

### Teaching Plan

**Department** : Botany  
**Class** : I B.Sc Botany  
**Title of the Course** : Core I PLANT DIVERSITY I - ALGAE  
**Semester** : I  
**Course Code** : BU231CC1

| Course Code | L | T | P | S | Credits | Inst. Hours | Total Hours | Marks |          |       |
|-------------|---|---|---|---|---------|-------------|-------------|-------|----------|-------|
|             |   |   |   |   |         |             |             | CIA   | External | Total |
| CC2041      | 3 | 2 | - | - | 5       | 5           | 75          | 25    | 75       | 100   |

### Learning Objectives

1. To provide a comprehensive knowledge on the biology of algae and to understand the evolution higher of plants.
2. To understand the role of algae in ecosystems as primary producers of nutrition and also the importance of algae to animals and humans.

### Course Outcomes

| On the successful completion of the course, student will be able to: |   |                    |
|--|---|--------------------|
| 1.   | Relate to the structural organization, reproduction and significance of algae.                                      | <b>K2 &amp;K5</b>  |
| 2.   | Demonstrate knowledge in understanding the various life cycle patterns and the fundamental concepts in algal growth | <b>K3 &amp;K1</b>  |
| 3.   | Explain the benefits of various algal technologies on the ecosystem.  | <b>K1</b>          |
| 4.   | Compare and contrast the thallus organization and modes of reproduction in algae.                                   | <b>K4 &amp; K5</b> |

|    |   |                    |
|----|---|--------------------|
| 5. | Determine the emerging areas of Algal Biotechnology for identifying commercial potentials of algal products and their uses. | <b>K5 &amp; K6</b> |
|----|---|--------------------|

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

### **Teaching plan**

**Total Contact hours: 75 (Including lectures, assignments and tests)**

| <b>Unit</b> | <b>Module</b> | <b>Topic</b>                                 | <b>Teaching Hours</b> | <b>Cognitive level</b> | <b>Pedagogy</b>  | <b>Assessment/ Evaluation</b>   |
|-------------|---------------|--|-----------------------|------------------------|--|---|
| I           |               |  |                       |                        |  |   |
|             | 1.            | Classification of algae (Fritsch-1935-1945). | 5                     | K1(R)                  | Lecture using Chalk and talk, hands on activities, Group Discussion, Mind mapping, Field Trips | True/False, Short essays, Concept explanations, Short summary field work report, peer assessment, CIA, Assignment |
|             | 2.            | Criteria for classification.                 | 5                     | K2(U)                  | Lecture using Chalk and talk, Peer tutoring, PPT   | Critique or justify with pros and cons, Short essay, Quiz, CIA  |
|             | 3.            | Algal distribution                           | 5                     | K2(U)                  | Field Study, and outdoor activities, Lecture   | Group Discussion, Concept explanations, Short summary presentation, field work report                             |

|    |    |  |   |       |   |   |
|----|----|--|---|-------|---|---|
| II | 1. | Thallus organization - unicellular- <i>Chlorella</i> , Diatoms.          | 3 | K2(U) | Group Discussion, Visual aids and multimedia.           | Seminar, CIA, True/False, Short essays, MCQ, Longer essay |
|    | 2. | Thallus organization - colonial- <i>Volvox</i> .                         | 3 | K2(U) | Mind mapping, Peer tutoring, Visual aids and multimedia | Seminar, CIA, True/False, Short essays, MCQ, Longer essay |
|    | 3. | Thallus organization- filamentous- <i>Anabaena</i> , <i>Oedogonium</i> . | 3 | K2(U) | PPT, Lecture, Slides, Chart                             | Seminar, CIA, True/False, Short essays, MCQ, Longer essay |
|    | 4. | Thallus organization - siphonous- <i>Caulerpa</i> .                      | 3 | K2(U) | Live Specimen, field trips, Map mapping                 | Seminar, CIA, True/False, Short essays, MCQ, Longer essay |

|     |    |   |   |         |   |   |
|-----|----|---|---|---------|---|---|
|     | 5. | Thallus organization - parenchymatous-<br><i>Sargassum</i> ,<br><i>Gracilaria</i> .   | 3 | K2(U)   | PPT, Live Specimen, Field trips, Lecture  | Seminar,<br>CIA,<br>True/False,<br>Short essays,<br>MCQ,<br>Longer essay                                      |
| III | 1  | Reproduction- Vegetative, asexual, sexual reproduction and life histories haplontic-<br><i>Oedogonium</i> and<br><i>Chara</i> . | 4 | K4 (AN) | Lecture using Chalk and talk,<br>Peer tutoring,<br>Lecture using videos, PPT,                                     | Seminar,<br>CIA,<br>True/False,<br>Short essays,<br>MCQ,<br>Longer essay                                      |
|     | 2  | Reproduction- Vegetative, asexual, sexual reproduction and life histories diplontic-Diatoms and<br><i>Sargassum</i> .           | 4 | K4 (AN) | Lecture using Chalk and talk,<br>Group Discussion,<br>Peer tutoring,<br>Lecture using videos, PPT,<br>Field Visit | Seminar,<br>CIA,<br>True/False,<br>Short essays,<br>MCQ,<br>Longer essay<br>Group Discussion,<br>Field Report |
|     | 3  | Reproduction- Vegetative, asexual, sexual reproduction and life histories diplohaplontic- <i>Ulva</i> .                         | 3 | K4 (AN) | Lecture using Chalk and talk,<br>Group Discussion,<br>Peer tutoring,<br>Lecture using videos, PPT,<br>Field Visit | Seminar,<br>CIA,<br>True/False,<br>Short essays,<br>MCQ,<br>Longer essay                                      |

|           |    |   |   |         |  |  |
|-----------|----|---|---|---------|--|--|
|           |    |   |   |         |  | Peer Assessment, Field Report  |
|           | 4  | Reproduction-<br>Vegetative, asexual, sexual reproduction and life histories diplobiontic-<br><i>Gracilaria</i> . | 2 | K4 (AN) | Lecture using Chalk and talk, Group Discussion,<br><br>Peer tutoring, Lecture using videos, PPT, Field Visit | Seminar, CIA, True/False, Short essays, MCQ, Longer essay<br><br>Quiz, Self-Assessment, Field Report |
| <b>IV</b> |    |   |   |         |  |  |
|           | 1. | Algal cultivation methods   | 5 | K2(U)   | Lecture using Chalk and talk, Group Discussion,<br><br>Peer tutoring, Lecture using videos, PPT              | Evaluation through short test, MCQ, True/False, Short essays   |
|           | 2. | Algal production systems; indoor cultivation methods  | 5 | K3(Ap)  | Lecture using Chalk and talk, Lecture using videos, PPT, Flow Chart,   | Simple definitions, MCQ, Recall steps,   |
|           | 3. | Large-scale cultivation of algae, harvesting of algae.  | 5 | K4(An)  | Lecture using Chalk and talk, Lecture using videos, PPT,<br><br>Group Discussion                             | Suggest idea/field work  |
| <b>V</b>  |    |   |   |         |  |  |

|   |  |   |        |  |   |
|---|--|---|--------|--|---|
| 1 | Algae as food and feed: Agar-agar, Alginic acid and Carrageenan; Diatomite.                | 4 | K3(An) | Lecture using Chalk and talk, Group Discussion, Peer tutoring, Lecture using videos, PPT | Short test, MCQ, True/False, Short essays |
| 2 | Resource potential of algae: Application of algae as fuel, agriculture and pharmaceutical. | 4 | K3(Ap) | Lecture using Chalk and talk, Lecture using videos, PPT                                  | Short test, MCQ, True/False, Short essays |
| 3 | Phycoremediation. Role of algae in CO <sub>2</sub> sequestration,                          | 3 | K3(Ap) | Lecture using Chalk and talk, Lecture using videos, PPT, Group Discussion, Demonstration | Suggest idea/field work                   |
|   | Algae as indicator of water pollution  | 2 | K2(U)  | Lecture using Chalk & talk, PPT  | Review, CIA, MCQ, True/False,             |
|   | Algal bioinoculants, Bioluminescence.  | 2 | K4(An) | Lecture using Chalk & talk, PPT and Group Discussion                                     | short test, MCQ, True/False, Short essays |

Course Focussing on Employability/ Entrepreneurship/ Skill Development:

Activities (Em/ En/SD):

Employability: Algae Identification

Entrepreneurship: Algae Cultivation, Algae Cuisine

Skill Development: Algae Data Collection and Analysis, Water Quality Analysis, Laboratory algal culture

Course Focussing on Cross Cutting Issues - Environment Sustainability, Water Quality management, Nutrient management,

Activities related to Cross Cutting Issues: Water Quality Management, Algae Cuisine, Biodiversity Conservation Research

Assignment: Classification of Algae by Fritsch, Algal Distribution, Thallus Organization, Vegetative and Asexual Reproduction of Algae, Sexual Reproduction of Algae, Life cycle of *Oedogonium*, Life cycle of Chara, Life cycle of *Diatoms*, Life cycle of *Sargassum*, Life cycle of *Ulva*, Life cycle of *Gracilaria*, Algal cultivation methods, Algal production systems, Indoor cultivation methods, Large-scale cultivation of algae, Harvesting of algae. Algae as food and feed: Agar-agar, Alginic acid and Carrageenan; Diatomite, Agar-agar, Alginic acid and Carrageenan; Diatomite, Application of algae as fuel, agriculture and pharmaceutical. Phycoremediation, Role of algae in CO<sub>2</sub> sequestration, Algae as indicator of water pollution, Algal bioinoculants, Bioluminescence.

### Sample questions

#### Part A

1. Algal distribution is influenced by which of the following factors?

- a) Temperature
- b) Light availability
- c) Nutrient levels
- d) All of the above

2. The thallus organization of *Volvox* is:

- a) Unicellular
- b) Colonial
- c) Filamentous
- d) Parenchymatous

3. What is the process of asexual reproduction in *Diatoms* called?

- a) Fragmentation
- b) Binary fission
- c) Sporulation
- d) Conjugation

4. Which of the following is NOT a type of algal production system?

- a) Open ponds
- b) Photobioreactors
- c) Closed systems
- d) Aquatic tanks

5. The process of using algae to remove pollutants and contaminants from water bodies is known as:

- a) Algal bloom
- b) Phycoremediation
- c) Bioluminescence
- d) Photosynthesis

### **Part B**

1. Explain Criteria for algal classification.
2. Compare and contrast the thallus organization of *Chlorella*, *Volvox*, and *Sargassum*.
3. Describe the vegetative and asexual reproduction in *Oedogonium*.
4. How and Why is it important to maintain optimal growth conditions for algae cultivation?
5. Discuss the role of diatomite in the water treatment industry and how it aids in filtration processes.

### **Part C**

1. Analyse classification of Algae by Fritsch.
2. Bring out the anatomy and thallus organisation of *Sargassum* and *Gracilaria*.
3. Explain the concept of alternation of generations in the life cycle of algae with reference to *Sargassum*.
4. Compare and contrast open pond systems and closed photobioreactors for algae cultivation.
5. Explain the process of algae cultivation and its significance in the production of biofuels.

Head of the Department

**Dr. A. Anami Augustus Arul**

Course Instructor

**Dr. A.R. Florence**

**Dr. A. Anami Augustus Arul**

### Teaching Plan

**Department** : Botany  
**Class** : I B.Sc Zoology  
**Title of the Course** : ELECTIVE ALLIED BOTANY-I  
**Semester** : I  
**Course Code** : BU231GE1

| Course Code | L | T | P | Credits | Inst. Hours | Total Hours | Marks |          |       |
|-------------|---|---|---|---------|-------------|-------------|-------|----------|-------|
|             |   |   |   |         |             |             | CIA   | External | Total |
| CC2041      | 4 | - | - | 3       | 4           | 60          | 25    | 75       | 100   |

#### Objectives

- To study morphological and anatomical adaptations of plants of various habitats.
- To familiarize with the structure of DNA, RNA, plant tissue culture techniques, and experiments related with plant physiology and biochemistry.

#### Course outcomes

| CO     | Upon completion of this course, the students will be able to:                                  | PSO addressed | Cognitive level |
|--------|--|---------------|-----------------|
| CO - 1 | increase the awareness and appreciation of human friendly algae and their economic importance. | PSO - 8       | K2 (U)          |
| CO - 2 | develop an understanding of microbes and fungi and appreciate their adaptive strategies        | PSO - 3       | K3 (A)          |

|        |  |         |         |
|--------|--|---------|---------|
| CO - 3 | develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms. | PSO - 2 | K5 (E ) |
| CO - 4 | compare the structure and function of cells and explain the development of cells.                                    | PSO - 3 | K5 (E ) |
| CO - 5 | understand the core concepts and fundamentals of plant biotechnology and genetic engineering.                        | PSO - 8 | K1 (R)  |

### **Teaching plan**

**Total Contact hours: 30 (Including lectures, assignments and tests)**

| Unit      | Module                            | Topic   | Teaching Hours | Cognitive level | Pedagogy  | Assessment/ Evaluation  |
|-----------|-----------------------------------|---|----------------|-----------------|---|---|
| <b>I</b>  | <b>Algae:</b>                     |   |                |                 |   |   |
|           | 1.                                | General characters of algae                                 | 2              | K1 (R)          | Lecture, PPT, Videos,   | Evaluation through class test, MCQ, True/False.   |
|           | 2.                                | Structure, reproduction and life cycle of - <i>Anabaena</i> | 4              | K2 (U)          | Lecture using chalk and board, microscope slides, diagrams, interactive discussions | quizzes, assignments, MCQ, Recall steps, class test, formative assessment                     |
|           | 3.                                | Structure, reproduction and life cycle of <i>Sargassum</i>  | 4              | K2 (U)          | Lecture, PPT, diagrams, videos, microscope slides                                   | Diagrams and Labeling, multiple-choice questions, short answer questions, and essay questions |
|           | 4.                                | Economic importance of algae                                | 2              | K3 (Ap)         | Lecture, group discussion, PPT, debates   | Assignments, Multiple-Choice or Short-Answer Tests.   |
| <b>II</b> | <b>Fungi, Bacteria and Virus:</b> |   |                |                 |   |   |
|           | 1.                                | General characters of fungi                                 | 2              | K1 (R)          | Lecture, Chalk and board, diagrams, PPT   | Class tests, diagram  |

|  |    |  |   |         |   |  |
|--|----|--|---|---------|---|--|
|  |    |  |   |         |   | labelling,<br>online quizzes   |
|  | 2. | Structure,<br>reproduction and life<br>cycle of <i>Penicillium</i>   | 2 | K2 (U)  | Lecture, PPT,<br>diagrams, chalk<br>and board,<br>videos          | MCQs, diagram<br>labelling short<br>answer<br>questions,<br>formative<br>assessments   |
|  | 3. | Structure,<br>reproduction and life<br>cycle of <i>Agaricus</i>  | 2 | K2 (U)  | Lecture, PPT,<br>diagrams,<br>guided<br>discussion,<br>flowcharts | quiz with<br>multiple-choice<br>questions,<br>true/false<br>statements, or<br>fill-in-the-blank<br>questions, class<br>test, formative<br>assessment |
|  | 4. | economic importance<br>of fungi  | 2 | K1 (Ap) | Lecture, PPT,<br>interactive<br>discussion,                       | Assignments,<br>class tests,<br>group<br>discussion<br>formative<br>assessments,<br>summative<br>assessments,  |
|  | 5. | Bacteria - general<br>characters, structure<br>and reproduction of<br><i>Escherichia coli</i> and<br>economic importance<br>of bacteria. | 2 | K2 (U)  | Lecture, PPT,<br>diagrams,<br>interactive<br>discussions,         | Diagram<br>Labeling, Short<br>Answer<br>Questions,<br>Essay Questions  |
|  | 6. | Virus - general<br>characters, structure of<br>TMV, structure of<br>bacteriophage.   | 2 | K2 (U)  | Lecture, PPT,<br>diagrams,<br>Interactive<br>Discussions          | MCQs,<br>Diagram<br>Labeling, Class<br>test, Visual<br>Presentations<br>Formative and  |

|     |   |   |   |        |   |   |
|-----|---|---|---|--------|---|---|
|     |   |   |   |        |   | Summative Assessments   |
| III | <b>Bryophytes, Pteridophytes and Gymnosperms:</b> |   |   |        |   |   |
|     | 1.  | General characters of Bryophytes                | 2 | K1 (R) | Lecture, PPT, illustrations, Group discussions              | Labelling diagrams, Short Answer Questions, Diagram Construction Formative and Summative Assessments, |
|     | 2.  | Structure and life cycle of <i>Funaria</i> .    | 2 | K2 (U) | Lecture, PPT, Charts, diagrams                              | Class test, Labeling Diagram, formative and summative assessments                                     |
|     | 3.  | General characters of Pteridophytes             | 2 | K1 (R) | Lecture, PPT, diagrams, interactive discussion              | MCQs, Diagram labelling, essay question   |
|     | 4.  | Structure and life cycle of <i>Lycopodium</i> . | 2 | K2 (U) | Lecture, PPT, flowcharts, diagram                           | Diagram Labeling, Class test, formative assessment, Life Cycle Sequencing                             |
|     | 5.  | General characters of Gymnosperms               | 2 | K1 (R) | Lecture, PPT, videos, comparing with other groups of plants | MCQs, Debate, Assignment, Class test  |
|     | 6.  | Structure and life cycle of <i>Cycas</i> .      | 2 | K2 (U) | Lecture, charts, chalk and board, diagram,                  | Labeling Diagram, Life Cycle  |

|           |   |   |   |        |  |  |
|-----------|---|---|---|--------|--|--|
|           |   |   |   |        | lifecycle flowcharts                                       | Sequencing, Class test                             |
| <b>IV</b> | <b>Cell Biology:</b>                    |   |   |        |  |  |
|           | 1.                                      | Prokaryotic and Eukaryotic cell-structure /organization.                | 2 | K2 (U) | Lecture, Chalk and board, PPT                              | Diagram labelling, class test, quizzes             |
|           | 2.                                      | ultra structure and function of chloroplast                             | 2 | K2 (U) | Lecture, PPT, photos, videos                               | MCQs, essay test. Formative assessment, class test |
|           | 3.                                      | ultra structure and function of mitochondria                            | 2 | K2 (U) | Lecture, PPT, videos, photos                               | Class test, Short answer test, MCQs,               |
|           | 4.                                      | ultra structure and function of nucleus.                                | 2 | K2 (U) | Lecture, PPT, Chart, videos                                | Quizzes, formative assessment, class test          |
|           | 5.                                      | Cell division - mitosis and meiosis.                                    | 2 | K1 (R) | Lecture, diagram, photos, chalk and board, videos.         | Short test, MCQs, open book test.                  |
| <b>V</b>  | <b>Genetics and Plant Biotechnology</b> |   |   |        |  |  |
|           | 1.                                      | Mendelism - Law of dominance, Law of segregation, Incomplete dominance. | 4 | K2 (U) | Lecture using chalk and board, group discussions, diagrams | Class tests, MCQs, formative assesment             |
|           | 2.                                      | Law of independent assortment.  | 2 | K2 (U) | Lecture, chalk and board, diagram, videos                  | Class test, MCQs, formative assessment, quizzes    |

|  |    |  |   |         |                                       |   |
|--|----|--|---|---------|---------------------------------------|---|
|  | 3. | Monohybrid and dihybrid cross - Test cross - Back cross.   | 2 | K3 (Ap) | Lecture, Chalk and board, PPT, Videos | MCQs, online quiz, essay questions      |
|  | 4. | Plant tissue culture - <i>In vitro</i> culture methods. Plant tissue culture and its application in biotechnology. | 4 | K2 (U)  | Lecture, chart, flow chart, PPT       | Fill in the blanks. MCQs. True or False |

Course Focussing on Employability

Activities: Seminar, Assignment

Course Focussing on Cross Cutting Issues: Professional Ethics

Activities related to Cross Cutting Issues: Assignment and Seminar

Assignment Topic : Ultra structure and function of nucleus.

Seminar Topic: Plant tissue culture and its application in biotechnology.

### Sample questions

#### Part A

- Which of the following best describes the reproduction method in Anabaena?
  - Binary fission
  - Budding
  - Conjugation
  - Fragmentation
- The body of a fungus is known as:
  - Mycelium
  - Hypha
  - Spore
  - Stipe
- Which of the following statements best describes the life cycle of Funaria, a common moss?
  - Funaria has a dominant gametophyte generation and a reduced sporophyte generation.
  - Funaria has a dominant sporophyte generation and a reduced gametophyte generation.
  - Funaria has equal-sized gametophyte and sporophyte generations.
  - Funaria reproduces exclusively through vegetative propagation and lacks a life cycle.
- The inner membrane of a chloroplast is highly folded to form structures known as:

a. Thylakoids            b. Grana            c. Stroma            d. Cristae

5. The Law of Independent Assortment states that:
- Genes on the same chromosome will always be inherited together.
  - Genes on different chromosomes will segregate independently during gamete formation.
  - Genes on different chromosomes will always be inherited together.
  - Genes on the same chromosome will segregate independently during gamete formation.

### **Part B**

- What is the economic importance of algae in the food industry?
- How does *Agaricus* reproduce?
- Where are the male gametes produced in pteridophytes, and how do they move?
- What are thylakoids?
- What is the Law of Independent Assortment?

### **Part C**

- Explain the role of algae in various industries and their economic significance.
- Outline the life cycle of *Agaricus*, highlighting the key stages and processes involved, and discuss the ecological importance of its life cycle.
- Discuss the general characters of gymnosperms, highlighting their unique features, reproductive structures, and ecological significance.
- Discuss the stages of mitosis and how they contribute to the maintenance of chromosome number and genetic stability.
- Discuss the steps involved in the establishment and maintenance of aseptic conditions in plant tissue culture

**Head of the Department:**

**Dr. A. Anami Augustus Arul**

**Course Instructors:**

**1. Dr. Sr. P. Leema Rose**

**2. Dr. Bojaxa A. Rosy**

## Teaching Plan

**Department** : Botany  
**Class** : I B.Sc Botany [NME]  
**Title of the Course** : NON-MAJOR ELECTIVE-I-NURSERY AND LANDSCAPING  
**Semester** : I  
**Course Code** : BU231SE1

| Course Code | L | T | P | Credits | Inst. Hours | Total Hours | Marks |          |       |
|-------------|---|---|---|---------|-------------|-------------|-------|----------|-------|
|             |   |   |   |         |             |             | CIA   | External | Total |
| CC2041      | 2 | - | - | 2       | 2           | 30          | 25    | 75       | 100   |

### Objectives

- To recognize the importance of growing plants and practice the knowledge gained by developing kitchen garden and ornamental garden.
- To be able to design gardens and become entrepreneur in Horticulture.

### Course outcomes

| CO     | Upon completion of this course, the students will be able to:                                    | PSO addressed | Cognitive level |
|--------|--|---------------|-----------------|
| CO - 1 | recognize the basic principles and components of gardening.                                      | PSO - 1       | K1(R)           |
| CO - 2 | explain about bio-aesthetic planning and conceptualize flower arrangement.                       | PSO - 5       | K2(U)           |
| CO - 3 | apply techniques for design various types of gardens according to the culture and art of bonsai. | PSO - 6       | K2(U)           |
| CO - 4 | compare and contrast different garden styles and landscaping patterns.                           | PSO - 10      | K4(An )         |

|        |   |         |       |
|--------|---|---------|-------|
| CO - 5 | establish and maintain special types of gardens for outdoor and indoor landscaping. | PSO – 5 | K5(E) |
|--------|---|---------|-------|

**Teaching plan**

**Total Contact hours: 60 (Including lectures, assignments and tests)**

| Unit      | Module | Topic                                       | Teaching Hours | Cognitive level | Pedagogy   | Assessment/ Evaluation  |
|-----------|--------|---|----------------|-----------------|--|---|
| <b>I</b>  |        |   |                |                 |  |   |
|           | 1.     | Introduction, of nursery and landscaping    | 2              | K2(U)           | Lecture, PPT, photos                                       | MCQ, True/False, Class test, quizzes  |
|           | 2.     | Prospects of nursery and landscaping        | 2              | K1(R)           | Lecture, PPT, videos                                       | Short test, Knowledge-based Assessments, MCQ, Recall steps, Concept definitions             |
|           | 3.     | Scope of nursery and landscaping            | 2              | K2(U)           | Lecture, PPT, subject interaction, Environmental Education | problem-solving tasks, Knowledge-based Assessments, formative assessment                    |
| <b>II</b> |        |   |                |                 |  |   |
|           | 1.     | Methods of Propagation – cutting, layering, | 1              | K3(Ap)          | Lecture, PPT, videos, diagram, Hands-on learning           | multiple-choice questions, short-answer questions, or essay questions, Visual Presentations |

|            |    |   |   |        |  |  |
|------------|----|---|---|--------|--|--|
|            | 2. | grafting, budding,                          | 2 | K3(Ap) | Lecture, PPT, videos, diagram, photos                        | multiple-choice questions, short-answer questions, essay questions, Visual Identification of parts of a grafted/budded plant |
|            | 3. | Floriculture – Rose, Chrysanthemum,         | 2 | K2(U)  | Lecture, hands on training, diagram, PPT                     | Multiple-choice or true/false questions, Short-answer questions, Essay questions   |
|            | 4. | Jasmine – cultivation.                      | 1 | K2(U)  | Lecture, PPT, videos, hands on training, diagram             | Written Tests, Class test, MCQs  |
| <b>III</b> |    |   |   |        |  |  |
|            | 1. | Gardening – formal garden, informal garden, | 2 | K2(U)  | Lecture, PPT, videos, group discussions, Hands-on Activities | MCQs, class test, formative assessment   |
|            | 2. | vegetable garden                            | 2 | K1(R)  | Lecture, PPT, group discussions, videos, Hands-on Activities | Class test, Multiple-choice or true/false questions, Short-answer questions, Essay questions                                 |
|            | 3. | landscaped layout designing – formation     | 2 | K2(U)  | Lecture, videos, Hands-on Activities                         | problem-solving tasks, Knowledge-  |

|           |    |                                    |   |        |  |   |
|-----------|----|------------------------------------|---|--------|--|---|
|           |    | and maintenance of lawn.           |   |        |  | based Assessments, formative assessment                                   |
| <b>IV</b> |    |                                    |   |        |  |   |
|           | 1. | Nursery structures – Green house – | 2 | K1(R)  | Lecture, PPT, videos, diagram, Hands-on learning             | Simple definitions, MCQ, Recall steps, Graphical representation           |
|           | 2. | Shade house, Mist chamber –        | 2 | K2 (U) | Lecture, PPT, videos, diagram, photos                        | Class Test, MCQ, True/False, Short essays, Recall, flow chart             |
|           | 3. | Topiary, Bonsai culture.           | 2 | K2 (U) | Lecture, PPT, group discussions, videos, Hands-on Activities | true/false questions, Short-answer questions, Essay questions, flow chart |
| <b>V</b>  |    |                                    |   |        |  |   |
|           | 1. | Manures,                           | 2 | K2 (U) | Lecture, PPT, video, group discussion                        | Recall steps, MCQ, Short-answer questions,                                |
|           | 2. | composting                         | 2 | K1(R)  | Lecture, chalk and board, photos                             | Essay questions, class test, formative assessment                         |
|           | 3. | vermicomposting                    | 2 | K3(Ap) | Lecture, PPT, videos, photos,                                | Simple definitions, MCQ,  |

|  |  |  |  |  |                   |                       |
|--|--|--|--|--|-------------------|-----------------------|
|  |  |  |  |  | group interaction | true/false questions, |
|--|--|--|--|--|-------------------|-----------------------|

Course Focussing on: Entrepreneurship

Activities (Em/ En/SD): Seminar and Assignment

Course Focussing on Cross Cutting Issues: Environment Sustainability

Activities related to Cross Cutting Issues : Seminar and Assignment

Assignment: Gardening – formal garden, informal garden

Seminar Topic: Bonsai culture

### Sample questions

#### Part A

1. What is the primary purpose of a plant nursery?
  - a. To cultivate and sell edible crops
  - b. To propagate and grow plants for landscaping and gardening
  - c. To conduct experiments on plant diseases
  - d. To manufacture and sell fertilizers
2. What is the scion in grafting?
  - a. The plant providing the rootstock
  - b. The bud or shoot to be grafted onto the rootstock
  - c. The grafting tool used in the process
  - d. The grafting tape or bandage applied after grafting
3. Which of the following factors is essential for successful vegetable gardening?
 

|                                   |                               |
|-----------------------------------|-------------------------------|
| a. Adequate sunlight              | b. Excessive water            |
| c. Neglecting regular maintenance | d. Planting in compacted soil |
4. What is topiary?
  - a. A method of plant propagation
  - b. An art form of shaping plants into ornamental designs
  - c. A type of plant disease
  - d. A gardening tool used for pruning

5. Which type of worms are commonly used in vermicomposting?
- a. Earthworms      b. Mealworms      c. Silkworms      d. Caterpillars

**Part B**

1. What is the significance of nurseries in the horticultural industry?
2. What are the different types of layering techniques commonly used?
3. What are the advantages of using organic methods in vegetable gardening?
4. How does a shade house provide protection from excessive sunlight and heat?
5. How can manures be applied to plants or soil effectively?

**Part C**

1. Explain the scope of nursery and landscaping.
2. Explain the budding method of plant propagation, including the process, advantages, and limitations associated with this technique.
3. Write an essay about vegetable garden.
4. Discuss the various techniques and tools used in topiary, including pruning, shaping, and maintaining the desired forms of plants.
5. Discuss the significance of composting as a sustainable waste management strategy and its role in promoting environmental sustainability.

**Head of the Department:**

**Dr. A. Anami Augustus Arul**

**Course Instructor:**

**Dr. Bojasa A. Rosy**

## Teaching Plan

**Department** : Botany  
**Class** : I B.Sc Botany  
**Title of the Course** : Foundation Course - Basics of Botany  
**Semester** : I  
**Course Code** : BU231FC1

| Course Code | L | T | P | Credits | Inst. Hours | Total Hours | Marks |          |       |
|-------------|---|---|---|---------|-------------|-------------|-------|----------|-------|
|             |   |   |   |         |             |             | CIA   | External | Total |
| BU231FC1    | 2 | - | - | 2       | 2           | 30          | 25    | 75       | 100   |

### Objectives:

- To learn about the classification, distinguishing traits, geographic distribution, and reproductive cycle of algae, fungi, lichens, and bryophytes.
- To understand the biodiversity by describing and explaining the morphology and reproductive processes of algae, fungi, bryophytes and microorganisms

### Course Outcomes

| CO     | Upon completion of this course the students will be able to:  | PSO addressed | CL |
|--------|---|---------------|----|
| CO – 1 | Increase the awareness and appreciation of human friendly algae and their economic importance                       | PSO - 5       | Ap |
| CO – 2 | Develop an understanding of microbes and fungi and appreciate their adaptive strategies                             | PSO - 5       | Ap |
| CO – 3 | Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms | PSO - 7       | U  |
| CO – 4 | Compare the structure and function of cells and explain the development of cells.                                   | PSO - 3       | U  |
| CO – 5 | Understand the core concepts and fundamentals of plant biotechnology and genetic engineering.                       | PSO - 5       | U  |

## **Teaching plan**

**Total Contact hours: 60 (Including lectures, assignments and tests)**

| Unit | Module | Topic   | Teaching Hours | Cognitive level | Pedagogy                         | Assessment/ Evaluation                       |
|------|--------|---|----------------|-----------------|----------------------------------|--|
| I    |        |   |                |                 |                                  |  |
|      | 1.     | Systematics : Two Kingdom and Five Kingdom systems                                  | 2              | K2(U)           | Lecture using videos             | Evaluation through short test, Short summary |
|      | 2.     | Salient features of various Plant Groups : Algae, Fungi                             | 2              | K1(R)           | PPT, Chart, Live specimen        | Simple definitions, MCQ,                     |
|      | 3.     | Salient features of various Plant Groups :Bryophytes, Pteridophytes and Gymnosperms | 1              | K2(U)           | PPT, Chart, Live specimen        | Chart preparation, Slip test                 |
|      | 4.     | Salient features of various Plant Groups :Viruses - Bacteria                        | 1              | K1 (R)          | PPT, Chart, Live specimen        | Quiz   |
| II   |        |   |                |                 |                                  |  |
|      | 1      | Cell as the basic unit of life - Prokaryotic and Eukaryotic Cell (Plant Cell)       | 3              | K2(U)           | Lecture using videos, Models     | Evaluation through short test, Short summary |
|      | 2      | Light Microscope and Electron Microscope  | 3              | K1(R)           | PPT, Demonstration in laboratory | Simple definitions, MCQ                      |
|      | 3      | Ultra Structure of Prokaryotic and Eukaryotic Cells                                 | 3              | K2(U)           | PPT, Chart                       | Chart preparation, Slip test                 |

|     |   |   |   |       |                                     |   |
|-----|---|---|---|-------|-------------------------------------|---|
| III |   |   |   |       |                                     |   |
|     | 1 | Structure and Modification of Root, Stem and Leaf | 3 | K2(U) | Lecture using videos                | Evaluation through short test, Short summary                      |
|     | 2 | Structure and Types of Inflorescences             | 3 | K1(R) | Video clipping                      | Simple definitions, MCQ   |
|     | 3 | Structure and Types of Flowers, Fruits and Seeds. | 3 | K2(U) | PPT, Chart                          | Chart preparation, Slip test                                      |
| IV  |   |   |   |       |                                     |   |
|     | 1 | Concept of Heredity                               | 3 | K2(U) | PPT                                 | Evaluation through short test, Group discussion                   |
|     | 2 | Concept of Variation                              | 3 | K1(R) | PPT, Group discussion               | Simple definitions  |
|     | 3 | Mendel's Laws of Inheritance                      | 3 | K2(U) | PPT, Chart                          | Group discussion  |
| V   |   |   |   |       |                                     |   |
|     | 1 | Water relations - Absorption and movement         | 2 | K1(R) | PPT, Demonstration with Experiments | Concept description, Evaluation through short test, Short summary |
|     | 2 | Diffusion, Osmosis, Plasmolysis                   | 2 | K2(U) | PPT, Demonstration with Experiments | Simple definitions, MCQ   |

|  |   |  |   |       |   |                               |
|--|---|--|---|-------|---|-------------------------------|
|  | 3 | Imbibition -<br>Permeability, Water<br>Potential   | 2 | K1(R) | PPT,<br>Demonstration<br>with<br>Experiments            | Experiments,<br>Slip test     |
|  | 4 | Transpiration -<br>Movement - Mineral<br>Nutrition | 2 | K2(U) | Lecture using<br>Chalk and talk,<br>Group<br>Discussion | Flow chart,<br>Open book test |

Course Focussing on Employability/ Entrepreneurship/ Skill Development: **Employability**

Activities (Em/ En/SD): **Van Mahotsav Celebration**

Course Focussing on Cross Cutting Issues (Professional Ethics/ Human Values/Environment

Sustainability/ Gender Equity): **Environment Sustainability**

Activities related to Cross Cutting Issues: **NIL**

Assignment: **Unit II: Prokaryotic cell, Eukaryotic cell, Cell wall, Cell membrane, Plastids, Ribosomes**

Seminar Topic: **Unit I: Salient features of various Plant Groups : Bryophytes, Pteridophytes and Gymnosperms**

**Sample questions**

#### **Part A**

1. Flagella of bacteria is made up of a protein known as -----.
2. The site for protein synthesis is -----.  
a.Ribosomes            b.Mitochondria            c.Chloroplast            d. Golgi bodies
3. -----is the process of formation of fruit without fertilization.
4. The father of Genetics is Gregor Johan Mendel – State True or False.
5. -----is the movement of solute molecule from lower concentration to higher concentration through semi permeable membrane.

#### **Part B**

6. List out the difference between bacteria and virus.
7. State the role of Plastids in prokaryotic and eukaryotic cells.
8. Point out the types of Inflorescences with neat diagram.

9. Write the concept of Heredity and variation.
10. Write short notes on Diffusion.

**Part C**

11. Outline Whittaker's five kingdom concept in systematic and elaborate it.
12. Discuss the principle, working condition and uses of electron microscope.
13. Describe the structure and types of flowers with a neat sketch.
14. Summarize the Mendel's law of inheritance.
15. Explain Transpiration with experimental proof and diagrammatic representation.

**Head of the Department**

**Course Instructor**

**Dr. A. Anami Augustus Arul**

**Dr. J. AlbinoWins**

## Teaching Plan

**Department** : Botany  
**Class** : II B.Sc Botany  
**Title of the Course** : Core IV: Archegoniate  
**Semester** : III  
**Course Code** : BC2031

| Course Code | L | T | P | Credits | Inst. Hours | Total Hours | Marks |          |       |
|-------------|---|---|---|---------|-------------|-------------|-------|----------|-------|
|             |   |   |   |         |             |             | CIA   | External | Total |
| CC2041      | 4 | - | - | 4       | 4           | 60          | 25    | 75       | 100   |

### Objectives

1. To acquire knowledge on early land plants.
2. To understand the life cycle patterns of archegoniate

### Course outcomes

| CO | Upon completion of this course, the students will be able to:              | PSO addressed | Cognitive level |
|----|--|---------------|-----------------|
| 1  | describe the general characters of early land plants                       | PSO - 1       | K2(U)           |
| 2  | interpret the ecological and economic importance of archegoniate           | PSO - 8       | K3(Ap)          |
| 3  | describe the external, internal structure and reproduction of archegoniate | PSO - 4       | K2(U)           |
| 4  | differentiate the life cycle patterns of archegoniate                      | PSO - 9       | K4(An)          |
| 5  | classify cryptogams and comment on the stelar evolution in pteridophytes   | PSO - 2       | K2(U)           |
| 6  | compare the fossil members of pteridophytes and gymnosperms                | PSO - 3       | K5(An)          |

## Teaching plan

**Total Contact hours: 60 (Including lectures, assignments and tests)**

| Unit                    | Module | Topic  | Teaching Hours | Cognitive level | Pedagogy   | Assessment/Evaluation  |
|-------------------------|--------|--|----------------|-----------------|--|--|
| <b>I BRYOPHYTES</b>     |        |  |                |                 |  |  |
|                         | 1.     | Unifying features of bryophytes, transition to land habit<br>Classification by Rothmaler (1951). | 2              | K2(U)           | Lecture using Chalk & talk, Flow chart, PPT and videos, Introductory session, Group Discussion, Review   | Evaluation through Simple definitions, Test, MCQ, True/False, Short essays, Recall, Concept, explanations, Short summary or overview |
|                         | 2.     | Distribution, morphology, anatomy reproduction of <i>Marchantia</i>                              | 3              | K4(An)          | Lecture using Chalk & talk, Live specimen, Sectional review, Permanent slides, PPT and Group Discussion, | Simple definitions, MCQ, Recall steps, Graphical representation  |
|                         | 3.     | Distribution, morphology, anatomy, reproduction and life cycle of <i>Polytrichum</i>             | 2              | K4(An)          | Lecture using Chalk & talk, Live specimen, Permanent slides, Charts, PPT and Group Discussion,           | Test, MCQ, True/False, Short essays, Recall, explanations, Short summary Graphical representation                                    |
|                         | 4.     | Ecological and economic importance of Bryophytes   | 2              | K4(An)          | Lecture using Chalk & talk and PPT and Group Discussion  | Suggest idea, Recall, explanations   |
| <b>II PTERIDOPHYTES</b> |        |  |                |                 |  |  |
|                         | 1      | Distribution, morphology, anatomy, reproduction and life cycle of <i>Selaginella</i>             | 4              | K4(An)          | Lecture using Chalk & talk, Flow chart, PPT and videos, Group Discussion                                 | Evaluation through Simple definitions, Test, MCQ, True/False, Short essays, Recall, overview, Graphical representation               |

|                          |   |   |   |        |  |   |
|--------------------------|---|---|---|--------|--|---|
|                          | 2 | Distribution, morphology, anatomy, reproduction and life cycle of <i>Marsilea</i><br>Heterospory, seed habit and stelar evolution | 3 | K4(An) | Lecture using Chalk & talk, Live specimen, Permanent slides, Charts, PPT and Group Discussion,           | Simple definitions, MCQ, Recall steps, Class test, Graphical representation     |
|                          | 3 | Ecological and economical importance of Pteridophytes   | 2 | K3(Ap) | Lecture using Chalk & talk, Live specimen, Permanent slides, Charts, PPT and Group Discussion,           | Suggest idea/concept with examples, Class Test                                  |
| <b>III PTERIDOPHYTES</b> |   |   |   |        |  |   |
|                          | 1 | General characteristics of Gymnosperms<br>Classification by Chamberlain (1935)  | 3 | K2(U)  | Lecture using Chalk & talk, Flow chart, PPT and videos, Introductory session, Group Discussion, Review   | Evaluation through Simple definitions, Test, MCQ, True/False, Essays, Recall    |
|                          | 2 | Salient features, distribution, morphology, anatomy and reproduction of <i>Pinus</i> .  | 4 | K4(An) | Lecture using Chalk & talk, Live specimen, Sectional review, Permanent slides, PPT and Group Discussion, | Test, MCQ, True/False, Short essays, Recall, overview, Graphical representation |
|                          | 3 | Ecological and economical importance of Gymnosperms.  | 2 | K4(An) | Lecture using Chalk & talk, Live specimen, Permanent slides, Charts, PPT and Group Discussion,           | MCQ, Class Test, overview   |
| <b>IV GYMNOSPERMS</b>    |   |   |   |        |  |   |
|                          | 1 | Distribution, morphology, anatomy, reproduction   | 4 | K2(U)  | Lecture using Chalk & talk, Flow chart, PPT and videos, Introductory                                     | MCQ, True/False, Short essays, Recall, Concept, explanations, Short             |

|                  |   |  |   |        |  |   |
|------------------|---|--|---|--------|--|---|
|                  |   | and life cycle of <i>Selaginella</i>   |   |        | session, Group Discussion, Review  | summary, Graphical representation   |
|                  | 2 | Distribution, morphology, anatomy, reproduction and life cycle of <i>Marsilea</i><br>Heterospory, seed habit and stellar evolution | 3 | K4(An) | Lecture using Chalk & talk, Live specimen, Sectional review, Permanent slides, PPT and Group Discussion, | MCQ, True/False, Short essays, Recall, Short summary, Graphical representation ,                            |
|                  | 3 | Ecological and economical importance of Pteridophytes  | 2 | K4(An) | Lecture using Chalk & talk, Live specimen, Permanent slides, Charts, PPT and Group Discussion            | MCQ, True/False, Short essays, Recall, Overview   |
| <b>V FOSSILS</b> |   |  |   |        |  |   |
|                  | 1 | Geological time scale  | 2 | K1(R)  | Peer tutoring and PPT  | Assignment, Recall, Test  |
|                  | 2 | Methods of fossilization and importance of fossils.  | 2 | K2(U)  | Lecture using Chalk & talk   | Peer Tutoring, MCQ, True/False,   |
|                  | 3 | Distribution, morphology, anatomy and reproduction of <i>Rhynia</i>  | 2 | K2(U)  | Lecture using Chalk & talk, PPT, Review, Group Discussion  | Test, MCQ, True/False, Short essays, Recall, overview, Graphical representation                             |
|                  | 4 | Distribution, systematic position, morphology, anatomy and reproduction of <i>Lyginopteris</i>                                     | 3 | K2(U)  | Lecture using Chalk & talk, PPT, Explanation using permanent slide                                       | Test, MCQ, True/False, Short essays, Recall, overview, Graphical representation<br>Graphical representation |

Course Focussing on Employability

**Activities (Em/ En/SD):** Seminar, Assignment

**Course Focussing on Cross Cutting Issues:** Professional Ethics

**Activities related to Cross Cutting Issues:** Environment Sustainability

**Assignment:** Geological time scale; Methods of fossilization and importance of fossils.

**Seminar Topic:** Ecological and economical importance of Pteridophytes

## SAMPLE QUESTIONS

### Part A

1. *Marchantia* is a/an \_\_\_\_\_.  
a. algae      b. fungi      c. bryophyte      d. pteridophyte
2. Pteridophytes means plants with feather like fronds. State True or False.
3. Who said that *Marsilea* sporocarp is the lateral fertile segment of the leaf?
4. The smallest gymnosperm is -----.
5. *Lyginopteris oldhamia* is also known as  
a) *Crossotheca haeninghausi*   b) *Calymatotheca haeninghausi*  
c) *Crossotheca oldhamia*   d) *Calymatotheca oldhamia*

### Part B

1. What are the key characteristics that unify Bryophytes?
2. Explain the concept of sporangium and describe a sectional view of sporangium.
3. Can you provide an explanation of heterospory and the seed habit in *Selaginella*, including their significance and ecological adaptations?
4. List out the economic benefits and contributions of gymnosperms?
5. Enumerate the comprehensive explanation of Palaeozoic era and its significance within the geological time scale?

### **Part C**

1. Classify the classification of bryophytes with a flow chart according to Rothmaler and explain its salient features.
2. Explain the process of sexual reproduction in *Psilotum* using relevant examples and diagrams?
3. Evaluate the concept of "stele" and its significance in the context of stelar evolution, drawing connections to relevant evidence and examples.
4. Illustrate a diagram that effectively represents and explains the structure and characteristics of *Pinus* needles.
5. Critically analyze and synthesize the systematic position, distribution, morphology, anatomy, and reproduction of Rhynia, integrating relevant evidence and examples to support your explanations and drawings.

**Head of the Department**

**A. Anami Augustus Arul**

**Course Instructor**

**A. R. Florence**

### Teaching Plan

**Department** : Botany  
**Class** : II B.Sc Botany  
**Title of the Course** : Major Elective – I (b) Nursery and Gardening  
**Semester** : III  
**Course Code** : BC2033

| Course Code | L | T | P | Credits | Inst. Hours | Total Hours | Marks |          |       |
|-------------|---|---|---|---------|-------------|-------------|-------|----------|-------|
|             |   |   |   |         |             |             | CIA   | External | Total |
| BC2033      | 4 | - | - | 4       | 4           | 60          | 30    | 70       | 100   |

### Objectives

- Understand the propagation and cultural practices of useful vegetable and garden plants.
- Understand the basic concepts of landscaping and garden designing.

### Course Outcomes

| CO     | Upon completion of this course the students will be able to:           | PSO addressed | CL |
|--------|--|---------------|----|
| CO – 1 | incorporate lab to land programme by raising home garden and nurseries | PSO - 5       | Ap |
| CO – 2 | practice different techniques in propagating horticultural plants      | PSO - 5       | Ap |
| CO – 3 | explain the different methods of vegetative propagation and hardening  | PSO - 7       | U  |
| CO – 4 | understand the types of garden and its operation                       | PSO - 3       | U  |
| CO – 5 | explain the cultivation of different vegetables                        | PSO - 5       | U  |

### Teaching plan

**Total Contact hours: 60 (Including lectures, assignments and tests)**

| Unit | Module | Topic   | Teaching Hours | Cognitive level | Pedagogy             | Assessment/ Evaluation                       |
|------|--------|---|----------------|-----------------|----------------------|--|
| I    |        |   |                |                 |                      |  |
|      | 1.     | Objectives, scope and building up of infrastructure for nursery   | 2              | K2(U)           | Lecture using videos | Evaluation through short test, Short summary |
|      | 2.     | Direct seeding and transplants  | 2              | K1(R)           | PPT, Chart           | Simple definitions, MCQ                      |
|      | 3.     | Nursery practices for some important crops – Coconut, Areca nut, Pepper and Cardamom                        | 2              | K2(U)           | PPT, Flow chart      | Chart preparation, Slip test                 |
| II   |        |   |                |                 |                      |  |
|      | 1      | Importance and scope of ornamental horticulture in India. Making and maintenance of lawn, hedges and edges. | 3              | K2(U)           | Lecture using videos | Evaluation through short test, Short summary |
|      | 2      | Commercial cultivation of Rose, Canna, Marigold and Gladiolus   | 4              | K1(R)           | PPT, Mind map        | Simple definitions, Flow chart               |

|     |   |   |   |       |                                     |  |
|-----|---|---|---|-------|-------------------------------------|--|
|     | 3 | Flower arrangement and techniques to prolong vase life of flowers.  | 2 | K2(U) | PPT, Demonstration                  | Chart preparation, Slip test                 |
| III |   |   |   |       |                                     |  |
|     | 1 | Vegetative propagation: Brief introduction about grafting, cutting and layering - air and ground layering | 3 | K2(U) | Lecture using videos                | Evaluation through short test, Short summary |
|     | 2 | Cutting, selection of cutting, treatment of cutting, rooting medium and planting of cuttings.             | 3 | K1(R) | Lecture using chalk and talk method | Simple definitions, Quiz                     |
|     | 3 | Hardening of plants – greenhouse, mist chamber, shade house and glass house.                              | 3 | K2(U) | PPT, Models                         | Chart preparation, Slip test                 |
| IV  |   |   |   |       |                                     |  |
|     | 1 | Gardening: definition and scope, types of gardens- formal (Mughal) and informal (Japanese).               | 3 | K2(U) | PPT, Models                         | Evaluation through short test, Short summary |
|     | 2 | Bog or Marsh garden, Sunken garden and roof garden.   | 3 | K1(R) | PPT                                 | Simple definitions, MCQ                      |

|   |   |  |   |       |  |  |
|---|---|--|---|-------|--|--|
|   | 3 | Gardening operations: soil laying, manuring, watering, management of pests and diseases. | 3 | K2(U) | PPT, Charts                                    | Chart preparation, Slip test                 |
| V |   |  |   |       |  |  |
|   | 1 | Cultivation of vegetable crops – Tomato and Brinjal.                                     | 2 | K1(R) | PPT, Garden visit                              | Evaluation through short test, Short summary |
|   | 2 | Cultivation of Root Crops – Radish and Carrot.   | 2 | K2(U) | PPT, Garden visit                              | Simple definitions, MCQ, Recall steps        |
|   | 3 | Cultivation of Cucurbits – Cucumber and Bittergourd.                                     | 2 | K1(R) | PPT, Garden visit                              | Chart preparation, Slip test                 |
|   | 4 | Storage and marketing procedures of vegetable crops                                      | 2 | K2(U) | Lecture using Chalk and talk, Group Discussion | Open book test                               |

Course Focussing on Employability/ Entrepreneurship/ Skill Development : **Entrepreneurship**

Activities (Em/ En/SD): **Botanical Garden Visit**

Course Focussing on Cross Cutting Issues (Professional Ethics/ Human Values/Environment

Sustainability/ Gender Equity) : **Environment Sustainability**

Activities related to Cross Cutting Issues : **NIL**

Assignment : **Unit V: Cultivation of vegetable crops – Tomato and Brinjal.**

**Root Crops – Radish and Carrot.**

**Cucurbits-Cucumber and Bittergourd.**

Seminar Topic: **Unit IV: Definition and scope, types of gardens- formal (Mughal) and informal (Japanese).**

## Sample questions

### Part A

1. The botanical name of Coconut is *Cocus nucifera* – State True or False.
2. The prolonged vase life of an ornamental flower is -----.
3. The upper part of an graft is -----.
4. The upper part of graft is -----.  
a.scion      b.scian      c.scion      d.trion
5. -----season is better for raddish cultivation.

### Part B

1. List out the scope of Nursery.
2. Write the protocol for cultivating rose.
3. Comment on Green House.
4. How will you manage the pests and diseases in plants?
5. Write the marketing procedures for vegetable crops?

### Part C

6. Explain in detail about the infrastructure used to construct Nursery.
7. Write an essay on Flower arrangement with a neat sketch.
8. Summarize the layering techniques with schematic representation.
9. Describe the special types of garden with diagrammatic representation.
10. Write an essay on cultivation of Cucumber and Bitterguord with a flow chart.

**Head of the Department**

**Course Instructor**

**Dr. A. Anami Augustus Arul**

**Dr. J. Albino Wins**

### Teaching Plan

**Department** : Botany  
**Class** : II B.Sc., Zoology  
**Title of the Course** : Allied II – Theory: Plant Diversity -I  
**Algae, Fungi, Bryophytes and Pteridophytes**  
**Semester** : III  
**Course Code** : BA2031

| Course Code | L | T | P | S | Credits | Inst. Hours | Total Hours | Marks |          |       |
|-------------|---|---|---|---|---------|-------------|-------------|-------|----------|-------|
|             |   |   |   |   |         |             |             | CIA   | External | Total |
| CC2041      | 4 | - | - | - | 3       | 4           | 60          | 25    | 75       | 100   |

### Learning Objectives

1. To understand the importance of different groups of lower plants and their diversity.
2. To study in detail the different genera belonging to various classes of Algae, Fungi, Bryophytes and Pteridophytes.

### Course Outcomes

| CO | On the successful completion of the course, student will be able to:  | PSO addressed | CL        |
|----|---|---------------|-----------|
| 1. | categorize different groups of plants based on their morphological variation  | PSO -1        | <b>K1</b> |
| 2. | study and impart knowledge about the reproduction and life cycle of given genera of algae, fungi, bryophytes and pteridophytes. | PSO - 2       | <b>K2</b> |
| 3. | interpret the economic importance of algae, fungi, bryophytes and pteridophytes   | PSO -1        | <b>K3</b> |

|    |  |       |           |
|----|--|-------|-----------|
| 4. | Compare the common characters shared by bryophytes and pteridophytes | PSO-2 | <b>K4</b> |
|----|--|-------|-----------|

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Crea

### **Teaching plan**

**Total Contact hours: 75 (Including lectures, assignments and tests)**

| Unit | Module | Topic   | Teaching Hours | Cognitive level | Pedagogy   | Assessment/ Evaluation   |
|------|--------|---|----------------|-----------------|--|--|
| I    |        |   |                |                 |  |  |
|      | 1.     | General Characters, Classification of algae (Fritsch-1935-1945)                   | 4              | K1(R)           | Lecture using Chalk and talk, Group Discussion, Mind mapping, Peer tutoring, PPT, Video, field trips and outdoor activities. | True/False, Short essays, Presentation, field work report, CIA, Seminar.                               |
|      | 2.     | Thallus structure, reproduction and life cycle of <i>Nostoc</i> (Cyanophyceae)    | 4              | K2(U)           | Visual aids and multimedia, Lecture using Chalk and talk.  | Peer assessment, self-assessment, MCQ, Short summary, Concept explanations, Longer essay, CIA, Seminar |
|      | 3.     | Thallus structure, reproduction and life cycle of <i>Volvox</i> (Chlorophyceae)   | 4              | K3(AN)          | Group Discussion, Mind mapping, Peer tutoring, PPT, video  | Group Discussion, Debating, CIA, Seminar, MCQ  |
| II   | 1.     | Thallus structure, reproduction and life cycle of <i>Sargassum</i> (Phaeophyceae) | 4              | K2(U)           | Visual aids and multimedia, field trips and outdoor activities.  | Debating Seminar, CIA, Quiz, Field Report  |

|     |    |   |   |         |  |  |
|-----|----|---|---|---------|--|--|
|     | 2. | Thallus structure, reproduction and life cycle of <i>Gracilaria</i> (Rhodophyceae)              | 4 | K(AN)   | PPT, Video, live specimen, Lecture using Chalk and talk,                                 | Debating Seminar, CIA, Quiz, Field Report          |
|     | 3. | Economic importance of Algae  | 4 | K1(R)   | Lecture using Chalk and talk, Lecture using videos, PPT, Peer Tutoring                   | Group Discussion, Field Report, Seminar, Quiz, CIA |
| III | 1. | General characters, a brief introduction of fungi classification by Alexopoulos and Mims, 1979. | 3 | K1 (R)  | Lecture using Chalk and talk, Lecture using videos, PPT, Group Discussion, Mind Mapping  | Group Discussion, Seminar, Quiz, CIA               |
|     | 2. | Thallus structure, reproduction and life cycle <i>Aspergillus</i> (Ascomycetes)                 | 3 | K2 (U)  | Lecture using Chalk and talk, Lecture using videos, PPT, Group Discussion, Mind mapping  | Group Discussion, Seminar, Quiz, CIA               |
|     | 3. | Thallus structure, reproduction and life cycle of <i>Puccinia</i> (Basidiomycetes)              | 3 | K2 (U)  | Lecture using Chalk and talk, Group Discussion, Peer tutoring, Lecture using videos, PPT | Group Discussion, Seminar, Quiz, CIA               |
|     | 4. | Economic importance of Fungi  | 3 | K4 (AN) | Lecture using Chalk and talk, Lecture using  | Debating, Peer assessment, MCQ, Short summary,     |

|           |    |  |   |        |  |   |
|-----------|----|--|---|--------|--|---|
|           |    |  |   |        | videos, PPT,<br>Group<br>Discussion  | Longer essay,<br>CIA, Seminar   |
| <b>1V</b> |    |  |   |        |  |   |
|           | 1. | Bryophytes: General characters, A brief introduction of bryophyta classification by Rothmaler,1951         | 4 | K2 (R) | Lecture using Chalk and talk, Group Discussion, Peer tutoring, Lecture using videos, PPT | Evaluation through short test, MCQ, True/False, Short essays, CIA, Seminar. |
|           | 2. | Morphology, anatomy, reproduction and life cycle of <i>Polytrichum</i> .                                   | 4 | K3(U)  | Lecture using Chalk and talk, Lecture using videos, PPT, Flow Chart,                     | Simple definitions, MCQ, Recall life cycle steps, Seminar, CIA.             |
|           | 3. | Economic importance of Bryophytes.   | 4 | K4(An) | Lecture using Chalk and talk, Lecture using videos, PPT, Group Discussion                | Short test, MCQ, True/False, Short essays, CIA, Seminar.                    |
| <b>V</b>  |    |  |   |        |  |   |
|           | 1  | Pteridophytes: General characteristics, A brief introduction of pteridophyte classification by Smith, 1955 | 4 | K1(R)  | Lecture using Chalk and talk, Group Discussion, Peer tutoring, Lecture using videos, PPT | Short test, MCQ, True/False, Short essays, Seminar, CIA.                    |
|           | 2  | Morphology, anatomy, reproduction and life cycle of <i>Selaginella</i>                                     | 4 | K2(U)  | Lecture using Chalk and talk, Lecture using  | Short test, MCQ, Chart Preparation, True/False, Short essays,               |

|  |   |  |   |        |  |  |
|--|---|--|---|--------|--|--|
|  |   |  |   |        | videos, PPT,<br>Live Specimen  | Quiz, Seminar,<br>CIA.   |
|  | 3 | Economic importance<br>of Pteridophytes. | 4 | K3(AN) | Lecture using<br>Chalk and talk,<br>Lecture using<br>videos, PPT,<br><br>Group<br>Discussion,<br>Demonstration | Debating, Peer<br>assessment,<br>MCQ, Short<br>summary, Slip<br>Test, Longer<br>essay, CIA,<br>Seminar |

Course Focussing on Employability/ Skill Development:

Activities (Em/SD):

Employability: Algae Identification, Biology Teaching

Skill Development: Identification of different lower order plant species

Course Focussing on Cross Cutting Issues - Environment Sustainability.

Activities related to Cross Cutting Issues: Biodiversity Conservation Research

Assignment: General Characters, Classification of algae according to Fritsch, 1945, Thallus organization of Nostoc and Volvox,

### Sample questions

#### Part A

1. Algal distribution is influenced by which of the following factors?

- a) Temperature
- b) Light availability
- c) Nutrient levels
- d) All of the above

2. The thallus organization of *Volvox* is:

- a) Unicellular
- b) Colonial

- c) Filamentous                      d) Parenchymatous
3. What is the process of asexual reproduction in *Diatoms* called?
- a) Fragmentation                      b) Binary fission
- c) Sporulation                      d) Conjugation
4. Which of the following is NOT a type of algal production system?
- a) Open ponds                      b) Photobioreactors
- c) Closed systems                      d) Aquatic tanks
5. The process of using algae to remove pollutants and contaminants from water bodies is known as:
- a) Algal bloom                      b) Phycoremediation
- c) Bioluminescence                      d) Photosynthesis

### **Part B**

1. Explain Criteria for algal classification.
2. Compare and contrast the thallus organization of *Chlorella*, *Volvox*, and *Sargassum*.
3. Describe the vegetative and asexual reproduction in *Oedogonium*.
4. How and Why is it important to maintain optimal growth conditions for algae cultivation?
5. Discuss the role of diatomite in the water treatment industry and how it aids in filtration processes.

### **Part C**

1. Analyse classification of Algae by Fritsch.
2. Bring out the anatomy and thallus organisation of *Sargassum* and *Gracilaria*.
3. Explain the concept of alternation of generations in the life cycle of algae with reference to *Sargassum*.
4. Compare and contrast open pond systems and closed photobioreactors for algae cultivation.
5. Explain the process of algae cultivation and its significance in the production of biofuels.

Head of the Department

**Dr. A. Anami Augustus Arul**

Course Instructor

**Dr. A. Anami Augustus Arul**

**Dr. J. Albino Wins**

### Teaching Plan

**Department** : Botany  
**Class** : III B.Sc Botany  
**Title of the Course** : Major Core-V Taxonomy of Angiosperms and Economic Botany  
**Semester** : V  
**Course Code** : BC2051

| Course Code | L | T | P | Credits | Inst. Hours | Total Hours | Marks |          |       |
|-------------|---|---|---|---------|-------------|-------------|-------|----------|-------|
|             |   |   |   |         |             |             | CIA   | External | Total |
| CC2041      | 6 | - | - | 6       | 6           | 90          | 25    | 75       | 100   |

#### Objectives

- To know the principles of classification of taxa and to evaluate the medicinal importance of selected angiosperms.
- To acquire knowledge on the botanical vocabulary and taxonomical terminology to identify plants.

#### Course outcomes

| CO     | Upon completion of this course, the students will be able to:                                    | PSO addressed | Cognitive level |
|--------|--|---------------|-----------------|
| CO - 1 | relate the modifications in plant parts.   | PSO-1         | K2 (U)          |
| CO - 2 | differentiate the artificial, natural and phylogenetic classification and learn about ICN rules. | PSO-2         | K4 (An)         |
| CO - 3 | evaluate the taxonomists of India.   | PSO-1         | K5 (E)          |
| CO - 4 | recall the characters of some important families.  | PSO-1         | K1 (R)          |
| CO - 5 | understand the economically important products of plants and their use at various levels.        | PSO - 2       | K2 (U)          |
| CO - 6 | construct digital herbarium and learn about Herbarium techniques.                                | PSO - 5       | K6 (C)          |

## **Teaching plan**

**Total Contact hours: 60 (Including lectures, assignments and tests)**

| Unit     | Module | Topic   | Teaching Hours | Cognitive level | Pedagogy   | Assessment/ Evaluation  |
|----------|--------|---|----------------|-----------------|--|---|
| <b>I</b> |        |   |                |                 |  |   |
|          | 1.     | Botanical nomenclature: Principles and rules of International Code of Nomenclature (ICN);   | 2              | K2 (U)          | Lecture using Chalk and board, PPT                     | Class test, MCQ, True/False, essay test                                 |
|          | 2.     | Ranks and names; Typification, author citation, valid publication, rejection of names, principle of priority and its limitations. | 2              | K3 (Ap)         | Lecture, PPT, chalk and board                          | Simple definitions, MCQ, Recall steps, Concept definitions              |
|          | 3.     | Morphology – root, stem – their modifications.  | 2              | K2 (U)          | Lecture, PPT, photos, diagram,                         | Short question test, essay question test, quizzes, formative assessment |
|          | 4.     | Morphology of leaf and inflorescence – their modifications.   | 3              | K2 (U)          | Lecture, PPT, diagram, chalk and board, live specimens | Formative assessment, true/false, fill in the blanks                    |
|          | 5.     | Morphology of flower, and fruit – their modifications.  | 3              | K2 (U)          | Lecture, PPT, chalk and                                | Class test, Essay test, MCQs,   |

|            |    |  |   |        |  |  |
|------------|----|--|---|--------|--|--|
|            |    |  |   |        | board, diagram,<br>live specimens  | formative<br>assessment  |
| <b>II</b>  |    |  |   |        |  |  |
|            | 1. | Detailed study on Sexual system-Carolus Linnaeus,  | 2 | K1 (R) | Lecture, PPT,<br>diagram,<br>flowchart.<br>photos                                | Class test,<br>formative<br>assessment,                          |
|            | 2. | Natural System – Bentham and Hooker,   | 3 | K1 (R) | Lecture, PPT,<br>flowchart,<br>group<br>discussion,<br>Photos,<br>diagram,       | MCQs, short<br>test, essay test,<br>fill in the blanks           |
|            | 3. | Phylogenetic System - APG Classification (2016).   | 1 | K1 (R) | Lecture, PPT,<br>interactive<br>discussion,<br>flowchart.<br>Photos,<br>diagram, | Quizzes,<br>formative<br>assessment,<br>essay test               |
|            | 4. | Field inventory: Functions of Herbarium; Virtual herbarium; E-flora; Herbarium techniques.     | 3 | K2 (U) | Lecture, Video,<br>teaching using<br>website, debate,<br>group<br>discussion     | quizzes, class<br>test, formative<br>and summative<br>assessment |
|            | 5. | Contribution to systematic botany by Indian Taxonomists: K.M. Mathew and Hermenegild Santapau. | 3 | K1(R)  | Lecture, chalk<br>and board, PPT,<br>photos                                      | Essay test, class<br>test, quizzes                               |
| <b>III</b> |    |  |   |        |  |  |
|            | 1. | Detailed study of the following families   | 3 | K2 (U) | Lecture, PPT,<br>diagram,<br>photos,   | Class test,<br>formative and<br>summative                        |

|           |    |   |   |        |  |  |
|-----------|----|---|---|--------|--|--|
|           |    | with their economic importance:<br>Annonaceae,<br>Rutaceae,   |   |        | interactive discussion                             | assessment, quizzes, essay test  |
|           | 2. | Detailed study of the following families with their economic importance:<br>Meliaceae,<br>Caesalpinaceae, | 3 | K1 (R) | Lecture, PPT, diagram, photos, debate, live plants | Short answer test, essay test, true/false, fill in the blanks                  |
|           | 3. | Anacardiaceae,<br>Cucurbitaceae,  | 3 | K1 (R) | Lecture, PPT, diagram, debate, photos, live plants | Class test, Quizzes, formative and summative assessment.                       |
|           | 4. | Detailed study of the following families with their economic importance: Rubiaceae and Sapotaceae.        | 3 | K2 (U) | Lecture, photos, live plants, illustration, PPT    | MCQs, true/false, fill in the blanks, class test                               |
| <b>IV</b> |    |   |   |        |  |  |
|           | 1. | Apocynaceae,<br>Asclepiadaceae,   | 3 | K1 (R) | Lecture, PPT, diagram, live specimens, photos      | Class test, true/false, fill in the blanks, formative and summative assessment |

|          |    |   |   |        |   |  |
|----------|----|---|---|--------|---|--|
|          | 2. | Lamiaceae,<br>Euphorbiaceae,  | 3 | K2 (U) | Lecture, PPT,<br>live specimens,<br>demonstration,<br>photos, video,<br>diagram | Short answer<br>question, essay<br>question,<br>True/False, fill<br>in the blanks                                    |
|          | 3. | Amaranthaceae,<br>Cannaceae,  | 3 | K2 (U) | Lecture,<br>diagram, chalk<br>and board,<br>photos, live<br>specimens           | Formative and<br>summative<br>assessment,<br>Class test,<br>quizzes  |
|          | 4. | Orchidaceae and<br>Poaceae.   | 3 | K1 (R) | Lecture, PPT,<br>live specimens,<br>illustration,<br>interactive<br>discussion  | Class test, Short<br>test, oral<br>questioning,<br>formative<br>assessment   |
| <b>V</b> |    |   |   |        |   |  |
|          | 1. | Study of the following<br>plants with special<br>reference to their<br>botanical name,<br>family, morphology of<br>useful part, economic<br>products and uses:<br>Cereals - Paddy,<br>Wheat; Pulses - Green<br>gram, Bengal gram; | 3 | K1 (R) | Lecture, Chalk<br>and board,<br>diagrams, PPT,<br>live plant<br>products        | formative<br>assessments,<br>diagram<br>labelling short<br>answer<br>questions,<br>MCQs,                             |
|          | 2. | Tuber crops -Tapioca,<br>Potato; Spices -<br>Pepper, Cardamom;  | 2 | K2 (U) | Lecture, PPT,<br>diagrams, chalk<br>and board, live<br>specimens                | true/false<br>statements, or<br>fill-in-the-blank<br>questions, class<br>test, formative<br>assessment,<br>quiz with |

|  |    |   |   |         |   |  |
|--|----|---|---|---------|---|--|
|  |    |   |   |         |   | multiple-choice questions,   |
|  | 3. | Beverages - Tea, Coffee; Oil yielding plants - Coconut, Groundnut;              | 3 | K1 (R)  | Lecture, PPT, diagrams, guided discussion, flowcharts             | group discussion Assignments, class tests, formative assessments, summative assessments,     |
|  | 4. | Fibre yielding plants - Cotton, Coir; Timber yielding plants - Teak, Rose wood; | 2 | K3 (Ap) | Lecture, PPT, interactive discussion, live plant products         | Labeling, Short Answer Questions, Diagram Essay Questions                                    |
|  | 5. | Latex yielding plants - Para rubber, Sapota; Ornamental plants - Rose, Orchids. | 2 | K3 (Ap) | Lecture, PPT, diagrams, interactive discussions, live plant parts | Formative and Summative Assessments MCQs, Diagram Labeling, Class test, Visual Presentations |

Course Focussing on: Employability

Activities (Em/ En/SD): Assignment and Seminar

Course Focussing on Cross Cutting Issues: Professional Ethics

Activities related to Cross Cutting Issues : Seminar and Assignment

Assignment: Virtual herbarium

Seminar Topic: Ornamental plant - Orchids.

**Sample questions**

**Part A**

1. The flat, expanded part of a leaf is known as the:  
a. Petiole      b. Blade      c. Midrib      d. Vein
2. Which of the following is a commonly used method for drying plant specimens in a herbarium?  
a. Pressing between heavy books  
b. Hanging the specimen upside down  
c. Placing in a microwave oven  
d. Immersing in water
3. Which of the following plants belongs to the Anacardiaceae family?  
a. Sunflower      b. Rose      c. Mango      d. Lavender
4. The Amaranthaceae family is characterized by the presence of edible seeds known as:  
a. Nuts      b. Grains      c. Legumes      d. Drupes
5. What is the structure in orchids that is modified into a highly specialized lip?  
a. Sepal      b. Petal      c. Column      d. Stamen

### **Part B**

1. What is the correct format for writing scientific plant names according to the ICN?
2. What is the purpose of e-flora?
3. What is the distinctive characteristic of the leaves in the Rutaceae family?
4. What is the distinctive feature of the flowers in the Lamiaceae family?
5. What is the process involved in the extraction of latex from latex-yielding plants?

### **Part C**

1. Explain the characteristics and examples of racemose inflorescence.
2. Explain the functions of herbarium specimens in documenting plant diversity and distribution.
3. Provide an overview of the Meliaceae family, including its botanical characteristics, distribution, and economic importance.
4. Discuss the taxonomic characteristics and diversity of the Amaranthaceae family.
5. Describe the botanical name, family, morphology of useful part, economic products and uses of Paddy and Wheat.

**Head of the Department:**

**Course Instructor:**

Dr. A. Anami Augustus Arul

Dr. Bojaxa A. Rosy

### Teaching Plan

Department : Botany  
Class : III B.Sc  
Title of the Course : Biochemistry and Biophysics  
Semester : V  
Course Code : BC2052

| Course Code | L | T | P | Credits | Inst. Hours | Total Hours | Marks |          |       |
|-------------|---|---|---|---------|-------------|-------------|-------|----------|-------|
|             |   |   |   |         |             |             | CIA   | External | Total |
| CC2052      | 6 | - | - | 6       | 6           | 90          | 25    | 75       | 100   |

#### Objectives:

1. To understand the structure and properties of bio-molecules.
2. To learn the emerging field of biophysics and principles of bioenergetics.

| CO | Upon completion of this course the students will be able to:         | PSO addressed | Cognitive Level |
|----|--|---------------|-----------------|
| 1  | apply the usage of $P^H$ and buffers in biological experiments.      | PSO-3         | K (4)           |
| 2  | understand the importance of Bio-molecules                           | PSO-. 1       | K(2)            |
| 3  | describe its biological roles and significance of lipids.            | PSO- 1        | K(2)            |
| 4  | analyse enzyme activity.   | PSO-2         | K (3)           |
| 5  | demonstrate thermodynamic principles in biological energy conversion | PSO-7         | K (5)           |

## Teaching plan

**Total Contact hours: 90 (Including lectures, assignments and tests)**

| Unit | Module | Topics   | Teaching hours | Cognitive level | Pedagogy  | Assessment /Evaluation                                |
|------|--------|--|----------------|-----------------|---|---|
|      | 1      | Types Chemical bonds –co-ordinate, covalent, hydrogen  | 2              | K3(An)          | Lecture, Chalk, ppt, video                              | Oral presentation, Written explanation,               |
|      | 2      | Acids and Bases  | 1              | K4(Ap)          | Interactive demonstration, pH testing, group discussion | Written Assessment, Practical skills                  |
|      | 3      | pH and Buffer system.  | 3              | K4(Ap)          | Interactive demonstration, Buffer experiment            | Written Assessment, Group discussion                  |
|      | 4      | Classification of carbohydrates; Monosaccharides: Structure of glucose (linear, open chain, ring form) | 4              | K6(C)           | Hands on activities, Interactive demonstration          | Model building, structural diagrams, Group discussion |

|    |   |  |   |        |  |  |
|----|---|--|---|--------|--|--|
|    | 5 | Fructose, properties of monosaccharides  | 2 | K1(R)  | Lecture, Chalk, ppt, video                       | Conceptual question, Group discussion  |
|    | 6 | Disaccharides: Structure and properties of maltose, sucrose and lactose          | 3 | K2(U)  | Lecture, PPT, diagrams, chalk and board, videos  | formative assessments  |
|    | 7 | Polysaccharides: Structure and properties of starch and cellulose.               | 3 | K3(An) | Lecture, PPT, diagrams, guided discussion,       | quiz with multiple-choice questions, true/false statements, or fill-in-the-blank questions, class test, formative assessment |
| II | 1 | Amino acids - classification, structure and properties                           | 3 | K2(U)  | Lecture, PPT, interactive discussion,            | Assignments, class tests, group discussion   |
|    | 2 | Protein – primary, secondary, tertiary (myoglobin) and quaternary (haemoglobin). | 4 | K2(U)  | Lecture, PPT, diagrams, interactive discussions, | Answer Questions, Essay Questions  |
|    | 3 | Protein denaturation and biological roles of proteins                            | 3 | K1(R)  | Lecture, PPT, Structure,                         | Class test, Visual   |

|     |   |  |   |        |                                      |   |
|-----|---|--|---|--------|--------------------------------------|---|
|     |   |  |   |        |                                      | Presentations                                   |
|     | 4 | Water-soluble vitamins e.g., Thiamine, Riboflavin and Niacin;          | 4 | K4(Ap) | Lecture, PPT, Group discussions      | Short Answer Questions,                         |
|     | 5 | Fat-soluble vitamins e.g., vitamin A- retinol, Vitamin D – Ergosterol. | 4 | K4(Ap) | Lecture, PPT,                        | Class test, formative and summative assessments |
| III | 1 | Introduction to Lipids: saturated and unsaturated fatty acids          | 4 | K2(U)  | Lecture, PPT, interactive discussion | MCQs, essay question                            |
|     | 2 | Simple lipids (waxes and triglycerides).                               | 4 | K3(An) | Lecture, PPT, flowcharts,            | Class test, formative assessment, Sequencing    |
|     | 3 | Compound lipids (phospholipid and glycolipid)                          | 5 | K2(U)  | Lecture, PPT, videos,                | Assignment, Class test                          |
|     | 4 | Derived lipids (cholesterol, carotenoids and terpenes).                | 5 | K3(An) | Lecture, chalk and board,            | Class test                                      |
| IV  | 1 | Enzymes: Classification, nomenclature based on IUB                     | 4 | K2(U)  | Lecture, Chalk and board, PPT        | class test, quizzes                             |
|     | 2 | Activation energy, active site, cofactors,                             | 5 | K3(An) | Lecture, PPT,                        | MCQs, essay test. Formative                     |

|                     |   |  |   |        |  |   |
|---------------------|---|--|---|--------|--|---|
|                     |   | coenzymes (NAD, CoA), isoenzyme;                                       |   |        | photos, videos   | assessment, class test                    |
|                     | 3 | Mechanism of enzyme action (lock and key model, induced - fit theory), | 5 | K4(Ap) | Lecture, PPT, videos, photos                               | Class test, Short answer test, MCQs,      |
| ~~~~~<br>~~~~~<br>` | 4 | Enzyme inhibition  | 2 | K4(Ap) | Lecture, PPT, Chart, videos                                | Quizzes, formative assessment, class test |
|                     | 5 | Factors affecting enzyme activity.                                     | 2 | K2 (U) | Lecture, chalk and board,                                  | Short test, MCQs, open book test.         |
| V                   | 1 | Photobiology- Dual nature of light and its characteristics             | 2 | K2(U)  | Lecture using chalk and board, group discussions, diagrams | Class tests, MCQs, formative assessment   |
|                     | 2 | Electromagnetic Spectrum, Action and Absorption spectrum,              | 2 | K1(R)  | Lecture, chalk and board,                                  | Class test, formative assessment, quizzes |
|                     | 3 | Emission spectrum – excitation and de-excitation.                      | 2 | K4(Ap) | Lecture, Chalk and board, PPT,                             | online quiz, essay questions              |
|                     | 4 | Phosphorescence, fluorescence and bioluminescence.                     | 3 | K2 (U) | Lecture, chart, flow chart, PPT                            | Fill in the blanks. True or False         |
|                     | 5 | Bioenergetics: Laws of thermodynamics,                                 | 3 | K4(Ap) | Lecture using chalk and board,                             | Class tests, MCQs,                        |

|  |   |   |   |        |   |   |
|--|---|---|---|--------|---|---|
|  |   | coupled reactions,<br>redox reactions                             |   |        | group<br>discussions,                             | formative<br>assessment                           |
|  | 6 | Concept of free<br>energy, endergonic and<br>exergonic reactions, | 3 | K4(Ap) | Interactive<br>demonstration, group<br>discussion | Written<br>Assessment,<br>Practical<br>skills     |
|  | 7 | ATP: structure, its role<br>as an energy currency<br>molecule     | 3 | K2(U)  | Interactive<br>demonstration,                     | Written<br>Assessment,<br><br>Group<br>discussion |

Course Focussing on Employability

**Activities:** Interactive demonstration, pH testing, group discussion, Buffer experiment.

**Course Focussing on Cross Cutting Issues:** Health, Diabetics

**Activities related to Cross Cutting Issues:** -

**Assignment Topic:** Straight chain and Ring chain structure of Glucose

**Seminar Topic:** water-soluble vitamins - Thiamine, Riboflavin and Niacin.

### Sample questions

#### Part A

- A buffer solution comprises which of the following?
  - A weak acid in solution
  - A strong acid in solution
  - A weak base in solution
  - A weak acid and its conjugate base in solution
- Identify the homopolysaccharides.
  - Glucose
  - Galactose
  - Starch
  - Glyceraldehyde
- Amino acids are the building blocks of
  - Protein
  - Cytokinin
  - Auxin
  - Phenylalanine

4. Which of the following is a fat-soluble vitamin?  
(a) Vitamin B (b) Vitamin K (c) Vitamin B<sub>12</sub> (d) Vitamin C
5. Out of the four statements one is fit to Soap making  
a) Emulsification b) Saponification c) Rancidification d) Insulation
6. The term lipid was first introduced by -----.  
a. Fischer b. Haworth c. Bloor d. Koshland
7. A holoenzyme is a) functional unit b) apoenzyme c) coenzyme d) all of these
8. Factors affecting enzyme activity a) concentration b) pH c) temperature d)all of these
9. \_\_\_\_\_ is light produced by a chemical reaction within a living organism. a) action spectrum  
b) adsorption spectrum c) absorption spectrum d) bioluminescence
10. The measure of a system's thermal energy per unit temperature that is unavailable for doing useful work is called a) enthalpy b) entropy c) closed system d) open system

#### **PART - B**

1. Describe the structure and importance of myoglobin.
2. Explain the secondary structure of proteins.
3. Examine the structure and functions of fatty acids.
4. Discuss the mechanism of enzyme action with suitable examples.
5. Compare and contrast phosphorescence and fluorescence.

#### **PART-C**

1. Assess the structure and properties of disaccharides.
2. Explain the structure, importance, sources and deficiency symptoms of fat soluble vitamins :  
vitamin A and vitamin D.
3. Comprehend the classification of lipids based on their hydrolysis.
4. Point out the factors affecting the enzyme activity
5. With relevant figure, describe the electromagnetic spectrum.

**Head of the Department:**

**Dr. A. Anami Augustus Arul**

**Course Instructor:**

**Dr. Sr. P. Leema Rose**

## Teaching Plan

**Department** : Botany  
**Class** : III B.Sc., Botany  
**Title of the Course** : Major Core – VII – Microbiology and Plant Pathology  
**Semester** : V  
**Course Code** : BC2053

| Course Code | L | T | P | Credits | Inst. Hours | Total Hours | Marks |          |       |
|-------------|---|---|---|---------|-------------|-------------|-------|----------|-------|
|             |   |   |   |         |             |             | CIA   | External | Total |
| BC2053      | 6 | - | - | 5       | 6           | 60          | 25    | 75       | 100   |

### Objectives

- To provide the students with the comprehensive understanding and appreciation for the diversity and significance of microbes on planet earth.
- To study the interaction between plant and pathogen and to develop method of disease management.

### Course Outcomes

| CO     | Upon completion of this course the students will be able to :  | PSO addressed | CL |
|--------|--|---------------|----|
| CO – 1 | get an insight on the structure and reproduction of bacteria and viruses.                            | PSO - 1       | U  |
| CO – 2 | explore the role and relevance of bacteria and viruses in the field of microbiology.                 | PSO - 1       | An |
| CO–3   | learn the sterilization techniques and preparation of culture media.                                 | PSO–2         | Ap |
| CO– 4  | become an expert in operating microbiological instruments thereby undertaking careers in that field. | PSO - 5       | Ap |

|       |   |         |   |
|-------|---|---------|---|
| CO -5 | understand the economic and pathological importance of bacteria, viruses and fungi. | PSO - 1 | U |
|-------|---|---------|---|

### **Teaching plan**

**Total Contact hours: 60 (Including lectures, assignments and tests)**

| Unit      | Module | Topic   | Teaching Hours | Cognitive level | Pedagogy                                       | Assessment/ Evaluation                               |
|-----------|--------|---|----------------|-----------------|--|--|
| <b>I</b>  |        |   |                |                 |  |  |
|           | 1.     | Introduction to microbial world: Bacteria: General characteristics; Archaeobacteria, Eubacteria, wall-less forms (mycoplasmas). | 2              | K2(U)           | Lecture using videos                           | Evaluation through short test, Short summary         |
|           | 2.     | Ultrastructure; Nutritional types of bacteria - autotrophs and heterotrophs   | 2              | K1(R)           | Lecture using chart                            | Simple definitions, MCQ, Diagrammatic representation |
|           | 3.     | Reproduction and recombination (conjugation, transformation and transduction).  | 2              | K2(U)           | Lecture using models                           | Chart preparation, Flow charts, Slip test            |
|           | 4.     | Binary fission and endospore formation  | 2              | K1(R)           | PPT  | Flow chart, Open book test                           |
|           | 5.     | Economic importance of bacteria with reference to their role in agriculture and industry (fermentation and medicine).           | 2              | K3(Ap)          | Lecture using Chalk and talk, Group Discussion | Chart preparation, Quiz,                             |
| <b>II</b> |        |   |                |                 |  |  |
|           | 1      | General characteristics; classification (Baltimore)   | 2              | K2(U)           | Chalk and talk method                          | Evaluation through short test,                       |

|     |   |   |   |        |  |  |
|-----|---|---|---|--------|--|--|
|     |   | re),  |   |        |  | Short summary  |
|     | 2 | Structure and replication of DNA virus (T4)   | 2 | K1(R)  | PPT  | Simple definitions, MCQ, Recall steps                |
|     | 3 | Lytic and lysogenic cycle   | 2 | K2(U)  | Video  | Chart preparation, Cycle representation, Slip test   |
|     | 4 | RNA virus (TMV, Corona Virus), viroids and prions.  | 3 | K1(R)  | PPT  | Flow chart, Open book test                           |
|     | 5 | Economic importance of viruses with reference to vaccine production, role in research, medicine and diagnostics, as causal organisms of plant diseases. | 3 | K3(Ap) | Lecture using Chalk and talk, Group Discussion | Chart preparation, Quiz,                             |
| III |   |   |   |        |  |  |
|     | 1 | Sterilization of glassware  | 2 | K2(U)  | Lecture using videos                           | Evaluation through short test, Short summary         |
|     | 2 | Preparation of agar medium.   | 1 | K1(R)  | Laboratory test                                | Practical representation                             |
|     | 3 | Bacterial growth-growth curve - pure culture, batch culture And continuous culture.   | 2 | K2(U)  | PPT, Laboratory test                           | Graphical representation, Problem solving, Slip test |
|     | 4 | Physical and chemical agents for controlling microorganisms.  | 2 | K1(R)  | PPT, Instrumentation Demonstration             | Open book test                                       |

|    |   |   |   |         |   |  |
|----|---|---|---|---------|---|--|
|    |   | Dry and Wet sterilization   |   |         |   |  |
|    | 5 | Working principles of Autoclave, Laminar Air Flow and Incubator.  | 2 | K3 (Ap) | Lecture using Chalk and talk, Instrumentation Demonstration | Chart preparation, Quiz, Schematic representation    |
|    | 6 | Contributions to Microbiology: Anton Van Leeuwenhoek, Louis Pasteur and Robert Koch.                        | 3 | K1 (R)  | Lecture using Chalk and talk, Mind map                      | Online quiz, Group Discussions                       |
| IV |   |   |   |         |   |  |
|    | 1 | Food Microbiology: General account of food spoilage through microbes.                                       | 2 | K2(U)   | PPT, Chart  | Evaluation through short test, Short summary         |
|    | 2 | Food borne infections and preventions – Botulism and Salmonellosis  | 3 | K1(R)   | PPT, Mind map   | Simple definitions, MCQ, Recall the name of microbes |
|    | 3 | Dairy microbiology – Sources of milk contamination, Pasteurization technique, Test for grading milk quality | 2 | K2(U)   | PPT, Group Discussion, Laboratory test                      | Chart preparation, Slip test, Laboratory tests       |

|   |   |  |   |         |  |   |
|---|---|--|---|---------|--|---|
|   | 4 | Potable and non-potable water  | 2 | K1(R)   | Lecture using Chalk and talk, Group Discussion | Open book test  |
|   | 5 | Municipal sewage treatment process : Primary, Secondary,(aerobic and anaerobic process), chemical treatment: chlorination. Disposal of treated sewage.(sludge as fertilizer; irrigation and dilution ) | 1 | K3 (Ap) | Lecture using videos                           | Chart preparation, Quiz,  |
|   | 6 | Test for detection of coliform bacteria  | 2 | K1 (R)  | Video, Laboratory test                         | Flow chart, Laboratory test                                       |
| V |   |  |   |         |  |   |
|   | 1 | Terms and concepts; General symptoms; Etiology; Symptomology; Host-Pathogen relationships; Disease cycle and environmental relation; prevention and control of plant diseases, and role of quarantine. | 3 | K1(R)   | PPT, Plant specimen                            | Concept description, Evaluation through short test, Short summary |
|   | 2 | Bacterial diseases – Citrus canker and angular   | 3 | K2(U)   | PPT, Plant specimen                            | Simple definitions, MCQ, Recall names of                          |

|  |   |  |   |       |  |  |
|--|---|--|---|-------|--|--|
|  |   | leaf spot of Cotton.   |   |       |  | plant with reference to disease  |
|  | 3 | Viral diseases – Bunchy Top of Banana, Vein clearing in lady's finger. | 3 | K1(R) | PPT, Plant specimen                          | MCQ, Recall names of plant with reference to disease                     |
|  | 4 | Fungal diseases – Late blight of Potato and Tikka Disease of Groundnut | 3 | K2(U) | Lecture using Chalk and talk, Plant specimen | Simple definitions, MCQ, Recall names of plant with reference to disease |
|  |   |  |   |       |  |  |

Course Focussing on Employability/ Entrepreneurship/ Skill Development : **Employability**

Activities (Em/ En/SD): **Dairy Farm Visit**

Course Focussing on Cross Cutting Issues (Professional Ethics / Human Values /Environment Sustainability / Gender Equity): **Environment Sustainability**

Activities related to Cross Cutting Issues :**NIL**

Assignment :**Unit III: Working principles of Autoclave, Laminar Air Flow and Incubator.**

**Contributions to Microbiology: Anton Van Leeuwenhoek, Louis Pasteur and Robert Koch.**

Seminar Topic: **Unit V: General symptoms; Etiology;Symptomology; Host-Pathogen relationships; Disease cycle and environmental relation; prevention and control of plant diseases, and role of quarantine.**

**Sample questions**

#### **Part A**

1. Bacillus is a Gram positive bacteria – State True or False.
2. Viruses are -----parasites.
  - a.obligate
  - b.intracellular
  - c.facultative
  - d.non-cellular

3. Hot air oven works under the principle of -----sterilization.  
a.moist heat   b.dry heat   c.water   d.chemical
4. Botulism is caused by the bacterium -----.
5. Tikka disease of groundnut is caused by fungus - State True or False.

### **Part B**

1. List out the general characters of Mycoplasma.
2. Schematically represent lytic cycle.
3. Plot bacterial growth curve and comment on it.
4. How will you test the quality of milk in laboratory?
5. What are the symptoms of citrus canker and angular leaf spot of cotton?

### **Part C**

1. Explain the ultrastructure of bacteria with a neat sketch.
2. Write an account of Corona virus with a neat sketch.
3. Summarize the physical agents involved in controlling microorganisms.
4. Describe the municipal sewage treatment process with diagrammatic representation.
5. Write an essay on Host – Pathogen relationships involved in plants.

**Head of the Department**

**Course Instructor**

**Dr. A. Anami Augustus Arul**

**Dr. J. Albino Wins**

