PAPER-III. MEDICINAL CHEMISTRY-I (DRUG DESIGN)(Theory)

Total Hours: 50 (2 hr/week),	**Examination**	**Max Marks**
	Annual	100
	Internal Assessment Exam:	30
	Seminar Evaluation:	20
	Total:	150

GOAL:

The goal of studying this paper is to train the candidates to ensure that he/she develops the skill in the designing of target specific molecules.

OBJECTIVES:

1) To train candidates with different theoretical aspects involved in drug design.
2) To know about the various basic molecules useful in designing newer compounds for the treatment of different disease conditions.
3) Ability to master the different techniques used in the synthesis of dug molecules.
4) Use information technology tools to carry out research.
5) update his/her knowledge by self-study and by attending advanced courses, conferences and seminars in drug design.

S.N	**Syllabus**	**Hr/Week**
1.	**Theoretical aspects of Drug Design** Introduction to drug design and discovery. Conventional methods of drug design. Lead, discovery of lead, lead optimization, objectives of lead optimization, pharmacophore identification and analog approach of drug discovery	**4**
2.	**Targets in Drug Discovery and Development** Introduction, Different biological targets for drug discovery: enzymes, nucleic acids, and polysaccharides. Cellular Communication, Receptor Nomenclature, Receptor Classes- G-Protein-Coupled Receptors, Ligand-Gated Ion Channels, Steroid Receptors, Orphan Receptors, Defining the Receptor-Ligand Interaction, Receptor Binding Assays, Functional Assays, Receptor Sources.	**8**
3.	**History and development of QSAR.**	**8**
a)	Theoretical compartment model for relationship between physical properties and biological activity(Hammet, Taft)	3
b)	Mathematical methods for the analysis of QSAR i) Diagnosis mechanism ii) Prediction of activity iii) Optimization	

iv) Refinement of synthetic Targets 3

c) Application of Hansh Analysis 1

d) Application of Free-Wilson Analysis 1

4. In-silico and Computer Aided Drug design **10**

Molecular Mechanics, force fields (Potential energy function), Energy Minimization Methods, Conformational Analysis. Concepts of Virtual Screening, Drug likeness, Screening-Counting Schemes, Functional Group Filters, Topological Drug Classification-Pharmacophore Point Filter-Focused Screening Libraries for Lead Identification, Pharmacophore Screening, Structure-Based Virtual Screening, Protein Structures, Computational Protein-Ligand Docking Techniques, Rigid Docking, Flexible or induced fit Docking, i*n silico* De Novo design.

5. Designing and applications of Prodrugs **5**

Basic concept, Prodrugs of functional group, Prodrug design to improve Patient acceptability, Drug solubility, Drug absorption and distribution, site specific drug delivery, and sustained drug action. Rationale of prodrug design and practical consideration of prodrug design.

6. Rational design of enzyme inhibitors **8**

a) Enzyme inhibitors- Reversible, irreversible, Kcat inhibitors, transition state analogs and their application with respect to drug design. 3

b) Enzyme inhibitors of ACE, leukotrienes Lipoxygenase, Cycloxygenase, Aromatase, Xanthine oxidase, Cytochrome P-450 Inhibitors, DHFR Inhibitors, and Gastric proton pump Inhibitors. 3

c) HIV-Protease / Reverse Transcriptase, Integrase and DNA polymerase Inhibitors, 2

7. Recent advances in the development of Immuno modulators **2**

8. Recombinant DNA technology **5**

a) Introduction; New drugs from Recombinant DNA technology 1

b) Protein engineering and site directed mutagenesis. 2

c) Development of t-PA as a therapeutic agents Epitope mapping and Human growth hormone. 1

d) Screening of recombinant DNA libraries and development of HIV-tat inhibitor. 1

PAPER-III. MEDICINAL CHEMISTRY-I (DRUG DESIGN)(Practical)

Total Hours: 150 (6 hr/week),	**Examination**	**Max Marks**
	Annual	**100**
	Internal Assessment Exam:	**30**
	Practical record Evaluation:	**20**
	Total:	**150**

Part 1: Synthesis of the following important medicinal compounds involving more than one step and characterization using TLC. M.P. and IR spectroscopy.

1. INH
2. Methaqualone
3. Saccharin Sodium
4. Dapsone
5. Phenytoin from Benzoin
6. Sulfanilamide
7. 2-Methyl Benzimidazole from OPDA (Phillips synthesis)
8. 2-Mercapto Benzimidazole/Benzimidazolyl-2-thiol
9. Antipyrine

Part 2:

1. Determination of Partition coefficient by shake flask method (Diazepam,Pheytoin and Caffeine)
2. Determination of *pKa* value by potentiometric method (Phenobarbitone, Ibuprofen)
3. In vitro screening of medicinally important compounds for Anti-inflammatory, Antimicrobial and Antioxidant study.
4. In Silico QSAR based experiments (Three experiments)

TEACHING AND LEARNING ACTIVITIES

Journal Club:

Each student is required to present any two recent articles relevant to the Advanced Pharmaceutical chemistry from any of the journals in a year.

Seminars:

Each student is required to give two seminars relevant to the subject in a year.

Field/ Industrial Visits:

It is desirable to make to one visit to the relevant Laboratory / Industry in a year.

Conference / Meetings:

Each student has to be encouraged to attend at least one relevant national conference.

Scheme of Practical Examination

Sl. No	**Synopsis**	**Experiments**		**Viva-voce**	**Total**
		Major	Minor		
1	20	35	25	20	**100**

Reference Books:

1. A Biochemical basis – Medicinal chemistry by Thomas Nogrady
2. Introduction to quantitative drug design by Y.C.Martin
3. Selective Toxicity by Drein Albert
4. Comprehensive Medicinal Chemistry by Corwin and Hansch.
5. Medicinal Chemistry by Burger, 4th Edition.
6. Principles of Medicinal Chemistry by William O. Foye, 3rd Edition.
7. Drug design volumes by Ariens
8. Principles of Drug design by Smith
9. Strategy of Drug design by Brucell
10. The Organic Chemistry of the Drug design and Drug action by Richard B.Silverman

Journal: At least one international journal is to be subscribed

1. Indian Journal of Chemistry Section B
2. Indian Journal of Heterocyclic Chemistry
3. Indian Journal of Pharmaceutical Sciences

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