Gyanmanjari Innovative University

Course Syllabus
Gyanmanjari Pharmacy College
Semester-4 (B. Pharm.)

Subject: Pharmaceutical Organic Chemistry -III (BPHBP14315)

Type of course: Major

Prerequisite: Pharmaceutical Organic Chemistry –I and II.

Rationale: Pharmaceutical Organic Chemistry-III introduces B.Pharmacy students to advanced concepts in organic chemistry, focusing on reactions, mechanisms, and synthesis of complex organic compounds relevant to drug development. This course provides an in-depth understanding of reaction intermediates, stereochemistry, and specific functional groups essential for pharmacological action. By exploring the principles of organic synthesis and retro synthetic analysis, students gain skills crucial for designing and developing new drug molecules, bridging the gap between theoretical chemistry and practical pharmaceutical applications. Mastery of these topics empowers graduates with a solid foundation for further studies in medicinal chemistry, drug synthesis, and the pharmaceutical industry.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
				Theory Marks		Practical Marks		CA	
CI	T	P	C	ESE	MSE	V	P	ALA	
3	1	-	4	75	25	-	-	50	150

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

Course Content:

Chapter No.	Course content	Hrs	% Weightage
1.	**Stereo isomerism** Optical isomerism – Optical activity, enantiomerism, diastereoisomerism, meso compounds Elements of symmetry, chiral and achiral molecules DL system of nomenclature of optical isomers, sequence rules, RS system of nomenclature of optical isomers Reactions of chiral molecules	10	22

	Racemic modification and resolution of racemic mixture. Asymmetric synthesis: partial and absolute		
2.	**Geometrical isomerism** Nomenclature of geometrical isomers (Cis Trans, EZ, Syn Anti systems) Methods of determination of configuration of geometrical isomers. Conformational isomerism in Ethane, n-Butane and Cyclohexane. Stereo isomerism in biphenyl compounds (Atropisomerism) and conditions for optical activity. Stereospecific and stereoselective reactions	10	22
3.	**Heterocyclic compounds**: Nomenclature and classification Synthesis, reactions and medicinal uses of following compounds/derivatives Pyrrole, Furan, and Thiophene Relative aromaticity and reactivity of Pyrrole, Furan and Thiophene	8	18
4.	**Synthesis, reactions and medicinal uses of following compounds/derivatives** Pyrazole, Imidazole, Oxazole and Thiazole. Pyridine,Quinoline,Isoquinoline,AcridineandIndole.Basicityofpyridine Synthesis and medicinal uses of Pyrimidine, Purine, azepines and their derivatives	10	22
5.	**Reactions of synthetic importance** Metal hydride reduction (NaBH4andLiAlH4), Clemmensen reduction, Birch reduction, Wolff Kishner reduction. Oppenauer - oxidation and Dakin reaction. Beckmanns rearrangement and Schmidt rearrangement. Claisen-Schmidt condensation	7	16

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1.	**Reaction Pathway Mapping**: Faculty will provide name of synthesis pathway to the students and ask them to create a pathway map for synthesizing specific drugs, incorporating the types of reactions and reagents used at each step and upload on GMIU web portal.	10
2.	**Functional group identification:** Faculty will provide sample name of organic compounds or representations of molecular structures, and have students identify functional groups and classify them based on chemical properties. and upload those details on GMIU web portal.	10
3.	**Heterocyclic Compounds & Medicinal Applications:** Faculty will provide name of Heterocyclic compound and students will give their specific medicinal applications and pharmacological activity and upload this report on GMIU web portal.	10
4.	**Nomenclature and Identification of Molecules:** Faculty will provide structure of medicinal compound and students have to identify element of symmetry like DL/RS based on nomenclature rule and upload on GMIU web portal.	10
5.	**Case studies On Heterocyclic:** Faculty will provide heterocyclic functional group and students have solve the Case study of that Heterocyclic Compound and also explain how this Functional Group is used in Drugs.	10

Total	50

Suggested Specification table with Marks (Theory):75

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	30%	35 %	20%	05%	05%	05%

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcome:

After learning the course the students should be able to:	
CO1	Explain the fundamental concepts of organic reaction mechanisms, including electrophilic and nucleophilic reactions, and apply these principles to pharmaceutical compound synthesis.
CO2	Analyze stereochemical aspects of organic molecules, including configurations, conformations, and optical isomerism, and evaluate their significance in drug efficacy and activity.
CO3	Understand the methods of preparation and properties of organic compounds
CO4	Know the medicinal uses and other applications of organic compounds
CO5	Identify and explain key name reactions (e.g., Friedel-Crafts, Grignard, Aldol condensation) and their role in synthetic organic chemistry relevant to drug development.

Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
From the content 10% topics are suggested for flipped mode instruction.
Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory
The internal evaluation will be done on the basis of Active Learning Assignment
Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Reference Books:

[1] Organic chemistry by I.L. Finar, Volume-I&II.

[2] A text book of organic chemistry–Arun Bahl,B.S.Bahl
[3] Heterocyclic Chemistry by Raj K. Bansal
[4] Organic Chemistry by Morrison and Boyd
[5] Heterocyclic Chemistry by T.L. Gilchrist