



Sarva Vidyalaya Kelvani Mandal, Kadi Sanchalit
PRAMUKH SWAMI SCIENCE & H.D.PATEL ARTS COLLEGE, KADI
Re-Accredited with Grade 'A' by NAAC Third Cycle (CGPA 3.25)
"College with Potential for Excellence" Phase I & II (2010-2019) by UGC,
AAA Rank-1 by Govt. of Gujarat



PRAMUKH SWAMI SCIENCE & H D PATEL ARTS COLLEGE, KADI

Affiliated with

**HEMCHANDRACHARYA NORTH GUJARAT
UNIVERSITY, PATAN**

SCIENCE FACULTY

Department of Chemistry

PSO & CO (UG, PG)

Programme: B. Sc. Chemistry

Programme Specific Outcomes (PSOs) for B. Sc. Chemistry

Sr. No.	On completing B.Sc. Chemistry, the student will be able to:
PSO 1	Knowledge: Apply the principles of analytical, organic, inorganic and physical chemistry to solve basic chemical problems locally and globally
PSO 2	Laboratory skills: Employ classical and modern laboratory techniques in the performance and documentation of experiments, suitable for a chemical industry or a chemistry graduate program.
PSO 3	Environmental concern: Practice environmentally benign chemistry
PSO 4	Employability/future prospects: Develop problem-solving skills and aptitude that are highly valuable to employers and entrepreneurship skills for self-employment
PSO 5	Scientific communication: Have effective written and oral scientific communication skills, especially the ability to transmit complex technical information in a clear and concise manner

Course Outcomes (COs): B.Sc. Chemistry

Semester I

Course Title: Fundamentals of chemistry I

Course Code: SC23MJDSCCHE101

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Analytical, Inorganic, Organic and Physical Chemistries as synthetic methods for hydrocarbons	1, 2, 3, 4	U, R, An, Ap
CO 2	Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behavior in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.	1, 2, 3, 4, 5	U, R, An, Ap
CO 3	Students will be able to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments.	1, 2, 3, 4, 5	U, R, An, Ap, C, E
CO 4	Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.	1, 2, 3, 4, 5	U, R, An, C, E
CO 5	To know about the Volumetric titrations and calculations for estimation.	1, 2, 4, 5	U, R, An, Ap, E

Semester II

Course Title: Fundamentals of chemistry II

Course Code: SC23MJDSCCHE201

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Analytical, Inorganic, Organic and Physical Chemistries. Majors to be certified by the American Chemical Society will have extensive laboratory work and knowledge of Biological Chemistry.	1, 2, 3, 4	U, R, An, Ap
CO 2	Students will be able to explore new areas of research in both chemistry and allied fields of science and technology.	1, 2, 3, 4, 5	U, R, An, Ap, E
CO 3	Students will appreciate the central role of chemistry in our society and use of this as basis for ethical behaviour in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.	1, 2, 3, 4, 5	U, R, An, Ap, E
CO 4	Students will be able to explain why chemistry is an integral activity for addressing social, economic, and environmental problems.	1, 2, 3, 4, 5	U, R, An, Ap, C, E
CO 5	Students will be able to function as a member of an interdisciplinary problem solving team.	1, 2, 4, 5	U, R, An, Ap, C, E

Semester III

Course Title: Basic chemistry I

Course Code: SC23MJDSCCHE301

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in coordination compounds, carbohydrates and thermodynamics.	1, 4, 5	U, R, An, Ap
CO 2	Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behaviour in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine	1, 2, 3, 4, 5	U, R, An, Ap, E
CO 3	Students will be able to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments.	1, 2, 3, 4, 5	U, R, An, Ap, C, E
CO 4	Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.	1, 2, 4, 5	U, R, An, Ap, C, E

Semester III

Course Title: Basic chemistry II

Course Code: SC23MJDSCCHE301A

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories based on wave mechanics, magnetic properties, Organic aromatic reactions and liquid behaviour.	1, 4, 5	U, R, An, Ap
CO 2	Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behaviour in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine	1, 2, 3, 4, 5	U, R, An, Ap, E
CO 3	Students will be able to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments.	1, 2, 3, 4, 5	U, R, An, Ap, E
CO 4	Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.	1, 2, 4, 5	U, R, An, Ap, C, E
CO 5	To know about the physical characteristics of liquids for various estimations.	1, 2, 4, 5	U, R, An, Ap, C, E

Semester IV

Course Title: Basic chemistry III

Course Code: SC23MJDSCCHE401

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Inorganic, Organic and Physical Chemistries.	1, 2, 3, 4, 5	U, R, An, Ap
CO 2	Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behaviour in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.	1, 2, 3, 4, 5	U, R, An, Ap, E
CO 3	Students will be able to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments.	1, 2, 3, 4, 5	U, R, An, Ap, E
CO 4	Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.	1, 3, 4, 5	U, R, An, Ap, C, E
CO 5	To know about the conductometric titrations and calculations for estimation of components in mixtures.	1, 2, 3, 4, 5	U, R, An, Ap, E

Semester IV

Course Title: Basic chemistry IV

Course Code: SC23MJDSCCHE401A

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Analytical, Inorganic, Organic and Physical Chemistries.	1, 2, 3, 4, 5	U, R, An, Ap
CO 2	Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behaviour in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine	1, 2, 3, 4, 5	U, R, An, Ap, E
CO 3	Students will be able to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments.	1, 2, 3, 4, 5	U, R, An, Ap, E
CO 4	Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.	1, 3, 4, 5	U, R, An, Ap, C, E
CO 5	To know about the analytical tools like spectrophotometry for industrial practical applications.	1, 2, 3, 4, 5	U, R, An, Ap, E

Semester V

Course Title: Inorganic Chemistry

Course Code: CC CH-501

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Understanding inner sphere and outer sphere mechanisms in complexes.	1, 4	U, R, An, Ap
CO 2	Know OMC and their industrial applications.	1, 2, 3, 4, 5	U, R, An, Ap, E
CO 3	Elaborate the process and chemistry of corrosion.	1, 2, 3, 4, 5	U, R, An, Ap, E

Course Title: Organic Chemistry

Course Code: CC CH-502

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Know stereo compounds and their nomenclature methods.	1, 2, 4, 5	U, R, An, Ap, C
CO 2	Extension to chemistry of carbohydrates and isoprenoids.	1, 2, 3, 4, 5	U, R, An, Ap, C
CO 3	Differentiating the various reactions mechanisms (SN1, SN2).	1, 2, 3, 4, 5	U, R, An, Ap, C

Course Title: Physical Chemistry

Course Code: CC CH-503

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Elaborating the concepts of EMF, types of various cells and applications.	1, 2, 3, 4, 5	U, R, An, Ap, C
CO 2	Know statistical thermodynamics and various distribution laws.	1, 3, 4, 5	U, R, An, Ap, E
CO 3	Developing understanding on polymer-plastics, their industrial synthesis and applications.	1, 2, 3, 4, 5	U, R, An, Ap, C

Course Title: Analytical Chemistry
Course Code: CC CH-504

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Understanding the symmetrical and non-symmetrical structures of nature and extending them to chemical	1, 4, 5	U, R, An, Ap
CO 2	Extension of spectroscopic analysis based on proton nucleus and their applications.	1, 2, 3, 4, 5	U, R, An, Ap, C
CO 3	Extension to acid base concepts and acid base titrations	1, 2, 3, 4, 5	U, R, An, Ap, E

Semester VI

Course Title: Inorganic Chemistry
Course Code: CC CH-601

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Strengthening the understanding about the valence of elements	1, 4	U, R, An, Ap
CO 2	Know bio inorganic synthesis and their mechanisms.	1, 2, 3, 4, 5	U, R, An, Ap, E
CO 3	Elaborating the concepts of metal carbonyls and their catalytic applications.	1, 2, 3, 4, 5	U, R, An, Ap, E

Course Title: Organic Chemistry
Course Code: CC CH-602

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Developing the understanding of addition reactions and differentiating the mode of reactions.	1, 2, 4, 5	U, R, An, Ap, C
CO 2	Know active methylene compounds and their synthetic application.	1, 2, 3, 4, 5	U, R, An, Ap, C
CO 3	Understand aromatic nucleophilic substitution.	1, 2, 3, 4, 5	U, R, An, Ap, C

Course Title: Physical Chemistry**Course Code: CC CH-603**

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Resume of law of thermodynamics and the transformations of industrial processes	1, 2, 3, 4, 5	U, R, An, Ap, C
CO 2	Know photo induced reactions and their chemistry.	1, 3, 4, 5	U, R, An, Ap, E
CO 3	Extension to chemical kinetics, theories of reaction rates and their limitations.	1, 2, 3, 4, 5	U, R, An, Ap, C

Course Title: Analytical Chemistry**Course Code: CC CH-604**

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Know spectroscopic term symbols and J-J coupling.	1, 4, 5	U, R, An, Ap
CO 2	Develop the skills to determine the Structure of organic compounds by the spectroscopic data (IR, NMR, UV)	1, 2, 3, 4, 5	U, R, An, Ap, C
CO 3	Extension to advance chromatographic techniques and applications.	1, 2, 3, 4, 5	U, R, An, Ap, E

PRAMUKH SWAMI SCIENCE & H D PATEL ARTS

COLLEGE, KADI

Affiliated with

HEMCHANDRACHARYA NORTH GUJARAT

UNIVERSITY, PATAN

SCIENCE FACULTY

Department of Chemistry

PSO & CO (PG)

Programme: M. Sc. Organic Chemistry

Programme Specific Outcomes (PSOs) for M. Sc. Organic Chemistry

Sr. No.	On completing M.Sc. Organic Chemistry, the student will be able to:
PSO 1	Knowledge: <ul style="list-style-type: none">• Understand fundamental principles and advanced concepts of organic, inorganic and physical chemistry.• Demonstrate understanding of various types of reactions, reaction mechanisms, stereochemistry, photochemistry, rearrangements, heterocyclic and medicinal chemistry, reactions involving use of metals.• Interpret analytical data for structure elucidation obtained using NMR, IR, UV and Mass spectroscopy.
PSO 2	Personal and Professional Competence: <ul style="list-style-type: none">• Carry out experiments which include various chemical techniques and also setting of dry reactions, handling of hazardous reagents, assembling of apparatus, isolation of natural products, purification by column chromatography.• Formulate ideas, scientific writing and authentic reporting, effective presentation and communication skills.
PSO 3	Research Competence: <ul style="list-style-type: none">• Review scientific literature and findings in systematic manner and processing of information obtained to understand scope for novelty.• Design novel synthetic routes using a retrosynthetic approach for development of elegant, economic and eco-friendly schemes.
PSO 4	Entrepreneurial and Social competence: <ul style="list-style-type: none">• Demonstrate importance of industrial applications of organic chemistry in various fields.• Devise chemical processes with Green approach having advantage in safe operations.
PSO 5	Scientific communication: Have effective written and oral scientific communication

Course Outcomes (COs): M.Sc. Organic Chemistry

Semester I

Course Title: Inorganic Chemistry

Course Code: CHNN-401 (Core compulsory)

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	<ul style="list-style-type: none">• A course on stereochemistry and bonding in main group compounds may help students learn about the spatial arrangement of atoms in molecules and the nature of chemical bonds	1, 4, 5	U, R, Ap
CO 2	<ul style="list-style-type: none">• Know about the thermodynamic stability of the complex• Learn the stepwise formation of complex and stability constant• Identify the trends in stepwise formation constants• Evaluate the factors affecting the stability of complexes	1, 2, 3, 4,5	U, R, Ap, E
CO 3	<ul style="list-style-type: none">• Student will be able to understand about Reaction mechanism of Transition metal complexes, including inert and labile complexes, kinetics of octahedral substitution, acid hydrolysis and base hydrolysis will be cleared.	1, 2, 4, 5	U, R, An, E
CO 4	<ul style="list-style-type: none">• Describe Metal-ligand bonding in transition metal complexes.• Illustrate crystal field splitting in octahedral, tetrahedral, square planar complexes, and factors affecting the crystal-field parameters.• Differentiate magnetic behaviour of transition metal complexes.• Determine magnetic moment data for 3d metal complexes.	1, 2, 4,5	U, R, An, Ap, E

Course Outcomes (COs): M.Sc. Organic Chemistry

Semester I

Course Title: Organic Chemistry

Course Code: CHNN-402 (Core compulsory)

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	<ul style="list-style-type: none">• The fundamental concept of delocalized chemical bonding, conjugation in organic molecules and role of electronic effects.	1, 4, 5	U, R, Ap, An
CO 2	<ul style="list-style-type: none">• At the end of the course, the student is able to: Identify different types of chirality (e.g. point, axial, helical, planar) and stereoisomerism (e.g. enantiomers, diastereomers, conformers, atropisomers)	1, 2, 5	U, R, An, Ap
CO 3	<ul style="list-style-type: none">• Reaction Mechanism: Structure and Reactivity will be discussed for learners.• Here they will be enriched with Types of reactions, kinetic and thermodynamic control, transition states and intermediates, Generation, structure, stability and reactivity of carbocations, carbanions, free radicals, carbenes and nitrenes and Effect of structure on reactivity.	1, 2, 3	U, R, An, Ap, C
CO 4	<ul style="list-style-type: none">• The student is able to: Understand the SN2, SNI, mixed SNI and SN2 and SET mechanisms.• Application of NMR spectroscopy in the detection of carbocations.• Types, mechanisms of free radical substitution reactions & neighbouring group assistance.• Reactivity for the aliphatic and aromatic substances at a bridgehead. Reactivity of attacking radical. Effect of solvent on reactivity. Auto-oxidation, coupling of alkynes.	1, 2, 4, 5	U, R, An, Ap, E

Course Outcomes (COs): M.Sc. Organic Chemistry

Semester I

Course Title: Physical Chemistry

Course Code: CHNN-403 (Core compulsory)

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	<ul style="list-style-type: none">• Need of Quantum chemistry for the study of matter in sub-atomic level, Quantum mechanical operators, Schrodinger wave equation and its application to hydrogen & hydrogen like atoms.• Variation and Approximate methods for the study of multi-electronic systems, study of Slater orbitals and valance theory to multi-electronic system.	1, 5	U, R, Ap, An
CO 2	Understand <ul style="list-style-type: none">• Eigen function for angular, eigenvalues of angular momentum, ladder operators, anti-symmetry and Pauli exclusion principle.• Russell-Saunders terms and coupling schemes, Slater-Condon parameters, magnetic effects: spin-orbit coupling and Zeeman splitting• Molecular orbital theory, Huckel theory of conjugated system etc.	1, 5	U, R, An, Ap
CO 3	<ul style="list-style-type: none">• Brief resume of concepts of laws of thermodynamics.• Concept of fugacity and determination of fugacity.• Non ideal system & solutions, Application of phase rule to three component systems	1, 2, 5	U, R, An, Ap, E
CO 4	<ul style="list-style-type: none">• Statistical Thermodynamics• Partial functions• Heat capacity behaviour of solids• Bose Eistein statistics.• Non-equilibrium thermodynamics.	1, 2, 5	U, R, An, Ap, E

Course Outcomes (COs): M.Sc. Organic Chemistry

Semester I

Course Title: Symmetry, Group Theory and Spectroscopy

Course Code: CHNN-404 (Core compulsory)

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	<ul style="list-style-type: none">• Symmetry and Group theory• Equivalent symmetry elements, similarity transformation and conjugacy• Use of matrix and matrix representation of symmetry elements.• Reducible and nonreducible representation and character table.	1, 5	U, R, An, C
CO 2	<ul style="list-style-type: none">• Group theory and its application• Application of symmetry to hybrid and molecular orbitals• Application of symmetry to vibrations interpretation of IR & Raman activity.	1, 2, 4, 5	U, R, An, Ap, E
CO 3	<ul style="list-style-type: none">• Advance knowledge about spectroscopy with respect to absorption, emission, transmission, reflection, refraction polarisation and scattering.• Time dependent perturbation theory.• Born Oppenheimer approximation• Rotational vibrational energy levels.	1, 2, 4	U, R, An, Ap, E
CO 4	<ul style="list-style-type: none">• Mossbauer spectroscopy• Interpretation of isomer shift• Quadruped interaction• Mossbauer emission spectroscopy and its applications.	1, 2, 4	U, R, An, Ap, E

Course Outcomes (COs): M.Sc. Organic Chemistry

Semester II

Course Title: Inorganic Chemistry

Course Code: CHNN-501 (Core compulsory)

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	<ul style="list-style-type: none">• Electronic spectra and magnetic properties of transition metal complexes.• Spectroscopic ground states, correlation, Orgel and Tanabe-Sugano diagram.• Metal chelates and their spectrochemical information.	1, 2, 4,	U, R, Ap, An, E
CO 2	<ul style="list-style-type: none">• Metal pi complexes• Structure and bonding of Metal carbonyls• Important reactions of Metal carbonyls	1, 2,	U, R, An
CO 3	<ul style="list-style-type: none">• Metal clusters• Higher boranes, carboranes, metallocenes,• Metal carbonyls, Halide clusters, compounds with metal-metal multiple bonds.	1, 2	U, R, An
CO 4	<ul style="list-style-type: none">• Isopoly and heteropoly acids and salts.• Sigma bonded organometallic compounds of transition metals.• Classification, synthesis, structure properties and applications	1, 2, 4	U, R, An, Ap, E

Course Outcomes (COs): M.Sc. Organic Chemistry

Semester II

Course Title: Organic Chemistry

Course Code: CHNN-502 (Core compulsory)

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	<ul style="list-style-type: none">• Aliphatic electrophilic substitution• Bimolecular mechanism SE₂ and SE₁ mechanism• Effect of substrates.• Leaving group and the solvent polarity on the reactivity.• Aromatic electrophilic substitution• Gatterman-Koch reaction.	1, 2, 3,5	U, R, Ap, An, C
CO 2	<ul style="list-style-type: none">• Aliphatic electrophilic substitution• S_NAr, S_N1, S_NR1 mechanisms• The von Richter, Sommelet-Houser and smiles rearrangements.• Addition to carbon carbon multiple bonds.• Regio and chemoselectivity• Hydrogenation of double, triple and aromatic rings.• Micheal reaction.	1, 2, 3, 5	U, R, An, Ap, C
CO 3	<ul style="list-style-type: none">• Addition to carbon hetero multiple bonds• Addition of Grignard reagent• Witting, Claisen, Mannich, benzoin, perking and Stobbe reaction• Mechanism of condensation reactions involving enolates• Elimination reactions.	1, 2, 3, 5	U, R, An, Ap, C
CO 4	<ul style="list-style-type: none">• Pericyclic reactions• Classification of Pericyclic reactions• Woodward Hoffman correlation diagram• FMO and PMO approach• Electrocyclic reactions• Cycloaddition and Chelotropic reactions	1, 2, 3, 5	U, R, An, Ap, C

Course Outcomes (COs): M.Sc. Organic Chemistry

Semester II

Course Title: Physical Chemistry

Course Code: CHNN-503 (Core compulsory)

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	<ul style="list-style-type: none">• Chemical dynamics• Collision theory of rate of reactions• Steric factor• Activated complex theory• Kinetics of enzyme theory• Lindemann – Hinshelwood and Rice-Ramsperger-Kassel Marcus theories of unimolecular reaction.	1, 2, 4, 5	U, R, Ap, An
CO 2	<ul style="list-style-type: none">• Surface chemistry• Laplace equation• Kelvin equation• BET equation• Electro kinetic phenomenon• Micelles	1, 2, 4, 5	U, R, Ap, An
CO 3	<ul style="list-style-type: none">• Macromolecules• Kinetics of polymerization• Mechanism of polymerization• Calculation of average dimensions of various chain structures	1, 2, 4, 5	U, R, Ap, An
CO 4	<ul style="list-style-type: none">• Electrochemistry• Debye Huckel onsager treatment and its extension• Lippman equation• Gouy Chapman Stern Graham Devanathan Mottswatts, Tobin, Bockris and Devanthan Model.• Semiconductor interfaces• Electrocatalysis	1, 2, 4, 5	U, R, Ap, An

Course Outcomes (COs): M.Sc. Organic Chemistry

Semester II

Course Title: Spectroscopy – part II

Course Code: CHNN-504 (Core compulsory)

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	<ul style="list-style-type: none">• Advances in Atomic spectroscopy• Spectra of Hydrogen atom alkali metals• Advances in Molecular spectroscopy• Radiative and non-radiative spectra• Frank condon principle• Spectra of transition metal complexes• Charge transfer spectra	1, 2, 3,4, 5	U, R, Ap, An, E
CO 2	<ul style="list-style-type: none">• Raman spectroscopy• Selection rules• Mutual exclusion principle• Resonance Raman spectroscopy• Coherent anti stokes Raman spectroscopy (CARS)	1, 2, 3, 4, 5	U, R, An, Ap, E
CO 3	<ul style="list-style-type: none">• Microwave spectroscopy• Rigid rotor model• Stark effect• Nuclear and electron spin interaction and effect of external fields• Application of Microwave spectroscopy	1, 2, 3, 4, 5	U, R, An, Ap, E
CO 4	<ul style="list-style-type: none">• NMR• FT NMR• Influencing chemical shift• NMR studies of nuclei other than proton ¹⁹F and ³¹P NMR• Use of NMR in medical diagnostics	1, 2, 3, 4, 5	U, R, An, Ap, E

Course Outcomes (COs): M.Sc. Organic Chemistry

Semester III

Course Title: Organic Chemistry Paper –I Natural Products

Course Code: CHNN-601-(O)

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	<ul style="list-style-type: none">• Natural Coloring Matter• Biosynthesis studies of Anthocyanine (Cyanin and Palargonidin, Flavones (Chrysin), Flavonols (Quercetin), Flavonone (Dihydro flavone) and Isoflavones (Daidzein),• Coumarin, Quinones (Polyporic acid), Porphyrin. Chemistry of Hemin and Chlorophyll.	1, 2, 3,4,	U, R, Ap, An, E
CO 2	<ul style="list-style-type: none">• Terpenoids• Chemistry of Abietic Acid, Gibberellic acid Gibberellin-A), Squalene, Eudesmol, Phytol and Cadinene, Zingiberene• Biosynthesis study of Triterpenoid and Tetra terpenoid	1, 2, 3,4,	U, R, Ap, An, E
CO 3	<ul style="list-style-type: none">• Vitamins• Detailed Study of Chemistry of Thiamine (Vitamin-B1), Pantothenic Acid (Vitamin-B2), Pyridoxine- (Vitamin-B6), Ascorbic Acid (Vitamin-C) Tocopherols (Vitamin-E), Biotin (Vitamin-H)• Biological importance of Vitamins	1, 2, 3,4,	U, R, Ap, An, E
CO 4	<ul style="list-style-type: none">• Alkaloids• General Biogenetic Studies of Alkaloids• Chemistry of Reserpine, Colchicine, Strychnine, Morpholine, Narcotine	1, 2, 3,4,	U, R, Ap, An, E

Course Outcomes (COs): M.Sc. Organic Chemistry

Semester III

Course Title: Organic Chemistry Paper –II Industrial Organic Chemistry

Course Code: CHNN-602-(O)

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	<ul style="list-style-type: none">• Basic Principle of Unit Process & GMP, GLP• Batch Versus Continuous Operation• Design Flowcharts• Chemical Process Selection• Safety Hazards• Research and Development• Patents• Good Manufacturing Practice and Laboratory Practice	1, 2, 3,4, 5	U, R, Ap, An, C, E
CO 2	<ul style="list-style-type: none">• Soap, Detergents and Preservatives• Chemistry of Alkyl Benzenes, Fatty Acids and Fatty Alcohols and Soaps• Animal Fixatives• Fruit Concentrates (Vanilla, Chocolate, Monosodium Glutamate)• Food Additives, Preservatives	1, 2, 3,4, 5	U, R, Ap, An, C, E
CO 3	<ul style="list-style-type: none">• Oils, Fats & Agrochemicals• Chemistry of Vegetable Oils, Cotton Seed Oil• Hydrogenation• Chemistry of Agrochemicals, Insecticides,• Fungicides, Weedicides, Rodenticides, Plant Nutrients, Plant Hormones.	1, 2, 3,4, 5	U, R, Ap, An, C, E
CO 4	<ul style="list-style-type: none">• Pulp & Paper• Process of Pulping• Manufacture of Paper and Rayon	1, 2, 3,4, 5	U, R, Ap, An, C, E

Course Outcomes (COs): M.Sc. Organic Chemistry

Semester III

Course Title: Organic Chemistry Paper –III Synthetic Drugs

Course Code: CHNN-603-(O)

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	<ul style="list-style-type: none">• Drug Design & QSAR• Classification of Drugs• Drug Design• Relation between Molecule• Structure and Biological Activity (QSAR)• Receptor Site Theory• Indian Standards• Modern Methods of Pharmaceutical Analysis, Diagnostic Agents• Pharmaceutical Aids: Solvents, Vehicles, Flavors, Suspending Agents, Surfactants, Emulsifying Agents.	1, 2, 3,4, 5	U, R, Ap, An, C, E
CO 2	<ul style="list-style-type: none">• Antibiotics• Synthesis and Activity of Penicillin, Cephalosporins,• Streptomycin, Tetracycline's, Actinomycin, Chloramphenicol and Polyene.	1, 2, 3,4, 5	U, R, Ap, An, C, E
CO 3	<ul style="list-style-type: none">• Sulphadruugs• Synthesis and Uses, Sulphanilamide, Sulphafurazole, Sulphaguanidine, Sulphathiazole, Sulphamerazine, Sulfalene, Sulfathiazole, Trimethoprim	1, 2, 3,4, 5	U, R, Ap, An, C, E
CO 4	<ul style="list-style-type: none">• Miscellaneous Drugs• Drugs Stimulating or Blocking• Cholinergic & Anticholinergic Drugs, Histamine & Antihistamine• Local and General Anesthetics	1, 2, 3,4, 5	U, R, Ap, An, C, E

Course Outcomes (COs): M.Sc. Organic Chemistry

Semester III

Course Title: Organic Chemistry Paper –IV Selected Topics in Organic Chemistry

Course Code: CHNN-604-(O)

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	<ul style="list-style-type: none">• Nomenclature and Classification of Heterocyclic Compounds• Chemistry of Monocyclic Diheteroatomic Compounds (5 & 6 members)• Synthesis and Chemical Reactivity of Pyrazole, Isoxazole, Isothiazole, Imidazole, Oxazole, thiazole	1, 2, 3,4	U, R, An, C, E
CO 2	<ul style="list-style-type: none">• Reaction and Synthesis of Bicyclic Heterocyclic Compounds• Chemistry of Quinoline and Isoquinoline• Nucleophilic Substitution with Displacement of Halide, Reactions with Reducing Agents (Grignard's Reaction)• Skraup Synthesis, Knorr Synthesis• Bischner-Napieralski Synthesis• Heterocyclic System Containing Two Nitrogen Atoms: Synthesis of Cinnoline, Quinolone, Quinoxaline, Phthalazine	1, 2, 3,4	U, R, An, C, E
CO 3	<ul style="list-style-type: none">• Application of Oxidation Reagents $\text{Na}_2\text{Cr}_2\text{O}_7$, KMnO_4, CF_3COOH, MnO_2, Ag_2CO_3, NaIO_4, SeO_2, H_2O_2, $\text{Al(O-}i\text{Pr)}_3$, Al(O-tBu)_3	1, 2, 3,4	U, R, An, C, E
CO 4	<ul style="list-style-type: none">• Application of Reduction Reagents viz. LiAlH_4, Fe+HCl, NH_2NH_2, BH_3, NaBH_4, $\text{NaBH}_4 + \text{CeCl}_3 \cdot 7\text{H}_2\text{O}$, Pd/H_2, Ni/H_2, Pt/H_2• Chemistry of Diisobutyl Aluminum Hydride(DIBAL-H), Sodium Cyano Borohydride and Sodium triacetoxy Borohydride	1, 2, 3,4	U, R, An, C, E

Course Outcomes (COs): M.Sc. Organic Chemistry

Semester IV

Course Title: Organic Chemistry Paper –I Natural & Stereo Chemistry

Course Code: CHNN-701-(O)

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	<ul style="list-style-type: none">• Purine & Nucleic Acid• Chemistry of Uric acid, Adenine, Caffeine• Structure of Nucleotides, Nucleosides• DNA, RNA and Conformations• Protein Synthesis• Prebiotic Chemistry	1, 2, 3,4,	U, R, Ap, An
CO 2	<ul style="list-style-type: none">• Carbohydrates• Understand the types of Naturally Occurring Sugars, Dexoy Sugars, Amino Sugar• General Method of Structure and Ring Size Determination with Reference to Starch and Cellulose• Photosynthesis of Carbohydrates	1, 2, 3,4,	U, R, Ap, An
CO 3	<ul style="list-style-type: none">• Steroids• Biosynthesis Studies of Steroids• Chemistry of Ergosterol and Lanosterol Androgens: Oestrone, Oestriol and Oestradiol• Cortisone, Diosgenine and• Its Utility in Hormone Synthesis, Transformation in Steroids Molecules.	1, 2, 3,4,	U, R, Ap, An
CO 4	<ul style="list-style-type: none">• Conformational Analysis• Conformation of Monocyclic System viz. Cyclo Propane, Cyclo Hexane, Cyclo Hexanone, Bridge ring system, Fused Ring System	1, 2, 3,4,	U, R, Ap, An

Course Outcomes (COs): M.Sc. Organic Chemistry

Semester IV

Course Title: Organic Chemistry Paper –II Industrial Organic Chemistry

Course Code: CHNN-702-(O)

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	<ul style="list-style-type: none">• Synthetic Industries Based on Petroleum• Chemistry of Coal, Petroleum, Natural Gas• Coal Distillation, Refining of Crude Oil FCR Industrial Fuels, C1, C2, C3, C4 and Aromatic Chemicals.• Textile Fibers Classification• Manufacture of Important Polyamide, Poly Ester Fibers	1, 2, 3,4, 5	U, R, Ap, An, C, E
CO 2	<ul style="list-style-type: none">• Paints & Varnish, Explosive• Manufacture of Paints & Varnish• Methods of Applying Paints.• Types of Explosives• Industrial Explosives, propellants, Rocket and Missiles, Propellants for Rocket• Miscellaneous Industrial Explosives Uses, Pyrotechnics, Military Explosives, Incendiaries, Toxic Chemical Agents (Weapons).	1, 2, 3,4, 5	U, R, Ap, An, C, E
CO 3	<ul style="list-style-type: none">• Industrial Polymers• Manufacture of Polyethylene• Low and High Density Polyethylene co-polymers of Ethylene and Application• Monomers, Dacron, Orlon, Bakelite, Nylone 6,6 Teflon Polymer Reactions, Hydrogenation, Addition and Substitution Aldehyde and ketonic Group Reactions. Cyclisation, Cross linkage Reaction• Resins• Acrylic Polymer	1, 2, 3,4, 5	U, R, Ap, An, C, E
CO 4	<ul style="list-style-type: none">• Small Scale Industries• Chemistry of Safety Matches, Agarbatties, Naphthalene balls, Candles, Shoe Polish, Gum paste, Pen Ink, Removal of Stains, Phenol disinfectant Soaps, Detergents	1, 2, 3,4, 5	U, R, Ap, An, C, E

Course Outcomes (COs): M.Sc. Organic Chemistry

Semester IV

Course Title: Organic Chemistry Paper –III Synthetic Drugs

Course Code: CHNN-703-(O)

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	<ul style="list-style-type: none">• Chemotherapeutic Drugs• Chemotherapy of Malaria, Malaria Parasite and its cycle• Chemistry of 4-aminoquinolines, 8-aminoquinolines, 9-aminoacridines, Di-amino pyrimidine's, Antimoebic Drugs, Anti-viral drugs and Anti-Cancer drugs	1, 2, 3,4, 5	U, R, Ap, An, C, E
CO 2	<ul style="list-style-type: none">• CNS Drugs or Psychopharmacological Agents• Chemistry and synthesis of Antipsychotics, Antidepressant, Antianxiety, Hallucinogenic Drugs, Anti-Convulsant, Hypnotics & Sedative, Anti Parkinsonism Drugs	1, 2, 3,4, 5	U, R, Ap, An, C, E
CO 3	<ul style="list-style-type: none">• Cardiac & Diuretics Drugs• Drugs acting on the Cardiovascular, Hypertensive Drugs, Haematopoetic and Renal Systems Cardiac drugs, diuretics	1, 2, 3,4, 5	U, R, Ap, An, C, E
CO 4	<ul style="list-style-type: none">• Chemistry and synthesis of Anti-diabetic Dugs (Hypoglycemic Drugs) & Anti-Bacterial, Antitubercular and Antileprotic Drugs, Antifungal Drugs	1, 2, 3,4, 5	U, R, Ap, An, C, E

Course Outcomes (COs): M.Sc. Organic Chemistry

Semester IV

Course Title: Organic Chemistry Paper –IV Selected Topic in Chemistry

Course Code: CHNN-704-(O)

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	<ul style="list-style-type: none">•Rearrangement to electron deficient carbon•Rearrange to Electron Deficient Nitrogen•Rearrangement to Electron Deficient Oxygen	1, 2	U, R, Ap, An,
CO 2	<ul style="list-style-type: none">•Stevens rearrangement, Wittig rearrangement, Favorskii rearrangement•Hofmann Martius rearrangement, Claisen rearrangement, Cope rearrangement Benzidine rearrangement, Fries rearrangement	1, 2	U, R, Ap, An,
CO 3	<ul style="list-style-type: none">•Chemistry of Organo Magnesium Compounds, Organo Aluminum Compounds, Organo Cadmium Compounds, Organo Silicon Compounds, Organo Lithium Compounds	1, 2	U, R, Ap, An,
CO 4	<ul style="list-style-type: none">•Name Reactions viz. Cannizaro Reaction, Dieckman Reaction, Fischer Indole Reaction, Leuckart Reaction, Reformastky Reaction, Wittig reaction, Pechmann Reaction, Dilesalder Reaction, Wolfkishner Reduction, Friedel-Crafts Reaction, Reimertiemann Reaction	1, 2	U, R, Ap, An,