

KU6DSECHE302: PHARMACEUTICAL CHEMISTRY

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
VI	DSE	300	KU6DSECHE302	4	60

Learning Approach (Hours/ Week)		Marks Distribution			Duration of ESE (Hours)
Lecture/ Tutorial	Practical/ Internship	CE	ESE	Total	
4	0	30	70	100	2

Course Description: The Pharmaceutical chemistry course explores the intricate relationships between molecular structures, biochemical processes, and drug actions, emphasizing the roles of proteins and DNA in drug efficacy and design. The course covers enzyme kinetics, the regulation of enzymatic activity, and the therapeutic applications of enzymes, along with the biochemical mechanisms of various pharmacodynamic agents. Additionally, students will study the biochemistry of gastrointestinal agents, antimicrobials, and radiopharmaceuticals. The course also integrates physical chemistry principles essential to pharmaceutical sciences, such as buffer systems, solubility, and diffusion, preparing students for advanced study and research in pharmaceutical biochemistry.

Course Prerequisite: Basic understanding of chemical kinetic, biomolecules and organic chemistry

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	To identify and recall the fundamental biochemical structures, such as proteins and DNA, and their relevance to drug action and design.	A
2	To describe the mechanisms of action for various pharmacodynamic agents	U

3	To apply principles of enzyme kinetics and regulation to understand enzyme inhibition and therapeutic uses, and utilize this knowledge in the context of drug interactions	A
4	To analyze the complex biochemical mechanisms and classification of antimicrobials, gastrointestinal agents, and radiopharmaceuticals, and compare their therapeutic and diagnostic applications	An

**Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)*

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3	0	0	3	0	0	3
CO 2	0	3	0	0	3	1	3
CO 3	3	1	3	3	0	0	3
CO 4	0	0	0	3	0	0	3

Course Contents for Classroom Transaction:

M O D U L E	U N I T	DESCRIPTION	HOURS
1	PHARMACEUTICAL BIOCHEMISTRY		10
	1	Protein structure and its relevance to drug action-DNA structure and its importance to drug action- Drug absorption, distribution, metabolism and excretion. Structure, activity and drug design- Drugs affecting the adrenergic system- Drugs exerting non-adrenergic effects on cardiac output and vascular tone.	

	2	Enzyme kinetics - Enzyme inhibitors with examples- Regulation of enzymes- enzyme induction and repression-Therapeutic and diagnostic applications of enzymes and isoenzymes Coenzymes- Structure and biochemical functions- Drugs interacting with mammalian enzymes.	
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	PHARMACODYNAMIC AGENTS		10
2	1	Drug acting on CVS-Antihypertensive, anti-arrhythmic, anti-anginal, anti-lipidemic agents and diuretics-Analgesics, narcotics and Nonnarcotic antipyretics, anti-inflammatory, anti-gout drugs.	
	2	Drugs acting on CNS-Hypnotics; sedatives, general anesthetics, anti-epileptics. Psychotropic agents, anti-depressants, anti-parkinsonian agents, hypo glycaemic drugs, anti-thyroid drugs. Anti-histamines H1, and H2 antagonists, anti- serotoninins. Carbohydrate based drugs, oligonucleotides.	
	3	Anticancer drugs, antimicrobial chemotherapy, Antiviral drugs, Antifungal chemotherapy.	

	INORGANIC CHEMISTRY IN PHARMACEUTICS		18
3	1	Gastrointestinal agents Acidifiers: Antacids- Ideal properties of antacids -combinations of antacids- Sodium Bicarbonate- Aluminum hydroxide gel- Magnesium hydroxide	
	2	Antimicrobials: Mechanism- classification- Potassium permanganate- Boric acid- Hydrogen peroxide- Iodine- Antidote: Sodium thiosulphate- Activated charcoal- Sodium nitrite333 Astringents: Zinc Sulphate- Potash Alum	
	3	Electrolytes: Sodium chloride- Potassium chloride- Calcium gluconate and Oral Rehydration Salt (ORS)- Radiopharmaceuticals: Radio isotopes and study of radio isotopes - Sodium iodide I131- Storage	

		conditions- precautions & application of radioactive substances as pharmaceuticals	
	4	Impurities in pharmaceutical substances: Detection of impurities like Chloride, Sulphate, Iron, Arsenic, Lead and Heavy metals in pharmaceutical substances- Miscellaneous compounds: Expectorants- Potassium iodide- Ammonium chloride- Emetics: Copper sulphate, Sodium potassium tartrate	

	PHYSICAL PHARMACEUTICS		10
4		Buffer and pH in pharmaceuticals: Buffer equations- buffers in pharmaceutical systems- preparation- stability- buffered isotonic solutions-Sorensen's pH scale- pH determination (electrometric and calorimetric), Solubility of drugs: Solubility expressions- solute solvent interaction mechanism- ideal solubility parameters- solvation & association- factors influencing solubility of drugs- diffusion principles in biological systems.	
	TEACHER SPECIFIC MODULE		
	Directions: Topics such as Pharmacology, Pharmacopoeia or any other topic relevant to the course can be included		12
5	1	Introduction to pharmacology- sources of drugs- dosage forms and routes of administration- Pharmacodynamics: General principles of drug action- Molecular basis of drug targets	
	2	Pharmacokinetics: Absorption, distribution, metabolism and excretion of drugs. Principles of pharmacokinetics- bioavailability and bioequivalence- pharmacogenetics- drug interactions- bioassays & preclinical studies- Clinical trials	

	3	History of pharmacopoeia- Indian, British USP and Extra Pharmacopoeia.	
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Essential Readings:

1. Textbook of Biochemistry by Rama Rao.
2. A.I. Vogel, Textbook of Quantitative Inorganic analysis
3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry, 3 rd Edition
4. M.L Schroff, Inorganic Pharmaceutical Chemistry
5. Bentley and Driver's Textbook of Pharmaceutical Chemistry
6. Anand & Chatwal, Inorganic Pharmaceutical Chemistry
7. Principles of Biochemistry by Lehninger.
8. Harper's Biochemistry by Robert K. Murry, Daryl K. Granner and Victor W. Rodwell.
9. Biochemistry by Stryer.
10. Physical Pharmaceutics by Ramasamy C and ManavalanR
11. Physical Pharmaceutics by C.V.S. Subramanyam
12. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchill Livingstone Elsevier

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation		70
Continuous Evaluation		30
a)	Test Paper*	12
b)	Assignment	6
c)	Seminar	6
d)	Viva-Voce	6
Total		100

*Average mark of the best two written tests may be considered for internal mark.