws of motion to solve various problems in daily life.
- CO2 : To explain the concepts like zero work done, conservative forces, mass energy equivalence.
- CO3 : To describe effect of force on various types of materials and their physical properties like elasticity, different moduli etc. along with their relation.
- CO4 : To give examples of surface tension in nature and its applications in our day to day life.
- CO5 : To Concept of viscosity of fluids, Bernoulli's Equation and its applications.

Programme year and Pattern: F.Y.B.Sc. (2013 Pattern)
Semester : 2
Course/Paper Name : Physics Paper 1 : Heat and Thermodynamics
Paper Code : PHY121

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To describe various thermodynamic processes like isothermal, isobaric, isochoric processes and laws of thermodynamics.
- CO2 : To define the concept of entropy.
- CO3 : To understand Carnot's cycle, Heat engines and Refrigerators
- CO4 : To understand Principle of thermometry and various types of thermometers like Liquid filled thermometers, Gas filled thermometers, Bimetallic thermometers, Platinum resistance thermometer

Programme year and Pattern: F.Y.B.Sc. (2013 Pattern)
Semester : 1
Course/Paper Name : Physics Paper 2 : Physics Principles and Applications
Paper Code : PHY112

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain structure of atom and its different models.
- CO2 : To describe different forces which hold atoms together to form a molecule and different types of chemical and physical bonds like ionic, covalent, Van der Waal's bonds.
Energy levels of rotational and vibrational diatomic molecule.
- CO3 : To identify and compare the characteristics of electromagnetic spectrum including speed, wavelength and frequency.
- CO4 : To give examples common uses and applications of electromagnetic waves.

CO5 : To explain basic principles of Laser, excitation and de-excitation process, pumping scheme, population inversion and metastable state. Characteristics, applications and different types of laser.

Programme year and Pattern: F.Y.B.Sc. (2013 Pattern)
Semester : 2
Course/Paper Name : Physics Paper 2 : Electromagnetics
Paper Code : PHY122

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain the concepts of the electric force, electric field and electric potential for stationary charges
- CO2 : To calculate electric potential and electric field by using Gauss's law.
- CO3 : To describe dielectric phenomenon and effect of electric field on dielectric.
- CO4 : To correlate the concept of magnetic field, magnetic field for steady currents using Biot-Savart's and Ampere's Circuital laws.
- CO5 : To illustrate magnetic materials and explain its properties.

Programme year and Pattern: F.Y.B.Sc. (2013 Pattern)
Semester : 1 and 2
Course/Paper Name : Physics Paper 3 : Practical
Paper Code : PHY123

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To perform practicals based on simple mechanics, oscillations and electricity which are used in our daily life.
- CO2 : To skilfully handle experimental apparatus.
- CO3 : To systematically write down the report of the experiments performed.

Programme year and Pattern: S.Y.B.Sc. (2013 Pattern)
Semester : 1

Course/Paper Name : Physics Paper 1 : Mathematical Methods in Physics I
Paper Code : PHY211

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To correlate and collaborate Mathematics and Physics.
- CO2 : To Solve problems using of De Moivre's theorem and determine the power of given complex number.
- CO3 : To describe and correlate the mathematical terms like divergence, curl and gradient in Physics.
- CO4 : To apply the concept of partial differentiation in solving Physics situations which have more than one variable.
- CO5 : To explain the need of complex numbers in solving mathematical equations in different branches of Physics like Electricity and Magnetism, Fluid Dynamics and quantum mechanics.

Programme year and Pattern: S.Y.B.Sc. (2013 Pattern)
Semester : 1
Course/Paper Name : Physics Paper 2 : Electronics I
Paper Code : PHY212

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To apply network theorems to solve problems related to complicated circuits by converting them into simpler circuits.
- CO2 : To explain the semiconductors which is a basic materials used in many electronic components like diode, transistors FET, UJT etc.
- CO3 : To explain the Characteristics and working of operational amplifiers.
- CO4 : To explain concepts of regulated power supply, rectifiers, filters and regulators.
- CO5 : To apply logic gates in daily life electrical instruments

Programme year and Pattern: S.Y.B.Sc. (2013 Pattern)
Semester : 2
Course/Paper Name : Physics Paper 1 : Oscillations, Waves and Sound
Paper Code : PHY221

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain the body oscillations without damping amplitude and its significance.
- CO2 : To apply forced oscillations to any object and set it in continuous motion
- CO3 : To explain the Doppler effect and its use in in day-to-day life.
- CO4 : To describe the concepts of sound.

Programme year and Pattern: S.Y.B.Sc. (2013 Pattern)

Semester : 2

Course/Paper Name : Physics Paper 2 : Optics

Paper Code : PHY222

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To create various Image formations related to geometrical optics, Deviation, Magnification, Concept for Equivalent lens and Cardinal Points
- CO2 : To describe different types of monochromatic and chromatic aberrations and Achromatism in lenses
- CO3 : To explain the Construction and working of Simple Microscope, Compound Microscope, Ramsden's Eyepiece and Huygen's Eyepiece
- CO4 : To illustrate concepts of Interference and diffraction of light, Formation of fringes, Resolution
- CO5 : To explain the Concept of Polarization, Double refraction, Construction and working of Nicol Prism

Programme year and Pattern: S.Y.B.Sc. (2013 Pattern)

Semester : 2

Course/Paper Name : Physics Paper 3 : Practical

Paper Code : PHY223

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To perform practicals based on simple mechanics, oscillations and electricity which are used in our daily life.
- CO2 : To skilfully handle experimental apparatus.
- CO3 : To systematically write down the report of the experiments performed.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)

Semester : 3

Course/Paper Name : **Physics Paper 1 : Mathematical Methods in Physics II**
Paper Code : **PHY331**

Course Outcomes:

By the end of this course, student will be able:

- CO1 : The three commonly used co-ordinate systems and general curvilinear co-ordinate system.
- CO2 : To explain the Concept of relativity, length contraction, relativistic mass, time dilation and twin paradox.
- CO3 : To use Various methods to solve different differential equations.
- CO4 : To explain properties of Legendre polynomials, Hermite polynomials and Bessel function.
- CO5 : To solve the problem of linear simple harmonic oscillator in quantum mechanics.

Programme year and Pattern: **T.Y.B.Sc. (2013 Pattern)**
Semester : **3**
Course/Paper Name : **Physics Paper 2 : Classical Electrodynamics**
Paper Code : **PHY332**

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To illustrate basic mathematical concepts related to electromagnetic vector fields.
- CO2 : To explain basic principles and concepts of electromagnetism and magneto statics
- CO3 : To explain Maxwell's equations and boundary value problems. Applications of these equations for solving problems.
- CO4 : To understand the basics of electromagnetic waves, wave equations in free space and pointing theorem.

Programme year and Pattern: **T.Y.B.Sc. (2013 Pattern)**
Semester : **3**
Course/Paper Name : **Physics Paper 3 : Classical Mechanics**
Paper Code : **PHY333**

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To define, present and demonstrate basic mechanical concepts and their applications used in daily life.
- CO2 : To understand the motion of a body, Equations of motions, trajectory of an objects in constant field such as electrical, magnetic field.

- CO3 : To understand how to launch rockets and satellites. Motion of planets and satellites and dynamic molecular collisions. How the mechanical concepts used in sports and military.
- CO4 : To will learn Lagrangian and Hamiltonian formulations, Canonical transformation, Poisson's Bracket concept
- CO5 : To explain Newton's laws such as projectile motion and rocket motion. Also Kepler's laws related to motion. Scattering of particles.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 3
Course/Paper Name : Physics Paper 4 : Atomic and Molecular Physics
Paper Code : PHY334

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain many atomic models to explain atomic structure.
- CO2 : To find out interaction energy from different coupling schemes.
- CO3 : To scientifically understand, how the x-rays produced and what precaution should be taken during handling of x- rays.
- CO4 : To understand the importance rotational and vibrational energy levels.
- CO5 : To draw vector diagrams easily.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 3
Course/Paper Name : Physics Paper 5 : Computational Physics
Paper Code : PHY335

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To Learn the Basic Programming Concept.
- CO2 : To improve the logical as well as Computational ability.
- CO3 : To allocate Memory and utilization technique learning.
- CO4 : To apply computer resources in physics.
- CO5 : To apply Graphical technique using some Graphical Commands in C programming.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 3

Course/Paper Name : Physics Paper 6 : Elective I (Select any One)

Paper Code : PHY336(?)

A: Astronomy and Astrophysics , B: Elements of Materials Science , C: Motion Picture Physics , D: Biophysics , E: Medical Electronics

Course Outcomes:

By the end of this course, student will be able:

CO1 : To

CO2 : To

CO3 : To

CO4 : To

CO5 : To

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)

Semester : 4

Course/Paper Name : Physics Paper 1 : Solid State Physics

Paper Code : PHY341

Course Outcomes:

By the end of this course, student will be able:

CO1 : To differentiate between crystalline and amorphous material, crystal structures, miller indices, interplaner distances, interatomic forces and bonds.

CO2 : To explain understand Bragg's diffraction, Bragg's law. X-ray diffraction and characterization techniques.

CO3 : To explain electrical and thermal conductivity of free electron in metals, Energy levels of free electrons in one and three dimensions.

CO4 : To describe and explain the behaviour of permanent magnet including induced magnetism, behaviour of paramagnetic, diamagnetic, ferromagnetic materials in terms of magnetic domain.

CO5 : To describe superconducting materials, their properties and technological applications of superconductivity.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)

Semester : 4

Course/Paper Name : Physics Paper 2 : Quantum Mechanics

Paper Code : PHY342

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain Quantum Mechanics, Historical background, Matter Waves, Wave particle duality, Phase and Group Velocity, Heisenberg's Uncertainty Principle
- CO2 : To physically interpret of Wave function, Schrödinger's Wave Equation, Eigen Function and Eigen values
- CO3 : To explain the concepts of Free Particle, One Dimensional and Three Dimensional Rigid Box, Potential Barrier
- CO4 : To explain the concepts Spherically symmetric potential, Examples of Rigid Rotor and hydrogen atom
- CO5 : To explain the concepts Hermitian and other operators in Quantum Mechanics, Commutator brackets and concept of parity

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Physics Paper 3 : Thermodynamics and Statistical Physics
Paper Code : PHY343

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To study the transport phenomenon such as viscosity, thermal conductivity, diffusion.
- CO2 : To learn about thermodynamic functions, variables and their relations.
- CO3 : To acquire the skill of solving problems based of particle distribution.
- CO4 : To study about types of ensembles viz. Microcanonical, canonical and grand canonical.
- CO5 : To get the knowledge about Maxwell Boltzmann statistics, Bose Einstein statistics and Fermi Dirac Statistics

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Physics Paper 4 : Nuclear Physics
Paper Code : PHY344

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain Basic properties of nucleus, student got the idea of inner information of the nucleus.
- CO2 : To describe the effects on radiations on human.
- CO3 : To acquaint with importance rotational and vibrational energy levels.
- CO4 : To produce high energy particle which can be used for research purpose
- CO5 : To explain uses of nuclear reactors to produce huge amount of heat energy.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Physics Paper 5 : Electronics II
Paper Code : PHY345

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To design different circuits and working of electronics used in different applications.
- CO2 : To describe Special Purpose diodes like LED, photodiode, Varactor, Optocoupler
- CO3 : To identify Amplifiers, Class A, Class B and Class C , Push Pull emitter follower and differential amplifier
- CO4 : To explain Junction Field Effect Transistor and MOS Field Effect Transistor,
- CO5 : To work with Sequential Logic Circuits, Flip- Flop, Counters and Shift Register

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Physics Paper 6 : Elective II (Select any One)
Paper Code : PHY346

F: Renewable Energy Sources , G: Physics of Nano materials , H: Microcontrollers , I: Electro Acoustics and Entertainment Electronics , J: Lasers , K: Methods of Experimental Physics

Course Outcomes:

By the end of this course, student will be able:

- CO1 :
- CO2 :
- CO3 :
- CO4 :
- CO5 :

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Physics Paper 7 : Laboratory Course I
Paper Code : PHY347

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To perform practicals based on simple mechanics, oscillations and electricity which are used in our daily life.
- CO2 : To skilfully handle experimental apparatus.
- CO3 : To systematically write down the report of the experiments performed.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Physics Paper 8 : Laboratory Course II
Paper Code : PHY348

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To perform practicals based on simple mechanics, oscillations and electricity which are used in our daily life.
- CO2 : To skilfully handle experimental apparatus.
- CO3 : To systematically write down the report of the experiments performed.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Physics Paper 9 : Laboratory Course III(Project)
Paper Code : PHY349

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To perform practicals based on simple mechanics, oscillations and electricity which are used in our daily life.
- CO2 : To skilfully handle experimental apparatus.
- CO3 : To systematically write down the report of the experiments performed.

Faculty : Science
Department : Chemistry
Programme Name : B.Sc. Chemistry

Pattern : 2013

Programme Outcomes:

By the end of this Programme, student will be able :

- PO1 : To develop Scientific attitude.
- PO2 : To acquire basic Theoretical, Practical and Technical knowledge of different subjects in the science stream.
- PO3 : To possess subject knowledge required for higher studies, professional and applied courses like Pure Sciences, Applied Sciences, Management Studies, Law etc.
- PO4 : To avail different career opportunities in different fields like Education, Research and Development, IT, Data Analysis ,etc.
- PO5 : To develop solution oriented approach towards various Social and Environmental issues and work towards inculcating and spreading its awareness.

Programme Specific Outcomes:

By the end of this Programme, student will be able:

- PSO1 : To apply the fundamental knowledge of the basic principles in Chemistry to the real life problems.
- PSO2 : To create awareness about the issues related to Environmental pollution and degradation.
- PSO3 : To do qualitative and quantitative analyses in required in the industrial processes.
- PSO4 : To communicate scientific information precisely and accurately.
- PSO5 : To collaborate Chemistry with other Material Sciences and Life Sciences.

Programme year and Pattern: F.Y.B.Sc. (2013 Pattern)

Semester : 1

Course/Paper Name : Chemistry Paper 1 : Physical and Inorganic Chemistry

Paper Code :

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To apply principles of thermodynamic to different physical and chemical processes
- CO2 : To relate free energy and equilibrium.
- CO3 : To explain concept of ionization, hydrolysis and related concepts such as common ion effect, hydrolysis constant, ionic product and solubility product.
- CO4 : To explain dynamic nature of surface and its applications in catalysis and in dispersed phases will lead to new area of nanoscience.
- CO5 : To explain the concepts of oxidation & reduction, oxidizing agent, reducing agent, redox reaction, oxidation number, Balance the equation by ion electron method & oxidation number method.

Programme year and Pattern: F.Y.B.Sc. (2013 Pattern)
Semester : 1
Course/Paper Name : Chemistry Paper 2 : Organic and Inorganic Chemistry
Paper Code :

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain different theories and principles to reveal of atomic structure, origin of quantum mechanics and time independent Schrodinger equation with meaning of various terms in it.
- CO2 : To apply rules for electrons filling method in various orbitals ,periodic table ,periodicity in properties such as atomic and ionic size ,ionization energies etc.
- CO3 : To describe geometry and effect of lone pairs with examples
- CO4 : To Compare different types of hybridization.
- CO5 : To define various types of bonds, characteristics of ionic bond ,summarize BornLand equation and Born-Haber cycle.

Programme year and Pattern: F.Y.B.Sc. (2013 Pattern)
Semester : 1
Course/Paper Name : Chemistry Paper 3 : Practical
Paper Code :

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To handle experiments and required apparatus skilfully.
- CO2 : To obey Laboratory etiquettes
- CO3 : To prepare normal and molar solution.
- CO4 : To calculate molecular weight, equivalent weight, normality, and molarity

Programme year and Pattern: S.Y.B.Sc. (2013 Pattern)
Semester : 2
Course/Paper Name : Chemistry Paper 1 : Physical and Analytical Chemistry
Paper Code : CH211

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain laws in Kinetics
- CO2 : To explain concepts in Photochemistry
- CO3 : To explain concepts in Chemical analysis
- CO4 : To describe Thermodynamical phenomena of free energy and equilibria
- CO5 : To apply basics of Volumetric Analysis and titration curves in practical life industrial processes.

Programme year and Pattern: S.Y.B.Sc. (2013 Pattern)
Semester : 2
Course/Paper Name : Chemistry Paper 2 : Organic and Inorganic Chemistry
Paper Code : CH212

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To define concepts of stereochemistry (chirality, optical activity, enantiomers, etc.) of cyclohexane and other organic compounds.
- CO2 : To illustrate Addition, Elimination, substitution (aliphatic electrophilic and nucleophilic and rearrangement reactions).
- CO3 : To describe General Principles of Metallurgy in metal extraction
- CO4 : To explain Corrosion and Passivity in metals.
- CO5 : To recognize different hybridizations in organic compounds.

Programme year and Pattern: S.Y.B.Sc. (2013 Pattern)
Semester : 2
Course/Paper Name : Chemistry Paper 1 : Physical and Analytical Chemistry
Paper Code : CH221

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain Thermodynamical phenomena of free energy and equilibria
- CO2 : To draw P-N, T-N diagrams
- CO3 : To describe liquid solution miscibility features.
- CO4 : To solve mathematical problems based on normality and molarity.
- CO5 : To apply basics of Volumetric Analysis and titration curves.

Programme year and Pattern: S.Y.B.Sc. (2013 Pattern)
Semester : 2

Course/Paper Name : **Chemistry Paper 2 : Organic and Inorganic Chemistry**
Paper Code : **CH222**

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To differentiate between oxidizing and reducing reagents.
- CO2 : To draw and illustrate the structure, properties, synthesis and reactions five and six member heterocyclic compounds
- CO3 : To describe different properties of different biomolecules.
- CO4 : To give applications of organometallic compounds.
- CO5 : To identify toxic chemicals in the environment.

Programme year and Pattern: **S.Y.B.Sc. (2013 Pattern)**
Semester : **2**
Course/Paper Name : **Chemistry Paper 3 : Chemistry Practical**
Paper Code : **CH223**

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To apply different techniques Inorganic Qualitative as well as Quantities analysis
- CO2 : To apply different techniques Organic Qualitative analysis
- CO3 : To handle experiments and required apparatus skilfully.
- CO4 : To obey Laboratory etiquettes

Programme year and Pattern: **T.Y.B.Sc. (2013 Pattern)**
Semester : **3**
Course/Paper Name : **Chemistry Paper 1 : Physical Chemistry**
Paper Code : **CH331**

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To identify the molecularity of chemical reactions and experimentally determine the order of the reaction.
- CO2 : To describe the application of molecular spectroscopy in the identification molecular structure.
- CO3 : To explain different phases of substances change with respect to the change in pressure and temperature.

CO4 : To conclude which electrolyte is strong and weak based on dissociation constant by conductance measurements.

CO5 : To calculate the rate of reaction and factors which can affect the rate of reaction.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 3
Course/Paper Name : Chemistry Paper 2 : Inorganic Chemistry
Paper Code : CH332

Course Outcomes:

By the end of this course, student will be able:

CO1 : To apply knowledge in the practical chemical processes.

CO2 : To name coordinate complexes using IUPAC nomenclature.

CO3 : To explain isomerism in coordinate complexes.

CO4 : To give applications of VBT, CFT, MOT in coordination chemistry.

CO5 : To draw MOT diagrams of homonuclear diatomic molecules from H₂ to Ne₂.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 3
Course/Paper Name : Chemistry Paper 3 : Organic Chemistry
Paper Code : CH333

Course Outcomes:

By the end of this course, student will be able:

CO1 : To summarize the importance of IUPAC nomenclature of organic compounds.

CO2 : To draw their structures and name them.

CO3 : To compare acidity and basicity of organic compounds and illustrate factors like inductive, resonance, hyper-conjugation and tautomerism effects.

CO4 : To explain Stereochemistry of di-substituted cyclohexane and the relative stabilities

CO5 : To illustrate the nucleophilic substitutions, addition and elimination reactions and guess products in such reactions.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 3
Course/Paper Name : Chemistry Paper 4 : Analytical Chemistry

Paper Code : CH334

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain the technique of Polarography
- CO2 : To explain the technique of Spectrophotometric analysis
- CO3 : To describe the technique of Gravimetric analysis
- CO4 : To describe the technique of Electrogravimetric analysis
- CO5 : To apply the above techniques

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)

Semester : 3

Course/Paper Name : Chemistry Paper 5 : Industrial Chemistry

Paper Code : CH335

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To describe various methods of preparation of various important chemicals.
- CO2 : To explain synthesis and applications of Agrochemicals.
- CO3 : To tell functioning of industry and safety measures in industry.
- CO4 : To connect the theory with the processes carried out in the industries synthesizing chemicals.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)

Semester : 3

Course/Paper Name : Chemistry Paper 6 : Environmental and Green Chemistry

Paper Code : CH336(D)

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To recognize the processes that cause pollution.
- CO2 : To get awareness of environmental problems occurring due to pollution and other man made activities.
- CO3 : To develop interest in making new methodologies for reducing pollution or harm caused by man-made activities to the environment.
- CO4 : To apply Green chemistry rules to different industrial processes to reduce pollution.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Chemistry Paper 1 : Physical Chemistry
Paper Code : CH341

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain Uncertainty of position and momentum in microscopic particles.
- CO2 : To state applications of various tracers used in medicines and other fields of research.
- CO3 : To draw the different crystal structures and explain different elements of symmetry and to calculate the d spacing in crystal structure and theta values in XRD analysis
- CO4 : To calculate the degeneracy of molecules, energy change during excitations and bond length of molecules.
- CO5 : To identify Radioactive nuclides and explain the decay of specific particles through nuclear reactions and also calculate the decay constant, half life of radioactive nuclides

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Chemistry Paper 2 : Inorganic Chemistry
Paper Code : CH342

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To describe Metalloproteins, Haemoglobin and Myoglobin.
- CO2 : To explain the meaning of the terms f-block elements, inner transition elements, lanthanides, actinides.
- CO3 : To illustrate Homogeneous and heterogeneous catalysis with examples.
- CO4 : To differentiate between metal, semiconductor and insulator.
- CO5 : To draw the cubic, BCC and FCC structures

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Chemistry Paper 3 : Organic Chemistry
Paper Code : CH343

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To illustrate the structure, reactivity of carbanions and rearrangements useful in designing organic syntheses
- CO2 : To describe basics of natural products alkaloids and terpenoids and general methods for determination of their structure.
- CO3 : To describe basic synthetic methods and use of spectral data in organic chemistry
- CO4 : To understand basic principles of organic spectroscopy and deduce structures of molecules by exploring the given spectral data of UV, IR and PMR
- CO5 : To explain the concept of retrosynthetic analysis of a target molecule and strategically plan synthesis of any given target.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Chemistry Paper 4 : Analytical Chemistry
Paper Code : CH344

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To describe the techniques of Solvent Extraction and Electrophoresis.
- CO2 : To describe the techniques of Nephelometry and Turbidimetry.
- CO3 : To define the basics of Chromatography and types.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Chemistry Paper 5 : Industrial Chemistry
Paper Code : CH345

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To give applications of polymer chemistry, their synthetic methods and utilization in real life.
- CO2 : To explain the synthetic process of sugar and fermentation process
- CO3 : To explain the synthesis of dyes and paints.
- CO4 : To recognize pollution prevention and waste management
- CO5 :

Programme year T.Y.B.Sc. (2013 Pattern)

and Pattern:

Semester : 4
Course/Paper Name : Chemistry Paper 6 : Environmental and Green Chemistry
Paper Code : CH346

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To apply different methods of water treatment and effluent management.
- CO2 : To perform various instrumentation methods in environmental analysis.
- CO3 : To explain energy relations and the process of water being used as a solvent in various organic and inorganic reaction (Universal solvent).
- CO4 : To understand various types of soil and their nature and also the fertility of soil.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)

Semester : 4
Course/Paper Name : Chemistry Paper 7 : Physical Chemistry Practicals
Paper Code : CH347

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To identify the molecularity of chemical reactions.
- CO2 : To measure different physical parameters and handling of chemical reactions based on any physical parameters
- CO3 : To plot graphs and calculate the values essential for different experimentation.
- CO4 : To prepare solutions of specific required molarity, normality, molality and density by using suitable apparatus
- CO5 : To calculate the rate of reaction experimentally and determine the order of the reaction.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)

Semester : 4
Course/Paper Name : Chemistry Paper 8 : Inorganic Chemistry Practicals
Paper Code : CH348

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To identify the basic radicals and acidic radicals present in binary inorganic mixture.

- CO2 : To prepare inorganic coordination complexes
CO3 : To use column chromatography to analyse binary cationic mixture.
CO4 : To apply techniques of gravimetry and colorimetry for quantitative analysis

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Chemistry Paper 9 : Organic Chemistry Practicals
Paper Code : CH349

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To identify, separate and analyse qualitatively mixtures of organic compounds efficiently.
CO2 : To carry out quantitative estimation of organic compounds.
CO3 : To carry out syntheses of small organic molecules on micro scale.
CO4 : To apply the basic techniques and their use for analyses, syntheses, and research and also basic computer skills.
CO5 : To develop analytical independent thinking required for academics, research and industrial work.

Faculty : Science
Department : Botany
Programme Name : B.Sc. Botany
Pattern : 2013

Programme Outcomes:

By the end of this Programme, student will be able :

- PO1 : To apply the fundamental knowledge of the basic principles of major fields of biology.
PO2 : To apply the concepts in conservation of indigenous, medicinal, endemic and endangered plant species.
PO3 : To develop ethics in work and reverence for self and others.
PO4 : To convey and practice to follow the social, environmental and biological ethics.
PO5 : To analyse of plant materials in the context of plant physiology and biochemistry.

Programme Specific Outcomes:

By the end of this Programme, student will be able:

- PSO1 : To explain Biodiversity, climate change and plant pathology.

- PSO2 : To effectively communicate scientific information in a precise manner.
- PSO3 : To apply Biotechnology, Ecology, Genetics and Plant breeding techniques in plant sciences.
- PSO4 : To collaborate effectively on team-oriented projects in the field of life
- PSO5 : To apply knowledge of Medicinal and Economic botany in day to day life.

Programme year and Pattern: F.Y.B.Sc. (2013 Pattern)

Semester : 1

Course/Paper Name : Botany Paper 1 : Plant Diversity

Paper Code : BO111

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain the kingdom classification systems of living things
- CO2 : To acquaint the status of cryptogams as a group in plant kingdom.
- CO3 : To discuss about morphological structure, classification and reproduction of thallophytes (Algae, Fungi, Lichens) and Bryophytes.
- CO4 : To describe the life cycles of selected genera of thallophytes (Algae, Fungi, Lichens) and Bryophytes
- CO5 : To spread awareness economic and ecological importance of Algae, fungi, Lichens and Bryophytes.

Programme year and Pattern: F.Y.B.Sc. (2013 Pattern)

Semester : 2

Course/Paper Name : Botany Paper 1 : Plant Diversity , Plant Morphology and Anatomy

Paper Code : BO111

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain the importance of plant morphology in allied branches of botany
- CO2 : To explain various floral whorl and its importance in plant reproduction
- CO3 : To apply the concepts of anatomy in other allied branches of botany
- CO4 : To describe different tissues present in plant their structure
- CO5 : To differentiate the internal organization of two distinct plant group and plant parts

Programme year F.Y.B.Sc. (2013 Pattern)

and Pattern:

Semester : 1
Course/Paper Name : Botany Paper 2 : Industrial Botany I
Paper Code : BO112

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To illustrate Plant resources and industries: Food, fodder, fibres, medicines, timber, dyes, gum, tannins.
- CO2 : To explain Importance floricultural crops, open cultivation practices, harvesting and marketing of Tuberose.
- CO3 : To describe various methods of Propagation: Seed propagation, natural vegetative propagation and artificial vegetative propagation (Cutting: Stem, Layering: Air layering, Grafting: Stone grafting and Approach grafting, Budding : Tbudding)
- CO4 : To get knowledge of Commercial significance of Botany.
- CO5 : To understand Mushroom cultivation.

Programme year and Pattern: F.Y.B.Sc. (2013 Pattern)

Semester : 2
Course/Paper Name : Botany Paper 2 : Industrial Botany II
Paper Code : BO112

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To apply concepts in Bio-Fertilizer , Bio-fuel industries and Bio-pesticide industries
- CO2 : To illustrate different types of pharmaceutical products: Churna, Asava and Arishta
- CO3 : To apply knowledge in processing of canned fruits, dried fruit chips, fruit pulp, squash, jam, jelly, pickle and ketchups
- CO4 : To explain role of bacteria and fungi in Nitrogenous fertilizers.
- CO5 : To describe products and applications of Trichoderma, Penicillium, Aspergillus and yeast.

Programme year and Pattern: F.Y.B.Sc. (2013 Pattern)

Semester : 1 and 2
Course/Paper Name : Botany Paper 3 : Practical
Paper Code : BO113

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To identify various life forms of plants, design and inter-relations.
- CO2 : To execute experiments related to basic studies on evolution, ecology, developmental biology, physiology, biochemistry, plant interactions with microbes and insects, morphology, anatomy, reproduction, genetics, microbiology etc.
- CO3 : To apply the theoretical knowledge to real life cases
- CO4 : To conduct experiments practically both in field and laboratory.
- CO5 : To conduct experiments based on Plant Diversity , Plant Morphology and Anatomy and Industrial Botany

Programme year and Pattern:

S.Y.B.Sc. (2013 Pattern)

Semester :

1

Course/Paper Name :

Botany Paper 1 : Taxonomy of Angiosperms and Plant community

Paper Code :

BO211

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To Identify and classify plants according to their characteristics, genera and species
- CO2 : To explain types of systems with their merits and limitations
- CO3 : To apply the concepts of Flora, monograph, revisions, manuals, journals, periodicals and references books in research.
- CO4 : To use Sources of data for Systematics
- CO5 : To name plants according to the Botanical Nomenclature

Programme year and Pattern:

S.Y.B.Sc. (2013 Pattern)

Semester :

1

Course/Paper Name :

Botany Paper 2 : Plant Physiology

Paper Code :

BO212

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To define the terminologies: Plant water relations, Growth, Transpiration, Ascent of Sap, Plant growth regulators and Nitrogen metabolism.
- CO2 : To explain processes of mineral nutrition, absorption of water, ascent of sap, mechanisms of water loss from plants.
- CO3 : To demonstrate processes imbibition, Osmosis, Diffusion and Plasmolysis, measure growth by arc auxanometer, Bose Cresco graph.
- CO4 : To describe Plant growth regulators and their types and Discuss nitrogen metabolism

in plants

CO5 : To explain mechanisms and application of photoperiodism, vernalisation and classify the plants based on Photoperiodism.

Programme year and Pattern: S.Y.B.Sc. (2013 Pattern)
Semester : 2
Course/Paper Name : Botany Paper 1 : Plant Anatomy and Embryology
Paper Code : BO221

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To define terms related to plant Anatomy, Embryology.
- CO2 : To describe various tissue systems in plants like epidermal, mechanical and vascular.
- CO3 : To differentiate between Normal secondary growth and Anomalous secondary growth
- CO4 : To illustrate the structure and function of xylem, phloem and cambium
- CO5 : To explain concepts like inflexibility, incompressibility, inextensibility and shearing stress,

Programme year and Pattern: S.Y.B.Sc. (2013 Pattern)
Semester : 2
Course/Paper Name : Botany Paper 2 : Plant Biotechnology
Paper Code : BO222

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To know various applications of Plant Biotechnology.
- CO2 : To describe the Uses of Plants and Fungi in enzyme technology-based industries and in in fermentation industries
- CO3 : To explain the Single cell protein manufacturing process
- CO4 : To apply basic knowledge of plant genetic engineering
- CO5 : To explain the concepts of Bio-nano technology and its applications in Agriculture

Programme year and Pattern: S.Y.B.Sc. (2013 Pattern)
Semester : 2
Course/Paper Name : Botany Paper 3 : Practical based on theory courses (Paper I and Paper II)

Paper Code :

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To identify various life forms of plants, design and inter-relations.
- CO2 : To execute experiments related to basic studies on evolution, ecology, developmental biology, physiology, biochemistry, plant interactions with microbes and insects, morphology, anatomy, reproduction, genetics, microbiology etc.
- CO3 : To apply the theoretical knowledge to real life cases
- CO4 : To conduct experiments practically both in field and laboratory.
- CO5 : To conduct experiments based on Taxonomy of Angiosperms and Plant community , Plant Physiology , Plant Anatomy and Embryology and Plant Biotechnology

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 3
Course/Paper Name : Botany Paper 1 : Cryptogamic Botany
Paper Code : BO331

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To describe characters of Cryptogams
- CO2 : To inform Chapman and Chapman system of classification used for cryptogams.
- CO3 : To explain the life cycle of Rhizopus, Saccaromyces, Puccinia and Cercospora
- CO4 : To illustrate Bryophytes and Pteridophytes
- CO5 : To explain lifecycle of Marchantia, Anthoceros, Polytrichum, Psilotum, Selaginella and Marsilea.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 3
Course/Paper Name : Botany Paper 2 : Cell and Molecular Biology
Paper Code : BO332

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To define different terminologies related to cell and molecular biology.
- CO2 : To identify localization and describe all cell organelles.
- CO3 : To discuss the dynamics of plant cell structure and function, Nucleus and chromosomes.

- CO4 : To describe the processes of DNA replication, Transcription and Translation.CO7 Explain gene action and regulation (concept of operon, its structure and regulation).
- CO5 : To interpret the genomic organization and its role in gene expression

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 3
Course/Paper Name : Botany Paper 3 : Genetics and Evolution
Paper Code : BO333

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To understand the genetic terminology of genetics and laws of mendelism.
- CO2 : To solve the various example of interaction of genes and multiple alleles
- CO3 : To construct linkage map by test cross
- CO4 : To differentiate various types of inheritance and structural changes in chromosome.
- CO5 : CO 5 Understanding the concept, Evidences of Evolution and population genetics.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 3
Course/Paper Name : Botany Paper 4 : Spermatophyta and Palaeobotany
Paper Code : BO334

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain the different members of higher plant group (Phanerogams) when they see and they can make systematics of them
- CO2 : To understand plant composition in natural communities
- CO3 : To apply economical use of families helps to understand potential of plants in various industries
- CO4 : To handle various tools used in plant identification in laboratory as well as in field.
- CO5 : To understand the pattern of higher plant evolution over the time period

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 3
Course/Paper Name : Botany Paper 5 : Horticulture and Floriculture
Paper Code : BO335

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To understand the importance of Horticulture and Horticulture zones of Maharashtra and India.
- CO2 : To explain branches of Horticulture on the basis of uses, climatic condition, life cycle pattern of plants.
- CO3 : To apply techniques of artificial and natural propagation.
- CO4 : To describe different treatments for changing flowering season according demand in the market.
- CO5 : To give information about types of gardens and floriculture technology.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 3
Course/Paper Name : Botany Paper 6 : Computational Botany
Paper Code : BO336

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To state the claim or hypothesis clearly by using experimental data.
- CO2 : To condense the data into systematic manner i.e. in tabular form.
- CO3 : To represent data which is in tabular form into various graphical methods.
- CO4 : To explain the Use of different scales or measurements related to centrality, viability and symmetry of data.
- CO5 : To solve statistical problems based on co-relation and regression, testing of hypothesis.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Botany Paper 1 : Plant Physiology and Biochemistry
Paper Code : BO341

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain the Significance of photosynthesis.
- CO2 : To differentiate between the Concepts of abiotic, biotic and xenobiotic stresses.
- CO3 : To explain the Mechanism of translocation – Pressure flow theory, Diffusion, Source to sink relationship, Phloem loading and unloading

CO4 : To describe different biomolecules like Carbohydrates, Amino acids and proteins and Lipids.

CO5 : To classify enzymes.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Botany Paper 2 : Plant Ecology and Biodiversity
Paper Code : BO342

Course Outcomes:

By the end of this course, student will be able:

CO1 : To inter-relate living world and the environment, levels of organization, components and dynamism of ecosystem, homeostasis, niche concept, concept of limiting factors

CO2 : To explain different types of ecologies.

CO3 : To describe differnt concepts like Environmental Audit, Remote Sensing and Ecological management.

CO4 : To to illustrate different Biogeochemical cycles like carbon cycle, Nitrogen cycle, Phosphorus cycle, and Hydrologic cycle

CO5 : To correlate Biology and Geography.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Botany Paper 3 : Plant Pathology
Paper Code : BO343

Course Outcomes:

By the end of this course, student will be able:

CO1 : To define basic Fundamentals of plant pathology

CO2 : To elaborate the terminologies like disease cycle, Inoculation, Prepenetration, Penetration, Infection and Dissemination.

CO3 : To explain the Defence Mechanisms of the body.

CO4 : To illustrate Fungal , Bacterial, Mycoplasma and Nematodal Plant Diseases

CO5 : To illustrate Viral and non-parasitic Plant Diseases.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Botany Paper 4 : Medicinal and Economic Botany

Name :

Paper Code : BO344

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To describe the importance of Ayurveda in the field of medicine.
- CO2 : To be aware of Conservation of endangered and endemic medicinal plants
- CO3 : To illustrate the Folk medicines of ethnobotany, ethnomedicine, ethnoecology, ethnic communities of India
- CO4 : To apply the methods in nursery.
- CO5 : To apply natural products to certain diseases Jaundice, cardiac, infertility, diabetics, Blood pressure and skin diseases.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)

Semester : 4

Course/Paper Name : Botany Paper 5 : Plant Biotechnology

Paper Code : BO345

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To describe work and significant achievements in Indian plant Biotechnology Global Impact and Current excitements of plant Biotechnology - Plant Health care and plant protection.
- CO2 : To illustrate applications of callus culture, cell suspension culture, protoplast culture.
- CO3 : To distinguish between In situ and Ex situ conservation
- CO4 : To explain Transgenic Plants as Bioreactors
- CO5 : To apply the technique of Biological Nitrogen Fixation.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)

Semester : 4

Course/Paper Name : Botany Paper 6 : Plant Breeding and Seed Technology

Paper Code : BO346

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To apply Conventional techniques, methods and practice breeding
- CO2 : To apply Hybridization in real life situations.

- CO3 : To describe different types of Breeding's.
- CO4 : To convey Importance of Polyploidy and aneuploidy in crop improvement
- CO5 : To apply techniques of Seed sampling, storage and packaging

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)

Semester : 4

Course/Paper Name : Botany Paper 7 : Practicals Based on BO.331: Cryptogamic Botany , BO. 332: Cell and Molecular Biology , BO.341: Plant Physiology & Biochemistry , BO.345: Plant Biotechnology

Paper Code : BO347

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To identify various life forms of plants, design and inter-relations.
- CO2 : To execute experiments related to basic studies on evolution, ecology, developmental biology, physiology, biochemistry, plant interactions with microbes and insects, morphology, anatomy, reproduction, genetics, microbiology etc.
- CO3 : To apply the theoretical knowledge to real life cases
- CO4 : To conduct experiments practically both in field and laboratory.
- CO5 : To conduct experiments based on Cryptogamic Botany ,Cell and Molecular Biology , Plant Physiology & Biochemistry and Plant Biotechnology

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)

Semester : 4

Course/Paper Name : Botany Paper 8 : Practicals Based on BO.333: Genetics and Evolution, BO.334: Spermatophyta and Palaeobotany , BO.342: Plant Ecology and Biodiversity , BO.346: Plant Breeding and Seed technology

Paper Code : BO348

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To identify various life forms of plants, design and inter-relations.
- CO2 : To execute experiments related to basic studies on evolution, ecology, developmental biology, physiology, biochemistry, plant interactions with microbes and insects, morphology, anatomy, reproduction, genetics, microbiology etc.
- CO3 : To apply the theoretical knowledge to real life cases
- CO4 : To conduct experiments practically both in field and laboratory.
- CO5 : To conduct experiments based on Genetics and Evolution, Spermatophyta and Palaeobotany , Plant Ecology and Biodiversity and Plant Breeding and Seed technology

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Botany Paper 9 : Practicals Based on BO.335: Horticulture and Floriculture , BO.336: Computational Botany , BO343: Plant Pathology ,BO.344: Medicinal and Economic Botany
Paper Code : BO349

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To identify various life forms of plants, design and inter-relations.
- CO2 : To execute experiments related to basic studies on evolution, ecology, developmental biology, physiology, biochemistry, plant interactions with microbes and insects, morphology, anatomy, reproduction, genetics, microbiology etc.
- CO3 : To apply the theoretical knowledge to real life cases
- CO4 : To conduct experiments practically both in field and laboratory.
- CO5 : To conduct experiments based on Horticulture and Floriculture , Computational Botany ,Plant Pathology and Medicinal and Economic Botany

Faculty : Science
Department : Zoology
Programme Name : B.Sc. Zoology
Pattern : 2013

Programme Outcomes:

By the end of this Programme, student will be able :

- PO1 : To trigger curiosity in the students for Zoology
- PO2 : To tell importance of abiotic and biotic factors of environment and their conservation
- PO3 : To inculcate good laboratory practices in students and to train them about proper handling of lab instruments.
- PO4 : To demonstrate knowledge and understanding of Zoology and management principles and apply these to one's own work, as a member and leader in a team.
- PO5 : To function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

Programme Specific Outcomes:

By the end of this Programme, student will be able:

- PSO1 : To analyse the relationships among animals with their ecosystems
- PSO2 : To correlate Zoology with Agriculture, Medicine and daily life
- PSO3 : To define basic concepts of cell biology, genetics, taxonomy, physiology, ecology and applied Zoology
- PSO4 : To acquaint with the knowledge about research methodologies, effective communication and skills of problem solving methods
- PSO5 : To contribute the knowledge for wellbeing of the society.

Programme year and Pattern: F.Y.B.Sc. (2013 Pattern)

Semester : 1

Course/Paper Name : Zoology Paper 1 : Animal Systematics and Diversity I

Paper Code : ZY101

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To understand classify and identify the diversity of animals.
- CO2 : To understand the importance of classification of animals and classifies them effectively using the six levels of classification
- CO3 : To know his/her role in nature as a protector, preserver and promoter of life which he has achieved by learning, observing and understanding life.
- CO4 : To classify invertebrates and to be able to understand the possible group of the invertebrate observed in nature.
- CO5 : To understand the Animal diversity around us.

Programme year and Pattern: F.Y.B.Sc. (2013 Pattern)

Semester : 2

Course/Paper Name : Zoology Paper 1 : Animal Systematics and Diversity II

Paper Code : ZY101

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To understand classify and identify the diversity of animals.
- CO2 : To understand the importance of classification of animals and classifies them effectively using the six levels of classification
- CO3 : To know his/her role in nature as a protector, preserver and promoter of life which he has achieved by learning, observing and understanding life.
- CO4 : To classify invertebrates and to be able to understand the possible group of the invertebrate observed in nature.
- CO5 : To understand the Animal diversity around us.

Programme year and Pattern: F.Y.B.Sc. (2013 Pattern)
Semester : 1
Course/Paper Name : Zoology Paper 2 : Fundamentals of Cell Biology
Paper Code : ZY102

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To understand the importance of cell as a structural and functional unit of life.
- CO2 : To compares between the prokaryotic and eukaryotic system and extrapolates the life to the aspect of development.
- CO3 : To explain The dynamism of bio membranes indicates the dynamism of life whose working mechanism and precision are responsible for our performance in life.
- CO4 : To describe the cellular mechanisms and its functioning depends on endo-membranes and structures which are best studied with microscopy.

Programme year and Pattern: F.Y.B.Sc. (2013 Pattern)
Semester : 2
Course/Paper Name : Zoology Paper 2 : Genetics
Paper Code : ZY102

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To describe Exceptions to Mendelian Inheritance
- CO2 : To define Classical and Modern concept of Gene, Cistron, Muton, Recon
- CO3 : To understand Sex-determination patterns in different species.
- CO4 : To explain different Types of mutations: spontaneous, induced, somatic, gametic, forward, reverse and Types of point mutation - deletion, insertion, substitution, transversion, transition.
- CO5 : To understand applications of genetics.

Programme year and Pattern: F.Y.B.Sc. (2013 Pattern)
Semester : 1 and 2
Course/Paper Name : Zoology Paper 3 : Practical
Paper Code : ZY103

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To recognize the live forms of vertebrates and invertebrates.

- CO2 : To analyse and describe zoological concepts, including morphology and anatomy.
- CO3 : To explain conservation and sustainable use of animals.
- CO4 : To explain and demonstrate the impact that animals have on human society
- CO5 : To perform basic practicals based on animal identification.

Programme year and Pattern: S.Y.B.Sc. (2013 Pattern)
Semester : 1
Course/Paper Name : Zooloy Paper 1 : Animal Systematics and Diversity III
Paper Code : ZY211

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To compare fundamental characters of Chordates with Non Chordates.
- CO2 : To characterize members of the class Protochordata
- CO3 : To differentiate Vertebrata and non-vertebrates.
- CO4 : To explain different types of scales and fins.
- CO5 : To describe Scoliodon with respect to Systematic position, Geographical distribution, Habit, Habitat

Programme year and Pattern: S.Y.B.Sc. (2013 Pattern)
Semester : 1
Course/Paper Name : Zooloy Paper 2 : Applied Zoology I
Paper Code : ZY212

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To understands processes of fisheries, sericulture, along with crop pest management techniques
- CO2 : To gain knowledge about various disease related vectors and their impact on human
- CO3 : To understand concepts of apiculture, poultry, dairy along with tissue and cell culture technique
- CO4 : To understand the types of agricultural pests, Major insect pests of agricultural importance and Pest control practices.
- CO5 : To understand the biology, varieties of silkworms and the basic techniques of silk production.

Programme year and Pattern: S.Y.B.Sc. (2013 Pattern)
Semester : 2

Course/Paper Name : Zooloy Paper 1 : Animal Systematics and Diversity IV

Paper Code : ZY221

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To classify Non-chordates along with studies on various physiological functions and interactions of non-chordate organisms with type specimens
- CO2 : To classify chordates along with studies on various physiological functions and comparative anatomy of organs of chordate with example.
- CO3 : To characterize Reptilia , Aves and Mammalia .
- CO4 : To describe rat in detail with respect to Systematic position, habit and habitat.
- CO5 : To describe various adaptations of Reptilia , Aves and Mammalia .

Programme year and Pattern: S.Y.B.Sc. (2013 Pattern)

Semester : 2

Course/Paper Name : Zooloy Paper 2 : Applied Zoology II

Paper Code : ZY222

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To understands processes of fisheries, sericulture, along with crop pest management techniques
- CO2 : To gain knowledge about various disease related vectors and their impact on human
- CO3 : To understand concepts of apiculture, poultry, dairy along with tissue and cell culture technique
- CO4 : To understand the types of agricultural pests, Major insect pests of agricultural importance and Pest control practices.
- CO5 : To understand the biology, varieties of silkworms and the basic techniques of silk production.

Programme year and Pattern: S.Y.B.Sc. (2013 Pattern)

Semester : 2

Course/Paper Name : Zoology Paper 3 : Practical based on theory courses (Paper I and Paper II)

Paper Code : ZY223

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To experience First-hand knowledge about identification of non-chordate and chordate specimens (fresh and preserved) along with larval forms and study of endoskeleton of vertebrates

- CO2 : To understand the nature and basic concepts of cell biology, genetics, taxonomy, physiology, ecology and applied Zoology
- CO3 : To analyse the relationships among animals, plants and microbes.
- CO4 : To perform basic level practicals based on identification of animals and Applied Zoology.
- CO5 : To develop laboratory etiquettes.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 3
Course/Paper Name : Zoology Paper 1 : Animal Systematics and Diversity V
Paper Code : ZY331

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To classify protochordates and chordates along with studies on various physiological functions and interactions of chordate organisms with examples
- CO2 : To imparts conceptual knowledge of vertebrate adaptations in relation to their environment
- CO3 : To understanding of general taxonomic rules on animal classification
- CO4 : To inter-relate animals with other factors in nature.
- CO5 : To classify of Non-chordates along with studies on various physiological functions and interactions of non-chordate organisms with examples

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 3
Course/Paper Name : Zoology Paper 2 : Mammalian Histology
Paper Code : ZY332

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To define the basic terms in histology.
- CO2 : To list the various types of tissues.
- CO3 : To identify the histological peculiarities in various organs.
- CO4 : To explain the location, structure and functions of various organs.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 3
Course/Paper Name : Zoology Paper 3 : Biological Chemistry
Paper Code : ZY333

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To define the basic terms in biochemistry.
- CO2 : To explain the structure, functions and reactions of the various biomolecules.
- CO3 : To illustrate each group type of biomolecules.
- CO4 : To correlate the changes in the levels of these biomolecules with the diseases in human

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)

Semester : 3

Course/Paper Name : Zoology Paper 4 : Environmental Biology and Toxicology

Paper Code : ZY334

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To give an overview of evolutionary ecology and environmental concepts
- CO2 : To describe nature of ecosystem, production, food webs, energy flow, biogeochemical cycles, resilience of ecosystem and ecosystem management.
- CO3 : To understand the biosphere, biomes and impact of climate on biomes.
- CO4 : To describe biodiversity assessment, conservation and management, Sustainable development, natural resource management in changing environment.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)

Semester : 3

Course/Paper Name : Zoology Paper 5 : Parasitology

Paper Code : ZY335

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To define the basic terms in parasitology.
- CO2 : To list common ectoparasites and endoparasites and discuss the life cycle and importance of major parasites.
- CO3 : To explain animal associations and their types.
- CO4 : To illustrate transmission routes of animal and zoonotic parasites and justify the control measures of arthropod vectors.
- CO5 : To convince the importance of hygiene with respect to epidemic diseases.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)

Semester : 3
Course/Paper Name : Zoology Paper 6 : Cell Biology
Paper Code : ZY336

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To define the terms in cell biology
- CO2 : To describe the composition, structure and functions of the plasma membrane.
- CO3 : To describe the three primary components of the cell's cytoskeleton and how they affect cell shape, function, and movement.
- CO4 : To differentiate between prokaryotes and eukaryotes.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Zoology Paper 1 : Biological Techniques
Paper Code : ZY341

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To define the basic terms solution preparation.
- CO2 : To list the separation techniques.
- CO3 : To explain the principle of separation techniques.
- CO4 : To explain the procedure of preparing permanent histological slides.
- CO5 : To illustrate the working of microscopes.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Zoology Paper 2 : Mammalian Physiology and Endocrinology
Paper Code : ZY342

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To define the basic terms in physiology.
- CO2 : To explain the physiological processes in mammals.
- CO3 : To explain the anatomy of various systems.
- CO4 : To illustrate the reproductive cycles with hormonal control.
- CO5 : To diagrammatically represent the working of kidney and justify the endocrine disorders.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Zoology Paper 3 : Genetics and Molecular Biology
Paper Code : ZY343

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To define the basic terms in genetics.
- CO2 : To discuss the linkage groups and gene frequency.
- CO3 : To explain the concept of mutation.
- CO4 : To explain DNA structure and Illustrate the mechanism of replication, transcription and translation.
- CO5 : To paraphrase the Central dogma of molecular biology.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Zoology Paper 4 : Organic Evolution
Paper Code : ZY344

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain Evidences from: anatomy, embryology, geographical distribution, palaeontology, physiology, biochemistry, genetics and molecular biology
- CO2 : To understand different theories of organic evolution : Lamarckism , Darwinism and Neo Darwinism , Mutation Theory and Modern Synthetic theory
- CO3 : To classify isolating mechanism as Pre-zygotic and post-zygotic
- CO4 : To explain Mechanism of speciation.
- CO5 : To describe Methods of distribution and Classification of animal distribution

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Zoology Paper 5 : General Embryology
Paper Code : ZY345

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To identify the developmental stages
- CO2 : To describe the key events in early and systematic embryological development.
- CO3 : To explain the theories of preformation, and concepts like growth, differentiation and reproduction.
- CO4 : To explain the principles and process of fertilization and cleavage.
- CO5 : To describe early embryonic development of invertebrates and vertebrates.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Zoology Paper 6 : Public Health and Hygiene or Medical Entomology
Paper Code : ZY346

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To outline the branches of entomology.
- CO2 : To define medical entomology.
- CO3 : To explain the social organization of insects with examples.
- CO4 : To illustrate the role of household insects in relation to human health.
- CO5 : To classify major medically important insects.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Zoology Paper 7 : Practicals related to ZY331, ZY332,ZY341, ZY342.
Paper Code : ZY347

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To experience first-hand knowledge about identification of non-chordate and chordate specimens (fresh and preserved) along with larval forms and study of endoskeleton of vertebrates
- CO2 : To handle microscopes, work with camera lucida and micrometers
- CO3 : To identify zooplanktons and phytoplanktons
- CO4 : To gain skill about histological slide preparation, staining and mounting , determination of pH and quantitative analysis of blood cells
- CO5 : To identify parasites from rectal and fecal contents of animals and collect parasite and pest specimen

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)

Semester : 4
Course/Paper Name : Zoology Paper 8 : Practicals related to ZY333, ZY334, ZY343, ZY344
Paper Code : ZY348

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To experience first-hand knowledge about identification of non-chordate and chordate specimens (fresh and preserved) along with larval forms and study of endoskeleton of vertebrates
- CO2 : To handle microscopes, work with camera lucida and micrometers
- CO3 : To identify zooplanktons and phytoplanktons
- CO4 : To gain skill about histological slide preparation, staining and mounting , determination of pH and quantitative analysis of blood cells
- CO5 : To identify parasites from rectal and faecal contents of animals and collect parasite and pest specimen

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)

Semester : 4

Course/Paper Name : Zoology Paper 9 : Practicals related to ZY335, ZY336, ZY345, ZY346.

Paper Code : ZY349

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To experience first-hand knowledge about identification of non-chordate and chordate specimens (fresh and preserved) along with larval forms and study of endoskeleton of vertebrates
- CO2 : To handle microscopes, work with camera lucida and micrometers
- CO3 : To identify zooplanktons and phytoplanktons
- CO4 : To gain skill about histological slide preparation, staining and mounting , determination of pH and quantitative analysis of blood cells
- CO5 : To identify parasites from rectal and fecal contents of animals and collect parasite and pest specimen

Faculty : Science

Department : Mathematics

Programme Name : B.Sc. Mathematics

Pattern : 2013

Programme Outcomes:

By the end of this Programme, student will be able :

- PO1 : To develop Scientific attitude.
- PO2 : To acquire basic Theoretical, Practical and Technical knowledge of different subjects in the science stream.
- PO3 : To possess subject knowledge required for higher studies, professional and applied courses like Pure Sciences, Applied Sciences, Management Studies, Law etc.
- PO4 : To avail different career opportunities in different fields like Education, Research and Development, IT, Data Analysis ,etc.
- PO5 : To develop solution oriented approach towards various Social and Environmental issues and work towards inculcating and spreading its awareness.

Programme Specific Outcomes:

By the end of this Programme, student will be able:

- PSO1 : To recall basic facts about Mathematics and interpret and recreate the knowledge of conventions such as notations,terminology,formulae,diagrams,etc.
- PSO2 : To acquire adequate exposure to applications and issues which are concerned with Mathematical Sciences.
- PSO3 : To equip himself/herself with different skills like Mathematical Modelling, Problem Solving, Data Analysis , Logic Development , etc.
- PSO4 : To harness his/her creativity, talent and power of communication necessary for various kinds of employment and presentations.
- PSO5 : To develop a positive attitude towards Mathematics as an interesting, applicable and valuable subject of study.

Programme year and Pattern: F.Y.B.Sc. (2013 Pattern)
Semester : 1
Course/Paper Name : Mathematics Paper 1 : Algebra and Geometry
Paper Code : MT101

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To get the knowledge about fundamental theories like Set Theory , Number theory , Graph Theory , Complex Analysis etc.
- CO2 : To learn real life applications of Number Theory and enhance computational skills.
- CO3 : To reduce general equation of second degree to its standard form.
- CO4 : To learn geometry of 2D and 3D.
- CO5 : To describe geometry of line, plane and sphere and their equations in various forms.

Programme year and Pattern: F.Y.B.Sc. (2013 Pattern)

Semester : 1
Course/Paper Name : Mathematics Paper 2 : Calculus and Differential Equations
Paper Code : MT102

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To learn the properties of real numbers and concepts like Functions, Limits, Continuity and Differentiability.
- CO2 : To able to plot the graphs of basic functions and relate them with the theoretical concepts and their geometrical representations.
- CO3 : To apply the concepts of Calculus in higher mathematics.
- CO4 : To develop the theoretical as well as computational skills.
- CO5 : To get acquainted with all the basic concepts of differential equations and the usage the basic concepts for the higher study in differential equations.

Programme year and Pattern: F.Y.B.Sc. (2013 Pattern)
Semester : 1
Course/Paper Name : Mathematics Paper 3 : Mathematics Practicals
Paper Code : MT103

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To correlate the Mathematical concepts with subjects from the other disciplines like Pure and Applied Sciences, Humanities and Social Sciences.
- CO2 : To gain the confidence in proving theorems and solving problems.
- CO3 : To convert the verbal information into mathematical form and process it using appropriate mathematical concepts and formulae to draw the relevant conclusion.
- CO4 : To solve problems based on Algebra and Geometry.
- CO5 : To solve problems based on Calculus and Differential Equations.

Programme year and Pattern: S.Y.B.Sc. (2013 Pattern)
Semester : 1
Course/Paper Name : Mathematics Paper 1 : Multivariable Calculus I
Paper Code : MT211

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To Identify various functions one and several variables.
- CO2 : To interpret the terminologies like of Limits, Continuity and Differentiability of functions of several variables.
- CO3 : To find Critical points, Maximum and Minimum values of functions of several variables using derivatives.
- CO4 : To evaluate double and triple integration.
- CO5 : To apply Integral Calculus to obtain area and volume

Programme year and Pattern: S.Y.B.Sc. (2013 Pattern)
Semester : 1
Course/Paper Name : Mathematics Paper 2(A) : Discrete Mathematics
Paper Code : MT212(A)

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To write an argument using logical notation and determine if the argument is or is not valid.
- CO2 : To understand the basic principles of sets and operations in sets.
- CO3 : To demonstrate the ability to write and evaluate a proof or outline the basic structure of and give examples of each proof technique described.
- CO4 : To solve the problems of Permutation and Combinations.
- CO5 : To modify the Counting Principles according to the given solution.

Programme year and Pattern: S.Y.B.Sc. (2013 Pattern)
Semester : 1
Course/Paper Name : Mathematics Paper 2(B) : Laplace Transformation and Fourier Transforms
Paper Code : MT212(B)

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To define Laplace transform of different types of functions, their derivatives and integrals.
- CO2 : To evaluate Inverse Laplace transform of functions, their derivatives and integrals,
- CO3 : To use Convolution theorem for solving integrals.
- CO4 : To apply Laplace Transform to solve Ordinary Differential equations with constant coefficients.
- CO5 : To evaluate the Fourier series of various even and odd functions.

Programme year and Pattern: S.Y.B.Sc. (2013 Pattern)
Semester : 1
Course/Paper Name : Mathematics Paper 3 : Practical based on MT211 and MT212
Paper Code : MT213

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To correlate the Mathematical concepts with subjects from the other disciplines like Pure and Applied Sciences, Humanities and Social Sciences.
- CO2 : To gain the confidence in proving theorems and solving problems.
- CO3 : To convert the verbal information into mathematical form and process it using appropriate mathematical concepts and formulae to draw the relevant conclusion.
- CO4 : To solve problems based on Multivariable Calculus.
- CO5 : To solve problems based on Discrete Mathematics/Laplace Transformation and Fourier Transforms.

Programme year and Pattern: S.Y.B.Sc. (2013 Pattern)
Semester : 2
Course/Paper Name : Mathematics Paper 1 : Linear Algebra
Paper Code : MT221

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain the importance of Linear Transformations in Physics, Engineering, Social sciences and various other Fields
- CO2 : To find Eigen values and Eigen vectors of a matrix is used in the Regression Analysis, study of motions and vibrations, chemical reactions and geometry.
- CO3 : To define Inner Product spaces.
- CO4 : To obtain orthonormal vectors using Gram-Schmidt process of orthogonalization.
- CO5 : To develop Mathematical Modelling skills.

Programme year and Pattern: S.Y.B.Sc. (2013 Pattern)
Semester : 2
Course/Paper Name : Mathematics Paper 2(A) : Multivariable Calculus II
Paper Code : MT222(A)

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To interpret the terminologies like Limits and Continuity, Derivatives in the vector field.
- CO2 : To differentiate between Tangent vector and Normal vector.
- CO3 : To apply Calculus in solving problems related to Work done by a Force over a Curve in Space, Flow Integrals and Circulation for Velocity Fields, Flow across the Simple Closed Plane Curve.
- CO4 : To parametrize the surfaces in the 2D and 3D.
- CO5 : To apply Stokes theorem and Divergence theorem to simplify the complicated integrals.

Programme year and Pattern:

S.Y.B.Sc. (2013 Pattern)

Semester :

2

Course/Paper Name :

Mathematics Paper 2(B) : Numerical methods and it's applications

Paper Code :

MT222(B)

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To find approximations to difficult equations occurring in Physics and Engineering Sciences.
- CO2 : To plot a curve of Regression using Interpolation and Extrapolation.
- CO3 : To derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
- CO4 : To approximately solve the by using numerical techniques.
- CO5 : To analyse and evaluate the accuracy of common numerical methods.

Programme year and Pattern:

S.Y.B.Sc. (2013 Pattern)

Semester :

2

Course/Paper Name :

Mathematics Paper 3 : Practical based on MT221 and MT222

Paper Code :

MT223

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To correlate the Mathematical concepts with subjects from the other disciplines like Pure and Applied Sciences, Humanities and Social Sciences.
- CO2 : To gain the confidence in proving theorems and solving problems.
- CO3 : To convert the verbal information into mathematical form and process it using appropriate mathematical concepts and formulae to draw the relevant conclusion.
- CO4 : To solve problems based on Linear Algebra.

CO5 : To solve problems based on Multivariable Calculus/Numerical methods and its applications.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 3
Course/Paper Name : Mathematics Paper 1 : Metric Spaces
Paper Code : MT331

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To understand the Euclidean distance function on R^n and appreciate its properties and state and use the Triangle inequality.
- CO2 : To illustrate the geometric meaning of each of the metric space
- CO3 : To explain the definition of continuity for functions defined on different metric space.
- CO4 : To distinguish between open and closed balls in a metric space.
- CO5 : To determine convergence of sequence in a metric space converges

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 3
Course/Paper Name : Mathematics Paper 2 : Real Analysis I
Paper Code : MT332

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To describe fundamental properties of the real numbers that lead to the formal development of real analysis.
- CO2 : To illustrate basic techniques and examples in analysis to be well prepared for courses like Topology, Measure theory and Functional analysis.
- CO3 : To describe various types of sets and relations, and concept of countable and uncountable.
- CO4 : To explain concept of sequence and series and hence find sum of infinite terms with different methods.
- CO5 : To connect the notions of lub and glb which helps to learn integrations which helps to find area under any functions.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)

Semester : 3
Course/Paper Name : Mathematics Paper 3 : Problem Course on MT331 and MT332
Paper Code : MT333

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To appreciate how abstract ideas and rigorous methods in mathematical analysis can be applied to important practical problems.
- CO2 : To solve problems on metric space and connected and compact spaces.
- CO3 : To solve problems on Sequences and Series.
- CO4 : To gain the confidence in proving theorems and solving problems.
- CO5 : To convert the verbal information into mathematical form and process it using appropriate mathematical concepts and formulae to draw the relevant conclusion.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 3
Course/Paper Name : Mathematics Paper 4 : Group Theory
Paper Code : MT334

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To understand the importance of algebraic properties with regard to working within various number systems.
- CO2 : To enhance abstract thinking.
- CO3 : To extend group structure to finite permutation groups (Caley Hamilton Theorem).
- CO4 : To understand the three major concrete models of Boolean algebra: the algebra of sets, the algebra of electrical circuits, and the algebra of logic
- CO5 : To compare two different algebraic structures and study transfer of properties in between these structures through homomorphism and isomorphism

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 3
Course/Paper Name : Mathematics Paper 5 : Ordinary Differential Equations
Paper Code : MT335

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To solve first order differential equations utilizing the standard techniques for separable, exact, linear, homogeneous, or Bernoulli cases.
- CO2 : To find the complete solution of a nonhomogeneous differential equation as a linear combination of the complementary function and a particular solution.
- CO3 : To use knowledge of basic application problems described by second order linear differential equations with constant coefficients.
- CO4 : To learn power series solution method using ordinary and singular points.
- CO5 : To learn methods for solving non-homogenous differential equation.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 3
Course/Paper Name : Mathematics Paper 6 : Problem Course on MT334 and MT335
Paper Code : MT336

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To appreciate how abstract ideas and rigorous methods in mathematical analysis can be applied to important practical problems.
- CO2 : To solve problems on Algebra and Group Theory.
- CO3 : To solve problems on Ordinary Differential Equations.
- CO4 : To gain the confidence in proving theorems and solving problems.
- CO5 : To convert the verbal information into mathematical form and process it using appropriate mathematical concepts and formulae to draw the relevant conclusion.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 3
Course/Paper Name : Mathematics Paper 7(A) : Operations Research
Paper Code : MT337(A)

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To Develop linear programming (LP) models for shortest path, maximum flow, minimal spanning tree, critical path, minimum cost flow, and transshipment problems.
- CO2 : To use mathematical tools that are needed to solve optimization problems.
- CO3 : To formulate pure, mixed, and binary integer programming models.
- CO4 : To formulate the nonlinear programming models.
- CO5 : To use some solution methods for solving the nonlinear optimization problems.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 3
Course/Paper Name : Mathematics Paper 7(F) : Number Theory
Paper Code : MT337(F)

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To illustrate the properties of the set of integers in detail.
- CO2 : To find integer solutions to the system of equations which arises in real life problems.
- CO3 : To solve problems based on various theorems on primes and congruence which are used in cryptography.
- CO4 : To solve problems using Theory of quadratic residue
- CO5 : To determine multiplicative inverses, modulo n and use to solve linear congruence.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 3
Course/Paper Name : Mathematics Paper 8 : Practical based on Papers selected from MT337(A) to MT337(F)
Paper Code : MT338

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To appreciate how abstract ideas and rigorous methods in mathematical analysis can be applied to important practical problems.
- CO2 : To solve problems on Number Theory.
- CO3 : To solve problems on Operation Research.
- CO4 : To gain the confidence in proving theorems and solving problems.
- CO5 : To convert the verbal information into mathematical form and process it using appropriate mathematical concepts and formulae to draw the relevant conclusion.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Mathematics Paper 1 : Complex Analysis
Paper Code : MT341

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To compute sums, products, quotients, conjugate, modulus, and argument of complex numbers
- CO2 : To define and analyse limits and continuity for complex functions as well as consequences of continuity
- CO3 : To determine whether a given function is differentiable and analytical.
- CO4 : To explain the basic methods of complex integration and its application in contour integration
- CO5 : To Evaluate complex contour integrals directly and by the fundamental theorem, apply the Cauchy integral theorem in its various versions, and the Cauchy integral formula.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Mathematics Paper 2 : Real Analysis II
Paper Code : MT342

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain Integrability and prove theorems on integrability.
- CO2 : To recognize the difference between Point wise and Uniform convergence of a sequence of functions.
- CO3 : To illustrate the effect of uniform convergence on the limit function with respect to continuity, differentiability, and integrability.
- CO4 : To solve improper integration using Riemann integration.
- CO5 : To study different tests for solving improper integrals of first and second kind.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Mathematics Paper 3 : Problem Course on MT341 and MT342
Paper Code : MT343

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To appreciate how abstract ideas and rigorous methods in mathematical analysis can be applied to important practical problems.
- CO2 : To solve problems on Complex Analysis.
- CO3 : To solve problems on Real Analysis.

- CO4 : To gain the confidence in proving theorems and solving problems.
CO5 : To convert the verbal information into mathematical form and process it using appropriate mathematical concepts and formulae to draw the relevant conclusion.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Mathematics Paper 4 : Ring Theory
Paper Code : MT344

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To describe the algebraic structure Ring in detail through various examples.
CO2 : To construct field of quotients of an integral domain.
CO3 : To explain the concept Rings of polynomials and its factorization over a field.
CO4 : To illustrate the notion of ideals and factor rings with examples.
CO5 : To define Unique Factorization domain, Euclidean Domain and related results

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Mathematics Paper 5 : Partial Differential Equations
Paper Code : MT345

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To form mathematical models and derivations that lead to PDEs.
CO2 : To recognize the major classification of PDEs and the qualitative differences between the classes of equations.
CO3 : To efficiently solve linear PDEs using classical solution methods.
CO4 : To apply Ordinary differential Equations to find Orthogonal Trajectories.
CO5 : To explain the difference between ODE and PDE.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Mathematics Paper 6 : Problem Course on MT344 and MT345
Paper Code : MT346

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To appreciate how abstract ideas and rigorous methods in mathematical analysis can be applied to important practical problems.
- CO2 : To solve problems on Algebra and Ring Theory.
- CO3 : To solve problems on Partial Differential Equations.
- CO4 : To gain the confidence in proving theorems and solving problems.
- CO5 : To convert the verbal information into mathematical form and process it using appropriate mathematical concepts and formulae to draw the relevant conclusion.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Mathematics Paper 7(A) : Optimization Techniques
Paper Code : MT347

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To apply the concept of optimality criteria for various type of optimization problems.
- CO2 : To solve various constrained and unconstrained problems in single variable as well as multivariable.
- CO3 : To solve simple games using various techniques
- CO4 : To analyse economic situations using game theoretic techniques .
- CO5 : To recommend and prescribe which strategies to implement

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Mathematics Paper 7(F) : Computational Geometry
Paper Code : MT347(F)

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To Illustrate two dimensional transformations.
- CO2 : To Illustrate three dimensional transformations.
- CO3 : To get acquainted with typical problem on Computational Geometry.
- CO4 : To explain the concept of projection and its types.
- CO5 : To apply the concept of Bezier curves in Graphics.

Programme year and Pattern: T.Y.B.Sc. (2013 Pattern)
Semester : 4
Course/Paper Name : Mathematics Paper 8 : Practical based on Papers selected from MT337 to MT338
Paper Code : MT348

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To appreciate how abstract ideas and rigorous methods in mathematical analysis can be applied to important practical problems.
- CO2 : To solve problems on Optimization Techniques.
- CO3 : To solve problems on Computational Geometry.
- CO4 : To gain the confidence in proving theorems and solving problems.
- CO5 : To convert the verbal information into mathematical form and process it using appropriate mathematical concepts and formulae to draw the relevant conclusion.

SCIENCE DEPARTMENT
Bachelor of Science (B. Sc.) 2019 Pattern

Faculty : Science

Department : Physics
Programme Name : B.Sc. Physics
Pattern : 2019

Programme Outcomes:

By the end of this Programme, student will be able :

- PO1 : To develop Scientific attitude.
- PO2 : To acquire basic Theoretical, Practical and Technical knowledge of different subjects in the science stream.
- PO3 : To possess subject knowledge required for higher studies, professional and applied courses like Pure Sciences, Applied Sciences, Management Studies, Law etc.
- PO4 : To avail different career opportunities in different fields like Education, Research and Development, IT, Data Analysis ,etc
- PO5 : To develop solution oriented approach towards various Social and Environmental issues and work towards inculcating and spreading its awareness.

Programme Specific Outcomes:

By the end of this Programme, student will be able:

- PSO1 : To apply the basic principles of Physics to the events occurring around in real life.
- PSO2 : To find out and logically analyse scientific reasoning for various phenomena.
- PSO3 : To communicate scientific information in a précised manner both orally and in writing.
- PSO4 : To skilfully handle practical work, experiments and laboratory in Physics.
- PSO5 : To work independently and to collaborate effectively in team work and team building.

Programme year and Pattern: F.Y.B.Sc. (2019 Pattern)
Semester : 1
Course/Paper Name : Physics Paper 1 : Mechanics and Properties of Matter
Paper Code : PHY111

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To apply Newton's laws of motion to solve various problems in daily life.
- CO2 : To explain the concepts like zero work done, conservative forces, mass energy equivalence.
- CO3 : To describe effect of force on various types of materials and their physical properties like elasticity, different moduli etc. along with their relation.
- CO4 : To give examples of surface tension in nature and its applications in our day to day

life.

CO5 : To Concept of viscosity of fluids, Bernoulli's Equation and its applications.

Programme year and Pattern: F.Y.B.Sc. (2019 Pattern)
Semester : 1
Course/Paper Name : Physics Paper 2 : Physics Principles and Applications
Paper Code : PHY112

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain structure of atom and its different models.
- CO2 : To describe different forces which hold atoms together to form a molecule and different types of chemical and physical bonds like ionic, covalent, Van der Waal's bonds.
Energy levels of rotational and vibrational diatomic molecule.
- CO3 : To identify and compare the characteristics of electromagnetic spectrum including speed, wavelength and frequency.
- CO4 : To give examples common uses and applications of electromagnetic waves.
- CO5 : To explain basic principles of Laser, excitation and de-excitation process, pumping scheme, population inversion and metastable state. Characteristics, applications and different types of laser.

Programme year and Pattern: F.Y.B.Sc. (2019 Pattern)
Semester : 1
Course/Paper Name : Physics Paper 3 : Physics Practical 1A
Paper Code : PHY113

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To perform practicals based on simple mechanics, oscillations and electricity which are used in our daily life.
- CO2 : To skilfully handle experimental apparatus.
- CO3 : To systematically write down the report of the experiments performed.

Programme year and Pattern: F.Y.B.Sc. (2019 Pattern)
Semester : 2
Course/Paper Name : Physics Paper 1 : Heat and Thermodynamics

Paper Code : PHY121

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To describe various thermodynamic processes like isothermal, isobaric, isochoric processes and laws of thermodynamics.
- CO2 : To define the concept of entropy.
- CO3 : To understand Carnot's cycle, Heat engines and Refrigerators
- CO4 : To understand Principle of thermometry and various types of thermometers like Liquid filled thermometers, Gas filled thermometers, Bimetallic thermometers, Platinum resistance thermometer

Programme year and Pattern: F.Y.B.Sc. (2019 Pattern)

Semester : 2

Course/Paper Name : Physics Paper 2 : Electricity and Magnetism

Paper Code : PHY122

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain the concepts of the electric force, electric field and electric potential for stationary charges
- CO2 : To calculate electric potential and electric field by using Gauss's law.
- CO3 : To describe dielectric phenomenon and effect of electric field on dielectric.
- CO4 : To correlate the concept of magnetic field, magnetic field for steady currents using Biot-Savart's and Ampere's Circuital laws.
- CO5 : To illustrate magnetic materials and explain its properties.

Programme year and Pattern: F.Y.B.Sc. (2019 Pattern)

Semester : 1

Course/Paper Name : Physics Paper 3 : Physics Practical 1B

Paper Code : PHY123

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To perform practicals based on simple mechanics, oscillations and electricity which are used in our daily life.
- CO2 : To skilfully handle experimental apparatus.
- CO3 : To systematically write down the report of the experiments performed.

Programme year and Pattern: S.Y.B.Sc. (2019 Pattern)
Semester : 3
Course/Paper Name : Physics Paper 1 : Mathematical Methods in Physics I
Paper Code : PHY231

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To correlate and collaborate Mathematics and Physics.
- CO2 : To Solve problems using of De moivre's theorem and determine the power of given complex number.
- CO3 : To describe and correlate the mathematical terms like divergence, curl and gradient in Physics.
- CO4 : To apply the concept of partial differentiation in solving Physics situations which have more than one variable.
- CO5 : To explain the need of complex numbers in solving mathematical equations in different branches of Physics like Electricity and Magnetism, Fluid Dynamics and quantum mechanics.

Programme year and Pattern: S.Y.B.Sc. (2019 Pattern)
Semester : 3
Course/Paper Name : Physics Paper 2 : Electronics I
Paper Code : PHY232

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To apply network theorems to solve problems related to complicated circuits by converting them into simpler circuits.
- CO2 : To explain the semiconductors which is a basic materials used in many electronic components like diode, transistors FET, UJT etc.
- CO3 : To explain the Characteristics and working of operational amplifiers.
- CO4 : To explain concepts of regulated power supply, rectifiers, filters and regulators.
- CO5 : To apply logic gates in daily life electrical instruments

Programme year and Pattern: S.Y.B.Sc. (2019 Pattern)
Semester : 3
Course/Paper Name : Physics Paper 3 : Physics Laboratory 2(A)
Paper Code : PHY233

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To perform practicals based on simple mechanics, oscillations and electricity which are used in our daily life.
- CO2 : To skilfully handle experimental apparatus.
- CO3 : To systematically write down the report of the experiments performed.

Programme year and Pattern: S.Y.B.Sc. (2019 Pattern)
Semester : 3
Course/Paper Name : Physics Paper 4 : Environment -I
Paper Code : PHY2310

Course Outcomes:

By the end of this course, student will be able:

- CO1 :
- CO2 :
- CO3 :
- CO4 :
- CO5 :

Programme year and Pattern: S.Y.B.Sc. (2019 Pattern)
Semester : 3
Course/Paper Name : Physics Paper 5 : Language I
Paper Code : PHY2311

Course Outcomes:

By the end of this course, student will be able:

- CO1 :
- CO2 :
- CO3 :
- CO4 :
- CO5 :

Programme year and Pattern: S.Y.B.Sc. (2019 Pattern)

Semester : 4
Course/Paper Name : Physics Paper 1 : Oscillations, Waves and Sound
Paper Code : PHY241

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain the body oscillations without damping amplitude and its significance.
- CO2 : To apply forced oscillations to any object and set it in continuous motion
- CO3 : To explain the Doppler effect and its use in in day-to-day life.
- CO4 : To describe the concepts of sound.

Programme year and Pattern: S.Y.B.Sc. (2019 Pattern)
Semester : 4
Course/Paper Name : Physics Paper 2 : Optics
Paper Code : PHY242

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To create various Image formations related to geometrical optics, Deviation, Magnification, Concept for Equivalent lens and Cardinal Points
- CO2 : To describe different types of monochromatic and chromatic aberrations and Achromatism in lenses
- CO3 : To explain the Construction and working of Simple Microscope, Compound Microscope, Ramsden's Eyepiece and Huygen's Eyepiece
- CO4 : To illustrate concepts of Interference and diffraction of light, Formation of fringes, Resolution
- CO5 : To explain the Concept of Polarization, Double refraction, Construction and working of Nicol Prism

Programme year and Pattern: S.Y.B.Sc. (2019 Pattern)
Semester : 4
Course/Paper Name : Physics Paper 3 : Physics Laboratory 2(B)
Paper Code : PHY243

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To perform practicals based on simple mechanics, oscillations and electricity which are

used in our daily life.

CO2 : To skilfully handle experimental apparatus.

CO3 : To systematically write down the report of the experiments performed.

**Programme year
and Pattern:** S.Y.B.Sc. (2019 Pattern)
Semester : 4
**Course/Paper Name
:** Physics Paper 4 : Environment II
Paper Code : PHY2410

Course Outcomes:

By the end of this course, student will be able:

CO1 :

CO2 :

CO3 :

CO4 :

CO5 :

**Programme year
and Pattern:** S.Y.B.Sc. (2019 Pattern)
Semester : 4
**Course/Paper Name
:** Physics Paper 5 : Language I
Paper Code : PHY2411

Course Outcomes:

By the end of this course, student will be able:

CO1 :

CO2 :

CO3 :

CO4 :

CO5 :

**Programme year
and Pattern:** T.Y.B.Sc. (2019 Pattern)
Semester : 5
**Course/Paper Name
:** Physics Paper 1 : Mathematical Methods in Physics II

Paper Code : PHY351

Course Outcomes:

By the end of this course, student will be able:

- CO1 : The three commonly used co-ordinate systems and general curvilinear co-ordinate system.
- CO2 : To explain the Concept of relativity, length contraction, relativistic mass, time dilation and twin paradox.
- CO3 : To use Various methods to solve different differential equations.
- CO4 : To explain properties of Legendre polynomials, Hermite polynomials and Bessel function.
- CO5 : To solve the problem of linear simple harmonic oscillator in quantum mechanics.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)

Semester : 5

Course/Paper Name : Physics Paper 2 : Classical Electrodynamics

Paper Code : PHY352

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To illustrate basic mathematical concepts related to electromagnetic vector fields.
- CO2 : To explain basic principles and concepts of electromagnetism and magneto statics
- CO3 : To explain Maxwell's equations and boundary value problems. Applications of these equations for solving problems.
- CO4 : To understand the basics of electromagnetic waves, wave equations in free space and pointing theorem.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)

Semester : 5

Course/Paper Name : Physics Paper 3 : Classical Mechanics

Paper Code : PHY353

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To define, present and demonstrate basic mechanical concepts and their applications used in daily life.
- CO2 : To understand the motion of a body, Equations of motions, trajectory of an objects in constant field such as electrical, magnetic field.
- CO3 : To understand how to launch rockets and satellites. Motion of planets and satellites and dynamic molecular collisions. How the mechanical concepts used in sports and

military.

CO4 : To will learn Lagrangian and Hamiltonian formulations, Canonical transformation, Poisson's Bracket concept

CO5 : To explain Newton's laws such as projectile motion and rocket motion. Also Kepler's laws related to motion. Scattering of particles.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 5
Course/Paper Name : Physics Paper 4 : Atomic and Molecular Physics
Paper Code : PHY354

Course Outcomes:

By the end of this course, student will be able:

CO1 : To explain many atomic models to explain atomic structure.

CO2 : To find out interaction energy from different coupling schemes.

CO3 : To scientifically understand, how the x-rays produced and what precaution should be taken during handling of x- rays.

CO4 : To understand the importance rotational and vibrational energy levels.

CO5 : To draw vector diagrams easily.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 5
Course/Paper Name : Physics Paper 5 : Computational Physics
Paper Code : PHY355

Course Outcomes:

By the end of this course, student will be able:

CO1 : To Learn the Basic Programming Concept.

CO2 : To improve the logical as well as Computational ability.

CO3 : To allocate Memory and utilization technique learning.

CO4 : To apply computer resources in physics.

CO5 : To apply Graphical technique using some Graphical Commands in C programming.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 5
Course/Paper Name : Physics Paper 6 : Elective I (Select any One)

Paper Code : PHY356(?)

A: Astronomy and Astrophysics , B: Elements of Materials Science , C: Motion Picture Physics , D: Biophysics , E: Medical Electronics

Course Outcomes:

By the end of this course, student will be able:

CO1 : To

CO2 : To

CO3 : To

CO4 : To

CO5 : To

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)

Semester : 6

Course/Paper Name : Physics Paper 1 : Solid State Physics

Paper Code : PHY361

Course Outcomes:

By the end of this course, student will be able:

CO1 : To differentiate between crystalline and amorphous material, crystal structures, miller indices, interplaner distances, interatomic forces and bonds.

CO2 : To explain understand Bragg's diffraction, Bragg's law. X-ray diffraction and characterization techniques.

CO3 : To explain electrical and thermal conductivity of free electron in metals, Energy levels of free electrons in one and three dimensions.

CO4 : To describe and explain the behaviour of permanent magnet including induced magnetism, behaviour of paramagnetic, diamagnetic, ferromagnetic materials in terms of magnetic domain.

CO5 : To describe superconducting materials, their properties and technological applications of superconductivity.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)

Semester : 6

Course/Paper Name : Physics Paper 2 : Quantum Mechanics

Paper Code : PHY362

Course Outcomes:

By the end of this course, student will be able:

CO1 : To explain Quantum Mechanics, Historical background, Matter Waves, Wave particle duality, Phase and Group Velocity, Heisenberg's Uncertainty Principle

- CO2 : To physically interpret of Wave function, Schrödinger's Wave Equation, Eigen Function and Eigen values
- CO3 : To explain the concepts of Free Particle, One Dimensional and Three Dimensional Rigid Box, Potential Barrier
- CO4 : To explain the concepts Spherically symmetric potential, Examples of Rigid Rotor and hydrogen atom
- CO5 : To explain the concepts Hermitian and other operators in Quantum Mechanics, Commutator brackets and concept of parity

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 6
Course/Paper Name : Physics Paper 3 : Thermodynamics and Statistical Physics
Paper Code : PHY363

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To study the transport phenomenon such as viscosity, thermal conductivity, diffusion.
- CO2 : To learn about thermodynamic functions, variables and their relations.
- CO3 : To acquire the skill of solving problems based of particle distribution.
- CO4 : To study about types of ensembles viz. Microcanonical, canonical and grand canonical.
- CO5 : To get the knowledge about Maxwell Boltzmann statistics, Bose Einstein statistics and Fermi Dirac Statistics

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 6
Course/Paper Name : Physics Paper 4 : Nuclear Physics
Paper Code : PHY364

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain Basic properties of nucleus, student got the idea of inner information of the nucleus.
- CO2 : To describe the effects on radiations on human.
- CO3 : To acquaint with importance rotational and vibrational energy levels.
- CO4 : To produce high energy particle which can be used for research purpose
- CO5 : To explain uses of nuclear reactors to produce huge amount of heat energy.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 6
Course/Paper Name : Physics Paper 5 : Electronics II
Paper Code : PHY365

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To design different circuits and working of electronics used in different applications.
- CO2 : To describe Special Purpose diodes like LED, photodiode, Varactor, Optocoupler
- CO3 : To identify Amplifiers, Class A, Class B and Class C , Push Pull emitter follower and differential amplifier
- CO4 : To explain Junction Field Effect Transistor and MOS Field Effect Transistor,
- CO5 : To work with Sequential Logic Circuits, Flip- Flop, Counters and Shift Register

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 6
Course/Paper Name : Physics Paper 6 : Elective II (Select any One)
Paper Code : PHY366

F: Renewable Energy Sources , G: Physics of Nano materials , H: Microcontrollers , I: Electro Acoustics and Entertainment Electronics , J: Lasers , K: Methods of Experimental Physics

Course Outcomes:

By the end of this course, student will be able:

- CO1 :
- CO2 :
- CO3 :
- CO4 :
- CO5 :

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 6
Course/Paper Name : Physics Paper 7 : Physics Laboratory 4(A)
Paper Code : PHY367

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To perform practicals based on simple mechanics, oscillations and electricity which are used in our daily life.
- CO2 : To skilfully handle experimental apparatus.
- CO3 : To systematically write down the report of the experiments performed.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)

Semester : 6

Course/Paper Name : Physics Paper 8 : Physics Laboratory 4(B)

Paper Code : PHY368

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To perform practicals based on simple mechanics, oscillations and electricity which are used in our daily life.
- CO2 : To skilfully handle experimental apparatus.
- CO3 : To systematically write down the report of the experiments performed.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)

Semester : 6

Course/Paper Name : Physics Paper 9 : Project

Paper Code : PHY369

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To perform practicals based on simple mechanics, oscillations and electricity which are used in our daily life.
- CO2 : To skilfully handle experimental apparatus.
- CO3 : To systematically write down the report of the experiments performed.

Faculty : Science

Department : Chemistry

Programme Name : B.Sc. Chemistry

Pattern : 2019

Programme Outcomes:

By the end of this Programme, student will be able :

- PO1 : To develop Scientific attitude.
- PO2 : To acquire basic Theoretical, Practical and Technical knowledge of different subjects in the science stream.
- PO3 : To possess subject knowledge required for higher studies, professional and applied courses like Pure Sciences, Applied Sciences, Management Studies, Law etc.
- PO4 : To avail different career opportunities in different fields like Education, Research and Development, IT, Data Analysis ,etc
- PO5 : To develop solution oriented approach towards various Social and Environmental issues and work towards inculcating and spreading its awareness.

Programme Specific Outcomes:

By the end of this Programme, student will be able:

- PSO1 : To apply the fundamental knowledge of the basic principles in Chemistry to the real life problems.
- PSO2 : To create awareness about the issues related to Environmental pollution and degradation.
- PSO3 : To do qualitative and quantitative analyses in required in the industrial processes.
- PSO4 : To communicate scientific information precisely and accurately.
- PSO5 : To collaborate Chemistry with other Material Sciences and Life Sciences.

Programme year and Pattern: F.Y.B.Sc. (2019 Pattern)
Semester : 1
Course/Paper Name : Chemistry Paper 1 : Physical Chemistry
Paper Code : CH101

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To apply thermodynamic principles to physical and chemical process.
- CO2 : To calculate enthalpy , Bond energy, Bond dissociation energy , resonance energy
- CO3 : To illustrate Third law of thermodynamic and its applications
- CO4 : To describe Concept to ionization process occurred in acids, bases and pH scale
- CO5 : To interpret Gas equilibrium , equilibrium constant and molecular interpretation of equilibrium constant

Programme year F.Y.B.Sc. (2019 Pattern)

and Pattern:

Semester : 1
Course/Paper Name : Chemistry Paper 2 : Inorganic Chemistry
Paper Code : CH102

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To create foundation for research and development in Chemistry.
- CO2 : To familiarize with current and recent developments in Chemistry
- CO3 : To boost interest towards chemistry as the main subject.
- CO4 : To understand the fundamentals, principles, and recent developments in the subject area.
- CO5 : To correlate Chemistry with other fields in Science.

Programme year and Pattern: F.Y.B.Sc. (2019 Pattern)

Semester : 1
Course/Paper Name : Chemistry Paper 3 : Chemistry Practical I
Paper Code : CH103

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To inculcate in themselves the importance of chemical safety and Lab safety while performing experiments in laboratory
- CO2 : To acquaint with Techniques of pH measurements
- CO3 : To prepare buffer solutions
- CO4 : To perform Elemental analysis of organic compounds (non-instrumental)
- CO5 : To perform Chromatographic Techniques for separation of constituents of mixtures

Programme year and Pattern: F.Y.B.Sc. (2019 Pattern)

Semester : 2
Course/Paper Name : Chemistry Paper 1 : Inorganic Chemistry
Paper Code : CH203

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To describe Significance of quantum numbers.
- CO2 : To explain rules for filling electrons in various orbitals- Aufbau's principle, Pauli exclusion principle, Hund's rule of maximum multiplicity
- CO3 : To define various types of chemical bonds- Ionic, covalent, coordinate and metallic bond
- CO4 : To define term mole, mill mole, molar concentration, molar equilibrium concentration and Percent Concentration.
- CO5 : To interpret concept of different types of valence shell electron pairs and their contribution in bonding.

Programme year and Pattern: F.Y.B.Sc. (2019 Pattern)
Semester : 2
Course/Paper Name : Chemistry Paper 2 : Organic Chemistry
Paper Code : CH202

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To define concepts of stereochemistry (chirality, optical activity, enantiomers,etc.) of cyclohexane and other organic compounds.
- CO2 : To illustrate Addition, Elimination, substitution (aliphatic electrophilic and nucleophilic and rearrangement reactions.
- CO3 : To recognize different hybridizations in organic compounds.
- CO4 : To Compare different types of hybridization.
- CO5 : To give applications of organometallic compounds.

Programme year and Pattern: F.Y.B.Sc. (2019 Pattern)
Semester : 1
Course/Paper Name : Chemistry Paper 3 : Chemistry Practical II
Paper Code : CH203

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To perform Inorganic Estimations using volumetric analysis
- CO2 : To Synthesize Inorganic compounds
- CO3 : To Analyse commercial products
- CO4 : To Purify organic compounds
- CO5 : Prepare and mechanism of reactions involved in industries.

Programme year and Pattern: S.Y.B.Sc. (2019 Pattern)
Semester : 3
Course/Paper Name : Chemistry Paper 1 : Physical and Analytical Chemistry
Paper Code : CH301

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain laws in Kinetics
- CO2 : To explain concepts in Photochemistry
- CO3 : To explain concepts in Chemical analysis
- CO4 : To describe thermo dynamical phenomena of free energy and equilibria
- CO5 : To apply basics of Volumetric Analysis and titration curves in practical life industrial processes.

Programme year and Pattern: S.Y.B.Sc. (2019 Pattern)
Semester : 3
Course/Paper Name : Chemistry Paper 2 : Organic and Inorganic Chemistry
Paper Code : CH302

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To define concepts of stereochemistry (chirality, optical activity, enantiomers, etc.) of cyclohexane and other organic compounds.
- CO2 : To illustrate Addition, Elimination, substitution (aliphatic electrophilic and nucleophilic and rearrangement reactions).
- CO3 : To describe General Principles of Metallurgy in metal extraction
- CO4 : To explain Corrosion and Passivity in metals.
- CO5 : To recognize different hybridizations in organic compounds.

Programme year and Pattern: S.Y.B.Sc. (2019 Pattern)
Semester : 3
Course/Paper Name : Chemistry Paper 3 : Chemistry Practical I
Paper Code : CH303

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To apply different techniques Inorganic Qualitative as well as Quantitative analysis
- CO2 : To apply different techniques Organic Qualitative analysis
- CO3 : To handle experiments and required apparatus skilfully.
- CO4 : To obey Laboratory etiquettes

Programme year and Pattern:

S.Y.B.Sc. (2019 Pattern)

Semester : 4

Course/Paper Name :

Chemistry Paper 1 : Physical and Analytical Chemistry

Paper Code : CH401

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain Thermo dynamical phenomena of free energy and equilibria .
- CO2 : To draw P-N, T-N diagrams
- CO3 : To describe liquid solution miscibility features.
- CO4 : To solve mathematical problems based on normality and molarity.
- CO5 : To apply basics of Volumetric Analysis and titration curves.

Programme year and Pattern:

S.Y.B.Sc. (2019 Pattern)

Semester : 4

Course/Paper Name :

Chemistry Paper 2 : Organic and Inorganic Chemistry

Paper Code : CH402

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To differentiate between oxidizing and reducing reagents.
- CO2 : To draw and illustrate the structure, properties, synthesis and reactions five and six member heterocyclic compounds
- CO3 : To describe different properties of different biomolecules.
- CO4 : To give applications of organometallic compounds.
- CO5 : To identify toxic chemicals in the environment.

Programme year and Pattern: S.Y.B.Sc. (2019 Pattern)
Semester : 4
Course/Paper Name : Chemistry Paper 3 : Chemistry Practical II
Paper Code : CH403

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To apply different techniques Inorganic Qualitative as well as Quantitative analysis
- CO2 : To apply different techniques Organic Qualitative analysis
- CO3 : To handle experiments and required apparatus skilfully.
- CO4 : To obey Laboratory etiquettes

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 5
Course/Paper Name : Chemistry Paper 1 : Physical Chemistry I
Paper Code : CH501

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To identify the molecularity of chemical reactions and experimentally determine the order of the reaction.
- CO2 : To describe the application of molecular spectroscopy in the identification molecular structure.
- CO3 : To explain different phases of substances change with respect to the change in pressure and temperature.
- CO4 : To conclude which electrolyte is strong and weak based on dissociation constant by conductance measurements.
- CO5 : To calculate the rate of reaction and factors which can affect the rate of reaction.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 5
Course/Paper Name : Chemistry Paper 2 : Analytical Chemistry I
Paper Code : CH502

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain the technique of Polarography
- CO2 : To explain the technique of Spectrophotometric analysis
- CO3 : To describe the technique of Gravimetric analysis
- CO4 : To describe the technique of Electrogravimetric analysis
- CO5 : To apply the above techniques

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 5
Course/Paper Name : Chemistry Paper 3 : Physical Chemistry Practical I
Paper Code : CH503

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To identify the molecularity of chemical reactions.
- CO2 : To measure different physical parameters and handling of chemical reactions based on any physical parameters
- CO3 : To plot graphs and calculate the values essential for different experimentation.
- CO4 : To prepare solutions of specific required molarity, normality, molality and density by using suitable apparatus
- CO5 : To calculate the rate of reaction experimentally and determine the order of the reaction.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 5
Course/Paper Name : Chemistry Paper 4 : Inorganic Chemistry I
Paper Code : CH504

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To apply knowledge in the practical chemical processes.
- CO2 : To name coordinate complexes using IUPAC nomenclature.
- CO3 : To explain isomerism in coordinate complexes.
- CO4 : To give applications of VBT, CFT, MOT in coordination chemistry.
- CO5 : To draw MOT diagrams of homonuclear diatomic molecules from H₂ to Ne₂.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 5

Course/Paper Name : Chemistry Paper 5 : Industrial Chemistry
Paper Code : CH505

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To describe various methods of preparation of various important chemicals.
- CO2 : To explain synthesis and applications of Agrochemicals.
- CO3 : To tell functioning of industry and safety measures in industry.
- CO4 : To connect the theory with the processes carried out in the industries synthesizing chemicals.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 5
Course/Paper Name : Chemistry Paper 6 : Inorganic Chemistry Practical I
Paper Code : CH506

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To identify the basic radicals and acidic radicals present in binary inorganic mixture.
- CO2 : To prepare inorganic coordination complexes
- CO3 : To use column chromatography to analyse binary cationic mixture.
- CO4 : To apply techniques of gravimetry and colorimetry for quantitative analysis

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 5
Course/Paper Name : Chemistry Paper 7 : Organic Chemistry
Paper Code : CH507

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To summarize the importance of IUPAC nomenclature of organic compounds.
- CO2 : To draw their structures and name them.
- CO3 : To compare acidity and basicity of organic compounds and illustrate factors like inductive, resonance, hyper-conjugation and tautomerism effects.
- CO4 : To explain Stereochemistry of di-substituted cyclohexane and the relative stabilities
- CO5 : To illustrate the nucleophilic substitutions, addition and elimination reactions and guess products in such reactions.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 5
Course/Paper Name : Chemistry Paper 8 : Chemistry of Biomolecules
Paper Code : CH508

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To describe biological composition and organization of cell membrane, structure and function of various cell organelles of plant and animal cell.
- CO2 : To illustrate the types of carbohydrates and their biochemical significance in living organisms, structure of carbohydrates and reactions of carbohydrates with Glucose as example.
- CO3 : To explain types of lipids with examples, structure of lipids and their properties.
- CO4 : To draw the structure and types of amino acids, Peptide bonds and determine N and C terminus of peptide chain.
- CO5 : To explain the concepts of Enzyme specificity, Equations of enzyme kinetics K_m and its significance, features of various types of enzyme inhibitions, industrial applications of enzymes.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 5
Course/Paper Name : Chemistry Paper 9 : Organic Chemistry Practical I
Paper Code : CH509

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To identify, separate and analyse qualitatively mixtures of organic compounds efficiently.
- CO2 : To carry out quantitative estimation of organic compounds.
- CO3 : To carry out syntheses of small organic molecules on micro scale.
- CO4 : To apply the basic techniques and their use for analyses, syntheses, and research and also basic computer skills.
- CO5 : To develop analytical independent thinking required for academics, research and industrial work.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 5
Course/Paper Name : Chemistry Paper 10(A) : Introduction of Medicinal Chemistry / Chemistry Paper 10(B) : Polymer Chemistry

Paper Code : CH510

Course Outcomes:

By the end of this course, student will be able:

CO1 :

CO2 :

CO3 :

CO4 :

CO5 :

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)

Semester : 5

Course/Paper Name : Chemistry Paper 11(A) : Environmental Chemistry/ Chemistry Paper 11(B) : Chemo informatics

Paper Code : CH511

Course Outcomes:

By the end of this course, student will be able:

CO1 :

CO2 :

CO3 :

CO4 :

CO5 :

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)

Semester : 6

Course/Paper Name : Chemistry Paper 1 : Physical Chemistry II

Paper Code : CH601

Course Outcomes:

By the end of this course, student will be able:

CO1 : To measure EMF of electrochemical cell.

CO2 : To explain Thermodynamic conditions of reversible cell, reversible and irreversible electrochemical cell with suitable example.

CO3 : To differentiate between primary and secondary reference electrode.

CO4 : To explain Fuel Cells , its Types , advantages, disadvantages and comparison of battery Vs fuel cell

CO5 : To solve numericals based on the content.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 6
Course/Paper Name : Chemistry Paper 2 : Physical Chemistry III
Paper Code : CH602

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To define Solution, electrolytes, nonelectrolytes and colligative properties.
- CO2 : To define Solution, electrolytes, nonelectrolytes and colligative properties.
- CO3 : To relate Vant Hoff's factor and degree of dissociation of electrolyte by colligative property,
- CO4 : To apply colligative properties to determine molecular weight of nonelectrolyte, abnormal molecular weight.
- CO5 : To explain Lowering of vapour pressure of solvent in solution, Elevation of B.P. of solvent in solution and freezing point depression.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 6
Course/Paper Name : Chemistry Paper 3 : Physical Chemistry Practical-II
Paper Code : CH603

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To identify the molecularity of chemical reactions.
- CO2 : To measure different physical parameters and handling of chemical reactions based on any physical parameters
- CO3 : To plot graphs and calculate the values essential for different experimentation.
- CO4 : To prepare solutions of specific required molarity, normality, molality and density by using suitable apparatus
- CO5 : To calculate the rate of reaction experimentally and determine the order of the reaction.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 6
Course/Paper Name : Chemistry Paper 4 : Inorganic Chemistry II
Paper Code : CH604

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To understand the uses of organometallic compounds in the homogenous catalysis
- CO2 : To illustrate heterogeneous catalysts.
- CO3 : To explain the functions of haemoglobin and myoglobin in O₂ transport and storage
- CO4 : To compare organic polymers
- CO5 : To understand Preparation of inorganic solids by various methods.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 6
Course/Paper Name : Chemistry Paper 5 : Inorganic Chemistry III
Paper Code : CH605

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain the effect on acid and base strengths in presence of non-aqueous solvents.
- CO2 : To describe different properties of acids and bases.
- CO3 : To calculate Strengths of various types acids.
- CO4 : To understand different theories of acids and bases.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 6
Course/Paper Name : Chemistry Paper 6 : Inorganic Chemistry Practical II
Paper Code : CH606

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To identify the basic radicals and acidic radicals present in binary inorganic mixture.
- CO2 : To prepare inorganic coordination complexes
- CO3 : To use column chromatography to analyse binary cationic mixture.
- CO4 : To apply techniques of gravimetry and colorimetry for quantitative analysis

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 6

Course/Paper Name : **Chemistry Paper 7 : Organic Chemistry II**
Paper Code : **CH607**

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain the principle of UV spectroscopy and the nature of UV spectrum.
- CO2 : To describe the principle of IR spectroscopy, types of vibrations and the nature of IR spectrum.
- CO3 : To explain the geometrical isomerism in disubstituted cyclohexanes
- CO4 : To interpret the NMR data and they will be able to use it for determination of structure of organic compounds.
- CO5 : To use models and to draw different types of conformational isomers of decalin in chair form

Programme year and Pattern: **T.Y.B.Sc. (2019 Pattern)**
Semester : **6**
Course/Paper Name : **Chemistry Paper 8 : Organic Chemistry III**
Paper Code : **CH608**

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain Retrosynthesis and Synthesis of target molecules: Acetophenone, Crotonaldehyde, Cyclohexene, Benzylbenzoate, and Benzyl diethyl malonate.
- CO2 : To explain Functional group interconversions and structural problems using chemical reactions
- CO3 : To describe the process of Preparation and Applications of different reagents.
- CO4 : To illustrate reactive intermediates in Chemistry.
- CO5 : To prepare reducing and Oxidizing agents

Programme year and Pattern: **T.Y.B.Sc. (2019 Pattern)**
Semester : **6**
Course/Paper Name : **Chemistry Paper 9 : Organic Chemistry Practical II**
Paper Code : **CH609**

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain “fingerprint region” of an infrared spectrum can used in the identification

of an unknown compound.

CO2 : To gain practical hands-on experience of modern Extraction.

CO3 : To realize the selection of appropriate mobile phase, column and detector

CO4 : To interpret integration of NMR spectra

CO5 : To determine the molecular weight of given tribasic acids.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)

Semester : 6

Course/Paper Name : Chemistry Paper 10(A) : Chemistry of Soil and Agrochemicals / Chemistry Paper 10(B) : Introduction of Forensic Chemistry

Paper Code : CH610

Course Outcomes:

By the end of this course, student will be able:

CO1 :

CO2 :

CO3 :

CO4 :

CO5 :

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)

Semester : 6

Course/Paper Name : Chemistry Paper 11(A) : Analytical Chemistry-II / Chemistry Paper 11(B) : Chemistry of Cosmetics and Perfumes

Paper Code : CH611

Course Outcomes:

By the end of this course, student will be able:

CO1 :

CO2 :

CO3 :

CO4 :

CO5 :

Faculty : Science
Department : Botany

Programme Name	B.Sc. Botany
Pattern :	2019

Programme Outcomes:

By the end of this Programme, student will be able :

- PO1 : To apply the fundamental knowledge of the basic principles of major fields of biology.
- PO2 : To apply the concepts in conservation of indigenous, medicinal, endemic and endangered plant species.
- PO3 : To develop ethics in work and reverence for self and others.
- PO4 : To convey and practice to follow the social, environmental and biological ethics.
- PO5 : To analyse of plant materials in the context of plant physiology and biochemistry.

Programme Specific Outcomes:

By the end of this Programme, student will be able:

- PSO1 : To explain Biodiversity, climate change and plant pathology.
- PSO2 : To effectively communicate scientific information in a precise manner.
- PSO3 : To apply Biotechnology, Ecology, Genetics and Plant breeding techniques in plant sciences.
- PSO4 : To collaborate effectively on team-oriented projects in the field of life
- PSO5 : To apply knowledge of Medicinal and Economic botany in day to day life.

Programme year and Pattern:	F.Y.B.Sc. (2019 Pattern)
Semester :	1
Course/Paper Name :	Botany Paper 1 : Plant life and utilization I
Paper Code :	BO111

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain the kingdom classification systems of living things
- CO2 : To acquaint the status of cryptogams as a group in plant kingdom.
- CO3 : To discuss about morphological structure, classification and reproduction of thallophytes (Algae, Fungi, Lichens) and Bryophytes.
- CO4 : To describe the life cycles of selected genera of thallophytes (Algae, Fungi, Lichens) and Bryophytes
- CO5 : To spread awareness economic and ecological importance of Algae, fungi, Lichens and Bryophytes.

Programme year and Pattern:	F.Y.B.Sc. (2019 Pattern)
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Semester :	1
Course/Paper Name :	Botany Paper 2 : Plant morphology and Anatomy
Paper Code :	BO112

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain the importance of plant morphology in allied branches of botany
- CO2 : To explain various floral whorl and its importance in plant reproduction
- CO3 : To apply the concepts of anatomy in other allied branches of botany
- CO4 : To describe different tissues present in plant their structure
- CO5 : To differentiate the internal organization of two distinct plant group and plant parts

Programme year and Pattern:	F.Y.B.Sc. (2019 Pattern)
Semester :	1
Course/Paper Name :	Botany Paper 3 : Practical based on BO 111 & BO112
Paper Code :	BO113

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To identify various life forms of plants, design and inter-relations.
- CO2 : To execute experiments related to basic studies on evolution, ecology, developmental biology, physiology, biochemistry, plant interactions with microbes and insects, morphology, anatomy, reproduction, genetics, microbiology etc.
- CO3 : To apply the theoretical knowledge to real life cases
- CO4 : To conduct experiments practically both in field and laboratory.
- CO5 : To conduct experiments based on Plant life and utilization, Plant morphology and Anatomy

Programme year and Pattern:	F.Y.B.Sc. (2019 Pattern)
Semester :	2
Course/Paper Name :	Botany Paper 1 : Plant life and utilization II
Paper Code :	BO121

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To acquaint with the status of vascular plants as a group in plant kingdom.

- CO2 : To discuss about morphological structure, classification and reproduction of pteridophytes and gymnosperms.
- CO3 : To understand the life cycles of selected genera of pteridophytes and gymnosperms
- CO4 : To describe the economic and ecological importance of pteridophytes and Gymnosperms
- CO5 : To understand the morphological differences in dicot and monocot and their classification

Programme year and Pattern:	F.Y.B.Sc. (2019 Pattern)
Semester :	2
Course/Paper Name :	Botany Paper 2 : Principles of plant science
Paper Code :	BO122

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To understand the scope and importance of plant physiology.
- CO2 : To demonstrate processes imbibition, Osmosis, Diffusion and Plasmolysis CO3: Describe Plant growth regulators and their types.
- CO3 : To discuss the structure of plant cell and Plasma membrane and cell cycle in plants
- CO4 : To explain the scope and importance of molecular biology.
- CO5 : To describe the structure of DNA, Packing of DNA and types of DNA, RNA and explain the DNA replication process, enzymes involved in that process.

Programme year and Pattern:	F.Y.B.Sc. (2019 Pattern)
Semester :	2
Course/Paper Name :	Botany Paper 3 : Practical based on BO 121 & BO122
Paper Code :	BO123

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To identify various life forms of plants, design and their inter-relations.
- CO2 : To execute experiments related to basic studies on evolution, ecology, developmental biology, physiology, biochemistry, plant interactions with microbes and insects, morphology, anatomy, reproduction, genetics, microbiology etc.
- CO3 : To apply the theoretical knowledge to real life cases
- CO4 : To conduct experiments practically both in field and laboratory.
- CO5 : To conduct experiments based on Plant life and utilization and Principles of plant science

Programme year and Pattern:	S.Y.B.Sc. (2019 Pattern)
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Semester :	3
Course/Paper Name :	Botany Paper 1 : Taxonomy of Angiosperms and Plant Ecology
Paper Code :	BO231

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To Identify and classify plants according to their characteristics, genera and species
- CO2 : To explain types of systems with their merits and limitations
- CO3 : To apply the concepts of Flora, monograph, revisions, manuals, journals, periodicals and references books in research.
- CO4 : To use Sources of data for Systematics
- CO5 : To to name plants according to the Botanical Nomenclature

Programme year and Pattern:	S.Y.B.Sc. (2019 Pattern)
Semester :	3
Course/Paper Name :	Botany Paper 2 : Plant Physiology
Paper Code :	BO232

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To define the terminologies: Plant water relations, Growth, Transpiration, Ascent of Sap, Plant growth regulators and Nitrogen metabolism.
- CO2 : To explain processes of mineral nutrition, absorption of water, ascent of sap, mechanisms of water loss from plants.
- CO3 : To demonstrate processes imbibition, Osmosis, Diffusion and Plasmolysis, measure growth by arc auxanometer, Bose Cresco graph.
- CO4 : To describe Plant growth regulators and their types and Discuss nitrogen metabolism in plants
- CO5 : To explain mechanisms and application of photoperiodism, vernalisation and classify the plants based on Photoperiodism.

Programme year and Pattern:	S.Y.B.Sc. (2019 Pattern)
Semester :	3
Course/Paper Name :	Botany Paper 3 : Practical based on BO 231 & BO 232
Paper Code :	BO233

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To identify various life forms of plants, design and their inter-relations.
- CO2 : To execute experiments related to basic studies on evolution, ecology, developmental biology, physiology, biochemistry, plant interactions with microbes and insects, morphology, anatomy, reproduction, genetics, microbiology etc.
- CO3 : To apply the theoretical knowledge to real life cases
- CO4 : To conduct experiments practically both in field and laboratory.
- CO5 : To conduct experiments based on Taxonomy of Angiosperms and Plant Ecology and Plant Physiology

Programme year and Pattern:	S.Y.B.Sc. (2019 Pattern)
Semester :	4
Course/Paper Name :	Botany Paper 1 : Plant Anatomy and Embryology
Paper Code :	BO241

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To define terms related to plant Anatomy, Embryology.
- CO2 : To describe various tissue systems in plants like epidermal, mechanical and vascular.
- CO3 : To differentiate between Normal secondary growth and Anomalous secondary growth
- CO4 : To illustrate the structure and function of xylem, phloem and cambium
- CO5 : To explain concepts like inflexibility, incompressibility, inextensibility and shearing stress,

Programme year and Pattern:	S.Y.B.Sc. (2019 Pattern)
Semester :	4
Course/Paper Name :	Botany Paper 2 : Plant Biotechnology
Paper Code :	BO242

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To know various applications of Plant Biotechnology.
- CO2 : To describe the Uses of Plants and Fungi in enzyme technology-based industries and in fermentation industries
- CO3 : To explain the Single cell protein manufacturing process
- CO4 : To apply basic knowledge of plant genetic engineering
- CO5 : To explain the concepts of Bio-nano technology and its applications in Agriculture

Programme year	S.Y.B.Sc. (2019 Pattern)
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and Pattern:

Semester :	4
Course/Paper Name :	Botany Paper 3 : Practical based on BO 241 & BO 242
Paper Code :	BO243

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To identify various life forms of plants, design and their inter-relations.
- CO2 : To execute experiments related to basic studies on evolution, ecology, developmental biology, physiology, biochemistry, plant interactions with microbes and insects, morphology, anatomy, reproduction, genetics, microbiology etc.
- CO3 : To apply the theoretical knowledge to real life cases
- CO4 : To conduct experiments practically both in field and laboratory.
- CO5 : To conduct experiments based on Plant Anatomy and Embryology and Plant Biotechnology

Programme year and Pattern:

	T.Y.B.Sc. (2019 Pattern)
Semester :	5
Course/Paper Name :	Botany Paper 1 : Algae and Fungi
Paper Code :	BO351

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To describe characters of Cryptogams
- CO2 : To inform Chapman and Chapman system of classification used for cryptogams.
- CO3 : To explain the life cycle of Rhizopus, Saccaromyces, Puccinia and Cercospora
- CO4 : To illustrate Bryophytes and Pteridophytes
- CO5 : To explain lifecycle of Marchantia, Anthoceros, Polytrichum, Psilotum, Selaginella and Marsilea.

Programme year and Pattern:

	T.Y.B.Sc. (2019 Pattern)
Semester :	5
Course/Paper Name :	Botany Paper 2 : Archegoniate
Paper Code :	BO352

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To define different terminologies related to cell and molecular biology.
- CO2 : To identify localization and describe all cell organelles.
- CO3 : To discuss the dynamics of plant cell structure and function, Nucleus and chromosomes.
- CO4 : To describe the processes of DNA replication, Transcription and Translation.CO7 Explain gene action and regulation (concept of operon, its structure and regulation).
- CO5 : To interpret the genomic organization and its role in gene expression

Programme year and Pattern:

T.Y.B.Sc. (2019 Pattern)

Semester :

5

Course/Paper Name :

Botany Paper 3 : Spermatophyta and Paleobotany

Paper Code :

BO353

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain the different members of higher plant group (Phanerogams) when they see and they can make systematics of them
- CO2 : To understand plant composition in natural communities
- CO3 : To apply economical use of families helps to understand potential of plants in various industries
- CO4 : To handle various tools used in plant identification in laboratory as well as in field.
- CO5 : To understand the pattern of higher plant evolution over the time period

Programme year and Pattern:

T.Y.B.Sc. (2019 Pattern)

Semester :

5

Course/Paper Name :

Botany Paper 4 : Plant Ecology

Paper Code :

BO354

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To inter-relate living world and the environment, levels of organization, components and dynamism of ecosystem, homeostasis, niche concept, concept of limiting factors
- CO2 : To explain different types of ecologies.
- CO3 : To describe different concepts like Environmental Audit, Remote Sensing and Ecological management.
- CO4 : To illustrate different Biogeochemical cycles like carbon cycle, Nitrogen cycle, Phosphorus

cycle, and Hydrologic cycle

CO5 : To correlate Biology and Geography.

Programme year and Pattern:	T.Y.B.Sc. (2019 Pattern)
Semester :	5
Course/Paper Name :	Botany Paper 5 : Cell and Molecular Biology
Paper Code :	BO355

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To describe different cell organelles.
- CO2 : To explain Morphology and ultrastructure of nucleus, nucleolus and nucleolar organizer
- CO3 : To describe the process of Cell signalling.
- CO4 : To describe the process of DNA replication , Transcription and Translation
- CO5 : To explain Regulation of gene expression

Programme year and Pattern:	T.Y.B.Sc. (2019 Pattern)
Semester :	5
Course/Paper Name :	Botany Paper 6 : Genetics
Paper Code :	BO356

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To apply techniques of genetics in industries.
- CO2 : To correlate Mono hybrid and dihybrid crosses.
- CO3 : To explain different terminologies related to genes like supplementary gene , Inhibitory genes, Masking genes, NonEpistatic inter-allelic genetic interactions Complementary genes and Duplicate genes (15:1)
- CO4 : To explain the concept of mutation.
- CO5 : To explain the concept Sex Linked Inheritance

Programme year and Pattern:	T.Y.B.Sc. (2019 Pattern)
Semester :	5
Course/Paper Name :	Botany Paper 7 : Practical based on BO 351 & BO352
Paper Code :	BO357

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To identify various life forms of plants, design and inter-relations.
- CO2 : To execute experiments related to basic studies on evolution, ecology, developmental biology, physiology, biochemistry, plant interactions with microbes and insects, morphology, anatomy, reproduction, genetics, microbiology etc.
- CO3 : To apply the theoretical knowledge to real life cases
- CO4 : To conduct experiments practically both in field and laboratory.
- CO5 : To conduct experiments based on Algae and Fungi and Archegoniate .

Programme year and Pattern:

T.Y.B.Sc. (2019 Pattern)

Semester :

5

Course/Paper Name :

Botany Paper 8 : Practical based on BO 353 & BO354

Paper Code :

BO358

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To identify various life forms of plants, design and inter-relations.
- CO2 : To execute experiments related to basic studies on evolution, ecology, developmental biology, physiology, biochemistry, plant interactions with microbes and insects, morphology, anatomy, reproduction, genetics, microbiology etc.
- CO3 : To apply the theoretical knowledge to real life cases
- CO4 : To conduct experiments practically both in field and laboratory.
- CO5 : To conduct experiments based on Spermatophyta and Paleobotany and Plant Ecology.

Programme year and Pattern:

T.Y.B.Sc. (2019 Pattern)

Semester :

5

Course/Paper Name :

Botany Paper 9 : Practical based on BO 355 & BO356

Paper Code :

BO359

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To identify various life forms of plants, design and inter-relations.
- CO2 : To execute experiments related to basic studies on evolution, ecology, developmental biology, physiology, biochemistry, plant interactions with microbes and insects, morphology, anatomy, reproduction, genetics, microbiology etc.
- CO3 : To apply the theoretical knowledge to real life cases

CO4 : To conduct experiments practically both in field and laboratory.

CO5 : To conduct experiments based on Cell and Molecular Biology and Genetics.

Programme year and Pattern:	T.Y.B.Sc. (2019 Pattern)
Semester :	5
Course/Paper Name :	Botany Paper 10 : Medicinal Botany
Paper Code :	BO3510

Course Outcomes:

By the end of this course, student will be able:

CO1 : To describe the importance of Ayurveda in the field of medicine.

CO2 : To be aware of Conservation of endangered and endemic medicinal plants

CO3 : To illustrate the Folk medicines of ethnobotany, ethnomedicine, ethnoecology, ethnic communities of India

CO4 : To apply the methods in nursery.

CO5 : To apply natural products to certain diseases Jaundice, cardiac, infertility, diabetics, Blood pressure and skin diseases.

Programme year and Pattern:	T.Y.B.Sc. (2019 Pattern)
Semester :	5
Course/Paper Name :	Botany Paper 11 : Plant Diversity and Human Health
Paper Code :	BO3511

Course Outcomes:

By the end of this course, student will be able:

CO1 : To distinguish between Genetic diversity and Species diversity.

CO2 : To give reasons of Loss of Biodiversity.

CO3 : To visit Organizations associated with biodiversity management-Methodology for execution-IUCN, UNEP, UNESCO, WWF, NBPGR.

CO4 : To tell the significance of Role of plants in relation to Human Welfare

CO5 : To work towards the Conservation of Biodiversity.

Programme year and Pattern:	T.Y.B.Sc. (2019 Pattern)
Semester :	6
Course/Paper Name :	Botany Paper 1 : Plant Physiology and Metabolism
Paper Code :	BO361

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain the Significance of photosynthesis.
- CO2 : To differentiate between the Concepts of abiotic, biotic and xenobiotic stresses.
- CO3 : To explain the Mechanism of translocation – Pressure flow theory, Diffusion, Source to sink relationship, Phloem loading and unloading
- CO4 : To explain the Role of essential elements for plants.
- CO5 : To describe Stomatal Biology.

Programme year and Pattern:

T.Y.B.Sc. (2019 Pattern)

Semester :

6

Course/Paper Name :

Botany Paper 2 : Biochemistry

Paper Code :

BO362

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To describe different biomolecules like Carbohydrates, Amino acids and proteins and Lipids.
- CO2 : To classify enzymes.
- CO3 : To distinguish primary and Secondary Metabolites.
- CO4 : To classify proteins on the basis of structure, properties and functions of proteins.
- CO5 : To explain the Synthesis and breakdown of starch

Programme year and Pattern:

T.Y.B.Sc. (2019 Pattern)

Semester :

6

Course/Paper Name :

Botany Paper 3 : Plant Pathology

Paper Code :

BO363

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To define basic Fundamentals of plant pathology
- CO2 : To elaborate the terminologies like disease cycle, Inoculation, Prepenetration, Penetration, Infection and Dissemination.
- CO3 : To explain the Defence Mechanisms of the body.
- CO4 : To illustrate Fungal , Bacterial, Mycoplasma and Nematodal Plant Diseases
- CO5 : To illustrate Viral and non-parasitic Plant Diseases.

Programme year and Pattern:	T.Y.B.Sc. (2019 Pattern)
Semester :	6
Course/Paper Name :	Botany Paper 4 : Evolution and Population genetics
Paper Code :	BO364

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To distinguish between Direct evidences and Indirect evidences.
- CO2 : To distinction between Origin of life and Organic Evolution.
- CO3 : To describe different theories of evolution.
- CO4 : To explain Fossils and Geological Time scale.
- CO5 : To explain Speciation and different Isolating Mechanisms

Programme year and Pattern:	T.Y.B.Sc. (2019 Pattern)
Semester :	6
Course/Paper Name :	Botany Paper 5 : Advanced Plant Biotechnology
Paper Code :	BO365

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To describe work and significant achievements in Indian plant Biotechnology Global Impact and Current excitements of plant Biotechnology - Plant Health care and plant protection.
- CO2 : To illustrate applications of callus culture, cell suspension culture, protoplast culture.
- CO3 : To distinguish between In situ and Ex situ conservation
- CO4 : To explain Transgenic Plants as Bioreactors
- CO5 : To apply the technique of Biological Nitrogen Fixation.

Programme year and Pattern:	T.Y.B.Sc. (2019 Pattern)
Semester :	6
Course/Paper Name :	Botany Paper 6 : Plant Breeding and Seed Technology
Paper Code :	BO366

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To apply Conventional techniques, methods and practice breeding
- CO2 : To apply Hybridization in real life situations.
- CO3 : To describe different types of Breedings.
- CO4 : To convey Importance of Polyploidy and aneuploidy in crop improvement
- CO5 : To apply techniques of Seed sampling, storage and packaging

Programme year and Pattern:	T.Y.B.Sc. (2019 Pattern)
Semester :	6
Course/Paper Name :	Botany Paper 7 : Practical based on BO 361 & BO362
Paper Code :	BO367

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To identify various life forms of plants, design and inter-relations.
- CO2 : To execute experiments related to basic studies on evolution, ecology, developmental biology, physiology, biochemistry, plant interactions with microbes and insects, morphology, anatomy, reproduction, genetics, microbiology etc.
- CO3 : To apply the theoretical knowledge to real life cases
- CO4 : To conduct experiments practically both in field and laboratory.
- CO5 : To conduct experiments based on Biochemistry and Plant Physiology and Metabolism.

Programme year and Pattern:	T.Y.B.Sc. (2019 Pattern)
Semester :	6
Course/Paper Name :	Botany Paper 8 : Practical based on BO 363 & BO364
Paper Code :	BO368

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To identify various life forms of plants, design and inter-relations.
- CO2 : To execute experiments related to basic studies on evolution, ecology, developmental biology, physiology, biochemistry, plant interactions with microbes and insects, morphology, anatomy, reproduction, genetics, microbiology etc.
- CO3 : To apply the theoretical knowledge to real life cases
- CO4 : To conduct experiments practically both in field and laboratory.
- CO5 : To conduct experiments based on Plant Pathology and Evolution and population genetics

Programme year and Pattern:	T.Y.B.Sc. (2019 Pattern)
Semester :	6
Course/Paper Name :	Botany Paper 9 : Practical based on BO 365 & BO366
Paper Code :	BO369

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To identify various life forms of plants, design and inter-relations.
- CO2 : To execute experiments related to basic studies on evolution, ecology, developmental biology, physiology, biochemistry, plant interactions with microbes and insects, morphology, anatomy, reproduction, genetics, microbiology etc.
- CO3 : To apply the theoretical knowledge to real life cases
- CO4 : To conduct experiments practically both in field and laboratory.
- CO5 : To conduct experiments based on Advanced Plant Biotechnology and Plant Breeding and Seed Technology

Programme year and Pattern:	T.Y.B.Sc. (2019 Pattern)
Semester :	6
Course/Paper Name :	Botany Paper 10 : Nursery and Gardening Management
Paper Code :	BO3610

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To apply techniques of Nursery Management in real life.
- CO2 : To understand and apply different Seed production technologies like seed testing and certification.
- CO3 : To apply techniques of Garden Management in real life.
- CO4 : To apply techniques like Sowing/raising of seeds and seedlings - Transplanting of seedlings
- CO5 : To explain the concepts of Vegetative propagation.

Programme year and Pattern:	T.Y.B.Sc. (2019 Pattern)
Semester :	6
Course/Paper Name :	Botany Paper 11 : Biofertilizers
Paper Code :	BO3611

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To deal with bacterial and fungal fertilizers.
- CO2 : To apply different techniques of Compost and Manure preparation.
- CO3 : To explain role of micro-organisms in Fertilizer preparation.
- CO4 : To explain Applications of Blue Green Algae
- CO5 : To describe Applications of Azospirillum

Faculty : Science

Department : Zoology

Programme

Name : B.Sc. Zoology

Pattern : 2019

Programme Outcomes:

By the end of this Programme, student will be able :

- PO1 : To trigger curiosity in the students for Zoology
- PO2 : To tell importance of abiotic and biotic factors of environment and their conservation
- PO3 : To inculcate good laboratory practices in students and to train them about proper handling of lab instruments.
- PO4 : To demonstrate knowledge and understanding of Zoology and management principles and apply these to one's own work, as a member and leader in a team.
- PO5 : To function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

Programme Specific Outcomes:

By the end of this Programme, student will be able:

- PSO1 : To analyse the relationships among animals with their ecosystems
- PSO2 : To correlate Zoology with Agriculture, Medicine and daily life
- PSO3 : To define basic concepts of cell biology, genetics, taxonomy, physiology, ecology and applied Zoology
- PSO4 : To acquaint with the knowledge about research methodologies, effective communication and skills of problem solving methods
- PSO5 : To contribute the knowledge for wellbeing of the society.

Programme year and Pattern: F.Y.B.Sc. (2019 Pattern)
Semester : 1
Course/Paper Name : Zoology Paper 1 : Animal Diversity I
Paper Code : ZO111

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To understand classify and identify the diversity of animals.
- CO2 : To understand the importance of classification of animals and classifies them effectively using the six levels of classification
- CO3 : To know his/her role in nature as a protector, preserver and promoter of life which he has achieved by learning, observing and understanding life.
- CO4 : To classify invertebrates and to be able to understand the possible group of the invertebrate observed in nature.
- CO5 : To understand the Animal diversity around us.

Programme year and Pattern:

F.Y.B.Sc. (2019 Pattern)

Semester :

1

Course/Paper Name :

Zoology Paper 2 : Animal Ecology

Paper Code :

ZO112

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To identify and critically evaluate their own beliefs, values and actions in relation to professional and societal standards of ethics and its impact on ecosystem and biosphere due to the dynamics in population.
- CO2 : To understand anticipate, analyse and evaluate natural resource issues and act on a lifestyle that conserves nature.
- CO3 : To appreciates the diversity of ecosystems and applies beyond the syllabi to understand the local lifestyle and problems of the community.
- CO4 : To link the intricacies of food chains, food webs and link it with human life for its betterment and for non-exploitation of the biotic and abiotic components.
- CO5 : The working in nature to save environment will help development of leadership skills to promote betterment of environment.

Programme year and Pattern:

F.Y.B.Sc. (2019 Pattern)

Semester :

1

Course/Paper Name :

Zoology Paper 3 : Zoology Practical Paper

Paper Code :

ZO113

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To recognize the live forms of vertebrates and invertebrates.

- CO2 : To analyse and describe zoological concepts, including morphology and anatomy.
- CO3 : To explain conservation and sustainable use of animals.
- CO4 : To explain and demonstrate the impact that animals have on human society
- CO5 : To perform basic practicals based on animal identification.

Programme year and Pattern: F.Y.B.Sc. (2019 Pattern)
Semester : 2
Course/Paper Name : Zoology Paper 1 : Animal Diversity II
Paper Code : ZO121

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To understand classify and identify the diversity of animals.
- CO2 : To understand the importance of classification of animals and classifies them effectively using the six levels of classification
- CO3 : To know his/her role in nature as a protector, preserver and promoter of life which he has achieved by learning, observing and understanding life.
- CO4 : To classify invertebrates and to be able to understand the possible group of the invertebrate observed in nature.
- CO5 : To understand the Animal diversity around us.

Programme year and Pattern: F.Y.B.Sc. (2019 Pattern)
Semester : 2
Course/Paper Name : Zoology Paper 2 : Cell Biology
Paper Code : ZO122

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To understand the importance of cell as a structural and functional unit of life.
- CO2 : To compares between the prokaryotic and eukaryotic system and extrapolates the life to the aspect of development.
- CO3 : To explain The dynamism of bio membranes indicates the dynamism of life whose working mechanism and precision are responsible for our performance in life.
- CO4 : To describe the cellular mechanisms and its functioning depends on endo-membranes and structures which are best studied with microscopy.

Programme year and Pattern: F.Y.B.Sc. (2019 Pattern)

Semester : 1
Course/Paper Name : **Zoology Paper 3 : Zoology Practical Paper**
Paper Code : **ZO123**

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To recognize the live forms of vertebrates and invertebrates.
- CO2 : To analyse and describe zoological concepts, including morphology and anatomy.
- CO3 : To explain conservation and sustainable use of animals.
- CO4 : To explain and demonstrate the impact that animals have on human society
- CO5 : To perform basic practicals based on animal identification.

Programme year and Pattern: **S.Y.B.Sc. (2019 Pattern)**
Semester : 3
Course/Paper Name : **Zoology Paper 1 : Animal Diversity III**
Paper Code : **ZO231**

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To compare fundamental characters of Chordates with Non Chordates.
- CO2 : To characterize members of the class Protochordata
- CO3 : To differentiate Vertebrata and non-vertebrates.
- CO4 : To explain different types of scales and fins.
- CO5 : To describe Scoliodon with respect to Systematic position, Geographical distribution, Habit, Habitat

Programme year and Pattern: **S.Y.B.Sc. (2019 Pattern)**
Semester : 3
Course/Paper Name : **Zoology Paper 2 : Applied Zoology I**
Paper Code : **ZO232**

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To understands processes of fisheries, sericulture, along with crop pest management techniques
- CO2 : To gain knowledge about various disease related vectors and their impact on human

- CO3 : To understand concepts of apiculture, poultry, dairy along with tissue and cell culture technique
- CO4 : To understand the types of agricultural pests, Major insect pests of agricultural importance and Pest control practices.
- CO5 : To understand the biology, varieties of silkworms and the basic techniques of silk production.

Programme year and Pattern: S.Y.B.Sc. (2019 Pattern)

Semester : 3

Course/Paper Name : Zoology Paper 3 : Zoology Practical Paper

Paper Code : ZO233

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To recognize the live forms of vertebrates and invertebrates.
- CO2 : To analyse and describe zoological concepts, including morphology and anatomy.
- CO3 : To explain conservation and sustainable use of animals.
- CO4 : To explain and demonstrate the impact that animals have on human society
- CO5 : To perform basic practicals based on animal identification.

Programme year and Pattern: S.Y.B.Sc. (2019 Pattern)

Semester : 3

Course/Paper Name : Environmental Science Paper : Environment Awareness

Paper Code : EVS231

Course Outcomes:

By the end of this course, student will be able:

- CO1 :
- CO2 :
- CO3 :
- CO4 :
- CO5 :

Programme year and Pattern: S.Y.B.Sc. (2019 Pattern)

Semester : 3

Course/Paper Name : Language : English/Marathi

Paper Code : LA231

Course Outcomes:

By the end of this course, student will be able:

CO1 :

CO2 :

CO3 :

CO4 :

CO5 :

Programme year and Pattern: S.Y.B.Sc. (2019 Pattern)

Semester : 4

Course/Paper Name : Zoology Paper 1 : Animal Diversity IV

Paper Code : ZO241

Course Outcomes:

By the end of this course, student will be able:

CO1 : To classify Non-chordates along with studies on various physiological functions and interactions of non-chordate organisms with type specimens

CO2 : To classify chordates along with studies on various physiological functions and comparative anatomy of organs of chordate with example.

CO3 : To characterize Reptilia , Aves and Mammalia .

CO4 : To describe rat in detail with respect to Systematic position, habit and habitat.

CO5 : To describe various adaptations of Reptilia , Aves and Mammalia .

Programme year and Pattern: S.Y.B.Sc. (2019 Pattern)

Semester : 4

Course/Paper Name : Zoology Paper 2 : Applied Zoology II

Paper Code : ZO242

Course Outcomes:

By the end of this course, student will be able:

CO1 : To understand processes of fisheries, sericulture, along with crop pest management techniques

CO2 : To gain knowledge about various disease related vectors and their impact on human

- CO3 : To understand concepts of apiculture, poultry, dairy along with tissue and cell culture technique
- CO4 : To understand the types of agricultural pests, Major insect pests of agricultural importance and Pest control practices.
- CO5 : To understand the biology, varieties of silkworms and the basic techniques of silk production.

Programme year and Pattern: S.Y.B.Sc. (2019 Pattern)

Semester : 4

Course/Paper Name : Zoology Paper 3 : Zoology Practical Paper

Paper Code : ZO243

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To recognize the live forms of vertebrates and invertebrates.
- CO2 : To analyse and describe zoological concepts, including morphology and anatomy.
- CO3 : To explain conservation and sustainable use of animals.
- CO4 : To explain and demonstrate the impact that animals have on human society
- CO5 : To perform basic practicals based on animal identification.

Programme year and Pattern: S.Y.B.Sc. (2019 Pattern)

Semester : 4

Course/Paper Name : Environmental Science : Environment Awareness

Paper Code : EVS241

Course Outcomes:

By the end of this course, student will be able:

- CO1 :
- CO2 :
- CO3 :
- CO4 :
- CO5 :

Programme year and Pattern: S.Y.B.Sc. (2019 Pattern)

Semester : 4

Course/Paper Name : Language : English/Marathi

Paper Code : LA241

Course Outcomes:

By the end of this course, student will be able:

CO1 :

CO2 :

CO3 :

CO4 :

CO5 :

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)

Semester : 5

Course/Paper Name : Zoology Paper 1 : Pest Management

Paper Code : ZO351

Course Outcomes:

By the end of this course, student will be able:

CO1 : To define pest management.

CO2 : To describe the economic, ecological, and sociological benefits of IPM.

CO3 : To distinguish positive and negative impacts of pesticide use.

CO4 : To analyse and compare management tactics to determine the best approach to reducing pest populations, weeds, and disease presence

CO5 : To locate appropriate, scientifically valid sources of information on specific tactics to manage insect pests, weeds, and diseases.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)

Semester : 5

Course/Paper Name : Zoology Paper 2 : Histology

Paper Code : ZO352

Course Outcomes:

By the end of this course, student will be able:

CO1 : To understand, classify and identify the different types of tissue.

CO2 : To explain complexity of various tissues in an organ.

CO3 : To describe structure & functions of various tissues.

CO4 : To describe the various diseases related to organs.

CO5 : To explain the role of glands in mammals.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 5
Course/Paper Name : Zoology Paper 3 : Biological Chemistry
Paper Code : ZO353

Course Outcomes:

By the end of this course, student will be able:

CO1 : To understand basic concepts and significance of biochemistry

CO2 : To explain and measure pH and Buffers.

CO3 : To explain the chemical structures of carbohydrate, and their biological and clinical significance.

CO4 : To understand, interpret structure and importance of proteins, carbohydrates and lipids

CO5 : To comprehend variations in enzyme activity and kinetics.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 5
Course/Paper Name : Zoology Paper 4 : Genetics
Paper Code : ZO354

Course Outcomes:

By the end of this course, student will be able:

CO1 : To describe Exceptions to Mendelian Inheritance

CO2 : To define Classical and Modern concept of Gene, Cistron, Muton, Recon

CO3 : To understand Sex-determination patterns in different species.

CO4 : To explain different Types of mutations: spontaneous, induced, somatic, gametic, forward, reverse and Types of point mutation - deletion, insertion, substitution, transversion, transition.

CO5 : To understand applications of genetics.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 5
Course/Paper Name : Zoology Paper 5 : Developmental Biology

Paper Code : Z0355

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To define different Concepts in Developmental Biology: Growth, Differentiation, Dedifferentiation, Cell determination, Cell communication, Morphogenesis, Induction and Regeneration.
- CO2 : To explain Spermatogenesis & Structure of sperm with respect to human.
- CO3 : To explain Gastrulation.
- CO4 : To describe Chick Embryology
- CO5 : To explain different Theories of Developmental Biology.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)

Semester : 5

Course/Paper Name : Zoology Paper 6 : Parasitology

Paper Code : Z0356

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To define the basic terms in parasitology.
- CO2 : To list common ectoparasites and endoparasites and discuss the life cycle and importance of major parasites.
- CO3 : To explain animal associations and their types.
- CO4 : To illustrate transmission routes of animal and zoonotic parasites and justify the control measures of arthropod vectors.
- CO5 : To convince the importance of hygiene with respect to epidemic diseases.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)

Semester : 5

Course/Paper Name : Zoology Paper 7 : Zoology Practical Paper 1

Paper Code : Z0357

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To experience first-hand knowledge about identification of non-chordate and chordate specimens (fresh and preserved) along with larval forms and study of endoskeleton of vertebrates
- CO2 : To handle microscopes, work with camera lucida and micrometers

- CO3 : To identify zooplanktons and phytoplanktons
- CO4 : To gain skill about histological slide preparation, staining and mounting ,
determination of pH and quantitative analysis of blood cells
- CO5 : To identify parasites from rectal and fecal contents of animals and collect parasite
and pest specimen

**Programme year
and Pattern:** T.Y.B.Sc. (2019 Pattern)
Semester : 5
**Course/Paper Name
:** Zoology Paper 8 : Zoology Practical Paper 2
Paper Code : ZO358

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To experience first-hand knowledge about identification of non-chordate and
chordate specimens (fresh and preserved) along with larval forms and study of
endoskeleton of vertebrates
- CO2 : To handle microscopes, work with camera lucida and micrometers
- CO3 : To identify zooplanktons and phytoplanktons
- CO4 : To gain skill about histological slide preparation, staining and mounting ,
determination of pH and quantitative analysis of blood cells
- CO5 : To identify parasites from rectal and fecal contents of animals and collect parasite
and pest specimen

**Programme year
and Pattern:** T.Y.B.Sc. (2019 Pattern)
Semester : 5
**Course/Paper Name
:** Zoology Paper 9 : Zoology Practical Paper 3
Paper Code : ZO359

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To experience first-hand knowledge about identification of non-chordate and
chordate specimens (fresh and preserved) along with larval forms and study of
endoskeleton of vertebrates
- CO2 : To handle microscopes, work with camera lucida and micrometers
- CO3 : To identify zooplanktons and phytoplanktons
- CO4 : To gain skill about histological slide preparation, staining and mounting ,
determination of pH and quantitative analysis of blood cells
- CO5 : To identify parasites from rectal and fecal contents of animals and collect parasite
and pest specimen

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 5
Course/Paper Name : Zoology Paper 10 : Aquarium Management
Paper Code : ZO3510

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To understand Physico-chemical parameters of water for fish culture.
- CO2 : To apply techniques of Fish Transportation, Food and feeding of Aquarium Fishes.
- CO3 : To apply techniques of Aquarium Fish Keeping.
- CO4 : To describe Fish preservation and fish breeding.
- CO5 : To understand Common characters and sexual dimorphism of Aquarium fishes - Guppy, Molly, Sword tail, Gold fish, Angel fish, Blue morph, Anemone fish, Butterfly fish and Fighter fish.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 5
Course/Paper Name : Zoology Paper 11 : Poultry Management
Paper Code : ZO3511

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To understand the Poultry farming practices and market value of poultry products.
- CO2 : To understand the poultry breeding techniques.
- CO3 : To understand poultry rearing techniques.
- CO4 : To understand feeding requirement and food ingredients.
- CO5 : To understand the poultry disease and their pathogens. 6. The students will be able to understand

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 6
Course/Paper Name : Zoology Paper 1 : Medical & Forensic Zoology
Paper Code : ZO361

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To understand the basics principles of Medical and Forensic Zoology.
- CO2 : To understand scientific methods in crime detection.
- CO3 : To understand the advancements in the field of Medical and Forensic Zoology.
- CO4 : To understand modern tools, techniques and skills in forensic investigations.
- CO5 : To describe the fundamental principles and functions of forensic science and its significance to human society.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 6
Course/Paper Name : Zoology Paper 2 : Animal Physiology
Paper Code : ZO362

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To describe various physiological organ-systems and their importance to the integrative functions of the human body.
- CO2 : To understand Concept of energy requirements
- CO3 : To explain Various aspects of Digestive physiology and Circulatory system with medical conditions
- CO4 : To understand Respiratory mechanism and gases transport, eliminations of waste materials from the body.
- CO5 : To develop understanding in Structure and functions of muscles

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 6
Course/Paper Name : Zoology Paper 3 : Molecular Biology
Paper Code : ZO363

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To get an insight into molecular mechanisms of various biological processes in cells and organisms
- CO2 : To get an insight into the Structure of DNA and RNA, DNA and RNA as genetic material
- CO3 : To get insight into the Central Dogma of Molecular Biology
- CO4 : To understand the concept of gene regulation
- CO5 : To understand the concept of gene regulation

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 6
Course/Paper Name : Zoology Paper 4 : Entomology
Paper Code : ZO364

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To understand basic concepts in Entomology and its scope.
- CO2 : To learn morphology and anatomy of Insects.
- CO3 : To understand the concept of social organization in Insects and their development process of Insects.
- CO4 : To identify disease causing insect vectors.
- CO5 : To design and implement pest controlling methods against pests.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 6
Course/Paper Name : Zoology Paper 5 : Techniques in Biology
Paper Code : ZO365

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To apply different statistical and mathematical Methods in Biodiversity:
- CO2 : To illustrate Types of PCR & DNA Barcoding.
- CO3 : To acquaint with Laboratory techniques and instruments.
- CO4 : To explain Haematological Techniques and Immunological Techniques:
- CO5 : To describe concepts in Microtomy: Tissue fixation and Processing

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 6
Course/Paper Name : Zoology Paper 6 : Evolutionary Biology
Paper Code : ZO366

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To learn most of the essential aspects of Evolutionary Biology in detail which will help them in acquiring better understanding regarding the subject.

- CO2 : To explain important processes, principles and concepts and critically evaluate theories and empirical research within evolutionary biology
- CO3 : To apply evolutionary theory and concepts to address empirical and theoretical questions in evolutionary biology.
- CO4 : To investigate evolutionary questions using literature and analyses of empirical data.
- CO5 : To communicate the principles, theories, problems and research results associated with questions that lie within the evolutionary framework to students

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 6
Course/Paper Name : Zoology Paper 7 : Zoology Practical Paper 1
Paper Code : ZO367

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To experience first-hand knowledge about identification of non-chordate and chordate specimens (fresh and preserved) along with larval forms and study of endoskeleton of vertebrates
- CO2 : To handle microscopes, work with camera lucida and micrometers
- CO3 : To identify zooplanktons and phytoplanktons
- CO4 : To gain skill about histological slide preparation, staining and mounting , determination of pH and quantitative analysis of blood cells
- CO5 : To identify parasites from rectal and fecal contents of animals and collect parasite and pest specimen

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 6
Course/Paper Name : Zoology Paper 8 : Zoology Practical Paper 2
Paper Code : ZO368

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To experience first-hand knowledge about identification of non-chordate and chordate specimens (fresh and preserved) along with larval forms and study of endoskeleton of vertebrates
- CO2 : To handle microscopes, work with camera lucida and micrometers
- CO3 : To identify zooplanktons and phytoplanktons
- CO4 : To gain skill about histological slide preparation, staining and mounting , determination of pH and quantitative analysis of blood cells
- CO5 : To identify parasites from rectal and fecal contents of animals and collect parasite and pest specimen

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 6
Course/Paper Name : Zoology Paper 9 : Zoology Practical Paper 3
Paper Code : ZO369

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To experience first-hand knowledge about identification of non-chordate and chordate specimens (fresh and preserved) along with larval forms and study of endoskeleton of vertebrates
- CO2 : To handle microscopes, work with camera lucida and micrometers
- CO3 : To identify zooplanktons and phytoplanktons
- CO4 : To gain skill about histological slide preparation, staining and mounting , determination of pH and quantitative analysis of blood cells
- CO5 : To identify parasites from rectal and fecal contents of animals and collect parasite and pest specimen

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 6
Course/Paper Name : Zoology Paper 10 : Environmental Impact Assessment
Paper Code : ZO3610

Course Outcomes:

By the end of this course, student will be able:

- CO1 :
- CO2 :
- CO3 :
- CO4 :
- CO5 :

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 6
Course/Paper Name : Zoology Paper 11 : Project
Paper Code : ZO3611

Course Outcomes:

By the end of this course, student will be able:

CO1 :

CO2 :

CO3 :

CO4 :

CO5 :

Faculty : Science

Department : Mathematics

Programme Name : B.Sc. Mathematics

Pattern : 2019

Programme Outcomes:

By the end of this Programme, student will be able :

PO1 : To develop Scientific attitude.

PO2 : To acquire basic Theoretical, Practical and Technical knowledge of different subjects in the science stream.

PO3 : To possess subject knowledge required for higher studies, professional and applied courses like Pure Sciences, Applied Sciences, Management Studies, Law etc.

PO4 : To avail different career opportunities in different fields like Education, Research and Development, IT, Data Analysis ,etc.

PO5 : To develop solution oriented approach towards various Social and Environmental issues and work towards inculcating and spreading its awareness.

Programme Specific Outcomes:

By the end of this Programme, student will be able:

PSO1 : To recall basic facts about Mathematics and interpret and recreate the knowledge of conventions such as notations,terminology,formulae,diagrams,etc.

PSO2 : To acquire adequate exposure to applications and issues which are concerned with Mathematical Sciences.

PSO3 : To equip himself/herself with different skills like Mathematical Modelling, Problem Solving, Data Analysis , Logic Development , etc.

PSO4 : To harness his/her creativity, talent and power of communication necessary for various kinds of employment and presentations.

PSO5 : To develop a positive attitude towards Mathematics as an interesting, applicable and valuable subject of study.

Programme year and Pattern: F.Y.B.Sc. (2019 Pattern)
Semester : 1
Course/Paper Name : Mathematics Paper 1 : Algebra
Paper Code : MT111

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To get the knowledge about fundamental theories like Set Theory , Number theory , Graph Theory etc.
- CO2 : To learn real life applications of Number Theory
- CO3 : To enhance computational skills.
- CO4 : To learn basics of Complex Analysis
- CO5 : To explain fundamental theorem of Algebra.

Programme year and Pattern: F.Y.B.Sc. (2019 Pattern)
Semester : 1
Course/Paper Name : Mathematics Paper 2 : Calculus 1
Paper Code : MT112

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To develop a positive attitude towards mathematics as an interesting and valuable subject of study.
- CO2 : To learn the properties of real numbers and concepts like Functions, Limits, Continuity and Differentiability.
- CO3 : To able to plot the graphs of basic functions and relate them with the theoretical concepts and their geometrical representations.
- CO4 : To apply the concepts of Calculus in higher mathematics.
- CO5 : To convert the verbal information into mathematical form and process it using appropriate mathematical concepts and formulae to draw the relevant conclusion.

Programme year and Pattern: F.Y.B.Sc. (2019 Pattern)
Semester : 1
Course/Paper Name : Mathematics Paper 3 : Mathematics Practical
Paper Code : MT113

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To correlate the Mathematical concepts with subjects from the other disciplines like Pure and Applied Sciences, Humanities and Social Sciences.
- CO2 : To gain the confidence in proving theorems and solving problems.
- CO3 : To convert the verbal information into mathematical form and process it using appropriate mathematical concepts and formulae to draw the relevant conclusion.
- CO4 : To solve problems based on Algebra.
- CO5 : To solve problems based on Calculus.

Programme year and Pattern: F.Y.B.Sc. (2019 Pattern)
Semester : 2
Course/Paper Name : Mathematics Paper 1 : Analytical Geometry
Paper Code : MT121

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To learn geometry of 2D and 3D.
- CO2 : To reduce general equation of second degree to its standard form.
- CO3 : To describe geometry of line, plane and sphere and their equations in various forms.
- CO4 : To trigger his/her intuitions about the n-dimensional space.
- CO5 : To correlate geometrical concepts with real life.

Programme year and Pattern: F.Y.B.Sc. (2019 Pattern)
Semester : 2
Course/Paper Name : Mathematics Paper 2 : Calculus 2
Paper Code : MT122

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To learn the properties of real numbers and concepts like Functions, Limits, Continuity and Differentiability.
- CO2 : To able to plot the graphs of basic functions and relate them with the theoretical concepts and their geometrical representations.
- CO3 : To apply the concepts of Calculus in higher mathematics.
- CO4 : To develop the theoretical as well as computational skills.
- CO5 : To get acquainted with all the basic concepts of differential equations and the usage the basic concepts for the higher study in differential equations.

Programme year and Pattern: F.Y.B.Sc. (2019 Pattern)
Semester : 2
Course/Paper Name : Mathematics Paper 3 : Mathematics Practical
Paper Code : MT123

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To correlate the Mathematical concepts with subjects from the other disciplines like Pure and Applied Sciences, Humanities and Social Sciences.
- CO2 : To gain the confidence in proving theorems and solving problems.
- CO3 : To convert the verbal information into mathematical form and process it using appropriate mathematical concepts and formulae to draw the relevant conclusion.
- CO4 : To solve problems based on Calculus.
- CO5 : To solve problems based on Analytical Geometry.

Programme year and Pattern: S.Y.B.Sc. (2019 Pattern)
Semester : 3
Course/Paper Name : Mathematics Paper 1 : Calculus of Several Variables
Paper Code : MT231

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To Identify various functions one and several variables.
- CO2 : To interpret the terminologies like of Limits, Continuity and Differentiability of functions of several variables.
- CO3 : To find Critical points, Maximum and Minimum values of functions of several variables using derivatives.
- CO4 : To evaluate double and triple integration.
- CO5 : To apply Integral Calculus to obtain area and volume

Programme year and Pattern: S.Y.B.Sc. (2019 Pattern)
Semester : 3
Course/Paper Name : Mathematics Paper 2(A) : Numerical Methods and Its Applications
Paper Code : MT232(A)

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To find approximations to difficult equations occurring in Physics and Engineering Sciences.
- CO2 : To plot a curve of Regression using Interpolation and Extrapolation.
- CO3 : To derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
- CO4 : To approximately solve the by using numerical techniques.
- CO5 : To analyse and evaluate the accuracy of common numerical methods.

Programme year and Pattern: S.Y.B.Sc. (2019 Pattern)
Semester : 3
Course/Paper Name : Mathematics Paper 2(B) : Graph Theory
Paper Code : MT232(B)

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To illustrate different types of graphs and operations on graphs
- CO2 : To explain the concept of trees in detail and algorithms to find special spanning
- CO3 : To use Graph Theory in Mathematical Modelling.
- CO4 : To apply Graph Theory in Computers.
- CO5 : To apply concepts of Directed Graphs in real life.

Programme year and Pattern: S.Y.B.Sc. (2019 Pattern)
Semester : 3
Course/Paper Name : Mathematics Paper 3 : Mathematics Practical based on MT231 and MT232
Paper Code : MT233

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To correlate the Mathematical concepts with subjects from the other disciplines like Pure and Applied Sciences, Humanities and Social Sciences.
- CO2 : To gain the confidence in proving theorems and solving problems.
- CO3 : To convert the verbal information into mathematical form and process it using appropriate mathematical concepts and formulae to draw the relevant conclusion.
- CO4 : To solve problems based on Numerical Methods.
- CO5 : To solve problems based on Graph Theory.

Programme year and Pattern: S.Y.B.Sc. (2019 Pattern)
Semester : 4
Course/Paper Name : Mathematics Paper 1 : Linear Algebra
Paper Code : MT241

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain the importance of Linear Transformations in Physics, Engineering, Social sciences and various other Fields
- CO2 : To find Eigen values and Eigen vectors of a matrix is used in the Regression Analysis, study of motions and vibrations, chemical reactions and geometry.
- CO3 : To define Inner Product spaces.
- CO4 : To obtain orthonormal vectors using Gram-Schmidt process of orthogonalization.
- CO5 : To develop Mathematical Modelling skills.

Programme year and Pattern: S.Y.B.Sc. (2019 Pattern)
Semester : 4
Course/Paper Name : Mathematics Paper 2(A) : Vector Calculus
Paper Code : MT242(A)

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To interpret the terminologies like Limits and Continuity, Derivatives in the vector field.
- CO2 : To differentiate between Tangent vector and Normal vector.
- CO3 : To apply Calculus in solving problems related to Work done by a Force over a Curve in Space, Flow Integrals and Circulation for Velocity Fields, Flow across the Simple Closed Plane Curve.
- CO4 : To parametrize the surfaces in the 2D and 3D.
- CO5 : To apply Stokes theorem and Divergence theorem to simplify the complicated integrals.

Programme year and Pattern: S.Y.B.Sc. (2019 Pattern)
Semester : 4
Course/Paper Name : Mathematics Paper 2(B) : Dynamical Systems
Paper Code : MT242(B)

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To develop mathematical maturity in their current and future courses shall develop
- CO2 : To develop theoretical, applied and computational skills.
- CO3 : To gain confidence in proving theorems and solving problems.
- CO4 : To efficiently deal with Eigen values and Eigen vectors.
- CO5 : To Ordinary Differential Equations and Planar Linear Systems

Programme year and Pattern:

S.Y.B.Sc. (2019 Pattern)

Semester :

4

Course/Paper Name :

Mathematics Paper 3 : Mathematics Practical based on MT241 and MT242

Paper Code :

MT243

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To correlate the Mathematical concepts with subjects from the other disciplines like Pure and Applied Sciences, Humanities and Social Sciences.
- CO2 : To gain the confidence in proving theorems and solving problems.
- CO3 : To convert the verbal information into mathematical form and process it using appropriate mathematical concepts and formulae to draw the relevant conclusion.
- CO4 : To solve problems based on Linear Algebra.
- CO5 : To solve problems based on Vector Calculus/Dynamical Systems.

Programme year and Pattern:

T.Y.B.Sc. (2019 Pattern)

Semester :

5

Course/Paper Name :

Mathematics Paper 1 : Metric Spaces

Paper Code :

MT351

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To understand the Euclidean distance function on \mathbb{R}^n and appreciate its properties and state and use the Triangle inequality.
- CO2 : To illustrate the geometric meaning of each of the metric space
- CO3 : To explain the definition of continuity for functions defined on different metric space.
- CO4 : To distinguish between open and closed balls in a metric space.
- CO5 : To determine convergence of sequence in a metric space converges

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 5
Course/Paper Name : Mathematics Paper 2 : Real Analysis I
Paper Code : MT352

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To describe fundamental properties of the real numbers that lead to the formal development of real analysis.
- CO2 : To illustrate basic techniques and examples in analysis to be well prepared for courses like Topology, Measure theory and Functional analysis.
- CO3 : To describe various types of sets and relations, and concept of countable and uncountable.
- CO4 : To explain concept of sequence and series and hence find sum of infinite terms with different methods.
- CO5 : To connect the notions of lub and glb which helps to learn integrations which helps to find area under any functions.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 5
Course/Paper Name : Mathematics Paper 3 : Group Theory
Paper Code : MT353

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To understand the importance of algebraic properties with regard to working within various number systems.
- CO2 : To enhance abstract thinking.
- CO3 : To extend group structure to finite permutation groups (Caley Hamilton Theorem).
- CO4 : To understand the three major concrete models of Boolean algebra: the algebra of sets, the algebra of electrical circuits, and the algebra of logic
- CO5 : To compare two different algebraic structures and study transfer of properties in between these structures through homomorphism and isomorphism

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 5
Course/Paper Name : Mathematics Paper 4 : Ordinary Differential Equations
Paper Code : MT334

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To solve first order differential equations utilizing the standard techniques for separable, exact, linear, homogeneous, or Bernoulli cases.
- CO2 : To find the complete solution of a nonhomogeneous differential equation as a linear combination of the complementary function and a particular solution.
- CO3 : To use knowledge of basic application problems described by second order linear differential equations with constant coefficients.
- CO4 : To learn power series solution method using ordinary and singular points.
- CO5 : To learn methods for solving non-homogenous differential equation.

Programme year and Pattern:

T.Y.B.Sc. (2019 Pattern)

Semester :

5

Course/Paper Name :

Mathematics Paper 5(A) : Operations Research

Paper Code :

MT355(A)

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To Develop linear programming (LP) models for shortest path, maximum flow, minimal spanning tree, critical path, minimum cost flow, and transshipment problems.
- CO2 : To use mathematical tools that are needed to solve optimization problems.
- CO3 : To formulate pure, mixed, and binary integer programming models.
- CO4 : To formulate the nonlinear programming models.
- CO5 : To use some solution methods for solving the nonlinear optimization problems.

Programme year and Pattern:

T.Y.B.Sc. (2019 Pattern)

Semester :

5

Course/Paper Name :

Mathematics Paper 6(B) : Number Theory

Paper Code :

MT356(B)

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To illustrate the properties of the set of integers in detail.
- CO2 : To find integer solutions to the system of equations which arises in real life problems.
- CO3 : To solve problems based on various theorems on primes and congruence which are used in cryptography.
- CO4 : To solve problems using Theory of quadratic residue

CO5 : To determine multiplicative inverses, modulo n and use to solve linear congruence.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)

Semester : 5

Course/Paper Name : Mathematics Paper 7 : Practical Course Lab-I: Metric Spaces and Real Analysis-I

Paper Code : MT357

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To appreciate how abstract ideas and rigorous methods in mathematical analysis can be applied to important practical problems.
- CO2 : To solve problems on metric space and connected and compact spaces.
- CO3 : To solve problems on Sequences and Series.
- CO4 : To gain the confidence in proving theorems and solving problems.
- CO5 : To convert the verbal information into mathematical form and process it using appropriate mathematical concepts and formulae to draw the relevant conclusion.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)

Semester : 5

Course/Paper Name : Mathematics Paper 8 : Practical Course Lab-II : Group Theory and Ordinary Differential Equations

Paper Code : MT358

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To appreciate how abstract ideas and rigorous methods in mathematical analysis can be applied to important practical problems.
- CO2 : To solve problems on Algebra and Group Theory.
- CO3 : To solve problems on Ordinary Differential Equations.
- CO4 : To gain the confidence in proving theorems and solving problems.
- CO5 : To convert the verbal information into mathematical form and process it using appropriate mathematical concepts and formulae to draw the relevant conclusion.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)

Semester : 5

Course/Paper Name : Mathematics Paper 9 : MT 359: Practical Course Lab-III: DSE-3A and DSE3B

Paper Code : MT359

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To appreciate how abstract ideas and rigorous methods in mathematical analysis can be applied to important practical problems.
- CO2 : To solve problems on Operations Research.
- CO3 : To solve problems on Number Theory.
- CO4 : To gain the confidence in proving theorems and solving problems.
- CO5 : To convert the verbal information into mathematical form and process it using appropriate mathematical concepts and formulae to draw the relevant conclusion.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)

Semester : 5

Course/Paper Name : Mathematics Paper 10 : MT 3510 : Programming in Python -I

Paper Code : MT3510

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To implement object oriented concepts.
- CO2 : To learn how to use lists, tuples, and dictionaries in Python programs.
- CO3 : To learn and understand python looping, control statements and string manipulations.
- CO4 : To acquire programming skills in core Python.
- CO5 : to explain basic principles of Python programming language

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)

Semester : 5

Course/Paper Name : Mathematics Paper 10 : MT 3511: LaTeX for Scientific Writing

Paper Code : MT3511

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To provide an understanding of the basic mechanisms of LaTeX, using plain text as a vehicle
- CO2 : To acquaint with the latest typesetting skills, which shall enable them to prepare high quality typesetting.
- CO3 : To write a simple LaTeX input document based on the article class

- CO4 : To turn the input document into pdf with the pdflatex program.
- CO5 : To Format Words, Lines, and Paragraphs and understand how to present data using tables.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)

Semester : 6

Course/Paper Name : Mathematics Paper 1 : Complex Analysis

Paper Code : MT361

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To compute sums, products, quotients, conjugate, modulus, and argument of complex numbers
- CO2 : To define and analyse limits and continuity for complex functions as well as consequences of continuity
- CO3 : To determine whether a given function is differentiable and analytical.
- CO4 : To explain the basic methods of complex integration and its application in contour integration
- CO5 : To Evaluate complex contour integrals directly and by the fundamental theorem, apply the Cauchy integral theorem in its various versions, and the Cauchy integral formula.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)

Semester : 6

Course/Paper Name : Mathematics Paper 2 : Real Analysis II

Paper Code : MT362

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To explain Integrability and prove theorems on integrability.
- CO2 : To recognize the difference between Point wise and Uniform convergence of a sequence of functions.
- CO3 : To illustrate the effect of uniform convergence on the limit function with respect to continuity, differentiability, and integrability.
- CO4 : To solve improper integration using Riemann integration.
- CO5 : To study different tests for solving improper integrals of first and second kind.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)

Semester : 6

Course/Paper Name : Mathematics Paper 3 : Ring Theory
Paper Code : MT363

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To describe the algebraic structure Ring in detail through various examples.
- CO2 : To construct field of quotients of an integral domain.
- CO3 : To explain the concept Rings of polynomials and its factorization over a field.
- CO4 : To illustrate the notion of ideals and factor rings with examples.
- CO5 : To define Unique Factorization domain, Euclidean Domain and related results

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 6
Course/Paper Name : Mathematics Paper 4 : Partial Differential Equations
Paper Code : MT364

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To form mathematical models and derivations that lead to PDEs.
- CO2 : To recognize the major classification of PDEs and the qualitative differences between the classes of equations.
- CO3 : To efficiently solve linear PDEs using classical solution methods.
- CO4 : To apply Ordinary differential Equations to find Orthogonal Trajectories.
- CO5 : To explain the difference between ODE and PDE.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)
Semester : 6
Course/Paper Name : Mathematics Paper 5(A) : Optimization Techniques
Paper Code : MT365(A)

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To apply the concept of optimality criteria for various type of optimization problems.
- CO2 : To solve various constrained and unconstrained problems in single variable as well as multivariable.
- CO3 : To solve simple games using various techniques

CO4 : To analyse economic situations using game theoretic techniques .

CO5 : To recommend and prescribe which strategies to implement

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)

Semester : 6

Course/Paper Name : Mathematics Paper 6(B) : Computational Geometry

Paper Code : MT366(B)

Course Outcomes:

By the end of this course, student will be able:

CO1 : To Illustrate two dimensional transformations.

CO2 : To Illustrate three dimensional transformations.

CO3 : To get acquainted with typical problem on Computational Geometry.

CO4 : To explain the concept of projection and its types.

CO5 : To apply the concept of Bezier curves in Graphics.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)

Semester : 6

Course/Paper Name : Mathematics Paper 7 : Practical Course Lab-I: Complex Analysis and Real Analysis-II

Paper Code : MT367

Course Outcomes:

By the end of this course, student will be able:

CO1 : To appreciate how abstract ideas and rigorous methods in mathematical analysis can be applied to important practical problems.

CO2 : To solve problems on Complex Analysis.

CO3 : To solve problems on Real Analysis.

CO4 : To gain the confidence in proving theorems and solving problems.

CO5 : To convert the verbal information into mathematical form and process it using appropriate mathematical concepts and formulae to draw the relevant conclusion.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)

Semester : 6

Course/Paper Name : Mathematics Paper 8 : Practical Course Lab-II: Ring Theory and Partial Differential Equations

Paper Code : MT368

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To appreciate how abstract ideas and rigorous methods in mathematical analysis can be applied to important practical problems.
- CO2 : To solve problems on Algebra and Ring Theory.
- CO3 : To solve problems on Partial Differential Equations.
- CO4 : To gain the confidence in proving theorems and solving problems.
- CO5 : To convert the verbal information into mathematical form and process it using appropriate mathematical concepts and formulae to draw the relevant conclusion.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)

Semester : 6

Course/Paper Name : Mathematics Paper 9 : Practical Course Lab-III: DSE-6A and DSE-6B

Paper Code : MT369

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To appreciate how abstract ideas and rigorous methods in mathematical analysis can be applied to important practical problems.
- CO2 : To solve problems on Optimization Techniques.
- CO3 : To solve problems on Computational Geometry.
- CO4 : To gain the confidence in proving theorems and solving problems.
- CO5 : To convert the verbal information into mathematical form and process it using appropriate mathematical concepts and formulae to draw the relevant conclusion.

Programme year and Pattern: T.Y.B.Sc. (2019 Pattern)

Semester : 6

Course/Paper Name : Mathematics Paper 10 : MT 3610 : Programming in Python - II

Paper Code : MT3610

Course Outcomes:

By the end of this course, student will be able:

- CO1 : To acquire Object Oriented Skills in Python.
- CO2 : To develop the skill of designing Graphical user Interfaces in Python.
- CO3 : To learn and understand Python programming basics and paradigm.

CO4 : To develop the ability to write database applications in Python.

CO5 : To demonstrate the use of Python in Mathematics such as operations research and computational Geometry etc.

**Programme year
and Pattern:** T.Y.B.Sc. (2019 Pattern)

Semester : 6

**Course/Paper
Name :** Mathematics Paper 10 : MT 3611: Mathematics Into Latex

Paper Code : MT3611

Course Outcomes:

By the end of this course, student will be able:

CO1 : The purpose of this course is to acquaint students with typesetting basic Mathematics in LaTeX.

CO2 : To use type set mathematical formulas, nested list, tabular and array environments.

CO3 : To import figures and pictures that are stored in external files.