



**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 65<sup>TH</sup>

**NAAC ACCREDITATION "A" GRADE WITH 3.23 CGPA SCORE**

# COURSE MODULE

<b>Program Title</b>	M. Pharmacy
<b>Department</b>	Pharmacology
<b>Course Title</b>	Cellular And Molecular Pharmacology

- 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:

**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:	<b>Cellular And Molecular Pharmacology</b>	
b. Course Number/Code	<b>MPL 104T</b>	
c. Credit Hours	Theory	Practical
	04	NA
d. Study level/semester at which this course is offered	Sem I	
e. Pre-requisite	B. Pharm Pharmacology	
f. Co-requisite	Pharmacodynamics, Pharmacogenomics	
g. Program in which the course is offered	M Pharm	
h. Language of teaching the course	English	
i. Prepared by	Dr. Khan Dureshahwar Dr. Nikhil Sakle	
j. Approved by HOD	Dr. Syed Ayaz Ali	

### 5.2.Course Description:

The subject imparts a fundamental knowledge on the structure and functions of cellular components and help to understand the interaction of these components with drugs. This information will further help the student to apply the knowledge in drug discovery process.

### 5.3.Course Objectives:

- Explain the receptor signal transduction processes.
- Explain the molecular pathways affected by drugs.
- Appreciate the applicability of molecular pharmacology and biomarkers 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	Describe Cell biology, genome organization, cell cycles and cell death.
CO-104.2	Demonstrate and find Cell signaling pathways and second messenger systems.
CO-104.3	Relate with principles and applications of genomic and proteomic tools, recombinant DNA technology and gene therapy.
CO-104.4	Explain detailed concepts of Pharmacogenomics and immunotherapeutics.
CO-104.5	Elaborate Cell culture techniques and biosimilars.

### 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-104.1	3	-	1	1	-
CO-104.2	3	1	2	-	-
CO-104.3	2	3	3	1	1
CO-104.4	1	3	3	-	-
CO-104.5	3	2	3	2	2

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
<b>Lectures (Constructivist learning)</b> <b>Collaborative learning (Discussion)</b> <b>Project based Learning</b> <b>Blended learning</b> <b>Inquiry based learning</b> <b>Flash cards</b> <b>Video</b> <b>Equipment models</b>	<b>Formative Assessment</b> <b>Case study</b> <b>Class test</b> <b>Multiple choice questions</b> <b>Assignments</b> <b>Seminar</b> <b>Viva Voce</b> <b>Synopsis</b> <b>Tutorials</b> <b>Summative Assessment</b>

### 6.3.Tools for the Teaching and learning

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

### 6.4.COURSE CONTENT

#### 6.1. Theoretical Aspect:

Order	Topic list/units	Subtopics list	Number of Weeks	Contact Hours
<b>1</b>	<b>Unit I</b>	Cell biology Structure and functions of cell and its organelles Genome organization. Gene expression and its regulation, importance of siRNA and micro RNA, gene mapping and gene sequencing	<b>03</b>	<b>12</b>

		<p>Cell cycles and its regulation.</p> <p>Cell death- events, regulators, intrinsic and extrinsic pathways of apoptosis.</p> <p>Necrosis and autophagy.</p>		
<b>2</b>	<b>Unit II</b>	<p>Cell signaling</p> <p>Intercellular and intracellular signaling pathways.</p> <p>Classification of receptor family and molecular structure ligand gated ion channels; G-protein coupled receptors, tyrosine kinase receptors and nuclear receptors.</p> <p>Secondary messengers: cyclic AMP, cyclic GMP, calcium ion, inositol 1,4,5-trisphosphate, (IP3), NO, and diacylglycerol.</p> <p>Detailed study of following intracellular signaling pathways: cyclic AMP signaling pathway, mitogen-activated protein kinase (MAPK) signaling, Janus kinase (JAK)/signal transducer and activator of transcription (STAT) signaling pathway.</p>	<b>03</b>	<b>12</b>
<b>3</b>	<b>Unit III</b>	<p>Principles and applications of genomic and proteomic tools DNA electrophoresis, PCR (reverse transcription and real time), Gene sequencing, micro array technique, SDS page, ELISA and western blotting,</p> <p>Recombinant DNA technology and gene therapy</p> <p>Basic principles of recombinant DNA technology- Restriction enzymes, various types of vectors.</p> <p>Applications of recombinant DNA technology.</p> <p>Gene therapy- Various types of gene transfer techniques, clinical applications and recent advances in gene therapy.</p>	<b>03</b>	<b>12</b>
<b>4</b>	<b>Unit IV</b>	<p>Pharmacogenomics</p> <p>Gene mapping and cloning of disease gene.</p> <p>Genetic variation and its role in health/ pharmacology</p> <p>Polymorphisms affecting drug metabolism</p> <p>Genetic variation in drug transporters</p> <p>Genetic variation in G protein coupled receptors</p> <p>Applications of proteomics science: Genomics, proteomics, metabolomics, functionomics, nutrigenomics</p> <p>Immunotherapeutics</p> <p>Types of immunotherapeutics, humanisation antibody therapy, Immunotherapeutics in clinical practice.</p>	<b>03</b>	<b>12</b>
<b>5</b>	<b>Unit V</b>	<p>a. Cell culture techniques</p> <p>Basic equipments used in cell culture lab. Cell culture media, various types of cell culture, general procedure for cell cultures; isolation of cells, subculture, cryopreservation, characterization of cells and their application.</p> <p>Principles and applications of cell viability assays, glucose uptake assay, Calcium influx assays</p> <p>Principles and applications of flow cytometry.</p> <p>b. Biosimilars</p>	<b>03</b>	<b>12</b>
	<b>TOTAL</b>		<b>15</b>	<b>60</b>

## 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)	2 <sup>nd</sup> 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	<b>100%</b>

**8.0.STUDENT SUPPORT:**

Office hours/week	Other procedures
<b>Two hours minimum</b>	<a href="mailto:dureshahwar_31@yahoo.com">dureshahwar_31@yahoo.com</a> , <a href="mailto:khan_duresahwar@ybccpa.ac.in">khan_duresahwar@ybccpa.ac.in</a>

**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	The Cell, A Molecular Approach. Geoffrey M Cooper. 2. Pharmacogenomics: The Search for Individualized Therapies. Edited by J. Licinio and M -L. Wong 3. Handbook of Cell Signaling (Second Edition) Edited by Ralph A. et.al 4. Molecular Pharmacology: From DNA to Drug Discovery. John Dickenson et.al 5. Basic Cell Culture protocols by Cheril D.Helgason and Cindy L.Miller
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:**

<b>Name</b>	<b>Dr. Khan Dureshahwar (KDR)</b>
<b>Location</b>	Department of Pharmacology
<b>Contact Detail (e-mail &amp; cell no.)</b>	9270072159 ( <a href="mailto:dureshahwar_31@yahoo.com">dureshahwar_31@yahoo.com</a> , <a href="mailto:khan_dureshahwar@ybccpa.ac.in">khan_dureshahwar@ybccpa.ac.in</a> )
<b>Office Hours</b>	10:00 AM to 5:00 PM

<b>Name</b>	<b>Dr. Nikhil Sakle (NSS)</b>
<b>Location</b>	Department of Pharmacology
<b>Contact Detail (e-mail &amp; Cell No.)</b>	9960659666 ( <a href="mailto:nikhilsakle@gmail.com">nikhilsakle@gmail.com</a> )
<b>Office Hours</b>	10:00 AM to 5:00 PM