Satyaniketan's

Adv. M. N. Deshmukh Arts, Science and Commerce College, Rajur.

Tal. Akole. Dist. Ahmednagar.

Department of Chemistry

ANNUAL TEACHING PLANNING (Tentative) 2024-2025

Class- M.Sc. Part-I

(As Per National Education Policy-2020)

Subject-CHE-503, Organic Chemistry-I

Month	Chapters	Hours
	Section - I	
July	**Chapter-1: Nature of Bonding in Organic Molecules** **a) Structure and Bonding:**1. Recapitulation: Various structural and electronic effects, strength of acids and bases and pKa and pKb 2. Electron Donor–Acceptor (EDA) complexes, crown ether complexes and cryptates, catenanes and rotaxanes, inclusion compounds, fullerenes **b) Aromaticity:** 1. Recapitulation: Benzenoid and non-benzenoid compounds, aromaticity and Huckel's rule	10
August	2. Antiaromaticity Quasiaroamtic and homoaromatic compounds, application to carbocyclic and heterocyclic systems, annulenes, azulenes and fulvenes, mesoionic compounds, current concepts of aromaticity, Frost Musulin Diagram **c) Reactive Intermediates:** 1. Recapitulation: Intermediate and transition state, carbocations, carbanions, benzyne, free radicals 2. Generation, structure, stability and reactivity of carbenes, nitrenes, ketene and isocyanate **Chapter-2: Stereochemistry** 1. Recapitulation: Origin of stereochemistry, optical activity, chirality. Projection formulae, Conformational concepts, conformations of acyclic & cyclic (ethane, propane, butane, cyclohexane, methylcyclohexane) molecules.	12
September	2. Stereoisomerism, enantiomeric relationship, diastereomeric relationship, % ee and % de, D/L, R/S and E/Z nomenclature in C, N, S, P containing compounds, prochiral relationship, Re/Si faces, Topicity, optical activity in biphenyls, spiranes, allenes, helical structures, ansa compounds and cyclophanes, stereospecific and stereoselective reactions, stability and optical activity in cis and trans decalins, stereochemical aspects of elimination (E2 and Ei) and addition reactions (syn and anti-additions).	08

Month	Chapters	Hours
	Section - II	
September	**Chapter 1: Aliphatic Nucleophilic Substitution reactions** 1. SN1, SN2 and SNi reactions (Mechanism, Reactivity and Stereochemical aspects) 2. Neighbouring group participation: The neighbouring group mechanism, The Neighbouring group participation by π and σ bonds, NGP by halogens and heteroatoms (O, N, S), anchimeric assistance, classical and non-classical carbocations, phenonium ions, norbornyl system, carbocation rearrangements in neighbouring group participation.	04
October	**Chapter 2: Aromatic electrophilic and nucleophilic substitution reactions** 1. Recapitulation: Mechanism of aromatic electrophilic substitution reaction. 2. Orientation effects in aromatic electrophilic substitution reactions (Benzene, Naphthalene, Anthracene, Pyridine, Pyrrole, Furan and Thiophene) 3. Kolbe, Gatterman, Gatterman-Koch, Riemer-Tieman, Vilsemeyer-Haack, Hoesch, Ipso substitution. 4. Benzyne reaction, Meisenheimer complex, cine and tele substitutions, Chichibabin reaction, Sandmeyer Reaction	12
November	**Chapter 3: Oxidation and Reduction Reactions** 1. Recapitulation: CrO_3 (Jones reagent), $KMnO_4$, O_3, OsO_4, $LiAlH_4$, $LiBH_4$, $NaBH_4$, 2. Oxidising reagents: PDC, PCC, MnO_2, Swern, $Pb(OAc)_4$, RuO_4, Woodward and Prevost dihydroxylation, peracid, HIO_4, TEMPO, IBX, CAN, Fetizon's Reagent 3. Reducing reagents: $NaBH_4/CeCl_3$, $NaBH_3CN$, Willkinsons catalyst, DIBAL, Clemenson, Wolff-Kishner reduction, Rosenmund Reduction, Birch, dissolving metal, Lindlar catalyst	14

Semester – I CHEOD-507(D) Organic Reactions and Reagents		
July	**Chapter 1: Organic Reactions** Acyloin condensation, Benzoin Condensation, Bamford-Stevens Reaction, Bergman Cyclisation, Chichibabin Reaction, Eschenmoser-Tanabe Fragmentation, Grob Fragmentation, Mitsunobu Reaction, McMurry Coupling,	10
August	Nazarov cyclisation, Nef reaction, Robinson annulation, Shapiro Reaction, Stork enamine reaction **Chapter 2: Reagents** Grignard Reagent, Organo Zinc, Organo Copper Reagent	10
September	Organo lithium reagents, Ylides-Phosphorus, Nitrogen and Sulphur ylide	10

(Mr. A.R. Mundhe)

Month	CHE-508, Research methodology	Hours
	Section - I	
July	**Chapter-1: Introduction to Research methodology** Objective of research, motivation in research, types of research, Fundamental research, applied research, experimental research, and interdisciplinary researcl **Chapter-2: Scope of Research and Ethics** Steps in scientific research: scientific methods of research, criteria of good research, and characteristics of a good research, Research problem: Identificatic Selection, developing research title, Criteria for prioritizing topics for research, Prioritizing Topics for Research, Formulation of research objectives. Types and importance of research ethics, Institutional ethics committee, Plagiarism, Patenting and intellectual property rights. Publication ethics: definition, introduction, and importance.	10
August	**Chapter-3: Literature Survey and Search technique** Print: Sources of information: Primary, secondary, tertiary sources; Journals: Journal abbreviations, abstracts, current titles, reviews, monographs, dictionaries, Introduction to Chemical Abstracts and Beilstein, Subject Index, Substance Index, Author Index, and Formula Index.Literature Search technique**:** SCOPUS, Google Scholar, PUBMED, Web of Science, science direct, Indian Citation Index, Research Gate, and scifinder, Scirus, ChemIndustry, Wiki- Databases, ChemSpider. **Chapter-4: Overview of the journal article** Selection of journals, Data bases and research metrics Databases: i) indexing databases ii) Citation databases: Web of Science, Scopus, UGC-Care List etc. Research Metrics: a) Impact Factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score b) Metrics: h-index, g index, i10 index.	12
September	**Chapter-5: Presentation of Scientific findings, Scientific Report Writing** Publication Process: Types of technical documents- Full length research paper, Short/Brief communications, Letters to editor, Book chapter, Review, Conference report, Patents, dissertation. Components of a research publication: Title/Topic statement, Abstract/key words, Aims and objectives, Hypothesis building, Rationale of the paper, Work plan, Materials and methodology, Results and discussion, Key issues, and arguments, Acknowledgement, Conflict of interest statement, bibliography, Technical Resumes & Cover Letters. Softwares in Chemistry Data Plotting Structure Drawing, Grammar Checkers and Sentence Correction Tools.	08

October	**Chapter-6: Data Analysis and interpretation** The Investigative Approach: Making and Recording Measurements. SI Units and their uses, Scientific method and design of experiments, Analysis and Presentation of Data: Descriptive statistics. Choosing and using statistical tests. Chemometrics. Analysis of variance (ANOVA), Correlation and regression, Curve fitting, fitting of linear equations, simple linear cases, weighted linear case, analysis of residuals, General polynomial fitting, linearizing transformations, exponential function fit, r and its abuse, basic aspects of the multiple linear regression analysis**Chapter-7: Presentation and Communication skills** Tables, Figures and Pictures using Excel, PowerPoint slide preparation, Preparation of Posters, Electronic submission of manuscripts, oral and poster, Communication skills.	04
November	**Chapter-8: Ethical Handling of Chemicals** Safe working procedure and protective environment, protective apparel, emergency procedure and first aid, laboratory ventilation. Handling of various chemicals, solvents & glassware. Fires and fighting with fires. Hazardous substances, Safe storage and use of hazardous chemicals, procedure for working with substances that pose hazards, flammable or explosive hazards classification, and handling Safety Data Sheet. Chemic entries, MSDS, CAS numbers, dead stocks maintenance. Disposal of was chemicals, recovery, recycling and reuse of laboratory chemicals.	12

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ANNUAL TEACHING PLANNING (Tentative) 2024-2025

Class- M.Sc.

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Subject- CHE-553, Organic Chemistry-II

Month	Chapters	Hours
Semester – II Section-I-Pericyclic Reactions and Molecular Rearrangements		
December	**Chapter-1: Pericyclic reactions** ➢ Electrocyclic, ➢ cycloaddition reactions, ➢ FMO approach, analysis by correlation diagrams, ➢ sigmatropic reactions, ➢ ene reactions, ➢ 1,3-dipolar additions.	15
January	**Chapter-2: Molecular Rearrangements** ➢ Mechanism to nucleophilic, electrophilic, and free radical molecular rearrangements, migratory aptitude ➢ Carbon-carbon rearrangements: Pinacol-Pinacolone, Favorskii, Wolff and Benzil-Benzilic acid rearrangements ➢ Carbon-nitrogen rearrangements: Hoffmann, Curtius, Lossen, Schmidt and Beckmann rearrangements. ➢ Carbon-oxygen rearrangements: Bayer-Villiger rearrangement, Dakin oxidation ➢ Oxygen-Carbon rearrangement: Fries rearrangement	15

Section-II- Photochemistry and Organic Spectroscopy		
February	**Chapter-1: Photochemistry** Principles of photochemistry, Jablonski diagram, photosensitization, photo-enolization, photochemistry of carbonyl and aromatic compounds, photo rearrangements, Paterno-Buchi Reaction, Barton reaction **Chapter-2: Organic Spectroscopy** **UV and IR Spectroscopy:** Calculation of λmax of aromatic system, Solvent effects, Factors affecting stretching frequencies and functional group interpretation from IR spectra, problems based on IR	15
March	**1H-NMR:** Principle, chemical and magnetic non-equivalence, chemical shifts and factors influencing chemical shift, chemical shifts of acidic protons, D2O exchange, spin-spin splitting, multiplicity patterns and coupling constant, Pascal's triangle, temperature dependent NMR. **13C NMR**: Basic of 13C-NMR: Chemical shift and factors affecting chemical shifts in 13C NMR, off resonance and proton decoupled spectra. Simple problems on 13C-NMR. Combined problems: Combined problems based on UV, IR and 1H-NMR should be solved.	15

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ANNUAL TEACHING PLANNING (Tentative) 2024-2025

Class- M.Sc. Part-II

Subject- CHO-655 (A) MJ: Asymmetric Synthesis

Month	Chapters	Periods
	Semester - IV	
December	**Chapter 1: Principles and applications of asymmetric synthesis** ➢ Stereoselectivity in cyclic compounds, ➢ enantio-selectivity, ➢ diastereo-selectivity, ➢ enatiomeric and diastereomeric excess, ➢ stereoselective aldol reactions.	07
January	➢ Cram's rule, Felkin Anh rule, ➢ Cram's chelate model. ➢ Resolution of racemic mixture, ➢ Dynamic kinetic resolution (DKR), ➢ cyclohexane and decalin based molecules, ➢ enantiomeric excess: R and S 2-butanol, ➢ resolution of racemic acid using chiral amines.	08
February	**Chapter 2: Asymmetric synthesis** ➢ use of chiral pool, chiral auxiliaries, ➢ chiral reagents and catalysts, ➢ asymmetric Diles-Alder reactions, ➢ asymmetric hydrogenation,	07
March	➢ Sharpless asymmetric hydroxylation and epoxidation, ➢ Jacobsen and Shi epoxidations. ➢ Organocatalysis, ➢ Enzyme catalysis-reduction of ketones. ➢ Total synthesis examples	08

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