Semester	**5**
Course	**Major**
Paper Code	C3CH230512T/ C3CH230512P
Paper Title	Organic Chemistry 4
No. of Credits	4
Theory / Practical / Composite	Composite
Minimum No. of preparatory hours per week a student has to devote	10
Number of Modules	03

Syllabus	**Module I: Spectroscopy-I (12 Lectures)** UV Spectroscopy: introduction;types of electronic transitions, end absorption; transition dipole moment and allowed/forbidden transitions; chromophores and auxochromes; Bathochromic and Hypsochromic shifts; intensity of absorptions (Hyper-/Hypochromic effects); extended conjugated systems (dienes, aldehydes and ketones); relative positions of λmax considering conjugative effect, steric effect, solvent effect, effect of pH; effective chromophore concentration: keto-enol systems; benzenoid transitions. IR Spectroscopy: introduction;modes of molecular vibrations(fundamental and non-fundamental); IR active molecules; application of Hooke's law, force constant; fingerprint region and its significance; effect of deuteration; overtone bands; vibrational coupling in IR; characteristic and diagnostic stretching frequencies of C-H, N-H, O-H, C-O, C-N, C-X, C=C (including skeletal vibrations of aromatic compounds), C=O, C=N, N=O, C≡C, C≡N; characteristic/diagnostic bending vibrations are included; factors affecting stretching frequencies: effect of conjugation, electronic effects, mass effect, bond multiplicity, ring-size, solvent effect, H-bonding on IR absorptions; application in functional group analysis. **Module II: Rearrangements (12 Lectures)** Mechanism with evidence and stereochemical features for the following Rearrangement to electron-deficient carbon: Wagner-Meerwein rearrangement, pinacol rearrangement, dienone-phenol; Wolff rearrangement in Arndt-Eistert synthesis, benzil-benzilic acid rearrangement, Demjanov rearrangement, Tiffeneau–Demjanov rearrangement. Rearrangement to electron-deficient nitrogen: rearrangements: Hofmann, Curtius, Lossen, Schmidt and Beckmann. Rearrangement to electron-deficient oxygen: Baeyer-Villiger oxidation, cumenehydroperoxide-phenol rearrangement and Dakin reaction. Aromatic rearrangements: Migration from oxygen to ring carbon: Fries rearrangement and Claisen rearrangement. Migration from nitrogen to ring carbon: Hofmann-Martius rearrangement, Fischer-Hepp rearrangement, N-azo to C-azo rearrangement,

	Bamberger rearrangement, Orton rearrangement and benzidine rearrangement. **Module III: Nitrogen compounds (12 Lectures)** Amines: Aliphatic & Aromatic: preparation, separation (Hinsberg's method) and identification of primary, secondary and tertiary amines; reaction (with mechanism): Eschweiler–Clarke methylation,diazo coupling reaction, Mannich reaction; formation and reactions of phenylenediamines, diazomethane and diazoacetic ester. Nitro compounds (aliphatic and aromatic): preparation and reaction (with mechanism): reduction under different conditions; Nef carbonyl synthesis, Henry reaction and conjugate addition of nitroalkane anion. Alkylnitrile and isonitrile: preparation and reaction (with mechanism): Thorpe nitrile condensation, von Richter reaction. Diazonium salts and their related compounds: reactions (with mechanism) involving replacement of diazo group; reactions: Gomberg, Meerwein, Japp-Klingermann. **Practical** a) Synthesis of drugs, industrially important organic compounds 1. Synthesis of paracetamol/ibuprofen 2. Synthesis of sulfanilamide. 3. Synthesis of aspirin. 4. Synthesis of tetrahydrocarbazole from phenyl hydrazine and cyclohexanone. 5. Synthesis of methyl orange. b) Estimation of organic compounds and drugs 1. Estimation of aniline/phenol 2. Estimation of vitamin-C/paracetamol. 3. Estimation of glucose/sucrose 4. Estimation of formaldehyde.
Learning Outcomes	**Theory:** To have knowledge about i) Spectroscopy of organic molecules ii) Rearrangement reactions iii) Reaction and synthesis of Nitrogen compounds **Practical:** Synthesis of drugs, industrially important organic compounds
Reading/Reference Lists	**Theory:**

	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. Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education). 7. Finar, I. L. Organic Chemistry (Volume 1) Pearson Education. 8. Graham Solomons, T.W., Fryhle, C. B. Organic Chemistry, John Wiley & Sons, Inc. 9. Kalsi, P. S. Spectroscopy of Organic Compounds, New Age International (P) Limited, 2005. 10. Kemp, W. Organic Spectroscopy, Palgrave Macmillan, 1991. 11. Norman, R., Principles of Organic Synthesis, Springer, 1993. 12. March, J., Advanced Organic Chemistry: Reactions, Mechanisms and Structure, Wiley; 4th edition, 2006. **Practical** 1. Vogel, A. I. Elementary Practical Organic Chemistry, Part 1: Small scale Preparations, CBS Publishers and Distributors. 2. University Hand Book of Undergraduate Chemistry Experiments, edited by Mukherjee, G. N. University of Calcutta, 2003. 3. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education (2009). 4. Furniss, B.S., Hannaford, A.J., Smith, P.W.G. &Tatchell, A.R. Practical Organic Chemistry, 5th Ed. Pearson (2012). 5. Ahluwalia, V.K. &Aggarwal, R. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, University Press (2000). 6. Practical Workbook Chemistry (Honours), UGBS, Chemistry, University of Calcutta, 2015.	
Evaluation	Theory: 60	Practical: 40 CA: 38; Attendance:2

	Internal: 15 (CIA: 10; Other form of Assessment: 2; Attendance: 3) Semester Exam: 45	
Paper Structure for Theory Semester Exam	Answer THREE out of FOUR questions of 15 marks each.	