

Dr. Ambedkar College of Arts, Commerce and Science, Chandrapur

Faculty of Science and Technology

Course Outcomes

DEPARTMENT OF BOTANY

M.SC. SEMESTER I

Course Title: Paper I (Microbiology, Algae and Fungi)

Course Code: PSCBOTT01

After successful completion of the course, students will be able to:

1. Understand history, structure and life cycle microorganism like Bacteria, Virus, Archaeobacteria and Eubacteria which is in daily life.
2. Know the diversity, systematics, structure, life cycle pattern, evolutionary trends, useful and harmful aspects of Algae and Fungi which create in research activities of subject.
3. Understand the Bacterial, Fungal and Viral diseases of plant and their control measure which is Use in their daily life.

Course Title: Paper II (Bryophytes and Pteridophytes)

Course Code: PSCBOTT02

After successful completion of the course, students will be able to:

1. Understand the diversity, systematics, structure, life cycle pattern, evolutionary trends, uses and fossil history of Bryophytes.
2. Know the diversity, systematics, structure, life cycle pattern, evolutionary trends of Pteridophytes and Indian Pteridologist.

Course Title: Paper III (Gymnosperm and Paleobotany)

Course Code: PSCBOTT03

After successful completion of the course, students will be able to:

1. Know the scope of Paleobotany, types of fossils, its role in global economy and geological timescale.
2. Understand the various fossil genera representing different fossil groups and their evolutionary trends.
3. Know the diversity, systematics, structure, life cycle pattern, evolutionary trends of
4. Gymnosperm.

Course Title: Paper IV (Cytology and Genetics)

Course Code: PSCBOTT04

After successful completion of the course, students will be able to:

1. Know the Medels law and chromosomal theory of inheritance, genetic inheritance in plants.
2. Understand molecular structure of chromosome and chromatin organization.
3. Differentiate the structural and numerical changes in chromosome.
4. Learn the mutation and its role in crop improvement and epigenetics.

BOTANY PRACTICAL: I

Course Code: PSCBOTP01

1. Students can differentiate the morphological and anatomical structure of Algae, Fungi, Bryophytes and Pteridophyte.
2. Students learn the symptomology of some diseased plants and Identification of fungal culture.
3. Students take interest in the field collection of Algae, Fungi, Bryophytes, Pteridophyte.

BOTANY PRACTICAL: II

Course Code: PSCBOTP02

1. Students can distinguish the morphological and anatomical structure of Gymnosperm.
2. Students learn the various fossils of gymnosperm and their permanent slides.
3. Students visit to fossiliferous localities and collection of specimen.

M.SC. SEMESTER-II

Course Title: Paper V (Plant Physiology and Biochemistry)

Course Code: PSCBOTT05

After successful completion of the course, students will be able to:

1. Distinguish between the plant physiology like Photosynthesis and Respiration.
2. Know the importance of metabolism of Carbohydrates, Lipids, Amino acids, and Nitrogen.
3. Know the importance of the Sulfur and Phosphate assimilation of plant.
4. Understand Enzymology of plant.
5. Know the importance of solute transport and photo-assimilate translocation in plants.

Course Title: Paper VI (Plant Development and Reproduction)

Course Code: PSCBOTT06

After successful completion of the course, students will be able to:

1. Differentiate the plant growth kinetics pattern of Shoot, Leaf, Root and Flower.
2. Understand the structure of Male Gametophyte, Female Gametophyte and mechanism Pollen-Pistil interaction and Fertilization.
3. They acquire the thorough knowledge of Seed development, Fruit growth, Germination and dormancy of seed.
4. Differentiate the mechanism of Senescence and Programmed Cell Death.

Course Title: Paper VII (Cell and Molecular Biology-I)**Course Code: PSCBOTT07**

After successful completion of the course, students will be able to:

1. Know the structure and function of Cell wall, Plasma membrane and Plasmodesmata.
2. Understand the ultra structure and function of various Cellular organelles, Cell shape and motility.
3. Know the ultra structure of Nucleus, forms of DNA and DNA replication in prokaryotic and eukaryotic cell.
4. Understand the Molecular biology of stress responses.

Course Title: Paper VIII (Angiosperm-I)**Course Code: PSCBOTT08**

After successful completion of the course, students will be able to:

1. Know the Angiosperm morphology, floral symmetry and evolution of floral organ.
2. Understand the Angiosperm Taxonomy like Taxonomic evidences and Taxonomic tools.
3. Take interest in the Biosystematics for plant identification.

BOTANY PRACTICAL: III**Course Code: PSCBOTP03**

1. Know the importance of the Enzyme activity and Carbohydrate, Chlorophyll, Protein content.
2. Students can distinguish the Anatomical detail of various parts of plant like Root, Stem and Leaf.
3. Students can acquire the practical knowledge of Gametogenesis, pollen tube germination and Pollen-Pistil interaction.
4. Students know the different type of endosperm, embryo sac and method of breaking seed dormancy practically.

BOTANY PRACTICAL: IV

Course Code: PSCBOTP04

1. Students can take interest in isolation of salivary gland chromosome, isolation of cell organelles like Chloroplast and Mitochondria practically.
2. Students can take interest in the flagellary staining, isolation of DNA and structure of cell.
3. Students know the differentiate the floral symmetry and differentiate the dicot and monocot flower.
4. Students can acquire the practical knowledge of the variation in stamens and carpel's, placentation and floral adaptation for pollination.
5. Students learn the anatomical, embryological, palynological, cytological feature of various taxa practically.

SEMESTER-III

Course Title: Paper IX (Plant Ecology)

Course Code: PSCBOTT09

After successful completion of the course, students will be able to:

1. Differentiate the Vegetation organization and Vegetation development .
2. Use Knowledge of Ecosystem organization and Air, Water, Soil Pollution in daily life.
3. Know the importance of Climate change and Ecosystem stability for healthy life on earth.

Course Title: Paper X (Cell and Molecular Biology-II)

Course Code: PSCBOTT10

After successful completion of the course, students will be able to:

1. Know the Structure and function of Ribosome and mechanism of Transcription and Translation.
2. Understand the Gene structure and mechanism of gene expression and Protein sorting.
3. Differentiate the Genome organization in prokaryotic and eukaryotic organism.
4. Understand the Genetic recombination, genetic mapping, cell cycle and apoptosis at molecular
5. level.
6. Acquire through knowledge of the Signal transduction and Techniques in cell biology.

Course Title: Paper XI (Paleobotany-I)

Course Code: PSCBOTT11

After successful completion of the course, students will be able to:

1. Know the importance of the science of Petrology, Geological time scale and Fossilization.
2. Know the types and techniques of fossil study.
3. Differentiate the fossil members of Pteridophyte.

Course Title: Paper XII (Basic Botany-I)

Course Code: PSCBOTT12

After successful completion of the course, students will be able to:

1. Know the Diversity of cryptogams.
2. Understand the Diversity of phanerogams.
3. Know the morphology of angiosperm.
4. Understand the anatomy of angiosperm.

BOTANY PRACTICAL: V

Course Code: PSCBOTP05

1. Students learn the distribution pattern of different plant species by Quadrate method practically.
2. Students take interest in the analysis of soil for CO₃, NO₃ practically.
3. Students take interest in the analysis of water for BOD, COD, O₂, and CO₂ practically.
4. Students can understand the adaptation of plant of Hydrophytic, Xerophytic and Halophytic zones through these plants practically.
5. Students learn the Isolation of nuclei and identification of histones by SDS-PAGE practically.
6. Students learn the isolation of Chloroplast and demonstration of two subunits of RUBISCO by SDS-PAGE.
7. Acquire knowledge of the in vitro transcription, translation and conjugation practically.
8. Students learn the presence of specific antigen by ELISA practically.
9. Students can isolate RNA and quantify it by spectrophotometric method.

BOTANY PRACTICAL: VI

Course Code: PSCBOTP06

1. Students learn the different technique of study fossil and see different types of fossil practically.
2. Students see practically the different types of Pteridophyte fossil.
3. Students work on the Stratigraphy and Geological Maps of India.
4. Students know the importance of Geological time scale and see different types of rocks practically.

SEMESTER-IV

Course Title: Paper XIII (Plant Biotechnology)

Course Code: PSCBOTT13

After successful completion of the course, students will be able to:

1. Acquire knowledge of the Recombinant DNA technology and Genetic engineering of plant.
2. Differentiate the Microbial genetic manipulation, Genomics and proteomics.
3. Know the importance of Plant tissue culture and transgenic production.
4. Have knowledge of the Bioinformatics, Database, Data analysis, prediction and submission tools
5. and their uses.

Course Title: Paper XIV (Angiosperms-II)

Course Code: PSCBOTT14

After successful completion of the course, students will be able to:

1. Know the importance of the floral variation, evolution and affinities of different family.
2. Have through knowledge of the probable ancestors of angiosperm, speciation and extinction, IUCN categories of threat.
3. Understand the Biological diversity concept and level, Endemism, Hot spot and local plant diversities and socioeconomic importance.

Course Title: Paper XV (paleobotany-II)

Course Code: PSCBOTT15

After successful completion of the course, students will be able to:

1. Differentiate the fossils members of Gymnosperm.
2. Understand the formation of Deccan trap and Intertrap, age and its floristic composition in relation to Pteridophyte, Gymnosperm and Angiosperm.
3. Know the difference between Paleopalynology, Paleoecology and paleogeography.
4. Understand the Indian Gondwana- its stratigraphy and classification.

Course Title: Paper XVI (Basic Botany-II)

Course Code: PSCBOTT16

After successful completion of the course, students will be able to:

1. Know the Plant physiology.
2. Understand the Ecology and evolution plant.
3. Understand importance of the Economic botany.
4. Know the importance of the Paleobotany.

BOTANY PRACTICAL: VII

Course Code: PSCBOTP07

1. Students take interest in studying the Growth characteristics of E.coli using plating method practically.
2. Students learn the Isolation of plasmid from E.coli practically.
3. Students learn the isolation of protoplast and determine its viability practically.
4. Students take interest in the preparation of media for plant tissue culture.
5. Students learn to write the description of locally available families.
6. Students learn to use the location of key characters and preparation of keys at generic and family level practically.
7. Students use the floras for identification of plants.
8. Students know the Deccan Intertrappean flora of India. Pteridophytes, Gymnosperm and Angiosperm- flowers and fruits.
9. Students know the important features of spores and pollen morphology by maceration technique.

BOTANY PRACTICAL: VIII

Course Code: PSCBOTP08

1. Students do their Project work and acquire the skill of taking observation in the field which develop their critical thinking.

M.Sc. Chemistry

SEMESTER-I

Course Title : Paper I (Inorganic Chemistry)

Course Code : PSCChT01

1. Learns the fundamentals of Stereochemistry and Bonding in Main Group Compound,
2. Metal – Ligand Bonding, Metal – Ligand Equilibria in Solution
3. Study the Metal – Ligand Equilibria in Solution
4. Understand details of Cluster.
5. Learn Metal-Metal bonds, Isopoly, Heteropoly acids and their anions

Course Title : Paper II (Organic Chemistry)**Course Code : PSCChT02**

1. Study Nature and Bonding in Organic Molecule, Synthetic applications of enamines and imines anions in organic synthesis, phase transfer catalysis, crown ethers and graphene.
2. Appreciates the fundamentals Stereochemistry , Reactive Intermediates
3. Understands the background of Reaction mechanism: Structure and Reactivity
4. Learn Aliphatic nucleophilic substitution, Aromatic electrophilic substitution, Aromatic Nucleophilic Substitution.

Course Title : Paper I Paper III (Physical Chemistry)**Course Code : PSCChT03**

1. Gains the information of FORMULATION OF QUANTUM MECHANICS
2. Understands the CLASSICAL THERMODYNAMICS
3. Learn PHASE EQUILIBRIA
4. Learns the CHEMICAL KINETICS, Photochemistry and Catalysis.

Course Title : Paper IV (Analytical Chemistry)**Course Code : PSCChT04**

1. Introduction to analytical chemistry and statistical analysis
2. Estimates the separation techniques
3. Study Classical methods of analysis
4. Study Optical methods of analysis

Course Title : Practical-I (Inorganic Chemistry)**Course Code : PSCChP01**

1. Preparation of Inorganic Complexes and their characterization by: Elemental analysis and physico-chemical

methods (Electronic and IR Spectra, magnetic susceptibility measurements, Thermal analysis and Molar conductance studies).

2. Quantitative Analysis: Separation and determination of two metal ions from the alloys involving : Volumetric, Gravimetric and Spectrophotometric methods

Course Title: Practical-II (Organic Chemistry)

Course Code : PSCChP02

1. Qualitative Analysis Separation, purification and identification of the mixture of two organic compounds (binary mixture with two solid, one solid one liquid and two liquids) using chemical methods or physical techniques.
2. Understands the method of organic preparation

SEMESTER-II

Course Title : Paper V (Inorganic Chemistry)

Course Code : PSCChT05

1. Learn the Electronic spectra of Transition Metal complexes, Magnetic Properties of Transition Metal complexes
2. Study Reaction mechanism of Transition Metal Complexes-II
3. Understand Structure and bonding, vibrational spectra of metal carbonyls
4. Gain the knowledge of Nitrosylating agents for synthesis of metal nitrosyls,
5. vibrational spectra and X-ray diffraction studies of transition metal nitrosyls for
6. bonding and structure

Course Title :Paper VI (Organic Chemistry)

Course Code : PSCChT06

1. Study Addition to carbon-carbon multiple bond, Addition to carbon-hetero atom
2. multiple bond
3. Understand Mechanism of molecular rearrangement, Free radical reactions-I
4. Learn Free radical reactions-II
5. Study Elimination reactions , understand Green chemistry

Course Title : Paper VII (Physical Chemistry)

Course Code : PSCChT07

1. Study the application of quantum mechanics Electronic structure of atoms, Hybridization
2. Gains the knowledge of thermodynamics
3. Understand Solid state chemistry
4. Enlights the knowledge about Nuclear Chemistry

Course Title : Paper VIII (Analytical Chemistry)

Course Code : PSCChT08

1. Understand Sampling and quantification
2. Gains the procedure for Modern separation techniques
3. Study Optical methods of analysis
4. Learn Electrochemical methods of analysis

Course Title : Practical-IV (Physical Chemistry)

Course Code : PSCChP04

1. Study the experiments related to thermochemistry and phase equilibria
2. Study the experiments base on thermodynamics and Chemical kinetics

Course Title : Practical-V (Analytical Chemistry)

Course Code : PSCChP05

1. Study Classical methods such as Volumetry, Gravimetry
2. Study Gravimetric estimation,
3. Understand Chromatographic separation techniques, Analysis of sample by Instrumental Electroanalytical techniques such as

SEMESTER-III

Course Title : Paper IX (Spectroscopy)

Course Code : PSCChT09

1. Study Symmetry properties of molecules and group theory
2. Understand Mass spectrometry, Mossbauer spectroscopy
3. Gains the importance of Microwave spectroscopy, ESR spectroscopy
4. Learn Infrared spectroscopy, Raman Spectroscopy

Course Title: Paper X (Special I-Organic Chemistry)

Course Code: PSCChT10

1. Study Photochemistry
2. Understand Pericyclic Reactions
3. Learn Oxidation, Reduction Reactions
4. Gains knowledge of Chemistry of P, S, Si, B, and Ti compounds

Course Title: Paper XI Special II- (Organic Chemistry)

Course Code: PSCChT11

1. Study Classification, nomenclature, occurrence, isolation, general methods of structure determination of Terpenoids, Porphyrins:
2. Learn Classification, nomenclature, occurrence, isolation, general methods of structure determination Alkaloids, Prostaglandins
3. Study Classification, nomenclature, occurrence, isolation, general methods of structure determination teroids, Plant Pigments

4. Understand Carbohydrate, Amino acids, protein and peptides

Course Title: Paper XII (Elective- Polymer Chemistry)

Course Code: PSCChT12

1. Introduction to polymers
2. Understand Molar mass and its determination
3. Study Physical characteristics of polymers
4. Learn Commercial polymers

Course Title : Practical-VII (Organic Chemistry Special)

Course Code: PSCChP07

1. Study Quantitative Analysis
2. Learn Isolation of Organic Compounds from Natural Source
3. Qualitative analysis Separation of the components of a mixture of three organic compounds (three solids, two solids and one liquid, two liquids and one solid, all three
a. liquids and identification of any two

Course Title : Practical VIII–Elective (Polymer Chemistry)

Course Code : PSCChP08

1. Study Synthesis of polymers
2. Follow Characterization of polymers
3. Understand Purification and fractionation of polymer , Magnetic and electrical properties of polymers
4. Learn Thermal analysis and degradation of polymers
5. Study Dielectric behavior of polymers and Kinetics of polymerization

SEMESTER-IV

Course Title : Paper XIII (Spectroscopy)

Course Code : PSCChT13

1. Study Ultraviolet and visible spectroscopy, Photoelectron spectroscopy
2. Learn Nuclear magnetic Resonance Spectroscopy
3. Follow Application of NMR spectroscopy
4. Understand Diffraction techniques

Course Title : Paper XIV (Special I-Organic Chemistry)

Course Code : PSCChT14

1. Study of Carbanions in organic Chemistry, Organometallic reagents -I
2. Understand Organometallic reagents-II, Transition metals in organic synthesis
3. Gains the potential about Advanced Stereochemistry
4. Learn Designing the synthesis based on retrosynthetic analysis

Course Title : Paper XV (Special II-Organic Chemistry)

Course Code : PSCChT15

1. Learn Enzyme chemistry, Co-Enzyme Chemistry
2. Study Heterocycles, Benzofused heterocycles, Diazines
3. Understand Nucleic Acids, Lipids, Vitamins
4. Gains the importance of Dyes, Polymer chemistry

Course Title: Paper XVI (Elective- Polymer Chemistry)

Course Code: PSCChT16

1. Understand Polymerization
2. Study Techniques of polymerization
3. Follow Characterization of polymers
4. Gain the importance of Specific polymers- Biomedical polymers, Inorganic polymers,
5. Coordination polymers

Course Title: Practical-X (Organic Chemistry Special)

Course Code: PSCChP10

1. Quantitative Analysis based on classical and instrumental technique
2. Determine Structure of organic compounds on the basis of spectral data

Course Title: Practical-XI Project

Course Code: PSCChP11

1. Enters in the first step of research aptitude
2. Visualizes the steps of project work presentation
3. Develop research skill for further research

DEPARTMENT OF ELECTRONICS

M. Sc.

Course Outcomes

Materials Research Methods:

On successful completion of this course the student are enabled with the Knowledge in Materials Research, Material Characterization.

Biomedical Electronics

After the successful completion of the course the student should have a throughout knowledge in Biomedical Electronic. He can handle various Instruments in Medical like ECG, EEG, EMG, Ultrasonography and many medical Instruments

Embedded System

On successful completion of this course the students should have the practical knowledge in Embedded system. He can design Microcontrollers and Microprocessors

Fuzzy Logic and Artificial Neural Network

On successful completion of this course the students can developed his logic. FuzzyLogic is used When one wants to deal with uncertainty of non-statistical kind. To capture humanistic understanding of processes and to develop a formal way to that. Fuzzy Logic is a decision making system

'C' Programming

This course aims to develop an understanding of the conceptual framework of Programming in C, C++. After the successful completion of the course the student acquires the knowledge in the Programming skill and decision making.

Virtual Instrumentation

On successful completion of this course the students provides knowledge on design of process control by using virtual instrumentation techniques. He acquires knowledge in process analysis by VI

Project Work & Viva-Voce

This gives practical exposure in the Project work, knowledge which will equip the students in Research work.

DEPARTMENT OF MATHEMATICS

Course Outcomes

M.Sc. SEM. I

COURSE TITLE: ALGEBRA-I

COURSE CODE: PSCMTHT01

Upon completion of this course, the student will be able to:

1. The concept of permutation group, group of symmetry, dihedral group, automorphisms, conjugacy and G-Sets.
2. Students will observe how so much theory can be developed from just a few simple axioms that define group and ring.
3. They will understand the importance of normal series, solvable groups, nilpotent groups, cyclic decomposition of permutation groups, alternating groups.
4. Knowledge of this course can help students to read field theory, another basic concept of Modern algebra, in the next semester

M. Sc. SEM. I

COURSE TITLE: REAL ANALYSIS-I

COURSE CODE: PSCMTHT02

Upon completion of this course, the student will be able to:

1. Understand basic properties of uniform convergence and continuity, uniform convergence and integration, uniform convergence and differentiation, The Stone-Weierstrass theorem.
2. Know contraction principle. The inverse and implicit function theorem, the rank theorem.
3. They will understand the topological manifolds, differential manifolds, real projective space, Grassman manifolds, differentiable functions and mapping.
4. Recognize the rank of mapping, immersion, sub manifolds, lie groups and examples of Lie groups.

M. Sc. SEM. I

COURSE TITLE: TOPOLOGY-I

COURSE CODE: PSCMTHT03 OUTCOMES:

After completing this course, the student will be able to:

1. Understand countable and uncountable sets, examples and related theorem, cardinal numbers and related theorems, Topological spaces and examples
2. Discuss open set and limit point, derived sets, closed set and closure operators, interior, exterior and boundary operators, bases and relative topologies.
3. Study connected sets and components, compact and countably compact spaces, continuous functions and homeomorphisms.
4. Recognize the axioms of countability, separability, regular and normal spaces.

M. Sc. SEM. I

COURSE TITLE: LINEAR ALGEBRA AND DIFFERENTIAL EQUATIONS

COURSE CODE: PSCMTHT04

OUTCOMES:

1. Define Vector Space, Quotient space Direct sum, linear span and linear independence, basis and inner product.
2. Discuss the linear transformations, rank, nullity.
3. Find the characteristic equation, eigen values and eigen vectors of a matrix.
4. To know homogeneous linear system, A non-homogeneous equation, higher order system, the primary decomposition, The S+N decomposition, Nilpotent canonical forms.
5. To Learn Jordan and real canonical forms, canonical forms and differential equations, Higher order linear equations on function spaces, Hyperbolic flows, Generic properties of operators, Significance of genericity.

M. Sc. SEM. I

COURSE TITLE: NUMERICAL ANALYSIS

COURSE CODE: PSCMTHT05

OUTCOMES:

Upon completion of this course, the student will be able to:

1. Understand the errors, source of error and its effect on any numerical computations and also analysis the efficiency of any numerical algorithms.
2. Learn how to obtain numerical solution of nonlinear equations using bisection, secant, Newton and fixed-point iterations methods and convergence analysis of these methods.
3. Solve linear and nonlinear systems of equations numerically.
4. Apply numerical methods to find eigen value and eigen vectors.
5. Handle the functions and data set using interpolation and least square curves.
6. Evaluate the integrals numerically.
7. Learn how to solve initial and boundary value problems numerically.

M. Sc. SEM. II

COURSE TITLE: ALGEBRA -II

COURSE CODE: PSCMTHT06

OUTCOMES:

Upon completion of this course, the student will be able to:

1. Understand the concepts of unique factorization domains, Principal ideal domains, Euclidean domains, polynomial rings over unique factorization domains.

2. Understand irreducible polynomials and Eisenstein criterion, adjunction of roots, normal extensions and multiple roots.
3. Understand the concepts of fundamental theorem of Galois theory and fundamental theorem of algebra.
4. Find the roots of unity and cyclotomic polynomials, cyclic extensions, polynomials solvable by radicals, Ruler and compass constructions.

M. Sc. SEM. II

COURSE TITLE: REAL ANALYSIS -II

COURSE CODE: PSCMTHT07

OUTCOMES:

Upon completion of this course, the student will be able to:

1. Understand how Lebesgue measure on \mathbb{R} is defined, Littlewoods three principles.
2. Understand basic properties are measurable functions,
3. Understand convex function, Riesz-Fischer theorem , bounded linear functions on L_p - spaces.
4. Know the basic convergence theorems for the Lebesgue integral,
5. Understand the compact metric spaces, baire category theorem, Arzela ascoli theorem, Locally compact spaces, Sigma compact spaces.

M. Sc. SEM. II

COURSE TITLE: TOPOLOGY-II

COURSE CODE: PSCMTHT08

OUTCOMES:

After completing this course, the student will be able to:

1. Understand Urysohn's lemma, Tietze extension theorem, Compactness for metric spaces, properties of metric spaces.
2. Know quotient topology, Nets and filters.
3. Study product topology.
4. Understand locally finite topological spaces , paracompact spaces, Urysohn's metrization theorem.

M. Sc. SEM. II

COURSE TITLE: CLASSICAL MECHANICS

COURSE CODE: PSCMTHT09

OUTCOMES:

After completing this course, the student will be able to:

1. Understand Variational Principle.
2. Analyze the Derivation of Lagrange's Equations from Hamilton's Principle and Extension of Hamilton's Principle to Non-holonomic Systems.
3. Study the concept of the Legendre transformations and the Hamilton equation of motion, the Hamiltonian formulation of relativistic mechanics
4. Understand the principle of least action.
5. Understand the equation of canonical transformation and examples of canonical transformation, Poisson bracket and other canonical invariants.
6. Know the equation of motion, Infinitesimal canonical transformation and conservation theorem in the Poisson bracket formulation.

M. Sc. SEM. II**COURSE TITLE: DIFFERENTIAL GEOMETRY****COURSE CODE: PSCMTHT10****OUTCOMES:**

After completing this course, the student will be able to:

1. Understand the definition of surface, curves on a surface, helicoids Intrinsic properties, Geodesics.
2. Learn to normal property of geodesics, existence theorems, geodesics curvature. Gauss Bonnet theorem.
3. Understand second fundamental form, principle curvature, lines of curvature.
4. Know compact surfaces whose points are umbilics, Gaussian or mean curvature, two dimensional Riemannian manifolds.

M. Sc. SEM. III**COURSE TITLE: COMPLEX ANALYSIS****Core Paper-XI OUTCOMES:**

After completing this course, students are expected to be able to:

1. Understand impossibility of ordering complex number, Extended Complex numbers and stereographic projection. Properties and example of Analytic function.
2. Know analytic function as mappings, Mobius transformation, power series representation of analytic function.
3. Study Cauchy 's theorem and integral formula the homotopic version of cauchy's theorem and simple connectivity, counting zero's , Goursat's theorem and classification of singularities.
4. Know the maximum principle Schwarz's lemma, Convex function and Hadamard's three circles theorem, Phragmen-lindel of theorem .

M. Sc. SEM. III**COURSE TITLE: FUNCTIONAL ANALYSIS****Core Paper- XII****OUTCOMES:**

After completing this course, the student will be able to:

1. Understand normed spaces, Banach spaces , properties of normed spaces, finite dimensional normed spaces and subspaces, compactness in finite dimension, bounded and continuous linear operators.
2. Know linear functional, normed spaces of operators, dual spaces, inner product space, properties of inner product spaces, Hilbert space orthonormal sets and sequences .
3. Understand representation of functionals on Hilbert spaces, reflexive spaces.
4. Study category theorem, uniform boundedness theorem, strong and weak convergence, convergence of sequences of operators and functionals .

M. Sc. SEM. III**COURSE TITLE: MATHEMATICAL METHODS****Core Paper- XIII****OUTCOMES:**

After completing this course, the student will be able to:

1. Study fourier integral theorem, Fourier theorem, Fourier cosine and sine transform, solution of partial differential equation by means of Fourier transform.

2. Understand the calculation of Laplace transform of some elements function, the convolution of two functions inverse formula for the laplace transform.
3. Solve ordinary differential equation by laplace transform.
4. Study finite Fourier transform, Finite Sturm-Liouville transform, generalized finite Fourier transform.
5. Understand finite Hankel transform, finite Legendre transform, and finite Mellin transform.

M. Sc. SEM. III

COURSE TITLE: GENERAL RELATIVITY-I

CORE ELECTIVE PAPER- XIV

OUTCOMES:

After completing this course, the student will be able to:

1. Understand the tensor formula, Riemannian geometry, curvature tensor.
2. Learn about the principle of covariance, the principle of equivalence, geodesic principle.
3. Study Newton's equations of motion as an approximation geodesic equations.
4. Understand gravitational field equations in free space.
5. Find Weyl's solution of linearized field equations, Interior Schwarzschild's solution.

M. Sc. SEM. III

COURSE TITLE: OPERATIONS RESEARCH I

FOUNDATION PAPER-- XV

OUTCOMES:

After completing this course, the student will be able to:

1. Study simplex method, theory of simplex method, duality, dual simplex method.
2. Understand the mathematical tools that are needed to solve optimization problems.
3. Solve transportation and assignment problems.
4. Study dynamic programming.
5. Develop a report that describes the model and the solving technique, analyze the results and propose recommendations in language understandable to the decision-making processes.

M. Sc. SEM. IV

COURSE TITLE: DYNAMICAL SYSTEMS

CORE PAPER XVI

OUTCOMES:

After completing this course, students are expected to be able to

1. Understand dynamical systems and vector fields, the fundamental theorem, the flow of a differential equation.
2. Learn nonlinear sink, gradient and inner product.
3. Study limit sets, the Poincare Bendixson theorem and its application.
4. Know asymptotic stability of closed orbit.

M. Sc. SEM. IV

COURSE TITLE: PARTIAL DIFFERENTIAL EQUATIONS

CORE PAPER -XVII

OUTCOMES:

After completing this course, students are expected to be able to

1. Study first order partial differential equations in two independent variables and the Cauchy problems.
2. Understand classification of second order partial differential equations.
3. Study the diffusion equation and parabolic differential equations.
4. Know wave equation and its application.

M. Sc. SEM. IV

COURSE TITLE: INTEGRAL EQUATIONS

CORE PAPER -XVIII

OUTCOMES:

After completing this course, students are expected to be able to

1. Learn preliminary concept of integral equations.
2. Study Fredholm equation.
3. Obtain solutions of integral equations with Green's function type kernels.
4. Know types of Volterra equations.
5. Understand approximate methods of solutions for linear integral equations.

M. Sc. SEM. IV

COURSE TITLE: GENERAL RELATIVITY -II

CORELECTIVE PAPER -XIX

OUTCOMES:

After completing this course, students are expected to be able to

1. Understand static cosmological models of Einstein and de sitter and their derivation its properties.
2. Study cosmological principle.
3. Know density and pressure of the present universe.
4. Realize galaxy count.

M. Sc. SEM. IV

COURSE TITLE: OPERATIONS RESEARCH -II

FOUNDATION PAPER -XX

OUTCOMES:

Upon successful completion of this course, the student will be able to:

1. Understand integer programming.
2. Study queuing theory and sequencing
3. Understand non-linear programming.
4. Study quadratic programming, fraction programming and goal programming.

DEPARTMENT OF ZOOLOGY

COURSE OUTCOMES

M.Sc. Sem. I

Course Title: Structure and function of Invertebrates

Upon completion of this course, the student will be able to:

1. Understand the concept of Ultrastructure of protozoan, locomotory organ, Polymorphism and metamorphosis..
2. Student will able to explain the Reproductive system of Dugesia, Fasciola, Taenia and Ascaris, and formation, Evolution and significance of coelom..
3. They will understand the structure, affinities and taxonomic position of Peripatus, Neopilina and Respiratory organ in Arthropoda...
4. Students will get the detailed knowledge about the water vascular system, Metamorphosis and phylogenetic significance in Echinodermata.

M. Sc. SEM. I

Course Title: General Physiology

Upon completion of this course, the student will be able to:

1. Understand the whole concept of Enzymes, Respiratory pigment, Neurotransmitters, Colour change mechanism.
2. They will able to do the comparative study of the term Thermoregulation and Osmoregulation..
3. They will understand the Myogenic and neurogenic heart, Digestion and absorption of carbohydrate, protein and Lipids.
4. They will get the detailed knowledge about the hydro mineral metabolism, Cerebrospinal
5. fluid, mechanism of reflex action and Physiology of environmental stress and strain..

M. Sc. SEM. I

Course Title: Cell Biology and Genetics

After completing this course, the student will be able to:

1. Understand and discuss the topic Structural organization and function of Cell organelles, cell division and cell cycle.
2. Able to explain and give demonstration of the topic Cell signaling, Cellular communication and disease Cancer..
3. Solves the problems based on the Mendelian, non- Mendelian inheritance and get the knowledge on the topic Mutation.
4. Know the detailed concept about Structural and numerical alteration of chromosomes, microbial genetics and human genetics..

M. Sc. SEM. I

Course Title: Advanced Reproductive Biology

1. Define the various methods of asexual and sexual reproduction in protozoa, Regeneration in Hydra, Dugesia and Annelid worms. Metamorphosis and mechanism of vitellogenesis in Insect.

2. Discuss the Spermatogenesis and oogenesis, cytological and , molecular event of fertilization..
3. Get detail knowledge about the Male accessory sex gland in mammals, Semen and Pheromones and sexual behavior in mammals.
4. Understand the neurohormonal control of fish reproduction and mechanism of vitellogenesis ,molecular induction and organizer concept.
5. Give demonstration and presentation on the topic Cryopreservation of gametes, embryo and test-tube baby and discuss about the In-vitro fertilization and its significance.

ZOOLOGY LAB I:

1. Students will have good laboratory skills, enabling them to take observations and
2. Measurements in a zoology laboratory and analyze the results to draw valid.
3. Students will adopt the skill of draw the neat and clean well labeled diagram.
4. Developed the Practical skill based on the Cell biology, Genetic and Advanced Reproductive biology.

M. Sc. SEM. II

Course Title: Structure and Function of Vertebrates.

Upon completion of this course, the student will be able to:

1. Understand the origin and ancestry of Chordate, General organization and affinities of Cephalochordata and Dipnoi...
2. Learn and discuss organ and mechanism of respiration in Pisces and Amphibia , Appendicular skeleton in Amphibia, Resptilia,Aves and Mammals.
3. Get the knowledge Evolution of urinogenital organ in vertebrates, origin of birds.
4. Understand the concept of comparative anatomy of the brain in vertebrates.
5. Give the demonstration on the Evolution of heart in vertebrates and sense organ in vertebrates, Evolution of Man.

M. Sc. SEM. II

Course Title: Comparative Endocrinology

Upon completion of this course, the student will be able to:

1. Understand the concept of Hormones and function in Coelentereta , Helminths and Echinodermata, Neurosecretory system in Annelida and Neuroendocrine system in Mollusca. .
2. Understand Endocrine control of metamorphosis , reproduction and colour change mechanisms in

Crustacea and in Insect and also get information about Cephalic neuroendocrine system in insect.

3. Able to give the demonstration structure, hormones and function of Pineal organ, Pituitary gland and Thyroid gland with the help of Chart.
4. Give the presentation on the topic Parathyroid Ultimobranchial glands their structures, hormones and regulatory mechanisms, Understand the structure, function and Hormones of Adrenal gland.

M. Sc. SEM. II

Course Title: Molecular Biology and Biotechnology

Upon completion of this course, the student will be able to:

1. Able to define the concept Cot $\frac{1}{2}$ and Rot $\frac{1}{2}$, DNA replication, DNA damage and repair, mismatch repair, recombination repair, double strand break repair and transcript coupled repair.
2. Understand Eukaryotic and prokaryotic transcription, Regulation of transcription Translation and mobile DNA element.
3. Get information about the Antisense and ribozymes technology, Isolation and sequencing of DNA, splicing and cloning and Hybridization techniques.
4. Get information about Medical biotechnology, application of restriction fragment length polymorphism in forensic science, Agricultural biotechnology.
5. Understand the Immunobiotechnology- Hybridoma technology and monoclonal antibodies and Industrial and environmental biotechnology..

M. Sc. SEM. II

Course Title: Advanced Developmental Biology

After completing this course, the student will be able to:

1. Understand the Implantation in Mammals, Foetal membrane, placenta and metamorphosis in Amphibia.
2. Know Regeneration in Vertebrate, Apoptosis, Ageing and polymorphism.
3. Get information about multiple ovulation and embryo transfer technology, embryonic sexing, cloning and cloning of animals by nuclear transfer.
4. Understand the concept of Immun contraception, classical contraceptive techniques, Anti-androgen and

anti-spermiogenic compound and role of mutant and transgenic in Human welfare.

ZOOLOGY LAB I:

1. Students will have good laboratory skills, enabling them to take observations and
2. Measurements in a zoology laboratory and analyze the results to draw valid.
3. Students will adopt the skill of draw the neat and clean well labeled diagram.
4. Able to tell in detailed general characters and classification of specimen of Vertebrate.

M. Sc. SEM. III

Course Title: Parasitology and Immunology

After completing this course, the student will be able to:

1. Understand the life cycle , mode of transmission, infection and treatment of Vibrio cholera and clostridium titani , Yersinia pestis, Influenza and H1 N1 viruses , Dengue and Hepatitis .
2. Get the information about life cycle , modes of transmission , infection and treatment of Trypanosoma and Entamoeba, Leishmania, Malaria, Wuchereria and Trichinella. And Toxins and antitoxins.
3. Understand the concept Immune system , cells and organs of immune system, Major histocompatibility complex , complement system.
4. Understand the cytokine receptors, hypersensitivity reactions their type, mechanism
5. Know the Transplantation immunology and Tumour immunology and RIA and ELISA immunotechniques.

M. Sc. SEM. III

Course Title: Special group- AQUACULTURE-I (FRESH WATER AQUACULTURE)

After completing this course, the student will be able to:

1. Understand the concept of aquaculture- definition, importance and present status of India.
2. Learn to normal property of pond –soil, chemical condition and Ecosystem.
3. Understand the detail information of Fish breeding in wet and dry bundhs.
4. Know the Hatching techniques and types of hatcheries.

M. Sc. SEM. III

Course Title: AQUACULTURE-II (AQUACULTURE AND RURAL DEVELOPMENT)

After completing this course, students are expected to be able to:

1. Understand the concept of culturing zooplankton, prawn, crab, pearl, and oyster.

2. Know the development and advancement of aquaculture in India.
3. Study the breeding and care of fresh water aquarium fishes.
4. Know the role of FFDA in development of aquaculture in India.

M. Sc. SEM. III

Course Title: FOUNDATION –I (FRESH WATER FISHERIS)

After completing this course, the student will be able to:

1. Understand the physic-chemical characteristics fresh water and construction of fish farm.
2. Know the brief outline of commercially important species of fresh water fishes and prawns and reverine fisheries.
3. Know the detailed information on fishery product and by product.
4. Study the fish seed production by chinese circular hatchery
5. Get information artificial feeds and their composition.

M. Sc. SEM. III

ZOOLOGY LAB-I:

1. Students will have good laboratory skills, enabling them to take observations and knowledge.
2. Measurements in a zoology laboratory and analyze the results to draw valid in practical.
3. Students will adopt the skill of draw the neat and clean well labeled diagram.
4. Develop the Practical skill based on the practical gram positive and gram negative bacteria.

M. Sc. SEM. IV

Course Title: BIOTESCHNIQUES, BIOSTATISTICS , ETHOLOGY AND BIOINFORMATICS.

After completing this course, the student will be able to:

1. Understand the Sterilization technique, Animal cell and tissue culture, basic principal of sedimentation and centrifugation.
2. Learn to solve the problems based on the Mean, mode and median and Probability , sampling its importance and example.
3. Understand the whole concept of Toxicology its scope Environmental toxicology and Toxicity test.
4. Understand the scope of bioinformatics, sequence alignment pair wise and multiple sequence alignment.
5. Get detailed information about the Biological databases and Phylogenetic analysis

M. Sc. SEM. IV

Course Title: Special group - AQUACULTURE –III (AQUACULTURE AND MANAGEMENT)

After completing this course, students are expected to be able to

1. Study the whole concept of Pond management i.e. Pre-stocking and post- stocking management
2. Get the information about Nutritional requirement of culturable carps, transport of live fish seed, brood and food fish.
3. Study the different system of aquaculture i.e. Polyculture and integrated aquaculture.
4. Understand the concept Integrated fish farming, sewage fed fish culture , cold water fish culture , Extensive , intensive, semi-intensive and super – intensive culture..

M. Sc. SEM. III

Course Title: Special Group-Aquaculture- IV (FISH PATHOLOGY AND FISH GENETICS)

After completing this course, the student will be able to:

1. Study the Biochemical composition and nutritional value of raw and preserved fish.
2. Understand the objective, principles and methods of Fish preservation.
3. Get detailed knowledge about the Fish decomposition, rigor mortis and fish spoilage.
4. Study the effect of water pollution on fishes and fish product and byproduct.
5. Get detailed information about the Fungal, bacterial and protozoan diseases.

M. Sc. SEM. IV

Course Title: Applied Fresh Water fisheries

After completing this course, students are expected to be able to

1. Get knowledge about the management of pond predators and their eradication , aquatic weeds and their control.
2. Know the Composition of fish farming, sewage fed fisheries and prawn culture.
3. Understand the Role of co-operative societies in fish marketing and fisheries extension services.
4. Able to give the presentation on the fresh water pearl culture and setting up of aquarium and its maintenance.

M. Sc. SEM. IV

ZOOLOGY LAB-I:

1. Students will have good laboratory skills, enabling them to take observations and knowledge.
2. Measurements in a zoology laboratory and analyze the results to draw valid in practical.
3. Students will adopt the skill of draw the neat and clean well labeled diagram.
4. Develop the Practical skill based on the practical gram positive and gram negative bacteria.