



**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>	Microbiology

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>Microbiology</b>	
b. Course Number/Code	<b>BP 303 T</b>	
c. Credit Hours	Theory	Practical
	45(3 Hrs/Week)	60 (4Hrs. / Week)
d. Study level/semester at which this course is offered	Third Semester B. Pharm.	
e. Pre-requisite	<b>Basics of Biochemistry, Formulations</b>	
f. Co-requisite	Pharmaceutics	
g. Program in which the course is offered	B Pharm	
h. Language of teaching the course	English	
i. Prepared by	Mr. Mohammed Imran Anees	
j. Approved by HOD	Dr. S.R.Lahoti	

**5.2.Course Description:** Microbiology is the study of all organisms that are invisible to the naked eye- that is the study of microorganisms. Microorganisms are necessary for the production of bread, cheese, beer, antibiotics, vaccines, vitamins, enzymes etc. Microbiology has an impact on medicine, agriculture, food science, ecology, genetics, biochemistry, immunology etc.

### 5.3.Course Objectives:

- Understand methods of identification, cultivation and preservation of various microorganisms
- Importance of sterilization in microbiology and pharmaceutical industry
- Learn sterility testing of pharmaceutical products.
- Microbiological standardization of Pharmaceuticals.
- Understand the cell culture technology and its applications in pharmaceutical industries.

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

(Use Bloom's Taxonomy words)

CO Code	Course outcome
CO 303.01	Identify the key growth parameters required by micro-organisms and how to identify bacteria and able to cultivation and preservation of various microorganisms.
CO 302.02	Describe the principles and commonly used methods of sterilization and disinfection used in the pharmaceutical industry and to plan out the protocols for sterility checkups in labs and in industries
CO 303.02	Describe laminar air flow technology used to prevent contamination of pharmaceutical parental and ophthalmic products and to focus on health care of common individual.
CO 303.04	Describes and explains Microbiological standardization of Pharmaceuticals and Environmental safety.
CO 303.05	Describe the causes and control of microbial spoilage of pharmaceutical products and understands and highlights cell culture technology and applications in pharmaceutical industries
CO 303.06	To study the importance of how to maintain environment safety by sterility checkup of Labs and Household process and lifelong learning process in day-to-day life while water and food analysis process.

## 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 303.01	1	1	2	1	--	1	1	--	1	1	1
CO 303.02	2	1	2	1	1	2	1	1	2	2	2
CO 303.03	1	1	2	1	---	2	2	1	2	2	2
CO 303.04	1	1	2	2	--	3	2	--	3	2	1
CO 303.05	2	1	1	3	--	2	2	1	2	2	2
CO 303.06	2	2	2	2	--	2	2	1	2	2	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
<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

### Theoretical Aspect:

Order	Topic list/units	Subtopics list	Number of Weeks	Contact Hours
1	<b>Unit I</b>	<p>a) Introduction to Prokaryotes and Eukaryotes</p> <p>b) Study of ultra-structure and morphological classification of bacteria, nutritional requirements, raw materials used for culture media and physical parameters for growth, growth curve, isolation and preservation methods for pure cultures, cultivation of anaerobes, quantitative measurement of bacterial growth (total &amp; viable count).</p> <p>c) Study of different types of phase contrast microscopy, dark field microscopy and electron microscopy.</p>	<b>3 and Half week</b>	<b>10</b>
2	<b>Unit II</b>	<p>a) Identification of bacteria using staining techniques (simple, Gram's &amp; Acid-fast staining) and biochemical tests (IMViC).</p> <p>b) Study of principle, procedure, merits, demerits and applications of Physical, chemical and mechanical method of sterilization.</p> <p>c) Evaluation of the efficiency of sterilization methods Equipment's employed in large scale sterilization. Sterility indicators.</p>	<b>3 and Half week</b>	<b>10</b>
3	<b>Unit III</b>	<p>a) Study of morphology, classification, reproduction/replication and cultivation of Fungi and Virus.</p> <p>b) Classification and mode of action of disinfectants</p> <p>c) Factors influencing disinfection, antiseptics and their evaluation. For bacteriostatic and bactericidal actions</p> <p>d) Evaluation of bactericidal &amp; Bacteriostatic.</p> <p>e) Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.</p>	<b>3 and Half week</b>	<b>10</b>
4	<b>Unit IV</b>	<p>Designing of aseptic area, laminar flow equipment's; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification.</p> <p>a) Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins and amino acids.</p> <p>b) Assessment of a new antibiotic and testing of antimicrobial activity of a new substance.</p>	<b>2 and half week</b>	<b>8</b>

		c) General aspects-environmental cleanliness.		
5	<b>Unit V</b>	a) Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products, sources and types of microbial contaminants, assessment of microbial contamination and spoilage. b) Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations. c) Growth of animal cells in culture, general procedure for cell culture, Primary, established and transformed cell cultures. d) Application of cell cultures in pharmaceutical industry and research.	<b>2 and half week</b>	<b>7</b>
	<b>TOTAL</b>			<b>45</b>

### 6.1. Practical Aspects

Order	Name of Experiment	Number of Weeks
1	Introduction and study of different equipment's and processing, e.g., B.O.D. incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes used in experimental microbiology.	<b>One week</b>
2	Sterilization of glassware, preparation and sterilization of media.	<b>One week</b>
3	Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations.	<b>One week</b>
4	Staining methods- Simple, Gram's staining and acid-fast staining, Negative staining, Monochrome staining (Demonstration with practical).	<b>Five weeks</b>
5	Isolation of pure culture of micro-organisms by multiple streak plate technique and other techniques.	<b>Three weeks</b>
6	Microbiological assay of antibiotics by cup plate method and other methods	<b>Two weeks</b>
7	Motility determination by Hanging drop method.	<b>One week</b>
8	Sterility testing of pharmaceuticals.	<b>Three weeks</b>
9	Bacteriological analysis of water	<b>Two weeks</b>
10	Biochemical test (IMViC reactions)	<b>One week</b>

### ASSESSMENT MECHANISM:





## 9.0.LEARNING RESOURCES:

Sr. No.	Title of Learning Material	Details
1	Text books	<ol style="list-style-type: none"><li>1) Textbook of Pharmaceutical Microbiology by chanderkant kokare.</li><li>2) W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.</li><li>3) Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn</li><li>4) Ananthnarayan : Text Book of Microbiology, Orient-Longman, Chennai</li></ol>
2	Essential references (as per syllabus)	<ol style="list-style-type: none"><li>1) Edward: Fundamentals of Microbiology</li><li>2) W.B.Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.</li><li>3) Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn</li><li>4) Ananthnarayan : Text Book of Microbiology, Orient-Longman, Chennai</li><li>5) N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi</li><li>6) Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company</li></ol>
3	Reference material	Hand Written Notes.
4	E-materials and websites	Soft copies (word/ Pdf files), PPT's.
5	Other learning material	Handouts

## 10.0. 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

## 11.0. COURSE IMPROVEMENT PROCESSES:

### 11.1. Strategies for obtaining student feedback on effectiveness of teaching:

Course delivery evaluation by students using: Questionnaire forms and online questionnaires

### 11.2. 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.

### 11.3. Process for improvement of teaching:

Use of ICT tools, teaching aids, Simultaneous practical orientation and theory classes (SPOT), Adoption of reflective teaching.

### 11.4. 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.

### 11.5. Course development plans:

Provide inputs for course improvement and update to University Course development Committees (Board of Studies)

**12.0. INFORMATION ABOUT FACULTY MEMBER RESPONSIBLE FOR THE COURSE:**

<b>Name</b>	Dr.Syed Iftequar Ahmed
<b>Location</b>	Pharmaceutics Department
<b>Contact Detail (e-mail &amp;cell no.)</b>	9028223979; iftequar2212@gmail.com
<b>Office Hours</b>	10:00 AM to 5:00 PM

<b>Name</b>	Mr. Mohammed Imran Anees (B. Pharm II <sup>nd</sup> SEM A & B Div)
<b>Location</b>	Pharmaceutical-Chemistry Dept.
<b>Contact Detail (e-mail &amp;cell no.)</b>	imran.anees2020@gmail.com 8087611801
<b>Office Hours</b>	10:00 AM to 5:00 PM