

Name of the Department : DEPARTMENT OF CHEMISTRY

Academic Year : 2017-18

**A. Program Outcome and Program Specific Outcomes**

Name of the programme (UG/PG/M.Phil./ Diploma etc.)	Programme Outcomes  Students will be able to	Program Specific Outcomes  Students will be able to have
UG B.Sc. Chem	1. Students acquire knowledge about the concepts in Organic, Inorganic and Physical Chemistry.	1. Clear understanding of the fundamental concepts in Organic, Inorganic, Physical and Analytical Chemistry.
	2. Students develop the skills on different methods of qualitative and quantitative analysis.	2. Ability to perform scientific experiments skillfully by application of procedural knowledge.
	3. Students be able to appreciate the applications of chemistry in day to day life and explore new areas of Chemistry and Allied fields of Science and technology	3. Idea about research in chemistry and knowledge of the significance of the scientific concepts learnt which find application in industry, medicine and modern research.
		4. Capacity of working in research labs and related fields.
PG M.Sc. Chem	1. An advanced level of knowledge in main area of chemistry like analytical, organic, inorganic and physical.	1 Aptitude and skills necessary to pursue research as a career.
	2. A basic understanding in the major area(s) of research and acquire basic tools needed to carry out minor research projects.	2 Skills necessary to be employed in the various sectors like chemical, pharmaceutical, food and materials industries.
	3. The ability to implement chemistry in an integral activity of social, economic and environmental problems.	3 Competency to clear competitive examination
	4 Skills in problem solving, critical thinking and analytical reasoning in designing problems in research.	
	5 Knowledge of for safe handling of chemicals in research and applied chemical laboratory.	

Name of the programme (UG/PG/M.Phil./ Diploma etc.)	Programme Outcomes  Students will be able to	Program Specific Outcomes  Students will be able to have
M.Phil.	1. Adopt research methodologies and analytical techniques.	
	2. Conduct innovative, high impact research.	
	3. Develop a testable hypothesis, execute research experiments, compile raw data and provide conclusions.	
	4. Identify and describe the underlying principles behind chemical techniques relevant to academic and industry.	

**B1. Course Outcomes of all Programmes Offered by the Department**Name of the Programme : **B.Sc. Chemistry**

Sl. No.	Name of the Course	Course Code	Program Specific Outcomes (After completing this course, the students will be able to)
1.	Core I : General Chemistry – I	U16CH101	1 Explain the periodic properties of elements.
			2 Relate the periodicity of elements with their properties.
			3 Distinguish the types of chemical bonding and to predict the shape of molecules based on various theories.
			4 Perform a systematic and skillful volumetric analysis.
2	Core Prac. I : Volumetric Analysis and Physical Constant Determination	U16CH1P1	1 Distinguish the applications of quantitative analysis
			2 Determine the physical constants of organic substances accurately
			3 Perform volumetric estimations skilfully
3	Core II : General Chemistry - II	U16CH202	1 Write the IUPAC nomenclature of hydrocarbons upto 20 carbon system, alcohols, ethers and organohalogens
			2 Discuss the preparation and interpret the chemical properties of alkanes, cycloalkanes, alkenes, dienes, alkynes, alcohols (mono-, di-, tri- & polyhydric), ethers and organohalogens
			3 Analyse the properties of different states of matter (gaseous, liquid, solid and colloidal)
4	Elecitive I : Analytical Chemistry Practical and Virtual Lab	U16CH2:P	1 Determine the physical constant of the particular compound with precision.
			2 Apply analytical techniques in qualitative and quantitative measurements.
			3 Calculate the bond energy of molecules based on computational tools.

Sl. No.	Name of the Course	Course Code	Program Specific Outcomes (After completing this course, the students will be able to)
5	SBEC I : Textile Chemistry	U16CH2S1	1 Describe their structure and properties.
			2 Classify types of natural, synthetic and semi-synthetic fibres.
			3 List out dyes in textile industries and their interaction with fibres.
			4 Describe the dyeing processes and treatment techniques.
6	Core III : General Chemistry – III	U16CH303	1 Compare the Chemical reactivity of elements in the group III to VII
			2 Write the special properties of d- block elements and their chemistry.
			3 Discuss the stability, preparation and chemical properties of aromatic compounds
			4 Derive rate equations, and describe molecularity of catalysed and uncatalysed processes.
7	Core Prac. II : Inorganic Semi Micro Analysis	U16CH3P2	1 Skilful in identifying mixtures containing two inorganic salts in semi-micro level.
			2 Able to analyze mixtures containing two cations (from group I to VI) and two anions of which one will be an interfering one.
8	NMEC I : Food and Nutrition	U16CH3E1	1 Able to describe the role and importance of various components of food
			2 Explain the different methods of food processing and preservation
			3 Discuss the various sources of food poisoning and adulteration
9	Core IV : Inorganic Chemistry - I	U16CH404	1 Predict the hybridizations of Coordination compounds.
			2 Describe the structure of Biologically important coordination compounds.
			3 Summarize the importance of actinides, metal carbonyls, nitrosyls and metal olefins.

Sl. No.	Name of the Course	Course Code	Program Specific Outcomes (After completing this course, the students will be able to)
10	Core Prac. III : Organic Analysis	U16CH4P3	1 Apply the principles of organic qualitative analysis to identify organic molecules.
			2 Confirm structure of the organic compounds.
			3 Identify alkaloids, flavanoids, pharmaceutical drugs and biomolecules by simple tests.
11	NMEC II : Principles of Medicinal Chemistry	U16CH4E2	1 Describe the symptoms and causes of some common diseases
			2 Classify the types of drugs and their role.
			3 List out a few health promoting drugs
			4 Explain the therapeutic role of different classes of drugs.
12	Core V : Organic Chemistry - I	U16CH505	1 Describe optical activity and geometrical isomerism.
			2 Recognize the stereoisomers of chiral compounds that do not contain a stereogenic carbon centre and assign the configuration of the stereoisomers.
			3 Explain and predict the stereo chemical outcome of organic reactions by considering the reaction mechanism.
			4 Describe and give mechanisms for various naming reactions that involve deprotonation of the $\alpha$ -carbon of a carbonyl compounds.
			5 Describe the reaction for the formation of unsaturated aldehydes and ketones.
			6 Design reactions of carboxylic acids and their derivatives.
			7 Describe methods to prepare different nitrogenous organic compounds

Sl. No.	Name of the Course	Course Code	Program Specific Outcomes (After completing this course, the students will be able to)
13	Core VI : Physical Chemistry - I	U16CH506	1 Define the terms and laws of thermodynamics.
			2 Calculate various energy changes and heat capacities of different systems.
			3 Predict the conditions for thermodynamic equilibrium and spontaneity of reactions.
			4 Recognize the thermodynamic conditions for one and two component systems.
			5 Distinguish different types of solutions based on their miscibility and their respective laws
14	Core Prac. IV : Gravimetric Analysis, Organic and Inorganic Preparation	U16CH5P4	1 On Completion of this course, the students will be able to
			2 Estimate the quantities of metal cations gravimetrically.
			3 Prepare different organic and Inorganic compounds.
			4 Relate the UV-Visible spectra of various inorganic complexes with their structures.
15	Core Project : Project	U16CH5PJ	1
16	Elective I : Biochemistry	U16CH5:2	1 Describe the mechanistic pathways of biochemical reactions
			2 Explain the various bio-metabolisms
			3 Identify biologically significant molecules and their role in human life.
17	SBEC II : Pharmaceutical Chemistry	U16CH5S2	1 Define the terminologies used in pharmaceuticals
			2 Demonstrate the drugs derived from chemical compounds
			3 Identify the types of anaesthetics and diagnostic agents
18	SBEC III : Industrial Chemistry	U16CH5S3	1

Sl. No.	Name of the Course	Course Code	Program Specific Outcomes (After completing this course, the students will be able to)
19	Core VII : Inorganic Chemistry - II	U16CH607	1 List out the various fundamental particles and nuclear forces
			2 Discuss the applications of radio isotopes and radioactive waste disposal.
			3 Distinguish metallic bonding from other types of bonding
			4 Differentiate the structure of n type and p type semiconductors.
			5 Classify the various metallurgical operations.
			6 Identify fertilizers and micronutrients and their role in plant life.
20	Core VIII : Organic Chemistry - II	U16CH608	1 Write the mechanisms of substitution, elimination and molecular rearrangements.
			2 Comprehend the preparation, properties, structure and importance of carbohydrates (mono-, di- and polysaccharides).
			3 Elucidate the structure and chemistry of natural products (terpenes and alkaloids) and heterocyclic compounds (5- & 6-membered and fused rings).
21	Core IX : Physical Chemistry - II	U16CH609	1 Define the laws of weak and strong electrolytes and its role in titrimetric analysis.
			2 Construct the different types of electrochemical cells and batteries.
			3 Illustrate the principles of Molecular Spectroscopy (UV-Vis, IR, Raman, NMR and ESR) and interpret the spectra of selected molecules.
22	Core Prac. V : Physical Chemistry Practicals	U16CH6P5	1 Perform potentiometric and conductometric titrations skillfully
			2 Determine the physical properties of some salts, hydrates and their mixtures in solution and solid phases.
			3 Calculate the molecularity and rates of some simple reactions.

Sl. No.	Name of the Course	Course Code	Program Specific Outcomes (After completing this course, the students will be able to)
23	Elective -III Analytical Chemistry	U16CH6:3	1 Apply the different analytical techniques
			2 Implement the laboratory safety measures in everyday process
			3 Compute the different types of errors in practicals
24	Allied - I PHY /BOT/ZOO : Allied Chemistry - I	U16CHY33 U16CHY34	1 Compare different types of chemical bonds, hybridisation and structures of compounds.
			2 Assign IUPAC nomenclature to organic compounds.
			3 Appreciate the basic concepts of acid - base reactivity.
			4 Derive the integrated rate expressions for first order reactions and to select a suitable catalyst for industrial applications.
			5 List out the different applications of colloids in day to day life.
25	Allied - II BOT/ZOO : Chemistry for Life Sciences Physics : Chemistry for Physicists	U16CHY44 U16CHY03	1 Explain the methods of preparation and biological functions of important biomolecules.
			2 Describe the methods of water purification and chromatography techniques.
			3 Recognize the basic concepts of various analytical techniques.
			4 Distinguish different types of organic reactions and reactivity of different intermediates.
26	Allied -III Allied chemistry-III	U16CHY04	1 Perform conductometric titrations for different acids and bases.
			2 Suggest the methods to prevent corrosion of metals.
			3 Identify different types of errors in quantitative analysis.
			4 Distinguish different types of organic reactions and their reactivity.



Sl. No.	Name of the Course	Course Code	Program Specific Outcomes (After completing this course, the students will be able to)
27	Allied Practicals – I PHY /BOT/ZOO : Volumetric and Organic Analysis and Biotech	U16CHYP1	1 Perform simple acid basic and redox titrations skillfully
			2 Prepare and adjust the pH of a buffer solution
			3 Identify the functional groups of an organic molecule by characteristic tests

**B2. Course Outcomes of all Programmes Offered by the Department**Name of the Programme : **M.Sc. Chemistry**

Sl. No.	Name of the Course	Course Code	Program Specific Outcomes (After completing this course, the students will be able to)
1	Inorganic Chemistry - I	P16CH101	1 Explain the structure and bonding in ionic and covalent compounds and bonding in metals.
			2 Describe the various types of crystal defects.
			3 Describe the concepts in nuclear chemistry, radioactivity and illustrate their applications in various fields.
			4 Compare the structure and bonding in Boranes, Carboranes, metal clusters and iso and hetero polyacids.
2	Basic Concepts in Organic Chemistry	P16CH102	1 Differentiate the reactive intermediates and compare their stabilities.
			2 List the factors affecting the reaction to propose a mechanism for reactions.
			3 Analyse the stereo-chemical outcome of organic reactions.
3	Physical Chemistry - I	P16CH103	1 Apply mathematical tools to calculate the thermodynamic and kinetic properties.
			2 Derive the relationship between microscopic properties of molecules with macroscopic thermodynamic observables.
			3 Derive the of rates equation from mechanistic data.
			4 Comprehend the applications of electrical energy in chemical phenomena.
4	Inorganic Chemistry Practical - I	P16CH1P1	1 Separate and estimate the mixture of metal ions.
			2 Prepare inorganic complexes.
			3 Identify and match UV spectra to complexes.

Sl. No.	Name of the Course	Course Code	Program Specific Outcomes (After completing this course, the students will be able to)
5	Organic Chemistry Practical - I	P16CH1P2	1 Separate the binary mixture of organic components.
			2 Prepare maximum quantity of organic compound in single stage.
			3 Separate organic mixtures using paper & thin layer chromatography.
6	Inorganic Chemistry - II	P16CH204	1 Deduce the reaction mechanisms and stability of the coordination complexes.
			2 List out the photochemical reactions of organometallic and coordination complexes.
			3 Describe the structure, bonding and stability of organometallic compounds and their applications as industrial catalyst.
7	Reactions and Mechanisms in Organic Chemistry	P16CH205	1 Depict the different Molecular Orbitals & their symmetries.
			2 Predict the feasibility of Pericyclic reactions.
			3 List out the various photochemical reactions in organic compounds.
			4 Propose mechanism of addition reactions of C = C and C = O bonds.
			5 Choose the right organic reagents for various functional group interconversions.
8	Inorganic Chemistry Practical - II	P16CH2P3	1 Identify common cations and rare cations by performing semi-micro qualitative analysis.
			2 Estimate different metal cations by colorimetric method.
9	Organic Chemistry Practical - II	P16CH2P4	1 Estimate the organic compounds by back titration method.
			2 Perform double stage organic preparation.
			3 Interpret IR and UV spectra of simple organic molecules with different functional groups.

Sl. No.	Name of the Course	Course Code	Program Specific Outcomes (After completing this course, the students will be able to)
10	Organic Spectroscopy	P16CH306	1 Explain the basic principles of different spectroscopic techniques.
			2 Deduce structure of organic molecules from spectral data.
			3 Solve problems related to structure elucidation using spectral data.
11	Physical Chemistry -II	P16CH307	1 Describe fundamental concepts of atoms and molecules and their arrangements in different energy levels by statistical approach.
			2 Apply the mathematical concepts to compute properties of chemical systems at molecular dimensions.
			3 Explain the importance of adsorption process and catalytic activity at the solid surfaces.
			4 Identify the application of quantum chemistry in Molecular Orbital and Valance Bond theories and construct hybridization schemes.
12	Physical Chemistry Practical - I	P16CH3P5	1 Apply the principles of mathematics to describe to study chemical kinetics and thermodynamic behaviour of molecules.
			2 Verify adsorption isotherm.
			3 Construct phased diagram for equilibrium systems.
13	Physical Chemistry Practical - II	P16CH3P6	1 Handle electrochemical instruments such as conductometer and potentiometer to carry out qualitative and quantitative estimations.
14	Project Preparatory course	P16CH4PJ	1 Choose the right sources to review the literature.
			2 Perform entry level research.
			3 Compile and interpret project findings.
			4 Present the project finding in a publishable format.

Sl. No.	Name of the Course	Course Code	Program Specific Outcomes (After completing this course, the students will be able to)
15	Analytical Techniques and C Programming	P16CH3:1	1 Perform experiments using Polarography, Cyclic Voltammetry and Amperometric methods of analysis.
			2 Explain the principles of chromatography techniques and to apply them.
			3 Describe the working principles of optical methods like AAS, spectrofluorimetry, UV and NMR.
16	Inorganic Chemistry -III	P16CH408	1 Describe the basic applications of electronic spectroscopy of simple molecules.
			2 Elucidate structure of inorganic compounds from nuclear magnetic and electron spin resonance spectroscopy data.
			3 Interpret Raman and IR spectroscopy and describe application to chemical analysis.
17	Physical Chemistry - III	P16CH409	1 identify the elements of symmetry, symmetry operations and point groups of molecules.
			2 Apply the fundamentals of group theory in electronic spectroscopy.
			3 Describe the basic principles of molecular spectroscopy.
18	Principles and application of Drug design and Discovery	P16CH4:2	1 Describe method of identify lead for drug design.
			2 Define the drug receptor interactions and mode of action of different drugs.
			3 Plan a retero synthetic strategy to synthesize drug molecules.
			4 Explain the principles involved in analyzing drug molecules.
			5 Describe the methods to correlate structure to activity of drug candidates

Sl. No.	Name of the Course	Course Code	Program Specific Outcomes (After completing this course, the students will be able to)
19	Bio-Inorganic Chemistry	P16CH4:3	1 Comprehend the role of coordination compounds in living systems.
			2 Describe the structural and biological functions of proteins.
			3 List out the functions and fate of metals in biology.
			4 Describe the advantages and side effects of drugs.
			5 Compare the toxicity of different metals.
20	Computational Chemistry and Drug Designing - Practical	P16CH4:P	1 Construct the Algorithm for solving chemical problems by using Programming in C+ .
			2 Execute an error -free program for calculation of chemical properties.
			3 Construct and Execute a semiempirical quantum chemical calculation and derive the chemical information from the results of the computation.

**B3. Course Outcomes of all Programmes Offered by the Department**

Name of the Programme : M.Phil.

Sl. No.	Name of the Course	Course Code	Program Specific Outcomes (After completing this course, the students will be able to)
1	Research methodology	M12CH101	1 A sound knowledge in the fundamental applications of current chemical and interdisciplinary research as well as in the retrieval of the information.
			2 Ability to design and carry out scientific experiments as well as accurately record and analyze the results.
			3 Skills to explore new areas of chemical research and other fields of science and technology.
			4 A concise idea of various separation and electro analytical techniques and will discern their use.
2	Physical methods in Chemistry	M11CH102	1 Knowledge of the applications of advanced spectroscopic techniques essential for chemical research.
			2 Skills to elucidate the structure and chemical composition of the sample from the spectra.
			3 Ability to carry out XRD studies to characterize the crystalline nature and morphology of the sample.
			4 Knowledge regarding the principles and instrumentation of various sophisticated characterization techniques for nanomaterials.
3	Adsorption and Surface Kinetics	M11CH:01	1 Skills to analyze and arrive at the adsorption isotherms for industrial applications.
			2 Ability to carry out catalytic reactions and its applications.
			3 Skills to evaluate the influence of substituents on reaction rates and reaction mechanism.
			4 Knowledge about water quality parameters and experimental determination of toxic metals in polluted water.

Sl. No.	Name of the Course	Course Code	Program Specific Outcomes (After completing this course, the students will be able to)
4	Corrosion inhibition of Metals	M11CH:02	1 Comprehend the significance and adverse consequences of various types of corrosions and their environmental factors.
			2 Deduce the mechanism of corrosion and suggest measures to prevent it.
			3 Identify suitable corrosion inhibitors through different electrochemical techniques.
5	Research Topics in Chemistry	M11CH:03	1 Appreciate the various methods of extraction and identification of natural products and to design and modify the structure of molecules by synthetic means.
			2 Describe the various methods of drug designing for various diseases.
			3 Students will have an idea regarding the fundamentals of polymers, biopolymers and synthetic polymers.
			4 Handle the sophisticated electrochemical instruments.
			5 Assess the impact of environmental pollution by measuring various testing parameters.
6	Material Science: Recent Advances and Techniques	M12CH:04	1 Appreciate the biological importance of transition metal complexes and their interaction with DNA.
			2 Predict the structure and properties of newly synthesized inorganic compounds by various spectral and analytical techniques.
			3 Describe the structure, properties and applications of nanomaterials.
			4 Apply electrochemical concepts in the field of sensors, fuel cells and chemically modified electrodes.
7	Chemistry of Advanced Materials	M11CH:05	1 Comprehend the types, properties and applications of nanomaterials
			2 Design innovative routes for nanomaterial synthesis.
			3 Analyze and characterize the nanomaterials by advanced techniques such as XRD, SEM, TEM, AEM and SPM.



Sl. No.	Name of the Course	Course Code	Program Specific Outcomes (After completing this course, the students will be able to)
8	General Skills of Teaching and Learning in Chemistry	M11CH103	1 Knowledge about teaching and learning soft skills. 2 Skills in preparing organized, logical, and concise research reports. 3 Ability to effectively communicate their research ideas to other researchers and scientists. 4 Understanding on educational psychology and skills for effective teaching.

