

<b>Course Title</b>	<b>MICROBIOLOGY</b>	
<b>Course Code</b>	BSM301	
<b>Course Credit</b>	Lecture	: 4
	Practical	: 3
	Total	: 7
<b>Course Objectives</b>		
<p>On the completion of the course, students will be able to:</p> <ul style="list-style-type: none"> <li>▪ To introduce concept of molecular phylogeny and microbial diversity</li> <li>▪ Discuss non-cultivable microorganisms, archaea &amp; extremophile. Their adaptation to extremity; halophily, thermophily, acidophily and the applications of the products from extremophile</li> <li>▪ Introduce detail account of different type of diversity eg, akaryotic diversity, eukaryotic diversity, Prokaryotic diversity, etc.</li> </ul>		
<b>Detailed Syllabus</b>		
<b>Unit No.</b>	<b>Name of Chapter &amp; Details</b>	<b>Hours Allotted</b>
	<b>Section-I</b>	
<b>1</b>	<u><b>INTRODUCTION TO MICROBIAL DIVERSITY</b></u> 1.1 Introduction to Biodiversity- Microbial evolution and diversity 1.2 Microbial Taxonomy : Introduction and Overview 1.3 Classification Systems – Taxonomic ranks of microorganisms 1.4 Major characteristics used in taxonomy 1.5 Phylogeny – Survey of prokaryotic phylogeny and phylogenetic groups of eukaryotes	<b>12</b>
<b>2</b>	<u><b>PROKARYOTIC DIVERSITY</b></u> 2.1 Introduction to Achaea and Eubacteria	<b>12</b>

	<p>2.2 <u>Gram Negative bacteria</u> – General features of :</p> <ul style="list-style-type: none"> <li>➤ Aerobic/Microaerophilic motile, helical vibroid</li> <li>➤ Non-motile curved bacteria</li> <li>➤ Aerobic/Microaerophilic rods and cocci</li> <li>➤ Facultative anaerobes – rods, curved and helical bacteria</li> <li>➤ Dissimilatory Sulfate reducers</li> <li>➤ Anaerobic cocci</li> <li>➤ Phototrophic bacteria</li> </ul> <p>2.3 <u>Gram Positive bacteria</u> : General features of :</p> <ul style="list-style-type: none"> <li>➤ Endospore forming rods and cocci</li> <li>➤ Asporogenous rods</li> <li>➤ Mycobacteria and Actinomycetes</li> </ul>	
<p><b>3</b></p>	<p><b><u>DIVERSITY OF SOME UNUSUAL PROKARYOTES</u></b></p> <p>3.1 <u>General features of bacteria with unusual morphology :</u></p> <ul style="list-style-type: none"> <li>➤ Rickettsia and Chlamydia</li> <li>➤ Budding and appendaged bacteria</li> <li>➤ Sheathed bacteria</li> <li>➤ Bacteria with gliding motility</li> <li>➤ Mycoplasma</li> </ul> <p>3.2 <u>General features of bacteria with extreme environments:</u></p> <ul style="list-style-type: none"> <li>➤ Thermophiles</li> <li>➤ Halophiles</li> <li>➤ Acidophiles</li> <li>➤ Barophiles</li> <li>➤ Methanogens</li> </ul>	<p><b>12</b></p>
	<p><b>Section-II</b></p>	

<p><b>4</b></p>	<p><b><u>EUKARYOTIC DIVERSITY</u></b></p> <p>4.1 <u>Fungi</u></p> <ul style="list-style-type: none"> <li>➤ General Characteristics – Definition, Occurrence, Structure, Reproduction</li> <li>➤ Classification and Introduction to major divisions of fungi</li> <li>➤ Economic Importance of fungi</li> </ul> <p>4.2 <u>Algae</u></p> <ul style="list-style-type: none"> <li>➤ General Characteristics – Definition, Occurrence, Ultra Structure, Reproduction</li> <li>➤ Economic Importance of Algae</li> </ul> <p>4.3 <u>Protozoa</u></p> <ul style="list-style-type: none"> <li>➤ General Characteristics – Definition, Occurrence, Ultra Structure, Reproduction</li> <li>➤ Economic Importance of Protozoa</li> </ul>	<p><b>12</b></p>
<p><b>5</b></p>	<p><b><u>AKARYOTIC DIVERSITY (VIRUSES)</u></b></p> <p>5.1 Introduction and general characteristics : Definition, Structure, Classification</p> <p>5.2 Cultivation and Enumeration of Virus</p> <p>5.3 <u>Bacterial Viruses</u> :</p> <ul style="list-style-type: none"> <li>➤ Classification, Lytic life cycle (T<sub>4</sub> Phage), lysogenic life cycle (<math>\lambda</math> Phage and <math>\mu</math> Phage), RNA Phage (MS13)</li> </ul> <p>5.4 <u>Animal Viruses</u>:</p> <ul style="list-style-type: none"> <li>➤ Classification, Replication, Cytocidal effects, Viruses and Cancer, Vibroids</li> </ul> <p>5.5 <u>Plant Viruses</u> :</p> <ul style="list-style-type: none"> <li>➤ Classification, Structure and Reproduction of TMV, Economic importance, Prions</li> </ul>	<p><b>12</b></p>

Sr No.	MICROBIOLOGY (PRACTICAL) (6 HOUR/WEEK)
1	Isolation of gram negative bacteria from given sample
2	Identification of gram negative bacteria from given pure culture using biochemical media ( <i>E.coli, Entrobacter aerogens, Proteus, Salmonella</i> )
3	Isolation of gram negative bacteria from given sample
4	Identification of gram negative bacteria from given pure culture using biochemical media ( <i>Bacillus megaterium, Bacillus subtilis, Staphylococcus aureus, Streptococcus</i> )
5	Identification of Fungi on the basis of Morphological Characteristics .
6	Cultivation of yeast from different natural samples and its morphological characterization using microscopic observation
7	Microscopic observation of different algae from given samples
8	Isolation and cultivation of bacteriophage of <i>E.coli</i> from the given sewage sample
9	Isolation and microscopic observation of Actinomycetes from the given sample Isolation and microscopic observation of Halophiles from the given sample
10	Isolation and microscopic observation of Thermophiles from the given sample
11	
<b>Instructional Method and Pedagogy:</b>	
<ul style="list-style-type: none"> <li>▪ Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.</li> <li>▪ Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.</li> <li>▪ Surprise tests/Quizzes/Tutorials will be conducted.</li> <li>▪ The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.</li> <li>▪ Minimum ten experiments shall be there in the laboratory related to course contents.</li> </ul>	

## Students Learning Outcomes:

At the end of the course the students will be able to:

- Know the basics of molecular phylogeny and microbial diversity
- Know the hidden facts of uncultivable microbes
- Know the extremophiles and their novel molecules, applications of extremophiles, thermophiles, halophiles, etc.
- Know detail account of different type of diversity eg, akaryotic diversity, eukaryotic diversity, Prokaryotic diversity, etc.

## Reference books for theory:

1. Prescott, Healey and Klein., **Microbiology-5th International Edition**, Tata- McGraw Hill publications, Delhi
2. Atlas. R.M., **Principles of Microbiology- 2nd Edition**
3. Modi, H.A. **Elementary Microbiology - Vol -I**, Akta Prakashan, Nadiyad.
4. Modi, H.A. **Elementary Microbiology - Vol -II**, Akta Prakashan, Nadiyad
5. Dubey, R.C.and Maheshwari, D.K., **A Text Book of Microbiology**, S. Chand Publications , New Delhi.
6. Tortora, Funke & Case. **Microbiology-An Introduction, 8 Edition**, Pearson Education, Delhi.
7. Powar and Dagainawala, **General Microbiology Vol-II**. Himalaya Publishing House, Mumbai.
8. Stainer, R.Y., Ingraham, J.L., Wheelis, M.L., Painter, R.K. **General Microbiology, 5th Edition**. MacMillan Press Ltd., London.
9. Pelczar, M.J., Chan E.C.S., Krieg, N.R., **Microbiology, 5 Edition**. Tata McGraw Hill Publication Co. Ltd. New Delhi.
10. Salle, S.J. **Fundamental Principals of Bacteriology**, Tata McGraw Hill Publication Co. Ltd. New Delhi.
11. Frobisher M., Hinsdill, Crabtree and Goodherat, **Fundamentals of Microbiology, 9th Edition**. W.B Saunders Co. USA .

12. Purohit, S.S., **Microbiology-Fundamentals and Applications-6th Edition**, Agrobios Publications, Delhi.
13. Mani, A., Selwaraj, A.M., Narayanan L.M., and Arumngam, N., **Microbiology**, Saras Publication, Delhi.
14. Harmeet Kaur, **Encyclopedia of Microbiology**, Anmol Publication, Delhi.

**Reference Books for Practicals:**

1. Patel.R.J., Patel. K.R., **Experimental Microbiology, Vol-I**, Aditya Publications, Ahmedabad, India .
2. Patel.R.J., Patel. K.R., **Experimental Microbiology, Vol-II**, Aditya Publications, Ahmedabad, India .
3. Dubey. R.C., Maheshwari. D.K., **Practical Microbiology**, S.Chand & Company Ltd., New Delhi.
4. Konika Sharma, **Manual of Microbiology – Tools and Techniques** , Ane books, Delhi