Central University of Rajasthan
Department of Pharmacy

Ph.D. Coursework Syllabus

PPMC 101: Research Methodology in Pharmaceutical and Medicinal Chemistry

Preamble: This course is designed to expose the fresh PhD students to literature survey and to understand research objectives of the selected papers and methodology used, prepare a report, present it in the form of a seminar to improve their scientific communication abilities, learning the advanced instrumental techniques to be used in research, and computational application in Pharmaceutical and Medicinal Chemistry research. The students should also be made aware of the research ethics and Intellectual Property Rights.

Each of the topics will have laboratory demonstration/hand-on practice.

Course structure:

Course Contents	Contact Hours
Separation Techniques	6
Analytical Techniques	9
Flash and Preparative Chromatography	6
Seminar	9

Credits: 04

PPMC 102: Drug Discovery and Development

Preamble: This course is designed to expose the fresh PhD students to various aspects of drug discovery and development.

Course structure:

Course Contents	Contact Hours
Fundamental of Drug Actions: *Inter and intramolecular interactions*: Weak interactions in drug molecules; Chirality and drug action; Covalent, ion, ion-dipole, hydrogen bonding, C-H hydrogen bonding, dihydrogen bonding, van der waals interactions and the associated energies. Cation-and-OH interactions. *Receptorology*: Drug-receptor interactions, receptor theories and drug action; Occupancy theory, rate theory, induced fit theory, macromolecular perturbation theory, activation-aggregation theory. Topological and stereochemical consideration. Pharmacological Screening and Assays : General principles of screening, correlations between various animal models and human situations. Pharmacological screening models for therapeutic areas. Correlation between in-vitro and in-vivo screens; Special emphasis on cell-based assay, biochemical assay, radiological binding assay, high through put screening, specific use of reference drugs and interpretation of results.	15
Lead Optimization and validation Concept of Hit, Lead, Drug molecule, Drug likeness, Lipinski's rule and modifications, Identification of the pharmacophore, functional group modification, privileged structures and drug like molecules, modifications to increase potency and the therapeutic index, modifications to increase oral bioavailability. Effects of Ionization on Lipophilicity and Bioavailability, Other Properties that Influence Oral Bioavailability and ability to cross the Blood Brain Barrier. Approaches to Lead Optimization: Optimizing target interactions, Bioisosteric replacement, Conformational restriction, pharmacophore, analog based SAR etc., Optimizing access to the target: hydrophilic/hydrophobic properties, chemical and enzymatic degradation of molecules, drug metabolism, targeting drugs, reducing toxicity, prodrug.	10

Preformulation studies: Introduction and goals of preformulation, physicochemical properties, criteria for selection of excipients including compatibility test procedures, techniques of solubilization of drugs including surfactant systems, co-solvents, solid state manipulations, complexation and chemical modifications, pharmaceutical significance of partition coefficient, correlation with *in-vivo* performance, techniques to estimate log P values, shake flask method, choice of solvent systems, chromatographic determination, theoretical computation using Hansch & Leo/Rekker principle, effect of various variants like temperature and pH on partition coefficient.	10
Regulatory Aspects: Drug Laws, FDA, OECD, ICH, Schedule Y, Design non clinical toxicity studies and clinical development, clinical risk/benefit analysis. *Drug registration*: Regulatory affairs, WTO, Patent regime, Accreditation and harmonization process. Regulations of human pharmaceuticals and biological products.	15
Clinical Trial: Main features of clinical trials, including methodological and organizational considerations and the principles of trial conduct and reporting. Key designs surrounding design, sample size, delivery and assessment of clinical trials.	10

Credits: 04

PPMC 103: Elective Course (Specific Topics depending upon the field of specialization of the faculty)

Preamble: This course is designed to expose the fresh PhD students to specific topics related to research.

Course structure: *(Any four courses to be taken with each of 15 contact hours)*

Sr. No.	Course Contents
1	Ligand based drug designing techniques
2	Structure based drug designing techniques
3	Organometallic chemistry
4	Fundamentals of stereospecific and stereoselective synthesis
5	Novel drug delivery systems
6	Advanced pharmacokinetics
7	Advanced pharmaceutics
8	Drug metabolism
9	Pharmaceutical Biotechnology

Credits: 04