COURSE MODULE

Program Title	M. Pharmacy
Department	Pharmacology
Course Title	Principle of Drug Discovery

1. **NAME OF INSTITUTION** : Y. B. CHAVAN COLLEGE OF PHARMACY, AURANGABAD

2. **AFFILIATED UNIVERSITY** : DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD

3. **DEPARTMENT** : PHARMACOLOGY
4. **PROGRAM TITLE** : M. PHARM.

4.1. Program Specific Outcome:

After completing the program, the student will be able to:

M. Pharm in Pharmacology: After completion of the program, the student will be able to:

PSO 01: Highlight advancement in knowledge associated with advance pharmacology, toxicology, molecular pharmacology, drug discovery, clinical research and pharmacovigilance.

PSO 02: Independently carry out research and development work in pharmacology and interdisciplinary areas utilizing modern tools and employing problem analysis skills to solve practical problems.

PSO 03: Build the professional skills, computational, analytical and critical thinking skills.

PSO 04: Build protocols to test efficacy, safety and toxicity of the new chemical entities as per the guidelines.

PSO 05: Apply the GLP concepts, CCSEA and OECD guidelines in animal studies.

5. COURSE SPECIFICATION :

5.1.Course Identification and General Information

a. Course Title:	**PRINCIPLES OF DRUG DISCOVERY**	
b. Course Number/Code	**MPL 203T**	
c. Credit Hours	Theory	Practical
	04	NA
d. Study level/semester at which this course is offered	Sem II	
e. Pre-requisite	B. Pharm Pharmacology III	
f. Co-requisite	Pharmacodynamics, Pharmacokinetics, Drug discovery, Targets of drug discovery.	
g. Program in which the course is offered	M Pharm	
h. Language of teaching the course	English	
i. Prepared by	Mr. Mohd Mukhtar khan Dr. Nikhil Sakle	
j. Approved by HOD	Dr. Syed Ayaz Ali	

5.2.Course Description:

The subject imparts a fundamental knowledge role of genomics, proteomics and bioinformatics in drug discovery process. This information will further help the student to apply the knowledge in computer aided drug design in drug discovery.

5.3.Course Objectives:

- Explain the various stages of drug discovery processes.
- Explain the molecular pathways related to Genomics and proteomics
- Appreciate the applicability of computer aided drug design in drug discovery process.
- Demonstrate molecular biology techniques as applicable for pharmacology.

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

(Use Bloom's Taxonomy words)

CO Code	Course outcome
CO-104.1	To provide students with an understanding of the process of drug discovery and development from the identification of novel drug targets
CO-104.2	Demonstrate and find new drugs into clinical practice.
CO-104.3	Relate with principles and applications of genomic and proteomic tools.
CO-104.4	Explain detailed concepts of computer aided drug design in drug discovery process.
CO-104.5	Elaborate the techniques in computer aided drug design in drug discovery.

6.1. Knowledge and Understanding

(Alignment of PSOs to COs)

Course Code	Program Specific Outcome			
	PSO-1	**PSO-2**	**PSO-3**	**PSO-4**
CO-104.1	**3**	**1**	**1**	**1**
CO-104.2	**3**	**-**	**2**	**-**
CO-104.3	**2**	**2**	**3**	**1**
CO-104.4	**1**	**2**	**3**	**-**
CO-104.5	**3**	**3**	**3**	**-**

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

6.1. Theoretical Aspect:

Order	Topic list/units	Subtopics list	Number of Weeks	Contact Hours
1	**Unit I**	An overview of modern drug discovery process: Identification, target validation, lead identification and lead Hrs Optimization, Economics of drug discovery. Target Discovery and validation-Role of Genomics, Proteomics and Bioinformatics. Role of Nucleic acid microarrays, Protein microarrays, Antisense technologies, siRNAs, antisense oligonucleotides, Zinc finger proteins. Role of transgenic animals in target validation.	**03**	**12**
2	**Unit II**	Lead Identification- combinatorial chemistry & high throughput screening, in silico lead discovery techniques, Assay development For hit identification. Protein structure Levels of protein structure, Domains, motifs, and folds in protein Structure. Computational prediction of protein structure: Threading and homology modelling methods. Application of NMR and X-ray crystallography in protein structure prediction	**03**	**12**
3	**Unit III**	Rational Drug Design Traditional vs rational drug design, Methods followed in traditional drug design. High throughput screening. Concepts of Rational Drug Design, Rational Drug Design Methods: Structure and Pharmacophore based approaches Virtual Screening techniques: Drug likeness screening, Concept of pharmacophore mapping and pharmacophore based Screening.	**03**	**12**
4	**Unit IV**	Molecular docking: Rigid docking, flexible docking, manual docking; Docking based screening. De novo drug design. Quantitative analysis of Structure Activity Relationship History and development of QSAR, SAR versus QSAR, Physicochemical parameters, Hansch analysis, Fee Wilson analysis and relationship between them.	**03**	**12**
5	**Unit V**	QSAR Statistical methods regression analysis, partial least square analysis (PLS) and other multivariate statistical methods. 3D-QSAR approaches like COMFA and COMSIA Prodrug design-Basic concept, Prodrugs to improve patient acceptability, Drug solubility, Drug absorption and distribution, site specific drug delivery and sustained drug action. Rationale of prodrug design and practical consideration of prodrug design.	**03**	**12**
	TOTAL		**15**	**60**

6.2.Practical Aspects - NA

Order	Name of Experiment	Number of Weeks
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

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	Mr. Mukhtar Khan mukhtarpharma@gmail.com Dr. Nikhil Sakle nikhilsakle@gmail.com

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	1. MouldySioud. Target Discovery and Validation Reviews and Protocols: Volume 2 Emerging Molecular Targetsand Treatment Options. 2007 Humana Press Inc. 2. Darryl León. Scott Markelin. Silico Technologies in Drug Target Identification and Validation. 2006 by Taylor and Francis Group, LLC. 3. Johanna K. DiStefano. Disease Gene Identification. Methods and Protocols. Springer New York Dordrecht Heidelberg London. 4. Hugo Kubiny. QSAR: Hansch Analysis and Related Approaches. Methods and Principles in Medicinal Chemistry, Publisher Wiley-VCH 5. Klaus Gubernator, Hans-Joachim Böhm. Structure-Based Ligand Design. Methods and Principles in Medicinal Chemistry. Publisher Wiley-VCH 6. Abby L. Parrill. M Rami Reddy. Rational Drug Design. Novel Methodology and Practical Applications. ACS Symposium Series: American Chemical Society: Washington, DC, 1999.
2	Reference material	Text books in college library
3	E-materials and websites	You tube videos, e-books, slide share
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	**Mr. Mohd Mukhtar khan**
Location	Department of Pharmacology
Contact Detail (e-mail &cell no.)	9960833118(mukhtarpharma@gmail.com)
Office Hours	10:00 AM to 5:00 PM

Name	**Dr. Nikhil Sakle (NSS)**
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