

M.Sc. Botany		
Course code	Course title	Course outcome
Semester I		
BO 211	Phycology, Mycology, Microbiology and Plant Pathology	<p>CO1: Know the general characteristics, classification, morphology, anatomy, reproduction, life cycle and evolutionary trends of algae, fungi, lichens, microbes and pathogens.</p> <p>CO2: Collect, identify and classify different lower plant groups.</p> <p>CO3: Understand the geographical distribution, ecological and economic significance and interactions of lower groups of plants.</p> <p>CO4: Discuss the applications of lower plant groups in agriculture, environment and industry and culturing of algae and bacteria.</p> <p>CO5: Analyze the plant diseases caused by various pathogens, microbes, pathogenesis and control measures.</p> <p>CO6: Determine the</p>

		importance of lower groups of plants in our life
BO 212	Bryophyta, Pteridophyta and Gymnosperms	<p>CO1: Students develop skills to identify Bryophytes, Pteridophytes and Gymnosperms, and also to classify different groups with their specific characters</p> <p>CO2: Students can explain about the characters of different groups, and their economic, medicinal and horticultural potentials</p> <p>CO3: By studying the contributions of important Scientists, students develop an understanding of the research works undergone and undergoing in India, and get motivated to know and do novel research contributions in Bryophyte, Pteridophyta and Gymnosperm of India</p> <p>CO4: Students can be able to explain the characters, and compare the affinities and evolutionary trends of different groups of Bryophytes, Pteridophytes and Gymnosperms to primitive Angiosperms</p>

BO 213	Histology, Reproductive Biology, Microtechnique and histochemistry	<p>CO1: Acquire in depth knowledge on differentiation and development of plant tissue systems and correlate the variations in cambial activity with different types of anomalous growth</p> <p>CO2: Gain knowledge on anatomical specialization in different plant parts and interpretation of phylogenetic relationship</p> <p>CO3: Develop concepts on different types of plant reproduction, mechanisms associated with pollination and plant development and application of techniques for mitigating fertilization barriers.</p> <p>CO4: Correlate the anatomical and palynological features to taxonomy and apply such data in basic research.</p> <p>CO5: Acquire practical skill on preparation of permanent slides of plant specimen using tools and techniques in microtechnique for</p>

		<p>preservation and use in academic and research purpose</p> <p>CO6: Application of the skill acquired through the cytological and histochemical technique for tissue processing and localization of plant metabolites in further research</p>
BO 214	Practical I	<p>CO1: Identification of lower groups</p> <p>CO2: Preparation of permanent slides and histology</p> <p>CO3: Identification of plant diseases</p> <p>CO4: localization of metabolites</p>
	SEMESTER II	
BO 221	Taxonomy of angiosperms, Economic Botany and ethnobotany	<p>CO1: Students will appraise the purpose of plant systematics – one of the oldest branches of science. They will understand the various components of systematics and different sources of data</p> <p>CO2: Understand the universal principles of naming of plants and can</p>

		<p>make use of the skills to solve nomenclatural ambiguities</p> <p>CO3: Understand phylogenetic systematics. They will be able to apply the knowledge in identifying plants from any part of the plant or plant product using DNA barcoding methodology</p> <p>CO4: Appreciate the need of maintaining /conserving plants in Botanical gardens & will be able to identify plants using keys using standard flora and identify the need to preserve plant specimens in Herbaria</p> <p>CO5: The students will understand the significance of ethnic societies and traditional knowledge and will explore it</p> <p>CO6: Students will be able to classify economically important crop plants and their products</p>
BO 222	Environmental biology, forest botany, phytogeography and conservation biology	<p>CO1: Understand the interactive phase of environment, biota and man</p> <p>CO2: Understand the structural and functional</p>

		<p>dynamics of different ecosystems</p> <p>CO3: Develop strategies for the conservation and sustainable utilization of our resources</p> <p>CO4: Identify and act on environmental issues</p> <p>CO5: Play lead roles in various conservation programmes</p>
BO 223	Cell biology, genetics and evolution	<p>CO1: Develop concepts on ultrastructure of cell organelles, cell cycle and acquire practical skill on cytological preparations</p> <p>CO2: Understand the mechanism of cell differentiation and interaction. Develop conceptual knowledge on techniques of karyotype and pachytene analysis for further research in cytology</p> <p>CO3: Gain conceptual knowledge on genetic material, DNA repair mechanisms, genetic code, gene expression, regulation, benefits of artificial gene synthesis and diseases</p>

		<p>associated with genetic disorders</p> <p>CO4: Acquire knowledge on role of genetics in evolution of population, elemental forces involved, principles and applications. Awareness on genetic control of development in plants and animals. Application of pedigree analysis in elucidation of genetic diseases in humans</p> <p>CO5: Realize the significance on the origin of life and mechanisms of evolution.</p>
BO 224	Practical II	<p>CO1: identification of families</p> <p>CO2: Conduct of meiosis</p> <p>CO3: Understanding genetics problems</p>
	Semester III	
BO 231	Plant breeding, horticulture and biostatistics	<p>CO1: Acquire knowledge and skill for crop improvement programme</p> <p>CO2: The students will be able to know and perform different horticultural techniques</p> <p>CO3: Undertake the development and management of vegetable</p>

		<p>garden ornamental garden</p> <p>CO4: Analyse scientific data statistically</p>
BO 232	Biochemistry, plant physiology and research methodology	<p>CO1: Understand the biochemistry of cell metabolism, plant physiological processes and the Research methodology in life sciences</p> <p>CO2: Analyze and interpret biosynthetic pathways and metabolites that are the prerequisites and consequences of physiological processes leads to the production of plant secondary metabolites.</p> <p>CO3: Analyze and compare the efficiency of C3, C4 and CAM plants</p> <p>CO4: Analyse the response of plants to various biotic and abiotic stresses and critically evaluate the plant defense mechanisms</p> <p>CO5: Identify a research problem, develop hypothesis and formulate a research methodology, familiarise</p>

		review of literature, conduct and evaluate experiments, analyze the data, derive valid conclusions and present the outcome in publication
BO 233	Molecular biology, immunology and plant biotechnology	CO1: Develop an overall idea about Molecular Biology and Immunology CO2: Develop knowledge about various techniques in Molecular Biology CO3: Develop practical skill in isolation of DNA, RNA and Protein CO4: Acquire an in depth knowledge on plant biotechnology and its application
BO 234	Practical III	CO1: Understanding different types of propagation methods and pollen viability CO2: DNA isolation and estimation CO3: Understanding biochemistry and physiology experiments
	SEMESTER IV	
BO 241	Bioinformatics and biophysics	CO1: Acquire knowledge on Bioinformatics and its applications CO2: Familiarize protein and

		<p>nucleic acid data bases and genomics & proteomics</p> <p>CO3; Develop skill in phylogenetic tree construction and molecular docking using suitable software</p> <p>CO4: Acquire information of computer aided drug designing</p> <p>CO5: Learn the fundamentals of instruments and techniques used in Biology</p>
BO 242	Environmental biology	<p>CO1: Understand the concept on the structural and functional dynamics of different ecosystems and population</p> <p>CO2: Develop knowledge about community ecology and interactions of organism with others and their ecosystems</p> <p>CO3: Analyze the sources and uses of energy resources and describe the environmental impact.</p> <p>CO4: Identify and act on various environmental issues and suggest remedial measures</p>

		CO5: Develop knowledge about waste disposal and recycling
BO243	Practical IV	CO1: Develop knowledge on molecular docking and databases CO2: Conduct of different chromatographic techniques CO3: Understanding of ecology experiments

M.Sc. Chemistry

Course code	Course title	Course outcomes
Semester -1		
CH 211	INORGANIC CHEMISTRY I	<p>CO1: employ crystal field theory in analysing the splitting of d-orbitals in octahedral, tetragonal, square planar, tetrahedral, trigonal bipyramidal and square pyramidal fields, calculate Crystal Field Stabilization Energy and Interpret Octahedral Site Stabilization Energy.</p> <p>CO2: apply Jahn-Teller theorem and demonstrate evidence for JT effect, static and dynamic JT effect.</p> <p>CO3: illustrate MOT for octahedral and tetrahedral complexes with and without pi bonds and construct MO diagrams.</p> <p>CO4: critically evaluate data from a variety of analytical chemistry techniques and apply knowledge of the statistical analysis of data</p> <p>CO5: interpret complexometric titrations, redox titrations, gravimetric titrimetry and titrations in non-aqueous solvents.</p> <p>CO6: apply TG, DTA and DSC in the study of metal complexes.</p> <p>CO7: explain the functioning of the frontier materials in inorganic chemistry like Solid Electrolytes, Solid oxide fuel cells, Rechargeable battery materials, Molecular materials and fullerenes</p> <p>CO8: explain the preparation, properties and structure of isopoly acids of Mo, W and V and heteropoly acids of Mo and W.</p> <p>CO9: explain preparation and properties of xenon fluorides, and noble gas compounds, aluminosilicates, zeolites and silicates and identify the importance of shape selectivity.</p>

		CO10: identify the chemical processes occurring naturally in earth's atmospheric, aquatic and soil environments and evaluates the impacts of human perturbations to these processes.
CH 212	ORGANIC CHEMISTRY I	<p>CO1: write down the IUPAC name of polycyclic, spirocyclic and heterocyclic compounds and draw the structures from the IUPAC name of these compounds.</p> <p>CO2: determine R and S, P and M, E and Z configuration of compounds with chiral centres, biphenyls, allenes, spiranes and draw the configurations in dash and wedge formula, or zig – zag configurations.</p> <p>CO3: detect prochirality in a compound and explain relevance of prochirality.</p> <p>CO4: explain chiral centre, chiral axis and chiral plane with examples, stability of conformations, stereo selective and stereospecific reactions.</p> <p>CO5: calculate Cotton effect of a compound from its structure and configuration.</p> <p>CO6: explain different methods for generation of free radical and different types of free radical reactions- Predict the products in a free radical reaction.</p> <p>CO7: describe different types mechanism of substitution, elimination, hydrolysis and addition reactions.</p> <p>CO8: differentiate the rate, mechanism and stereochemistry influenced by solvent, substrate structure, intermediate stability</p> <p>CO9: predict the products or reactants or reagents in selected types of reactions.</p> <p>CO10: design the mechanism of selected reactions.</p>
CH 213	PHYSICAL CHEMISTRY I	CO1: outline the development of quantum mechanics and its tools and apply them in determining the wave functions and energies of moving particles.

		<p>CO2: recognize the nature of adsorption and propose theories and choose theoretical and instrumental methods of measurements of surface property</p> <p>CO3: understand theory and mechanism of catalytic action.</p> <p>CO4: correlate thermodynamic properties and apply them in systems.</p> <p>CO5: understand theories, mechanism and, kinetics of reactions and solve numerical problems</p> <p>CO6: identify point groups and construct character table and predict hybridisation and spectral properties of molecules.</p>
CH 214	INORGANIC CHEMISTRY PRACTICALS-1	<p>CO1: interpret data from an experiment, including the construction of appropriate graphs and the evaluation of errors.</p> <p>CO2: estimate volumetrically the concentration of Zn, Mg and Ni using EDTA and the volumetric estimation of Fe</p> <p>CO3: estimate volumetrically the hardness of water and concentration of Ca in water samples using EDTA.</p> <p>CO4: estimate colorimetrically the concentration of Chromium – (using Diphenyl carbazide), Iron (using thioglycollic acid), Iron (using thiocyanate), Manganese (using potassium periodate), Nickel (using dimethyl glyoxime).</p> <p>CO5: carry out the preparation of the metal complexes Potassium trioxalatochromate (III), Tetraammoniumcopper (II) sulphate, Hexamminecobalt (III) chloride.</p> <p>CO6: record the UV spectra, IR spectra, magnetic susceptibility, TG, DTA and XRD of the complexes prepared.</p>
CH 215	ORGANIC CHEMISTRY PRACTICALS-1	<p>CO1: interpret data from an experiment, including the construction of appropriate graphs and the evaluation of errors.</p>

		<p>CO2: determine the correct method for separation of a binary mixture and make the separated compounds in pure form.</p> <p>CO3: develop thin layer chromatogram of a compound and determine its purity.</p> <p>CO4: separate two compounds by column chromatography.</p> <p>CO5: utilize the synthetic procedures and reagents to convert a compound into another. Differentiate the products by spectroscopic methods</p> <p>CO6: use green chemical principles in the synthesis.</p> <p>CO7: solve GC MS and LC MS of a compound to ascertain purity and identity, apply the basic principles</p>
CH 216	<p>PHYSICAL CHEMISTRY PRACTICALS-1</p>	<p>CO1: interpret data from an experiment, including the construction of appropriate graphs and the evaluation of errors.</p> <p>CO2: construct the Freundlich and Langmuir isotherms for adsorption of acetic/oxalic acid on active charcoal/ alumina and determine the concentration of acetic/ oxalic acid</p> <p>CO3: determine the rate constant, Arrhenius parameters, rate constant and concentration using kinetics</p> <p>CO4: construct the phase diagram and determine the composition of an unknown mixture</p> <p>CO5: construct the ternary phase diagram of acetic acid chloroform-water system and out the procedure in an unfamiliar situation to find out the composition of given homogeneous mixture.</p> <p>CO6: construct the tie-line in the ternary phase diagram of acetic acid chloroform-water system</p> <p>CO7: determine distribution coefficient using distribution law</p> <p>CO8: determine the equilibrium constant employing the distribution law.</p>

		<p>CO9: determine the coordination number of Cu^{2+} in copper- ammonia complex.</p> <p>CO10: determine K_f of solid solvent, molar mass of non-volatile solute, mass of solvent and composition of given solution</p> <p>CO11: determine K_T of salt hydrate, molar mass of solute, mass of salt hydrate and composition of given solution.</p> <p>CO12: determine surface tension and parachor of liquids</p> <p>CO13: ascertain the relationship between surface tension with concentration of a liquid and use this to find out the composition of given homogeneous mixture.</p> <p>CO14: determine the concentration of given strong acid/alkali</p> <p>CO15: determine the heat of ionisation of acetic acid.</p> <p>CO16: determine the heat of displacement of Cu^{2+} by Zn.</p>
Semester II		
CH 221	INORGANIC CHEMISTRY II	<p>CO1: obtain the term symbols of d_n system and determine the splitting of terms in weak and strong octahedral and tetrahedral fields.</p> <p>CO2: explain the correlation diagrams for d_n and d_{10-n} ions in octahedral and tetrahedral fields and interprets electronic spectra of complexes.</p> <p>CO3: applies magnetic measurements in the determination of structure of transition metal complexes.</p> <p>CO4: relates crystalline structure to X-ray diffraction data and the reciprocal lattice and explains the diffraction methods</p> <p>CO5: explains crystal defects</p> <p>CO6: elaborates the structure of selected compounds of AX, AX₂, AmX₂, ABX₃ and spinels</p>

		<p>CO7: explains the electronic structure of solids using free electron theory and band theory</p> <p>CO8: understands the differences in semiconductor and dielectric materials and their electrical and optical properties</p> <p>CO9: explain the structure and reactions of S–N, P–N, B–N, S– P compounds and boron hydrides</p> <p>CO10: analyse the topological approach to boron hydride structure and estimates styx numbers and apply Wade’s rules in borane and carboranes.</p> <p>CO11: identify the electronic configurations and term symbols of lanthanides and actinides.</p> <p>CO12: sketches the shapes of f orbital and shows their splitting in cubic ligand field.</p> <p>CO13: elaborates the importance of the beach sands of Kerala and their important components</p>
CH 222	ORGANIC CHEMISTRY II	<p>CO1: discuss the fundamentals, operating principles and instrumentation of separation techniques.</p> <p>CO2: differentiate the principle and applications of phase transfer catalysis with examples</p> <p>CO3: describe the various methods of determining reaction mechanisms and basic thermodynamic principles of organic reactions.</p> <p>CO4: explain the Hammett parameters of reaction and design an experiment to confirm the mechanism of a reaction</p> <p>CO5: identify different types of rearrangement reactions, determine the product of the reaction applying migratory aptitude, and reproduce the evidences for the mechanism of the reaction.</p> <p>CO6: understand that the outcomes of pericyclic reactions may be understood in terms of frontier orbital interactions, correlation diagram, Möbius and Hückel approach.</p> <p>CO7: recall and define the various types of pericyclic reaction; define such terms as ‘conrotatory’, ‘suprafacial</p>

		<p>CO8: predict and rationalise the outcomes of pericyclic reactions including stereospecificity, regioselectivity, and stereoselectivity.</p> <p>CO9: state the synthetic importance of the above cycloaddition and rearrangement reactions, and give disconnections of target compounds corresponding to these reactions</p> <p>CO10: describe the fate of excited molecule based on Jablonski diagram, predict the course of an organic photochemical reaction and identify the product with the type of functional group.</p> <p>CO11: propose synthetic routes to a variety of molecules, starting from simple precursors with correct stereochemistry and reagents of selected reactions.</p>
CH 223	PHYSICAL CHEMISTRY II	<p>CO1: propose synthetic routes to a variety of molecules, starting from simple precursors with correct stereochemistry and reagents of selected reactions.</p> <p>CO2: describe and explain the physical and chemical principles that underlie molecular structure determination techniques like microwave, vibrational, Raman and electronic spectroscopy</p> <p>CO3: predict likely spectral characteristics of given molecular species, and be able to rationalise those characteristics on the basis of structural and electronic arguments.</p> <p>CO4: acquire knowledge of basics of statistical mechanics and compare statistical methods</p> <p>CO5: understand and apply of theories of heat capacity.</p> <p>CO6: understand theories of electrolytes and electrochemical reactions</p> <p>CO7: ascertain the application of electrochemistry in industrial fields</p> <p>CO8: understand the theories and applications behind various types of analytical techniques in electrochemistry.</p>

		CO9: acquire skill in solving numerical problems.
Semester III		
CH 231	INORGANIC CHEMISTRY III	<p>CO1: demonstrate knowledge of advanced content in the areas of inorganic chemistry such as in organometallic compounds, bioinorganic compounds, spectroscopic methods in inorganic Chemistry and nuclear chemistry.</p> <p>CO2: examine the bonding in simple and poly nuclear carbonyls with and without bridging and complexes with linear π donor ligands.</p> <p>CO3: explain the structure and bonding of ferrocene and dibenzenechromium with the help of MO theory.</p> <p>CO4: understand fundamental reaction types and mechanisms in organometallics and to employ them to understand selected catalytic processes in industry.</p> <p>CO5: contrasts the thermodynamic and kinetic stability of complexes, analyses the factors affecting stability of complexes and explains the methods of determining stability constants.</p> <p>CO6: classifies ligand substitution reactions and explains its kinetics and various mechanisms.</p> <p>CO7: analyze the chemical and physical properties of metal ions responsible for their biochemical action as well as the techniques frequently used in bioinorganic chemistry such as oxygen transport, e-transfer, communication, catalysis, transport, storage etc.</p> <p>CO8: explain the principles of spectroscopic methods employed in inorganic chemistry and their applications in the study of metal complexes.</p> <p>CO9: demonstrate a knowledge of fundamental aspects of the structure of the nucleus, radioactive decay, nuclear reactions, counting techniques</p> <p>CO10: evaluate the role of nuclear chemistry to find the most suitable measures, administrative methods</p>

		and industrial solutions to ensure sustainable use of the world's nuclear resources.
CH 232	ORGANIC CHEMISTRY III	<p>CO1: describe and explain the physical and chemical principles that underlie molecular structure determination techniques such as UV-visible, IR, mass and NMR spectroscopy.</p> <p>CO2: apply knowledge of molecular structure determination using UV-visible, IR, mass and NMR spectroscopic techniques to identify and/or characterise chemical compounds from experimental data</p> <p>CO3: calculate λ_{max} of a compound, apply IR frequency table to determine the functional groups present in the molecule, interpret mass spectrum of compound from fragmentation.</p> <p>CO4: predict likely spectral characteristics of given molecular species; solve the structures of unknown molecules using appropriate spectroscopic techniques.</p> <p>CO5: devise a 2 D NMR of a compound based on learned principles and solve the structure of a compound based on NMR data</p> <p>CO6: discuss organic transformations with organometallic compounds and predict the products of the reactions.</p> <p>CO7: propose the retro synthetic pathways to a variety of molecules</p> <p>CO8: propose mechanisms for chemical reactions, given starting materials, reagents, conditions, and/or products.</p> <p>CO9: compare the reactions and mechanism and determine the products of a selected set of reactions; identify protecting group strategies.</p> <p>CO10: devise combinatorial method to create a library of compounds</p> <p>CO11: give examples of stereoselective, regioselective and chemoselective reductions and oxidations.</p>

CH 233	PHYSICAL CHEMISTRY III	<p>CO1: understand the theories of chemical bonding and their application with help of approximate methods predict the nature of orbitals and molecular spectra.</p> <p>CO2: compare MO and VBT</p> <p>CO3: understand the properties of gases and liquids and the nature of the intermolecular forces in them.</p> <p>CO4: describe the principle behind the determination of surface tension and coefficient of viscosity.</p> <p>CO5: describe and explain the physical and chemical principles that underlie molecular structure determination techniques like NMR, ESR, Mossbauer, NQR and PES spectroscopy.</p> <p>CO6: judge the degrees of freedom of systems and understand theories of irreversible thermodynamic systems.</p> <p>CO7: understand the quantum mechanical and non-quantum mechanical methods in computational chemistry, potential energy surface and basic functions.</p> <p>CO8: write the Z matrix of simple molecules.</p> <p>CO9: acquire skill in solving numerical problems.</p>
CH 234	INORGANIC CHEMISTRY PRACTICALS-II	<p>CO1: interpret data from an experiment, including the construction of appropriate graphs and the evaluation of errors.</p> <p>CO2: estimate a simple mixture of ions (involving quantitative separation) by volumetric and gravimetric methods.</p> <p>CO3: perform COD, BOD, DO, TDS analysis.</p> <p>CO4: predict likely spectral characteristics of given metal complexes solve the structures of unknown metal complexes using appropriate spectroscopic techniques and magnetic measurements.</p> <p>CO5: analyse the XRD of simple substances.</p> <p>CO6: interpret TG and DTA curves.</p>

CH 235	ORGANIC CHEMISTRY PRACTICALS-II	<p>CO1: interpret data from an experiment, including the construction of appropriate graphs and the evaluation of errors.</p> <p>CO2: predict likely spectral characteristics of given molecular species; solve the structures of unknown molecules using appropriate spectroscopic techniques</p> <p>CO3: develop paper chromatogram of a compound and determine its purity</p> <p>CO4: estimate quantitatively the Aniline, Phenol, glucose, Ascorbic acid and Aspirin in a sample</p> <p>CO5: estimate colorimetrically paracetamol, protein and ascorbic acid</p> <p>CO6: use green chemical principles in the synthesis</p>
CH 236	PHYSICAL CHEMISTRY PRACTICALS-II	<p>CO1: interpret data from an experiment, including the construction of appropriate graphs and the evaluation of errors.</p> <p>CO2: determine the strength of strong/ weak acids by conductometric titrations.</p> <p>CO3: verify Onsager equation and Kohlraush's law conductometrically.</p> <p>CO4: determine the activity and activity coefficient of electrolyte.</p> <p>CO5: determine the concentration of a solution potentiometrically or pH metrically.</p> <p>CO6: employ spectrophotometry in determining unknown concentration.</p> <p>CO7: determine the viscosity of liquid mixtures and use this in determining the concentration of a component in a mixture.</p> <p>CO8: determine the concentration of a liquid mixture using a refractometer.</p> <p>CO9: determine the unknown concentration of a given glucose solution.</p>
Semester IV		

CH 241	CHEMISTRY OF ADVANCED MATERIALS	<p>CO1: understand dimensions, synthesis, physicochemical properties of nanomaterials and its applications.</p> <p>CO2: understand and apply characterization tools for analysing Nano structures.</p> <p>CO3: outline and recognize the types of polymerization, kinetics and mechanisms.</p> <p>CO4: understand the stereo chemical aspects and methods for the determination of molecular weights of polymers.</p> <p>CO5: discuss the synthesis and applications of selected classes of speciality polymers.</p> <p>CO6: distinguish the types and important applications of smart materials.</p> <p>.</p>
CH 242 (a)	INORGANIC CHEMISTRY IV	<p>CO1: explain the schemes for σ and π bonding with examples.</p> <p>CO2: explain MO and Ligand field theory with the support of group theory and construct the MO diagram of octahedral complexes.</p> <p>CO3: apply character tables to find out the Infrared and Raman active modes for C_{2v}, C_{3v} and D_{4h}.</p> <p>CO4: assimilate the concepts of molecular recognition, self-assembly, dynamic combinatorial chemistry and supramolecular chirality, and be aware of the most important work in the field.</p> <p>CO5: understand the nature of bonding in metal atom clusters and distinguish Low nuclearity and High nuclearity carbonyl clusters.</p> <p>CO6: perform the electron counting schemes in cluster compounds.</p> <p>CO7: differentiate the different types of cluster molecules and understand their utility in catalysis.</p> <p>CO8: understand and explain the role of metal ions in biological systems and give examples for the use of metals in medicine.</p>

		<p>CO9: differentiate the defects arising due to deficiency and excess presence of metal ions in the body.</p> <p>CO10: explain the acid base concept in non-aqueous media and identify the reactions taking place in selected non aqueous solvents.</p>
CH 242 (b)	ORGANIC CHEMISTRY IV	<p>CO1: define secondary metabolites from plants and animals.</p> <p>CO2: explain the biosynthesis of terpenes and sterols, illustrate the structural elucidation and synthesis of natural products.</p> <p>CO3: list the forces involved in molecular recognition and recognize molecular receptors.</p> <p>CO4: quote molecular recognition events in biological systems.</p> <p>CO5: discuss the methods of creating combinatorial libraries and its processing to locate lead molecule.</p> <p>CO6: explain the various stages in drug development process, and outline the synthesis of paracetamol, phenobarbital, diazepam, sulphamethoxazole, benzylopenicillin, and chloramphenicol</p> <p>CO7: construct a solid phase synthesis of tripeptide from any three amino acids, explain protection, de protection and automated synthesis of peptides and nucleotides.</p> <p>CO8: describe twelve principles green chemistry.</p> <p>CO9: illustrate reactions in which green chemistry principles are applied and calculate atom economy.</p>
CH 242 (c)	PHYSICAL CHEMISTRY IV	<p>CO1: apply the group theory in the identification of IR and Raman active normal modes in molecules coming under various point groups such as C_{2v}, C_{3v}, C_{4v}, D_{3h}, T_d and O_h.</p> <p>CO2: apply group theory in solving spectroscopic problems.</p>

		<p>CO3: solve the problems in Exactly solvable systems like Simple Harmonic Oscillator, rigid rotor and the Hydrogen atom.</p> <p>CO4: explain the approximation methods used in quantum mechanics.</p> <p>CO5: illustrate trial wave functions for calculation of H atom and particle in a 1D box as examples.</p> <p>CO6: set up secular determinants</p> <p>CO7: explain the variation in the state of a system with time</p> <p>CO8 : apply computational methods as potential tools for practicing chemistry</p> <p>CO9: construction of Z-matrices of simple molecules H₂, H₂O, H₂O₂, H₂CO, CH₃CHO, CH₄, C₂H₆ and with dummy atom, CO₂, NH₃, C₆H₆.</p> <p>CO10: explain the commonly using force fields (MM3, MMFF, AMBER and CHARMM) and Softwares.</p> <p>CO11: Compare Molecular Mechanics, Ab-initio method, Semi empirical method and DFT method of computations.</p>
<p>CH 243 (a)</p>	<p>DISSERTATION</p>	<p>CO1: demonstrate an advanced theoretical and technical knowledge of chemistry as a creative endeavour; analyse, interpret and critically evaluate scientific information.</p> <p>CO2: present information, articulate arguments and conclusions, in a variety of modes, to audiences in their field of research</p> <p>CO3: as part of a team or individually, design, conduct, analyse and interpret results of an experiment, and effectively communicate these in written reports and other formats.</p> <p>CO4: develop an understanding of the requirements to undertake independent research in a chemistry field.</p>

		CO5: demonstrate an understanding of the relationship between scientific research and the progress of new knowledge in a global scenario.
CH 243 (b)	Visit to R & D Centre	CO1: Understand the relevance of independent supervised research in a chemistry field and the need of well-developed judgement, adaptability and accountability as a practitioner or learner

M.Com.

Course code	Course title	Course outcomes
Semester -1		
CO 211	BUSINESS ETHICS AND CORPORATE GOVERNANCE	Course Outcome: <ol style="list-style-type: none">1. Create awareness and interest among the students in modern management concepts and thought2. Enable the students to choose appropriate functional area of management in their future studies.
CO 212	LEGAL FRAMEWORK FOR BUSINESS	Course outcome: <ol style="list-style-type: none">1. Enable the students to acquire basic ideas about environment and emerging issues about environmental problems.2. Aware about the need and importance of environmental protection
CO 213	RESEARCH METHODOLOGY	Course Outcome: <ol style="list-style-type: none">1. Provide an insight into the fundamentals of social science research2. Understand the need, significance and relevance of research and research design3. Acquire practical knowledge and required skills in carrying out research
CO 214	PLANNING AND DEVELOPMENT ADMINISTRATION	Course Outcome: <ol style="list-style-type: none">1. Make the students aware of the need for information systems, its application in managerial decision making.2. Make the students aware of the recent trends in information system.

CO 215	ADVANCED CORPORATE ACCOUNTING AND REPORTING	<p>Course Outcome:</p> <ol style="list-style-type: none"> 1. Make the students to understand International Financial Reporting Standards and tools & techniques in various accounting situations. <p>Expose the students to advanced accounting issues and practices like Investment, Consolidation of financial statements, Liquidation etc</p>
Semester II		
CO 221	E-BUSINESS & CYBERLAWS	<p>Course Outcome:</p> <ol style="list-style-type: none"> 1. Equip the students with the emerging trends in business 2. Equip the students to introduce and explore the use of information technology in all aspects of business 3. Familiarise with the students cyber world and cyber regulations
CO 222	STRATEGIC MANAGEMENT	<p>Course Outcome:</p> <ol style="list-style-type: none"> 1. Create a conceptual awareness on various strategies 2. Familiarise students with the formulation and implementation of strategies
CO 223	QUANTITATIVE TECHNIQUES AND FINANCIAL ECONOMETRICS	<p>Course Outcome:</p> <ol style="list-style-type: none"> 1. Impart expert knowledge in the application of quantitative techniques in research. 2. Impart knowledge in the use of SPSS in processing and analysis of data
CO 224	INTERNATIONAL BUSINESS	<p>Course Outcome:</p> <ol style="list-style-type: none"> 1. Provide an understanding of international business and its various dimensions

CO 225	INVESTMENT MANAGEMENT	Course Outcome: <ol style="list-style-type: none"> 1. To provide general understanding about investment avenues and personal finance 2. To give a broader understanding about behavioural finance and how it equip to decide personal investment
Semester III		
CO 231U	INCOME TAX PLANNING AND MANAGEMENT	Course Outcome: <ol style="list-style-type: none"> 1. Expose the students to the latest provisions of Income Tax Act. Identify the Tax Planning and Assessment Procedures for Individuals, Firms and Companies
CO 232F	SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT	Course Outcome: <ol style="list-style-type: none"> 1. Provide the students a comprehensive understanding on the areas of security analysis and portfolio management and acquainting them with various tools and techniques for making prudent investment decisions. 2. Identify the principles of security analysis and the development of skills in portfolio management. 3. Understand the inputs from IFM and Financial services
CO 233F	INTERNATIONAL FINANCIAL MANAGEMENT	Course Outcome: <ol style="list-style-type: none"> 1. Familiarise the students with the international financial markets and instruments. 2. Create awareness on the global financial markets and institutions 3. Convey an understanding on the management of funds by MNCs

CO 234F	STRATEGIC COST AND MANAGEMENT ACCOUNTING	Course Outcome: <ol style="list-style-type: none"> 1. Comprehend and familiarize the established techniques, methods and practices in advanced Cost and Management Accounting to the students. 2. Introduce the evolving dynamic Cost and Management Techniques developed to support the emerging business models.
Semester IV		
CO 241 W	GOODS AND SERVICE TAX AND CUSTOMS DUTY	Course Outcome: <ol style="list-style-type: none"> 1. Gain expert knowledge of the principles and laws relating to the Service Tax, Central Excise Duty, Customs duty
CO 242 F	RISK MANAGEMENT	Course Outcome: <ol style="list-style-type: none"> 1. Convey the basic concepts of strategic financial management. 2. Impart knowledge on strategies that support corporate finance.
CO 243 F	ACCOUNTING STANDARDS	Course Outcome: <ol style="list-style-type: none"> 1. Familiarize the students about the new developments in the reporting of financial statements. 2. Equip the students with the techniques to interpret the financial statements
CO 244 F	MANAGEMENT OPTIMIZATION TECHNIQUES	Course Outcome: <ol style="list-style-type: none"> 1. Impart knowledge on various facets of project management viz. project preparation, feasibility study as well as project scheduling and monitoring. 2. Convey basic principles of project optimization using various Operational Research

		tools.

M.A. ECONOMICS

SEMESTER 1

Course Code	Course Title	Course outcome
EC 211	MICRO ECONOMICS – I	<p>CO1: To provide students with an understanding of the principles of economics in application to individual decision-makers, both consumers and firms.</p> <p>CO2: Equip the students themselves with the various aspects of the conventional and the recent developments in microeconomic theory.</p> <p>CO3: The students will get a deep understanding of the workings of different market structures in the world.</p> <p>CO4: To develop a conceptual foundation on Managerial and Behavioral theories of the firm.</p>
EC 212	ECONOMICS OF GROWTH AND DEVELOPMENT	<p>CO1: It familiarizes students with the conceptual routes, theoretical dynamics, and practical strategies of growth and development.</p> <p>CO2: This course would orient them towards major themes of development, lead them towards more methodical probes.</p> <p>CO3: Equip the students with adequate analytical knowledge.</p> <p>CO4: It connects students to academic concerns, policies and practical solutions relevant to the progression of all economies.</p>
EC 213	INDIAN ECONOMIC POLICY - I	<p>CO1: To enable the students to understand the various issues of the Indian Economy from a policy perspective.</p> <p>CO2: The students will be able to get deep knowledge of structural reforms in the Indian Economy</p> <p>CO3: It provides an exposition of the effect of demonetization on the economy.</p> <p>CO4: The students will be able to analyse and criticize the recent policy changes in the field of agriculture, industry and service sectors.</p>
EC 214	QUANTITATIVE METHODS FOR ECONOMICS	<p>CO1: To provide the students with an insight into the importance of quantitative methods in Economics</p> <p>CO2: Enable students to introduce and apply qualitative techniques in finding solutions to economic problems.</p> <p>CO3: Enable students to make use of a quantitative approach in formulating economic problems</p>

		CO4: It will help students to inculcate analytical ability to find solutions to mathematically formulated economic problems.
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SEMESTER 2

Course Code	Course Title	Course Outcome
EC 221	MICROECONOMICS - II	CO1: Enable students to get an insight into the importance and developments in the areas of theories of distribution in Economics. CO2: The students will be able to understand the significance of general equilibrium and welfare economics. CO3: To impart an idea regarding the uncertainty and informational asymmetry. CO4: To equip the students to understand the importance of behavioural economics.
EC 222	ECONOMICS OF SOCIAL SECTOR AND ENVIRONMENT	CO1: Enable the students to understand and apply the key economic concepts in the context of social sectors like education, environment, and healthcare. CO2: The students will be able to understand how economic factors contribute to the development and implementation of educational policies. CO3: Identify the major theories governing the development of human resources, school improvement, and development. CO4: Recognize the important linkages between the environment and economics, be aware of the key environmental issues around the globe and understand approaches to identify and value costs and outcomes to include in economic evaluation of the environment through benefit-cost analysis.
EC 223	INDIAN ECONOMIC POLICY - II	CO1: Enable the students to understand the basic concepts of economics and equip them with the basic idea for further learning in Indian and Kerala economies. CO2: The students will get knowledge about the financial and external sector CO3: To help students to analyze the sectoral development that has taken place India as well as in Kerala's economy. CO4: To make the students aware of the need for reforms in Indian Economy
EC 224	ECONOMETRICS AND RESEARCH METHODOLOGY	CO1: To create an understanding among the students on basic econometric methodology

		<p>CO2: To train the students in applying economic theories to real economic data through empirical models.</p> <p>CO3: to give a comprehensive idea on the process of doing economics research.</p> <p>CO4: To enable the students to undertake regression analysis in economic research</p>
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SEMESTER 3

Course Code	Course Name	Course Outcome
EC 231	MACRO ECONOMICS I	<p>CO1: The student will familiarize themselves with the development of macroeconomics after the Keynesian revolution including Neo-classical and Keynesian synthesis</p> <p>CO2: The students should be able to understand the structural underpinnings of the theoretical development of macroeconomic thoughts and their application.</p> <p>CO3: The students will be able to get the idea of macroeconomic models in an open economy context.</p> <p>CO4: to create consciousness among students about the recent crises in global capitalism.</p>
EC 232	INTERNATIONAL ECONOMICS I	<p>CO1: It gives the students an introduction to the main theoretical tools and policies that are central to the study of international trade.</p> <p>CO2: Focus on the application of tools and policies to the trade flows, trading blocks, and international macroeconomic events that characterize the global economy today.</p> <p>CO3: Gives students the ability to use economic analysis to reach a deeper understanding of international trade.</p> <p>CO4: Provides an important formative element for those who intend to develop careers in international business and management.</p>
EC 233	PUBLIC ECONOMICS	<p>CO1: The student should be able to understand the regulatory and developmental responsibilities of government in a democratic country like India.</p> <p>CO2: Enable the students to cover the theoretical and empirical dimensions of public goods and public choice.</p> <p>CO3: It gives an idea about fiscal instruments, and fiscal federalism with special reference to the Indian context.</p> <p>CO4: It also discusses the present fiscal management issues of India.</p>
EC 203	LABOUR ECONOMICS	<p>CO1: To develop abilities in understanding the functioning of labour markets.</p> <p>CO2: It introduces students to the economics of the labour market through a blend of theoretical and empirical analyses.</p>

		<p>CO3: Enable the students to understand different aspects of the labour market.</p> <p>CO4: It gives an idea about labour organizations, labour relations and labour legislations, wage and employment theory, collective bargaining theory, social security and welfare measures, etc.</p>
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SEMESTER 4

Course Code	Course Name	Course Outcome
EC 241	MACRO ECONOMICS II	<p>CO1: The students will be able to get an understanding about the theoretical development of the macroeconomic issues of inflation, unemployment and business fluctuations.</p> <p>CO2: Enable the students to have a basic understanding of the development of macroeconomics after classical & Keynes.</p> <p>CO3: The students should be able keep abreast with the latest development of macroeconomics development.</p> <p>CO4: Enable the students to impart knowledge about the impacts of various macroeconomic policies in society.</p>
EC 242	INTERNATIONAL ECONOMICS II	<p>CO1: to introduce to students the theories of international finance flows, determination of interest and exchange rates in interconnected economies.</p> <p>CO2: Enable students to develop a comprehensive knowledge of macroeconomic policies available to the government, and the nature of financial crises.</p> <p>CO3: To provide a framework for consistent reasoning about international flows of goods, factors of production, financial assets.</p> <p>CO4: Enable students to impart knowledge about trade policy and monetary policy in an open economy.</p>
EC 243	FINANCIAL SECURITIES MARKET ANALYSIS	<p>CO1: To provide a comprehensive study of the significance of the Securities Market in the modern financial system.</p> <p>CO2: Enable students to develop a comprehensive knowledge of efficient securities markets' theory in finance, bond pricing, and price-earnings models of share valuation, and introduce the top-down approach to investment decisions.</p> <p>CO3: Enable the students to understand modern finance theory as applied to investment analysis, balanced with a consideration of new developments in the discipline.</p> <p>CO4: It also gives an idea about the application of both old and new theoretical perspectives to understand the current environment for financial investment decisions.</p>

EC2010	INDUSTRIAL ECONOMICS	<p>CO1: It is designed to use theoretical models to understand industries and regulatory decision-making and helps to use diagrams & basic mathematical models.</p> <p>CO2: It also provides guidelines to urge through knowledge to the students on the basic issues in the industrial development of India.</p> <p>CO3: Equip the students to acquire fair knowledge of the international experience of industrial progress.</p> <p>CO4: To provide an understanding of the importance of industrial finance in India</p>
EC 244	DISSERTATION AND VIVA VOCE	<p>CO1: It will familiarize the students to develop research aptitude and skills.</p> <p>CO2: Enable students to develop a comprehensive knowledge of academic writings</p> <p>CO3: This would impart the skills essential for analyzing research issues</p> <p>CO4: Enable the students to conduct research in future.</p>

M.A. English

Course code	Course title	Course outcomes
Semester -1		
EL 511	British Literature 1	CO 1: Ability to comprehend the various socio-political and literary movements from the Anglo-Saxon to the age of Transition. CO 2: Can identify the writers and their works of the period from Anglo-Saxon to the age of Transition. CO 3: Develop abilities to analyse the characteristic literary styles of the essayists, dramatists, and writers from Anglo-Saxon to the age of Transition
EL 512	British Literature 2	CO 1: can comprehend the various socio-political and literary movements from the Romantic Age period to 20th century. CO 2: can identify the writers and their works of the period from Romantic Age period to 20th century. CO 3: ability to analyse the characteristic literary styles of the essayists, dramatists, and writers from Romantic Age period to 20th century.
EL 513	Shakespeare Studies	CO 1: gains competence to critically analyse the selected plays and sonnets of Shakespeare. CO 2: gains an understanding of the critical perspectives on Shakespeare. CO 3: develops an overview of Shakespeare performances and adaptations and their influence on English language and literature through the ages.
EL 514	Language Studies	CO 1: can understand the basic concepts, branches and history of linguistics. CO 2: learns to describe and analyze language units based on their phonological, morphological and syntactical features CO 3: learns to explain the transformation of sentences based on TG grammar CO 4: gains competence to use language effectively with a conscious understanding of its features, syntactic structures and uses
Semester II		
EL 521	World Literatures I	CO 1: Recognises the various socio-cultural and political experiences and expressions seen in world literatures CO 2: Learns the theoretical grounding to read literatures in English from different regions

		<p>CO 3: Recognises the ways in which transcultural flows affect the readings of texts across social and historical borders</p> <p>CO 4: Analyses the discursive reach of English in shaping imaginative journeys across continents</p> <p>CO 5: gains an understanding through reading, discussion and writing about literatures in different genres</p>
EL 522	Literatures of the 20 th Century	<p>CO1: learns to distinguish the theoretical positions that present Indian literature as an essentialist category</p> <p>CO2: identifies the category of ' Literatures of India' in relation to the emerging discourses of nation, marginality, region, and resistance</p> <p>CO3: learns to interpret the reading of literatures of India in vernacular ways through insightful critical perceptions</p> <p>CO4: understands the role of translation in the making and unmaking of literary traditions</p>
EL 523	Gender Studies	<p>CO 1: Interrogates and analyzes gendered performance and power in a range of social spheres.</p> <p>CO2: analyzes patriarchal socio-political-historic structures and cultural representations and discourses</p> <p>CO 3: Explores and deepens their gender-related perspectives on gender laws, activism, policy/advocacy.</p> <p>CO 4: Arrives at critically informed readings of literary texts and cultural practices with an understanding of the politics of gender</p> <p>CO 5: understands the positioning of intersectional gender identities in the process of development.</p>
EL 524	Critical Studies 1	<p>CO 1: critically analyses literary and cultural texts using the foundational concepts explored in this course.</p> <p>CO 2: gains the critical acumen to negotiate contested knowledge systems.</p> <p>CO 3: learns to steer the theoretical paradigms and unsettle disciplinary boundaries.</p>
Semester III		
EL 531	World Literatures II	<p>CO 1: Recognises the various socio-cultural and political experiences and expressions seen in world literatures</p>

		<p>CO 2: Learns the theoretical grounding to read literatures in English from different regions</p> <p>CO 3: Recognises the ways in which transcultural flows affect the readings of texts across social and historical borders</p> <p>CO 4: Analyses the discursive reach of English in shaping imaginative journeys across continents</p> <p>CO 5: gains an understanding through reading, discussion and writing about literatures in different genres by writers who have significantly influenced World Literatures</p>
EL 532	Critical Studies 2	<p>CO 1: understands new directions that inform the terrain of contemporary critical theory.</p> <p>CO 2: attains the reflexivity to engage with theory and critical practices</p> <p>CO 3: gains critical acumen to pursue interdisciplinary academic interests..</p>
EL 533.4	American Literature	<p>CO 1: Develops an awareness of the socio-political and cultural history of America</p> <p>CO 2: Identifies key ideas and characteristic perspectives or attitudes as expressed in American literature</p> <p>CO 3: Demonstrates knowledge of the contributions of major literary periods, works and persons in American literature and recognize their continuing significance.</p> <p>CO 4: Reflects the thoughts, beliefs, customs, struggles, and visions of African American writers.</p> <p>CO 5: Compares/contrasts literary works through an analysis of genre, theme, character, and other literary devices</p>
EL 534.2	African and Caribbean Literature	<p>CO 1: appreciates the diversity of literary voices from Africa and the Caribbean and to enable them to read texts in relation to the historical and cultural contexts</p> <p>CO 2: understands the debates and concepts emerging from the field of African-Caribbean Studies</p> <p>CO 3: develops the ability to think critically about African Caribbean Diaspora</p>

EL 535.1	Indian Writing in English	<p>CO 1: displays a deep awareness of the major historical events and the socio-cultural contexts which moulded the various genres in Indian Writing in English</p> <p>CO 2: analyzes how the sociological, historical, cultural and political context impacted the texts selected for study</p> <p>CO 3: evaluates critically the contributions of major Indian English poets, dramatists, prose writers, novelists and short story writers</p> <p>CO 4: develops a literary sensibility and display an emotional response to the literary texts and cultivate a sense of appreciation for them</p> <p>CO 5: applies the ideas encapsulated in Indian Aesthetics to literary texts</p>
Semester IV		
EL 541	Kerala Culture and Literature	<p>CO1: Understands the socio-cultural specificities and nuances that shaped Kerala</p> <p>CO2: Understands the inherent ironies and contradictions within Kerala and imbibe a sense of everyday critique</p> <p>CO3: Learns from lived everyday experiences</p> <p>CO4: Develops a sense of creative and critical thinking</p> <p>CO5: Understands the socio-cultural plurality that defines Kerala through divergent historical/cultural formations.</p>
EL 542	English Language Teaching: Theory and Practice	<p>CO 1: acquires knowledge of the evolution of ELT as a discipline, especially in India.</p> <p>CO 2: gains knowledge of the theoretical frameworks that inform ELT practices.</p> <p>CO 3: learns to assess critically the implications of the various approaches, methods and techniques.</p> <p>CO 4: develops the ability to critically evaluate syllabi, teaching materials and evaluation procedures.</p>
EL543	Cultural Studies	<p>CO 1: develops a thorough understanding of the origin and evolution of Cultural Studies, major theorists and their contributions</p> <p>CO 2: Gains sufficient knowledge about methodology and praxis of cultural studies</p> <p>CO 3: Gains competence to analyse and valuate cultural texts and practices critically</p>
EL 544.2	Regional Literatures in English Translation	<p>CO 1: demonstrates knowledge of at least a few languages and literatures with a smaller number of native speakers and readers</p> <p>CO 2: demonstrates basic knowledge about the 8th schedule of the Indian Constitution</p>

		<p>CO 3: shows an understanding of the major landmarks and trends in at least a few of India's major literatures from the 19th century to the present day</p> <p>CO 4: analyses critically some of the thematic concerns running through most of the above literatures such as the critical exploration of the idea of nationalism, protest against inequities based on caste, creed, gender and social status, concern for the environment and reworking/ retelling of long established myths and dominant narratives.</p>
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M.Sc. Physics

Course code	Course title	Course outcomes
Semester I		
PH 211	Classical Mechanics	<p>CO1: Students are able to learn the concepts of Lagrangian and Hamiltonian mechanics and use them to solve problems in mechanics. Able to learn concepts of generating functions, Poisson brackets Hamilton Jacobi equations and action angle variables.</p> <p>CO2: To equip the students to deal with central force problem and analyzing Kepler's laws.</p> <p>CO3: To inculcate the students the concepts of special and general theory of relativity and related problems.</p> <p>CO4: To acquaint the students about the theory of small oscillations and Euler's equations of motions of rigid bodies.</p> <p>CO5: To analyze nonlinear dynamical systems and to explain the concepts of classical chaos.</p>
PH 212	Mathematical Physics	<p>CO1: To apply and analyze the various vector and matrix operations and to perform complex analysis for solving physical problems.</p> <p>CO2: To demonstrate and utilize the concepts of Fourier series and its transforms.</p> <p>CO3: To explain and differentiate different probabilistic distributions.</p>

		<p>CO4: To apply partial differential equations and special functions for solving mathematical problems.</p> <p>CO5: To illustrate and apply concepts of group theoretical operations and tensors.</p>
PH 213	Basic Electronics	<p>CO1: To equip the students design and analyze different analogue and digital circuits.</p> <p>CO2: To summarize the knowledge of basic arithmetic and data processing circuits and memory devices.</p> <p>CO3: To equip the students to explain various components in optical communications systems and microwave devices.</p> <p>CO4: To measure and analyze the different electronic signals.</p>
Semester II		
PH 221	Modern Optics & Electromagnetic theory	<p>CO1: To demonstrate the linear and nonlinear optical phenomena.</p> <p>CO2: To explain and discuss propagation of electromagnetic waves through different media.</p> <p>CO3: To restate formulations and relativistic effects in electrodynamics.</p> <p>CO4: To analyse the propagation of electromagnetic waves through waveguides.</p>

		CO5: To use radiation theory in developing different antennas.
PH 222	Thermodynamics, Statistical Physics & Basic Quantum Mechanics	CO1: To explain the basic thermodynamic relations, Maxwell's equations and its consequences. CO2: To equip the students to demonstrate and apply classical and quantum statistics in different physical phenomena. CO3: To distinguish the different phase transitions using Ising model. CO4: Outline and apply foundations of quantum mechanics.
PH 223	Computer Science & Numerical Techniques	CO1: To summarize computer hardware and its operating systems CO2: Explain internal architecture of microprocessors 8085 and create assembly language programming. CO3: To develop and compile programs in python and C++. CO4: Apply numerical methods to solve physical problems.
PH 251	General Physics Practicals	CO1: To measure and analyze various physical quantities. CO2: To calculate error in various general physics experiments. CO3: To develop experimental skills.
PH 252	Electronics & Computer	CO1: To design and construct various electronic circuits and its validation.

	Science Practicals	<p>CO2: To calculate error in various electronics experiments.</p> <p>CO3: To develop experimental and programming skills.</p>
Semester III		
PH 231	Advanced Quantum Mechanics	<p>CO1: To extend the use of approximation methods viz variation, WKB, time dependent and time independent perturbations.</p> <p>CO2: To summarize different types of symmetry, conservation laws and quantum theory of scattering.</p> <p>CO3: To distinguish different approximation methods, to study the structure and properties of many electron systems.</p> <p>CO4: To compute eigen values of angular momentum and evaluation of CG coefficients.</p> <p>CO 5: Infer the requirements of relativistic quantum mechanics.</p>
PH 232	Atomic and Molecular Spectroscopy	<p>CO1: Explain different symmetry operations and deduction of molecular structure.</p> <p>CO2: Distinguish and classify the different spectra shown by atoms and molecules.</p> <p>CO3: Illustrate the various spectroscopic experimental techniques.</p>
PH 233E	Advanced Electronics-I	<p>CO1: To summarize various techniques of digital and analog communication systems.</p>

		<p>CO2: Generalize the idea of information theory.</p> <p>CO3: Illustrate various techniques for digital signal processing based Fourier and Z transform.</p>
Semester IV		
PH 241	Condensed Matter Physics	<p>CO1: Discuss crystal physics, lattice vibrations, models of thermal properties and band theory of solids.</p> <p>CO2: Explain the theoretical concepts of semiconductors, dielectric, magnetic and superconducting materials.</p> <p>CO3: To describe the synthesis and characterization techniques of nanomaterials.</p> <p>CO4: To apply the concepts in condensed matter physics to meet the challenges.</p>
PH 242	Nuclear and Particle Physics	<p>CO1: To describe and analyze nuclear structure, models and reactions.</p> <p>CO2: To illustrate the mechanisms of nuclear fission and fusion reactions.</p> <p>CO3: Discuss various nuclear detectors and particle accelerators.</p> <p>CO4: To classify elementary particles and discuss their interactions.</p>
PH 243 E	Advanced Electronics-II	<p>CO1: Demonstrate microprocessor architecture, programming and interfacing devices.</p>

		<p>CO2: Outline the basic concepts of embedded systems, artificial intelligence and neural networks.</p> <p>CO3: Illustrate fundamental data communications codes, radar and satellite communication systems.</p>
PH 261	Advanced Physics Practicals	<p>CO1: To measure and analyze various physical quantities.</p> <p>CO2: To calculate error in various advanced physics experiments.</p> <p>CO3: To develop experimental skills.</p> <p>CO4: To analyze and point out results of experimental data.</p>
PH 262 E	Advanced Electronics Practicals	<p>CO1: To design and construct various electronic circuits and its validation.</p> <p>CO2: To calculate error in various electronics experiments.</p> <p>CO3: To develop and test assembly language programs using microprocessors.</p>

P.G. AND RESEARCH DEPARTMENT OF ZOOLOGY

COURSE OUTCOMES

M.Sc. Zoology

Course Code	Course Title	Course outcomes
Semester – I		
ZO 211	Systematics & Evolutionary biology	<p>CO1. Thorough understanding in the principles and practice of systematics.</p> <p>CO2. Acquire an in-depth knowledge on the diversity and relationships in animal world.</p> <p>CO3. Develop a holistic appreciation on the phylogeny and adaptations in animals.</p> <p>CO4. Enable the students to understand the evolution of universe and life.</p> <p>CO5. Understanding on the process and theories in evolutionary biology.</p> <p>CO6. Develop an interest in the debates and discussion taking place in the field of evolutionary biology</p>
ZO 212	Biochemistry	<p>CO1. Understand the chemical nature of life and life process.</p> <p>CO2 Get an idea on structure and functioning of biologically important molecules.</p> <p>CO3. Help to explore new developments in biochemistry.</p> <p>CO4. Enable the students to illustrate various Biochemical pathways.</p> <p>CO5. Develop an interest in the debates and discussions associated with Lifestyle Diseases.</p>
ZO 213	Biophysics, Instrumentation and Computer Science	<p>CO1. Understand the importance of Physics to recognize life process.</p> <p>CO2 Get an idea on tools and techniques available for studying biochemical and biophysical nature of life.</p> <p>CO3. Equip the learner to use the tools and techniques for project work and research.</p> <p>CO4. Equip the learner to carry out original research in biology.</p> <p>CO5. Improve analytical and critical thinking skills through problem solving.</p> <p>CO6. Training in the use of various tools and techniques.</p>
ZO 214	Practical I- Systematics and Evolutionary Biology, Biochemistry, Biophysics, Instrumentation and Computer Science	<p>CO1: Understand the principle of volumetric titrations.</p> <p>CO2: Understand the significance of pKa and isoelectric point.</p> <p>CO3: Perform quantitative estimation of biomolecules in given samples.</p> <p>CO4: Develop skill to measure micro-objects using micrometry.</p> <p>CO5: Perform statistical analysis of given data.</p> <p>CO6: Develop skill to sketch objects using camera lucida.</p>
Semester – II		
ZO 221	Advanced Physiology and Functional Anatomy	<p>CO1. Compare the functioning of organ systems across the animal world.</p> <p>CO2. Learn more about human physiology and anatomy.</p>

ZO 222	Genetics, Quantitative Analysis and Research Methodology	<p>CO1. In-depth understanding on the principles and mechanisms of inheritance.</p> <p>CO2 Explain the fine structure and molecular aspects of genetic material.</p> <p>CO3. Learn the mechanism of Inheritance in Man.</p> <p>CO4. Expose the learners to the emerging field of research and equip them the various research methodologies.</p>
ZO 223	Cell Biology, Molecular Biology & Bioinformatics	<p>CO1. Understanding on the details of the basic unit of life at the molecular level.</p> <p>CO2 Explain the fine structure and functions of cell organelles.</p> <p>CO3. Introduce the new developments in molecular biology and its implications in human welfare.</p> <p>CO4. Expose the learners to the emerging field of research in Molecular Biology.</p>
ZO 224	Practical II-Advanced Physiology and Functional Anatomy, Genetics Quantitative Analysis, Cell and Molecular Biology and Bioinformatics	<p>CO1: Quantify blood cells and the effect of tonicity on diameter of RBC.</p> <p>CO2: Develop skills in biostatistical methods and tools in analyzing data and representation of data using appropriate software.</p> <p>CO3: Prepare slides of giant chromosome.</p> <p>CO4: Develop skills in mounting of mouth parts of insects and interpretation of its feeding preferences.</p> <p>CO5: Learn methods and techniques of biochemical assays.</p> <p>CO6: Gain skills in enzyme assays and estimate the effect of pH on enzyme activity.</p> <p>CO7: Develop skills in histological localization of protein and glycogen in paraffin sections.</p>
Semester – III		
ZO 231	Microbiology and Biotechnology	<p>CO1. Over view of the microbial world, its structure and function.</p> <p>CO2. Familiarize the learner with the applied aspects of microbiology.</p> <p>CO3. Intensive and in-depth learning in the field of biotechnology.</p> <p>CO4. Understand the modern biotechnology practices and approaches with an emphasis in technology application, medical, industrial, environmental and agricultural areas.</p> <p>CO5. Familiarize the students with public policy, biosafety, and intellectual property rights issues related to biotechnology.</p>
ZO 232	Ecology, Ethology and Biodiversity Conservation	<p>CO1. Understanding on the basic theories and principles of ecology.</p> <p>CO2. Learn current environmental issues based on ecological principles.</p> <p>CO3. Gain critical understanding on human influence on environment.</p> <p>CO4. Expose to the basics and advances in ethology.</p> <p>CO5. Generate an interest in Ethology in order to understand the complexities of both animal and human behavior.</p> <p>CO6. Positive attitude towards Biodiversity conservation.</p>

ZO 233	Immunology and Developmental Biology	<p>CO1. Provide an intensive and in-depth knowledge to the students in immunology.</p> <p>CO2. Understand the role of immunology in human health and well-being.</p> <p>CO3. Familiarize new developments in immunology.</p> <p>CO4. Expose to concepts and process in developmental biology.</p> <p>CO5. Understand and appreciate the genetic mechanisms and the unfolding of the same during development.</p> <p>CO6. Expose the learner to the new developments in embryology and its relevance to man.</p>
ZO 234	Practical- Microbiology and Biotechnology, Ecology, Ethology and Biodiversity, Immunology and Advanced Developmental Biology.	<p>CO1: Develop skills in microbial enumeration and determination of quality of milk.</p> <p>CO2: Develop knowledge on isolation DNA from tissues.</p> <p>CO3: Identify blood cells and blood groups and able to detect pregnancy using test kits.</p> <p>CO4: Develop expertise in vital staining of chick blastoderm and tracing the development.</p> <p>CO5: Gain ability to identify the types of eggs and placenta of animals.</p> <p>CO6: Estimate pyramid of numbers and biomass in an ecosystem.</p> <p>CO7: Learn to estimate diversity indices</p>
Semester – IV		
ZO 241	Pollution Biology and environmental physiology	<p>CO1: Understand the basics and causes of different types of pollution.</p> <p>CO2: Acquire new knowledge regarding air and noise pollution and its abatement technologies.</p> <p>CO3: Understand the causes, effects of water pollution and its abatement technologies.</p> <p>CO4: Understand the causes, and effects of terrestrial, industrial, and radioactive pollution.</p> <p>CO5: Impart knowledge on morphological and physiological adaptations about temperature and pressure variation.</p> <p>CO6: Understand the eco-physiological and osmoregulatory adaptations of freshwater, marine, estuarine and terrestrial animals.</p>
ZO 242	Environmental management	<p>CO1: Understand the potential resources of earth.</p> <p>CO2: Evaluate the extent of human exploitation of earth resources and its effects.</p> <p>CO3: Understand and evaluate the strategies of biological conservation and its management.</p> <p>CO4: Acquire current knowledge about the environmental policies and the significance environmental education.</p> <p>CO5: Impart knowledge on the principles and concepts environmental impact assessment and sustainable development.</p> <p>CO6: Application of pollution abatement technologies using microbes.</p>
ZO 243	Practical I-Pollution Biology and Environmental Physiology	<p>CO 1: Determination of soil quality parameters.</p> <p>CO 2: Estimation of water quality parameters.</p> <p>CO3: Conduct short term bioassay and determination of LC50 of fish exposed to a given pollutant.</p>

		<p>CO 4: Develop skill to identify indicator organism from an ecosystem.</p> <p>CO 5: Estimate the effect of polluting agents on the oxygen consumption of fishes.</p> <p>CO 6: Determine the temperature and pH preferences of fishes.</p>
ZO 244	Practical II- Environmental Management	<p>CO 1: Gain expertise in the determination of BOD and COD of polluted water.</p> <p>CO 2: Estimation of water quality parameters.</p> <p>CO 3: Construction of pyramid of numbers and biomass.</p> <p>CO 4: Develop skill to identify indicator organisms from an ecosystem.</p> <p>CO 5: Estimation of species diversity of local aquatic and terrestrial habitats.</p> <p>CO 6: Determine the pH and texture of soil samples.</p> <p>CO 7: Working with the laboratory instruments water and soil quality estimation.</p>
ZO 201	Project work	<p>CO1: Able to conduct a literature survey and identify their research area</p> <p>CO2: Identify a research hypothesis and prepare a research plan</p> <p>CO3: Standardise research methodology</p> <p>CO4: Organised data collection will be done</p> <p>CO5: Data will be analysed and interpreted</p> <p>CO6: Dissertation will be prepared</p>