



**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 SEM-II
<b>Department</b>	Pharmaceutics
<b>Course Title</b>	<b>MOLECULAR PHARMACEUTICS (NANO TECHNOLOGY &amp; TARGETED DDS) (NTDS) (MPH 201T)</b>

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

#### 4.1. Program Specific Outcome:

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**PSO-1:** Independently carry out research and development work by utilizing modern tools like Artificial Intelligence (AI), Computer based Informatics and Simulations Models.

**PSO-2:** Highlight advancement in knowledge associated with novel as well as conventional drug delivery systems

**PSO-3:** Build professional, Statistical, computational, analytical, critical thinking and Problem-solving skills.

**PSO-4:** Apply Good manufacturing Practices and Regulations to Drugs and Cosmetics.

**PSO-5:** Explain and apply the concepts of Biopharmaceutical, Molecular and Biological aspects in formulation development and drug targeting

#### 5.1.Course Description:

This course is designed to impart knowledge on the area of advances in novel drug delivery systems.

#### 5.2.Course Objectives:

Upon completion of the course, student shall be able to understand

- The various approaches for development of novel drug delivery systems.
- The criteria for selection of drugs and polymers for the development of NTDS
- The formulation and evaluation of Novel drug delivery systems.

### 5. COURSE SPECIFICATION :

#### 5.3.Course Identification and General Information

a. Course Title:	MOLECULAR PHARMACEUTICS (NANO TECHNOLOGY & TARGETED DDS) (NTDS)
b. Course Number/Code	(MPH 201T)

c. Credit Hours	Theory	Practical
	60hr	--
d. Study level/semester at which this course is offered	M.Pharm SEM-II	
e. Pre-requisite	Basic of Pharmaceutics	
f. Co-requisite	Pharmaceutics	
g. Program in which the course is offered	M Pharm Pharmaceutics	
h. Language of teaching the course	English	
i. Prepared by	Dr. Mohammad Ismail M	
j. Approved by HOD	Dr. S. R. Lahoti	

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

CO Code	Course Outcomes
<b>CO 201.01</b>	To remember, understand, apply the Concepts, Events and biological processinvolved in drug targeting, tumor and Brain targeting
<b>CO 201.02</b>	To analyse various methods of targeting. Apply for the preparation & evaluation of Nano Particles, Liposomes andNiosomes.
<b>CO 201.03</b>	Apply, analyse and evaluate the Microspheres, Aquasomes, Phytosomes, Electrosomes.
<b>CO 201.04</b>	To remember and understand the various methods of aerosol fillings, components for pulmonary and nasal dosage forms and its evaluation thereof.
<b>CO 201.05</b>	Remember the importance of Gene therapy, and understand the potential target diseases for gene therapy and its expression

#### 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
<b>CO 201.01</b>	<b>H</b>	<b>M</b>	<b>H</b>	<b>M</b>	<b>H</b>
<b>CO 201.02</b>	<b>M</b>	<b>H</b>	<b>S</b>	<b>M</b>	<b>H</b>

<b>CO 201.03</b>	<b>H</b>	<b>M</b>	<b>S</b>	<b>M</b>	<b>H</b>
<b>CO 201.04</b>	<b>M</b>	<b>M</b>	<b>S</b>	<b>H</b>	<b>H</b>
<b>CO 201.05</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>S</b>	<b>H</b>

**Correlation levels 1, 2 or 3 as defined below:**

1: Slight Low**S**; 2: Moderate (Medium)**S**; 3: Substantial (High)**H**; If there is no correlation,

## **6.2.Teaching and Assessment Methods for achieving learning outcome:**

<b>Teaching Strategies(methods)/Tools used</b>	<b>Methods of Assessment</b>
<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**

<b>Theory subjects</b>	<b>Practical Subjects</b>
<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
1	Unit I	Targeted Drug Delivery Systems: Concepts, Events and biological process involved in drug targeting. Tumor targeting and Brain targeting	3	12
2	Unit II	Targeting Methods: Introduction , types, preparation evaluation. Nano Particles & Liposomes, Niosomes	3	12
3	Unit III	Micro Capsules / Micro Spheres: Types, preparation and evaluation ,and applications of Monoclonal Antibodies : Aquasomes, Phytosomes, Electrosomes	3	12
4	Unit IV	a) Pulmonary Drug Delivery Systems : Types, Preparation and Evaluation of Aerosols, propellents, Containers, Types, preparation and evaluation. b) Intra Nasal Route Delivery systems; Types, preparation and evaluation	3	12
5	Unit V	Nucleic acid based therapeutic delivery system: Gene therapy, introduction (ex-vivo & in-vivo gene therapy). Potential target diseases for gene therapy (inherited disorder and cancer). Gene expression systems (viral and nonviral gene transfer). Liposomal gene delivery systems and its Biodistribution and Pharmacokinetics. Knowledge of therapeutic antisense molecules and aptamers as drugs of future.	3	12
	TOTAL		15	60

### 6.2. Practicals: NA

## 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>	

#### 9.0.TEACHER'S AVAILABILITY FOR STUDENT SUPPORT:

Days	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Time	<b>12:00-1:00</b>	<b>12:00-1:00</b>	<b>12:00-1:00</b>	<b>12:00-1:00</b>	<b>12:00-1:00</b>	<b>12:00-1:00</b>

#### 10.0. LEARNING RESOURCES:

Sr.No.	Title of Learning Material	Details
1	Text books	1. Y W. Chien, Novel Drug Delivery Systems, 2nd edition, revised and expanded, Marcel Dekker, Inc., New York, 1992. 2. N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001). 3. S.P.Vyas and R.K.Khar, Controlled Drug Delivery - concepts and advances, Vallabh Prakashan, New Delhi, First edition 2002
2	Reference material	Encyclopedia of Pharmaceutical Technology by James swarbick
3	E-materials and websites	1. Indian Journal of Pharmaceutical Sciences (IPA) 2. Indian drugs (IDMA) 3. Journal of controlled release (Elsevier Sciences) desirable 4. Drug Development and Industrial Pharmacy (Marcel & Decker) desirable
4	Other learning material	New publications, GOI notification & US FDA updates

#### **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>	Dr. Mohammad Ismail M
<b>Location</b>	Respective Cabin (beside Stores, IInd floor)
<b>Contact Detail (e-mail &amp;cell no.)</b>	9834368366, mdismail23456@gmail.com
<b>Office Hours</b>	10:00 AM to 5:00 PM

<b>Name</b>	Dr. S.R. Lahoti
<b>Location</b>	Industry Institute Interaction cell
<b>Contact Detail (e-mail &amp;cell no.)</b>	9823371119 , pharmalahoti@gmail.com
<b>Office Hours</b>	10:00 AM to 5:00 PM

<b>Name</b>	Dr. Maria Saiffee
<b>Location</b>	Academic Incharge Cabin
<b>Contact Detail (e-mail &amp;cell no.)</b>	9970070232
<b>Office Hours</b>	10:00 AM to 5:00 PM