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| Name of Faculty | Science and Technology |
| Name of the Department | Chemistry |
| PG Programme | M. Sc |
| **Programme Specific Outcome(PSO)**  At the completion of the M.Sc. Chemistry program, the students of our Department will be able to:  **1.** Work in the interdisciplinary and multidisciplinary areas of chemical sciences and its applications  **2.** Analyze the data obtained from sophisticated instruments (like FTIR, NMR, GCMS, HPLC, GCMS UVVis, Fluorescence, and TGA) for the structure determination and chemical analysis.  **3.** Apply green/sustainable chemistry approach towards planning and execution of research in frontier areas of chemical sciences.  **4.** Have sound knowledge about the fundamentals and applications of chemical and scientific Theories  **5**. Apply appropriate techniques for the qualitative and quantitative analysis of chemicals in laboratories and in industries.  **6.** Helps in understanding the causes of environmental pollution and can open up new methods for environmental pollution control.  **7.** Acquires the ability to synthesize, separate and characterize compounds using laboratory and instrumentation techniques.  **8.** Carry out experiments in the area of organic analysis, estimation, separation, derivative process, inorganic semi micro analysis, preparation, conductometric and potentiometric analysis  **9.** Learns about the potential uses of analytical industrial chemistry, medicinal chemistry and green chemistry.  **10.** Understands the background of organic reaction mechanisms, complex chemical structures, and instrumental method of chemical analysis, molecular rearrangements and separation techniques. | |
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| **Course Outcomes (CO) M. Sc-II Organic Chemistry (CBCS 2019 Pattern)** | |
| **Semester-III**  **Theory Courses:**  **Course: 1) CHO: 350 Organic Reactions Mechanisms and Biogenesis (4 Credits)**  The learner will be acquired with sound knowledge of **-**  1) Formation & Stability of Carbanions.  2) Formation & Applications of Enamines.  3) Reactions of Carbenes & Nitrenes.  4) Free Radical Reactions.  5) Mechanisms in Biological Chemistry.  6) Neighboring group participation in Organic Reactions.  7) Metabolic pathways of Shikimic acid, Terpenoid, Stereoids, Alkaloids etc.  8) Hammet plots, Hammet equation, substituent constants, reaction constants, use of Hammet plots.  **Course: 2) CHO-351: Structure Determination of Organic Compounds by Spectroscopic Methods (4 Credits)**  The learner will be acquired with sound knowledge of-  1) 1H NMR Spectroscopy.  2) 13C NMR Spectroscopy.  3) COSY, TOCSY, NOESY, HETERO COSY etc. techniques.  4) Mass Spectrometry.  **Course: 3) CHO-352: Stereochemistry and Asymmetric Synthesis of Organic Compounds.**  **(4 Credits)**  The learner will be acquired with sound knowledge of-  1) Stereochemistry of Six membered rings.  2) Stereochemistry of rings other than six membered rings.  3) Fused, Bridged & Caged rings.  4) Resolution of Racemic Modification.  5) Geometrical isomerism & Stereochemistry of Olefins.  6) Determination of configuration, Cram’s rule, Cram’s cycle model, Cram’s dipolar model,  Felkin-Anh Model  7) Introduction of Asymmetric Synthesis, Chirol pool and Chiral auxillaries.  8) Asymmetric Organocatalysis  9) Asymmetric Aldol Reaction, Enantioselective, diastereoselective and double  diastereoselective Aldol reactions.  10) Transition Metal-Catalyzed Homogeneous Asymmetric Hydrogenation  11) Transition Metal-Catalyzed Homogeneous Asymmetric Hydroxylation and Epoxidation  12) Asymmetric Phase-Transfer and Ion Pair Catalysis  **Course: 4) CHO-353A: Protection - De-protection, Chiron approach and Carbohydrate Chemistry (4 Credits)**  The learner will be acquired with sound knowledge of **-**   1. Designing of organic synthesis: Protection and de-protection of hydroxyl, amino,   carboxyl, ketone and aldehyde functions as illustrated in the synthesis of polypeptide and polynucleotide, enamines, Umpolung in organic synthesis, Retrosynthesis.   1. Chiron approach- Introduction,The concept of chiral templates and chirons wherein the   carbon skeleton is the chiral precursor   1. Carbohydrates- Introduction of sugars, structures of triose, tetrose, pentose, hexose,   stereochemistry and reactions of Glucose, conformation and anomeric effects in hexoses.  **Organic Practical Course**  **CHO-354: Practical I: Solvent Free Organic Synthesis (4 Credits)**  The learner will be acquired with sound knowledge of **-**   1. Micro scale technique for Synthesis of compounds by different methods like oxidation,   reduction addition reactions.  2) Different Practical Conditions like reaction time, temperature, pressure etc.  3) Study of name reactions like benzil- benzilic acid rearrangement, Nitration, Pechmann  Condensation, Fischer indole synthesis, Cannizzaro reaction etc.   1. Use of Magnetic stirrer, Suction pump, Digital Melting point apparatus, Alumina foil &   UV chamber for TLC technique etc. | |
| **Semester-IV**  **Course: 1) CHO-450: Chemistry of Natural Products (4 Credits)**  The learner will be acquired with sound knowledge of **-**   1. Understanding and planning of total synthesis while maintaining the stereochemistry.   case study: Longifolene   1. Total Synthesis of: i. Hirsutellone B ii. Ribisins A and B iii. Subincanadine E   iv) Vannusals v) Pinnaic acid  **Course: 2) CHO-451: Organometallic Reagents in Organic Synthesis (4 Credits)**  The learner will be acquired with sound knowledge of **-**  1) Transition metal complexes in organic synthesis; only Pd, Ni, Co, Fe  2) C-X bond formation reactions: Suzuki, Heck, Sonogashira, Stille, Fukuyama, Kumada,  Hiyama, Negishi, Buchwald-Hartwig, Noyori, Reppe, Oxo process.  3) C=C formation reactions: Wittig, Horner-Wordworth-Emmons, Shapiro, Bamford-Stevens,  McMurry, Julia-Lythgoe and Peterson olefination reactions, Titanium-carbene mediated  olefination: Tebbe, Petasis and Nysted reagent.  4) Multi-component reactions: Ugi, Passerini, Biginelli and Mannich reactions.  5) Ring formation reactions: Pausan-Khand, Bergman and Nazerov cyclization.  6) Click chemistry: criterion for click reaction, Sharpless azides cycloadditions.  7) Use of Boron and Silicon in organic synthesis.  **Course: 3) CHO-452B: Medicinal Chemistry (4 Credits)**  The learner will be acquired with sound knowledge of **–**   1. Introduction to Peptides and proteins, Proteins as biological catalyst Nucleic acids, Metabolism, Chemistry of cofactors/coenzymes, Chemistry of TPP, PLP, Folic Acid and other vitamins, Principle of drug design, Chemistry of diseases and Drug development, Proton pump inhibitors and Problem solving. 2. Peptides, sequencing and applications in therapeutics, Solution phase and solid phase peptide synthesis and Modern techniques for biomolecules and disease diagnosis 3. Introduction to medicinal Chemistry. History, drug targets, Drug discovery, design and development, Case Study: Design of Oxamniquine. 4. Pharmacokinetics and Pharmacodynamics of drug: Drug absorption, distribution, metabolism, elimination and toxicity, drug metabolism, biotransformation, Drug receptor interactions, Hansch Equation and significance of terms involved in it. 5. Structure and activity Relationship: QSAR, Applications of SAR and QSAR in drug design, physio-chemical parameters lipophilicity, partition coefficient, electronic ionization constant, Case Study: Statins 6. Introduction, Developments, SAR, Mode of action, limitations and adverse effect of Anti-infective Agents, Beta lactam antibacterial agents (Penicillins, Cephalosporins), Tetracyclins, Macrolides, Chloramphenicol, Polyenes, Amphotrecin-B, Azoles, Amantadine,Acyclovir, Quinine, Quinolines, Quinolones, Refamycine, Sulphonamides   **CHO-454: Practical-II: Convergent and Divergent Organic Syntheses (4 Credits)**  **CHO-453: Practical III:**  **Select any two Sections from I, II, III**  Section-I: Ternary Mixture Separation **(2 Credits)**  Section-II: Carbohydrates Synthesis and Isolation of Natural Products **(2 Credits)**  Section-III: Project / Industrial Training/ Internships (including Summer Project) **(2 Credits)**  **The students should be able to**  1. Understand and employ concept of type determination and separation  2. Meticulously record physical constants  3. Perform micro scale chemical elemental analysis  4. Perform qualitative estimation of functional groups  5. Recrystallize /distill the separated compounds  6. Extend these skills to organic synthesis    `    . | |