LJ UNIVERSITY

LJ INSTITUTE OF PHARMACY

SEMESTER: IV

Subject Name: Medicinal Chemistry-I
Subject Code: BP403TP

Scope: This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs. The syllabus also emphasizes on chemical synthesis of important drugs under each class.

Objectives: Upon completion of this course the student should be able to

1. Understand the chemistry of drugs with respect to their pharmacological activity
2. Understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
3. know the Structural Activity Relationship (SAR) of different class of drugs
4. write the chemical synthesis of some drugs

Teaching scheme and examination scheme:

Teaching Scheme				Evaluation Scheme			
				Theory		Practical	
Theory	Tutorial	Practical	Total	External	Internal	External	Internal
3	1	4	6	75	25	35	15

Sr. No.	Course Contents	Hours
1	**1.1 Introduction to Medicinal Chemistry** History and development of medicinal chemistry **1.2 Physicochemical properties in relation to biological action** Ionization, Solubility, Partition Coefficient, Hydrogen bonding, Protein binding, Chelation, Bioisosterism, Optical and Geometrical isomerism. **1.3 Drug metabolism** Drug metabolism principles- Phase I and Phase II. Factors affecting drug metabolism including stereo chemical aspects.	10
2	**2.1 Drugs acting on Autonomic Nervous System Adrenergic Neurotransmitters:** Biosynthesis and catabolism of catecholamine. Adrenergic receptors (Alpha & Beta) and their distribution. **2.2 Sympathomimetic agents: SAR of Sympathomimetic agents** **Direct acting:** Nor-epinephrine, Epinephrine, Phenylephrine*, Dopamine, Methyldopa, Clonidine, Dobutamine, Isoproterenol, Terbutaline, Salbutamol*, Bitolterol, Naphazoline, Oxymetazoline and Xylometazoline. **Indirect acting agents:** Hydroxyamphetamine, Pseudoephedrine, Propylhexedrine. **Agents with mixed mechanism:** Ephedrine, Metaraminol. **2.3 Adrenergic Antagonists:** **Alpha adrenergic blockers:** Tolazoline*, Phentolamine, Phenoxybenzamine, Prazosin, Dihydroergotamine, Methysergide. **Beta adrenergic blockers:** SAR of beta blockers, Propranolol*, Metibranolol, Atenolol, Betazolol, Bisoprolol, Esmolol, Metoprolol, Labetolol, Carvedilol.	10
3	**3.1 Cholinergic neurotransmitters:** Biosynthesis and catabolism of acetylcholine. Cholinergic receptors (Muscarinic & Nicotinic) and their distribution.	10

	3.2 Parasympathomimetic agents: SAR of Parasympathomimetic agents **Direct acting agents:** Acetylcholine, Carbachol*, Bethanechol, Methacholine, Pilocarpine. **Indirect acting/ Cholinesterase inhibitors (Reversible & Irreversible):** Physostigmine, Neostigmine*, Pyridostigmine, Edrophonium chloride, Tacrine hydrochloride, Ambenonium chloride, Isofluorphate, Echothiophate iodide, Parathione, Malathion. Cholinesterase reactivator: Pralidoxime chloride. **3.3 Cholinergic Blocking agents:** SAR of cholinolytic agents **Solanaceous alkaloids and analogues:** Atropine sulphate, Hyoscyamine sulphate, Scopolamine hydrobromide, Homatropine hydrobromide, Ipratropium bromide*. Synthetic cholinergic blocking agents: Tropicamide, Cyclopentolate hydrochloride, Clidinium bromide, Dicyclomine hydrochloride*, Glycopyrrolate, Methantheline bromide, Propantheline bromide, Benztropine mesylate, Orphenadrine citrate, Biperidine hydrochloride, Procyclidine hydrochloride*, Tridihexethyl chloride, Isopropamide iodide, Ethopropazine hydrochloride.	
4	**4. Drugs acting on Central Nervous System** **4.1 Sedatives and Hypnotics:** **Benzodiazepines:** SAR of Benzodiazepines, Chlordiazepoxide, Diazepam*, Oxazepam, Chlorazepate, Lorazepam, Alprazolam, Zolpidem **Barbiturtes:** SAR of barbiturates, Barbital*, Phenobarbital, Mephobarbital, Amobarbital, Butabarbital, Pentobarbital, Secobarbital **Miscelleneous:** **Amides & imides:** Glutethmide. **Alcohol & their carbamate derivatives:** Meprobomate, Ethchlorvynol. Aldehyde & their derivatives: Triclofos sodium, Paraldehyde. **4.2 Antipsychotics** **Phenothiazeines:** SAR of Phenothiazeines - Promazine hydrochloride, Chlorpromazine hydrochloride*, Triflupromazine, Thioridazine hydrochloride, Piperacetazine hydrochloride, Prochlorperazine maleate, Trifluoperazine hydrochloride. **Ring Analogues of Phenothiazeines:** Chlorprothixene, Thiothixene, Loxapine succinate, Clozapine. **Fluro buterophenones:** Haloperidol, Droperidol, Risperidone. SAR of Buterophenones Beta amino ketones: Molindone hydrochloride. **Benzamides:** Sulpieride. **4.3 Anticonvulsants:** SAR of Anticonvulsants, mechanism of anticonvulsant action **Barbiturates:** Phenobarbitone, Methabarbital. **Hydantoins:** Phenytoin*, Mephenytoin, Ethotoin **Oxazolidine diones:** Trimethadione, Paramethadione **Succinimides:** Phensuximide, Methsuximide, Ethosuximide* **Urea and monoacylureas:** Phenacemide, Carbamazepine* **Benzodiazepines:** Clonazepam **Miscellaneous:** Primidone, Valproic acid, Gabapentin, Felbamate	08
5	**5. Drugs acting on Central Nervous System** **5.1 Anti-parkinson:** Levodopa* **5.2 Alzheimer's Disease** **5.3 Narcotic and non-narcotic analgesics** **Morphine and related drugs:** SAR of Morphine analogues, Morphine sulphate, Codeine, Meperidine hydrochloride, Anilerdine hydrochloride, Diphenoxylate hydrochloride, Loperamide hydrochloride, Fentanyl citrate*, Methadone hydrochloride*, Propoxyphene hydrochloride, Pentazocine, Levorphanol tartarate. **Narcotic antagonists:** Nalorphine hydrochloride, Levallorphan tartarate, Naloxone hydrochloride. **Anti-inflammatory agents:** Sodium salicylate, Aspirin, Mefenamic acid*, Meclofenamate, Indomethacin, Sulindac, Tolmetin, Zomepriac, Diclofenac, Ketorolac, Ibuprofen*, Naproxen, Piroxicam, Phenacetin, Acetaminophen, Antipyrine, Phenylbutazone.	07
Total Hours		45

Practical

1. Preparation of drugs/ intermediates
    1. 1,3-pyrazole
    2. Benzimidazole
    3. Benztriazole
    4. 2,3- diphenyl quinoxaline
    5. Phenytoin
    6. Aspirin
    7. Methyl salicylate
2. Assay of drugs
    1. Chlorpromazine
    2. Atropine
    3. Ibuprofen
    4. Aspirin
    5. Furosemide
3. Determination of Partition coefficient for any two drugs
4. To perform thin layer Chromatography

Recommended Books:

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams
5. Remington's Pharmaceutical Sciences
6. Martindale's extra pharmacopoeia.
7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
9. Indian Pharmacopoeia
10. Test book of practical organic chemistry – A. I. Vogel