

Estd. June 1964



“Education for Knowledge, Science and Culture.”

– Shikshanmaharshi Dr. Bapuji Salunkhe

Shri. Swami Vivekanand Shikshan Sanstha's

**VIVEKANAND COLLEGE, KOLHAPUR
(AUTONOMOUS)**

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UGC Recognition Under 2 F & 12(B) UGC Act 1956

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Department of Chemistry

Course Outcomes (COs): Chemistry

M. Sc. Part I Chemistry (NEP Introduced in the year 2023 - 24)	
Semester I	
DSC - I: Major Paper: Inorganic & Organic Chemistry (DSC14CHE11)	
CO No.	On completion of the course, student will be able to:
CO1	Learn transition elements and the role of various metals and nonmetals in our health.
CO2	Impart essential knowledge regarding the characteristics, properties, applications, and separation of lanthanides and actinides.
CO3	Identify different types of chirality, stereoisomerism, and concept involved in stereoisomers.
CO4	Adopt the types of reactions, transition states and intermediates, generation, structure, stability and reactivity of carbocations, carbanions, free radicals, carbenes, and nitrenes and the effect of structure on reactivity.
DSC-II: Major Paper: Physical & Analytical Chemistry (DSC14CHE12)	
CO No.	On completion of the course, student will be able to:
CO1	Learn and understand quantum Chemistry, Heisenberg's uncertainty principle, concept of energy operators (Hamiltonian), Schrodinger wave equation, Physical interpretation of the ψ and ψ^2 . Particle in a one dimensional box.
CO2	Know about chemical and physical methods of kinetics of a reaction, Steady state approximation and its examples, Classification of catalysis, mathematical expression of autocatalytic reactions, Michaelis-Menten enzyme catalysis,
CO3	Demonstrate a comprehensive understanding of quality control techniques, quality management systems, GLP, and GMP in

	analytical chemistry and pharmaceutical industries.
CO4	Gain proficiency in NMR and MS techniques and deduce structural information of organic compounds.
DSE - I: Elective Paper I: Inorganic Chemistry: Advanced Inorganic Chemistry (DSE14CHE11)	
CO1	Improve the level of understanding of structure, method of preparation, reactions and applications of organometallic compound in various fields.
CO2	Gain a thorough knowledge of preparation, structure, physical and chemical properties of metal carbonyls and their related compounds.
CO3	Grasp the synthesis and applications of the inorganic materials in optical, electrical and electronic devices.
CO4	Study of all chemical properties of solutes in Chemistry and develop interest in various nuclear reactions and applications of radioactivity in various fields.
DSE - II: Elective Paper II: Organic Chemistry: Basics in Organic Chemistry (DSE14CHE12)	
CO1	Study the SN^2 , SN^1 , mixed SN^1 and SN^2 , SN^i mechanisms. Along with this, they will also gain information about neighbouring group participation by pi and sigma bonds, and anchimeric assistance.
CO2	Understand Delocalized chemical bonding, Aromaticity in benzenoid and non-benzenoid compounds, alternant and non-alternant hydrocarbons, Huckel's rule, annulenes, and antiaromaticity.
CO3	Learn about the hydroboration reactions of alkenes and alkynes and identify the mechanism involved and regio-stereo-chemistry of hydroboration.
CO4	Understand the importance of organo-lithium, copper, aluminium, zinc, titanium, mercury and cobalt in organic synthesis.
DSE - III: Elective Paper III: Physical Chemistry (DSE14CHE13)	
CO No.	On completion of the course, student will be able to:
CO1	Gain knowledge about spectroscopy, Electromagnetic spectrum, Study of rotational spectra of diatomic molecules: Rigid rotor model, Infrared spectroscopy, vibrational spectra of diatomic molecules, Born Oppenheimer approximation.

CO2	Adopt information about activity, types of electrodes, acid and alkaline storage batteries and electrokinetic phenomenon.
CO3	Grasp the knowledge of sol, micelle, BET equation and applications of photoelectron spectroscopy.
CO4	Learn about polymer, methods of determining molecular weights, Polymer processing techniques, and rubber.
DSE - IV: Elective Paper IV: Analytical Chemistry (DSE14CHE14)	
CO No.	On completion of the course, student will be able to:
CO1	Learn about the introduction of electronic and Raman spectroscopy. They are also able to explain the difference between Stokes and anti-Stokes lines in a Raman spectrum. Justify the difference in intensity between Stokes and anti-Stokes lines.
CO2	Explain the principles and operation of a range of advanced techniques such as X-ray, spectroscopic, microscopic, and used in the characterization of various materials and compounds.
CO3	Learn about thermal, and electroanalytical, currently used in the characterization of various materials and compounds.
CO4	Grasp about the instrumentation and applications of AAS and ICP in trace elements analysis. They will also learn about the plasma torch and precise optical sensors
RMD I: Research Methodology (RMD14CHE11)	
CO1	Acquire knowledge about fundamental concepts of research methodology and develop research aptitude.
CO2	Inculcate mechanics of report writing and interpretation.
CO3	Understand the role and applications of computers and various software in the area of research and development.
CO4	Analyze the data with the help of various advanced instrumental techniques.
Semester II	
DSC - III: Major Paper: Inorganic & Organic Chemistry (DSC14CHE21)	
CO1	Study the synthesis, properties and structure of halides and oxides of the non-transition elements.
CO2	Gain an understanding of spatial arrangement and the nature of bonding in the case of main group compounds and important aspects of the stability of metal complexes.
CO3	Understand the organic reactions induced by photons, especially by

	various functional groups, and their mechanism
CO4	Know about the types of organic transformations based on the name of the reaction and mechanisms as well as applications of these name reactions in organic synthesis.
DSC-IV: Major Paper: Physical & Analytical Chemistry (DSC14CHE22)	
CO1	Learn and understand the Entropy, Maxwell relations, Duhem-Margules and Gibbs-Duhem equation, Henry's law.
CO2	Know about activity, types of electrodes, acid and alkaline storage batteries and electrokinetic phenomenon.
CO3	Gain a comprehensive understanding of TGA, DTA, DSC, and their significance in analytical chemistry. They will learn the principles, instrumentation, and working of these techniques, exploring the effects of heat on materials, including chemical decomposition and phase transformation. Additionally, students will analyze TGA curves, interpret compound qualities, and apply thermal analysis methods in research and analytical implications. They will also practice problem-solving in TGA, DTA, and DSC, enhancing their analytical skills in thermal analysis.
CO4	Understand Ultraviolet Spectroscopy and Infrared Spectroscopy. They will gain expertise in identifying characteristic vibrational frequencies of functional groups and explore the effects of hydrogen bonding and solvent on vibrational frequencies.
DSE - V: Elective Paper I: Inorganic Chemistry: Applied Inorganic Chemistry (DSE14CHE21)	
CO1	Get a basic understanding of the medicinal use of metal complexes as antibacterial, antiviral, antibiotics, and related compounds.
CO2	Understand synthetic oxygen carriers, role of globin chain, oxygen storage and its fascinating aspects.
CO3	Impart essential knowledge regarding general properties of polymer, types of phosphorus, silicon and coordination polymer is explained.
CO4	Study the important aspects of the metal complexes in inorganic qualitative analysis, the separation of metals, medicinal chemistry, industrial processes, and agriculture is explained.
DSE - VI: Elective Paper II: Organic Chemistry: Fundamental Organic Chemistry (DSE14CHE22)	

CO1	Understand the applications of different oxidizing reagents and oxidation reactions and their mechanism.
CO2	Understand the applications of different reducing reagents in organic synthesis and their mechanism.
CO3	Know about the different disconnection approaches with chemoselectivity and reversal of polarity, Types of alkylation and alkylating agents.
CO4	Know use of advanced techniques such as supported reagents, magnetic nanoparticles, electro-organic synthesis, ionic liquids, and enzyme catalysed reactions, MCRs, MW and US techniques in organic synthesis.
DSE - VII: Elective Paper III: Physical Chemistry (DSE14CHE23)	
CO1	Know about spectroscopy, Electromagnetic spectrum, Study of rotational spectra of diatomic molecules: Rigid rotor model, Infrared spectroscopy, vibrational spectra of diatomic molecules, Born Oppenheimer approximation will be gained by the students..
CO2	Know about activity, types of electrodes, acid and alkaline storage batteries and electrokinetic phenomenon.
CO3	Gain about Metals, insulators and semiconductors, properties of semi conductor, and applications of the semiconductor.
CO4	Grasp knowledge about material preparation, lattice and atomic defects.
DSE - VIII: Elective Paper IV: Analytical Chemistry (DSE14CHE24)	
CO1	Gain a comprehensive understanding of chromatographic techniques, including partition chromatography, thin layer chromatography, and column chromatography. They will learn about the general principles, classification, and chromatographic behavior of solutes. They will explore applications and advances in TLC, including modern techniques.
CO2	Develop expertise in advanced gas chromatographic techniques, understanding plate theory, instrumentation, and working of a Gas Chromatograph. They will be familiar with sampling, sample pretreatment, sample injection types, columns, detectors, programmed temperature G.C., and pyrolysis gas and vapor phase chromatography. Moreover, students will gain insights into gas

	chromatography-mass spectrometry and its applications, as well as the significance of TGA-MS/TGA-GC-MS.
CO3	Achieve proficiency in advanced liquid chromatographic techniques, focusing on high-performance liquid chromatography (HPLC) and ultra-performance liquid chromatography (UPLC). They will learn about the principles, instrumentation, mobile phase, stationary support in HPLC, detectors, and applications. Moreover, they will explore supercritical fluid chromatography (SCFC) and liquid chromatography-mass spectrometry interface, understanding their instrumentation and applications.
CO4	Gain in-depth knowledge of ion chromatography and size exclusion chromatography. They will explore analytical applications and environmental speciation by ion chromatography. Additionally, students will understand the principles and applications of size exclusion chromatography.



S. D. Shirke
 Dr. (Mrs). S, D, Shirke
HEAD
 DEPARTMENT OF CHEMISTRY
 VIVEKANAND COLLEGE, KOLHAPUR
 (EMPOWERED & AUTONOMOUS)