

Program	Faculty	Branch/Specialization	Name of Subject	Subject Code
Ph.D	Pharmacy	Pharmaceutics	Pharmaceutics	PHAR19902/01

Unit-wise Content distribution

Unit	Contents
Unit-I	Preformulation studies of drug substances, proteins and peptides. Preformulation work sheet. Metal and organic molecular complexes, inclusion compounds with reference to cyclodextrins, methods of analysis. Solubility and solubilization of nonelectrolyte, drug solubilization in surfactant systems, use of co-solvents, solid-state manipulations and drug derivitization.
Unit-II	Statistical methods and factorial design, Quality by Design. Stability of dosage forms as per ICH guidelines. Crystallinity, crystal habit, polymorphism, amorphous state, solvates, hydrates, analytical techniques for characterization (DSC, PXRD, SEM, FTIR), molecular modeling in solid state characterization- case studies and regulatory perspective,
Unit-III	Particle size, particle shape, porosity, surface area, compaction, particle engineering in pharmaceuticals and relevance in doses form designing, Bulk density, compressibility, flow properties, compaction and consolidation cohesivity, electrostatics, aggregation, agglomeration, role in formulation development and processing.
Unit-IV	ADME, Pharmacokinetic characterization of drugs: Absorption rate constants (Wagner- Nelson, Loo-Reigelman methods), limitations, lag-time, pharmacokinetics in presence of lag-time; Flip-flop model. Protein and tissue binding, factors effecting protein binding, kinetics of protein binding, determination of rate constants and different plots (direct, scatchard and reciprocal); Significance volume of distribution, implications and in vitro methodologies.
Unit-V	Chronopharmacokinetics; Drug toxicity and forensic, pharmacokinetics; Case study; Pharmacokinetics in elderly; Drug dosage in children, obese patient; First dose size; Kinetics of maternal-fetal drug transfer; Pharmacokinetics- pharmacologic/clinical response; Distribution kinetics; Metabolic kinetics; Dose and time dependencies; Turnover concepts; Small volume of distribution; Dialysis. Drug disposition, renal clearance, mechanism of clearance , clearance ratio, determination of clearance, hepatic clearance, % drug metabolized, relationship between blood flow, intrinsic clearance, and hepatic clearance. Pharmacokinetics of multiple dosing, dosage regimen design based on mean average, minimum and maximum, plasma/serum concentrations, limited fluctuation methods; Repeated one point method; Dosage adjustment in disease patients.

TEXTBOOKS/REFERENCES:

1. Remington's Pharmaceutical Science
2. The Extra Pharmacopoeia- Martindale
3. Basic Principles and Application to Pharmacy Practice By Alekha K. Das.
4. Pharmaceutical Analysis By Parimoo P..
5. Davis's Pocket Clinical Drug By Cynthia Sanoski & Shamim.
6. Pharmaceutical Calculations Paperback By Maria Glauca Teixeira, Joel L. Zatz

Program	Faculty	Branch/Specialization	Name of Subject	Subject Code
Ph.D	Pharmacy	Pharmaceutical Chemistry	Pharmaceutical Chemistry	PHAR19902/02

Unit-wise Content distribution

Unit	Contents
Unit-I	Methods of determining reaction mechanisms (kinetic and non-kinetic methods); Energy profile diagrams, reaction intermediates, crossover experiments and isotopic labelling; Order of reactions, reversible, consecutive and parallel reactions, solvent, ionic strength and salt effects; Multi-component reactions of pharmaceutical importance such as Biginelli reaction, Hantzsch reaction, Ugi reaction, Passerini reaction and Strecker synthesis.
Unit-II	General principles, Identification and study of targets for development of various therapeutic agents, Rational approach for drug design, Computer aided drug design, Study of recently developed drugs and molecules in development pipeline.
Unit-III	Principles, methods, interpretation of data and pharmaceutical applications of various analytical techniques like UV-Visible, IR, NMR spectroscopy; Mass spectrometry; GC, HPLC, HPTLC, Flash Chromatography and hyphenation. Assay of drugs and metabolites in pharmaceuticals and biological fluids. Analytical and bioanalytical methods validation using ICH Guidelines.
Unit-IV	Introduction to drug discovery and development process, Drug discovery Phase, The new drug pipeline identity, Screening and Optimization of new Compounds, Commercializing Research Innovations Technology, Commercialization pathway
Unit-V	Rational Approach for drug design, Computer aided Drug designing, Quantitative structure Activity Relationship (QSAR), Molecular modeling and virtual screening techniques.

TEXTBOOKS/REFERENCES:

1. Organic Chemistry By Morrison & Boyd
2. Medicinal Chemistry By S N Pande
3. Pharmaceutical Calculations Paperback By Maria Glauca Teixeira, Joel L. Zatz
4. Handbook of Research on Medicinal Chemistry: Innovations and Methodologies Hardcover By Debarshi Kar Mahapatra, Sanjay Kumar Bharti.

Program	Faculty	Branch/Specialization	Name of Subject	Subject Code
Ph.D	Pharmacy	Pharmacology	Pharmacology	PHAR19902/03

Unit-wise Content distribution

Unit	Contents
Unit-I	Introduction to Pharmacogenomics, Proteomics and Array technology Detailed study of guidelines for maintenance, breeding techniques and experimentation using laboratory animals: CPCSEA OECD ICH GLP ICMR Guidelines according to official compendia 02 Recent advances in Transgenic and Knockout animals.
Unit-II	Organization of screening: Pharmacological activity of new substances and safety assessment tests. Toxicity studies: acute, subacute (Repeated dose), subchronic and chronic toxicity. 05 Alternatives to animal experimentation: Animal cell lines and their uses Radioligand binding assay Patch clamp and ELISA Stem cell research etc.
Unit-III	Fundamentals of Molecular mechanism of drug action: Receptor occupancy and cellular signaling systems such as G-proteins, cyclic nucleotides, calcium and calcium binding proteins, phosphatidyl inositol. Ion channels and their modulators. Endogenous bioactive molecules: Cytokines, neuropeptides and their modulators, neurosteroids, nitric oxide, phosphodiesterase enzyme and protein kinase C, arachidonic acid metabolites, COX-2 regulators and their role in inflammation, endothelium derived vascular substances (NO, endothelins) and their modulators. Pharmacology of atrial peptides, reactive oxygen intermediates, antioxidants and their therapeutic implications.
Unit-IV	Recent trends on different classes of receptors and drugs acting on them: Angiotensin receptors, Excitatory amino acid receptors, Kinin receptors, Adrenoceptors, Low molecular weight heparins, hirudins and GP II/IIIa receptor antagonists, Imidazole receptors, Cholinergic receptors, Dopamine receptors, Serotonin receptors, Hormone receptors, GABA and Benzodiazepine receptors, Opioid receptors, Purinergic receptors, Glutamate receptors
Unit-V	Ion channel and their modulators: calcium, potassium, sodium and chloride channels. Apoptosis: basic functions, mechanisms and role of caspases. pharmacological and clinical implications. Adhesion therapy and cardiac and vascular remodeling. Basic Concepts of Chronopharmacology and their implications to Drug Therapy. Immunopharmacology: antibody dependent and cellular cytotoxicity. Monoclonal antibodies and its importance. Gene therapy: Concept of gene therapy and recent development in the treatment of various hereditary diseases. Human genome mapping and its potential in drug research. Techniques for the study of Molecular Pharmacology: Western Blotting, Immunostaining, RT-PCR, Cloning, RIA, Cell Cultures etc.

TEXTBOOKS/REFERENCES:

1. Clinical Pharmacology By Morris J. Brown
2. Elements of Pharmacology (German) By Oswald Schmiedeberg, Thomas Dixon.
3. Lippincott Illustrated Reviews: Pharmacology By Karen Whalen
4. The Pharmacological Basis of Therapeutics By Goodman and Gilman.
5. Handbook of Sample Size Guidelines for Clinical Trials by Jonathan J. Shuster

Program	Faculty	Branch/Specialization	Name of Subject	Subject Code
Ph.D	Pharmacy	Pharmacognosy	Pharmacognosy	PHAR19902/04

Unit-wise Content distribution

Unit	Contents
Unit-I	Introduction, use of natural products in traditional medicines, potential of natural products, Natural products in drug discovery and development
Unit-II	Recent development in the research on Natural medicinal products: Introduction, Biological and Pharmacological activities, Isolation and characterization studies of different class of Phytoconstituents (Alkaloids, Glycosides, Steroids, Saponins etc). Natural product drug discovery from different sources (Marine, Microbial, Mineral etc) : Introduction, recent development, methods of extraction and isolation, applications etc
Unit-III	Extraction and Isolation techniques: Introduction, Principle and Applications of different extraction & isolation methods viz Soxhlet extraction, microwave extraction, supercritical fluid extraction, solid phase extraction, Column chromatography, Flash chromatography etc.
Unit-IV	NDDS: Phytosomes, Liposomes, Microspheres, novel vesicular herbal formulations etc
Unit-V	Standardization of herbal drugs/formulations: Conventional methods, Modern techniques (Role of genetic markers, RAPD, DNA fingerprinting technique etc) WHO Guidelines for assessment of crude drugs Evaluation of identity, purity, and quality of crude drugs. Determination of pesticide residue Determination of Micro-organisms Dtermination of Arsenic and heavy metals Herbal Drug Regulatory affairs: Role and importance of national and international regulatory bodies in assessment of quality of herbal drugs and formulations.

TEXTBOOKS/REFERENCES:

1. Text book of Pharmacognosy by T.E.Wallis
2. Selected topics in Experimental Pharmacology
3. Protection of industrial property rights by P Das and Gokul Das.
4. Principles of instrumental analysis by Skoog Holler Nieman
5. Phramcognosy by G.E. Trease, W.C. Evans, ELBS
6. Pharmacopoeial Standards for Ayurvedic formulations
7. Pharmacognosy by VE Tyler, LR Brady and JE Robbers
8. Jenkins Quantitative pharmaceutical chemistry by AN Kenwell