INSTITUTE	**FACULTY OF PHARMACY**
PROGRAM	**BACHELOR OF PHARMACY**
SEMESTER	**5**
COURSE TITLE	**PHARMACEUTICAL MICROBIOLOGY**
COURSE CODE	**13PH0504**
COURSE CREDITS	**6**

Objective:

1 To Study of all microorganisms Bacteria, fungi and virus and their reproduction, involvement in disease, isolation, preservation.
To study how can we prevent/kill pathogenic method
To study microorganism for the production of alcohol, antibiotics, vaccines, vitamins, enzymes etc...

2 Study of all categories of microorganisims especially for the production of alchol antibiotics, vaccines, vitamins enzymes etc

3 Study of all categories of microorganisims especially for the production of alchol antibiotics, vaccines, vitamins enzymes etc.

Course Outcomes: After completion of this course, student will be able to:

1 Understand methods of identification, cultivation and preservation of various microorganisms

2 To understand the importance and implementation of sterlization in pharmaceutical processing and industry

3 Learn sterility testing of pharmaceutical products

4 Understand the cell culture technology and its applications in pharmaceutical industries

5 Carried out microbiological standardization of Pharmaceuticals.

Pre-requisite of course: Study of all categories of microorganisims especially for the production of alchol antibiotics, vaccines, vitamins enzymes etc.

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	1	4	75	15	10	35	15

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Contents : Unit	Topics	Contact Hours
1	**Unit-1: History of microbiology** Introduction, history of microbiology, its branches, scope and its importance. Introduction to Prokaryotes and Eukaryotes : 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). Study of different types of phase constrast microscopy, dark field microscopy and electron microscopy.	10
2	**Unit-2:Identification of bacteria** Identification of bacteria using staining techniques (simple, Gram's &Acid fast staining) and biochemical tests (IMViC). Study of principle, procedure, merits, demerits and applications of physical, chemical gaseous,radiation and mechanical method of sterilization. Evaluation of the efficiency of sterilization methods. Equipments employed in large scale sterilization. Sterility indicators.	10
3	**Unit-3:Fungi and Virus** Study of morphology, classification, reproduction/replication and cultivation of Fungi and Viruses. Classification and mode of action of disinfectants Factors influencing disinfection, antiseptics and their evaluation. For bacteriostatic and bactericidal actions. Evaluation of bactericidal & Bacteriostatic. Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.	10
4	**Unit-4:Microbiological assay** Designing of aseptic area, laminar flow equipments; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification. Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins and amino acids. Assessment of a new antibiotic.	8
5	**Unit-5:Microbial contaminants** 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. Growth of animal cells in culture, general procedure for cell culture, Primary, established and transformed cell cultures. Application of cell cultures in pharmaceutical industry and research.	7
Total Hours		**45**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Tutorial** Workshop 1, Workshop 2, Workshop 3, Workshop 4, Workshop 5, Workshop 6, Workshop 7, Workshop 8, Workshop 9, Workshop 10, Workshop 11, Workshop 12, Workshop 13, Workshop 14, Workshop 15	15
2	**Practical** Experiment No.1, Experiment No.2, Experiment No.3, Experiment No.4, Experiment No.5, Experiment No.6, Experiment No.7, Experiment No.8, Experiment No.9, Experiment No.10, Experiment No.11, Experiment No.12, Experiment No.13, Experiment No.14, Experiment No.15	40
Total Hours		**55**

Textbook :

1 Pharmaceutical Microbiology, Hugo and Russell's Pharmaceutical Microbiology, W.B. Hugo and A.D. Russel, Blackwell Scientific publications, 2004

References:

1 PRESCOTT AND DUNNS INDUSTRIAL MICROBIOLOGY, PRESCOTT AND DUNNS INDUSTRIAL MICROBIOLOGY, Prescott and Dunn., CBS Publishers & Distributors, , 2004

2 MICROBIOLOGY : APPLICATION BASED APPROACH , MICROBIOLOGY : APPLICATION BASED APPROACH , Pelczar, Chan Kreig, , Tata McGraw Hill , 2009

3 Pharmaceutical Microbiology, Pharmaceutical Microbiology, Malcolm Harris, Balliere Tindall and Cox, Bailliere, Tindall & Cox, 1964

4 Industrial Microbiology., Industrial Microbiology., Anthony H.Rose, Butterworths, 1961

5 Fundamentals of Microbiology, , Fundamentals of Microbiology, , Probisher, Hinsdill , Thomson Learning , 1974

6 Cooper and Gunn’s Tutorial pharmacy, Cooper and Gunn’s Tutorial pharmacy, Cooper and Gunn’s, CBS Publisher and Distribution., 2008

7 Microbial Technology: Fermentation Technology, Microbial Technology: Fermentation Technology, Peppler, Academic Press, 2014

8 I.P., B.P., U.S.P., I.P., B.P., U.S.P., IPC, BPC, USP, IPC, BPC, USP, 2019

9 Ananthanarayan and Paniker's Textbook of Microbiology, Ananthanarayan and Paniker's Textbook of Microbiology, Ananthnarayan : , Orient-Longman, 2020

10 Pharmaceutical Microbiology Paperback, Pharmaceutical Microbiology Paperback, N.K.Jain: , Vallabh Prakashan, 2019

11 Fundamentals of Microbiology, Fundamentals of Microbiology, Edward, Addison-Wesley Educational Publishers Inc, 1983

12 Bergey's Manual of Systematic Bacteriology, Bergey's Manual of Systematic Bacteriology, Stanley Thomas WIlliams, Lippincott Williams and Wilkins, 1989

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
10.00	20.00	25.00	25.00	10.00	10.00

Instructional Method:

1 The course delivery method will depend upon the requirement of content and the need of students. The teacher in addition to the conventional teaching method by the blackboard may also use any tools such as demonstration, role play, quiz, brainstorming, MOOCs etc.

2 The internal evaluation will be done based on continuous evaluation of students in the laboratory and classroom.

3 Students will use supplementary resources such as online videos, NPTEL videos, MOOCs/ e-courses, virtual laboratories.

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