

Shivaji University, Kolhapur

Name of Department: Chemistry

Name of Programme: M.Sc Organic Chemistry

Vision: Engender Human Resource to Lead the Competitive Science World for Nation Building

Mission : Impart most advanced scientific knowledge and training to the students so that genuine researchers and skilled scientists of world standard will be made available for the advancement of national science and technology programs as well as to cater the needs of industrial and pharma sectors

Program Outcomes

PO1: Students will be able to acquire in depth knowledge about fundamental as well as applied organic chemistry concepts.

PO2 : Students will be able to solve various problems by identifying the essential parts of a problem, formulate strategy for solving the problem, applying appropriate techniques to arrive at a solution, test the precision and accuracy of the solution and interpret the results.

PO3: Students will be able to acquire domain specific knowledge and technical skills needed for employment in industries, teaching fields and pursue research.

PO4: Students will be able to apply the fundamental knowledge to address the cross-cutting issues such as sustainable development.

PO5: Students will get perfect insight into organic chemistry research ethics for production of quality research.

PO6: Students will be able to communicate effectively i. e. being able to comprehend and write effective reports, make effective presentations and documentation and capable of expressing the subject through technical writing as well as through oral presentation.

Program Specific Outcomes		
<p>PSO1. Students will be able to qualify competitive examinations like NET, SET, GATE, etc.</p> <p>PSO 2. Students will have opportunities to serve in different Chemical, Pharmaceutical as well as food and agrochemical industries.</p> <p>PSO 3. Students will have global level research opportunities in Ph.D. programme.</p> <p>PSO 4. Collaborate effectively on team-oriented projects in the field of Chemistry or other related fields.</p> <p>PSO 5. Students can start their own chemical industry / business (entrepreneurship).</p> <p>PSO 6. Students will be able to interpret NMR, MS, IR for structural elucidation.</p> <p>...</p>		
Course Outcomes		
Part-I Semester-I		
CH-1.1	(Inorganic Chemistry – I)	<p>1. CO1: Students will be able to explain the basic chemistry of transition metals and its compounds, spectroscopic characteristics of such compounds, nomenclature, reactions and applications.</p> <p>CO2: Students will obtain knowledge about Preparation, structure, physical and chemical properties of metal carbonyls of transition metals.</p> <p>CO3: Students will be able to understand the all aspects of synthesis, bonding, structure and reactivity of organometallic compounds and their applications in homogenous catalysis.</p> <p>CO4: Student will be able determine the stability of the complexes and will be able to explain the nuclear stability and reactions.</p>

<p>CH-1.2</p>	<p>(Organic Chemistry – I)</p>	<p>CO1: Students will be able to differentiate between various organic reactive intermediates.</p> <p>CO2: Students can recognize, classify, explain, and apply fundamental organic reactions.</p> <p>CO3: Students will have ability to distinguish between different kinds of isomers.</p> <p>CO4: Course will develop interest in writing and finding mechanisms of new reactions.</p> <p>.</p> <p>.</p>
<p>CH-1.3</p>	<p>(Physical Chemistry – I)</p>	<p>CO1: Students will be able to understand basic principles of thermodynamics and statistical mechanics</p> <p>CO2: Able to learn advanced topics like quantum statistics and molecular dynamic simulation methods.</p> <p>CO3: Develop abilities to understand how to estimate and analyze the physicochemical properties of condensed and gas phase materials.</p> <p>CO4: Able to utilize spectral data to estimate molecular thermodynamic properties through partition function calculations.</p> <p>CO5: Understand properties of detergents and colloidal materials</p> <p>CO6: Learns the principles and techniques to understand gas and liquid adsorptions on solid surfaces</p> <p>CO7: Can learn spectral techniques to study surface adsorption phenomena.</p> <p>CO8: Learn principles and techniques for estimation</p>

		<p>of average molecular weight of a polymer or biological macromolecules</p> <p>CO9: Develop abilities to characterize polymers through understanding theories of virial coefficients, concepts of glass transition temperatures, etc.</p>
CH.1.4:	Analytical Chemistry-I	<p>CO1: Students would acquire the knowledge about the fundamentals of Analytical Chemistry including the sampling, sample pretreatment, basic techniques, methods and data handling, processing and statistical analysis of the same.</p> <p>CO2: Students would acquire the knowledge and understand the scope of Analytical Chemistry spanning various fields. The students will learn fundamentals of qualitative analysis using conventional techniques</p> <p>CO3: Students will learn the chromatographic techniques, choice of chromatographic techniques and tuning of the chromatographic technique as per the need based on the samples to deal with, learn electroanalytical techniques and computation chemistry which would groom them for alternative analytical strategies which form one of the important components of analytical chemistry.</p> <p>CO4: Students will learn about referring to the standard reference books and infer information from the same. Analytical case study problems would be discussed to familiarize with the scope and advantages of Analytical Chemistry.</p>
PCH-1.1	(Practical – I)	CO1: Ability in professional sampling and sample

		<p>treatment before actual analysis</p> <p>CO2: Ability to treat and evaluate the results of analysis</p> <p>CO3: Understanding and capability of performing basic chemical processes in a chemical laboratory</p> <p>CO4: Capability of performing measurements on basic analytical instruments (photometers, spectrometers, chromatographs, ion-selective electrodes)</p>
PCH-1.2	(Practical – II)	<p>CO1: Students can be able to prepare various concentration solutions like molar, normal, ppm, etc.</p> <p>CO2: Determine the rate constants of various first order and second order reactions</p> <p>CO3: Determine the redox potential of a system, relative strength of acid etc using potentiometer, conductometer</p> <p>CO4: Know the formation of alloys like Brass, Bronze, phase diagram for binary and ternary systems studied in details like a composition, critical temperature, etc</p> <p>CO5: Validity of Freundlich adsorption isotherms to remove toxic material such as dye, acetic acid, and other industrial effluents</p>
Part-I Semester-II		
CH-2.1	(Inorganic Chemistry – II)	<p>CO1: Students will get the knowledge of the basic chemistry of non-transition elements and their compounds, synthesis and structural features, and applications.</p> <p>CO2: To be able to explain the structures of inorganic compounds based on different theories. Student will</p>

		<p>understand the chemistry of various types of solvents.</p> <p>CO3: Be well versed with the knowledge about the chemistry of Lanthanides and Actinides with respect to occurrence, separation, compounds and applications.</p> <p>CO4: To understand the three dimensional structures of solid-state materials of industrial importance and to get the knowledge of bio-inorganic Chemistry.</p>
CH-2.2	(Organic Chemistry – II)	<p>Course Outcomes (COs)</p> <p>CO1: Illustration of modern synthetic methods and applications of reagents.</p> <p>CO2: Provide knowledge of different organometallic compounds and various coupling reactions.</p> <p>CO3: Understand principle and applications of protection and deprotection of various functional groups.</p> <p>CO4: It will elaborate to understand the concept of chemoselectivity, regioselectivity and enantioselectivity.</p>
CH2.3	(Physical Chemistry – II)	<p>CO1: Students will learn basics of quantum mechanics.</p> <p>CO2: Knowledge of the course will form the basis or essential requirement for the course “Advanced Quantum Chemistry”</p> <p>CO3: Able to understand selection rules and to predict the electronic spectra of conjugated organic molecules.</p> <p>CO4: Able to study photochemical and photophysical phenomena</p> <p>CO5: Capable of qualitative and quantitative analysis</p>

		<p>of various ingredients from industrial, food and pharma samples using techniques of emission spectroscopy.</p> <p>CO6: Capable of understand the electrochemical aspects of materials, ionic processes and electrochemical sensors, battery materials and characterizations etc.</p> <p>CO7: Able to study electrokinetic effects and their applications in the field of protein separation, characterization etc.</p> <p>CO8: Understanding the molecular dynamics through kinetic studies. Applications to explore reaction pathways, protein-ligand binding rates, etc. will help to understand life governing processes.</p>
<p>CH.2.4:</p>	<p>Analytical Chemistry-II</p>	<p>CO1: Students will acquire the knowledge of spectroscopic tools/instruments used in chemical analysis and interpretation of the data. The scope and limitations of the spectroscopic tools would be discussed so that the students learn about the type of samples which could be analyzed by these tools offering choices among the spectroscopic tools.</p> <p>CO2: Students will learn about the simple and advanced instruments used for analysis like NMR, MS, AAS, ICP and thermal analysis (TGA, DTA, DSC etc.) techniques spanning wide variety of samples to be considered for analysis.</p> <p>CO3: Students will learn about the instrumentation, sample preparation and handling of sample, analysis and data interpretation and structural elucidation.</p> <p>CO4: Learning about different instruments will give them idea about appropriate choice of the instrument</p>

		for analysis based on the source and type of analyte(s) in the sample under consideration.
PCH-2.1	(Practical – III)	<p>CO1: Students developed for precise sample solution preparation and sample treatment before actual analysis.</p> <p>CO2: Students can be able to perform the calculations and error analysis</p> <p>CO3: Develop understanding of basic chemical processes and deciding methods of analysis.</p> <p>CO4: Capability of performing measurements on basic analytical instruments (photometers, spectrometers, chromatographs, high end thermometers, refractometer, pH meter etc.)</p>
PCH-2.2	(Practical – IV)	<p>CO1: Students can be able to prepare various concentration solutions like molar, normal, ppm, etc.</p> <p>CO2: Determine the unknown concentration and thermodynamic parameters using conductometer</p> <p>CO3: Student will explore how to estimate order of reaction and the catalysis</p> <p>CO4: students can estimate refractive index and molecular weights of species.</p> <p>CO5: Students can understand the estimation of equilibrium properties like redox potential, phase diagram etc</p>
Part-II Semester-III		
OCH-3.1	(Organic Reaction Mechanism)	CO1: Develop an ability to use effective written and/or oral communication through the application of organic chemistry concepts.

		<p>CO2: Gives a basic understanding of how organic chemistry impacts the natural and technological environments.</p> <p>CO3: This course gives wide understanding about the organic reaction mechanism.</p> <p>CO4: This course will give an idea about pericyclic reactions.</p>
OCH-3.2	(Advanced Spectroscopic Methods)	<p>CO1: Students will be able to identify different stretching and bending vibrational modes in IR spectroscopy and can apply their knowledge in interpretation of functional groups.</p> <p>CO2: Understand mass spectral fragmentation techniques with respect to structure determination.</p> <p>CO3: Understand how to interpret nuclear magnetic resonance spectrum from values of chemical shift.</p> <p>CO4: Students will have an idea of Beer Lambert's law and its applications.</p>
OCH- 3.3:	(Advanced Synthetic Methods)	<p>CO1: The applications of the reagents help students in designing multistep organic synthesis.</p> <p>CO2: They can utilize advanced techniques like microwaves, ionic liquids, ultrasound etc during their higher studies.</p> <p>CO3: Knowledge of retro-synthetic analysis helps for the study and design of a new reaction.</p> <p>CO4: Students will have an ability to develop ecofriendly methods for organic transformations</p>
OCH-3. 4	(A) (Drugs and Heterocycles)	<p>CO1: Able to correlate structure activity relationship of bioactive compounds</p> <p>CO2: Give idea of different classes of drugs for particular diseases</p> <p>CO3: Utilize their knowledge in synthesis of various bioactive heterocycles.</p> <p>CO4: Able to recognize reactivity and applications of three, four, five, six and seven-member heterocycles.</p>
OCH-3.4	(B) (Polymer Chemistry)	<p>CO1: Students will acquire the knowledge of Techniques of polymerization.</p> <p>CO2: Students can identify stereochemistry of polymers.</p> <p>CO3: Students will be able to apply their knowledge of polymerization in industries.</p>

		CO4: Students will have an idea regarding Chemical kinetics of polymers.
OCHP – V	Practical-V	CO1: Separate and analyze the different component mixtures of simple organic compounds CO2: Students will be able to purify organic compounds employing different techniques. CO3: Independently perform synthesis of simple organic compounds. CO4: Independently perform synthesis of simple organic compounds.
OCHP – VI	Practical-VI	CO1: Separate and analyze the different component mixtures of simple organic compounds CO2: Students will be able to purify organic compounds employing different techniques. CO3: Students will have good experimental skills for qualitative and quantitative analysis. CO4: Independently perform synthesis of simple organic compounds.
Part-II semester-IV		
OCH	4.1 (Theoretical Organic Chemistry)	CO 1: Students will apply principles of green chemistry in organic synthesis CO 2: Students will be able to identify aromatic compounds. CO 3: Students will get an idea of calculation of

		<p>delocalization energy of organic compounds.</p> <p>CO 4: Students will acquire knowledge of kinetic and thermodynamic controlled reactions.</p>
OCH-4.2	(Stereochemistry)	<p>CO1: The study of stereochemical aspects of organic molecules gives very important tool in assigning the properties of bioactive molecules.</p> <p>CO2: Students will have sound knowledge about conformations of acyclic and cyclic compounds.</p> <p>CO3: Students will have sound expertise in designing of new bioactive molecules with specific stereochemical properties.</p> <p>CO4: Students will have an idea of applications of chiral reagents in asymmetric synthesis.</p>
OCH-4.3	Chemistry of Natural Products)	<p>CO1: Gain knowledge about classification of natural products and their stereochemistry.</p> <p>CO2: Illustrate the principles of biosynthesis, green synthesis, stereoselective transformations and its physiological role in human body.</p> <p>CO3: Understand structure and synthesis of various hormones.</p> <p>CO4: Able to understand vitamin deficiency and importance of different vitamins in human health.</p>
OCH-4.4 (A)	(Applied Organic Chemistry)	<p>CO1: This knowledge helps to get placement to the students</p>

		<p>in agrochemicals, cosmetic, pharmaceuticals, dyes, polymers industries</p> <p>CO2: Students will have knowledge of cosmetics, perfumes and food flavours in day to day life.</p> <p>CO3: Knowledge of unit processing will be useful for automation industries.</p> <p>CO4: Students will get an idea of synthesis of pesticides and their applications in agriculture.</p>
OCH-4.4	(B) (Bioorganic Chemistry)	<p>CO1: Students will understand the concept building blocks of biomacromolecules.</p> <p>CO2: Students will have an idea regarding classification, structure and functions of different bioorganic molecules.</p> <p>CO3: Students will get idea regarding structure and functions of plant and animal cells.</p> <p>CO4: Students will understand the physiological role of RNA, DNA and enzymes</p>
OCHP – VII	Practical-VII	<p>CO1: To demonstrate professional and ethical attitude with enormous responsibility to serve the society</p> <p>CO2: Students will have knowledge of safety signs on container of chemicals, safety in handling of chemicals, MSDS sheets.</p> <p>CO3: Students will have ability to synthesize</p>

		<p>commercial products.</p> <p>CO4: Based on the experience of project work, students will have ability to start their R & D laboratory.</p>
OCHP – VIII	Practical-VIII	<p>CO1: To demonstrate professional and ethical attitude with enormous responsibility to serve the society</p> <p>CO2: Students will have knowledge of safety signs on container of chemicals, safety in handling of chemicals, MSDS sheets.</p> <p>CO3: Students will have ability to synthesize commercial products.</p> <p>CO4: Based on the experience of project work, students will have ability to start their R & D laboratory.</p>