

Objectives and Learning Outcomes of M.Sc. Chemistry

Course Objectives: To equip the students with the knowledge of bonding and structures of Inorganic compounds and their chemical aspects

Course Learning Outcomes: Upon successful learning, students will be able to

Unit I: access structural knowledge of inorganic molecules and their applications

Unit II: understand metal- ligand interaction in solution phase and their applications

Unit III: apply crystal field theory and molecular orbital theory for metal-ligand bonding

Unit IV: evaluate acidic nature acids formed by oxides and hydroxides of metals

Unit V: understand preparation, properties and structural aspects of metal-ligand pi complex.

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Objectives and Learning Outcomes of M.Sc. Chemistry

Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	First	CHE-CC-122	Organic Chemistry	Mid Sem: 40 End Sem = 60	04

Course Objectives: To impart advanced knowledge on nature of bonding in organic molecules, structure and reactivity, reaction mechanism, nucleophilic substitution, addition reactions to carbon-heteroatom multiple bonds and radical reactions.

Course Learning Outcomes: Upon successful completion of the course, students will be able to understand:

Unit I: The fundamental concept of delocalized chemical bonding, conjugation in organic molecules and role of electronic effects.

Unit II: Types of organic reactions and determining reaction mechanism, kinetics, energetics, structure, stabilities and reactivities of various reactive intermediates.

Unit III: The fundamental concepts of aliphatic nucleophilic substitution reactions, neighbouring group participations including their reaction mechanism and stereochemical outcomes of products.

Unit IV: The fundamental aspects of various addition reactions to carbon-heteroatom multiple bonds including their mechanistic aspects and applications in organic synthesis.

Unit V: The chemistry for the generation radicals, detection, radical geometry and stability, various types of free radical reactions, including radical substitution, rearrangement and oxidation reaction, mechanistic aspects of various free radical reactions.

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Course Objectives: To impart advanced knowledge on nature of bonding in organic molecules, structure and reactivity, reaction mechanism, nucleophilic substitution, addition reactions to carbon-heteroatom multiple bonds and radical reactions.

Unit I: Basic principles and laws of Quantum Chemistry
Unit II: Understanding about classical thermodynamics including non ideal systems.
Unit III: Understanding rate laws based on Chemical Kinetics
Unit IV: Understanding different aspects of surface chemistry
Unit V: Different aspects of Electrochemistry

Scheme of M.Sc. Program in Chemistry under CBCS system

Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	First	CHE-CC-124	Group Theory and Spectroscopy	Mid Sem: 40 End Sem = 60	04

Course Objectives: To impart advanced knowledge on nature of bonding in organic molecules, structure and reactivity, reaction mechanism, nucleophilic substitution, addition reactions to carbon-heteroatom multiple bonds and radical reactions.

Course Learning Outcomes: Upon successful completion of the course, students will be able to understand:

Unit I: Basic principles of symmetry and group theory

Unit II: Background of spectroscopy and their applications.

Unit III: Understanding various aspects of molecular spectroscopy

Unit IV: Basic principles of vibrational spectroscopy including and its application in molecular characterization

Unit V: Basic principles of Raman spectroscopy and Microwave spectroscopy with different applications.

Objectives and Learning Outcomes of M.Sc. Chemistry

Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	Second	CHE-CC-125A	Mathematics for Chemists	Mid Sem: 40 End Sem = 60	02

Course Objectives: To equip the students with the knowledge of basic mathematics routinely used in Chemistry

Course Learning Outcomes: Upon successful learning, students will be able to

- Unit I: Basic asthmatics of vector addition, subtraction and multiplications and Matrices
- Unit II: would able to calculates number of permutations, combinations and probability
- Unit III: learn differential calculus viz. functions, continuity, and differentiation of a function.
- Unit IV: learn to solve the integration of a function of single and multiple variables.
- Unit V: learn to solve the differential equations and their applications in kinetics, quantum chemistry, spectroscopy

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Department of Chemistry						
Class	Subject	Semester	Course code	Course Title	Marks	Credit
M.Sc.	Chemistry	First	CHE-C-125B	Bio. For Chemist	Midsem -40 Endsem – 60	02

Course Objectives: To introduce the basics of the chemical structure and function of important biological molecules. .

Course learning outcomes: Upon successful learning, students will be able to

Unit I- Incorporate the basic terminology of cell structures and inculcating the understanding of the basic function different cell organelles as well as introducing the biomolecules.

Unit-II- To impart understanding about the structure and function of important carbohydrates and learning the carbohydrate metabolism through various biological cycles.

Unit III- To know and gain information about various important lipid molecules in biological system and their role in the structure of biological membrane.

Unit IV- To gain knowledge about the chemical and enzymatic reactions of peptides, proteins and amino acids, study amino acid metabolism and sequence determination.

Unit V- Understanding the chemical composition of the genetic material DNA and RNA as well as preliminary information about their replication.

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Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	First	CHE-CC-126	Inorganic Chemistry	Mid Sem: 40 End Sem = 60	04
Course Objectives: To impart practical knowledge of qualitative and quantitative analysis of less common ion in metallic mixture, in alloys and in less soluble inorganic compounds Course Learning Outcomes: Upon successful learning, students will be able to - Identify the less common ions directly and in the mixture - Analyze less soluble metal oxides - Identify metals from the metallic alloys						

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Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	First	CHE-CC-127	Laboratory Course - Organic Chemistry	Mid Sem: 40 End Sem = 60	02

Course Objectives:

- To develop experimental skills of various qualitative analysis including separation and purification techniques, TLC and column chromatographic methods, functional group identification using IR spectra.
- To prepare various organic compounds, study of reaction mechanism involving different reactive intermediates, characterization of products by spectral techniques.
- To develop experimental skills for quantitative analysis.

Course Learning Outcomes: Upon successful learning, students will be able

- To acquire knowledge on the qualitative analysis of separation of binary mixture of organic compounds and purification techniques,
- To understand separation by TLC methods, separation and purification by column chromatographic methods,
- To develop knowledge on functional group identification using IR spectra.
- To prepare various organic compounds involving different reactive intermediates, study of reaction mechanism, characterization of products by various spectral techniques.
- To understand quantitative analysis and develop experimental skill to determine iodine and saponification values of an Oil sample and acquire knowledge on DO, COD, BOD of water sample.

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Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	First	CHE-CC-128	Laboratory Course - Physical Chemistry	Mid Sem: 40 End Sem = 60	02

Course Objectives:

- To show the practical applications of basic principles of physical chemistry, like of surface chemistry, phase equilibria, chemical kinetics, and electrochemistry

Course Learning Outcomes: Upon successful learning, students will be able to understand

- How to analyse errors and other statistical data
- To get hand on experience how to measure adsorption, determine congruent composition of binary mixture, glass transition temperatures, constructing phase diagram for 3 component system
- To calculate velocity constant of various rate equations including ester hydrolysis, iodine clock reaction and primary kinetic salt effect.
- To determine molecular weight, degree of dissociation of different electrolyte.
- To determine the rate constant for hydrolysis/ inversion of sugar using polarimeter

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Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	Second	CHE-CC-221	Inorganic Chemistry	Mid Sem: 40 End Sem = 60	04
Course Objectives: To impart mechanistic knowledge of inorganic chemical reactions and processes Course Learning Outcomes: Upon successful learning, students will be able to Unit I: access thermodynamic and kinetic knowledge of inorganic reactions Unit II: be aware of reaction mechanism of nucleophilic substitution and electron transfer reactions of coordination compounds Unit III: understand chemistry of metal-clusters Unit IV: investigate the spectral characteristics of electronic transitions Unit V: apply spectral and magnetic properties of molecule in molecular characterization.						

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Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	Second	CHE-CC-222	Organic Chemistry	Mid Sem: 40 End Sem = 60	04

Course Objectives: To impart advanced knowledge of reactive intermediates, stereochemistry of organic compounds, pericyclic reactions

Course Learning Outcomes: Upon successful learning, students will be able to learn

Unit-I : The chemistry of different types of aliphatic substitution reaction and its application.

Unit-II : The chemistry of different types of aromatic electrophilic and nucleophilic substitution reaction and its application in advanced organic chemistry.

Unit-III : A concept of stereochemistry with stereo chemical aspects of organic synthesis at advance level.

Unit-IV: The mechanistic facets of Addition of Carbon- Carbon multiple bonds and Elimination reactions.

Unit-V : The advance knowledge of Pericyclic Reactions.

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Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	Second	CHE-CC-223	Physical Chemistry	Mid Sem: 40 End Sem = 60	04

Course Objectives: To impart advanced knowledge about quantum mechanics, equilibrium and dynamics of a chemical reaction.

Course Learning Outcomes: Upon successful learning, students will be able to learn

Unit-I: Concept of an angular momentum and electronic energy states of atom.

Unit-II: Chemistry behind equilibrium existed between different phases and physical understanding of macromolecules.

Unit-III: Thermodynamics at molecular level and in non-equilibrium states.

Unit-IV: Dynamics of a chemical reaction.

Unit-V: Various applications of electrochemistry and chemistry behind that.

Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	Second	CHE-CC-224	Spectroscopy and Diffraction Methods	Mid Sem: 40 End Sem = 60	03

Course Objectives: To make aware the students with various aspects of spectroscopy and diffraction methods as well as to equip them to use this knowledge for practical purposes.

Course Learning Outcomes: Upon successful learning, students will be able to

Unit I: understand various aspects of Nuclear Magnetic Resonance Spectroscopy like NMR like shielding of magnetic nuclei; factors influencing chemical shift etc.

Unit II: understand basic principles of Electron Spin Resonance Spectroscopy (ESR) and other important factors like factors affecting the ‘g’ value, Isotropic and anisotropic hyperfine constant etc.

Unit III: understand basic principles of photoelectron spectroscopy

Unit IV: understand principles and different aspects of X-ray diffraction, Debye – Scherrer method of X-ray structural analysis of crystals, Ramchandran diagrams etc.

Unit V: understand principles and applications of electron diffraction and neutron diffraction

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Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	Second	CHE-CC-225	Computer for Chemists (Theory)	Mid Sem: 40 End Sem = 60	02

Course Objectives: To equip the students with the knowledge of programming in FORTRAN

Course Learning Outcomes: Upon successful learning, students will be able to

- Unit I: know the basic structure and functioning of a computer
- Unit II: Learns FORTRAN language and various FORTRAN Statements and expressions
- Unit III: Develops small FORTRAN code using Chemistry formulas
- Unit IV: Develop code for the laboratory data analysis such as linear regression
- Unit V: how to operate standard program packages such as MS Excel using PC.

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Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	Two	CHE-CC-226	Inorganic Chemistry	Mid Sem: 40 End Sem = 60	04
Course Objectives: To impart practical knowledge of synthesis and spectral analysis of molecules Course Learning Outcomes: Upon successful learning, students will be able to • Synthesize the inorganic molecules • Understand spectral characteristics of the molecules • Apply spectroscopic knowledge in molecular characterization						

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Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	Second	CHE-CC-227	Laboratory Course - Organic Chemistry	Mid Sem: 40 End Sem = 60	02

Course Objectives:

- To develop experimental skills and techniques for organic synthesis and characterization of products by physical and spectral analysis.
- To develop experimental skill for quantitative analysis.

Course Learning Outcomes: Upon successful learning, students will be able to

- To acquire knowledge on principle and different techniques of organic synthesis to prepare various classes of organic compounds and purification methods,
- To gain knowledge on characterization of organic compounds using physical methods and spectroscopic analysis of IR and NMR spectra.
- To understand quantitative analysis and develop experimental skill for determination of number of hydroxyl groups and estimation of amines, phenols in an organic compound using acetylation method.

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Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	Second	CHE-CC-228	Laboratory Course-Physical Chemistry	Mid Sem: 40 End Sem = 60	02
Course Objectives: To equip the students with the knowledge of various experiments of electrochemistry by using conductometric, potentiometric and pH metric titrations Course Learning Outcomes: - Upon successful learning, students will be able to do investigate conductometric application for the - Determination of the strength of strong and weak acids in a given solution, - the effect of solvent on the conductance of AgNO_3 /acetic acid - determination of the degree of dissociation and equilibrium constant in different solvent and their mixtures (DMSO, DMF, dioxane, acetone, water) - the validation of Debye-Huckel-Onsager theory - determination of the activity coefficient using Debye-Huckel's limiting law - Upon successful learning, students will be able to do investigate potentiometric application for the - determination of the strengths of halides in a mixture - determination of valency of ions - determination of the strength of strong acid and weak acids in a given mixture - investigation of the temperature dependence of EMF of a cell - Upon successful learning, students will be able to do investigate pH metric application for the - determination of the activity and activity coefficient of electrolytes - determination of the dissociation constant of acetic acid in DMSO, DMF, acetone and dioxane by titrating it with KOH - determination of the thermodynamic constants ΔG, ΔH, ΔS for the reaction by e.m.f. method						

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Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	Second	CHE-CC-229	Computer for Chemists (Laboratory)	Mid Sem: 40 End Sem = 60	01
Course Objectives: To equip the students with the knowledge of using the standard program packages on computers and do small computer codes using FORTRAN Course Learning Outcomes: Upon successful learning, students will be able to Unit I: learn to operate standard program packages such as MS Excel using PC. Unit II: develop code for linear regression, numerical differentiation etc Unit III: develop FORTRAN code for the chemistry based formulas Unit IV: develop code for the laboratory data analysis such as linear regression Unit V: learn the use of program packages MS word, Excel and power-point etc.						

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Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	Third	CHE-CC-321	Spectroscopy, Photochemistry and Solid State Chemistry	Mid Sem: 40 End Sem = 60	04
Course Objectives: To impart knowledge of spectroscopic techniques and applications and brief knowledge of photochemical and solid state reactions. Course Learning Outcomes: Upon successful learning, students will be able to learn Unit-I: The fundamental principles of different instrumentation techniques and their use applied sciences. Unit-II : Knowledge and Applications of Nuclear Magnetic Resonance focused on ¹H-NMR spectroscopy. Unit-III: Knowledge and Applications of Mass spectrometry. Unit-IV: Basics of photochemical reactions and their use for solving advanced problems Unit-V: Concept of solid state reactions.						

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Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	Third	CHE-CC-322	Bioinorganic, Bioorganic and Biophysical Chemistry	Mid Sem: 40 End Sem = 60	03

Course Objectives: Biological aspects of Inorganic, Organic and Physical chemistry.

Course Learning Outcomes: Upon successful learning, students will be able to learn

Unit-I: The concept of Bioinorganic Chemistry and its biological applications.

Unit-II: Enzyme as biological catalysis and its remarkable catalytic power.

Unit-III: Co-enzyme chemistry and their structures function relationship.

Unit-IV: The concept of Biophysical Chemistry and Bioenergetics.

Unit-IV: The chemistry of Biopolymers and the role of various interactions existing with them.

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Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	Third	CHE-CC-323	Environmenta l Chemistry	Mid Sem: 40 End Sem = 60	02
Course Objectives: To learn about ecological chemical compositions and affect of their imbalance on ecosphere. Course Learning Outcomes: Upon successful learning, students will be able to learn Unit-I: Environmental composition of elements and their ecological cycle. Unit-II: Water quality parameters and their evaluation. Unit-III: Major nutrients of soil and factors affecting soil pollution. Unit-IV: gaseous/ionic composition of atmosphere and the factors that imbalance them. Unit-IV: Chemical pollutions and analytical methods of their sensing.						

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Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	Third	CHE-CC-324	Organometallic Chemistry	Mid Sem: 40 End Sem = 60	03
Course Objectives: To learn about synthesis, structure, bonding and application aspects metal-organic framework. Course Learning Outcomes: Upon successful learning, students will be able to learn Unit-I: Synthetic, stability and application aspects of metal-alkyls and metal-aryls. Unit-II: Chemistry of metal-carbon multiple bonds. Unit-III: Bonding and structural aspects of Pi complexes. Unit-IV: Role and mechanism of organometallic compounds in catalyzing organic reactions. Unit-IV: Aspects of fluxionality in organometallic compounds						

Objectives and Learning Outcomes of M.Sc. Chemistry

Course Objectives: To explore bioinorganic and supramolecular chemistry of inorganic compounds

Objectives and Learning Outcomes of M.Sc. Chemistry

Course Objectives: To give the quantitative ideas about the synthesis properties and uses of small and large heterocyclic rings.

Course Learning Outcomes: Upon successful learning, students will be able to

Unit I: learn about nomenclature and chemical behaviours of heterocycles.

Unit II: explore principle involved in cycle addition and cycle isolation reactions.

Unit III: investigate chemical behaviour of small ring heterocycles

Unit IV: explore chemical behaviour of large hetrocycles and the salts.

Unit V: explore special feature of P, As, Bi and Sb containing heterocycles.

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Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	Third	CHE-EC-327	Chemistry of Natural Products	Mid Sem: 40 End Sem = 60	03

Course Objectives: To introduce the basic knowledge of various natural products including terpenoids, carotenoids, alkaloids, steroids, plant pigments, Haemoglobin, prostaglandins, pyrethroids and rotenones.

Course Learning Outcomes: Upon successful completion of the course, students will be able to understand:

Unit I: The classification, occurrence, isolations, nomenclature, structure determination and chemical synthesis and biosynthesis of terpenoids.

Unit II: The classification, occurrence, isolations, nomenclature, structure elucidation, physiological effects, chemical synthesis and biosynthesis of alkaloids.

Unit III: The occurrence, isolations, nomenclature, determination of structure, chemical synthesis and biosynthesis of steroids.

Unit IV: The classification, occurrence, isolations, nomenclature, methods for determination of structure, chemical synthesis of various plant pigments, synthesis of haemoglobin, and biosynthesis of flavonoids.

Unit V: The classification, occurrence, isolations, nomenclature, biogenesis and physiological effects of prostaglandins, chemistry and importance of pyrethroids and rotenones.

Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	Third	CHE-EC-328	Chemistry of Materials	Mid Sem: 40 End Sem = 60	03

Course Objectives: To explore chemistry behind the materials.

Course Learning Outcomes: Upon successful completion of the course, students will be able to understand:

Unit I: preparation and chemical aspects of multiphase materials.

Unit II: Properties, different states and applications of glass, ceramics, composites and nanomaterials.

Unit III: Different aspects (physical, chemical and structural) of liquid crystals.

Unit IV: Materials and their conduction behaviour.

Unit V: Conductivity, magnetism and optical behaviour of organic solids.

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Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	Third	CHE-EC-329	Nuclear Chemistry and Radio Chemistry	Mid Sem: 40 End Sem = 60	03

Course Objectives: To explore Nuclear and Radiochemistry.

Course Learning Outcomes: Upon successful completion of the course, students will be able to understand:

Unit I: Radioactive radiations and their affects.

Unit II: Nuclear properties, especiaaly aspects of size and magnetic behaviour of the nucleus.

Unit III: Nuclear models to understand nuclear structure and their properties.

Unit IV: Nuclear reactions and mechanism behind that.

Unit V: Applications of nuclear reactions like in nuclear fission, nuclear fusion etc.

Department of Chemistry						
Class	Subject	Semester	Course code	Course Title	Marks	Credit
M.Sc.	Chemistry	Third	CHE-EC-3210	Advanced Anal. Chem	Midsem -40 Endsem – 60	03
Course Objectives: To impart an understanding about various qualitative and quantitative methods of analysis and statistical data handling. Course learning outcomes: Upon successful learning, students will be able to understand Unit I: how to prepare samples, how to analyse different experimental results and error evaluation. Unit II: how to analyze different food materials. Unit III: the nature of water pollution and to measure the same Unit IV: To analyze soil, fuel, body fluids and drugs Unit V: The clinical chemistry and drug analysis						

Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	Third	CHE-CC-3211	Laboratory course- Inorganic Chemistry	Mid Sem: 40 End Sem = 60	01

Course Objectives: To develop experimental skills of synthetic Inorganic chemistry and methods of characterization of molecules.

Course Learning Outcomes: Upon successful learning, students will be able to learn

- Synthetic methods for inorganic molecules.
- Application of spectroscopic techniques for characterization of synthesized molecules.
- Thermal of and magnetic analysis of Inorganic molecules and their applications.

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Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	Third	CHE-CC-3212	Laboratory course- Organic Chemistry	Mid Sem: 40 End Sem = 60	01

Course Objectives: To develop experimental skills of various separation, purification techniques and structural elucidation of natural products.

Course Learning Outcomes: Upon successful learning, students will be able to learn

- Isolation and identification of natural products.
- Estimation of bio-molecules by chemical methods.
- Multistage organic synthesis and spectroscopic analysis.

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Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	Fourth	CHE-CC-421	Spectroscopy, Photochemistry and Solid State Chemistry	Mid Sem: 40 End Sem = 60	04

Course Objectives: Advance knowledge of spectroscopy with electronic properties and band theory.

Course Learning Outcomes: Upon successful learning, students will be able to learn

Unit-I: Knowledge of Nuclear Quadrupole Resonance and Moss Bauer Spectroscopy.

Unit-II: Knowledge and Applications of Nuclear Magnetic Resonance focused on various types of ¹³C-NMR spectroscopy.

Unit-III: Photochemical reactions of different types of carbonyl compounds.

Unit-IV: Electronic properties of metals and band theory

Unit-V: how to deduce/solve the chemical structures of unknown/ known organic molecules by using combinatorial spectroscopy techniques.

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Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	Fourth	CHE-CC-422	Bioinorganic, Bioorganic and Biophysical Chemistry	Mid Sem: 40 End Sem = 60	03

Course Objectives: Advance biological aspects of Inorganic, Organic and Physical chemistry.

Course Learning Outcomes: Upon successful learning, students will be able to learn

Unit-I: The biochemistry of inorganic elements and compounds which includes the dynamics of metal ions in living systems, the function of metalloproteins, and the application of inorganic medicines.

Unit-II: About the scientific disciplines of chemistry and biochemistry where implementation of chemical methods in the study of biological processes with biological aspects of organic chemistry will be discussed.

Unit-III: Applications Of Enzymes In Biotechnology particularly in Cell Biology and Molecular Biology:

Unit-IV: About many techniques in numerous scientific fields by combining elements of biology, chemistry, and physics to elucidate the function of biological processes with the help of multiple studies, therefore as multi-disciplinary scientific field.

Unit-V: Structures and properties of biopolymers and knowledge of various diffraction methods.

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Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	Fourth	CHE-CC-423	Environmental Chemistry	Mid Sem: 40 End Sem = 60	03

Course Objectives: To make students aware about nature of chemicals and chemical pollution in nature.

Course Learning Outcomes: Upon successful learning, students will be able to learn

Unit-I: Chemical pollutions generated from cement and pulp& paper industry.

Unit-II: Chemical pollution generated from thermal and nuclear power plants.

Unit-III: Metallurgical processes and process of chemical waste management.

Unit-IV: Chemical methods to solve environmental pollution.

Unit-V: Case studies of chemical pollution.

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Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	Fourth	CHE-EC-424	Photoinorganic Chemistry	Mid Sem: 40 End Sem = 60	04
Course Objectives: To explore photo-physical and photochemical processes in inorganic compounds Course Learning Outcomes: Upon successful learning, students will be able to Unit I: understand and apply basics of photochemistry Unit II: evaluate properties of excited states Unit III: understand chemistry of excited states of metal complexes Unit IV: explore redox reactions of metal complexes and Unit V: investigate chemistry of metal complex sensitizer.						

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Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	Fourth	CHE-EC-425	Organic Synthesis	Mid Sem: 40 End Sem = 60	03

Course Objectives: To investigate various organic synthetic reaction and explore about the disconnection and retro synthetic analysis.

Course Learning Outcomes: Upon successful learning, students will be able to

- Unit I - identity usage of organometallic compounds in organic synthesis.
- Unit II - understand migration aptitude in various types of rearrangements.
- Unit III - design a plan to synthesise organic compounds with different functional groups.
- Unit IV - know two group disconnection approach and Metallocenes.
- Unit V - synthesize various compounds.

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Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	Fourth	CHE-EC-426	Medicinal Chemistry	Mid Sem: 40 End Sem = 60	03

Course Objectives:

- To acquire knowledge of drug design and development,
- To understand pharmacokinetics, and pharmacodynamics.

Course Learning Outcomes: Upon successful learning, students will be able to

Unit I – analyze procedure of designing new drugs.

Unit II - understand and apply pharmacokinetics, and pharmacodynamics procedures.

Unit III – explore the chemistry of antineoplastic agents.

Unit IV - get basic knowledge of the chemistry of cardiovascular drug and antiinfective drugs.

Unit V – explore chemistry of psychoactive drugs and antibiotics

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Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	Fourth	CHE-EC-427	Polymers	Mid Sem: 40 End Sem = 60	03

Course Objectives: To acquire knowledge of preparation, characterization, processing, structure and commercial applications of polymers,

Course Learning Outcomes: Upon successful learning, students will be able to

- Unit I – learn different methods of preparation of polymers
- Unit II – methods of characterization of polymers.
- Unit III – know the processing of polymers.
- Unit IV – understand structural aspects of the polymers.
- Unit V – learn various commercial applications of polymers.

Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	Fourth	CHE-EC-428	Chemistry of Nanomaterials	Mid Sem: 40 End Sem = 60	03

Course Objectives: To make aware the students with various aspects of nanomaterials specially synthesis, its various applications in different areas.

Course Learning Outcomes: Upon successful learning, students will be able to

Unit I: learn various methods to synthesis and characterize nanoparticles

Unit II: understand soft and hard template chemistry for nanoscience specially for the controlled synthesis of the same

Unit III: learn about Micro, Meso and Macro porous materials; their synthesis and characterizations.

Unit IV: understand the usage of nanoparticles in drug delivery, molecular catalysis, biosensor technology etc.

Unit V: understand quantum dots, quantum confinement effect, Bohr's radius in quantum dots etc.

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Dr. Harisingh Gour Vishwavidyalaya, Sagar
Scheme of M.Sc. Program in Chemistry under CBCS system
Objectives and Learning Outcomes of M.Sc. Chemistry

Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
M.Sc.	Chemistry	Fourth	CHE-EC-429	Organic Synthesis	Mid Sem: 40 End Sem = 60	03

Course Objectives:

- To provide knowledge of the microscopic structure of electrochemical interfaces and electrochemical phenomena along with derivations of fundamental equations.
- To investigate applications of these electrochemical principles and relaxation methods in energy storage/conversion, electrocatalysis, corrosion, electrodeposition and bioelectrochemistry will be introduced.

Course Learning Outcomes: Upon successful learning, students will be able to

Unit I – explore factors affecting electro-deposition of metals, Simultaneous discharge of cations, depolarisation of metal deposition, separation of metals by electrolysis, electrochemical passivity, and Electroplating processes.

Unit II - understand and apply chemical principle behind corrosion.

Unit III – understand and apply various polarographic techniques.

Unit IV - apply knowledge of electrochemistry in environmental monitoring.

Unit V – understand designer electrodes and to design a new electrode.

Department of Chemistry						
Class	Subject	Semester	Course code	Course Title	Marks	Credit
M.Sc.	Chemistry	Fourth	CHE-EC-4210	Advanced Anal. Chem	Midsem -40 Endsem – 60	03

Course Objectives: Understanding the basic components of a measuring device and applications of various measuring device

Course learning outcomes: Upon successful learning, students will be able to

Unit I- To incorporate the understanding of functional elements of a measuring device, analog and digital instruments and gain knowledge about various transducers and sensors.

Unit -II – To acquire insight about various thermos analytical methods with the concept of understanding the difference between each one of them and able to decide when and where to use these methods.

Unit III- Understanding the concept of modification of electrodes for the analytical application of development of biosensors.

Unit IV- Acquire enhanced information about various chromatographic and electrophoretic techniques and how to increase the sensitivity of measurement by hyphenated separation techniques.

Unit V – To learn about the techniques for trace chemical analysis and various instrumental techniques used for surface characterization of different compounds.