INSTITUTE	**FACULTY OF SCIENCE**
PROGRAM	**MASTER OF SCIENCE (MICROBIOLOGY)**
SEMESTER	**1**
COURSE TITLE	**MICROBIAL EVOLUTION AND PHYLOGENETICS**
COURSE CODE	**02MB0408**
COURSE CREDITS	**4**

Objective:

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

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

1 Understand the evolution and classification of life forms, Diversity and nomenclature of microorganism.

2 State approach of to construct Phylogenetic trees and its Algorithms

3 Develop and analyze different methods for determining evolutionary relationships among microorganisms

4 Develop an understanding of Microbial Diversity and economical importance of the organisms.

Pre-requisite of course:N.A.

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
4	0	0	50	30	20	0	0

Contents : Unit	Topics	Contact Hours
1	**Microbial taxonomy and Evolution** Microbial evolution: Hypothesis and Theories; Endosymbiosis Theory, RNA world, Introduction to Bergey's Manual of Systematic Bacteriology (Edition 1 and 2). Basis of classification: Classical approaches, Molecular approaches (Nucleic acid-base composition, Nucleic acid hybridization, Nucleic acid sequencing, Genomic fingerprinting, Amino acid sequencing) and Chemotaxonomy. Classification systems: Whittaker's Five Kingdom and Carl Woes Three Domain.	15

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Contents : Unit	Topics	Contact Hours
2	**Molecular Phylogenetic** Introduction, Definition and description, Systematic: Various types of Phylogenetic trees and Algorithms used for its construction., Probabilistic models and associated algorithms: Probabilistic models of evolution and Maximum likelihood algorithm; Phylogenetic analysis algorithms: Maximum Parsimony, Distance-based: UPGMA, Neighbor-Joining. Reliability of trees. Bootstrap and Application of phylogenetic tree.	15
3	**Methods for determining evolutionary relationships** Microbial hierarchy; C-value paradox; Molecular coding, Evolutionary Chronometer; Ribosomal RNA sequencing; Unculturable microbes: approaches to explore and revealing its potential. Concept of metagenomics. Culture-independent molecular methods for identification of unculturable bacteria.	10
4	**Microbial Diversity** General Characteristics, Classification and economic importance of Archaea (extremozymes), Bacteria (Enteric group: Escherichia, Klebsiella, Enterobacter, Proteus, Salmonella, Shigella, Yersinia, Haemophilus), Fungi (Phytophthora, Albugo, Mucor, Rhizopus, Aspergillus, Penicillium, Altemaria, Ustilago, Puccinia), Algae: Gelidium, Gracilaria, Pyropia and Economics Importance. Viruses [Polio Virus, Human Immunodeficiency Virus : AIDS and Plant virus (TMV)].	20
Total Hours		**60**

Textbook :

1 Prescott's Microbiology, Christopher Woolverton, Linda Sherwood, Joanne Willey, McGraw-Hill higher education. New York, NY. , 2013

2 Microbial Diversity: Current Perspectives and Potential Applications, T. Satyanarayana and B. N. Johri. , I. K. International Pvt Ltd, New Delhi, 2005

References:

1 Microbiology of Extreme environments, Microbiology of Extreme environments, Clive Edward. , McGraw-Hill higher education. New York. NY., 1990

2 Bergey's Manual of Determinative Bacteriology., Bergey's Manual of Determinative Bacteriology., 5. N. R. Krieg, P. H. A. Sneath, J. T. Staley, S. T. Williams, Williams and Wilkins publication. Baltimore., 1994

3 Microbes: Concepts and Applications. , Microbes: Concepts and Applications. , 6. Prakash Bisen, Mousumi Debnath, G. Prasad, John Wiley & Sons. , 2012

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 and evaluation

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 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.
2. 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.
3. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Supplementary Resources:

1. https://bio.libretexts.org/Bookshelves/Microbiology/Microbiology_(Boundless)/08%3A_Microbial_Evolution_Phylogeny_and_Diversity
2. https://www.youtube.com/watch?v=HMKAD13pncQ

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