ST. JOSEPH’S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

II SEMESTER **BOTANY**  TIME:4Hrs/Week

B-Ma2-2101(3) **ORIGIN OF LIFE AND DIVERSITY OF MICROBES** Marks: 100

w.e.f. 2023-24 admitted batch (23AK)

**I. Learning Objectives:** By the end of this course the learner has:

1. To get awareness on origin and evolution of life.

2. To understand the diversity of microbial organisms.

3. To get awareness on importance of microbes in nature and agriculture.

**II. Learning Outcomes:** On completion of this course students will be able to:

1. Illustrate diversity of viruses, multiplication and economic value.

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

3. Explain the structure, nutrition, reproduction and significance of eubacteria.

4. Evaluate the interactions among soil microbes.

5. Compile the value and applications of microbes in agriculture.

**III. Syllabus of Theory:**

**UNIT-1: ORIGIN OF LIFE AND VIRUSES 10 Hrs.**

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 7 Hrs.**

1. General characteristics, outline classification and economic importance of following

special groups of bacteria:

a) Archaebacteria b) Chlamydiae c) Actinomycetes

d) Mycoplasma e) Phytoplasma f) Cyanobacteria

2. Culture and cultivation of *Spirulina*

**UNIT-3: EUBACTERIA 8 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).

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**UNIT- 4: SOIL MICROBES – INTERACTIONS 10Hrs.**

1. Distribution of soil microorganisms in soil.

2. Factors influencing the soil microflora - Role of microorganisms in soil fertility.

3. Interactions among microorganisms, mutualism, comensalism, competition, amensalism,

parasitism, predation.

4. Microorganisms of rhizosphere, phyllosphere and spermophere; microbial interactions and their effect on plant growth.

**UNIT-5: MICROBES IN AGRICULTURE: 10 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.

**IV. 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

**V. REFERENCE BOOKS:**

1. Pelczar Jr., M.J., E.C.N. Chan & N. R. Krieg (2001) Microbiology, Tata McGraw- Hill Co, New Delhi

2. Presscott, 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

**VI. 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 Eu-bacteria 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.

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