Program	Bachelor of Pharmacy (BPharm)	**Semester - 3**
Type of Course	-	
Prerequisite		
Course Objective	-	
Effective From A.Y.	2023-24	

Teaching Scheme (Contact Hours)				Examination Scheme				
				Theory Marks		Practical Marks		
Lecture	Tutorial	Lab	Credit	External Marks (T)	Internal Marks (T)	External Marks (P)	Internal Marks (P)	Total Marks
3	1	4	6	75	25	35	15	150

SEE *- Semester End Examination,* ***CIA*** *- Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)*

Course Content

T - Teaching Hours | **W** - Weightage

Sr.	Topics	T	W
1	**UNIT 1** 1.Introduction, history of microbiology, its branches, scope and its importance. 2. Introduction to Prokaryotes and Eukaryotes 3. 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 & viable count). 4. Study of different types of phase constrast microscopy, dark field microscopy and electron microscopy.	10	22
2	**UNIT II** 5.Identification of bacteria using staining techniques (simple, Gram's & Acid-fast staining) and biochemical tests (IMViC). 6. Study of principle, procedure, merits, demerits and applications of physical, chemical gaseous,radiation and mechanical method of sterilization. 7. Evaluation of the efficiency of sterilization methods. 8. Equipments employed in large scale sterilization. 9. Sterility indicators.	10	22
3	**UNIT III** 10.Study of morphology, classification, reproduction/replication and cultivation of Fungi and Viruses. 11. Classification and mode of action of disinfectants Factors influencing disinfection, antiseptics and their evaluation. 12. For bacteriostatic and bactericidal actions Evaluation of bactericidal & Bacteriostatic. 13. Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.	10	22
4	**UNIT IV** 14.Designing of aseptic area, laminar flow equipments; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification. 15. Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins and amino acids. 16. Assessment of a new antibiotic.	8	18
5	**UNIT V**	7	16

Course Content

T - Teaching Hours | **W** - Weightage

Sr.	Topics	T	W
	17. Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products, sources and types of microbial contaminants, assessment of microbial contamination and spoilage. Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations. 18. Growth of animal cells in culture, general procedure for cell culture, Primary, established and transformed cell cultures. 19. Application of cell cultures in pharmaceutical industry and research		
	Total	**45**	**100**

Suggested Distribution Of Theory Marks Using Bloom's Taxonomy

Level	Remembrance	Understanding	Application	Analyze	Evaluate
Weightage	35	25	15	10	15

NOTE : This specification table shall be treated as a general guideline for the students and the teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes

At the end of this course, students will be able to:	
CO1	Understanding of methods of identification, cultivation and preservation of various microorganisms
CO2	To understand the importance of sterilization and disinfection process in pharmaceutical industry
CO3	To know and learn about sterility testing and microbiological standardisation of pharmaceuticals
CO4	To understand microbial stability of formulations and cell culture technology with its applications
CO5	To carry out microbiological standardisation in pharmaceuticals

Reference Books

1.	**Hugo and Russell's Pharmaceutical Microbiology (TextBook)** By Denyer S.P., Hodges N.A. and Gorman S.P. | Blackwell Publishers
2.	**Industrial Microbiology (TextBook)** By Prescott and Dunn | CBS Publishers and Distributors, Delhi. | 4th edition
3.	**Microbiology (TextBook)** By Pelczar MJ, Chan ECS and Krieg NR. | McGraw Hill Book Company
4.	**Pharmaceutical Microbiology (TextBook)** By Malcolm Harris, Balliere Tindall and Cox
5.	**Industrial Microbiology (TextBook)** By Rose
6.	**Fundamentals of Microbiology (TextBook)** By Probisher, Hinsdill et al | 9th edition
7.	**Tutorial Pharmacy (TextBook)** By Cooper and Gunn's | CBS Publishers and Distribution
8.	**Microbial Technology** By Peppler
9.	**I.P, B.P, U.S.P** | Latest editions.
10.	**Text book of Microbiology** By Ananthnarayan | Orient- Longman, Chennai
11.	**Fundamentals of Microbiology** By Edward
12.	**Pharmaceutical Microbiology** By N. K. Jain | Vallabh Prakashan, Delhi
13.	**Bergeys manual of systematic bacteriology,** Williams and Wilkins- A Waverly Company

List of Practical

1.	A. To study commonly used equipments in microbiology laboratory. B. Working in sterile area C. Working under Laminar air flow
2.	A. Preparation of culture media B. Sterilization of culture media by autoclave
3.	To carry out aseptic transfer of given culture A. From NB to NA B. From NA to NB
4.	To carry out isolation of bacteria by spread plate method.
5.	To carry out isolation of bacteria by streak plate method.
6.	To carry out isolation of bacteria by pour plate method.
7.	To study bacterial morphology by simple staining.
8.	To perform simple staining (Negative).
9.	To perform Gram staining.
10.	Demonstration of Acid Fast staining or Ziehl Neelson staining method.
11.	To study motility of bacteria by hanging drop technique.
12.	To carry out sterility test for sterile water for injection.
13.	To carry out sterility test for sterile gauze.
14.	To carry out two level factorial microbiological assay of Streptomycin Sulfate and find its potency.
15.	To determine ability of microorganisms to produce amylase.
16.	To determine ability of microorganisms to produce nitrate reductase.

List of Tutorial

1.	Bacterial Growth Curve
2.	Microscopy- Phase contrast, Dark field and electron
3.	Staining Technique-Simple, Gram and Acid Fast staining
4.	Sterilization- Principle, methods and Applications
5.	Disinfectants- Classification and factors affecting
6.	Sterility testing- Sterility testing of solids and liquids
7.	Sterility testing- Sterility testing of opthalmic
8.	Virus- Morphology and classification
9.	Fungi- Morphology and classification
10.	Aseptic area - Designing of aseptic area
11.	Aseptic area - Laminar flow equipments
12.	Microbiological assay- Principle and methods
13.	Microbiological assay- Standardization of vitamins and antibiotics
14.	Preservatives- Preservation and evaluation
15.	Animal cell culture- Growth and applications