J.B.S.P. Sanstha's

Changu Kana Thakur
Arts, Commerce and Science College, New Panvel (Autonomous)

Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded By University Grant Commission
'Best College Award' by University of Mumbai

Academic Year 2023-24

Department of Chemistry

F.Y.B.Sc.

Course Outcomes (as per the NEP 2020)

a) F.Y.B.Sc SEMESTER-I

F.Y.B.Sc.	General Chemistry (Paper-I)	Sem-I
Course Code : USC1GCH1	**Course Coordinator: Dr.V.S.Kamble,Dr.D.K.Patil**	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO1	Recall thermodynamics terms, the first law of thermodynamics and terms like normality, molarity.	Remember
CO2	Solve the Numerical problems based on the Concentration of solutions	Apply
CO3	Classify the elements according to electronic configuration and explain details of periodic trends and atomic structure.	Understand
CO 4	Explain the name, bonding , structure and bond fission of organic compounds.	Evaluating

F.Y.B.Sc.	General Chemistry (Paper-II)	Sem-I
Course Code : USC1GCH2	**Course Coordinator: Dr.V.S.Kamble, Dr.J.M.Pawara**	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO 1	Explain enantiomer, optical activity, diastereomers, projection formulas, isomerism.	Apply
CO 2	Outline the metallic and non-metallic nature, oxidation states, electronegativity, Anomalous behaviour and allotropy of main group elements.	Understand
CO 3	Explain the reactivity of group 1 and group 2 elements and the effects of Oxides of carbon, sulphur and nitrogen on the environment.	Understand
CO 4	Define surface tension, Viscosity, Refractive index of Liquid, Order of reaction.	Remember

F.Y.B.Sc.	General Chemistry Practical	Sem-I
Course Code : USC1CHP	**Course Coordinator: Dr.V.S.Kamble, Dr.D.K.Patil**	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO 1	Find exact concentration of the solutions and enthalpy of dissolution.	Remember
CO 2	Apply chemical kinetics law to calculate the rate constant of the reaction.	Apply
CO 3	Find the normality of acids and bases and purity of samples gravimetrically.	Remember
CO 4	Apply Thin Layer Chromatographic (TLC), Distillation, Recrystallization, Sublimation methods for separation of a mixture.	Apply

F.Y.B.Sc.	Indian Knowledge System (IKS)	Sem-I
Course Code : UIKS1CAI	**Course Coordinator: Dr.J.G.Pargaokar, Dr.S.M.Chilate**	

COs.	After completing course, Students will able to	Bloom Taxonomy Level (BTL)
CO 1	Explain the ancient Indian Science and Technology.	Understand
CO 2	Apply the knowledge of Rasayan Shastra used during ancient period and Charaka Samhita.	Apply
CO 3	Tell the history of Metals and Metallurgy in Ancient India**.**	Remember
CO 4	Explain the knowledge of extraction and smelting of metals in ancient India.	Understand

F.Y.B.Sc.	Chemistry in Everyday Life-I(OE)	Sem-I
Course Code : UOE1CEL1	**Course Coordinator: Dr.V.D.Patil**	

COs.	After completing course, Students will able to	Bloom Taxonomy Level (BTL)
CO1	Student understand the role of chemistry in every day life.	Remember
CO2	Analyse the connection between chemistry and nutrition and life	Analyse
CO3	Describe the impact of **chemistry** in areas of **human** activity	Describe
CO 4	Find the various chemicals used in the daily human life	Find

F.Y.B.Sc.	Techniques in Environmental Analysis-I (SEC)	Sem-I
Course Code : USEC1TEA	**Course Coordinator: Dr.S.N.Vajekar, Dr.J.G.Pargarokar**	

COs.	After completing course, Students will able to	Bloom Taxonomy Level (BTL)
CO1	Categorise the various parameters for determining the water quality such as alkalinity, hardness, total dissolved solids etc.	Analysing
CO2	Apply knowledge of basic water chemistry to solve problems associated with water/ waste-water treatment and water quality.	Apply
CO3	Understand various water treatment processes.	Understand
CO4	Apply the basic practical knowledge for sample of water analyses.	Apply

F.Y.B.Sc.	Techniques in Environmental Analysis-I (SEC) Practical	Sem-I
Course Code : USEC1TEP	**Course Coordinator: Dr.S.N.Vajekar, Dr.J.G.Pargarokar**	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO1	Find the p^H, Acidity, Alkalinity of the given water samples.	Find
CO2	Analyse the solid pollutant present in the water samples.	Analysing
CO3	Determine the total hardness and purity of the given water samples.	Evaluating

F.Y.B.Sc.	Good Laboratory Practices-I (VSC)	Sem-I
Course Code : UVSC1GLP	**Course Coordinator:** Dr. B.D.Aghav	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO1	Apply practical skills in science courses with the understanding of laboratory practices	Apply
CO2	Understand the different aspects and laboratory techniques in Chemistry	Understanding
CO3	Make use of safety measures while working in the laboratory.	Apply

a) F.Y.B.Sc SEMESTER-II

F.Y.B.Sc.	General Chemistry (Paper-III)	Sem-II
Course Code : USC2GCH3	**Course Coordinator:** Dr.V.S.Kamble,Dr.D.K.Patil	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO 1	Explain deviations from ideal gas laws , Joule-Thomson effect and nanotechnology with the experimental setup.	Understand
CO 2	Define the equilibrium constant, Le-Chatelier Principle and the second law of thermodynamics.	Remember
CO 3	Discuss basic terms of co-ordination chemistry, qualitative analysis and acid-base theories	Understand
CO 4	Identify the products of reactions of alkanes, alkenes and alkynes.	Apply

F.Y.B.Sc.	General Chemistry (Paper-IV)	Sem-II
Course Code : USC2GCH4	**Course Coordinator: Dr.J.M.Pawara**	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO 1	Identify the shapes of molecules with and without lone pair of electrons and the oxidation number of elements to balance the redox equations.	Apply
CO 2	Explain Law of crystallography, Different types of interaction of electromagnetic radiation with matter, Degree of ionization and Henderson equation for acidic and basic buffers.	Understand
CO 3	Classify between aromatic, anti-aromatic, and non-aromatic compounds.	Understand
CO 4	Write the mechanism of the Electrophilic aromatic substitution reaction.	Apply

F.Y.B.Sc.	General Chemistry Practical	Sem-II
Course Code : USC2CHP	**Course Coordinator: Dr.J.M.Pawara,Dr.D.K.Patil**	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO 1	Apply chemical kinetics law to calculate the rate constant of reaction.	Apply
CO 2	Make use of colorimeter and pH meter.	Apply
CO 3	Identify organic compound containing C,H (O) N, S, X elements.	Apply
CO 4	Identify cations and anions from the given mixture of compounds and percentage of metal present in the sample by titration.	Apply

F.Y.B.Sc.	Chemistry in Everyday Life-II (OE)	Sem-II
Course Code : UOE2CEL2	**Course Coordinator: Dr.J.M.Pawara, Dr.D.K.Patil**	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO1	Know the various compounds used in the everyday life.	Find
CO2	Analyse the role of chemistry in the different compounds utilised in the daily life.	Analyse
CO3	Understand the importance of chemistry in the everyday life	Understand

F.Y.B.Sc.	Techniques in Environmental Analysis-II (SEC)	Sem-II
Course Code : USEC2TEA	**Course Coordinator: Dr.D.K.Patil**	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO1	Understanding the sources and causes of soil pollution.	Understand
CO2	Study the soil pollution to understand the various health impacts.	Understand
CO3	List the various control measure of soil pollution.	Analysis
CO4	Determine the quality of soil of the surrounding.	Evaluate

F.Y.B.Sc.	Techniques in Environmental Analysis-II (SEC) Practical	Sem-II
Course Code : USEC2TEP	**Course Coordinator: Dr.D.K.Patil**	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO1	Identify the quality of soil of the surroundings.	Apply
CO2	Develop the environmental control plan for environment pollution problem.	Apply
CO3	Classify the various samples of soil according to their purity.	Understanding
CO4	Discover the various components of soil.	Analyse

F.Y.B.Sc.	Good Laboratory Practices –II (VSC)	Sem-II
Course Code : UVSC2GLP	**Course Coordinator: Dr.B.D.Aghav**	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO1	Apply the skills of laboratory techniques in performing laboratory work.	Applying
CO2	Make use of safety measures while working in the laboratory.	Applying

F.Y.B.Sc.	Minor Chemistry-I	Sem-II
Course Code : USC2CHM	**Course Coordinator: Dr.J.M.Pawara**	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO1	Explain the study chemical equilibrium	Understand
CO2	Explain the basics of acids and bases.	Understand
CO3	Understand the fundamentals of chemistry	Understand

F.Y.B.Sc.	Minor Chemistry-I Practical	Sem-II
Course Code : USC2CHMP	**Course Coordinator: Dr.J.M.Pawara**	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO1	prepare solutions of different Molarity/Normality.	Apply
CO2	determine quality of substance.	Analyse
CO3	perform the estimation of fruit juices, shampoos etc.	Analyse
CO4	Separate the mixtures by Chromatography.	Analyse

Janardan Bhagat Shikshan Prasarak Sanstha's

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DEPARTMENT OF CHEMISTRY

Course Outcomes (COs) S. Y. B.Sc. (Sem III)

Name of the Programme: BSc. Class : S.Y.B.Sc.	**Programme Coordinator: Dr. J.S.Thakur**	**Head of the Department : Prof. B.V.Jadhav**
Subject :	**Course: Paper - I** **Course Code: USC3CH1**	**Course Coordinator: Dr. V.D. Patil**
	After completing the Course, Students will able to :	Bloom Taxonomy Level(BLT)
CO1	Illustrate the equation of Gibbs free energy, Chemical potential, Transport number and degree of Ionization.	Level 2
CO2	Explain different types of ionic crystals and hybridizations.	Level 2
CO3	Construct the molecular orbital diagram of homonuclear diatomic molecules.	Level 3
CO4	Compare the different properties, reactions and reactivity of alkyl/aryl/halides/organometallic compounds/alcohol, Phenol and epoxide.	Level 2

Name of the Programme: BSc. Class : S.Y.B.Sc.	**Programme Coordinator: Dr. J.S.Thakur**	**Head of the Department : Prof. B.V.Jadhav**
Subject :	**Course: Paper - II** **Course Code: USC3CH2**	**Course Coordinator: Dr. V.D. Patil**
	After completing the Course, Students will able to :	**Bloom Taxonomy Level(BLT)**
CO1	Explain complex chemical reactions, Collision and activated complex theory, effect of temperature on Arrhenius equation, thermodynamics of ideal solutions.	Level 2
CO2	Summarize the chemistry of Boron, Silicon and Germanium compounds.	Level 2

CO3	Recall the facts and basic concepts like distillation of solution, Haber process and role of active methylene compounds.	Level 1
CO4	Construct the names and methods of preparation of carbonyl group compounds .	Level 3

Name of the Programme: BSc. Class : S.Y.B.Sc.	**Programme Coordinator: Dr. J.S.Thakur**	**Head of the Department : Prof. B.V.Jadhav**
Subject : Analytical Chemistry	**Course: Paper – III** **Course Code: USC3CH3**	**Course Coordinator: Dr. V.D. Patil**
	After completing the Course, Students will able to :	Bloom Taxonomy Level(BLT)
CO1	Classify analytical methods and errors in analysis.	Level 2
CO2	Outline the methods of calibration of tools used and preparations for titrimetric analysis.	Level 1
CO3	Explain the principles of titrimetric analysis and UV-Visible spectroscopy.	Level 2
CO4	Apply statistical methods to treat the analytical data.	Level 3

Name of the Programme: BSc. Class : S.Y.B.Sc.	**Programme Coordinator: Dr. J.S.Thakur**	**Head of the Department : Prof. B.V.Jadhav**
Subject :	**Course: Practical** **Course Code: USC3CHP**	**Course Coordinator: Dr. V.D. Patil**
	After completing the Course, Students will able to :	**Bloom Taxonomy Level(BLT)**
CO1	Determination of various constants such as solubility products, dissociation constant, rate constant based on physical principles.	Level 5
CO2	Identify the ions in inorganic salts.	Level 2
CO3	Demonstrate the effectiveness of crystallization as a separation technique.	Level 3
CO4	Infer the obtained results effectively presentation.	Level 2

Head
Department of Chemistry

Principal
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DEPARTMENT OF CHEMISTRY

Course Outcomes (COs) S.Y. B.Sc. (Sem IV)

Name of the Programme: BSc. Class : S.Y.B.Sc.	**Programme Coordinator: Dr. J.S.Thakur**	**Head of the Department : Prof. B.V.Jadhav**
Subject :	**Course: Paper - I** **Course Code: USC4CH1**	**Course Coordinator: Dr. V.D. Patil**
	After completing the Course, Students will able to :	**Bloom Taxonomy Level(BLT)**
CO1	Explain thermodynamics properties, equilibrium constant and different types of electrode.	Level 2
CO2	Illustrate Gibb's Phase rule, Phase diagram of one and two component system with examples.	Level 2
CO3	List the properties of transition metal compounds and different types of isomers in coordination compounds.	Level 1
CO4	Compare properties, acidity, preparations, reactions, nucleophilicity of acyl substituents of carboxylic acid and stereochemistry.	Level 4

Name of the Programme: BSc. Class : S.Y.B.Sc.	**Programme Coordinator: Dr. J.S.Thakur**	**Head of the Department : Prof. B.V.Jadhav**
Subject :	**Course: Paper - II** **Course Code: USC4CH2**	**Course Coordinator: Dr. V.D. Patil**
	After completing the Course, Students will able to :	**Bloom Taxonomy Level(BLT)**
CO1	Explain law of crystallography, types of crystal, Interplanar distance in lattice, types of catalysis, Mechanisms and Kinetics of catalyst.	Level 2
CO2	explain the concept of hydration of cations and anions with respect to effect of charge and radius.	Level 2

CO3	Identify the hazardous effect of air pollutant like sulphuric acid, nitric acid and phosphoric acid	Level 3
CO4	Outline the synthesis ,reaction of amines and heterocyclic compounds like Furan, Pyrrole, Thiophene.	Level 2

Name of the Programme: BSc. Class : S.Y.B.Sc.	**Programme Coordinator: Dr. J.S.Thakur**	**Head of the Department : Prof. B.V.Jadhav**
Subject : Analytical Chemistry	**Course: Paper – III** **Course Code: USC4CH3**	**Course Coordinator: Dr. V.D. Patil**
	After completing the Course, Students will able to :	**Bloom Taxonomy Level(BLT)**
CO1	Classify various separation methods based on their principles.	Level 2
CO2	Discuss the principles, construction and working of instrumental techniques based on the electrochemical properties of the analytes.	Level 2
CO3	Describe chemical methods of analysis and their suitable parameters.	Level 2
CO4	Apply the analytical methods to determine the physico chemical of environmental analysis.	Level 3

Name of the Programme: BSc. Class : S.Y.B.Sc.	**Programme Coordinator: Dr. J.S.Thakur**	**Head of the Department : Prof. B.V.Jadhav**
Subject :	**Course: Practical** **Course Code: USC4CHP**	**Course Coordinator: Dr. V.D. Patil**
	After completing the Course, Students will able to :	**Bloom Taxonomy Level(BLT)**
CO1	Find emf, amount of acid, acid strength potentiometrically.	Level 1
CO2	Compare the strength of HCl and H_2SO_4 by kinetically.	Level 2
CO3	Calculate the amount from given sample by conductometrically and gravimetrically.	Level 4
CO4	Analyze qualitatively bifunctional organic compounds.	Level 4

Head
Department of Chemistry

Principal
Changu Kana Thakur
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New Panvel

Course Outcomes

T.Y. B.Sc. Chemistry (Paper I)

T.Y.B.Sc.	Chemistry Paper No. I (Physical Chemistry)	Sem-V
Course Code: USC5CH1	**Course Coordinator: Dr. S.S. Patil, Dr. V.S. Kamble**	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO 1	Memorize concept of dipole moment, polar and non- polar molecules, examples of colligative properties, basic terms of radioactivity and Surface tension.	Understand
CO 2	Differentiate Rotational Spectroscopy and Vibrational Spectroscopy Raman Spectroscopy, Freundlich Adsorption Isotherm and Langmuir Adsorption Isotherm	Understand
CO 3	Explain first and second law of photochemistry Raoult's law, Clapeyron equation, van't Hoff Factor.	Evaluate
CO 4	Apply spectroscopic data for solving different numerical, lattice space information for determination structure of unit cell and Carbon Dating method	Apply

T.Y.B.Sc.	Chemistry Paper No. I (Physical Chemistry)	Sem-VI
Course Code : USC6CH1	**Course Coordinator: Dr. S.S. Patil, Dr. V.S. Kamble**	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO 1	Recall the concept Ionic Strength, activity and activity Coefficient, examples of different polymers, and concept of nanomaterial and nanotechnology	Understand
CO 2	Differentiate between Concentration cell and chemical cell natural and artificial polymers.	Understand
CO 3	Understand cell representation rules to representation of cells phase rule to determine degree of freedom	Evaluate
CO 4	Apply co-precipitation method for synthesis of new nanomaterials in laboratory	Apply

T.Y. B.Sc. Chemistry (Paper II)

T.Y.B.Sc.	Chemistry Paper No. II Inorganic Chemistry	Sem-V
Course Code : USC5CH2	**Course Coordinator: Prof. Dr. B.V. Jadhav**	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO 1	Explain concept of Superconductivity, types of super conductors and its applications, imperfections in solids and their effect on properties, chemistry of inner transition elements, extraction and applications, chemistry of non-aqueous solvents	Understand
CO 2	Explain electrical properties of conductors, insulators and semiconductors on the basis of Band theory. Explain Inorganic Polymers, Chemistry of interhalogens and Pseudo halogens.	Understand

CO 3	Assign the point group for given molecules using basic concepts of molecular symmetry and construct molecular orbital diagrams for heteronuclear diatomic molecules and polyatomic species.	Apply
CO 4	Determine packing density of different types of cubic unit cells	Evaluate

T.Y.B.Sc.	**Chemistry Paper No. II Inorganic Chemistry**	**Sem-VI**
Course Code : USC6CH2	**Course Coordinator: Prof. Dr. B.V. Jadhav**	

COs. No.	**After completing the course, students will be able to:**	**Bloom Taxonomy Level (BTL)**
CO 1	Demonstrate the knowledge of organometallic chemistry, and metallurgy.	Understand
CO 2	Explain importance of nanomaterials,Chemical methods of synthesis of nanomaterials and forms of nanomaterials	Understand
CO 3	Construct molecular orbital diagram of different coordination compounds, Analyse the electronic spectra of complexes.	Apply
CO 4	Measure Crystal field stabilization energy (CFSE) for octahedralcomplexes using basic concepts of Crystal Field Theory.	Evaluate

Course Outcomes

T.Y.B.Sc. Physical Chemistry and Inorganic Chemistry Practical 2023-24
SEMESTER-V

T.Y.B.Sc.	Chemistry Practical Paper No. I	Sem-V
Course Code: USC5CP1	**Course Coordinator: Prof. Dr. B.V. Jadhav, Dr. S.S. Patil, Dr. V.S. Kamble**	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO 1	Handle and Understand principles of different instruments like Potentiometry, Conductometry, pH Metry.	Understand
CO 2	Determine molecular weight of substance by using Rast Method	Understand
CO 3	With the help of Fractional change method find out order of reaction.	Analyse
CO 4	Develop the practical skills for preparation of different inorganic metal complexes	Understand
CO 5	Examine the percentage purity of the inorganic compounds qualitatively and quantitively and impurity identification.	Analyse

Course Outcomes

T.Y.B.Sc. Physical Chemistry and Inorganic Chemistry Practical 2023-24
SEMESTER-VI

T.Y.B.Sc.	Chemistry Practical Paper No. II	Sem-VI
Course Code : USC6CP1	**Course Coordinator: Prof. Dr. B.V. Jadhav, Dr. S.S. Patil, Dr. V.S. Kamble**	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO1	Handle and Understand principles of different instruments like Colorimetry, Potentiometry, Conductometry.	Understand
CO2	Determine molecular weight of any high polymer polyvinyl alcohols by viscosity measurement.	Analyse
CO3	Interpret the order of reaction graphically from given experimental data and to calculate the specific rate constant.	Analyse
CO 4	Develop the practical skills for preparation of different inorganic metalcomplexes	Understand
CO 5	Examine the percentage purity of the inorganic compounds qualitativelyand quantitively and impurity identification.	Analyse

T.Y.B.Sc. Chemistry Paper III

T.Y.B.Sc.	OrganicChemistry (Paper-V)	Sem-V
Course Code: USC5CH4	**Course Coordinator:** Prof. (Dr.) B.D. Aghav	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO1	Explain the fate of the excited molecule in photochemistry and systematic study of photochemical reactions.	Understand
CO2	Apply the concepts in writing and predicting the mechanism of organic reactions.	Apply

CO3	Examine the spectral data of UV-Visible, IR, NMR and Mass spectroscopy for structure elucidation of organic compounds.	Evaluate
CO4	Construct the structures of carbohydrates and its inter-conversion, describe the structures of proteins, nucleic acids and its components.	Apply

T.Y.B.Sc.	**Organic Chemistry (Paper-V)**	**Sem-VI**
Course Code: USC6CH4	**Course Coordinator:** Prof. (Dr.) B.D. Aghav	

COs. No.	**After completing the course, students will be able to:**	**Bloom Taxonomy Level (BTL)**
CO1	Explain stereoselectivity, stereospecificity, mechanism and stereochemistry of substitution, elimination and addition and rearrangement reactions.	Understand
CO2	Predict the synthons and functional group transformation and classify the selectivity of reagents and catalyst in organic synthesis.	Apply
CO3	Describe the structures of proteins, nucleic acids and its components.	Understand
CO4	Interpret the analytical and chemical evidences for structure elucidation of natural products	Evaluate

T.Y.B.Sc. Chemistry Paper IV

T.Y.B.Sc.	**Chemistry Paper No. IV Analytical Chemistry**	**Sem-V**
Course Code : USC5CH4	**Course Coordinator: Dr. (Mrs.) J.S. Thakur**	

COs. No.	**After completing the course, students will be able to:**	**Bloom Taxonomy Level (BTL)**
CO 1	Define, explain and understand the concepts of quality control, quality assurance, grades of chemicals, concentrations and importance of sampling at a basic level	2 (Understand)

CO 2	Explain the theoretical principals of titrations and apply them for end point detection and selection of suitable indicators	3 (Apply)
CO 3	Apply the Nernst law to the solvent extraction and describe the principles and processes of solvent extraction and solid phase extraction.	3 (Apply)
CO 4	Understand the role of analytical instruments in science and allied fields and explain the principles, instrumentation, working of Spectroscopic techniques.	2 (Understand)

T.Y.B.Sc.	**Chemistry Paper No. IV Analytical Chemistry**	**Sem-VI**
Course Code : USC6CH4	**Course Coordinator: Dr. (Mrs.) J.S. Thakur**	
COs. No.	**After completing the course, students will be able to:**	**Bloom Taxonomy Level (BTL)**
CO 1	Understand and explain the fundamentals and working of electroanalytical techniques such as polarography and amperometry.	2 (Understand)
CO 2	Understand basics of chromatography and describe underlying principle, instrumentation and working of advanced separation methods such as GC, HPLC and HPTLC	2 (Understand)
CO 3	Understand and explain principles of thermal and radioanalytical methods and study of thermal decomposition of materials.	2 (Understand)
CO 4	Apply analytical techniques for the analysis of cosmetics and food.	3 (Apply)

Course Outcomes

T.Y.B.Sc. Organic Chemistry and Analytical Chemistry Practical 2023-24

SEMESTER-V

T.Y.B.Sc.	**Chemistry Practical Paper No. IV Analytical Chemistry**	**Sem-V**
Course Code : USC5CP2	**Course Coordinator: Dr. (Mrs.) J.S. Thakur**	

COs. No.	**After completing the course, students will be able to:**	**Bloom Taxonomy Level (BTL)**
CO 1	Demonstrate the skills in quantitative analysis of the real samples such as cosmetics, environmental samples, fertilizers etc., apply appropriate methods to obtain experimental data and interpret it.	3 (Apply)
CO 2	Use of instrumental techniques for the estimation of various samples including calibration of instruments and preparation of standards and references.	4 (Analyze)
CO 3	Identify chemical type of components present in binary mixture of solid-solid mixture and unknown organic compound by micro-scale technique.	3 (Apply)
CO 4	Apply skills in the separation and qualitative analysis of organic compounds of solid-solid mixtures by microscale technique.	3 (Apply)

T.Y.B.Sc. Organic Chemistry and Analytical Chemistry Practical 2023-24

SEMESTER-V

T.Y.B.Sc.	**Chemistry Practical Paper No. IV Analytical Chemistry**	**Sem-VI**
Course Code : USC6CP2	**Course Coordinator: Dr. (Mrs.) J.S. Thakur**	

COs. No.	**After completing the course, students will be able to:**	**Bloom Taxonomy**

		Level (BTL)
CO 1	Demonstrate the analytical skills required for detection, identification, separation and analysis of food samples, environmental samples, pharmaceuticals etc.	4 (Analyze)
CO 2	Explore various analytical techniques for the analysis of commercial samples and learn graphical and numerical data representation	4 (Analyze)
CO 3	Demonstrate the separation of the liquid-liquid and solid-liquid mixtures by fractional distillation.	2 (Understand)
CO 4	Plan organic synthesis with calculations, stoichiometry, aspects of synthesis and predictions of spectral data in IR and NMR of the reactant and product.	3 (Apply)

Semester-V

Theory

T.Y.B.Sc.	**Drugs and Dyes (Paper-V)**	**Sem-V**
Course Code: USC5CH5	**Course Coordinator:** Dr. S.N. Vajekar, Dr. J. M. Pawara	

COs. No.	**After completing the course, students will be able to:**	**Bloom Taxonomy Level (BTL)**
CO1	Define the routes of administration, methods of ingestion, tolerance, withdrawal and interactions of these drugs with other psychoactive and non-psychoactive drugs.	Remember
CO2	Explain details about the pharmacodynamics agents used for the treatment of different diseases side effects and synthesis.	Understand
CO3	Classify the dyes based on applications and dyeing methods	Understand
CO4	Make use of Unit processes required for the synthesis of dyes intermediates	Apply

Semester-V

Practical

T.Y.B.Sc.	**PRACTICALS OF USC5CH5**	**Sem-V**
Course Code : USC5CP3	**Course Coordinator:** Dr. S.N. Vajekar, Dr. J. M. Pawara	

COs. No.	**After completing the course, students will be able to:**	**Bloom Taxonomy Level (BTL)**
CO1	Synthesis of simple drugs i.e aspirin	Evaluate
CO2	Estimation of Ibuprofen.	Create
CO3	Determination of iron from given drug sample.	Apply
CO4	Project on cotton dyeing.	Apply

Semester-VI

Theory

T.Y.B.Sc.	**Drugs and Dyes (Paper-V)**	**Sem-VI**
Course Code : USC6CH5	**Course Coordinator:** Dr. S.N. Vajekar, Dr. J. M. Pawara	

COs. No.	**After completing the course, students will be able to:**	**Bloom Taxonomy Level (BTL)**
CO1	Explain details about the chemotherapeutic agents used for the treatment of different diseases side effects and synthesis.	Understand
CO2	Explain drug discovery design and development and drug metabolism and application of nanoparticles in medicinal chemistry.	Understand
CO3	Classify the dyes based on Chemical Constitution and preparations	Understand
CO4	Explain the non-textile uses, Health and Environmental Hazards of the dyes	Understand

Semester-VI

Practical

T.Y.B.Sc.	**PRACTICALS OF USC6CH5**	**Sem-VI**
Course Code: USC6CP3	**Course Coordinator:** Dr. S.N. Vajekar, Dr. J. M. Pawara	

COs. No.	**After completing the course, students will be able to:**	**Bloom Taxonomy Level (BTL)**
CO1	Synthesize, Crystallization Physical constant, able to understand process of purification.	Apply
CO2	Determination of Calcium from given Calcium tablet	Create
CO3	Examine monograph	Evaluate
CO4	Apply the TLC technique for the separation of the mixture of dyes	Apply

Semester-V
Theory

T.Y.B.Sc.	Drugs and Dyes (Paper-V)	Sem-V
Course Code: USC5CH5	**Course Coordinator:** Dr. S.N. Vajekar, Dr. J. M. Pawara	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO1	Define the routes of administration, methods of ingestion, tolerance, withdrawal and interactions of these drugs with other psychoactive and non-psychoactive drugs.	Remember
CO2	Explain details about the pharmacodynamics agents used for the treatment of different diseases side effects and synthesis.	Understand
CO3	Classify the dyes based on applications and dyeing methods	Understand
CO4	Make use of Unit processes required for the synthesis of dyes intermediates	Apply

Semester-V
Practical

T.Y.B.Sc.	PRACTICALS OF USC5CH5	Sem-V
Course Code : USC5CP3	**Course Coordinator:** Dr. S.N. Vajekar, Dr. J. M. Pawara	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO1	Synthesis of simple drugs i.e aspirin	Evaluate
CO2	Estimation of Ibuprofen.	Create
CO3	Determination of iron from given drug sample.	Apply
CO4	Project on cotton dyeing.	Apply

Semester-VI
Theory

T.Y.B.Sc.	Drugs and Dyes (Paper-V)	Sem-VI
Course Code : USC6CH5	**Course Coordinator:** Dr. S.N. Vajekar, Dr. J. M. Pawara	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO1	Explain details about the chemotherapeutic agents used for the treatment of different diseases side effects and synthesis.	Understand
CO2	Explain drug discovery design and development and drug metabolism and application of nanoparticles in medicinal chemistry.	Understand
CO3	Classify the dyes based on Chemical Constitution and preparations	Understand
CO4	Explain the non-textile uses, Health and Environmental Hazards of the dyes	Understand

Semester-VI
Practical

T.Y.B.Sc.	PRACTICALS OF USC6CH5	Sem-VI
Course Code: USC6CP3	**Course Coordinator:** Dr. S.N. Vajekar, Dr. J. M. Pawara	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO1	Synthesize, Crystallization Physical constant, able to understand process of purification.	Apply
CO2	Determination of Calcium from given Calcium tablet	Create
CO3	Examine monograph	Evaluate
CO4	Apply the TLC technique for the separation of the mixture of dyes	Apply

M.Sc.-I Organic Chemistry
Semester-I

M.Sc-I Organic Chemistry	**Inorganic Chemistry**	**Sem-I**
Course Code: PSC1IC1	**Course Coordinator:** Dr. Anuja Singh	

Sr.No.	After completing the course, Student will able to:	Bloom Taxonomy Level (BTL)
CO1	Explain theories of bonding, hybridization, resonance concept, MOT for diatomic species of first transition Series, Polyatomic species and Higher boranes, carboranes, metalloboranes and metallocarboranes, metal carbonyls and halide clusters.	Understand
CO2	Explain The concept of band theory, Fermi level, K-Space and Brillouin Zones. Structures of Compounds of the type: AB, AB2 etc. and Preparative methods of inorganic solids & nano materials.	Understand
CO3	Construct Group Multiplication Tables, Character tables using concept of Molecular Symmetry and Group Theory.	Apply
CO4	Determine electronic parameters such as Δ, B, C, Nephelauxetic ratio, formation constants of metal complexes and Characterize coordination compounds using techniques like thermal studies, Conductivity measurements, electronic spectral and magnetic measurements, IR, NMR and ESR spectroscopic	Evaluate

M.Sc.-I Organic Chemistry	**Inorganic Chemistry Practical**	**Sem-I**
Course Code: PSC1ICP	**Course Coordinator:** Dr. B.V. Jadhav Dr. D. K. Patil	

Sr. No.	**After completing the course, Students will be able to:**	**Bloom Taxonomy Level (BTL)**
CO1	Prepare various inorganic complexes such as Bis-(tetramethylammonium) tetrachloroCuprate (II) (Me4 N) 2[CuCl4],Tetramminemonocarbanato Cobalt (III) Nitrate, Bis (ethylenediammine) Copper (II) Sulphate, Hydroniumdichlorobis(dimethylglyoximato) etc.	Understand
CO2	Determine the electrolytic nature of inorganic compounds	Apply
CO3	Apply Slope intercept method for determination of equilibrium constants forFe^{+3}/ SCN- system.	Apply
CO4	Analyze the inorganic complex for percentage of metal and ligand.	Analyse

M.Sc.-I Organic Chemistry	Organic Chemistry	Sem-I
Course Code: PSC1IOC1	**Course Coordinator:** Dr. J.M. Pawara	
Sr. No.	**After completing the course, Students will be able to:**	**Bloom Taxonomy Level (BLT)**
CO1	Understand the types of reaction and their applications	Remember
CO2	Summarize the various aspects of aromaticity, aliphatic and aromatic nucleophilic substitution reactions with their mechanism and examples.	Understand
CO3	Apply the concept of Configurational descriptors (R,S nomenclature) to chiral centres in Organic compounds	Apply
CO4	Predict the mechanism, selectivity, importance and applications of oxidizing and reducing agent	Apply

M.Sc.-I Organic Chemistry	Organic Chemistry Practical	Sem-I
Course Code: PSC1IOCP	**Course Coordinator:** Dr. J.M. Pawara	
Sr. No	**After completing the course, Students will be able to:**	**Bloom Taxonomy Level (BLT)**
CO1	Plan preparation of organic compounds	Apply
CO2	Demonstrate the skill of purification of organic compounds by recrystallization and sublimation methods.	Understand
CO3	Apply the thin layer chromatography technique to check the purity of the synthesized product.	Apply
CO4	Can Sketch the structure of organic compounds using software Chem Biodraw.	Apply

M.Sc.-I Organic Chemistry	Analytical Chemistry	Sem-I

Course Code: PSC1AC1		Course Coordinator: Dr. S.M. Chilate
Sr. No	**After completing the course, Students will be able to:**	**Bloom Taxonomy Level (BLT)**
CO1	Explain the concept of data domain, performance characteristics of an instrument/method, total quality management, quality standards for laboratories, quality audits and quality reviews.	Understand
CO2	Discover the applications of UV-Visible spectroscopy, IR spectroscopy, Differential scanning calorimetry.	Apply
CO3	Identify the need of automation in chemical analysis, safety measures in laboratory, need of accreditation of laboratories and GLP.	Evaluate
CO4	Interpret the data based on calculations and statistical tests.	Evaluate

M.Sc.-I Organic Chemistry	Analytical Chemistry Practical	Sem-I
Course Code: PSC1ACP	Course Coordinator: Dr. S.M. Chilate	
Sr. No	**After completing the course, Students will be able to:**	**Bloom Taxonomy Level (BLT)**
CO1	Demonstrate the titration skills for the analysis of samples of a diverse variety	Apply
CO2	Apply the statistical methods for data analysis	Apply
CO3	Analyze the measured data based on Chemical principles	Analyze
CO4	Measure the characteristics of ion exchange resins	Evaluate

M.Sc.-I Organic Chemistry	Physical Chemistry (Electives-I)	Sem-I
Course Code: PSC1PC1	Course Coordinator: Dr. V.S. Kamble	
Sr. No	**After completing the course, Students will be able to:**	**Bloom Taxonomy Level (BLT)**
CO1	Prove Maxwell relations and its significance and applications to ideal gases, Joule Thomson experiment, Joule Thomson coefficient and inversion temperature. Apply Third law of Thermodynamics to find out absolute entropy	Understand
CO2	Make use of quantum mechanics for Particle waves and Schrödinger wave equation, wave functions, properties of wave functions, Normalization of wave functions, orthogonality of wave functions. Particle in a one, two- and three-dimensional box	Apply

M.Sc.-I Organic Chemistry	Physical Chemistry (Electives-II)	Sem-I
Course Code: PSC1PC1	**Course Coordinator:** Dr. V.S. Kamble	

Sr. No	After completing the course, Students will be able to:	Bloom Taxonomy Level (BLT)
CO1	Define, understand basic terms of Chemical Dynamics i.e. rate constant, order of reaction, molecularity of reaction also compare Composite Reactions and Polymerization reactions	Evaluate
CO2	Make use of Colloids and Surface Phenomena in daily applications	Apply

M.Sc.-I Organic Chemistry	Physical Chemistry Practical	Sem-I
Course Code: PSC1PCP	**Course Coordinator:** Dr. V.S. Kamble	

Sr. No.	After completing the course, Students will be able to:	Bloom Taxonomy Level (BLT)
CO1	Know the principles of different instruments like Potentiometry, Conductometry, pH Metry.	Understand
CO2	Determine the heat of solution of sparingly soluble acid and identify the reaction between acetone and iodine.	Apply

M.Sc.-I Organic Chemistry	Research Methodology	Sem-I
Course Code: PSC1RM	**Course Coordinator:** Dr. J.M. Pawara	

Sr. No.	Course Outcomes	Bloom Taxonomy Level (BTL)
CO1	Explain the importance of different types of print and digital resources for gap analysis and data collection.	Understand
CO2	Design/propose methodologies preferably with green and safe approach to conduct research	Create
CO3	Anayze scientific data by statistical and graphical methods.	Analyse
CO4	Apply skills of chemical safety & ethical handling of chemicals	Apply

M.Sc.-I Organic Chemistry
Semester-II

M.Sc.-I Organic Chemistry	Inorganic Chemistry	Sem-II
Course Code: PSC2IC2	**Course Coordinator:** Dr. Anuja Singh	

Sr.No.	After completing the course, Student will able to:	Bloom Taxonomy Level (BTL)
CO1	Recall Organometallic Chemistry of Transition metals, Eighteen and sixteen electron rules, Preparation and property's structure and bonding of the Organometallic compounds	Remember
CO2	Explain Photochemical Reactions, Ligand substitution reactions of: Octahedral complexes, Square planar complexes, trans-effect, its theories and applications. Redox reactions: inner and outer sphere mechanisms, stereochemistry of substitution reactions of octahedral complexes	Understand
CO3	Explain Bioinorganic Chemistry related to biological oxygen carriers; hemoglobin, hemerythrene and hemocyanine- structure of metal active center and differences in mechanism of oxygen binding, Copper containing enzymes, Nitrogen fixation Metal ion transport and storage, Medicinal applications of cis-platin and related compounds.	Understand
CO4	Discuss the implication of toxic metallic species radioactive materials on environment and biological system using case studies.	Create

M.Sc.-I Organic Chemistry	Inorganic Chemistry Practical	Sem-II
Course Code: PSC2ICP	**Course Coordinator:** Dr. B.V. Jadhav Dr. D.K. Patil	

Sr. No	After completing the course, Student will able to:	Bloom Taxonomy Level (BTL)
CO1	Analyse ores and alloys using volumetric and gravimetric analysis.	Analyse
CO2	Estimate percentage of metals in the ore and alloy	Evaluate
CO3	Apply the potentiometric method for redox titrations of Fe, Cu etc.	Apply

M.Sc.-I Organic Chemistry	Organic Chemistry	Sem-II
Course Code: PSC2OC2	**Course Coordinator:** Dr. J.M. Pawara	

Sr. No	After completing the course, Student will able to:	Bloom Taxonomy Level (BTL)
CO1	Explain the Generation of carbanion, enolate, enamine with their alkylation & acylation reaction and name reactions with their mechanism.	Understand
CO2	Illustrate mechanism, stereochemistry, applications and importance of name reactions and rearrangements.	Understand
CO3	Explain the role of reagents in organic synthesis.	Analyse
CO4	Interpret the structure of organic compounds using combined of spectral techniques.	create

M.Sc.-I Organic Chemistry	Organic Chemistry Practical	Sem-II
Course Code: PSC2OCP	Course Coordinator: Dr. J.M. Pawara	

Sr. No	After completing the course, Student will able to:	Bloom Taxonomy Level (BTL)
CO1	Identify the chemical type of components present in a binary mixture of an organic compound.	Apply
CO2	Apply skills in the separation and qualitative analysis of organic compounds of binary mixtures by microscale technique.	Apply
CO3	Make use of crystallization, sublimation and distillation for purification of the organic compounds.	Apply
CO4	Demonstrate the practical aspects in the preparation of the organic compounds derivatives.	Understand

M.Sc.-I Organic Chemistry	Analytical Chemistry	Sem-II
Course Code: PSC2AC1	Course Coordinator: Dr. S.M. Chilate	

Sr. No	After completing the course, Student will able to:	Bloom Taxonomy Level (BTL)
CO1	Translate the theoretical principles of advanced separation techniques, spectroscopic techniques, radioanalytical techniques, electroanalytical techniques into applications.	Understand
CO2	Explain the working principles of surface analytical techniques such as SEM, STM, TEM, ESCA, Auger spectroscopy and ICP-AES	Understand
CO3	Compare the different ion sources and mass analyzers in mass spectroscopy	Analyze

CO4	Determine the electrical quantities such as charge, current, potential using Electroanalytical methods	Evaluate

M.Sc.-I Organic Chemistry	**Analytical Chemistry Practical**	**Sem-II**
Course Code: PSC2ACP	**Course Coordinator:** Dr. S.M. Chilate	
Sr. No	**After completing the course, Student will able to:**	**Bloom Taxonomy Level (BTL)**
CO1	Demonstrate the operational skills on the selected instruments and retrieve information	Understand
CO2	Develop a sense of time management, safe use of chemicals and environmental safety	Apply

M.Sc.-I Organic Chemistry	**Physical Chemistry (Elective-I)**	**Sem-II**
Course Code: PSC2PC2	**Course Coordinator:** Dr. V.S. Kamble	
Sr. No	**After completing the course, Student will able to:**	**Bloom Taxonomy Level (BTL)**
CO1	Explain Bioenergetics, Real solutions and Fugacity of real gases also show graphical representations of BET isotherms	Apply
CO2	Prove expressions for the total wave function for 1s,2s, 2p and 3d orbitals of hydrogen and aapplication of the Schrödinger equation to two electron system	Evaluate

M.Sc.-I Organic Chemistry	**Physical Chemistry (Elective-II)**	**Sem-II**
Course Code: PSC2PC2	**Course Coordinator:** Dr. V.S. Kamble	
Sr. No	**After completing the course, Student will able to:**	**Bloom Taxonomy Level (BTL)**
CO1	Explain terms involved in Chemical Kinetics and Molecular Reaction Dynamics. Elementary Reactions in Solution, Kinetics of reactions catalysed by enzymes -Michaelis-Menten analysis, Lineweaver-Burk and Eadie Analyses, Inhibition of Enzyme action.	Apply, Evaluate
CO2	Apply Photochemistry to solve NET, SET GATE Problems.	Apply

M.Sc.-I Organic Chemistry	Physical Chemistry Practical	Sem-II
Course Code: PSC2PCP	**Course Coordinator:** Dr. V.S. Kamble	
Sr. No	**After completing the course, Student will able to:**	**Bloom Taxonomy Level (BTL)**
CO1	Know principles of different instruments like Potentiometry, Conductometry, pH Metry and colorimeter.	Understand
CO2	Make use of graphical representation to identify Shape of Orbitals.	Apply

M.Sc.-I Organic Chemistry	On Job Training (OJT)	Sem-II
Course Code: PSC2OJT	**Course Coordinator:** All the Teachers	
Sr. No	**After completing the course, Student will able to:**	**Bloom Taxonomy Level (BTL)**
CO1	On-the-job training aims to enhance employees' practical skills and knowledge within their specific work environment.	Understand
CO2	The course outcomes include improved job proficiency, increased task efficiency, and a better understanding of workplace processes.	Apply

M.Sc.-I Analytical Chemistry
Semester-I

M.Sc.-I Organic Chemistry	Physical Chemistry	Sem-I
Course Code: PSC1PC1	**Course Coordinator:** Dr. V.S. Kamble	

Sr. No	After completing the course, Students will be able to:	Bloom Taxonomy Level (BLT)
CO1	Prove Maxwell relations and its significance and applications to ideal gases, Joule Thomson experiment, Joule Thomson coefficient and inversion temperature. Apply Third law of Thermodynamics to find out absolute entropy	Understand
CO2	Make use of quantum mechanics for Particle waves and Schrödinger wave equation, wave functions, properties of wave functions, Normalization of wave functions, orthogonality of wave functions. Particle in a one, two- and three-dimensional box	Apply
CO1	Define, understand basic terms of Chemical Dynamics i.e. rate constant, order of reaction, molecularity of reaction also compare Composite Reactions and Polymerization reactions	Evaluate
CO2	Make use of Colloids and Surface Phenomena in daily applications	Apply

M.Sc.-I Organic Chemistry	Physical Chemistry Practical	Sem-I
Course Code: PSC1PCP	**Course Coordinator:** Dr. V.S. Kamble	

Sr. No.	After completing the course, Students will be able to:	Bloom Taxonomy Level (BLT)
CO1	Know the principles of different instruments like Potentiometry, Conductometry, pH Metry.	Understand
CO2	Determine the heat of solution of sparingly soluble acid and identify the reaction between acetone and iodine.	Apply

M.Sc.-I Organic Chemistry	Organic Chemistry	Sem-I
Course Code: PSC1IOC1	**Course Coordinator:** Dr. J.M. Pawara	

Sr. No.	**After completing the course, Students will be able to:**	**Bloom Taxonomy Level (BLT)**
CO1	Understand the types of reaction and their applications	Remember
CO2	Summarize the various aspects of aromaticity, aliphatic and aromatic nucleophilic substitution reactions with their mechanism and examples.	Understand
CO3	Apply the concept of Configurational descriptors (R,S nomenclature) to chiral centres in Organic compounds	Apply
CO4	Predict the mechanism, selectivity, importance and applications of oxidizing and reducing agent	Apply

M.Sc.-I Organic Chemistry	**Organic Chemistry Practical**	**Sem-I**
Course Code: PSC1IOCP	**Course Coordinator:** Dr. J.M. Pawara	

Sr. No	**After completing the course, Students will be able to:**	**Bloom Taxonomy Level (BLT)**
CO1	Plan preparation of organic compounds	Apply
CO2	Demonstrate the skill of purification of organic compounds by recrystallization and sublimation methods.	Understand
CO3	Apply the thin layer chromatography technique to check the purity of the synthesized product.	Apply
CO4	Can Sketch the structure of organic compounds using software Chem Biodraw.	Apply

M.Sc.-I Organic Chemistry	**Analytical Chemistry**	**Sem-I**
Course Code: PSC1AC1	**Course Coordinator:** Dr. S.M. Chilate	

Sr. No	After completing the course, Students will be able to:	Bloom Taxonomy Level (BLT)
CO1	Explain the concept of data domain, performance characteristics of an instrument/method, total quality management, quality standards for laboratories, quality audits and quality reviews.	Understand
CO2	Discover the applications of UV-Visible spectroscopy, IR spectroscopy, Differential scanning calorimetry.	Apply
CO3	Identify the need of automation in chemical analysis, safety measures in laboratory, need of accreditation of laboratories and GLP.	Evaluate
CO4	Interpret the data based on calculations and statistical tests.	Evaluate

M.Sc.-I Organic Chemistry	Analytical Chemistry Practical	Sem-I
Course Code: PSC1ACP	**Course Coordinator:** Dr. S.M. Chilate	

Sr. No	After completing the course, Students will be able to:	Bloom Taxonomy Level (BLT)
CO1	Demonstrate the titration skills for the analysis of samples of a diverse variety	Apply
CO2	Apply the statistical methods for data analysis	Apply
CO3	Analyze the measured data based on Chemical principles	Analyze
CO4	Measure the characteristics of ion exchange resins	Evaluate

M.Sc-I Organic Chemistry	Inorganic Chemistry (Elective-I)	Sem-I
Course Code: PSC1IC1	**Course Coordinator:** Dr. Anuja Singh	

Sr.No.	After completing the course, Student will able to:	Bloom Taxonomy Level (BTL)
CO1	Explain theories of bonding, hybridization, resonance concept, MOT for diatomic species of first transition Series, Polyatomic species and Higher boranes, carboranes, metalloboranes and metallocarboranes, metal carbonyls and halide clusters.	Understand
CO2	Explain The concept of band theory, Fermi level, K-Space and Brillouin Zones. Structures of Compounds of the type: AB, AB2 etc. and Preparative methods of inorganic solids & nano materials.	Understand

M.Sc-I Organic Chemistry	Inorganic Chemistry (Elective-II)	Sem-I
Course Code: PSC1IC1	**Course Coordinator:** Dr. Anuja Singh	

Sr.No.	After completing the course, Student will able to:	Bloom Taxonomy Level (BTL)
CO1	Construct Group Multiplication Tables, Character tables using concept of Molecular Symmetry and Group Theory.	Apply
CO2	Determine electronic parameters such as Δ, B, C, Nephelauxetic ratio, formation constants of metal complexes and Characterize coordination compounds using techniques like thermal studies, Conductivity measurements, electronic spectral and magnetic measurements, IR, NMR and ESR spectroscopic	Evaluate

M.Sc.-I Organic Chemistry	Inorganic Chemistry Practical	Sem-I
Course Code: PSC1ICP	Course Coordinator: Dr. B.V. Jadhav Dr. D. K. Patil	

Sr. No.	After completing the course, Students will be able to:	Bloom Taxonomy Level (BTL)
CO1	Prepare various inorganic complexes such as Bis-(tetramethylammonium) tetrachloroCuprate (II) (Me4 N) 2[CuCl4],Tetramminemonocarbanato Cobalt (III) Nitrate, Bis (ethylenediammine) Copper (II) Sulphate, Hydroniumdichlorobis(dimethylglyoximato) etc.	Understand
CO2	Determine the electrolytic nature of inorganic compounds	Apply
CO3	Apply Slope intercept method for determination of equilibrium constants forFe^{+3}/ SCN- system.	Apply
CO4	Analyze the inorganic complex for percentage of metal and ligand.	Analyse

M.Sc.-I Organic Chemistry	Research Methodology	Sem-I
Course Code: PSC1RM	Course Coordinator: Dr. J.M. Pawara	

Sr. No.	Course Outcomes	Bloom Taxonomy Level (BTL)
CO1	Explain the importance of different types of print and digital resources for gap analysis and data collection.	Understand
CO2	Design/propose methodologies preferably with green and safe approach to conduct research	Create
CO3	Anayze scientific data by statistical and graphical methods.	Analyse
CO4	Apply skills of chemical safety & ethical handling of chemicals	Apply

M.Sc.-I Organic Chemistry
Semester-II

M.Sc.-I Organic Chemistry	Physical Chemistry	Sem-II
Course Code: PSC2PC2	**Course Coordinator:** Dr. V.S. Kamble	

Sr. No	After completing the course, Student will able to:	Bloom Taxonomy Level (BTL)
CO1	Explain Bioenergetics, Real solutions and Fugacity of real gases also show graphical representations of BET isotherms	Apply
CO2	Prove expressions for the total wave function for 1s,2s, 2p and 3d orbitals of hydrogen and aapplication of the Schrödinger equation to two electron system	Evaluate
CO1	Explain terms involved in Chemical Kinetics and Molecular Reaction Dynamics. Elementary Reactions in Solution, Kinetics of reactions catalysed by enzymes -Michaelis-Menten analysis, Lineweaver-Burk and Eadie Analyses, Inhibition of Enzyme action.	Apply, Evaluate
CO2	Apply Photochemistry to solve NET, SET GATE Problems.	Apply

M.Sc.-I Organic Chemistry	Physical Chemistry Practical	Sem-II
Course Code: PSC2PCP	**Course Coordinator:** Dr. V.S. Kamble	

Sr. No	After completing the course, Student will able to:	Bloom Taxonomy Level (BTL)
CO1	Know principles of different instruments like Potentiometry, Conductometry, pH Metry and colorimeter.	Understand
CO2	Make use of graphical representation to identify Shape of Orbitals.	Apply

M.Sc.-I Organic Chemistry	Organic Chemistry	Sem-II
Course Code: PSC2OC2	**Course Coordinator:** Dr. J.M. Pawara	

Sr. No	After completing the course, Student will able to:	Bloom Taxonomy Level (BTL)
CO1	Explain the Generation of carbanion, enolate, enamine with their alkylation & acylation reaction and name reactions with their mechanism.	Understand

CO2	Illustrate mechanism, stereochemistry, applications and importance of name reactions and rearrangements.	Understand
CO3	Explain the role of reagents in organic synthesis.	Analyse
CO4	Interpret the structure of organic compounds using combined of spectral techniques.	create

M.Sc.-I Organic Chemistry	**Organic Chemistry Practical**	**Sem-II**
Course Code: PSC2OCP	**Course Coordinator:** Dr. J.M. Pawara	
Sr. No	**After completing the course, Student will able to:**	**Bloom Taxonomy Level (BTL)**
CO1	Identify the chemical type of components present in a binary mixture of an organic compound.	Apply
CO2	Apply skills in the separation and qualitative analysis of organic compounds of binary mixtures by microscale technique.	Apply
CO3	Make use of crystallization, sublimation and distillation for purification of the organic compounds.	Apply
CO4	Demonstrate the practical aspects in the preparation of the organic compounds derivatives.	Understand

M.Sc.-I Organic Chemistry	**Analytical Chemistry**	**Sem-II**
Course Code: PSC2AC1	**Course Coordinator:** Dr. S.M. Chilate	
Sr. No	**After completing the course, Student will able to:**	**Bloom Taxonomy Level (BTL)**
CO1	Translate the theoretical principles of advanced separation techniques, spectroscopic techniques, radioanalytical techniques, electroanalytical techniques into applications.	Understand
CO2	Explain the working principles of surface analytical techniques such as SEM, STM, TEM, ESCA, Auger spectroscopy and ICP-AES	Understand
CO3	Compare the different ion sources and mass analyzers in mass spectroscopy	Analyze
CO4	Determine the electrical quantities such as charge, current, potential using Electroanalytical methods	Evaluate

M.Sc.-I Organic Chemistry	Analytical Chemistry Practical	Sem-II
Course Code: PSC2ACP	**Course Coordinator:** Dr. S.M. Chilate	

Sr. No	After completing the course, Student will able to:	Bloom Taxonomy Level (BTL)
CO1	Demonstrate the operational skills on the selected instruments and retrieve information	Understand
CO2	Develop a sense of time management, safe use of chemicals and environmental safety	Apply

M.Sc.-I Organic Chemistry	Inorganic Chemistry (Elective-I)	Sem-II
Course Code: PSC2IC2	**Course Coordinator:** Dr. Anuja Singh	

Sr.No.	After completing the course, Student will able to:	Bloom Taxonomy Level (BTL)
CO1	Recall Organometallic Chemistry of Transition metals, Eighteen and sixteen electron rules, Preparation and property's structure and bonding of the Organometallic compounds	Remember
CO2	Explain Photochemical Reactions, Ligand substitution reactions of: Octahedral complexes, Square planar complexes, trans-effect, its theories and applications. Redox reactions: inner and outer sphere mechanisms, stereochemistry of substitution reactions of octahedral complexes	Understand

M.Sc.-I Organic Chemistry	Inorganic Chemistry (Elective-II)	Sem-II
Course Code: PSC2IC2	**Course Coordinator:** Dr. Anuja Singh	

Sr.No.	After completing the course, Student will able to:	Bloom Taxonomy Level (BTL)
CO1	Explain Bioinorganic Chemistry related to biological oxygen carriers; hemoglobin, hemerythrene and hemocyanine- structure of metal active center and differences in mechanism of oxygen binding, Copper containing enzymes, Nitrogen fixation Metal ion transport and storage, Medicinal applications of cis-platin and related compounds.	Understand
CO2	Discuss the implication of toxic metallic species radioactive materials on environment and biological system using case studies.	Create

M.Sc.-I Organic Chemistry	Inorganic Chemistry Practical	Sem-II

Course Code: PSC2ICP		Course Coordinator: Dr. B.V. Jadhav Dr. D.K. Patil
Sr. No	**After completing the course, Student will able to:**	**Bloom Taxonomy Level (BTL)**
CO1	Analyse ores and alloys using volumetric and gravimetric analysis.	Analyse
CO2	Estimate percentage of metals in the ore and alloy	Evaluate
CO3	Apply the potentiometric method for redox titrations of Fe, Cu etc.	Apply

M.Sc.-I Organic Chemistry	On Job Training (OJT)	Sem-II
Course Code: PSC2OJT	Course Coordinator: All the Teachers	
Sr. No	**After completing the course, Student will able to:**	**Bloom Taxonomy Level (BTL)**
CO1	On-the-job training aims to enhance employees' practical skills and knowledge within their specific work environment.	Understand
CO2	The course outcomes include improved job proficiency, increased task efficiency, and a better understanding of workplace processes.	Apply

M.Sc.-II Organic Chemistry
Semester III

M.Sc.-II Organic Chemistry	**Paper I- Theoretical Organic Chemistry-I**	**Sem-III**
Course Code - PSC3TOC	**Course Coordinator-Prof. Dr. V. D. Patil**	

COs. No.	**After completing the course, students will be able to:**	**Bloom Taxonomy Level (BTL)**
CO1	Explain the structure, generation, stability and reactions of organic reactive intermediates and importance of neighbouring group participation, role of FMOs.	Understand
CO2	Apply the principles of photochemistry to carbonyl compounds, olefins, arenes and radical reactions.	Apply
CO3	Identify pericyclic reactions and describe cycloaddition reactions, electrocylic reactions and sigmatropic rearrangements	Apply
CO4	Analyze conformation of medium size ring, fused ring, bridge ring, steroids and reactivity of addition, elimination, rearrangement and reduction with stereoselective and stereospecific reactions.	Analyse

M.Sc.-II Organic Chemistry	**Paper II - Synthetic Organic Chemistry –I**	**Sem-III**
Course Code - PSC3SOC	**Course Coordinator- Dr. J.G. Pargaonkar**	

COs. No.	**After completing the course, students will be able to:**	**Bloom Taxonomy Level (BTL)**
CO 1	Summarize generation, stability, structure, stereochemical aspects of free radicals, its characteristic reactions and use in organic synthesis.	Understand
CO 2	Explain preparation of organometallic compound, its applications, mechanism and regiochemistry of reactions involving metals/non-metals in organic synthesis.	Understand
CO 3	Compare between enamines and enolates, methods of preparation, applications with stereochemical aspects in synthetic reactions	Analyse
CO 4	Predict the products of name reactions, domino reactions, click reactions, multicomponent reactions and describe the mechanisms showing how the products are formed	Create

M.Sc.-II Organic Chemistry	Paper III- Natural products Heterocyclic chemistry and Spectroscopy-I	Sem-III
Course Code - PSC3NPHS	Course Coordinator- Dr. D. K. Patil	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO 1	Explain the occurrence, structural features, and biological importance and multistep synthesis of natural products.	Understand
CO 2	Draw conclusion based on evidence for structure elucidation and synthesis of natural products.	Analysis
CO 3	Construct the names of heterocyclic compounds by IUPAC nomenclature and explain synthesis and reactivity of heterocyclic compounds	Analysis
CO 4	Interpret the data for the structure elucidation of organic compounds based on UV, IR, ^{1}H-NMR and ^{13}C-NMR.	Evaluate

M.Sc.-II Organic Chemistry	Paper IV- Medicinal, Biogenesis and Green Chemistry	Sem-III
Course Code - PSC3MBG	Course Coordinator- Ms. P.A. Patil	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO 1	Demonstrate the knowledge of the twelve principles of green chemistry which they can practice to a range of workplace for a safer less toxic and healthier environment.	Understand
CO 2	Explain the basic terms used in medicinal chemistry, the pharmacokinetics of drug, drug structure activity relationship, physical chemical parameters of drugs and procedures in drug design.	Understand
CO 3	Apply skills required for drug design, development of modern methods of synthesis required for employment in the pharmaceutical industries.	Apply
CO 4	Build the Biogenesis and biosynthesis of natural products by acetate pathway, shikimate pathway and mevalonate it pathway.	Apply

M.Sc.-II Organic Chemistry	Paper IV- Bioorganic Chemistry	Sem-III
Course Code - PSC3BIC	Course Coordinator- Ms. P.A. Patil	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO 1	Summarize amino acids, peptides, proteins and nucleic acids and chemical synthesis of oligonucleotides.	Understand
CO 2	Explain importance of enzymatic reactions and factors affecting enzyme kinetics.	Understand
CO 3	Relate the importance of enzymes in the synthesis of organic compound.	Understand
CO 4	Explain biological importance and metabolism of carbohydrates and lipids.	Evaluate

Semester-III Practical

M.Sc.-II Organic Chemistry	Ternary Mixture (Practical)	Sem-III
Course Code : PSC3TOP0	Course Coordinator: Ms. S. A. Shaikh	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO 1	Identify the chemical type of components present the in ternary mixture oforganic compounds.	Apply
CO 2	Apply skills in detection, identification and separation of organic compounds of ternary mixtures by microscale technique.	Apply

M.Sc.-II Organic Chemistry	Identification of organic compounds (Practical)	Sem-III
Course Code : PSC3SOP0	Course Coordinator: Ms. S. A. Shaikh	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO 1	Identify the chemical type of components present the in ternary mixture oforganic compounds.	Apply

CO 2	Demonstrate the practical aspects in the preparation of the organic compounds and their derivatives	Understand

M.Sc.-II Organic Chemistry	**Single step preparation (Practical)**	**Sem-III**
Course Code : PSC3NPP0 & (PSC3MBP0 or PSC3BIP0)	**Course Coordinator: Ms. S. A. Shaikh**	

COs. No.	**After completing the course, students will be able to:**	**Bloom Taxonomy Level (BTL)**
CO1	Demonstrate the skills in organic preparations required for pursuing acareer in the pharmaceutical, chemical industry, research etc.	Understand
CO2	Make use of column chromatography, crystallization steam and vacuumdistillation for purification of the organic compounds	Apply
CO3	Identify the prepared organic compounds by Thin Layer Chromatography	Apply

Semester IV

M.Sc.-II Organic Chemistry	**Paper I- Theoretical Organic Chemistry-II**	**Sem-IV**
Course Code – PSC4TOC	**Course Coordinator- Prof. Dr. V. D. Patil**	

COs. No.	**After completing the course, students will be able to:**	**Bloom Taxonomy Level (BTL)**
CO1	Explain the principles of molecular association and organization, host-guest interaction, structure and properties of crown ether, cryptands, cyclophanes, rotaxanes, cyclodextrines, molecular self-assembly and Supramolecular polymers	Understand
CO2	Explain principles, methods of asymmetric synthesis and use of chiral auxiliaries in asymmetric synthesis	Understand
CO3	Apply the linear free energy relationship for determination of organic reaction mechanism using Hammett equation and Taft equation.	Apply
CO4	Determine the enantiomer and diastereomer composition by different methods, asymmetric transformation, molecular dissymmetry and chiroptical properties and explain the ORD and CD curves, Cotton effects, octane rule and its applications.	Evaluate

M.Sc.-II Organic Chemistry	Paper II - Synthetic Organic Chemistry –II	Sem-IV
Course Code – PSC4SOC	Course Coordinator- Dr. J.G. Pargaonkar	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO1	Explain the concepts of retrosynthesis, protecting groups, synthetic planning and selective transformations in organic synthesis.	Understand
CO2	Apply disconnection approach, FGI, FGA, FGR and recognize starting compounds in designing organic synthesis of target molecules.	Apply
CO3	Summarize electro-organic chemistry and use of organocatalyst, Lewis acid, crown ethers, cryptands, micelles etc. in selected methods of organic synthesis.	Understand
CO4	Predict the products of organic synthesis in which transition and rare earth metals are used.	Create

M.Sc.-II Organic Chemistry	Paper III- Natural products Heterocyclic chemistry and Spectroscopy	Sem-IV
Course Code - PSC4NPHS	Course Coordinator- Dr. D. K. Patil	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO1	Explain occurrence, classification, structural and stereochemical features of steroids, insect pheromones, insecticides, vitamins and their biological role in life related processes.	Understand
CO2	Plan the synthesis of biologically important steroids, vitamins, antibiotics, insecticides.	Apply
CO3	Apply fundamentals of heterocyclic reactivity and synthesis skills required for heterocyclic compounds in research and industry and explain the names of heterocycliccompounds by IUPAC nomenclature and replacement nomenclature.	Apply
CO4	Interpret the data for the structure elucidation of organic compounds based on UV, IR, ^{1}H-NMR, ^{13}C-NMR two dimensional spectroscopic techniques, COSY and HETCOR spectra, NOE and NOESY, INEPT, APT and INADEQUATE techniques.	Evaluate

M.Sc.-II Organic Chemistry	Paper IV- Intellectual Property Rights & Cheminformatics	Sem-IV
Course Code - PSC4IPR	Course Coordinator- Ms. P.A. Patil	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO1	Define various terminologies related to IPR	Remember
CO2	Explain the role of law in the violation of IPR	Understand
CO3	Summarise the various models of cheminformatics.	Understand
CO4	Apply the knowledge of cheminformatics to predict the properties of compounds, structures and drug designing.	Apply

M.Sc.-II Organic Chemistry	Paper IV- Research Methodology	Sem-IV
Course Code - PSC4RMT	Course Coordinator- Ms. P.A. Patil	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO1	Explain the importance of different types of print and digital resources for gap analysis and data collection.	Understand
CO2	Design/propose methodologies preferably with green and safe approach to conduct research	Create
CO3	Anayze scientific data by statistical and graphical methods.	Analyse
CO4	Apply skills of chemical safety & ethical handling of chemicals	Apply

Semester-IV (Practical)

M.Sc.-II Organic Chemistry	Two step preparation (Practical)	Sem-IV
Course Code : PSC4TOP0 & PSC4SOP0	**Course Coordinator: Ms. P.A. Patil**	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO1	Plan the synthesis of organic compounds.	Apply
CO2	Make use of thin layer chromatography and physical constant to know thepurity of organic compounds	Apply
CO3	Apply principles of purification techniques such as recrystallization anddistillation for purification of organic compounds.	Analyse
CO4	Compare spectral data of reactant and product and explain mechanism ofreactions and MSDS of chemicals.	Apply

M.Sc.-II Organic Chemistry	Spectral identification &Project or Internship	Sem-IV
Course Code : PSC4NPP0 & (PSC4IPP0 or PSC4RMP0)	**Course Coordinator: Dr. J. M. Pawara**	

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO1	Interpret spectral data like FT-IR, ^{13}C NMR, ^{1}HNMR, UV-Visible spectrum and Mass spectrum for structure elucidation of organic compound	Evaluate
CO2	Analyze the print and digital resources critically to formulate the researchproblem, argue and justify the statements	Analyse
CO3	Apply the existing methodologies or develop a new methodology to address the research problem	Apply
CO4	Interpret the results and structures it to communicate via dissertation, andoral presentation by following ethical guidelines	Evaluate