

**Name of the Department: Chemical Sciences**  
**Programme: M.Sc. Chemistry**

**Paper CHL404-18 Spectroscopy-I**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Solve structural problems based on UV-Vis, IR, 1H-NMR, 13C-NMR and mass spectral data.	√	√	√	√	√		Evaluation	Yes	Mid semester tests, End Term Exams
CO 2: Elucidate the structures of various organic compounds on the basis of spectral data.	√	√	√	√	√	√	Applying	Yes	Mid semester tests, End Term Exams
CO 3: Understand various involved processes responsible for NMR chemical shifts and splitting patterns and mass spectrometry.	√	√	√	√	√	√	Understanding	Yes	Mid semester tests, End Term Exams
CO 4: Illustrate the mechanisms that give rise to the infrared and UV-Visible absorption bands and identify to which functional groups each correspond.	√	√	√	√	√		Evaluation	Yes	Mid semester tests, End Term Exams
CO 5:								Yes	Mid semester tests, End Term Exams

**Paper CHP407-18 Inorganic Chemistry Lab**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Preparation of different inorganic complexes.	√	√	√	√	√		Understanding	Yes	Mid semester tests, End Term Exams
CO 2: Purification and crystallisation of inorganic compounds.	√	√	√	√	√	√	Applying	Yes	Mid semester tests, End Term Exams
CO 3: Interpretation of compounds using UV-Vis, FT-IR techniques.	√	√	√	√	√	√	Evaluation	Yes	Mid semester tests, End Term Exams
CO 4: Measurement of various physical properties such as magnetic moment of complexes.	√	√	√	√	√	√	Evaluation	Yes	Mid semester tests, End Term Exams
CO 5: Gravimetric analysis of various cations.	√	√	√	√	√		Applying	Yes	Mid semester tests, End Term Exams

**Paper CHP408-18 Organic Chemistry Lab**


Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Apply various methods techniques in organic synthesis to build organic molecules.	√	√	√	√	√	√	Applying	Yes	Mid semester tests, End Term Exams
CO 2: Understand the fundamental mechanistic pathways of organic synthesis involving various practical lab techniques together.	√	√	√	√			Understanding	Yes	Mid semester tests, End Term Exams
CO 3: Apply the spectroscopic techniques for the determination of molecular structures of organic molecules.	√	√	√	√	√		Applying	Yes	Mid semester tests, End Term Exams
CO 4: Present their work with practical skills and the awareness of health and safety procedures.	√	√	√	√	√	√	Applying	Yes	Mid semester tests, End Term Exams

**Paper CHL414-18 Spectroscopy-II**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Learn the fundamental and advanced concepts of Microwave, Infrared Vibration-rotation Raman and infra-red Spectroscopy and their applications for chemical analysis	√	√	√	√	√		Understanding	Yes	Mid semester tests, End Term Exams
CO 2: Understand Electronic spectroscopy of different elements and simple molecules.	√	√	√	√	√		Understanding	Yes	Mid semester tests, End Term Exams
CO 3: Study the concepts and principles of Mössbauer Spectroscopy and its application.	√	√	√	√	√	√	Understanding	Yes	Mid semester tests, End Term Exams
CO 4: Apply Nuclear Quadruple Resonance and Electron Spin Resonance Spectroscopy for organic compounds analysis.	√	√	√	√	√	√	Applying	Yes	Mid semester tests, End Term Exams
CO 5: Solve structural problems based on these techniques.	√	√	√	√	√	√	Evaluation	Yes	Mid semester tests, End Term Exams

**Paper CHL416P-18 Physical Chemistry Lab**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Understand the basic procedures for carrying out a physical chemistry practical like preparation and standardisation of solutions, handling the equipments and measuring with precision.	√	√	√		√	√	Understanding, Apply	Yes	Mid semester tests, End Term Exams
CO 2: Correlate the theoretical and practical aspects and know about the limits of the experimental error.	√	√	√		√	√	Understanding, Apply	Yes	Mid semester tests, End Term Exams

  
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CO 3: Determine the various physical parameters for the various problems under study.	√	√	√	√	√	√	Evaluate	Yes	Mid semester tests, End Term Exams
CO 4: Verify various laws studied in the theory part.	√	√	√	√	√	√	Analyse	Yes	Mid semester tests, End Term Exams

**Paper CHP417P-18 Advanced Chemistry Lab-I**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Preparation of different inorganic complexes.	√	√	√	√	√	√	Understanding	Yes	Mid semester tests, End Term Exams
CO 2: Purification and crystallisation of inorganic compounds.	√	√	√	√	√	√	Applying	Yes	Mid semester tests, End Term Exams
CO 3: Interpretation of compounds using UV-Vis, FT-IR techniques.	√	√	√	√	√	√	Evaluation	Yes	Mid semester tests, End Term Exams
CO 4: Measurement of various physical properties such as magnetic moment of complexes.	√	√	√	√	√	√	Applying	Yes	Mid semester tests, End Term Exams
CO 5: Applying related experiments for their research work.	√	√	√	√	√	√	Applying	Yes	Mid semester tests, End Term Exams

**Paper CHL504-18 Advanced Characterization Techniques**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Understand the topography, morphology, composition, relationship between composition and material properties.	√	√	√	√	√	√	Understanding	Yes	Mid semester tests, End Term Exams
CO 2: Learn the functioning of the X-ray diffractometer, about its components and would be able to determine the crystal structure of a material, find impurity in the material, different phases present in the mixture of compound qualitative as well as functionalities	√	√	√	√	√	√	Understanding and Analyzing	Yes	Mid semester tests, End Term Exams
CO 3: Understand the instrumentation of TGA and also to calculate the weight loss with temperature, types of changes occurring in the material/substances during thermal breeding, enthalpy changes during heat treatment of a compound.	√	√	√	√	√	√	Understanding and Analyzing	Yes	Mid semester tests, End Term Exams
CO 4: Apply the knowledge of various characterization techniques in material industries, metallurgy industries, electronic industries, civil Engineering.	√	√	√	√	√	√	Understanding, Analyzing and Applying	Yes	Mid semester tests, End Term Exams
CO 5: Apply the quantitative and qualitative separation techniques in purification and its applications in food industry, pharmaceutical industry, purification, removal of pollutants, medicinal chemistry and essential oils.	√	√	√	√	√	√	Understanding, Analyzing and applying	Yes	Mid semester tests, End Term Exams

**Paper CHP506-18 Advanced Chemistry Lab-II**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Emphasize the importance of different techniques used for titration viz. potentiometry, pHmetry and amperometry .	√	√	√	√	√	√	Understanding, Apply, Analyse, Create	Yes	Mid semester tests, End Term Exams
CO 2: Correlate the theoretical and practical aspects and know about the limits of the experimental error.	√	√	√	√	√	√	Understanding, Apply	Yes	Mid semester tests, End Term Exams
CO 3: Determine the various physical parameters for the various problems under study.	√	√	√	√	√	√	Evaluate	Yes	Mid semester tests, End Term Exams
CO 4: Verify various laws studied in the theory part.	√	√	√	√	√	√	Analyse	Yes	Mid semester tests, End Term Exams

**Paper CHL512A-18 Advanced Physical Chemistry**


Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Understand major aspects of chemical terminology related to surface science, polymers and electrode processes.	√	√	√	√	√	√	Understand, Remember	Yes	Mid semester tests, End Term Exams
CO 2: Develop insights in the micelle formation process and emphasize its application in daily life.	√	√	√	√	√	√	Apply, Analyse	Yes	Mid semester tests, End Term Exams
CO 3: Know about polymers in detail.	√	√	√	√	√	√	Remember	Yes	Mid semester tests, End Term Exams
CO 4: Correlate various types of voltammetric techniques and their importance in sensing field.	√	√	√	√	√	√	Apply, Analyse, Evaluate	Yes	Mid semester tests, End Term Exams

**Paper CHL512E-18 Green Chemistry**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
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CO1: Conceptualize the various syntheses using novel and greener methods.	√	√	√	√	√		Understanding	Yes	Mid semester tests, End Term Exams
CO 2: Predict the relationships between organic chemical structures and their reactivity in different greener and benign conditions.	√	√	√	√	√		Evaluation	Yes	Mid semester tests, End Term Exams
CO 3: Learn the fundamental and advanced concepts of green chemistry in reaction mechanisms.	√	√	√	√	√		Understanding	Yes	Mid semester tests, End Term Exams
CO 4: Apply the new methodologies for altering the reactivity patterns of substrates	√	√	√	√	√	√	Applying	Yes	Mid semester tests, End Term Exams
CO 5: Synthesize various molecules using combinations of reactive species in novel conditions.	√	√	√	√	√		Applying	Yes	Mid semester tests, End Term Exams

  
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**Name of the Department: Chemical Sciences**  
**Programme: B.Sc. Honours Chemistry**

**Paper BHHL105-19 Communicative English-I**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Students will acquire basic proficiency in reading & listening, writing and speaking skills.	√	√	√	√	√	√	Understanding	Yes	Mid semester tests, End Term Exams
CO 2: Students will be able to understand spoken and written English language, particularly the language of their chosen technical field.	√	√	√	√	√	√	Understanding	Yes	Mid semester tests, End Term Exams
CO 3: They will be able to converse fluently and produce on their own clear and coherent texts.	√	√	√	√	√	√	Applying	Yes	Mid semester tests, End Term Exams
CO 4: Students will become proficient in professional communication such as interviews, group discussions, office environments, important reading skills as well as writing skills	√	√	√	√	√	√	Applying	Yes	Mid semester tests, End Term Exams

**Paper BHCP107-19 Inorganic Chemistry Lab-I**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Understand to calibrate and run the instruments for analysis.	√	√	√	√				Yes	Mid semester tests, End Term Exams
CO 2: Learn to the quantitative analysis of various metal ions/cations and anions.	√	√	√	√	√	√		Yes	Mid semester tests, End Term Exams
CO 3: Understand the various principles of different techniques involved in the quantitative analysis.	√	√	√	√	√	√		Yes	Mid semester tests, End Term Exams
CO 4: Learn to prepare various inorganic compounds.	√	√	√	√				Yes	Mid semester tests, End Term Exams

**Paper BHCP108-19 Organic Chemistry Lab-I**


Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: To check the purity of organic compounds by determining the melting or boiling points	√	√	√	√	√		Understand	Yes	Mid semester tests, End Term Exams
CO 2: To develop preparative skills for purification of organic compounds by crystallization method.	√	√	√	√	√		Understand and apply	Yes	Mid semester tests, End Term Exams
CO 3: To determine the element or functional groups present in organic compound by organic qualitative analysis.	√	√	√	√	√		Understand and apply	Yes	Mid semester tests, End Term Exams
CO 4: To present their work with practical skills and the awareness of health and safety procedures.	√	√	√	√	√	√	Apply	Yes	Mid semester tests, End Term Exams
CO 5: To apply related experiments for their research work	√	√	√	√	√	√	Apply	Yes	Mid semester tests, End Term Exams

**Paper BHHL115-19 Communicative English-II**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Students will acquire basic proficiency in LSRW skills- listening, speaking, reading, and writing.	√	√	√	√	√	√	Applying	Yes	Mid semester tests, End Term Exams
CO 2: Students will be able to develop their vocabulary so that they can understand spoken and written English language, particularly the language of their chosen technical field	√	√	√	√	√	√	Understanding	Yes	Mid semester tests, End Term Exams
CO 3: Students will be introduced to the skills and strategies of reading and writing by identifying organizational patterns, spotting classification systems and understanding associations between ideas through study of literary texts.	√	√	√	√	√	√	Understanding	Yes	Mid semester tests, End Term Exams
CO 4: Students will be able to converse fluently and produce on their own clear and coherent texts.	√	√	√	√	√	√	Applying	Yes	Mid semester tests, End Term Exams
CO 5: Students will be able to improve the employability of students and make them proficient in professional communication through understanding of career documents; job interviews; group discussions; internal communication in office environments etc.	√	√	√	√	√	√	Applying	Yes	Mid semester tests, End Term Exams

**Paper BHCP117-19 Inorganic Chemistry Lab-II**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
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CO1: CO1. Understand the concept of qualitative analysis.	√	√	√	√			Understanding	Yes	Mid semester tests, End Term Exams
CO 2: CO2. Learn to identify present cations and anions through qualitative analysis of various metal ions/cations and anions.	√	√	√	√	√	√	Applying	Yes	Mid semester tests, End Term Exams
CO 3: CO3. Understand the various techniques/principles involved in the qualitative analysis of mixtures in presence or absence of interfering ions.	√	√	√	√			Understanding	Yes	Mid semester tests, End Term Exams
CO 4: CO4. Learn to separate and identify less familiar ions through qualitative analysis.	√	√	√	√	√	√	Understanding	Yes	Mid semester tests, End Term Exams

**Paper BHCP118-19 Physical Chemistry Lab-I**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Understand the basic procedures for carrying out a physical chemistry practical like preparation and standardisation of solutions, handling the equipments and measuring with precision.	√	√	√		√	√	Understanding, Apply	Yes	Mid semester tests, End Term Exams
CO 2: Correlate the theoretical and practical aspects and know about the limits of the experimental error.	√	√	√		√	√	Understanding, Apply	Yes	Mid semester tests, End Term Exams
CO 3: Determine the various physical parameters for the various problems under study.	√	√	√	√		√	Evaluate	Yes	Mid semester tests, End Term Exams
CO 4: Verify various laws studied in the theory part.	√	√	√	√		√	Analyse	Yes	Mid semester tests, End Term Exams
								Yes	Mid semester tests, End Term Exams

**Paper UC-BSHP-125-19 Physics Lab-II**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Able to verify the theoretical concepts/laws learnt in theory courses.	√	√	√	√	√	√	understand	Yes	Mid semester tests, End Term Exams
CO 2: Trained in carrying out precise measurements and handling sensitive equipment.	√	√	√	√	√	√	understand	Yes	Mid semester tests, End Term Exams
CO 3: Understand the methods used for estimating and dealing with experimental uncertainties and systematic "errors".	√	√	√	√	√	√	apply	Yes	Mid semester tests, End Term Exams
CO 4: Learn to draw conclusions from data and develop skills in experimental design.	√	√	√	√	√	√	apply	Yes	Mid semester tests, End Term Exams
CO 5: Document a technical report which communicates scientific information in a clear and concise manner.	√	√	√	√	√	√	apply	Yes	Mid semester tests, End Term Exams

**Paper BHCL203-19 Spectroscopy**


Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Understand the fundamental principles and theories of various spectroscopic techniques	√	√	√	√	√		Understanding	Yes	Mid semester tests, End Term Exams
CO 2: Learn the interaction of various electromagnetic radiations with matter	√	√	√	√	√		Applying	Yes	Mid semester tests, End Term Exams
CO 3: Learn about the behaviour of different types of compounds towards different electromagnetic radiations	√	√	√	√	√	√	Applying	Yes	Mid semester tests, End Term Exams
CO 4: Understand the applications of interaction of light in their characterization	√	√	√	√	√		Understanding	Yes	Mid semester tests, End Term Exams
CO 5: Learn about the role of different techniques in the characterization of different compounds	√	√	√	√	√	√	Applying	Yes	Mid semester tests, End Term Exams

**Paper BHCP206-19 Organic Chemistry Lab-II**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: To synthesise organic compounds by conventional and greener approach.	√	√	√	√	√		Understanding and Apply	Yes	Mid semester tests, End Term Exams
CO 2: To develop preparative skills for purification of organic compounds by crystallization method.	√	√	√	√	√		Understanding and Apply	Yes	Mid semester tests, End Term Exams
CO 3: To separate the organic compound by thin layer chromatography technique.	√	√	√	√	√		Understanding and Apply	Yes	Mid semester tests, End Term Exams
CO 4: To present their work with practical skills and the awareness of health and safety procedures.	√	√	√	√	√	√	Apply	Yes	Mid semester tests, End Term Exams
CO 5: To apply related experiments for their research work	√	√	√	√	√	√	Apply	Yes	Mid semester tests, End Term Exams

**Paper BHCP207-19 Physical Chemistry Lab-II**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
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CO1: Understand the basic procedures for carrying out a physical chemistry practical like preparation and standardisation of solutions, handling the equipments and measuring with precision.	✓	✓	✓	✓	✓	✓	Understanding, Apply	Yes	Mid semester tests, End Term Exams
CO 2: Correlate the theoretical and practical aspects and know about the limits of the experimental error.	✓	✓	✓	✓	✓	✓	Understanding, Apply	Yes	Mid semester tests, End Term Exams
CO 3: Determine the various physical parameters for the various problems under study.	✓	✓	✓	✓	✓	✓	Evaluate	Yes	Mid semester tests, End Term Exams
CO 4: Verify various laws studied in the theory part.	✓	✓	✓	✓	✓	✓	Analyse	Yes	Mid semester tests, End Term Exams
								Yes	Mid semester tests, End Term Exams

#### Paper BHCL213-19 Green Chemistry

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: CO1. Understand the fundamental concepts of green chemistry	✓	✓	✓	✓	✓	✓	Understanding	Yes	Mid semester tests, End Term Exams
CO 2: CO2. Learn the use of these fundamental principles for the designing of various chemical reactions	✓	✓	✓	✓	✓	✓	Understanding	Yes	Mid semester tests, End Term Exams
CO 3: CO3. Understand the various techniques available and their present applications in different green reactions	✓	✓	✓	✓	✓	✓	Understanding	Yes	Mid semester tests, End Term Exams
CO 4: CO4. Learn about the various applications of the green chemistry	✓	✓	✓	✓	✓	✓	Applying	Yes	Mid semester tests, End Term Exams
CO 5: CO5. Understand the various expected future trends of the green chemistry	✓	✓	✓	✓	✓	✓	Applying	Yes	Mid semester tests, End Term Exams

#### Paper BHCL214-19 Polymer Chemistry

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Study the nomenclature, classifications and bonding in polymers	✓	✓	✓	✓	✓	✓	Understanding	Yes	Mid semester tests, End Term Exams
CO 2: Learn the criteria for the synthesis of polymers and mechanism involved in polymerization	✓	✓	✓	✓	✓	✓	Understanding	Yes	Mid semester tests, End Term Exams
CO 3: Understand the morphology, kinetics and their structure property relationship	✓	✓	✓	✓	✓	✓	Understanding	Yes	Mid semester tests, End Term Exams
CO 4: Learn the various techniques used for determining the molecular weight of polymeric compounds	✓	✓	✓	✓	✓	✓	Understanding and Evaluation	Yes	Mid semester tests, End Term Exams
CO 5: Study the physical, thermal, Flow and Mechanical Properties of Polymers	✓	✓	✓	✓	✓	✓	Understanding and Analysis	Yes	Mid semester tests, End Term Exams

#### Paper BHCL216-19 Basic Analytical Chemistry

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Understand the basics of analytical chemistry.	✓	✓	✓	✓	✓	✓	Understanding	Yes	Mid semester tests, End Term Exams
CO 2: Know about soil and water, their sampling, analysis & purification methods.	✓	✓	✓	✓	✓	✓	Understanding and	Yes	Mid semester tests, End Term Exams
CO 3: Familiarise with the principles and techniques of chromatography.	✓	✓	✓	✓	✓	✓	Understanding	Yes	Mid semester tests, End Term Exams
CO 4: Aware of the nutritional value of various food items and concept of food processing and adulteration.	✓	✓	✓	✓	✓	✓	Understanding	Yes	Mid semester tests, End Term Exams
CO 5: Understand the functions of various constituents present in cosmetics.	✓	✓	✓	✓	✓	✓	Understanding	Yes	Mid semester tests, End Term Exams

#### Paper BHCP217-19 Inorganic Chemistry Lab-III

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Understand the concept of quantitative analysis.	✓	✓	✓	✓	✓	✓	Understanding	Yes	Mid semester tests, End Term Exams
CO 2: Understand the various techniques/principles involved in the quantitative analysis for present metal ions.	✓	✓	✓	✓	✓	✓	Understanding	Yes	Mid semester tests, End Term Exams
CO 3: Learn to synthesize various inorganic compounds	✓	✓	✓	✓	✓	✓	Applying	Yes	Mid semester tests, End Term Exams
CO 4: Understand the principles involved in chromatographic separations	✓	✓	✓	✓	✓	✓	Understanding	Yes	Mid semester tests, End Term Exams
CO 5: Learn to estimate the cations present, through quantitative analysis	✓	✓	✓	✓	✓	✓	Applying	Yes	Mid semester tests, End Term Exams

#### Paper BHCP218-19 Physical Chemistry Lab-III

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
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CO1: Understand the basic procedures for carrying out a physical chemistry practical like preparation and standardisation of solutions, handling the equipments and measuring with precision.	√	√	√		√	√	Understanding, Apply	Yes	Mid semester tests, End Term Exams
CO 2: Correlate the theoretical and practical aspects and know about the limits of the experimental error.	√	√	√		√	√	Understanding, Apply	Yes	Mid semester tests, End Term Exams
CO 3: Determine the various physical parameters for the various problems under study.	√	√	√	√		√	Evaluate	Yes	Mid semester tests, End Term Exams
CO 4: Verify various laws studied in the theory part.	√	√	√	√		√	Analyse	Yes	Mid semester tests, End Term Exams
								Yes	Mid semester tests, End Term Exams

**Paper BHCP219-19 Basic Analytical Chemistry Lab**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Identify the adulterants in common food items.	√	√			√	√	Understanding and Analyzing	Yes	Mid semester tests, End Term Exams
CO 2: Analyse samples of soil (pH) and water (pH, acidity, alkalinity etc)	√	√	√	√	√	√	Understanding and Analyzing	Yes	Mid semester tests, End Term Exams
CO 3: Learn the paper chromatographic technique for separation of metal ions.	√	√	√			√	Understanding and Analyzing	Yes	Mid semester tests, End Term Exams
CO 4: Learn the spectrophotometric determination of compounds in commercial products.	√	√	√	√	√	√	Understanding and Analyzing	Yes	Mid semester tests, End Term Exams

**Paper BHCL304-19 Analytical Clinical Biochemistry**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Understand the structure & functions of Biomolecules.	√	√	√	√	√		Understanding	Yes	Mid semester tests, End Term Exams
CO 2: An advanced understanding and applied knowledge of the theory of clinical biochemistry.	√	√	√	√	√		Understanding	Yes	Mid semester tests, End Term Exams
CO 3: A critical understanding of how biochemical investigations are employed to develop a clinical diagnosis.	√	√	√	√	√		Understanding	Yes	Mid semester tests, End Term Exams
CO 4: To gain knowledge and understanding of clinical disorders.	√	√	√	√	√		Understanding	Yes	Mid semester tests, End Term Exams
CO 5: To gain knowledge of biological samples and their collection procedures.	√	√	√	√	√		Applying	Yes	Mid semester tests, End Term Exams

**Paper BHCL305-19 Industrial Chemicals and the Environment**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: understand different toxic gases and their toxicity hazards, Safe design systems for large scale production of industrial gases.	√	√	√		√	√	Understand, Analyze and Apply	Yes	Mid semester tests, End Term Exams
CO 2: Understand manufacturing processes, handling and storage of inorganic chemicals and knowledge of Hazardous effects of the inorganic chemicals on human beings and vegetation.	√	√			√	√	Understanding	Yes	Mid semester tests, End Term Exams
CO 3: understand the requirement of ultra-pure metals for the semiconducting technologies.				√	√		Understanding	Yes	Mid semester tests, End Term Exams
CO 4: understand different sources, effects and control measures of air, water pollutants, water quality parameters, different methods of Treatment of effluents from different sources.	√	√	√	√	√	√	Understand and Analyze	Yes	Mid semester tests, End Term Exams
CO 5: understand different sources of energy, source of nuclear waste and its disposal. Use of biocatalyst in chemical industries.			√	√	√	√	Understand and Analyze	Yes	Mid semester tests, End Term Exams

**Paper BHCL306-19 Ligand Field Theory**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Understand the fundamental concepts of various aspects of Ligand Field Theory	√	√	√	√	√		Understanding	Yes	Mid semester tests, End Term Exams
CO 2: Learn the different aspects of crystal field theory	√	√	√	√	√	√	Applying	Yes	Mid semester tests, End Term Exams
CO 3: Understand the effect of weak, medium and strong crystal field on free ions	√	√	√	√	√		Understand	Yes	Mid semester tests, End Term Exams
CO 4: Learn about the electronic spectra of transition metal complexes	√	√	√	√	√	√	Applying	Yes	Mid semester tests, End Term Exams
CO 5: Understand the factors affecting the electronic spectra of the complexes	√	√	√	√	√		Understand	Yes	Mid semester tests, End Term Exams

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**Paper BHCP307-19 Inorganic Chemistry Lab-IV**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Understand the concept of quantitative analysis.	✓	✓	✓	✓	✓		Understand	Yes	Mid semester tests, End Term Exams
CO 2: Learn to estimate the present cations through quantitative analysis	✓	✓	✓	✓	✓	✓	Applying	Yes	Mid semester tests, End Term Exams
CO 3: Understand the various techniques/principles involved in the quantitative analysis present metal ions.	✓	✓	✓	✓	✓		Understand	Yes	Mid semester tests, End Term Exams
CO 4: Learn to perform the volumetric analysis using different methods.	✓	✓	✓	✓	✓	✓	Applying	Yes	Mid semester tests, End Term Exams

**Paper BHCP308-19 Organic Chemistry Lab-III**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: To synthesise organic compounds by various approach.	✓	✓	✓	✓	✓		Understanding	Yes	Mid semester tests, End Term Exams
CO 2: To develop preparative skills for purification of organic compounds by crystallization method.	✓	✓	✓	✓	✓		Understanding and evaluation	Yes	Mid semester tests, End Term Exams
CO 3: To separate the organic compound by thin layer chromatography technique.	✓	✓	✓	✓	✓		Analysis and Evaluation	Yes	Mid semester tests, End Term Exams
CO 4: To present their work with practical skills and the awareness of health and safety procedures.	✓	✓	✓	✓	✓	✓	Analysis	Yes	Mid semester tests, End Term Exams
CO 5: To apply related experiments for their research work	✓	✓	✓	✓	✓	✓	Analysis	Yes	Mid semester tests, End Term Exams

**Paper BHCL313-19 Catalysis**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Understand the Organometallic chemistry	✓	✓	✓	✓	✓		Understanding	Yes	Mid semester tests, End Term Exams
CO 2: Understand the fundamental concepts of various concepts involved in catalysis.	✓	✓	✓	✓	✓		Understanding	Yes	Mid semester tests, End Term Exams
CO 3: Learn different application of catalysis in the synthesis of organic compounds.	✓	✓	✓	✓	✓		Apply	Yes	Mid semester tests, End Term Exams
CO 4: To Understand role of catalysis in biological model	✓	✓	✓	✓	✓	✓	Apply	Yes	Mid semester tests, End Term Exams

**Paper BHCL314-19 Analytical Methods in Chemistry**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: explain the fundamentals of analytical chemistry and steps of a characteristic analysis.	✓	✓	✓		✓	✓	Understanding	Yes	Mid semester tests, End Term Exams
CO 2: estimate kinds of errors in chemical analysis.	✓	✓	✓	✓	✓	✓	Apply, Analyse, Evaluate	Yes	Mid semester tests, End Term Exams
CO 3: Identify quality of experimental measurements.	✓	✓	✓	✓	✓	✓	Remember	Yes	Mid semester tests, End Term Exams
CO 4: Interpret the sources of random errors and effects of random errors on analytical results.	✓	✓	✓	✓	✓	✓	Understanding, Apply, Evaluate	Yes	Mid semester tests, End Term Exams
CO 5: Familiarise with various analytical techniques and compare them.	✓	✓	✓	✓	✓		Understanding, Remember	Yes	Mid semester tests, End Term Exams

**Paper BHCL315-19 Nanochemistry**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Understand the fundamental concepts of nanomaterials.	✓	✓	✓	✓	✓		Understanding	Yes	Mid semester tests, End Term Exams
CO 2: Learn the different methods of chemical synthesis of nanoparticles.	✓	✓	✓	✓	✓		Applying	Yes	Mid semester tests, End Term Exams
CO 3: Understand the basic techniques about the organic nanoparticles.	✓	✓	✓	✓	✓		Understanding	Yes	Mid semester tests, End Term Exams
CO 4: Learn about the various characterization techniques.	✓	✓	✓	✓	✓	✓	Applying	Yes	Mid semester tests, End Term Exams
CO 5: Understand the various applications of nanomaterials.	✓	✓	✓	✓	✓	✓	Understanding	Yes	Mid semester tests, End Term Exams

**Paper BHCL316-19 Molecular Modelling and Drug Design**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Understand the fundamental concepts of molecular modelling.	✓	✓	✓	✓	✓		Understanding	Yes	Mid semester tests, End Term Exams
CO 2: Learn the different methods of energy minimization and computer simulation.	✓	✓	✓	✓	✓		Applying	Yes	Mid semester tests, End Term Exams
CO 3: Understand the basic concepts of molecular dynamics.	✓	✓	✓	✓	✓		Understanding	Yes	Mid semester tests, End Term Exams
CO 4: Learn about the various concepts of drug designing and molecular modelling.	✓	✓	✓	✓	✓	✓	Applying	Yes	Mid semester tests, End Term Exams


**Paper BHCP318-19 Organic Chemistry Lab-IV**



Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: To study about properties of amino acids/proteins/enzymes.	√	√	√	√	√		Understanding	Yes	Mid semester tests, End Term Exams
CO 2: To estimate amino acids/proteins by various methods.	√	√	√	√	√		Analysis	Yes	Mid semester tests, End Term Exams
CO 3: To understand the isolation and characterisation of DNA.	√	√	√	√	√	√	Understanding	Yes	Mid semester tests, End Term Exams
CO 4: To present their work with practical skills and the awareness of health and safety procedures.	√	√	√	√	√	√	Analysis	Yes	Mid semester tests, End Term Exams
CO 5: To apply related experiments for their research work	√	√	√	√	√	√	Analysis	Yes	Mid semester tests, End Term Exams

**Paper BHCP319-19 Physical Chemistry Lab-IV**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Understand the basic procedures for carrying out a physical chemistry practical like preparation and standardisation of solutions, handling the equipments and measuring with precision.	√	√	√		√	√	Understanding, Apply	Yes	Mid semester tests, End Term Exams
CO 2: Correlate the theoretical and practical aspects and know about the limits of the experimental error.	√	√	√		√	√	Understanding, Apply	Yes	Mid semester tests, End Term Exams
CO 3: Determine the various physical parameters for the various problems under study.	√	√	√	√		√	Evaluate	Yes	Mid semester tests, End Term Exams
CO 4: Verify various laws studied in the theory part.	√	√	√	√		√	Analyse	Yes	Mid semester tests, End Term Exams

  
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