Syllabus for Master of Science

Microbiology

Subject Code: 02MB0406

Subject Name: Microbial Diversity and Molecular Phylogenetics

M. Sc. Semester - I

Objective: To impart knowledge about concepts of origin of microbial life and it's divergence in different families.

Credits Earned: 6 Credits

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

1. Understanding evolution and principles in classifying microbial systems.
2. Comprehend the scientific basis of evolutionary relationship of microbes and analyze methods for microbial cultivation and identification.
3. Apprehend mechanisms involved for microbial sustenance at extreme conditions and it's significance.
4. Understand classification of bacteria and its beneficial and harmful effects.

Pre-requisite of course: N.A.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA (M)	CSE (I)	Viva (V)	Practical	
5	0	2	6	50	30	20	25	25	150

Contents:

Unit	Topics	Contact Hours
1	**Microbial taxonomy** Microbial evolution: Hypothesis and Theories; Evolutionary Chronometer; Classification systems: Whittaker's Five Kingdom and Carl Woes Three Domain, Endosymbiosis Theory, RNA world, Molecular coding; Systematic: Types of Phylogenetic trees and Algorithms used for its construction.	12
2	**Methods for determining evolutionary relationships** Microbial hierarchy; C-value paradox; Basis of classification: Classical approaches, Molecular approaches, Ribosomal RNA sequencing and Chemotaxonomy; Unculturable microbes: approaches to explore and revealing its potential.	12
3	**Microbial Diversity: Archaea** Archaea: Phylogenetic position and general features; General features of three phylum of Archaea; Characteristics of Methanogens, Halophiles and Thermoacidophiles; Commercial potential of Archaea.	16
4	**Microbial Diversity: Bacteria** General features of: Gram-negative Aerobic eubacteria; Gram-negative anaerobic eubacteria; Gram-positive fermentative eubacteria; Gram-positive actionbacteria; Enteric group bacteria.	20
	Total Hours	**60**

References:

1. Christopher Woolverton, Linda Sherwood, Joanne Willey. *Prescott's Microbiology*. (2013). McGraw-Hill higher education. New York, NY.
2. Clive Edward. *Microbiology of Extreme environments*. (1990). McGraw-Hill higher education. New York. NY.
3. Gerard J. Tortora, Berdell R. Funke, Christine L. Case. *Microbiology: An Introduction*. (2007).Pearson Benjamin Cummings, San Francisco, CA.
4. N. R. Krieg, P. H. A. Sneath, J. T. Staley, S. T. Williams. *Bergey's Manual of Determinative Bacteriology*. (1994). Williams and Wilkins publication. Baltimore.
5. Prakash Bisen, Mousumi Debnath, G. Prasad. *Microbes: Concepts and Applications*. (2012). John Wiley & Sons.
6. Fergus Priest, Michael fellow. *Applied Microbial Systematics*. (2012). Springer Science. Germany.
7. T. Satyanarayana and B. N. Johri. *Microbial Diversity: Current Perspectives and Potential Applications*. (2005). I. K. International Pvt Ltd, New Delhi.

Suggested Theory distribution:

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

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	20%	30%	15%	10%	5%

Instructional Method:

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

b. The internal evaluation will be done on the basis of continuous evaluation of students in the class-room in the form of attendance, assignments, verbal interactions etc.

c. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.

List of Practical's:

Sr. No.	Name of Practical's
1.	Analyzing the diversity of the microbes from soil sample
2.	Analyzing the diversity of the microbes from water sample
3.	Cultural characterization of the microbes
4.	Biochemical characterization of the microbes
5.	Colony characterization of the microbes
6.	Construction of dendogram using biochemical, colonial and cultural characteristics
7.	Isolation of Metagenomic DNA
8.	Isolation of Halophiles