PROGRAMMES OUTCOMES (POs)

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Program Outcomes, Program Specific Outcomes and Course Outcomes

Department of Chemistry

BACHELOR OF SCIENCE	
PROGRAMME: B.Sc. Chemistry	
Program Outcomes	PO-1. Solve the problem and also think methodically, independently & draw logical conclusion.
	PO-2. Use modern techniques, decent equipments & chemistry software.
	PO-3. Find out the green root for chemical reaction for sustainable development.
	PO-4. Employ critical thinking &specific knowledge to design, carryout, record & analyze results of chemical reactions.
Program Specific Outcomes	PSO-1. Understand good laboratory practices & safety.
	PSO-2. Identify chemical formulae & solve numerical problems.
	PSO-3. To explain nomenclature, stereochemistry, structure, reactivity& mechanisms of chemical reactions.
	PSO-4. Use modern chemical tools, models, charts & equipment's.
	PSO-5. Gain the knowledge of chemistry through theory & practicals.
	PSO-6. Make aware & handle the sophisticated instruments/ equipment's.
Course Outcomes F.Y. B.Sc. (CBCS- 2019)	
CH-101: Physical Chemistry	CO-1. Students will be able to apply thermodynamic principles to physical and chemical process.
	CO-2. Third law of thermodynamic and its applications.
	CO-3. Calculations of enthalpy, Bond energy, Bond dissociation energy.
	CO-4. Students will able to understand Relation between Free energyand equilibrium and factors affecting on equilibrium constant.
	CO-5. Students will able to understand Exergonic and endergonic reaction
	CO-6. Students will able to understand Concept of ionization process occurred in acids, bases and pH scale.
	CO-7. Degree of hydrolysis and pH for different salts, buffer solutions
CH- 102: Organic Chemistry	CO-1. The students are able to understand the fundamentals, principles, and recent developments in the chemistry.
	CO-2. Students are familiarizing with current and recent developmentsin Chemistry.

	CO-3. Students will able to understand stereochemistry related concept.
	CO-4. Students will able to understand the difference between alkane, alkene, and alkynes.
CH- 103: Chemistry Practical	CO-1. Students will learn the chemical safety while performing experiments in laboratory.
	CO-2. Students will able to learn the thermochemical parameters and related concept.
	CO-3. Students will learn the techniques of pH measurements.
	CO-4. Students will able to learn the elemental analysis of organic compounds.
	CO-5. Students will able to learn the process of Preparation of buffer solutions
CH-201: Inorganic Chemistry	CO-1. Students will Learns the Various theories and principles applied to revel atomic structure.
	CO-2. Students will able to understand structure of hydrogen atom.
	CO-3. Students will learn the Shapes of orbitals.
	CO-4. Students will define various types of chemical bonds- Ionic, covalent, coordinate and metallic bond
	CO-5. Students will define Fajan's rule, bond moment, dipole moment and percent ionic character.
	CO-6. Students will able to discuss electronic configuration of an atom and anomalous electronic configurations
CH-202: Analytical Chemistry	CO-1. Students will define term mole, mill mole, molar concentration, molar equilibrium concentration and Percent Concentration.
	CO-2. Students will able to understand the relation between molecular formula and empirical formula
	CO-3. Basics of chromatography and types of chromatography
	CO-4. Students will able to learn Separation techniques of binary mixtures and analysis
	CO-5. Students are able to understand measurement and working of pH meter
CH-203: Chemistry Practical –II	CO-1. The practical course is in relevance to the theory courses to improve the Understanding of the concepts.
	CO-2. It would help in development of practical skills of the students.
	CO-3. Use of microscale techniques wherever required
S.Y. B.Sc. (CBCS- 2019)	
CH-301: Physical and Analytical Chemistry	CO-1. Student will able to- Define / Explain concept of kinetics, terms used, rate laws, molecularity, order.
	CO-2. Determines the order of reaction by integrated rate equation method, graphical method, half-life method and differential method.
	CO-3. Students will able to define, explain and compare meaning of accuracy and precision
	CO-4. Students will able to Apply the methods of expressing the errors in analysis from results.

	CO-5. Students will able to Explain / discuss different terms related to
	errors in quantitative analysis.
CH-302: Inorganic and Organic Chemistry	CO-1. Students will able to define terms related to molecular orbital theory (AO, MO, sigma bond, pi bond, bond order, magnetic property of molecules, etc).
	CO-2. Student will able to Draw and explain MO energy level diagrams for homo and hetero diatomic molecules. Explain bond order and magnetic property of molecule.
	CO-3. Student will able to Define different terms related to the coordination chemistry (double salt, coordination compounds, coordinate bond, ligand, central metal ion, complex ion, coordination number, magnetic moment, crystal field stabilization energy, types of ligands, chelate effect, etc.)
	CO-4. Students will able to Apply IUPAC nomenclature to coordination compound
	CO-5. Students will able to Identify and draw the structures aromatic hydrocarbons from their names or from structure name can be assigned.
CH-303: Chemistry Practical - III	CO-1. Students will able to verify theoretical Principles experimentally
	CO-2. Students will able to Correlate theory to experiments.
	CO-3. Students will able to Understand systematic methods of identification of substance by chemical methods.
	Co-4. Students will able to write balanced equation for the chemical reactions performed in the laboratory.
	CO-5. Students will understand/verify theoretical principles by experiment observations; explain practical output / data with the help of theory.
CH-401: Physical and Analytical Chemistry	CO-1. Define the terms in phase equilibria such as- system, phase in system, components in system, degree of freedom, one / two component system, phase rule, etc.
	CO-2. Explain meaning and Types of equilibrium such as true or static, metastable and unstable equilibrium.
	CO-3. Explain distillation of liquid solutions from temperature – composition diagram.
	Co-4. Explain / discuss azeotropes, Lever rule, Henrys law and its application.
	CO-5. Explain / discuss conductometric titrations.
	CO-6. Apply conductometric methods of analysis to real problem in analytical laboratory.
	CO-7. Explain construction and working of colorimeter.
CH-402: Inorganic and Organic Chemistry	CO-1. Student will able to- Isomerism in coordination complexes
	CO-2. Explain different types of isomerism in coordination complexes
	CO-3. Explain / discuss limitation of VBT.
	Co-4. Calculate field stabilization energy and magnetic moment for various complexes.

	CO-5. Explain: i) strong field and weak field ligand approach in Oh complexes ii) Magnetic properties of coordination compounds on the
	basis of weak and strong ligand field ligand concept
	CO-6. Perform inter conversion of functional groups.
	CO-7. Explain / discuss synthesis of carboxylic acids and their derivatives
	CO-8. Draw structures of different conformations of methyl / t-butyl monosubstituted cyclohexane (axial, equatorial) and 1, 2 dimethyl cyclohexane.
CH-403: Chemistry Practical - IV	CO-1. Interpret the experimental data on the basis of theoretical principles.
	CO-2. Correlate the theory to the experiments. Understand / verify theoretical principles by experiment or explain practical output with the help of theory.
	CO-3. Write balanced equation for all the chemical reactions performed in the laboratory.
	Co-4. Perform organic and inorganic synthesis and able to follow the progress of the chemical reaction.
	CO-5. Perform the quantitative chemical analysis of substances and able to explain principles behind it.
	CO-6. Set up the apparatus properly for the designed experiments.
	CO-7. Verify theoretical principles experimentally.
Course Outcome T.Y.B.Sc. (CBCS -2019)	
DSEC-I: CH-501: Physical Chemistry- I	CO-1. Students should understand and explain the differences between classical and quantum mechanics.
	CO-2. Students Should be able to explain De Broglie hypothesis and the uncertainty principle.
	CO-3. Students should know the Classification of molecules on the basis of moment of Inertia.
	CO-4 Students should be able to explain the difference between Rayleigh, Stokes and anti-Stokes lines in a Raman spectrum.
	CO-5. Students should be able to difference between thermal and photochemical processes.
	CO-6. Students should know Quantum yield and reasons for high and low quantum yield,
DSEC-I: CH: 502: Analytical Chemistry-I	CO-1. Students should be able to Define basic terms in gravimetry, spectrophotometry, qualitative analysis and parameters in instrumental analysis.
	CO-2. Explain different principles involved in the gravimetry, spectrophotometry, parameters in instrumental analysis, qualitative analysis.
	CO-3. Students should be able to differentiate / distinguish / compare among the different analytical terms, process and analytical methods.

	CO-4. Apply whatever theoretical principles he has studied in theory during practical session in laboratory.
DSEC-I: CH-503: Physical Chemistry Practical – I	CO-1. Student should be able to determine specific refractivity of the liquid.
	CO-2. Student should be able to determine concentration of the complex through Spectrophotometry and Colorimetry.
	CO-3. Student should be able to determine conductance of a liquid by using Conductometry.
	CO-4. Student should be able to determine viscosity of liquid by using Ostwald Viscometer.
	CO-5. Student should know the principle Photoflurometry.
DSEC-I: CH-504: Inorganic Chemistry – I	CO-1. Students should know electroneutrality principle and different types of pi bonding.
	CO-2. Explain MOT of Octahedral complexes with sigma bonding.
	CO-3. Students should able to explain Charge Transfer Spectra.
	CO-4. Students should able to compare the different approaches to bonding in Coordination compounds.
	CO-5. Students should know nuclear fuels and their applications.
	CO-6. The difference between metal, semiconductor and insulator.
DSEC-II: CH-505: Industrial Chemistry – I	CO-1. Knowledge of various industrial aspects.
	CO-2. They should also know the physico-chemical principals involved in manufacturing process.
	CO-3. Importance of sugar industry.
	CO-4 Manufacturing of ethyl alcohol by using molasses and fruit juice.
	CO-5. Synthesis, Structures, properties and applications of dyes
DSEC-II: CH-506 Inorganic Chemistry Practical	CO-1. Understood the gravimetric estimation of Fe as Fe_2O_3
	CO-2. Analyze the sodium bicarbonate from the binary mixture.
	CO-3. Analyze the Cation and Anion from the mixture.
	CO-4. Understood the gravimetric estimation of Ba as $BaSO_4$
DSEC-III: CH-507: Organic Chemistry – I	CO-1. Student Should define and classify polynuclear and heteronuclear aromatic hydrocarbons.
	CO-2. Student should be able to write structure and synthesis of polynuclear and heteronuclear aromatic hydrocarbons.
	CO-3. Student should know Synthetic applications ethyl acetoacetate and malonic ester.
	CO-4. Student should identify different types of intermediate in rearrangement reactions.
	CO-5. Student should understand stereochemistry by using models and learn reactivity of geometrical isomers.
	CO-6. Student should know effect of factors on the rate elimination reactions.
	CO-1. The types of lipids with examples, structure of lipids, properties of lipids.

DSEC-III: CH-508: Chemistry of Biomolecules	CO-2. Effect of pH on structure of amino acid, Determination of N and C terminus of peptide chain.
	CO-3. Enzyme specificity, Equations of enzyme kinetics Km and its significance, features of various types of enzyme inhibitions, industrial applications of enzymes.
	CO-4. The types of carbohydrates and their biochemical significance in
	living organisms, structure of carbohydrates and reactions ofcarbohydrates with Glucose as example.
CH-509: Organic Chemistry Practical-I	CO-1. Students should be able to perform the quantitative chemicalanalysis of binary mixture, explain principles behind it.
	CO-2. Students should be able understand the techniques involvingdrying and recrystallization by various method.
	CO-3. Students will be familiar to the test involving identification ofspecial elements.
	CO-4. Students should be able learn the confirmatory test for variousfunctional groups.
	CO-5. Students should be able to synthesis of various organiccompounds through greener approach.
	CO-6. Students will be expertise in the various techniques of preparationand analysis of organic substances.
	CO-7. Students should be able understand principle of Thin LayerChromatographic techniques.
	CO-8. Students should be able understand the purification techniqueused in organic chemistry.
CH-510 (B) Polymer Chemistry	CO-1. History of polymers.
	CO-2. Difference between simple compounds and polymer.
	CO-3. Names of polymers.
	CO-4 Various ways of nomenclature
	CO-5. Terms-Monomer, Polymer, Polymerization, Degree of polymerization, Functionality, Number average, Weight averagemolecular weight.
CH-511 (A): Environmental Chemistry	CO-1. Students should understand the importance and conservation ofenvironment.
	CO-2. Students should be able to explain the importance ofbiogeochemical cycles.
	CO-3. Students should know the different Water resources.
	CO-4. Students should be able to understand the Hydrological Cycle.
	CO-5. Students should learn different organic and inorganic pollutants.
	CO-6. Students should identify different water quality parameters.
	CO-1. Student should know thermodynamic conditions of reversiblecell, Explanations of reversible and irreversible electrochemical cell with suitable example.
	CO-2. Student should know EMF of electrochemical cell and itsmeasurement.

DSEC-IV: CH-601: Physical Chemistry-II	CO-3. Student should be able to distinguish between crystalline and amorphous solids / anisotropic and isotropic solids.
	CO-4. Student should understand methods of Crystal structure analysis:The Laue method and Braggs method: Derivation of Bragg's equation.
	CO-5. Student should know types and properties of radiations: alpha,beta and gamma.
	CO-6. Student should know application of radioisotopes as a tracer:Chemical investigation- Esterification, Friedel -Craft reaction and
	structure determination w.r.t PCl_5, Age determination use of tritium and C^{14} dating.
CH-602: Physical Chemistry-III	CO-1. Meaning of the terms-Solution, electrolytes, nonelectrolytes and colligative properties,
	CO-2. Students are expected to know Factors affecting on solid state reactions, Rate laws for reactions in solid state
	CO-3. Students should know Cohesive Energy of ionic crystals based on coulomb's law and Born Haber Cycle.
	CO-4. Students are expected to know History of polymers, Classification of polymers, Chemical bonding & Molecular forces in Polymer, Molecular weight of polymers.
DSEC-IV: CH-603: Physical Chemistry Practical-II	CO-1. Student should be able to determine emf of liquid by using Potentiometry.
	CO-2. Student should know the principle of pH metry.
	CO-3. Student should know the principle and operation of G M Counter.
	CO-4. Student should know the principle and operation of G M Counter.
	CO-5. Student should know the Colligative properties.
	CO-6. Student should know the principle of Turbidometry.
CH-604: Inorganic Chemistry –II	CO-1. Students should be able to understand M-C bond and to define organometallic compounds.
	CO-2. To know methods of synthesis of binary metal carbonyls.
	CO-3. A student should be able to Understand the phenomenon of catalysis, its basic principles and terminologies.
	CO-4. A student should identify the biological role of inorganic ions & compounds.
	CO-5. A student should be able to draw the structure of Vit.B_{12} and give its metabolism.
	CO-6. A student should understand Preparation of inorganic solids by various methods.
	CO-1. How acid and base strengths get affected in non-aqueous solvents.
	CO-2. Draw the simple cubic, BCC and FCC structures.
	CO-3. Be able to solve simple problems based on Born- Haber cycle.

DSEC-V: CH-605: Inorganic Chemistry -III	CO-4. Different Zeolite Framework Types and their classification.
	CO-5. Various methods of nanoparticle synthesis.
	CO-6. To know toxic chemical in the environment.
	CO-7. To know the biochemical effect of Arsenic, Cd, Pb, Hg.
CH-606- Inorganic Chemistry Practical	CO-1. Understood the Phosphate from fertilizer.
	CO-2. Analyze the Calcium from milk powder.
	CO-3. Analyze the Strength of medicinal H_2O_2.
	CO-4. Analyze the Na by flame photometry
	CO-5. Analyze the K by flame photometry
DSEC-VI: CH-607: Organic Chemistry-II	CO-1. Students will learn the principle of mass spectroscopy, its
	instrumentation and nature of mass spectrum.
	CO-2. Students will understand the principle of IR spectroscopy, types of vibrations and the nature of IR spectrum.
	CO-3. Students will understand the principle of NMR spectroscopy and will understand various terms used in NMR spectroscopy. They will learn measurement of chemical shift and coupling constants.
	CO-4. Students will be able to interpret the NMR data and they will be able to use it for determination of structure of organic compounds.
	CO-5. Student should know the geometrical isomerism in disubstituted cyclohexane's.
	CO-6. Student should know the stability of geometrical isomers of decalin.
DSEC-VI: CH-608: Organic Chemistry-III	CO-1. Meaning of terms Disconnection, Synthons, Synthetic equivalence, Functional Group Interconversion, Target Molecule
	CO-2. To write mechanism of some named rearrangement reactions.
	CO-3. Understand the difference between carbocation & carbanion.
	CO-4. Synthesis of Citral and Ephedrin by Barbier- Bouveault and Nagi methods, respectively.
	CO-5. Synthetic applications some reagents.
	CO-6. Various methods of isolation/extraction of these natural products.
	CO-7. To determine the structure of above compounds by chemical methods.
CH-609: Organic Chemistry Practical-II	CO-1. Students should be able to identify the functional group or groups present in a compound.
	CO-2. Students should be able to understand use NMR spectra to determine the structures of compounds.
	CO-3. Students should be able to calculate coupling constants from 1 H NMR spectra.
	CO-4. Students should be able to achieve the practical skills required to estimations of glucose and glycine and saponification value of oil.
	CO-5. Students should be able to determine the molecular weight of given tribasic acids.
	CO-6. Students should be able to apply the principles of extraction.

	CO-7. Students should be able to describe the extraction separation process.
	CO-8. Students should be able to explain the processes of a chromatography analysis.
	CO-9. Students should be able to realize the selection of appropriate mobile phase, column and detector.
CH-610 (A): Chemistry of Soil and Agrochemicals	CO-1. Understood various components of soil and soil properties and their impact on plant growth.
	CO-2. Understood the classification of the soil.
	CO-3 Got experience on advanced analytical and instrumentation methods in the estimation of soil.
	CO-4 Proper understanding of chemistry of pesticides will be inculcated among the students.
	CO-5. Imparts knowledge on different pesticides, their nature and, mode of action and their fate in soil so as to monitor their effect on the environment.
CH-611(A): Analytical Chemistry-II	CO-1. Students should be able to define basic terms in solvent extraction.
	CO-2. Students should be able to identify important parameters in analytical processes or estimations.
	CO-3. Students should be able to explain different principles involved in the analyses using solvent extraction, basics of instrumental chromatography, HPLC, GC, and atomic spectroscopic techniques.
	CO-4. Students should be able to perform quantitative calculations depending upon equations students have studied in the theory.
	CO-5. Students should be able to discuss / describe procedure for different types analyses included in the syllabus.
	CO-6. Students should be able to differentiate / distinguish / compare among the different analytical terms, process and analytical methods.
	CO-7. Students should be able to apply whatever theoretical principles he has studied in theory during practical in laboratory.

Department of Chemistry

MASTER OF SCIENCE	
PROGRAMME: M.Sc. Analytical Chemistry	
Programme Outcomes	PO-1. To develop a strong footing in the fundamentals and specialize in the disciplines of his/her
	PO-2. To develop in depth understanding of various aspects of the subject
	PO-3. To have deeper understanding of laws of nature through subjects like material science, Nanotechnology, quantum mechanics, Bio-organic Chemistry etc.
	PO-4. The ability of problem solving will be enhanced. Students can apply principles in chemistry to real life problems
Program Specific Outcomes	PSO-1. After completion of program, students will be able to have in-depth knowledge of basic concepts in Chemistry
	PSO-2. Students will be able to apply the laws of Physics in real life situations to solve the problems.
	PSO-3. Students develop the aptitude of doing research by undertaking small projects.
	PSO-4. The student will have set his foundation to pursue higher education in Chemistry.
	PSO-5. After completing the program student will have developed interdisciplinary approach and can pursue higher studies in subjects other than Chemistry.
Course Outcomes M. Sc.-I (Sem-I) (CBCS- 2019)	
CHP-110	CO-1. Students should understand the concept of thermodynamics
	CO-2. The course aims to provide a fundamental understanding of physical chemistry; students learn the concept of Gibbs and
	Helmholtz energies, Chemical potential, Expressing Chemical equilibrium in terms of chemical potential.
	CO-3. Elements of quantum chemistry, wave particle duality, uncertainty principle, wave function and its interpretation, well behaved functions, orthonormal functions, Schrodinger equation, particle in a box, degeneracy, quantum mechanical harmonic oscillator, and quantum tunnelling are introduced.
	CO-4. Students are made aware of Chemical kinetics and reaction dynamics topics such as Reversible reactions, the principle of microscopic reversibility, steady state approximation, elucidating mechanism using SSA.
	CO-1. Students should visualize in 3 dimension to understand the concept of symmetry

CHI-130	CO-2. Students are made to understand the symmetry and group theory and use this knowledge to interpret the properties like dipole moment, optical activity, and signals in IR and Raman spectroscopy for structure identification.
	CO-3. Students are also made to understand the periodic trends in properties of S and P block elements and their applications in fields like catalysis, industry, human metabolism
	CO-4. Students should understand the detail chemistry of S & P elements
CHO-150	CO-1. To understand some fundamental aspects of organic chemistry, to learn the concept aromaticity, to understand the various types of aromaticity
	CO-2. To study heterocyclic compound containing one and two hetero atoms with their structure, synthesis and reactions.
	CO-3. To know stereochemistry of organic compounds; able to do interconversion of Fischer to Newmann, Newmann to Sawhorse and vice versa, Able to assign R and S to given molecules; understand stereoselective and stereospecific reactions; acquire knowledge on topicity
	CO-4. To study structure, formation, stability and related name reaction of intermediates like Carbocation, Carbanion, Free Radical, Carbenes and nitrenes; Recognize neighboring group participation.
	CO-5. To study rearrangement reaction with specific mechanism and migratory aptitude of different groups.
	CO-6. To study Ylides and their reaction
	CO-7. To understands the basis of redox reaction; acquire knowledge about the reagents which causes selective.
CHA-190	CO-1. Students will be able to explore new areas of research in both chemistry and allied fields of science and technology.
	CO-2. Students will be able to function as a member of an interdisciplinary problem-solving team.
	CO-3. To impart the student's thorough idea in the chemistry of carbohydrates, amino acids, proteins and nucleic acids etc.
	CO-4. Be able to describe the chemical basis for replication,
	transcription, translation and how each of these central processes can be expanded to include new chemical matter.
	M. Sc.-I (Sem-II) (CBCS- 2019)
CHA-210	CO-1. The course aims to provide an understanding of physical chemistry, in this course, the fundamentals of molecular spectroscopy are introduced. Nuclear and radiation Chemistry concepts are introduced.
	CO-2. Students learn basic elements of rotational, vibrational, Raman and electronic spectroscopy.

	CO-3. Students get familiar with Chemical Bonding**:** Valence Bond theory, hybrid orbitals, geometry and hybridization, Molecular Orbital Theory, linear variation method, Approximations underlying Huckel theory, bond order, Aromaticity, Applications of Huckel theory
CHA-230	CO-1. Students are made aware of spectral and magnetic properties of d and f block elements and spectrophotometric analysis of metals like Cr, Mn, Ni and magnetic behavior of various complexes of f-block elements in MRI and as TV phosphors.
	CO-2. Students are also made aware of the role of the metal ion in biologically active compounds like Hb, Mb cytochromes and use of anticancer drugs i.e., platinum complexes.
CHA-250	CO-1. Students will be able to understand the MOT and will be able to extend this in predicting reaction mechanism and stereochemistry of electrocyclic reactions.
	CO-2. The concepts in free radical reactions, mechanism and the stereo chemical outcomes.
	CO-3. Students should able to write MO diagram for various olefinic compounds and should able to predict the products, the stereochemistry as well as should able to understand the preferred reaction pathways.
	CO-4. Student should able to calculate λmax value of organic compounds containing more than one and less than four conjugated systems. Students should able to correlate IR bands with functional groups using numerical data as well as spectral data.
	CO-5. The basic principle of spectroscopic methods and their applications in structure elucidation of organic compounds using given spectroscopic data or spectra.
CHA-290	CO-1. Students will be able to explore new areas of research in both chemistry and allied fields of science and technology.
	CO-2. Students will be able to function as a member of an interdisciplinary problem-solving team.
	CO-3. To impart the student's thorough idea in the chemistry of carbohydrates, amino acids, proteins and nucleic acids etc.
	CO-4. Be able to describe the chemical basis for replication, transcription, translation and how each of these central processes can be expanded to include new chemical matter.
CH-107 Physical Chemistry Practical	CO-1. These techniques will enable them to work as quality control chemist in various labs and such organizations.
	CO-2. Students are trained to use techniques such as pH metry, Conductometry, Potentiometry, Colorimetry, Spectrophotometry, Refractometry, and G. M. Counter.
CH -227	CO-1. Students are trained to different purification techniques in organic chemistry like recrystallization, distillation, steam distillation and extraction.
	CO-2. Students are made aware of safety techniques and handling of chemicals.

Inorganic & Organic Chemistry Practical	CO-3. Students are made aware of carrying out different types of reactions and their workup methods.
	CO-4. This practical course is designed to make student aware of green chemistry and role of green chemistry in pollution reduction.
M.Sc.-II (Sem-III) (CBCS- 2019)	
CHA-390 Electrochemical and Thermogravimetric Methods of Chemical Analysis	CO-1. Study of coulometry, Faraday law Electroanalysis.
	CO-2. Study of voltammetry and paleographic method of analysis, and radio analytical hydrodynamic voltammetry, plus paleography and cyclic voltammetry. methods of
	CO-3. Study of amperometry and their applications, analysis
	CO-4. Learn radio analytical methods of analysis, activation analysis, isotope dilution analysis, radio metric titration.
CHA-391 Analytical method development and Extraction Techniques	CO-1. To understand assay validation and inter laboratory transfer.
	CO-2. Study the statistical analysis and analytical figure.
	CO-3. Overview of worldwide regulations.
	CO-4 Specific methods and applications, Dissolution studies and USP types.
	CO-5 Method development technique and validation specific analyze.
	CO-6 Study extraction techniques in analytical chemistry.
	CO-7. Study the classical approach for aqueous extraction, solid phase extraction, micro extraction and SFE.
CHA-392 Advanced Chromatographic Methods of Analysis	CO-1. Study of Mass Spectroscopy apparatus
	CO-2. Study the fundamentals of Chromatographic methods- Gas Chromatography
	CO-3. Study the application of gas chromatography and mass spectrometry.
	CO-4. Study quantitative analysis by gas liquid chromatography method.
	CO-5. Study the instrumentation of HPLC
	CO-6. Methods of HPLC Reverse, adsorption, Ion Exchange, Size Exclusion and separation of enantiomers.
CHA-393 B Analysis of Food and Controlled Substances	CO-1. Analytical methods use for food analysis.
	CO-2. Study the preparation of sample and total solid analysis.
	CO-3. Analysis of Ash, Lipids and Proteins from Sample.
	CO-4. Study of Food preservatives.
	CO-5. Study the chemical test for narcotic drugs and psychotropic substances.
CHA-394 Practical I: Basic of Instrumentation Methods of	CO-1. To understand various terms involved practical methods of quantitative analysis.

Chemical Analysis	CO-2. To analyze organic and inorganic materials using appropriate chemicals.
	CO-3. To study basic principles of chemicals and instrumental methods.
	CO-4. To calculate the result and interpret the result
M.Sc.-II (Sem-II) (CBCS- 2019)	
CHA-490 Advanced Analytical spectroscopic Techniques	CO-1. Study of sample preparation techniques.
	CO-2. Atomic Absorption and Emission Spectroscopy method of analysis, its practical applications.
	CO-3. Understand an introduction AFS, AES and MS, its applications.
	CO-4. Study of chemiluminescence, Fluorescence and phosphorescence.
	CO-5. Study of ESR spectroscopy.
	CO-6. Study the electron paramagnetic resonance spectroscopy.
CHA-491 Chemicals Methods of Pharmaceuticals Analysis	CO-1. Study of pharmaceutical dosage from tablet, Oral Liquid and powder for injections.
	CO-2. To study the chemical test, limit test and assay of different material like Heavy metal, Vaccines, Assay of vitamin A etc.
	CO-3. To study the pharmaceutical methods of determination and its applications.
	CO-4. Study of agar diffusion assay, the theory and practice of tube assay, general practical aspects of microbiological assay.
CHA- 492 B Analytical Chemistry of agriculture, Polymer and Detergent	CO-1. Study of analysis of Soil, fertilizer, sampling and sample preparation, kjeldahl's method.
	CO-2. Understand the analysis of soap and detergents, UV-spectroscopic analysis of detergent.
	CO-3. Learn the polymer chemistry, analysis and testing of polymer, measurement of molecular weight and size.
	CO-4. To understand the analysis of pesticide residue.
CHA-493 A Optional Analytical Chemistry Practical **CHA-494 Applied Analytical Chemistry (Practical II)**	CO-1. To understand various terms involved practical methods of quantitative analysis.
	CO-2. To analyze organic and inorganic materials using appropriate chemicals.
	CO-3. To study basic principles of chemicals and instrumental methods.
	CO-4. To calculate the result and interpret the result.

MASTER OF SCIENCE	
PROGRAMME: M.Sc. Organic Chemistry	
Program Outcomes	PO-1. Determine molecular structure by using UV, IR and NMR.
	PO-2. To give students a comprehensive understanding of the principles of Chemistry
	PO-3. Improve the Skill of student in organic research area.
	PO-4. To gain the skill to design and carry out scientific experiments and interpret the data
	PO-5. Study of Asymmetric synthesis.
	PO-6. Determine the aromaticity of different compounds.
	PO-7. To be able to define and resolve new problems in Chemistry and participate in the future development of Chemistry.
Program Specific Outcomes	PSO1.To develop the post graduate department on the modern lines of education and training levels.
	PSO2.To impart the advanced practical and theoretical knowledge to the students and develop the scientific skills among them to be useful in the concerned field.
	PSO3.To trained students and make them eligible for accessing integrated multidimensional fields.
	PSO4.Anticipation of new/upcoming areas in academics as well as in technology.
Course Outcomes- Organic Chemistry M. Sc.-I (Sem-I) (CBCS- 2019)	
CHP-110 Fundamentals of Physical Chemistry-I	CO-1. The course aims to provide fundamental understanding of physical chemistry.
	CO-2 Students learn the concept of Gibbs and Helmholtz energies, Chemical potential and Expressing Chemical equilibrium in terms of chemical potential.
	CO-3 Elements of quantum chemistry, wave particle duality, uncertainty principle, wave function and its interpretation, well behaved functions, ortho normal functions, Schrodinger equation, particle in a box, degeneracy, quantum mechanical harmonic oscillator and quantum tunneling are introduced.

	CO-4. Students are made aware of Chemical kinetics and reaction dynamics topics such as Reversible reactions, principle of microscopic reversibility, steady state approximation and elucidating mechanism using SSA. Arrhenius theory, enzyme catalysis and Michaelis-Menten mechanism.
CHI-130 Molecular Symmetry & Chemistry of p-block elements	CO-1. Student should visualize/ imagine molecules in 3 dimensions. To understand the concept of symmetry and able to pass various symmetry elements through the molecule. Understand the concept and point group and apply it to molecules. To understand product of symmetry operations. To apply the concept of point group for determining optical activity and dipole moment.
	CO-2. Student should understand the importance of Orthogonality Theorem. They should able to learn the rules for constructing character table. Using reduction formulae should be able to find out the possible type of hybridization. Student should know the concept of SALC. Student able to find out character for reducible representation.
	CO-3. To know about projection operator. Apply projection operator to find out the normalized wave function for atomic orbital. Student should correlate the application of symmetry to spectroscopy. Students able to find out the possible modes of vibration. From the previous knowledge of symmetry student must able to find out which mode are IR active.
	CO-4. Student should understand the detail chemistry of S and P block elements w.r.t. their compounds, their reactions and applications. To learn the advance chemistry of boranes, fullerene, zeolites, polymers etc. Organometallic chemistry of some important elements from the main groups and their applications.
CHO-150 **Basic Organic Chemistry**	CO-1**.** To understand some fundamental aspects of organic chemistry, to learn the concept aromaticity, to understand the various types of aromaticity To study heterocyclic compound containing one and two hetero atoms with their structure, synthesis and reactions.
	CO-2. To know stereochemistry of organic compounds; able to do interconversion of Fischer to Newmann, Newmann to Sawhorse and vice versa, Able to assign R and S to given molecules; understand stereoselective and stereospecific reactions; acquire knowledge on topicity. To study structure, formation, stability and related name reaction of intermediates like Carbocation, Carbanion, Free Radical, Carbenes and nitrenes; Recognize neighboring group participation.
	CO-3. To study rearrangement reaction with specific mechanism and migratory aptitude of different groups. To study Ylides and their reaction.
	CO-4. Student should aware about reaction mechanism.

	CO-4. To understands the basis of redox reaction; acquire knowledge about the reagents which causes selective oxidation / reduction in various compounds; learn the basic mechanism of oxidation / reduction in organic compounds.
CHG – 190 **General Chemistry-I** **SECTION-I: Theory Course** **Elective Option-A** **: Introduction to Solid State of Matter**	CO-1. Bonding in solids – band theory
	CO-2. Electronic conductivity
	CO-3. Semiconductors, photoconductivity
	CO-4. Non-stoichiometry, defects and types of defects in solids
	CO-5. Ionic conductivity and their applications
	CO-6. Superconductivity and theory of superconductivity
CHP-107 **Practical Course – I** Basic Practical Chemistry-I **Sec-I: Physical Chemistry Practical** **Sec-II: Organic Chemistry**	CO-1. The students are made aware of necessary guidelines of safety in chemical laboratory and good laboratory practice.
	CO-2. Students get acquainted with different types of hazards at work place, use of personal protective.
	CO-3 Students also aware about types of fire extinguisher inventory management, storage and disposal material safety data sheets.
	CO-4 Students should know how to handle first Aid as while working different chemicals are in contact with the skin, eyes and inhalation and ingestion.
	CO-5 Students are trained to different purification techniques in organic chemistry like recrystallization, distillation, steam distillation and extraction.
	CO-6 This practical course is designed to make student aware of green chemistry and role of green chemistry in pollution reduction.
	CO-7. Students are made aware of Chemical kinetics and reaction dynamics topics.
	CO-8. To find the rate constant of reaction k and relative strength.
	CO-9. To find order of reaction
Course Outcomes **Semester-II**	
CHP-210 Fundamentals of Physical Chemistry II	CO-1. The course aims to provide understanding of physical chemistry.
	CO-2 In this course fundamentals of molecular spectroscopy are introduced. Students learn basic elements of rotational, vibrational, raman and electronic spectroscopy.

	CO-3. Nuclear and radiation Chemistry concepts are introduced. Students get familiar with Chemical Bonding.
	CO-4 Valence Bond theory, hybrid orbital, geometry and hybridization, Molecular Orbital Theory, linear variation method, Approximations underlying Huckel theory, bond order, Aromaticity, Applications of Huckel theory
CHI- 230 Coordination and Bioinorganic Chemistry	CO-1. Students are made aware of spectral and magnetic properties of d and f block elements, spectrophotometric analysis of metals like Cr, Mn, Ni and magnetic behavior of various complexes of f block elements in MRI and as TV phosphors.
	CO-2 Students are also made aware of a role of metal ion in biologically active compounds like Hb, Mb cytochromes and use of anticancer drugs i.e.platinum Complexes.
	CO-3 It explains biochemistry of Na, K, Ca, with respect to Na/K pumps.
CHO-250 Synthetic Organic Chemistry & Spectroscopy	CO-1. The main aim of this course is to study with various basic organic reactions with mechanism, reagent and ylides.
	CO-2 This course also covers with the basic introduction to various spectroscopic methods like UV, ^{1}H-NMR, ^{13}C-NMR, IR, Mass spectrometry and their applications.
CHA-290 General Chemistry	CO-1 The basicpurposeof this course is to understand the importance and properties of mass spectrometry, gas chromatography and high performance liquid Chromatography.
	CO-2 Students also familiar with concept of analytical chemistry like data handling and spreadsheets, Sampling, Standardization and calibration.
	CO-3 Separation by precipitation, distillation, extraction and ion exchange chromatography.
CHP-107 Practical Course (Physical Chemistry)	CO-1 Students are trained to use the techniques such as pH metry, Conductometry, Potentiometry, Colorimetry, Spectrophotometry, Refractometry and G. M. Counter.
	CO-2 These techniques will enable them to work asquality control chemist in various labs and such organizations.
CHI-147 Practical Course (Inorganic Chemistry)	CO-1 Students are given the knowledge of basic preparation of various solutions, synthesis of various inorganic complexes and their characterization
	CO-2 The students are trained for handling of natural materials and their quantitative analysis which involves disintegration, separation and individual estimations.

	CO-3 They are given hands on training to handle various equipments like spectrophotometer, flame photometer, Condutometer etc.
Semester- III	
CHO-350 Organic reaction mechanism	CO-1 The main aim of this course is to learn and understand the basic concept in reaction mechanism.
	CO-2 This course helps the students to understand the role of recent reagent, catalyst in mechanism of reaction.
	CO-3 This course also helps to improve the thinking ability of the students towards reaction mechanism.
CHO-351 Spectroscopic Methods in Structure Determination.	CO-1.This course enables to the students learn the basic of spectroscopic methods like UV, ^{1}H-NMR, ^{13}C-NMR, IR, Mass spectrometry and their application.
	CO-2.This course gives idea of structure determination of known and unknown organic molecules by using spectroscopic data.
CHO-352 Organic Stereochemistry	CO-1. This course helps to aware the students to understand the stereochemistry of organic reactions.
	CO-2. Also gives detail idea regarding stereochemistry of alicyclic rings, fused, bridge and caged rings.
	CO-3.This course also includes resolution of racemic modification and determination of stereochemistry of organic compound using NMR, which helps to the students that they predict stereochemistry of organic compounds
CH-353 Photochemistry, pericyclic Reactions and Heterocyclic Chemistry	CO-1. The aim of this course is to furnish the students with fundamental and theoretical understanding of heterocyclic chemistry.
	CO-2.This course includes photochemistry and pericyclicreactionswhichhelpsthestudentstoimprove their imagination power.
	CO-3.Heterocyclic chemistrygives basic idea to the students in synthesis of different heterocyclic derivatives.
Semester IV	
CHO-450 Chemistry of Natural product	CO-1. In this course PG students learn the different pathways of synthesis of natural products.
	CO-2. It also helps stereochemistry and structure determination of some natural products.
	CO-3. The biogenesis develops the synthetic strategies to prepare different important natural compounds in the laboratory.
	CO-4.This course involves multistep synthesis of coumarins,flavonoids, isoflavonoids and terpenoids.

CHO: 452 Carbohydrate and Chiron Approach, Chiral Drugs and Medicinal chemistry	CO-1. This course involves organometallic chemistry which helps the students to develop their ideas in organic synthesis.
	CO-2. This course involves the reactions like coupling reactions, multicomponent reactions, ring formation reactions, olifinationwhichhelpsthestudentstoplansynthesisof new organic molecules.
	CO-3.Click chemistry develops the ecofriendly approach towards organic synthesis
CHO-453 Designing organic Synthesis and Asymmetric Synthesis	CO-1. This course is specially designed to understand the designing of organic synthesis, which helps develops the research ideas.
	CO-2. It involves principle and applications of asymmetric synthesis which helps to predict the chiral products in organic synthesis.
	CO-3.Students also came to know the use of cram rule, felkinanh rule, cram chelate model, use of chiral auxillary and chiral reagents in organic synthesis.
CHO-347 Single stage preparations	CO-1. This practical course involves single stage preparation of different organic compounds and heterocycles.
	CO-2. The main objective of this course is to develop the skilled practical hand of the students in laboratory.
CHO-447 Two stage Preparations	CO-1. This course includes multistep synthesis of organic compounds and heterocycles.
	CO-2. This course helps the students to improve the techniques like workup of reactions, purification, TLC, M.P / B.P etc.
	CO-3. The mainof this course is to improve practical skill and practice of micro scale preparation.
CHO-448 Green Chemistry Practical	CO-1. This course makes the students to aware of roll of green chemistry in organic synthesis.
	CO-2. Green chemistry helps to reduce the pollution.
	CO-3. The main objective of this course is how to avoid solvents and do solvent free reactions.

Program Outcomes, Program Specific Outcomes and Course Outcomes

Department of Botany

PROGRAMME: B. Sc. BOTONY	
Course Outcomes F.Y.B.Sc. (CBCS- 2019)	
Semester: I Paper I: BO 111 Plant life and Utilization I	CO-1. Know the terminologies in Plant kingdom.
	CO-2. Gain the knowledge of outline of plant kingdom.
	CO-3. Know about the structure and life history of Algae, Fungi, Lichens and Bryophytes.
	CO-4. Understand the application of Algae, Fungi, Lichens and Bryophytes.
Paper II BO 112 Plant Morphology	CO-1. Understand the concepts and importance of plant morphology.
	CO-2. Know the reproductive parts of the flower.
	CO-3. Gain the knowledge of terminologies in plant anatomy.
	CO-4. Learn the internal organization of various tissues and plant body.
Paper III BO 113 Practical based on BO 111 & BO 112	CO-1. Gain the practical knowledge of reproductive structures of plants.
	CO-2. Understand the life cycle pattern in *Spirogyra, Agaricus* and *Riccia.*
	CO-3. Gain the knowledge about the types of fruit in plants.
	CO-4. Understand the internal morphology of dicot and monocot plants.
Semester: II Paper I BO 121 Plant Life and Utilization II	CO-1. Gain the knowledge the of plant diversity.
	CO-2. Describe the life cycle and economic importance of Pteridophytes.
	CO-3. Understand the life cycle and economic importance of Gymnosperms.
	CO-4. Know about the classification system in Angiosperms.
Paper II Principles of Plant Sciences BO122	CO-1. Know the importance and scope of Plant Physiology.
	CO-2. Understand the various processes in plant physiology.
	CO-3. Explain the concepts of cell biology and cell cycle.
	CO-4. Understand the biochemical nature of DNA.
Paper III BO 123 Practical based on BO 121 and BO 122	CO-1. Understand the life cycle of *Nephrolepis* and *Cycas.*
	CO-2. Know the comparative account of dicot and monocot plants.
	CO-3. Gain the practical knowledge of mitosis and meiosis.
	CO-4. Gain the practical knowledge of estimation of chlorophyll pigment, plasmolysis and DPD.
S.Y.B.Sc. (CBCS- 2019)	
Botany (Paper I) Sem-I BO-231 Taxonomy of	CO-1. Understand the Taxonomy of Angiosperm.
	CO-2. Classify the Angiosperm plants.

Angiosperms and Plant Ecology	CO-3. Gain the knowledge about Plant families and plant nomenclature.
	CO-4. Describe the plant ecology.
Botany (Paper-II) Sem-I BO-232 Plant Physiology	CO-1. Gain the Knowledge of Plant Physiology scope and Importance.
	CO-2. Understand the concept of Transpiration Ascent of sap.
	CO-3. Describe the Nitrogen metabolism.
	CO-4. Get aware about physiology of flowering and seed germination.
Botany (Paper-III) Sem-I BO-233 Practical based on BO-231 & BO-232	CO-1. Gain the practical knowledge of Taxonomic tools ecological instrument plant families.
	CO-2. Understand the internal morphology of hydrophytes and xerophytes.
	CO-3. Analysed the different test, processes of plant physiology.
	CO-4. Gain the practical knowledge about seed germination, Transpiration DPD.
Botany (Paper I) Sem-II BO-241 Plant Anatomy and Embryology	CO-1. Understand the scope and importance of plant Anatomy.
	CO-2. Classify the different types of tissue systems.
	CO-3. Gain the knowledge about growth of plants.
	CO-4. Describe the different processes in embryology.
Botany (Paper II) Sem-II BO-242 Plant Biotechnology	CO-1. Understand the scope and importance of plant biotechnology.
	CO-2. Gain the knowledge about Plant tissue culture and single cell protein.
	CO-3. Understand the plant genetic Engineering, Genomics, Proteomics and Bioinformatics.
	CO-4. Describe the Bioremediation and Biofuel technology.
Botany (Paper III) Sem-II BO-243 Practical based on BO-241 & BO-242	CO-1. Gain the practical knowledge of plant anatomy.
	CO-2. Understand the practical technique of double stained temporary preparation of plant stem.
	CO-3. Understand the working principle of tissue culture lab instrument.
	CO-4. Gain basic practical knowledge of plant tissue culture, Transgenic plants, *Spirulina* cultivation.
S.Y.B.Sc. Environment Studies Course Outcome (CBCS- 2019)	
S.Y.B.Sc. Semester I Environment Studies	CO-1. Understand the multidisciplinary nature of environment studies.
	CO-2. Gain the knowledge about Ecosystem.
	CO-3. Aware about the natural resources
	CO-4. Describe the Biodiversity and its conservation.
S.Y.B.Sc. Semester II Environment Studies	CO-1. Understand the Environmental Pollution.
	CO-2. Gain the knowledge about Environmental Policies and Practices.
	CO-3. Describe the human communities and Environment.
	CO-4. Understand the basic concept of environment by field visit.

Program Outcomes, Program Specific Outcomes and Course Outcomes

Department of Zoology

Course Outcomes F.Y. B.Sc.	
Paper I ZY-111 & ZY-121 (Animal Diversity I & II)	CO-1. The student will be able to understand classify and identify the diversity of animals.
	CO-2. The student understands the importance of classification of animals and classifies them effectively using the six levels of classification.
	CO-3. The student knows his role in nature as a protector, preserver and promoter of life which he has achieved by learning, observing and understanding life.
Paper II ZY-112 (Animal Ecology)	CO-1. The learners will be able to identify and critically evaluate their ownbeliefs, values and actions in relation to professional and societal standards of ethics and its impact on ecosystem and biosphere due to the dynamics in population.
	CO-2. To understand anticipate, analyse and evaluate natural resourceissues and act on a lifestyle that conserves nature.
	CO-3. The Learner understands and appreciates the diversity of ecosystems and applies beyond the syllabi to understand the local lifestyle and problems of the community.
	CO-4. The learner will be able to link the intricacies of food chains, food webs and link it with human life for its betterment and for non-exploitationof the biotic and abiotic components.
	CO-5. The working in nature to save environment will help development of leadership skills to promote betterment of environment.
Paper II ZY-122 (Cell Biology)	CO-1. The learner will understand the importance of cell as a structural and functional unit of life.
	CO-2. The learner understands and compares between the prokaryotic and eukaryotic system and extrapolates the life to the aspect of development.
	CO-3. The dynamism of bio membranes indicates the dynamism of life. Its working mechanism and precision are responsible for our performance inlife.
	CO-4. The cellular mechanisms and its functioning depend on endo-membranes and structures. They are best studied with microscopy.
Paper-IIIZO-113 Zoology Practical Paper Semester I	CO-1 Students will get exposure to diversity in animal groups(invertebrates) and Ecology.
	CO-2 It will inculcate good laboratory practices in students and trainthem about proper handling of lab instruments.
	CO-3 They will acquire knowledge about various tools and techniques

	of field ecology.
	CO-4 During field visits students will have social interaction with locals and develops ethical approach, to conserve diversity of animal kingdom.
Paper-III **ZO123** **Zoology Practical Paper** **Semester II**	CO-1 Students could identify various animals based on morphological features.
	CO-2 The student will be able to understand and classify the great variety of animals.
	CO-3 Students will acquire knowledge about cell organelles and cell division i.e., mitosis.
	CO-4 They will know how to measure and stain different cell types.
S.Y. B.Sc.	
Paper I **ZO - 231 Animal Diversity III** **Paper-II** **ZO - 241 Animal Diversity IV**	CO-1 The students will be able to understand, classify and identify the diversity of higher vertebrates.
	CO-2 The students will able to understand the complexity of higher vertebrates.
	CO-3 The students will be able to understand different life functions of higher vertebrates.
	CO-4 The students will be able to understand the linkage among different groups of higher vertebrates.
	CO-5 The student will become aware regarding his role and responsibility towards nature as a protector, to understand his role as a trustee and conservator of life which he has achieved by learning, observing and understanding life.
Paper II **ZO - 232 Applied Zoology I**	CO-1. The students will understand the various aspects of silkworm for effective rearing practices.
	CO-2. To aware the students about economic importance of sericulture, economics and qualities of silk etc.
	CO-3. Students will learn post-harvest processing of silk cocoons.
	CO-4. The learner understands the biology, varieties of silkworms and the basic techniques of silk production.
	CO-5. The learner understands the types of agricultural pests, Major insect pests of agricultural importance and Pest control practices.
Paper II **ZO - 242 Applied Zoology II**	CO-1. The learner understands the basics about beekeeping tools, equipment, and managing beehives.
	CO-2. The learner understands the basic information about fishery, cultural and harvesting methods of fishes and fish preservation techniques.
	CO-3. Learner will know about managing beehives for honey production and pollination.
	CO-4. The students will able to have self-employment in agricultural sector.
Paper-III **ZO – 233**	CO- It will provide exposure to diversity in animal groups (vertebrates), and applied zoology. CO-2 The practical course intends to inform students about Animal systematic, animal diversity and applied zoology field such as Sericulture and Agricultural pests.

Zoology Practical Paper Semester-I	CO-3 Students will be able to identify and control various pests.
Paper-III ZO – 233 Zoology Practical Paper Semester-II	CO-1 It will provide Knowledge of various animals from primitive to highly evolved forms and its complexity.
	CO-2 Students will be able to identify poisonous and non-poisonous snakes.
	CO-3 The practical course intends to inform students about Animal systematic, animal diversity and applied zoology field such as Fisheries, Apiculture etc.

Program Outcomes, Program Specific Outcomes and Course Outcomes

Department of Physics

Program	Program Objectives	Program Specific Outcome
Physics	1. To faster scientific attitude provides in depth knowledge of scientific & technological concept of Physics. 2. To Familiarize with recent scientific & technological development. 3. To help students to learn various experimental & computational tools there by developing analytical abilities to address real word problem.	1. Students will have acquired necessary skills & expertise to work in industry. 2. Students will have acquired necessary skills for working in research. 3. Students will have acquired necessary skills to teach physics in colleges. 4. To help students build up progressive & successful career in Physics.

F.Y. B.Sc. (CBCS- 2019)

Course	Course Outcome
PHY-111: Mechanics and properties of matter	CO-1. The students will be able to apply Newton's laws of motion.
	CO-2. The students will be able to apply the variational principles to real physical problem.
	CO-3. At the end of course student will have through knowledge & problem-solving skills related to the mechanics.
PHY-112: Physics Principles and Application	CO-1. Understanding of basics law of physics.
	CO-2. To understand the atomic excitation & laser principles.
	CO-3. To understands the bonding mechanism in molecules & rotational & vibrational energy level of diatomic molecules.
PHY-113: Physics Laboratory course 1A	CO-1. Use various instruments and equipment.
	CO-2. Design experiments to test a hypothesis and/or determine the value of an unknown quantity.
	CO-3. Investigate the theoretical background of an experiment.
	CO-4. Setup experimental equipment to implement an experimental approach.
	CO-5. Analyze the data, plot appropriate graphs and reach conclusions from data analysis.
PHY-122: Electromagnetism	CO-1. Understanding of basics law of electromagnetism.
	CO-2. The students will able to analyze radiation system in which the electric dipole, magnetic dipole or electric quadruple dominate.
	CO-3. Demonstrate an understanding of magnetization of materials.
PHY-121: Heat and Thermodynamics	CO-1. Apply the laws of thermodynamic to formulate the relations necessary to analyze a thermodynamics process.
	CO-2. Understand the types of thermometers & their usage.
	CO-3. Describe the properties of & relationships between the properties of a pure substance.

PHY-123: Physics Laboratory course 1B	CO-1. Use various instruments and equipment.
	CO-2. Design experiments to test a hypothesis and/or determine the value of an unknown quantity.
	CO-3. Investigate the theoretical background of an experiment.
	CO-4. Setup experimental equipment to implement an experimental approach.
	CO-5. Analyze the data, plot appropriate graphs and reach conclusions from data analysis.

S.Y. B.Sc. (CBCS- 2019)

Course	Course Outcome
PHY-231: Mathematical Methods in Physics-I	CO-1. Understand the complex algebra useful in physics courses.
	CO-2. Understand the concept of partial differentiation.
	CO-3. Understand the role of partial differential equations in physics.
	CO-4. Understand vector algebra useful in mathematics and physics.
	CO-5. Understand the concept of singular points of differential equations
PHY-232: Electronics	CO-1. Apply different theorems and laws to electrical circuits.
	CO-2. Understand the relations in electricity.
	CO-3. Understand the parameters, characteristics and working of transistors.
	CO-4. Understand the functions of operational amplifiers.
	CO-5. Design circuits using transistors and applications of operational amplifiers
	CO-6. Understand the Boolean algebra and logic circuit
PHY-233: Practical Course	CO-1. Use various instruments and equipment.
	CO-2. Design experiments to test a hypothesis and/or determine thevalue of an unknown quantity.
	CO-3. Investigate the theoretical background of an experiment.
	CO-4. Setup experimental equipment to implement an experimental approach.
	CO-5. Analyze the data, plot appropriate graphs and reach conclusionsfrom data analysis.
	CO-6. Work in a group to plan, implement and report on a project/experiment.
	CO-7. Keep a well-maintained and instructive laboratory logbook.
PHY-241: Oscillations, Waves, and Sound	CO-1. To study underlying principles of oscillations and its scope in development.
	CO-2. To understand and solve the equations / graphical representationsof motion for simple harmonic, damped, forced oscillators and waves.
	CO-3. To explain oscillations in terms of energy exchange with variouspractical applications.

	CO-4. To solve numerical problems related to undamped, damped,forced oscillations and superposition of oscillations.
	CO-5. To study characteristics of sound, decibel scales and applications.
PHY-242: Optics	CO-1. Acquire the basic concept of wave optics.
	CO-2. Describe how light can constructively and destructively interfere.
	CO-3. Explain why a light beam spread out after passing through an aperture
	CO-4. Summarize the polarization characteristics of electromagneticwave
	CO-5. Understand the operation of many modern optical devices thatutilize wave optics
	CO-6. Understand optical phenomenon such polarization, diffractionand interference in terms of the wave model
	CO-7. Analyze simple example of interference and diffraction.
PHY-243: Practical Course	CO-1. Use various instruments and equipment.
	CO-2. Design experiments to test a hypothesis and/or determine thevalue of an unknown quantity.
	CO-3. Investigate the theoretical background of an experiment.
	CO-4. Setup experimental equipment to implement an experimental approach.
	CO-5. Analyze the data, plot appropriate graphs and reach conclusionsfrom data analysis.
	CO-6. Work in a group to plan, implement and report on a project/experiment.
	CO-7. Keep a well-maintained and instructive laboratory logbook.

Program Outcomes, Program Specific Outcomes and Course Outcomes

Department of Mathematics

PROGRAMME: B.Sc.	
Course Outcomes (Mathematics)	
F.Y. B.Sc. (CBCS- 2019)	
(MT-111) Algebra	CO-1 To understand concept of sets, inverse of function and equivalence relation.
	CO-2 To understand the Division Algorithm and find g.c.d. by using Euclidean Algorithm.
	CO -3 Apply Euler-Fermat's Theorem to prove relations involving prime numbers.
	CO-4 To understand the theory of congruence.
	CO-5 Be able to prove n^{th} roots of unity and to find Regions in Complex Plane.
(MT-112) Calculus-I	CO-1 To understand The Algebraic and Order Properties of R, Absolute Value and the Real Line.
	CO-2 Define and utilize the following concepts: sequence, subsequence, monotone sequence.
	CO-3 To understand the Bolzano-Wierstrass Theorem and Divergence criteria.
	CO-4 Define Functions, domain and range, graphs of functions. Determine increasing and decreasing functions, even and odd functions.
	CO-5 Be able to understand the definition of continuous function at a point, Divergence criterion.
(MT-113) Mathematics Practical	CO-1 Solve problems related to all topics in the syllabus of Algebra and Calculus-I.
	CO-2 The student gets knowledge of maxima software, using this software they can solve.
	CO-3 Identify the monotonic increasing and decreasing sequence of real number.
	CO-4 Using Maxima Software to find the graph of functions.
	CO-5 To understand solves the problem using Maxima Software.
	CO-1 Be able to define translation and rotation of axis discuss the nature of conic.

(MT-121) Analytical Geometry	CO-2 Compute the angle between a line and a plane, length of perpendicular from a point to a line.
	CO-3 To understand Equations of a line in Symmetric and unsymmetrical forms, Line passing through two points.
	CO-4 To understand Intersection of a sphere and a line, Equation of tangent plane to sphere.
	CO-5. Find equation of a circle, sphere through a given circle.
(MT-122) Calculus-II	CO-1 To Understand the derivative of a function at a point, every differentiable function is continuous, Rules of differentiation.
	CO-2 Be able to calculate limits in indeterminate forms by a repeated use of L' Hopital's rule
	CO-3. Extract the solution of differential equations of the first order and of the first degree by variables separable, homogeneous and non-homogeneous method.
	CO-4. To understand Taylor's theorem and Maclaurin's theorem with Lagrange's form of remainder.
	CO-5. Find Integrating factors and decide exact differential equations
(MT-123) Mathematics Practical	CO-1. Solve problems related to all topics in the syllabus of Analytical Geometry and Calculus-II.
	CO-2 Find center of conic, nature of conic.
	CO-3 Apply Leibnitz theorem for successive differentiation and solve examples.
	CO-4 Using Maxima Software to find n^{th} derivative of function.
S.Y.B.Sc. (CBCS- 2019)	
(MT-231) Calculus of several variables	CO-1. Define functions of several variables, domain, range, level curves, limit graphs. Find limit of function of several variables, domain, range, can draw graph, level curves.
	CO-2. Calculate the partial derivatives of functions of several variables, Clairaut's theorem, laplace equation, wave equation, differentiability of functions, chain rule, homogeneous function
	CO-3. Determine the extrema of functions of several variables**,** second derivative test, Use the Lagrange multiplier method to find extrema of functions with constraint
	CO-4. Iterated Integrals, Fubini's Theorem, Double integral over general regions, Double integral in Polar coordinates, Triple integrals, Evaluation of triple integrals.
	CO-5. Triple integrals in spherical coordinates, Jacobians, Change of

	variables in multiple integrals
(MT-232(A)) Numerical Methods and its Application	CO-1. Be able to understand the basic idea of Errors and Their Computations. Know how to find Absolute, relative and percentage errors, and to understand the general error formula. Be familiar withthe notion rounding off numbers to n significant digits, to n decimal places,
	CO-2. To find the Solution of Algebraic and Transcendental Equations using Bisection method, The method of False position, Newton-Raphson method
	CO-3. Define Basic concepts of finite difference operators and their relation , Differences of a polynomial ,Newton's Interpolation Formulae (Forward and Backward) ,Lagrange's Interpolation Formula , Newton's General Interpolation formula
	CO-4. To understands and can find Numerical Differentiation Numerical Integration using General quadrature formula, Trapezoidal rule. Simpsons's $1/3^{rd}$ rule. Simpsons's $3/8^{th}$ rule
	CO-5. Able to find numerical solution of first order ordinary differential equations using Taylor Series method, Picard's methodof successive approximation, Euler's method, Modified Euler's methods, Runge - Kutta Methods 2nd and 4th order
MT-233 Mathematics Practical	CO-1. Solve problems related to the syllabus of Calculus of several variables and Numerical Methods and its Application.
	CO-2. The student gets knowledge of Maxima Software,
	CO-3. Using Maxima software student can solve the problems of Calculus of several variables and Numerical Methods and its Application.
T-241: Linear Algebra	CO-1. Students will be able to understand Row echelon form of a matrix, reduced row echelon form of a matrix.
	CO-2. Solve the system of linear equation, Consistency of homogeneous and non-homogeneous system of linear equations using rank, condition for consistency
	CO-3. Students will able to Define Vector Space, Subspace, linear combination linear span and linear dependence, independence, basis and inner product
	CO-4. Know how to find the row space, column space and null spaceof a matrix, and be familiar with the concepts of dimension of a subspace and the rank and nullity of a matrix
	CO-5. Apply the properties of linear transformations to linearity of transformations, kernel and rank of linear transformations, inverse transformations to solve the problems of matrix transformations, change of basis.

MT-242 Vector Space	CO-1. Define the Curves in Space, Limits and Continuity,
	Derivatives and Motion, Unit Tangent Vector, Curvature of a Plane Curve, Circle of Curvature for Plane Curves.
	CO-2. To find the Curvature of a Plane Curve, unit tangent vector
	CO-3. Understand the concept of Line Integral of Scalar Functions, Line integral in the Plane, Vector Fields, Gradient Fields, Line Integral of Vector Fields, Work done by a Force over a Curve in Space, Path Independence, Conservative and Potential Functions,
	CO-4. Solve the problem Parameterizations of Surfaces, Surface integrals, Surface Integrals of Vector Fields.
	CO-5. Students will be able to understand the concept The Curl Vector Field, Stokes' Theorem, Conservative Fields and Stokes' Theorem, Divergence Theorem, Unifying the Integral Theorems.
MT-243 Mathematics Practical	CO-1. Solve problems related to the syllabus of Linear Algebra and Vector Space.
	CO-2. Using Maxima software student can solve the problems Linear Algebra and Vector Space.

Program Outcomes, Program Specific Outcomes and Course Outcomes

Department of Computer Science

PROGRAMME: B.Sc. Computer Science	
F.Y. B.Sc. (CBCS- 2019)	
Programme Outcomes	PO-1: Develop the ability to analyze a problem, identify and define the computing requirements, which may be appropriate to its solution.
	PO-2: To prepare students to undertake careers involving problem-solving using computer science and technologies.
	PO-3: Develop the ability to pursue advanced studies and research in computer science.
	PO-3: To produce entrepreneurs who can innovate and develop software products.
Program Specific Outcome:	PSO-1: To produce entrepreneurs who can innovate and develop software products.
	PSO-2: To make students employable according to the current demand of the IT industry and responsible citizens.
	PSO-3: Ability to apply the knowledge gained during the program from Mathematics, Electronics, Statistics, and Computer Science courses to identify, formulate and solve real-life complex problems faced in the industry.
Course Outcomes:	
F.Y. B.Sc. Semester - I	
CS-101 Problem solving using computer and C programming	CO-1: Explore algorithmic approaches to problem-solving.
	CO-2: Ability to analyze a problem and devise an algorithm to solve it.
	CO-3: Develop modular programs using control structures and arrays in 'C'
	CO-4: Able to formulate algorithms, pseudo-codes and flowcharts for arithmetic and logical problems.
	CO-5: Ability to implement algorithms in the 'C' language.
CS-102 Database Management Systems	CO-1: Understand fundamental concepts of database.

	CO-2: Understand user requirements and frame them in the data model.
	CO-3: Ability in creation, manipulation, and querying of data in databases.
	CO-4: Ability to solve real-world problems using the appropriate set, function, and relational models.
	CO-5: Ability to design E-R Model for given requirements and convert the same into database tables.
CS-103 Practical Course based on CS-101 and CS-102 (C and DBMS)	CO-1: Able to devise pseudocode and flowchart for computational problems.
	CO-2: Understand how to write, debug and execute simple programs in C
	CO-3: Able to create database tables in Postgres SQL.
	CO-4: Able to write and execute simple and nested queries.
ELC-111: Semiconductor Devices and Basic Electronic Systems	CO-1: To study various types of semiconductor devices, elementary electronic circuits, and systems.
	CO-2: To bridge the gap between theoretical and practical knowledge.
ELC-112: Principles of Digital Electronics	CO-1: To get familiar with concepts of digital electronics.
	CO-2: To study arithmetic circuits, combinational circuits, and sequential circuits.
ELC-113 Electronics Practical Paper – I Course Outcomes:	CO-1: To use basic concepts for building various applications in electronics.
	CO-2: To understand design procedures of different electronic circuits as per requirement.
	CO-3: To build an experimental setup and test the circuits.
	CO-4: To develop skills of analyzing test results of given experiments.
MTC 111 Matrix Algebra	CO-1: Perform basic Matrix operation.
	CO-2: Define special matrices: diagonal, triangular, and symmetric.
	CO-3: Basics of solving systems of linear equations.
	CO-4: Understand determinants and their properties.
	CO-5: The logic behind writing programs using computer language.
	CO-6: Factorization of any square matrix in simpler LU-form.
MTC 112- Discrete Mathematics	CO-1: Understanding the concepts of discrete mathematics.

	CO-2: Learning applications of discrete structures in Computer Science.
	CO-3: Express a logic sentence in terms of predicates, quantifiers, and logical connectiv
	CO-4: Apply the operations of sets and use Venn diagrams to solve applied problems; solve problems using the principle of inclusion-exclusion.
	CO-5: Demonstrate different traversal methods for trees and graphs.
	CO-6: Model problems in Computer Science using graphs and trees.
MTC 113 Mathematics Practical	CO-1: Students will be able to compute matrix calculations using Maxima software.
	CO-2: Solve applied problems using matrices.
	CO-3: Students will be able to formulate problems in the language of sets and perform set operations and will be able to apply the Fundamental Principle of Counting, Multiplication Principle.
	CO-4: Use appropriate modern technology to explore calculus concepts.
CSST 111Descriptive Statistics	CO-1: The main purpose of descriptive statistics is to provide a summary of the samples and the measures done on a particular study.
	CO-2: To provide basic information about variables in a dataset.
CSST 112 Mathematical **Statistics**	CO-1: It will help students develop skills in thinking and analyzing problems from a probabilistic and statistical point of view.
	CO-2: It will provide the difference between Discrete and continuous distributions.
CSST 113Statistics Practical Paper I	CO-1: To Study free statistical software's and use them for data analysis in project.
	CO-2: To use Statistical tools in Ms-Excel.
Semester - II	
CS 201 Advanced C programming	CO-1: Develop advanced concepts of programming using C.
	CO-2: Develop modular programs using control structures, pointers, arrays, strings, and structures.
	CO-3: Design and develop solutions to real-world problems using C.
	CO-4: Able to develop a structured programming approach.
CS-202 Relational database Management Systems	CO-1: Able to acquire knowledge of data security and its importance.
	CO-2: Design E-R Model for given requirements and convert the same into database tables.

	CO-3: Able to use database techniques such as SQL & PL/SQL.
	CO-4: Understand and be able to implement the concept of transactions.
	CO-5: Use advanced database Programming concepts.
CS-203 Practical Course based on CS-201 and CS-202(Advanced C and RDBMS)	CO-1: Write debug and execute programs using advanced features in C.
	CO-2: To perform advanced database operations.
ELC-121 Instrumentation System	CO-1: To study various kinds of Instrument of different Instrumentation System
	CO-2: To control the parameter in the process or a particular system.
	CO-3: To study smart sensors for smart Electronics Applications.
ELC-122 Basics of Computer Organization	CO-1: To study and design different counters.
	CO-2: To study the basics of the computer system.
	CO-3: To study Memory Organization.
ELC- 123 Electronics Practical Paper – II	CO-1: To use basic concepts for building various applications in electronics.
	CO-2: To understand design procedures of different electronic circuits as per requirement.
	CO-3: To build an experimental setup and test the circuits.
	CO-4: To develop skills of analyzing test results of given experiments
MTC 121 Linear Algebra	CO-1: Solve systems of linear equations using various methods including Gaussian and Gauss Jordan elimination and inverse matrices.
	CO-2: Perform matrix algebra, invertibility, and transpose and understand vector algebra in R^n.
	CO-3: Compute linear transformations, kernel and range, and inverse linear transformations, and find matrices of general linear transformations.
	CO-4: Compute inner products on a real vector space and compute angle and orthogonality in inner product spaces.
	CO-5: Prove basic results in linear algebra using appropriate proof-writing techniques such as linear independence of vectors; properties of subspaces; linearity, injectivity, and surjectivity of functions; and properties of eigenvectors and eigenvalues.
MTC 122 Graph Theory	CO-1: Explain basic concepts in graph theory
	CO-2: Define how graphs serve as models for many standard problems.

	CO-3: Account for the theory of paths and degree of connectedness of graph.
	CO-4: Learn the use of a spanning tree.
	CO-5: Discuss the concept of the graph, tree, and Euler graph.
	CO-6: See the applications of graphs in science, business, and industry.
	CO-7: To present a survey of essential topics for computer science students who will encounter some of them again in more advanced courses.
MTC 123 Mathematics Practical	CO-1: Students will be able to find eigenvalues and eigenvectors using Maxima software.
	CO-2: Students will be able to perform operations on orthogonality and quadratic forms.
	CO-3: Use appropriate modern technology to explore calculus concepts.
CSST 121Method of Applied Statistics Course Outcomes:	CO-1: To create a mathematical model that can be used to predict the values.
	CO-2: To Handle large data and analyze it with statistical tools.
CSST 122 Continuous Probability Distribution and Testing of Hypothesis	CO-1: To study the distribution of various data
	CO-2: Students should use these techniques for their projects.
CSST 123Statistics Practical Paper II	CO-1: How to use statistical tools in a real-life situation.
	CO-2: Handling data for research purposes.
Semester- III	
CS 231 Data Structures and Algorithms – I	CO-1: To use well-organized data structures in solving various problems.
	CO-2: To differentiate the usage of various structures in problem solutions.
	CO-3: Implementing algorithms to solve problems using appropriate data structures.
CS 232 -Software Engineering	CO-1: Compare and chose a process model for a software project development.
	CO-2: Identify requirements analyze and prepare models.
	CO-3: Prepare the SRS, Design document, Project plan of a given software system.

CS 233 Practical course on CS 231 (Data Structures and Algorithms I) and CS 232 (Software Engineering)	CO-1: Use the appropriate data structure in the context of the solution of the given problem.
	CO-2: Develop programming skills which require to solve given problems.
	CO-3: Able to implement different data structures.
	CO-4: Describe the problem definition, Scope of the proposed system.
	CO-5: Able to identify the requirement of the project.
	CO-6: Apply their knowledge and understanding with a professional approach.
ELC-231: Paper I: Microcontroller Architecture & Programming	CO-1: Able to write programs for 8051 microcontroller
	CO-2: To study the basic instruction set of 8051microcontroller
	CO-3: To interface I/O peripherals to 8051 microcontroller
	CO-4: To design small microcontroller based projects
	CO-5: To study the Programming of8051microcontroller
	CO-6: To study the interfacing techniques of 8051microcontroller
	CO-7: To design different application systems using 8051microcontroller.
ELC-232: Paper II: Digital Communication & Networking	CO-1: On completion of the course, students will be able to
	CO-2: Understand various concepts involved in the process of communication
	CO-3: Define and explain terminologies of data communication.
ELC-233: Paper III, Practical Course I	CO-1: Can design and build his/her microcontroller-based projects.
	CO-2: Can build and test own network and do settings.
	CO-3: Get knowledge of multiplexing and modulation techniques useful in developing a wireless application
	CO-4: Can handle LAN network connections.
MTC-231: Groups and Coding Theory	CO-1: Group theory is one of the great simplifying and unifying ideas in modern mathematics. It was introduced to understand the solutions to polynomial equations.
	CO-2: A mathematical formulation of symmetry has been understood.
	CO-3: By Euclid's algorithm find GCD of numbers.
	CO-4: We will analyze the structure of 'small' finite groups, and examine examples arising as groups of permutations of a setand groups of matrices.
	CO-5: Application of group theory i.e. coding theory.

MTC-232: Numerical Techniques	CO-1: The accuracy of common numerical methods.
	CO-2: Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.
	CO-3: Apply numerical methods to obtain approximate solutions to mathematical problems.
	CO-4: Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
MTC-233: Mathematics Practical: Python Programming Language-I	CO-1: To provide Basic knowledge of Python. Python programming is intended for software engineers, system analysts, program managers, and user support personnel who wish to learn the Python programming language.
	CO-2: Find the root of the equation by using Newton's Raphson method and Regula Falsi Method, Trapezoidal rule, Simpson's (1/3)rd rule, Simpson's (3/8)th rule.
	CO-3: Learn matrix operations under sympy module.
	CO-4: Use of lists, tuples, strings, and dictionaries in Python programs.
ENGLISH- (Ability Enhancement Course-AEC)	CO-1: Competency to appreciate and analyze short stories and poetry.
	CO-2: Learning the use of multimedia
	CO-3: Improvement speaking skills in various contexts
	CO-4: Improvement writing skills in different contexts.
Semester- IV	
CS 241 Data Structures and Algorithms – II	CO-1: Implementation of different data structures efficiently.
	CO-2: Usage of well-organized data structures to handle a large amount of data.
	CO-3: Usage of appropriate data structures for problem-solving
CS 242 Computer Networks-I	CO-1: Have a good understanding of the OSI and TCP/IP Reference Models and in particular have a good knowledge of Layers.
	CO-2: Understand the working of various protocols.
	CO-3: Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.

CS 243 Practical course on CS 241(Data Structures and Algorithms II) and CS 242 (Computer Networks I)	CO-1: Discuss graph structure and understand various operations on graphs and their applicability.
	CO-2: Implement various tree traversal techniques and Graph techniques.
	CO-3: Get practical knowledge on the applications of data structures.
	CO-4: Understand how PCs can be connected using LAN
ELC-242: Paper II: Digital Communication & Networking	CO-1: Understand various concepts involved in the process of communication
	CO-2: Define and explain terminologies of data communication.
	CO-3: Understand the impact & limitations of various digital modulation techniques
	CO-4: To acknowledge the need for spread spectrum schemes.
ELC-243: Paper III, Practical Course II	CO-1: Able to design and develop own smart applications using Raspberry-Pi
	CO-2: Can write Python program for simple applications
	CO-3: Able to build own IoT based system
	CO-4: Get knowledge about how to connect PC with Raspberry-Pi
MTC-241: Computational Geometry	CO-1: In 2D & 3D, We learn Scaling,Shearing,reflection and rotation transformation.
	CO-2: Students will get acquainted with the typical problems of computational geometry.
	CO-3: The student will understand the existing solutions and their applications in computer graphics and machine vision.
	CO-4: Students will get a deeper knowledge of mathematics.
MTC-242: Operations Research	CO-1: Construct linear integer programming models and discuss the solution techniques.
	CO-2: Set up decision models and use some solution methods for nonlinear optimization problems.
	CO-3: Solve multi-level decision problems using the dynamic programming method.
	CO-4: Formulate pure, mixed, and binary integer programming models
MTC-243: Mathematics Practical: Python Programming Language-II	CO-1: How to draw 2D and 3D graphs by using various commands of the graph.
	CO-2: Solve examples of linear entities.
	CO-3: Representing polygons in python.
	CO-4: Various attributes of the polygon.

ENGLISH- (Ability Enhancement Course-AEC)	CO-1: Competency to appreciate and analyze short stories and poetry.
	CO-2: Understanding the meaning and apt use of various soft skills
	CO-3: Understanding of the existing communicative skills of the students and the skills they require at the professional level.
	CO-4: Improved technical writing skills in different contexts
Semester - V	
CS-351: Operating Systems – I	CO-1: Understanding the purpose, functions, and Structure of the operating system.
	CO-2: Understand Processes and Thread Scheduling by the operating system.
	CO-3: Understand process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
	CO-4: Understand Memory management by the operating system with the help of various schemes like Paging and segmentation.
CS-352: Computer Networks – II	CO-1: Study and understand the various protocols of the Application layer.
	CO-2: Develop an understanding of a technical aspect of Multimedia Systems
	CO-3: Develop various Multimedia Systems applicable in real-time.
	CO-4: Identify information security goals and understand cryptographic concepts.
CS-357: Practical course based on CS 351	CO-1: Demonstrate operation of the process like the creation of child process.
	CO-2: Demonstrate shell commands and some user-defined commands.
	CO-3: Demonstrate the concept of the zombie / Orphan process.
	CO-4: Implement CPU Scheduling Algorithm and Page replacement Algorithm
CS-353: Web Technologies – I	CO-1: Understand how to develop a dynamic and interactive Web site.
	CO-3: Understand the use of programming constructs.
	CO-4: Enhance the designing aspects of the webpage.
	CO-5: Understand how to handle different databases.
CS-354: Foundations of Data Science	CO-1: Understand the process of Data Science.
	CO-2: Understand the importance of data analysis using the statistical method in different fields.

	CO-3: Under the process of data analysis.
	CO-4: Detection of common data issues, like missing values, special values, outliers
CS-358: Practical course based on CS 353 and CS 354	CO-1: Understand how to develop dynamic and interactive Web Page.
	CO-2: Able to analyze, design, and develop different problems depends upon the situation.
	CO-3: Prepare data for use with a variety of statistical methods and recognize how the quality of the data may affect conclusions.
	CO-4: Perform exploratory data analysis.
CS-355: Object-Oriented Programming using Java – I	CO-1: Understand the concept of Object-Oriented Programming such as classes, objects, packages, and Collections
	CO-2: Develop Web-based applications and GUI-based Applications
	CO-3: Develop event-driven Applications.
CS-356: Theoretical Computer Science	CO-1: Understand pattern reorganization of Finite Automata.
	CO-2: Understand the use of automata during language design.
	CO-3: Relate various automata and Languages.
CS-359: Practical Course based on CS 355	CO-1: Use an integrated development environment to write, compile, run, and test simple object-oriented Java programs.
	CO-2: Develop real-world applications using Java programs.
	CO-3: Develop error-free applications with proper validation.
CS-3510: Python Programming	CO-1: Develop logic for problem-solving.
	CO-2: Understand methods to build Python programs by using data structures like lists, dictionaries, tuples, and sets.
	CO-3: To be familiar with the basic programming constructs like data, operations, conditions, loops, functions, etc.
CS-3511: Blockchain Technology	CO-1: Understand the fundamentals of Blockchain Technology.
	CO-2: Learn Blockchain programming using Python.
	CO-3: Acquire basic knowledge of Smart Contracts and how they function.
Semester- VI	
CS-361: Operating Systems – II	CO-1: Management of deadlocks and File systems by the operating system.
	CO-2: Scheduling storage or disk for processes.
	CO-3: Distributed Operating System and its architecture and the extended features in mobile OS.
CS-362: Software Testing	CO-1: Understand different software testing strategies and methods.
	CO-2: Understand different approaches and levels of testing.

	CO-3: Understand the testing life cycle and its implementation.
	CO-4: Identify defects and debugging process
CS-367: Practical course based on CS 361	CO-1: Management of deadlocks by the operating system using banker's algorithm.
	CO-2: Demonstrate concepts of file system management, its allocation, and free space management.
	CO-3: Able to implement Disk space management process and scheduling for processes.
	CO-4: Able to implement concepts of mobile Operating System.
CS-363: Web Technologies – II	CO-1: Build a dynamic website.
	CO-2: Using MVC based framework easy to design and handle the errors in a dynamic website.
CS-364: Data Analytics	CO-1: Use appropriate models of analysis, assess the quality of input, and derive insights from results.
	CO-2: Analyze data, choose appropriate models and algorithms for respective applications
	CO-3: Apply modeling and data analysis techniques to the solution of real-world business problems.
	CO-4: Understand the variety of data mining techniques such as classification, prediction, clustering, and association rule mining.
CS-368: Practical course based on CS 363 and CS 364	CO-1: Build a dynamic website.
	CO-2: Using MVC based framework easy to design and handle the errors in a dynamic website.
	CO-3: Design and develop models for data analysis using various data mining techniques.
	CO-4: Text analysis and sentiment analysis.
CS-365: Object-Oriented Programming using Java – II	CO-1: Develop the Java database application using Java DataBase Connectivity (JDBC).
	CO-2: Create and execute multiple processes simultaneously using multithreading.
	CO-3: Understand and Create dynamic web pages, using Servlets and JSP.
	CO-4: Work with basics of framework to develop secure web applications
CS-366: Compiler Construction	CO-1: Understand the process of scanning and parsing source code.
	CO-2: Understand compare the various methods of parsing.
	CO-3: Learn the conversion code written in the source language to machine language.

	CO-4: Understand tools like LEX and YACC.
CS-369: Practical Course based on CS 365	CO-1: To Learn database Programming using Java.
	CO-2: Understand and create dynamic web pages using Servlets and JSP.
	CO-3: Work with basics of framework to develop secure web applications
CS-3610: Software Testing Tools	CO-1: Identify and manage defects.
	CO-2: Implement the defect management process.
	CO-3: Understand software metrics and thereby improve the quality of software.
	CO-4: Design test cases and test plans, review reports of testing for qualitative software.
	CO-5: Understand the latest testing tools used in the software industries.
CS-3611: Project Course	CO-1: Undertake problem identification, formulation, and solution.
	CO-2: Understand project characteristics and various stages of project development.
	CO-3: Design solutions to complex problems.
	CO-4: Gain a sound technical knowledge of selected project development platforms.
	CO-5: Develop and enhance coding skills.