



**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>	B. Pharmacy
<b>Department</b>	Pharmaceutics
<b>Course Title</b>	Physical Pharmaceutics I

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** : 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:		
b. Course Number/Code		
c. Credit Hours	Theory	Practical
	45(3 Hrs/Week)	60 (4Hrs. / Week)
d. Study level/semester at which this course is offered	B.Pharm Sem III	
e. Pre-requisite	Physical chemistry of class 11 <sup>th</sup> and 12 <sup>th</sup> std.	
f. Co-requisite	Revision of previous lecture taught	
g. Program in which the course is offered	B Pharm	
h. Language of teaching the course	English	
i. Prepared by	Dr. Maria Saiffee	
j. Approved by HOD	Dr. S. R. Lahoti	

### 5.2.Course Description:

The course covers the different physical, physicochemical, and theoretical aspects of dosage forms and formulations. The subject's theoretical and practical components enable the student to gain a deeper understanding of many aspects of pharmaceutical formulation research and development as well as stability studies.

### 5.3. Course Objectives:

Upon the completion of the course student shall be able to

1. Understand various physicochemical properties of drug molecules in the designing the dosage form
2. Know the principles of drug dissolution and solubility
3. Demonstrate use of physicochemical properties in evaluation of dosage forms.
4. Appreciate physicochemical properties of drug molecules in formulation research and development

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

(Use Bloom's Taxonomy words)

CO Code	Course outcome
CO 302.01	Describe the intra and intermolecular forces that are involved in stabilizing molecular and physical structures and pharmaceutical relevance of the different states of matter to drug delivery systems by reference to specific examples.
CO302.02	Explain the phase rule and describe its application to different systems containing multiple components
CO 302.03	Describe the thermodynamic properties of ideal and real solutions and its applications
CO 302.04	Describe the principle behind complexation and protein binding and describe its application
CO 302.05	Developed skills in procedures and instrumental methods applied in analytical and practical tasks of physical chemistry
CO 302.06	Understand the surface and interfacial phenomenon and application of it in development of stable formulation.
CO 302.07	Understand the importance of pH, buffer and maintenance of isotonicity in pharmaceutical preparations

## 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 302.01	H	-	M	M	-	-	-	-	M	S	M
CO302.02	H	-	M	M	-	-	-	-	M	S	M
CO 302.03	H	-	M	M	-	M	-	-	M	S	M
CO 302.04	H	-	M	M	-	S	-	-	M	S	M
CO 302.05	H	S	M	H	-	-	-	-	M	S	M
CO 302.06	H	-	M	M	-	M	-	-	M	S	M
CO 302.07	H	S	M	M	-	M	-	-	M	S	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
<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
1	Unit I	<b>Solubility of drugs:</b> Solubility expressions, mechanisms of solute solvent interactions, ideal solubility parameters, solvation & association, quantitative approach to the factors influencing solubility of drugs, diffusion principles in biological systems. Solubility of gas in liquids, solubility of liquids in liquids, (Binary solutions, ideal solutions) Raoult's law, real solutions. Partially miscible liquids, Critical solution temperature and applications. Distribution law, its limitations and applications	3 and Half week	10
2	Unit II	<b>States of Matter and properties of matter:</b> State of matter, changes in the state of matter, latent heats, vapour pressure, sublimation critical point, eutectic mixtures, gases, aerosols – inhalers, relative humidity, liquid complexes, liquid crystals, glassy states, solid- crystalline, amorphous & polymorphism. <b>Physicochemical properties of drug molecules:</b> Refractive index, optical rotation, dielectric constant, dipole moment, dissociation constant, determinations and applications	3 and Half week	10
3	Unit III	<b>Surface and interfacial phenomenon:</b> Liquid interface, surface & interfacial tensions, surface free energy, measurement of surface & interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active	3 and Half week	10

		agents, HLB Scale, solubilisation, detergency, adsorption at solid interface.		
4	Unit IV	<b>Complexation and protein binding:</b> Introduction, Classification of Complexation, Applications, methods of analysis, protein binding, Complexation and drug action, crystalline structures of complexes and thermodynamic treatment of stability constants.	2 and half week	8
5	Unit V	<b>pH, buffers and Isotonic solutions:</b> Sorensen's pH scale, pH determination (electrometric and calorimetric), applications of buffers, buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions.	2 and half week	7
	<b>TOTAL</b>			<b>45</b>

### 6.1. Practical Aspects

Order	Name of Experiment	Number of Weeks
1	Determination the solubility of drug at room temperature	1
2	Determination of pKa value by Half Neutralization/ Henderson Hasselbalch equation.	1
3	Determination of Partition co- efficient of benzoic acid in benzene and water	1
4	Determination of Partition co- efficient of Iodine in CCl <sub>4</sub> and water	1
5	Determination of % composition of NaCl in a solution using phenol-water system by CST method	1
6	Determination of surface tension of given liquids by drop count and drop weight method	1
7	Determination of HLB number of a surfactant by saponification method	1
8	Determination of Freundlich and Langmuir constants using activated char coal	1
9	Determination of critical micellar concentration of surfactants	1
10	Determination of stability constant and donor acceptor ratio of PABA-Caffeine complex by solubility method	1
11	Determination of stability constant and donor acceptor ratio of Cupric-Glycine	1



	complex by pH titration method	
<b>12</b>	Determination of Critical Solution temperature of Water Phenol System	<b>1</b>

## 7.0. ASSESSMENT MECHANISM :

Sr. No.	Assessment Mechanism	Week due	Marks	Proportion of Final Assessment
1	Assignments, Exercises & Home works	2 <sup>nd</sup> 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	<b>100%</b>

## 8.0.STUDENT SUPPORT:

Office hours/week	Other procedures
<b>Two hours minimum</b>	<b>Google classroom, whatsapp</b>

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

Days	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Time	<b>4 -5 pm</b>	<b>4 -5 pm</b>	<b>4 -5 pm</b>	<b>4 -5 pm</b>	<b>4 -5 pm</b>	<b>4 -5 pm</b>

## 10.0. LEARNING RESOURCES:

Sr. No.	Title of Learning Material	Details
1	Text books	1. Physical Pharmacy by Alfred Martin 2. Physical Pharmaceutics by C.V.S. Subramanyam
2	Essential references (as per syllabus)	2. Tutorial Pharmacy by Cooper and Gunn. 3. Stocklosam J. Pharmaceutical Calculations,

		Lea &Febiger, Philadelphia. 4. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, MarcelDekkar Inc. 5. Liberman H.A, Lachman C, Pharmaceutical Dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc. 6. Physical Pharmaceutics by Ramasamy C and ManavalanR. 7. Test book of Physical Phramacy, by Gaurav Jain & Roop K. Khar
3	Reference material	
4	E-materials and websites	
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 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. Maria Saifee
<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