

Add-On Certificate Course on “**Pharmaceutical Chemistry and Drug (Medicine) Discovery**”

(Duration: 30 Hours)

Department of Chemistry in association with IQAC

St. Xavier's College (Autonomous), Ranchi

Course Coordinator: Dr. Reman Kumar Singh (PhD, IISER Pune & IIT Bombay),
Department of Chemistry, St. Xavier's College, Ranchi

Course Eligibility: 10+2 (intermediate)/ UG/PG (Chemistry, Botany, Zoology, Biotechnology, Physics, Mathematics and others)

No. of seats: 50

Course Fee: 2000/- (Two thousand five hundred rupees)

Classes will be from 3 pm onward (it may change depending on the availability of all the students)

Course Registration link- Google form available on St. Xavier's College, Ranchi website.

Learning Outcomes:

After the completion of the course, the students will have the ability to:

1. *Have sound knowledge of Drug(Medicine) discovery.*
2. *They will learn about the current stage of drug development in the world.*
3. *This course will help the students in getting jobs in the **pharmaceutical R&D, drug discovery associate, computational chemist, clinical pharmacology, drug formulation, and toxicology, basically any branch of the pharmaceutical industry.***
4. *They will know about common medicine and their action.*

Description of Course:

This course offers a foundational overview of pharmaceutical chemistry, focusing on drug discovery, development, and delivery. It begins with the **basics of drug design**, including drug classification, cell structure, binding forces, enzyme inhibition, and receptor interactions. Key pharmacological concepts like **pharmacokinetics (PK)**, **pharmacodynamics (PD)**, **ADME**, and drug metabolism are covered to show how drugs act in and are processed by the body.

Students learn about the **drug discovery process**, including high-throughput screening, SAR/QSAR, molecular docking, and the role of AI. The course also examines **common drugs** (e.g., antivirals, anticancer agents) and their mechanisms of action, as well as **drug resistance** and strategies like drug synergy.

Formulation science introduces different **dosage forms and delivery systems** (e.g., nanoparticles, liposomes), highlighting their impact on bioavailability and patient compliance. Through theory and labs, students gain practical skills and an integrated understanding of how chemistry, biology, and technology converge in modern drug development

1. **Introduction to Pharmaceutical Chemistry** 5Hr
 - (a) Pharmaceutical chemistry: Brief Description
 - (b) Structure of a cell, enzyme (drug receptor), a target or an active site in an enzyme (receptor)
 - (c) Type of interaction involved between the Drug (Medicine) and the target (protein active side)
 - (d) Mechanism of drug(medicine) action: Enzyme reaction and inhibition (all form) kinetics
 - (e) Type of receptor targeted for medicinal activity
2. **Drug Discovery and Delivery Process** 5 Hr
 - (a) General theory for drug(medicine) discovery
 - (b) HIT discovery, lead optimisation, and candidate selection using high-throughput screening and computational modelling
 - (c) Lipinski's Rule
 - (d) QSAR approach
 - (e) Role of AI and ML in drug discovery
4. **Pharmacokinetics(PK), Pharmacodynamics(PD), Toxicology, and pharmacology.** 10 Hr
 - (a) Absorption, distribution, metabolism and excretion (ADME) of the drugs(medicine): Pharmacokinetics and Pharmacodynamics (PD) behaviour of any drug
 - (b) bioavailability, half-life, and first-pass metabolism
 - (c) Models and clinical examples for PK and PD

(d) Toxicology and pharmacology of the drugs

4. **Synthesis of some common drugs and their mode of action** 3Hr
1. Antiviral Drugs 2. Anticancer Drugs. 3. Anti-Ulcer Agents. 4. Anti-Inflammatory Drugs and 5. Antidepressant drugs.

Hands-on lab experiments, both dry and wet lab

Experiment	
1. Synthesis of Aspirin and its purification.	2Hr
2. Separation of Penicillin using solvent extraction.	2Hr
3. Computational modelling of the drug	1.5Hr
4. Performing the docking to screen the drugs. (Finding drugs using computers)	1.5Hr

Note: For any query, contact to course coordinator (Dr. Reman Kumar Singh, Department of Chemistry). **Contact: 9766427952 (WhatsApp No.).**

Reman
24/5/2025

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24/05/2025

Dr. U. R. Sen
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