Semester	**3**
Course	**Major**
Paper Code	C2CH230321T
Paper Title	Organic Chemistry 2
No. of Credits	Theory: 4
Theory / Practical / Composite	Theory
Minimum No. of preparatory hours per week a student has to devote	12
Number of Modules	04
Syllabus	**Module I: General Treatment of Reaction Mechanism 12L** ***Reaction thermodynamics:*** free energy and equilibrium, enthalpy and entropy factor, calculation of enthalpy change via BDE, intermolecular & intramolecular reactions. ***Reaction kinetics:*** rate constant and free energy of activation; concept of order and molecularity; free energy profiles for one-step, two-step and three-step reactions; catalyzed reactions: electrophilic and nucleophilic catalysis; kinetic control and thermodynamic control of reactions; isotope effect: primary and secondary kinetic isotopic effect (k_H/k_D); principle of microscopic reversibility; Hammond's postulate. ***Free-radical substitution reaction:*** halogentaion of alkanes, mechanism (with evidence) and stereochemical features; reactivity-selectivity principle in the light of Hammond's postulate. ***Tautomerism:*** prototropy (keto-enol, nitro - *aci*-nitro, nitroso-oximino, diazo-amino and enamine-imine systems); valence tautomerism and ring-chain tautomerism; composition of the equilibrium in different systems (simple carbonyl; 1,2- and 1,3-dicarbonyl systems, phenols and related systems), factors affecting keto-enol tautomerism; application of thermodynamic principles in tautomeric equilibria. **Module II: Addition to carbon-carbon multiple bonds 12L** Halogenation reaction: Reaction, mechanism, stereoselectivity. Hydrohalogenation: Reaction, mechanism (with evidence wherever applicable), regioselectivity (Markownikoff and anti-Markownikoff additions). Iodolactonisation, Hydration: Oxymercuration-demercuration, hydroboration-oxidation, epoxidation, *syn* and *anti*-hydroxylation, ozonolysis, addition of singlet and triplet carbenes; electrophilic addition to diene (conjugated dienes and allene); radical addition: HBr addition; mechanism of allylic and benzylic bromination in competition with brominations across C=C; use of NBS; Birch reductions. Isomerisation of alkenes. Nucleophilic addition to C=C. **Module III: Carbonyl compounds-I 12L**

	Addition to C=O: structure, reactivity and preparation of carbonyl compounds; mechanism (with evidence), reactivity, equilibrium and kinetic control; Burgi-Dunitz trajectory in nucleophilic additions; formation of hydrates, cyano hydrins and bisulphite adduct; nucleophilic addition-elimination reactions with alcohols, thiols and nitrogen- based nucleophiles; reactions: benzoin condensation, Cannizzaro and Tischenko reactions, reactions with ylides: Wittig and Corey-Chaykovsky reaction; Rupe rearrangement, oxidations and reductions: Clemmensen, Wolff-Kishner, $LiAlH_4$, $NaBH_4$, MPV, Oppenauer, Bouveault-Blanc, acyloin condensation; oxidation of alcohols with PDC and PCC; periodic acid and lead tetraacetate oxidation of 1,2-diols. **Module IV: Stereochemistry-II 12L** ***Stereoaxis and chirality:*** Stereoisomerism of substituted cumulenes with even and odd number of double bonds; chiral axis in allenes, spiro compounds, alkylidenecycloalkanes and biphenyls (Atropisomerism, racemisation of chiral biphenyls; *buttressing* effect). Configurational nomenclature (R/S) for axially chiral molecules. ***Prostereoisomerism***: Topicity of ligands and faces (elementary idea); descriptors for stereoheterotopic ligands and faces: *Pro-R/Pro-S, Re/Si* descriptors ***Conformation analysis:*** Dihedral angle, torsion angle; Klyne-Prelog terminology; relative stability of conformers based on steric and electronic effects. Conformational analysis of n-butane, 2-methylbutane and halo alkanes, 1,2-dihaloalkanes and 1,2-diols, 1,2-halohydrin.
Learning Outcomes	To have knowledge about- i) General treatment of reaction mechanisms ii) Addition to C-C multiple bonds iii) Reaction and synthesis of Carbonyl and Related Compounds iv) Stereochemistry of Organic molecules
Reading/Reference Lists	1. Clayden, J., Greeves, N., Warren, S. Organic Chemistry, Second edition, Oxford University Press 2012. 2. Sykes, P. A guidebook to Mechanism in Organic Chemistry, Pearson Education, 2003. 3. Smith, J. G. Organic Chemistry, Tata McGraw-Hill Publishing Company Limited.

	4. Carey, F. A. & Guiliano, R. M. Organic Chemistry, Eighth edition, McGraw Hill Education, 2012. 5. Loudon, G. M. Organic Chemistry, Fourth edition, Oxford University Press, 2008. 6. Eliel, E. L. & Wilen, S. H. Stereochemistry of Organic Compounds, Wiley: London, 1994. 7. Nasipuri, D. Stereochemistry of Organic Compounds, Wiley Eastern Limited. 8. Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education). 9. Finar, I. L. Organic Chemistry (Volume 1) Pearson Education. 10. Graham Solomons, T.W., Fryhle, C. B. Organic Chemistry, John Wiley & Sons, Inc. 11. James, J., Peach, J. M. Stereochemistry at a Glance, Blackwell Publishing, 2003. 12. Robinson, M. J. T., Stereochemistry, Oxford Chemistry Primer, Oxford University Press, 2005. 13. Maskill, H., Mechanisms of Organic Reactions, Oxford Chemistry Primer, Oxford University Press. 14. March, J., Advanced Organic Chemistry: Reactions, Mechanisms and Structure, Wiley; 4th edition, 2006.	
Evaluation	Theory: 100 Internal: 30 (CIA:20, Other mode of Assesment:5, Attendance: 5) Semester Exam:70	
Paper Structure for Theory Semester Exam	Answer SEVEN out of NINE questions, of 10 marks each.	