



"Education for Knowledge, Science and Culture."

- Shikshanmaharshi Dr. Bapuji Salunkhe

Shri. Swami Vivekanand Shikshan Sanstha's

VIVEKANAND COLLEGE, KOLHAPUR
(EMPOWERED 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 II Organic Chemistry (NEP Introduced in the year 2024-25)	
Semester III	
DSC-V: Major Paper: Advanced Spectroscopic Methods (DSC14CHE31)	
CO No.	On completion of the course, student will be able to:
CO1	Learn the principles and theory behind UV and IR spectroscopy. Understand how molecules vibrate when they absorb IR radiation and how electronic excitations occur when absorbing UV radiation. This knowledge will help students identify the structures of unknown organic compounds and determine functional groups such as alcohols, aldehydes, ketones, esters, and aromatic compounds. Additionally, students will learn about overtones, combination bands, and the Fermi resonance FT-IR spectroscopic method.
CO2	Understand the recapitulation of proton NMR spectroscopy and factors affecting coupling constants. Also learned how to analyze the first-order spectra, simplification of complex spectra, and complex spin-spin splitting of second-order spectra. They will learn the effect of deuteration and spectra of Homotopic, Enantiotropic and Diastereotopic systems. Also adopt the knowledge of the Advanced NMR technique and about Fourier transform technique, Nuclear overhauser effect (NOE), COSEY, NOSEY, and resonance of F^{19} and P^{31} nuclei.
CO3	Learn the ion production - EI, CI, FD and FAB and factors affecting fragmentation analysis. Also understand the mass spectral fragmentation of different functional groups like aldehydes, ketones, esters, alcohols, etc. so that they will be able to solve the problems on mass spectroscopy.
CO4	Understand the concept of C^{13} NMR spectroscopy - chemical shift values of alkanes, alkenes, alkynes, aromatic compounds, carbonyl, and heterocyclic compounds. Also learn this advanced

	C^{13} technique - NOE, DEPT, HETCOR, and heteronuclear coupling. They will become confident in solving the problems on C^{13} NMR.
DSC-VI: Major Paper: Advanced Synthetic Methods (DSC14CHE32)	
CO No.	On completion of the course, student will be able to:
CO1	Understand the disconnection approach using synthons, retrosynthesis of difunctional compounds, and the importance of reaction order, chemoselectivity regioselectivity, and stereoselectivity. Retro Diels-Alder reaction, Michael addition, Robinson annulation, and Umpolung concept.
CO2	Study the applications of different reagents like LDA, DCC, TBTH, lead tetra-acetate, as well as applications of hypervalent iodine acid.
CO3	Learn how the different metals like Pd, Ru, Rh, Ti, Si, and Cu as well as phosphines, NHCs, and oxazoline ligands in synthetic chemistry.
CO4	Learn the mechanism, stereochemistry, migratory aptitude, and applications of various name reactions such as Dienone-phenol, Favorskii, Smile's, Brook, Sommelet-Hauser rearrangement, etc.
DSE - IX: Elective Paper I: Drugs And Heterocycles (DSE14CHE31)	
CO No.	On completion of the course, student will be able to:
CO1	Develop the new drugs, and procedures followed in drug design, History, and QSAR. Also, learn the concept of drug receptors and the relationship between structure and chemical reactivity. In addition, they will learn about antibiotics like β -lactam, cephalosporin, and SAR of both and understand the structural features of tetracycline & macrocyclic antibiotics.
CO2	Study the different types of drugs like antimalarials, anti-inflammatories, anesthetics, antitubercular, tranquilizers, etc. Also, they can study cardiovascular and antineoplastic drugs.
CO3	Understand the synthesis and reactions of five-membered heterocycles like furan, pyrrole, thiophene, benzofuran, and benzothiophene. In addition, they will learn about the synthesis and reactions of six-membered heterocycles like pyridine, quinoline, and coumarine.
CO4	Learn the synthesis and reactions of six-membered heterocycles diazines and triazines as of azepines, oxepines, and thiepinas as well as sevenmembered heterocycles.
DSE - X: Elective Paper II: Polymer Chemistry (DSE14CHE32)	

CO No.	On completion of the course, student will be able to:
CO1	Demonstrate a comprehensive understanding of fundamental polymer concepts such as monomers, functionality, repeat units, and degree of polymerization. Correctly define and use terms related to the general structure and naming of polymers.
CO2	Calculate and interpret the degree of crystallinity in polymers. Understand the concept of crystallites and factors affecting crystallinity in polymers. Identify and describe the properties and applications of key individual monomers. Understand the synthesis processes and properties of various polymers derived from individual monomers.
CO3	Understand and explain the different types of polymer degradation including thermal, mechanical, photo, oxidative, and hydrolytic degradation. Identify the factors that contribute to each type of degradation.
CO4	Understand and explain geometric and optical isomerism in polymers. Analyze the results and understand the significance of molecular weight in polymer properties.

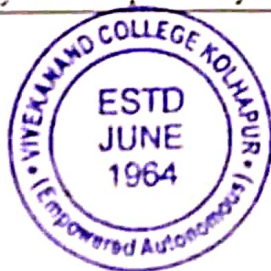
Semester IV

DSC-VII: Major Paper: Theoretical Organic Chemistry (DSC14CHE41)

CO No.	On completion of the course, student will be able to:
CO1	Understand the concept of aromaticity in benzenoids, Huckel's rule, energy level of pi-molecular orbital, calculation of energies of cyclic and acyclic systems, different concepts of Huckel's as well as calculation of charge densities - PMO theory and reactivity index.
CO2	Adopt the knowledge about the path and to determine the rates of reactions by Kinetic and non-kinetic methods, steps involved, reaction rate determination, order and molecularity, Testing and trapping of intermediates, stereochemistry and Hammett Taft equation.
CO3	Learn about the Kinetic and thermodynamic control of reaction, they will get the knowledge about Nitration and sulphonation of naphthalene, about Wittig reaction, Enolization, F. C. reaction and Diel's Alder reaction. Understand non-classical carbonation - Formation, stability, reactivity and synthetic applications.
CO4	Understand the concept of Pericyclic reactions, Woodward Hoffman correlation diagrams - FMO, PMO approach, conrotatory and disrotatory motion. Also identify the reactions as $4n$, $4n+2$ and $2+2$ addition of ketenes, sigmatropic shifts (3,3) and

	(5,5) Claisen and Cope and Aza Cope rearrangement.
DSC-VIII: Major Paper: Stereochemistry (DSC14CHE42)	
CO No.	On completion of the course, student will be able to:
CO1	Adopt the knowledge of about stereoselective, stereospecific synthesis as well as chemoselective and regioselective reactions - enantioselective synthesis, reactions with hydride donor, catalytic hydrogenation via chiral hydrazones and oxazolines etc.
CO2	Understand the stereochemistry of acyclic and alicyclic compounds. Understand in depth stability and reactivity of diastereoisomers - Curtin-Hammett principle. Some aspects of stereochemistry of ring compounds. The shapes of the rings other than six membered rings. Also, they will learn the conformational effects in medium sized rings and the concept of I-strain.
CO3	Knowledge about conformation and configuration fused bicyclic rings and bridged rings - Types, Nomenclature, stereochemical restrictions, and Bredt's rule. Understand O. R. D. and C. D. - Types of curves, circular dichroism, the Octane rule and axial haloketone rule.
CO4	Explain the stereochemistry of Allenes, Spiranes, and Biphenyls and how to assign the configuration and by using physical and chemical methods.
DSE - XI: Elective Paper I: Chemistry Of Natural Products (DSE14CHE41)	
CO No.	On completion of the course, student will be able to:
CO1	Learn the classification and isolation methods of natural products. Reveal the classification and isolation methods of terpenoids-structure and synthesis of Camphor, Carvone, Abietic acid, zingiberene, alpha-santonin and β -caryophyllene.
CO2	Know all about Alkaloids - the occurrence, isolation, structures, functions, stereochemistry and synthesis of the major Alkaloids like-Morphine, Reserpine, Atropine and Conin.
CO3	Learn the occurrence, nomenclature, basic skeleton of steroids and study the synthesis of hormones like cholesterol, Androsterone, Testosterone, Estrone etc. Study the nomenclature, classification, biogenesis, physiological effects and synthesis of prostaglandin PGE2 and PGF2.
CO4	Study about the Vitamins - Classification, Nomenclature, Source, effects due to deficiency, synthesis and biological functions of vitamin B1, B2, B5, B6 and Biotin i.e. vitamin H.
DSE - XII: Elective Paper II: Applied Organic Chemistry (DSE14CHE42)	

CO No.	On completion of the course, student will be able to:
CO1	Learn about the synthesis and uses of different types of Agrochemicals - Carbamates (carbaryl, Aldicarb, Ziram and Zineb), Organophosphorous insecticides (malathion, monocrotophos, mevinphos etc.), Natural and Synthetic Pyrethroids - structures classification and their synthesis. They will learn synthesis of some plant growth regulators as well as synthesis and applications of Juvenile hormones and Pheromones (bombykol, grandisol and disparlure).
CO2	Learn about the perfumery compounds - commercial process, preparation and importance of essential oils, synthesis of 2 - phenyl ethanol, yara-yara, vanillin, synthetic musk, jasmine, ionone etc. from citral, phenyl acetate ester, benzyl acetate ester.
CO3	Understand classification, synthesis of azo dyes, reactive dyes, optical brightners, dispersed dyes etc. by nitration, sulphonation and diazotization reactions.
CO4	Understand about Polymers: the mechanism of polymerization with some examples - polyesters, polyamide, PVC, etc. Also they will study about manufacturing processes of synthetic rubber like butadiene - styrene, formaldehyde resin, about plasticizers, anti-oxidents required for natural polymers like starch and cellulose. They will get the knowledge about Oxo and Wacker process necessary for Soap and Synthetic detergents.



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