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-I

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 completion of 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 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. Basic Aspects of Organic Chemistry, reaction mechanism and synthetic applications of named Reactions, Synthetic Reagents & their Applications, Protecting groups, Heterocyclic Chemistry, Synthon approach and retrosynthesis applications

5.2. Course Objective:

At completion of this course it is expected that students will be able to

- Explain the applications of protecting and deprotecting groups
- Write mechanism & applications of named reactions
- Apply the concept of disconnection to develop synthetic routes for small molecule.
- Explain and summarize the chemistry of heterocyclic compounds

5.3.COURSE SPECIFICATION : Course Identification and General Information

a. Course Title:	ADVANCED ORGANIC CHEMISTRY - I	
b. Course Number/Code	MPC 102T	
c. Credit Hours	Theory	Practical
	60	180
d. Study level/semester at which this course is offered	First semester	
e. Pre-requisite	Basic Organic chemistry	
f. Co-requisite	--	

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

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 protecting and deprotecting groups
CO 102.02	Write mechanism & applications of named reactions
CO 102.03	Apply the concept of disconnection to develop synthetic routes for small molecule
CO 102.04	Explain and summarize the chemistry of heterocyclic compounds

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**	**--**	**M**
CO 102.02	**M**	**H**	**L**	**L**	**H**
CO 102.03	**L**	**H**	**L**	**L**	**M**
CO 102.04	**H**	**H**	**L**	**--**	**M**

Correlation levels 1, 2 or 3 as defined below:

1: Slight (Low); 2: Moderate (Medium); 3: Substantial (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
• **PowerPoints presentation** • **Videos** • **Flash Card** • **Models** • **Software** • **Charts** • **Smart Boards** • **White boards** • **Online Platform**	• **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**	1. Basic Aspects of Organic Chemistry: 1. Organic intermediates: Carbocations, carbanions, free radicals, carbenes and nitrenes. Their method of formation, stability and synthetic applications. 2. Types of reaction mechanisms and methods of determining them, 3. Detailed knowledge regarding the reactions, mechanisms and their relative reactivity and orientations. Addition reactions a) Nucleophilic uni- and bimolecular reactions (SN1 and SN2) b) Elimination reactions (E1 & E2; Hoffman & Saytzeff's rule) c) Rearrangement reaction	**3**	**12**
2	**Unit II**	Study of mechanism and synthetic applications of following named Reactions: Ugi reaction, Brook rearrangement, Ullmann coupling reactions, Dieckmann Reaction, Doebner-Miller Reaction, Sandmeyer Reaction, Mitsunobu reaction, Mannich reaction, Vilsmeyer-Haack Reaction, Sharpless asymmetric epoxidation, Baeyer-Villiger oxidation, Shapiro & Suzuki reaction, Ozonolysis and Michael addition reaction	**3**	**12**
3	**Unit III**	Synthetic Reagents & Applications: Aluminiumisopropoxide, N-bromosuccinamide, diazomethane, dicyclohexylcarbodimide, Wilkinson reagent, Witting reagent. Osmium tetroxide, titanium chloride, diazopropane, diethyl azodicarboxylate, Triphenylphosphine, Benzotriazol-1-yloxy) tris (dimethylamino) phosphonium hexafluoro-phosphate (BOP). Protecting groups a. Role of protection in organic synthesis b. Protection for the hydroxyl group, including 1,2-and1,3-diols: ethers, esters, carbonates, cyclic acetals & ketals	**3**	**12**

		c. Protection for the Carbonyl Group: Acetals and Ketals d. Protection for the Carboxyl Group: amides and hydrazides, esters e. Protection for the Amino Group and Amino acids: carbamates and amides		
4	**Unit IV**	Heterocyclic Chemistry: Organic Name reactions with their respective mechanism and application involved in synthesis of drugs containing five, six membered and fused hetrocyclics such as Debus-Radziszewski imidazole synthesis, Knorr Pyrazole Synthesis Pinner Pyrimidine Synthesis, Combes Quinoline Synthesis, Bernthsen Acridine Synthesis, Smiles rearrangement and Traube purine synthesis. Synthesis of few representative drugs containing these hetrocyclic nucleus such as Ketoconazole, Metronidazole,Miconazole, celecoxib, antipyrin, Metamizole sodium, Terconazole, Alprazolam, Triamterene, Sulfamerazine,Trimethoprim, Quinine, Hydroxychloroquine, Chloroquine, Quinacrine, Amsacrine, Prochlorpherazine, Chlorpromazine, Theophylline, Promazine, Mercaptopurine ,Thioguanine.	**3**	**12**
5	**Unit V**	Synthon approach and retrosynthesis applications i. Basic principles, terminologies and advantages of retrosynthesis; guidelines for dissection of molecules. Functional group interconvertion and addition (FGI and FGA) ii. C-X disconnections; C-C disconnections – alcohols and carbonyl compounds; 1,2-, 1,3-,1,4-, 1,5-, 1,6-difunctionalized compounds iii. Strategies for synthesis of three, four, five and six-membered ring.	**3**	**12**
	TOTAL		**15**	**60**

Practical Aspects

Order	Name of Experiment	Number of weeks
01	Simultaneous Estimation of Multicomponent containing formulation by UV Spectrophotometry	01
02	**Flash Column Chromatography** method to purify individual chemical compounds from mixtures of compounds	01

03	High Performance Liquid Chromatography (HPLC) Analysis of prasugrel hydrochloride and Aspirin in bulk and pharmaceutical formulation	01
04	Estimation of Quinine sulphate by Fluorimetry	01
05	Estimation of Sodium/Potassium Concentration by Flame Photometry	01
06	Estimation of DNA and RNA by UV-Spectrophotometry	01
07	To study the various sections of Material Safety Data Sheet (MSDS)	01
08	To synthesis the Dibenzyl acetone using Claisen Schmidt reaction and perform the TLC of the product	01
09	To synthesis the Benzyllic acid using benzylic acid rearrangement and perform the TLC of the product	01
10	To synthesis anthranilic acid from phthalimide and perform TLC of the product	01
11	To synthesize sulphanilamide from acetanilide and perform TLC of the product	01
12	To estimate the amount of amide in the given sample	01
13	To synthesize N-Benzylidine benzylamine and perform TLC of the product	01
14	Purification of ethanol by simple distillation method	01
15	To synthesis Benzil from benzoin	01
16	To synthesis phenytoin from benzil and urea.	01

7.0. ASSESSMENT MECHANISM:

Sr. No.	Assessment Mechanism	Week due	Marks	Proportion of Final Assessment
1	Continuous Assessment (Theory)	2nd 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. "Mechanism and Structure in Organic Chemistry", ES Gould, Hold Rinchartand Winston, New York. 2. "Organic Chemistry" Clayden, Greeves, Warren and Woihers., Oxford University Press 2001. 3. "Organic Chemistry" Vol I and II. I.L. Finar. ELBS, Pearson Education Lts, Dorling Kindersley. 4. A guide to mechanisms in Organic Chemistry, Peter Skyes (Orient Longman, New Delhi). 5. Reactive Intermediates in Organic Chemistry, Tandom and Gowel, Oxford & IBH Publishers. 6. Organic Synthesis - The Disconnection Approach, S. Warren, Wily India 7. Principles of Organic Synthesis, ROC Norman and JM Coxan, NelsonThorns. 8.Advanced Organic chemistry, Reaction, Mechanisms and Structure", J March, John Wiley and Sons, New York.
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, 3rd floor
Contact Detail (e-mail &cell no.)	9422340342, nk_baheti@yahoo.com
Office Hours	10:00 AM to 5:00 PM