



Dr. Rafiq Zakaria Campus
Maulana Azad Educational Trust's

Y. B. CHAVAN COLLEGE OF PHARMACY

(B. Pharm, M. Pharm & Research Centre)

ISO 21001:2018 & ISO 14001:2015 CERTIFIED | NIRF-2022 ALL INDIA RANK 65TH

NAAC ACCREDITATION "A" GRADE WITH 3.23 CGPA SCORE

COURSE MODULE

Program Title	M. Pharmacy
Department	Pharmaceutical Chemistry
Course Title	Advance organic Chemistry-II

- 1. NAME OF INSTITUTION** : Y. B. CHAVAN COLLEGE OF PHARMACY,
AURANGABAD
- 2. AFFILIATED UNIVERSITY** : DR. BABASAHEB AMBEDKAR
MARATHWADA UNIVERSITY, AURANGABAD
- 3. DEPARTMENT** : PHARMACEUTICAL CHEMISTRY
- 4. PROGRAM TITLE** : M. PHARM.

5. Program Specific Outcome:

After completing the program, student will be able to:

PSO-1: Highlight advancements in knowledge associated with medicinal chemistry, Natural products chemistry, drug discovery, drug design, green chemistry, peptide chemistry, catalysis, stereochemistry and analytical techniques.

PSO-2: Independently carry out the design of bioactive molecules and synthetic research work.

PSO-3: Interpret the spectra of synthetic compounds, natural products and determine their structures.

PSO-4: Build professional, computational, analytical and critical thinking skills

PSO-5: Explain the unit operation and unit reactions in process chemistry

5.1.Course Description:

The subject is designed to provide in-depth knowledge about advances in organic chemistry, different techniques of organic synthesis and their applications to process chemistry as well as drug discovery. The subject includes green chemistry, peptide chemistry, stereochemistry, photocyclic, pericyclic reactions and catalysis.

Course Outcome :

After completing the course, student will be able to:

CO-1: Explain the applications of green chemistry

CO-2: Write mechanism & applications of photocyclic and pericyclic reaction

CO-3: Apply the concept of stereochemistry, asymmetric synthesis in medicinal chemistry

CO-4: Write the application of catalysts in organic reactions

5.2.COURSE SPECIFICATION : Course Identification and General Information

a. Course Title:	ADVANCED ORGANIC CHEMISTRY - II	
b. Course Number/Code	MPC 202T	
c. Credit Hours	Theory	Practical
	60	180
d. Study level/semester at which this course is offered	Second semester	
e. Pre-requisite	Basic Organic chemistry	
f. Co-requisite	Stereochemistry and catalysis	
g. Program in which the course is offered	M Pharm	
h. Language of teaching the course	English	
i. Prepared by	Dr. K G Baheti	

j. Approved by HOD	Dr. K G Baheti
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6.0. Course Outcomes (COs) : (Min. 4 and Max. 6)

(Use Bloom's Taxonomy words)

After completing the course, student will be able to:

CO Code	Course outcome
CO 102.01	Explain the applications of green chemistry
CO 102.02	Write mechanism & applications of photocyclic and pericyclic reaction
CO 102.03	Apply the concept of stereochemistry, asymmetric synthesis in medicinal chemistry
CO 102.04	Write the application of catalysts in organic reactions

6.1. Knowledge and Understanding

(Alignment of PSOs to COs)

Course Code	Program Specific Outcome				
	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CO 102.01	H	M	---	L	L
CO 102.02	H	M	--	L	L
CO 102.03	H	M	--	--	--
CO 102.04	H	L	--	---	L

Correlation levels 1, 2 or 3 as defined below:

2: Moderate (Medium); 3: Substantial

1: Slight (Low); (High); If there is no correlation, put '-'

6.2. Teaching and Assessment Methods for achieving learning outcome:

Teaching Strategies(methods)/Tools used	Methods of Assessment
Lectures (Constructivist learning) Collaborative learning (Discussion) Project based Learning Blended learning Inquiry based learning Flash cards Video Equipment models	Formative Assessment Case study Class test Multiple choice questions Assignments Seminar Viva Voce Synopsis Tutorials Summative Assessment

6.3. Tools for the Teaching and learning

Theory subjects	Practical Subjects
<ul style="list-style-type: none">• PowerPoints presentation• Videos• Flash Card• Models• Software• Charts• Smart Boards• White boards• Online Platform	<ul style="list-style-type: none">• White boards• Glassware• Chemicals• Instruments• Equipment• Software• Models• Plants/Crude Drugs• Animal

6.4. COURSE CONTENT

Theoretical Aspect:

Order	Topic list/units	Subtopics list	Number of Weeks	Contact Hours
1	Unit I	Green Chemistry: a. Introduction, principles of green chemistry b. Microwave assisted reactions: Merit and demerits of its use, increased reaction rates, mechanism, superheating effects of microwave, effects of solvents in microwave assisted synthesis, microwave technology in process optimization, its applications in various organic reactions and heterocycles synthesis c. Ultrasound assisted reactions: Types of sonochemical reactions, homogenous, heterogeneous liquid-liquid and liquid-solid reactions, synthetic applications d. Continuous flow reactors: Working principle, advantages and synthetic applications	3	12
2	Unit II	Chemistry of peptides a. Coupling reactions in peptide synthesis b. Principles of solid phase peptide synthesis, t-BOC and Fmoc protocols, various solid supports and linkers: Activation procedures, peptide bond formation, deprotection and cleavage from resin, low and high HF cleavage protocols, formation of free peptides and peptide amides, purification and case studies, site-specific chemical modifications of peptides c. Segment and sequential strategies for solution phase peptide synthesis with any two case studies d. Side reactions in peptide synthesis: Deletion peptides, side reactions initiated by proton abstraction, protonation, overactivation and side reactions of individual amino acids.	3	12
3	Unit III	Photochemical Reactions Basic principles of photochemical reactions. Photo-oxidation, photo-addition and photo-fragmentation. Pericyclic reactions Mechanism, Types of pericyclic reactions such as cycloaddition,	3	12

		electrocyclic reaction and sigmatropic rearrangement reactions with examples		
4	Unit IV	Catalysis: a. Types of catalysis, heterogeneous and homogeneous catalysis, advantages and disadvantages b. Heterogeneous catalysis – preparation, characterization, kinetics, supported catalysts, catalyst deactivation and regeneration, some examples of heterogeneous catalysis used in synthesis of drugs. c. Homogeneous catalysis, hydrogenation, hydroformylation, hydrocyanation, Wilkinson catalysts, chiral ligands and chiral induction, Ziegler-Natta catalysts, some examples of homogeneous catalysis used in synthesis of drugs d. Transition-metal and Organo-catalysis in organic synthesis: Metal-catalyzed reactions e. Biocatalysis: Use of enzymes in organic synthesis, immobilized enzymes/cells in organic reaction. f. Phase transfer catalysis - theory and applications	3	12
5	Unit V	Stereochemistry & Asymmetric Synthesis a. Basic concepts in stereochemistry – optical activity, specific rotation, racemates and resolution of racemates, the Cahn, Ingold, Prelog (CIP) sequence rule, meso Compounds, pseudo asymmetric centres, axes of symmetry, Fischers D and L notation, cis-trans isomerism, E and Z notation. b. Methods of asymmetric synthesis using chiral pool, chiral auxiliaries and catalytic asymmetric synthesis, enantiopure separation and Stereo selective synthesis with examples..	3	12
	TOTAL		15	60

Practical Aspects

Sr.no	Practical	Number of Weeks
1	Synthesis of organic compounds by adapting different approaches involving (3 experiments) a) Oxidation b) Reduction/hydrogenation c) Nitration	3
2	Comparative study of synthesis of APIs/intermediates by different synthetic routes (2 experiments)	2
3	assignments on regulatory requirements in API (2 experiments)	2
5	Comparison of absorption spectra by UV and Woodward – Fieser rule	1

5	Interpretation of organic compounds by FT-IR	1
6	Interpretation of organic compounds by NMR	1
7	Interpretation of organic compounds by MS	1
8	Determination of purity by DSC in pharmaceuticals	1
9	Identification of organic compounds using FT-IR, NMR, CNMR and Mass spectra	1
10	To carry out the preparation of following organic compounds	1
11	Preparation of 4-chlorobenzhydrylpiperazine. (an intermediate for cetirizine HCl).	1
12	Preparation of 4-iodotoluene from p-toluidine.	1
13	NaBH ₄ reduction of vanillin to vanillyl alcohol	1
14	Preparation of umbelliferone by Pechhman reaction	1
15	Preparation of triphenyl imidazole	1
16	To perform the Microwave irradiated reactions of synthetic importance (Any two)	1
17	Determination of log P, MR, hydrogen bond donors and acceptors of selected drugs using softwares	1
18	Calculation of ADMET properties of drug molecules and its analysis using softwares Pharmacophore modelling	1
19	2D-QSAR based experiments	1
20	3D-QSAR based experiments	1
21	Docking study-based experiment	1
22	Virtual screening based experiment	1

7.0. ASSESSMENT MECHANISM:

Sr. No.	Assessment Mechanism	Week due	Marks	Proportion of Final Assessment
1	Continuous Assessment (Theory)	2 nd week of every month	10	4%

2	Sessional (Internal Theory exam)	As per schedule of examination	15	6%
3	Continuous Practical Assessment (Sessional Practical exam)	Weekly during practical	20	8%
4	Sessional (Internal Practical exam)	As per schedule of examination	30	12%
5	Final exam (theory)	As per University at end of course	75	30%
6	Final exam(practical)		100	40%
Total			150	100%

8.0.STUDENT SUPPORT:

Office hours/week	Other procedures
Two hours minimum	---

9.0.TEACHER'S AVAILABILITY FOR STUDENT SUPPORT:

Days	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Time	12:00-1:00	12:00-1:00	12:00-1:00	12:00-1:00	12:00-1:00	12:00-1:00

10.0. LEARNING RESOURCES:

Sr. No.	Title of Learning Material	Details
1	Text books	---
2	Reference material	1. "Advanced Organic chemistry, Reaction, mechanisms and structure", J March, John Wiley and sons, New York. 2. "Mechanism and structure in organic chemistry", ES Gould, Hold Rinchartand Winston,NewYork. 3. "Organic Chemistry" Clayden, Greeves, Warren and Wothers., Oxford University Press 2001. 4. "Organic Chemistry" Vol I and II. I.L. Finar. ELBS, Sixth ed., 1995. 5. Carey, Organic chemistry, 5th edition (Viva Books Pvt. Ltd.) 6. Organic synthesis-the disconnection approach, S. Warren, Wiley India 7. Principles of organic synthesis, ROCCornman and JMCoxan, Nelson thorns 8. Organic synthesis- Special techniques VK Ahluwalia and R Aggarwal,Narosa Publishers. 9. Organic reaction mechanisms IV edtn, VK Ahluwalia and RK Parashar,Narosa Publishers.

3	E-materials and websites	---
4	Other learning material	--

11.0. FACILITIES REQUIRED:

Sr. No.	Particular of Facility Required
1	Lecture Rooms (capacity for 60 students)
2	Laboratory (capacity for 20 students)
3	Computing resources: PC with latest version and hardware/software and utilization of open source and licensed application software
4	Other resources: Appropriate laboratory tools, Chemicals, Glass ware, Apparatus, Instrumentation

12.0. COURSE IMPROVEMENT PROCESSES:

12.1. Strategies for obtaining student feedback on effectiveness of teaching:

Course delivery evaluation by students using: Questionnaire forms and online questionnaires

12.2. Other strategies for evaluation of teaching by the instructor or by the department: Periodic review by Academic Planning & Monitoring Committee and departmental review committee, Observations and assistance of colleagues, External assessments by advisors/ examiners and auditors.

12.3. Process for improvement of teaching:

Use of ICT tools, teaching aids, Simultaneous practical orientation and theory classes (SPOT), Adoption of reflective teaching.

12.4. Describe the planning procedures for periodically reviewing of course effectiveness and planning for improvement:

Periodic review by departmental meeting , Review of course delivery and outcome through assessment and feedback from all stake holders.

12.5. Course development plans:

Provide inputs for course improvement and update to University Course development Committees (Board of Studies)

13.0. INFORMATION ABOUT FACULTY MEMBER RESPONSIBLE FOR THE COURSE:

Name	Dr. K G Baheti
Location	IQAC, 3 rd floor

Contact Detail (e-mail & cell no.)	9422340342, nk_baheti@yahoo.com
Office Hours	10:00 AM to 5:00 PM