COURSE MODULE

Program Title	B. Pharmacy
Department	Pharmaceutical Chemistry
Course Title	Medicinal 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** : B. PHARM.

4.1. Program Outcomes (PO):

PO 01: Pharmacy Knowledge: Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioral, social, and administrative pharmacy sciences; and manufacturing practices.

PO 02: Planning Abilities: Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.

PO 03: Problem analysis: Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions.

PO 04: Modern tool usage: Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.

PO 05: Leadership skills: Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfillment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and wellbeing.

PO 06: Professional Identity: Understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).

PO 07: Pharmaceutical Ethics: Honour personal values and apply ethical principles in professional and social contexts. Demonstrate behavior that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.

PO 08: Communication: Communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.

PO 09: The Pharmacist and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.

PO 10: Environment and sustainability: Understand the impact of the professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 11:Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

5. COURSE SPECIFICATION:

5.1.Course Identification and General Information

a. Course Title:	**Medicinal Chemistry-II**	
b. Course Number/Code	**BP501T**	
c. Credit Hours	Theory	Practical
	45(3 Hrs/Week)	----------
d. Study level/semester at which this course is offered	**Fifth Semester B.Pharm**	
e. Pre-requisite	Medicinal Chemistry-I (B.Pharm Second year course)	
f. Co-requisite	Basic of organic reactions	
g. Program in which the course is offered	B Pharm	
h. Language of teaching the course	English	
i. Prepared by	**Mr.Ansari Altamash**	
j. Approved by HOD	**Dr. K. G. Baheti**	

5.2.Course Description:

Pharmaceutical Medicinal Chemistry –II is the branch of Pharmacy which deals with the biological activity of the compounds of different category. Which develop the linkage between organic molecules and their transformation to the drug and ability to name drugs having various structural features with classification, ADME, SAR study , MOA and side effect of respective drugs.

5.3.Course Objectives:

1. Interpretation and application of IUPAC rules for nomenclature.
2. To memories different classes of compounds on the basis of chemical class and biological activity
3. To explain physicochemical properties, mode of action and SAR of different class of medicinal compounds.
4. To recognize and describe the drug and receptor interaction.
5. To outline the synthesis of drug compounds.

6.0.Course Outcomes (COs) : (Min. 4 and Max. 6)

(Use Bloom's Taxonomy words)

CO Code	Course outcome
CO 501.01	Identify the medicinal compounds and Infer its IUPAC names

CO 501.02	Categories therapeutic agents & relate the structure with biological activity (SAR)
CO 501 .03	Summarize drugs receptor interaction, mode of action therapeutic uses and side effects of medicinal drugs.
CO 501 .04	Write the synthesis of medicinal compounds

6.1. Knowledge and Understanding

(Alignment of POs to COs)

CO Code	**Program Outcome (PO)**										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO 501T.01	**3**	**1**	**3**	**1**	**M**	**M**	**2**	**1**	**1**	**2**	**-**
CO 501T 02	**3**	**3**	**3**	**1**	**1**	**1**	**2**	**1**	**1**	**2**	**1**
CO 501T 03	**3**	**3**	**1**	**3**	**2**	**1**	**1**	**3**	**3**	**2**	**3**
CO 501T 04	**3**	**3**	**3**	**3**	**3**	**-**	**2**	**2**	**2**	**2**	**1**

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**	• **White boards**

• **Videos** • **Flash Card** • **Models** • **Software** • **Charts** • **Smart Boards** • **White boards** • **Online Platform**	• **Glassware** • **Chemicals** • **Instruments** • **Equipment** • **Software** • **Models** • **Plants/Crude Drugs** • **Animal**

6.4.COURSE CONTENT

6.1. Theoretical Aspect:

Order	Topic list/units	Subtopics list	Number of Weeks	Contact Hours
1	**Unit I**	**Antihistaminic agents:** Histamine, receptors and their distribution in the humanbody **. H_1–antagonists:** Diphenhydramine hydrochloride*, imenhydrinate, Doxylamines cuccinate, Clemastine fumarate, Diphenylphyraline hydrochloride, Tripelenamine hydrochloride, Chlorcyclizine hydrochloride, Meclizine hydrochloride, Buclizine hydrochloride, Chlorpheniramine maleate, Triprolidine hydrochloride*, Phenidamine tartarate, Promethazine hydrochloride*, Trimeprazine tartrate, Cyproheptadine hydrochloride, Azatidine maleate, Astemizole, Loratadine, Cetirizine, Levocetrazine Cromolyn sodium **H_2-antagonists:** Cimetidine*, Famotidine, Ranitidin. **Gastric Proton pump inhibitors:** Omeprazole, Lansoprazole, Rabeprazole, Pantoprazole **Anti-neoplastic agents: A. Alkylating agents:** Meclorethamine*, Cyclophosphamide, Melphalan, Chlorambucil, Busulfan, Thiotepa **B. Antimetabolites:** Mercaptopurine*, Thioguanine, Fluorouracil, Floxuridine, Cytarabine, Methotrexate*, Azathioprine **C. Antibiotics:** Dactinomycin, Daunorubicin, Doxorubicin, Bleomycin **D. Plant products:** Etoposide, Vinblastin sulphate, Vincristin sulphate **E. Miscellaneous:** Cisplatin, Mitotane.	**3 and Half week**	**10**
2	**Unit II**	**Anti-anginal: Vasodilators:** Amyl nitrite, Nitroglycerin*, Pentaerythritol tetranitrate, Isosorbide dinitrite*, Dipyridamole. **Calcium channel blockers:**	**3 and Half week**	**10**

		Verapamil, Bepridil hydrochloride, Diltiazem hydrochloride, Nifedipine, Amlodipine, Felodipine, Nicardipine, Nimodipine. **Diuretics:** Carbonic anhydrase inhibitors: Acetazolamide*, Methazolamide, Dichlorphenamide. Thiazides: Chlorthiazide*, Hydrochlorothiazide, Hydroflumethiazide, Cyclothiazide, Loop diuretics: Furosemide*, Bumetanide, Ethacrynic acid. Potassium sparing Diuretics: Spironolactone, Triamterene, Amiloride. Osmotic Diuretics: Mannitol **Anti-hypertensive Agents**: Timolol, Captopril, Lisinopril, Enalapril, Benazepril hydrochloride, Quinapril hydrochloride, Methyldopate hydrochloride,* Clonidine hydrochloride, Guanethidine monosulphate, Guanabenz acetate, Sodium nitroprusside, Diazoxide, Minoxidil, Reserpine, Hydralazine hydrochloride.		
3	**Unit III**	**Anti-arrhythmic Drugs**: Quinidine sulphate, Procainamide hydrochloride, Disopyramide phosphate*, Phenytoin sodium, Lidocaine hydrochloride, Tocainide hydrochloride, Mexiletine hydrochloride, Lorcainide hydrochloride, Amiodarone, Sotalol. **Anti-hyperlipidemic agents**: Clofibrate, Lovastatin, Cholesteramine and Cholestipol **Coagulant & Anticoagulants**: Menadione, Acetomenadione, Warfarin*, Anisindione, clopidogrel**. Drugs used in Congestive Heart Failure:** Digoxin, Digitoxin, Nesiritide,Bosentan, Tezosentan.	**3 and Half week**	**10**
4	**Unit IV**	**Drugs acting on Endocrine system** Nomenclature, Stereochemistry and metabolism of steroids **A. Sex hormones**: Testosterone, Nandralone, Progestrones, Oestriol, Oestradiol, Oestrione, Diethyl stilbestrol. **B. Drugs for erectile dysfunction:** Sildenafil, Tadalafil. **C. Oral contraceptives:** Mifepristone, Norgestril, Levonorgestrol **D. Corticosteroids:** Cortisone, Hydrocortisone, Prednisolone, Betamethasone, Dexamethasone **E. Thyroid and antithyroid drugs**: L-Thyroxine, L-Thyronine, Propylthiouracil, Methimazole.	**2 and half week**	**8**
5	**Unit V**	**Antidiabetic agents:** Insulin and its preparations Sulfonyl ureas: Tolbutamide*, Chlorpropamide, Glipizide, Glimepiride. Biguanides: Metformin. Thiazolidinediones: Pioglitazone, Rosiglitazone. Meglitinides: Repaglinide, Nateglinide. Glucosidase inhibitors: Acrabose, Voglibose. **Local Anesthetics:** SAR of Local anesthetics **Benzoic Acid derivatives**; Cocaine, Hexylcaine, Meprylcaine, Cyclomethycaine, Piperocaine. **Amino Benzoic acid derivatives**: Benzocaine*, Butamben, Procaine*, Butacaine, Propoxycaine, Tetracaine, Benoxinate. **Lidocaine/Anilide derivatives**: Lignocaine, Mepivacaine, Prilocaine,	**2 and half week**	**7**

		Etidocaine. **Miscellaneous**: Phenacaine, Diperodon, Dibucaine.*		
	TOTAL			**45**

7.0.ASSESSMENT MECHANISM :

Sr. No.	Assessment Mechanism	Week due	Marks	Proportion of Final Assessment
1	Assignments, Exercises & Home works	2nd week of every month	10	6%
2	Sessional (Internal Theory exam)	As per scheduled examination	15	10%
3	Continuous Practical Assessment (Sessional Practical exam)	Weekly during practicals	15	10%
4	Final exam (theory)	As per University at end of course	75	50%
5	Final exam(practical)		35	24%
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	**04:00-5:00**	**04:00-5:00**	**04:00-5:00**	**04:00-5:00**	**04:00-5:00**	**10:00-12:00**

10.0. LEARNING RESOURCES:

Sr.No.	Title of Learning Material	Details
1	Text books	
2	Essential references (as per syllabus)	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. 1to 5. 9. Indian Pharmacopoeia. 10. Text book of practical organic chemistry- A.I.Vogel.
3	Reference material	
4	E-materials and websites	https://www.youtube.com/channel/UC252n-tfXsYha31pGQwcQdA
5	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 onlinequestionnaires

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	Mr. Ansari Altamash Shakeel Ahmad
Location	Dept. of Pharmaceutical Chemistry M.Pharm Research lab.
Contact Detail (e-mail &cell no.)	9823967266
Office Hours	10:00 AM to 5:00 PM