



PARVATHANENI BRAHMAYYA
SIDDHARTHA COLLEGE OF ARTS & SCIENCE
Autonomous
Siddhartha Nagar, Vijayawada-520010
Re-accredited at 'A+' by the NAAC

23BOMAL122: Origin of Life and Diversity of Microbes

Offered to: BSc. Honours (Botany)

Course Type: Major 4 (TH)

Year of Introduction: 2023-24

Semester: II

Credits: 3

60Hrs

Max.Marks: 100(30+70)

Course Prerequisites: Knowledge of Origin of Life and Diversity of Microbes studied in intermediate.

Course Description: This course will provide one with a basic and comprehensive understanding of Origin of life and Viruses. Enable the student with depth of topics and helps them to gain an appreciation in the special groups of Bacteria. On the other hand, importance of understanding soil microbes and their interactions provides an extensive knowledge to the student.

Course Objectives:

1. Knowledge of awareness on origin and evolution of life.
2. The study of understanding the diversity of microbial organisms.
3. The study of general characters of special groups of bacteria.
4. Study of biology of eubacteria .
5. Knowledge of awareness on importance of microbes in nature and agriculture.

Course Outcomes: At the end of this course, students should be able to:

CO1: Illustrate diversity of viruses, multiplication and economic value.

CO2: Discuss the general characteristics, classification and economic importance of special groups of bacteria.

CO3: Explain the structure, nutrition, reproduction and significance of eubacteria.

CO4: Evaluate the interactions among soil microbes.

CO5: Compile the value and applications of microbes in agriculture.

CO-PO MATRIX							
CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1						M	
CO2					L		
CO3						M	
CO4					M		
CO5					H		

Syllabus

Course Details

Unit-1: Origin of life and Viruses

12Hrs.

1. Origin of life, concept of primary Abiogenesis; Miller and Urey experiment.;
discovery of microorganisms, Pasteur experiments, germ theory of diseases.
2. Five kingdom classification of R.H. Whittaker

3. Shape and symmetry of viruses; structure of TMV and Gemini virus.
4. Multiplication of TMV; A brief account of prions, viroids and virusoids;
Transmission of plant viruses and their control.
5. Significance of viruses in vaccine production, bio-pesticides and as cloning vectors.

Unit-2: Special groups of Bacteria **12 Hrs.**

1. General characteristics, outline classification and economic importance of following special groups of bacteria:

- | | | |
|--------------------|----------------|------------------|
| a) Archaeobacteria | b) Chlamydiae | c) Actinomycetes |
| d) Mycoplasma | e) Phytoplasma | f) Cyanobacteria |

2. Culture and cultivation of *Spirulina*

Unit-3: Eubacteria **12 Hrs.**

1. Occurrence, distribution and cell structure of eubacteria.
2. Classification of Eubacteria based on nutrition.
3. Reproduction- Asexual (Binary fission and endospores) and bacterial recombination (Conjugation, Transformation, Transduction).
4. Economic importance of Eu-bacteria with reference to their role in Agriculture and industry (fermentation and medicine).

Unit-4: Soil microbes – interactions **12 Hrs.**

1. Distribution of soil microorganisms in soil.
2. Factors influencing the soil microflora - Role of microorganisms in soil fertility.
3. Interactions among microorganisms, mutualism, commensalism, competition, amensalism, parasitism, predation.
4. Microorganisms of rhizosphere, phyllosphere and spermosphere; microbial interactions and their effect on plant growth.

Unit-5: Microbes in agriculture **12 Hrs.**

1. Mass production, mode of applications, advantages and limitations of bacterial inoculants (*Rhizobium*, *Azotobacter*, *Azospirillum*, Cyanobacteria).
2. Role of Frankia and VAM in soil fertility.
3. Microbial biopesticides: mode of action, factors influencing, target pests; microbial herbicides.

I. Text Books:

1. Bhattacharjee, R.N., (2017) Introduction to Microbiology and Microbial Diversity, Kalyani Publishers, New Delhi.

2. Dubey, R.C. & D. K. Maheswari (2013) A Text Book of Microbiology, S.Chand & Company Ltd., New Delhi
3. Toshniwal, R.L. (2007) Agricultural Microbiology, Agrobios (India), Jodhpur

II. Reference Books:

1. Pelczar Jr., M.J., E.C.N. Chan & N. R. Krieg (2001) Microbiology, Tata McGraw- Hill Co, New Delhi
2. Prescott, L. Harley, J. and Klein, D. (2005) Microbiology, Tata McGraw –Hill Co. New Delhi.
3. Gyaneshwar, A.D., G.J. Parekh, and V.S. Reddy (2004) Agricultural Microbiology: Plant-Soil Interactions, Research Signpost, Kerala, India
4. Zaki A. Shuler and Zainul Abid (2014) Agricultural Microbiology: Principles and Applications, CRC Press, Boca Raton, Florida, USA

III. Suggested activities and evaluation methods:

Unit-1: Activity: Collecting scientific literature on historical developments in microbiology.

Evaluation method: Evaluating the report based on a rubric.

Unit-2: Activity: Group discussion on various groups of special bacteria.

Evaluation method: Assessment of active participation, soft skills, communication skills, collaborative skills, time management etc., of a group or a student based on a rubric.

Unit-3: Activity: Presentation or poster summarizing the classification of Eubacteria based on nutrition.

Evaluation method: Assessment based on accuracy and understanding.

Unit-4: Activity: Microscopic observation of bacterial samples from soil/ phylloplane in their native place/ college campus.

Evaluation method: Evaluating the report on characteristics and classification of eubacteria.

Unit-5: Activity: Culture and mass production of bioinoculants.

Evaluation method: Skills performed in establishing the culture and mass production.

Semester End Examination Model Paper

Max Marks:70

Max Time:3Hrs

SECTION-A

Answer all Questions (5x4=20)

1. (a) Describe the Miller Urey Experiment. CO1,L2.
OR
(b) Summarize a note on cloning vectors. CO1,L2.
2. (a) Describe the ultrastructure of cyanobacteria. CO2,L2.
OR
(b) Extend the general account of mycoplasma.CO2,L2.
3. (a) Write a short note on gram staining. CO3,L6
OR
(b) Write the economic importance of bacteria in agriculture. CO3,L6.
4. (a) Discuss about microorganisms' of rizosphere. CO4,L2.
OR
(b) Describe about the distribution of soil micro organisms. CO4,L2.
5. (a) Explain the role of azospirillum in agriculture. CO5,L2.
OR
(b) Discuss about the mode of application in rhizobium. CO5,L2.

SECTION-B

Answer all Questions (5x10=50)

6. (a) Explain in detailed about five kingdom classification of R.H whittaker. CO1,L2.
OR
(b) Describe the structure and multiplication of TMV. CO1,L2.
7. (a) Explain the general characters of archaebacteria and mention their ecological significance.CO2,L2.
OR
(b) Describe the process of culture and cultivation of spirulina.CO2,L2.
8. (a) Describe the process of genetic recombination in bacteria. CO3,L2.
OR
(b) Discuss in detail the different modes of nutrition in bacteria. CO3,L2
9. (a) Write in detail the different interactions among microbes. CO4,L6.
OR
(b) Write an essay on factors influencing the soil microflora. CO4,L6.
10. (a) Describe the process of VAM in soil fertility. CO5,L2.
OR
(b) Extend a note on microbial bio pesticides. CO5,L2.