

**SRI SARADA COLLEGE FOR WOMEN  
(AUTONOMOUS)**

**Reaccredited with “B++” Grade by NAAC**

**(Affiliated to Periyar University)**

**SALEM – 16**



**DEPARTMENT OF BOTANY**

**CHOICE BASED CREDIT SYSTEM**

**(CBCS)**

**LEARNING OUTCOME BASED CURRICULUM FRAMEWORK**

**(LOCF)**

**B.Sc., BOTANY**

**2026 - 2029 BATCH**

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## **INTRODUCTION**

The Bachelor of Science in Botany is an undergraduate degree programme that provides a comprehensive understanding of the fascinating world of plants and their interactions with the environment. The course integrates classical knowledge of plant science with modern approaches in Biotechnology, Genetics, Herbal Technology and Advanced Biological science. Programme also with diverse electives and specializations and emphasis on interdisciplinary and applied learning.

The curriculum explores plant life from the cellular and molecular levels up to ecosystems, integrating both theoretical knowledge and practical laboratory skills. Fieldwork plays a crucial role, offering students exposure to real-life plant specimens and ecosystems

Students gain both theoretical knowledge and practical skills through laboratory experiments, fieldwork, herbarium techniques, and project-based learning. The curriculum is designed to nurture curiosity about plant life, promote sustainable use of natural resources, and encourage scientific research.

Graduates of the programme are equipped with critical thinking, analytical, and research skills that open career opportunities in education, research institutions, agriculture, forestry, horticulture, environmental management, pharmaceuticals, and biotechnology. The programme also provides a strong foundation for higher studies.

**LEARNING OUTCOME BASED CURRICULUM FRAMEWORK GUIDELINES**  
**BASED REGULATIONS FOR UNDER GRADUATE PROGRAMME**

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| <b>Programme:</b>          | <b>B.Sc. Botany</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Programme Code:</b>     | <b>UBO</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Duration:</b>           | <b>3 years [UG]</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Programme Outcomes:</b> | <p><b>PO1: Disciplinary knowledge:</b> Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study.</p> <p><b>PO2: Communication Skills:</b> Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.</p> <p><b>PO3: Critical thinking:</b> Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.</p> <p><b>PO4: Problem solving: Capacity</b> to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.</p> <p><b>PO5: Analytical reasoning:</b> Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.</p> <p><b>PO6: Research-related skills:</b> A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation.</p> <p><b>PO7: Cooperation/Team work:</b> Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team.</p> <p><b>PO8: Scientific reasoning:</b> Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.</p> |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
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|  | <p><b>PO9: Reflective thinking:</b> Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society.</p> <p><b>PO10 Information/digital literacy:</b> Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.</p> <p><b>PO 11 Self-directed learning:</b> Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.</p> <p><b>PO 12 Multicultural competence:</b> Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.</p> <p><b>PO 13: Moral and ethical awareness/reasoning:</b> Ability to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstrating the ability to identify ethical issues related to one's work, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.</p> <p><b>PO 14: Leadership readiness/qualities:</b> Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way.</p> <p><b>PO 15: Lifelong learning:</b> Ability to acquire knowledge and skills, including "learning how to learn", that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.</p> |
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| <b>Program specific Outcomes (PSO)</b>                                             |                                                                                                                                                                   |
|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| On successful completion of the B.Sc. Botany program, the students are expected to |                                                                                                                                                                   |
| <b>PSO1</b>                                                                        | Implement the concept of science and technology to foster the traditional and modern techniques for solving the complex problems in Plant Biology.                |
| <b>PSO2</b>                                                                        | Ensure the use of contemporary tools and techniques in understanding the scope and significance of Botany                                                         |
| <b>PSO3</b>                                                                        | Develop the scientific problem solving skills during experimentation, research projects, analysis and interpretation of data                                      |
| <b>PSO4</b>                                                                        | Design scientific experiments independently and to generate useful information to address various issues in Botany.                                               |
| <b>PSO5</b>                                                                        | Enhanced capacity to think critically; ability to design and execute experiments independently and/or team under multidisciplinary settings                       |
| <b>PSO6</b>                                                                        | Design and standardize protocols for public health and safety, and cultural, societal, and environmental considerations                                           |
| <b>PSO7</b>                                                                        | Apply appropriate techniques, resources, and modern ICT tools for understanding plant resources.                                                                  |
| <b>PSO8</b>                                                                        | Demonstrate the contextual knowledge in sustainable exploitation of medicinal, economically important and endangered plants as per the National Biodiversity Act. |
| <b>PSO9</b>                                                                        | Follow the concept of professional ethics and bioethics norms for practicing the value of plant kingdom.                                                          |
| <b>PSO10</b>                                                                       | Communicate proficiently with various stakeholders and society, to comprehend and to write and present reports effectively                                        |

### **Highlights of the Revamped Curriculum:**

- Student-centric, meeting the demands of industry & society, incorporating industrial components, hands-on training, skill enhancement modules, industrial project, project with viva-voce, exposure to entrepreneurial skills, training for competitive examinations, sustaining the quality of the core components and incorporating application oriented content wherever required.
- The Core subjects include latest developments in the education and scientific front, advanced programming packages allied with the discipline topics, practical training, devising statistical models and algorithms for providing solutions to industry / real life situations. The curriculum also facilitates peer learning with advanced statistical topics in the final semester, catering to the needs of stakeholders with research aptitude.
- The General Studies and problem solving skills are included as mandatory components in the ‘Training for Competitive Examinations’ course at the final semester, a first of its kind.
- The curriculum is designed so as to strengthen the Industry-Academia interface and provide more job opportunities for the students.
- The Internship during the second year vacation will help the students gain valuable work experience, that connects classroom knowledge to real world experience and to narrow down and focus on the career path.
- Project with viva-voce component in the fifth semester enables the student, application of conceptual knowledge to practical situations. The state of art technologies in conducting a Explain in a scientific and systematic way and arriving at a precise solution is ensured. Such innovative provisions of the industrial training, project and internships will give students an edge over the counterparts in the job market.
- State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature are incorporated as Elective courses, covering conventional topics.

### Value additions in the Revamped Curriculum:

| Semester        | Newly introduced Components                                                                                                                                                                                                  | Outcome / Benefits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I               | Foundation Course<br>To ease the transition of learning from higher secondary to higher education, providing an overview of the pedagogy of learning abstract Statistics and simulating mathematical concepts to real world. | <ul style="list-style-type: none"> <li>• Instill confidence among students</li> <li>• Create interest for the subject</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| I, II, III, IV  | Skill Enhancement Courses (Discipline centric / Generic/ Entrepreneurial)                                                                                                                                                    | <ul style="list-style-type: none"> <li>• Industry ready graduates</li> <li>• Skilled human resource</li> <li>• Students are equipped with essential skills to make them employable</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                            |
|                 |                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>• Training on Computing / Computational skills enable the students gain knowledge and exposure on latest computational aspects</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                         |
|                 |                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>• Data analytical skills will enable students gain internships, apprenticeships, field work involving data collection, compilation, analysis etc.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                      |
|                 |                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>• Entrepreneurial skill training will provide an opportunity for independent livelihood</li> <li>• Generates self – employment</li> <li>• Create small scale entrepreneurs</li> <li>• Training to girls leads to women empowerment</li> </ul>                                                                                                                                                                                                                                                                                                     |
|                 |                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>• Discipline centric skill will improve the Technical knowhow of solving real life problems using ICT tools</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                            |
| III, IV, V & VI | Elective Courses -<br>An open choice of topics categorized under Generic and Discipline Centric                                                                                                                              | <ul style="list-style-type: none"> <li>• Strengthening the domain knowledge</li> <li>• Introducing the stakeholders to the State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature</li> <li>• Students are exposed to Latest topics in the field of Botany that require strong subject background</li> <li>• Emerging topics in higher education / industry / communication network / health sector etc. are introduced with hands-on-training, facilitates designing of Biological models in the respective sectors</li> </ul> |

|                                        |                                                   |                                                                                                                                                                                                                                                                 |
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| IV                                     | Skill Enhancement Courses                         | <ul style="list-style-type: none"><li>● Exposure to industry moulds students into solution providers</li><li>● Generates Industry ready graduates</li><li>● Employment opportunities enhanced</li></ul>                                                         |
| II year Vacation activity              | Internship / Industrial Training                  | <ul style="list-style-type: none"><li>● Practical training at the Industry/ Banking Sector / Private/ Public sector organizations / Educational institutions, enable the students gain professional experience and also become responsible citizens.</li></ul>  |
| V                                      | Project with Viva – voce                          | <ul style="list-style-type: none"><li>● Self-learning is enhanced</li><li>● Application of the concept to real situation is conceived resulting in tangible outcome</li></ul>                                                                                   |
| VI                                     | Introduction of Professional Competency component | <ul style="list-style-type: none"><li>● Curriculum design accommodates all category of learners</li></ul>                                                                                                                                                       |
|                                        |                                                   | <ul style="list-style-type: none"><li>● ‘Training for Competitive Examinations’ – caters to the needs of the aspirants towards most sought - after services of the nation viz, UPSC, ISS, CDS, NDA, Banking Services, CAT, TNPSC group services, etc.</li></ul> |
| Extra Credits:<br>For Advanced Learner |                                                   | <ul style="list-style-type: none"><li>● To cater to the needs of peer learners / research aspirants</li></ul>                                                                                                                                                   |
| Skills acquired from the Courses       |                                                   | <ul style="list-style-type: none"><li>● Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</li></ul>                                                                                   |

**Total – 141 Credits**[illegible]

**Consolidated Semester wise and Component wise Credit distribution**

| <b>Parts</b>    | <b>Sem I</b> | <b>Sem II</b> | <b>Sem III</b> | <b>Sem IV</b> | <b>Sem V</b> | <b>Sem VI</b> | <b>Total Credits</b> |
|-----------------|--------------|---------------|----------------|---------------|--------------|---------------|----------------------|
| <b>Part I</b>   | 3            | 3             | 3              | 3             | -            | -             | 12                   |
| <b>Part II</b>  | 3            | 3             | 3              | 3             | -            | -             | 12                   |
| <b>Part III</b> | 10           | 13            | 12             | 11            | 23           | 22            | 91                   |
| <b>Part IV</b>  | 4            | 5             | 4              | 6             | 4            | 3             | 26                   |
| <b>Total</b>    | <b>20</b>    | <b>24</b>     | <b>22</b>      | <b>23</b>     | <b>27</b>    | <b>25</b>     | <b>141</b>           |

Part I, II, and Part III components will be separately taken into account for CGPA calculation and classification for the undergraduate programme and the other component. Part IV has to be completed during the duration of the programme as per the norms, to be eligible for obtaining the UG degree.

**Total Credits: 141**

**EXTRA CREDITS FOR EXTRA SKILLS**

**Total Extra Credits - 28 (20% of the total credits)**

## COURSE STRUCTURE - SEMESTER-I

| Part                                            | Course Code                     | Course Title                                   | Course Type                                 | Hrs. /<br>Week<br>L/T/P | Credits   | CIA             | ESE           | TOTAL |
|-------------------------------------------------|---------------------------------|------------------------------------------------|---------------------------------------------|-------------------------|-----------|-----------------|---------------|-------|
| I                                               | 26ULTC1/<br>26ULHC1/<br>26ULSC1 | Tamil/Hindi/<br>Sanskrit –I                    | Language                                    | 6                       | 3         | 30              | 70            | 100   |
| II                                              | 26ULEC1                         | English – I                                    | English                                     | 6                       | 3         | 30              | 70            | 100   |
| III                                             | 26UBOCC1                        | Plant<br>Diversity I –<br>Algae                | Core Course                                 | 5                       | 5         | 30              | 70            | 100   |
|                                                 | 26UBOCCQ1                       | Plant<br>Diversity I –<br>Algae -<br>Practical | Core Course                                 | 4                       | 2         | 40              | 60            | 100   |
|                                                 | 26UBOZGEC1                      | Zoology – I                                    | Generic<br>Elective                         | 3                       | 3         | 30              | 70            | 100   |
|                                                 | 26UBOZGECQ                      | Zoology<br>Practical                           |                                             | 2                       | -         | -               | -             | -     |
| IV                                              | 26UBOSEC1                       | Nursery and<br>Landscaping                     | Skill<br>Enhancement<br>Course – I<br>(NME) | 2                       | 2         | 30              | 70            | 100   |
|                                                 | 26UBOSEFC                       | Basics of<br>Botany                            | Foundation<br>Course                        | 2                       | 2         | 30              | 70            | 100   |
| <b>Total</b>                                    |                                 |                                                |                                             | <b>30</b>               | <b>20</b> |                 |               |       |
| <b>*Extra Skills<br/>(Out of College Hours)</b> |                                 |                                                |                                             |                         |           | <b>*Credits</b> | <b>*Marks</b> |       |
| <b>Articulation and Idea Fixation</b>           |                                 |                                                |                                             |                         |           | -               | -             |       |
| <b>Physical Fitness Practice</b>                |                                 |                                                |                                             |                         |           | -               | -             |       |
| <b>Society Connect Activity</b>                 |                                 |                                                |                                             |                         |           | -               | -             |       |

**\*Extra credits are given for extra skills and courses qualified in MOOC / NPTEL**

## **PEDAGOGICAL**

### **APPROACHES TEACHING**

### **LEARNING STRATEGIES**

- a) **Chalk and talk**
- b) **Group -Learning and Teaching**
- c) **Individual Learning /Self-Study**
- d) **Game Based Learning**
- e) **Technology Based Learning**
- f) **Peer Teaching**
- g) **Learning Through Problem solving**
- h) **Project Based Learning**

### **METHODS OF EVALUATION AND ASSESSMENT**

| <b>Methods of Evaluation -Theory</b>   |                                                                                                                                               |                  |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| <b>Internal Evaluation</b>             | Continuous Internal Assessment Test                                                                                                           | 30 Marks         |
|                                        | Assessment Components                                                                                                                         |                  |
|                                        | Model Examination and Attendance                                                                                                              |                  |
| <b>External Evaluation</b>             | End Semester Examination                                                                                                                      | 70 Marks         |
|                                        | <b>Total</b>                                                                                                                                  | <b>100 Marks</b> |
| <b>Methods of Evaluation-Practical</b> |                                                                                                                                               |                  |
| <b>Internal Evaluation</b>             | Laboratory work assessment (best 2 out of 3)                                                                                                  | 40 Marks         |
|                                        | Viva voce/ Lab quiz, Class Performance                                                                                                        |                  |
| <b>External Evaluation</b>             | End Semester Examination                                                                                                                      | 60 Marks         |
|                                        | Record                                                                                                                                        |                  |
|                                        | <b>Total</b>                                                                                                                                  | <b>100 Marks</b> |
| <b>REVISED BLOOMS LEVEL</b>            |                                                                                                                                               |                  |
| <b>BL1</b>                             | Exhibits memory of previously learned material by recalling fundamental facts, terms, basic concept and answers about the selection.          |                  |
| <b>BL2</b>                             | Demonstrate understanding of parts and Idea free organizing, comparing, translating, interpreting, giving descriptors and stating main ideas. |                  |
| <b>BL3</b>                             | Solve problems in new situation by applying acquired knowledge, facts, techniques and rules in different or new way.                          |                  |
| <b>BL4</b>                             | Examine and break information into parts by identifying motives or causes. Make inference and find evidence to support generalizations.       |                  |
| <b>BL5</b>                             | Present and depend opinion by making judgement about information, validity of ideas or quality of work based on a set of criteria.            |                  |
| <b>BL6</b>                             | Compile information together into different way by combining elements in a new pattern or proposing alternative solutions.                    |                  |

### **Evaluation Pattern**

An academic year is divided into two semesters. The first semester is from June/July to November/December and the second semester is from November/December to April/May. A semester consists of 90 working days.

Evaluation consists of both Continuous Internal Assessment (CIA) and End Semester Examinations (ESE). The Undergraduate Programme offered by our college have various assessments for continuous internal evaluation. Relevant types of internal assessment are developed suiting the needs and requirements of each specific course. The various assessment components are quiz, snap test, viva-voce, seminar, listening comprehension, reading comprehension, problem solving, map reading, group discussion, panel discussion, assignment, field visit, poster presentation, open book test, writing composition, case study, online test, Book Review, Projects etc.

The CIA marks are read out and signed by the students in the respective classes on the day specified in the calendar. CIA is mandatory for all the students.

### **Internal Assessment Modes (Theory Course)**

|                                      |                 |
|--------------------------------------|-----------------|
| Any six of the assessment components | 15 marks        |
| Cycle Test (2)                       | 5 marks         |
| Model Examination                    | 5 marks         |
| Attendance                           | 5 marks         |
| <b>Total</b>                         | <b>30 marks</b> |

### **Internal Assessment Modes (Practical Course)**

|                                              |                 |
|----------------------------------------------|-----------------|
| Laboratory work assessment (best 2 out of 3) | 20 marks        |
| Viva voce/ Lab quiz                          | 10 marks        |
| Class Performance                            | 10 marks        |
| <b>Total</b>                                 | <b>40 marks</b> |

### **Society Connect Project**

|                                            |                 |
|--------------------------------------------|-----------------|
| Project Assessment                         | 10 marks        |
| Presentation and feedback from the society | 10 marks        |
| Participation in discussion                | 10 marks        |
| <b>Total</b>                               | <b>30 marks</b> |

### **Internal Assessment Modes (Project)**

|                             |                 |
|-----------------------------|-----------------|
| Project Assessment          | 15 marks        |
| Participation in discussion | 10 marks        |
| Presentation                | 5 marks         |
| <b>Total</b>                | <b>30 marks</b> |

### **PASSING MINIMUM**

The candidate shall be declared to have passed the examination if the candidates secure not less than 28 marks out of 70 marks in the semester examination in each theory course and in total (CIA mark + Theory ESE) not less than 40 marks.

The candidates shall be declared to have passed the examination if she secures not less than 40 marks in total (CIA mark + Practical Exam mark) with minimum of 24 marks out of 60 marks in the Practical Exam conducted by the University. There is no passing minimum for the record notebook. However, submission of the record notebook is necessary. Candidate who does not obtain the required minimum marks for a pass in a Course/Practical shall be declared Re-Appear (RA) and the candidate has to appear and pass the same at a subsequent appearance.

## Theory Course (Revised Bloom's Taxonomy)

### Question Paper Model for UG

|                                                                                    |                                                                                          |
|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| <b>Intended Learning Skills</b>                                                    | <b>Maximum 70 marks</b><br><b>Passing Minimum : 40 %</b><br><b>Duration: Three hours</b> |
| Memory Recall/ Example/ Counter Example/Knowledge about the Concept/ Understanding | Part- A (20×1=20 marks)<br>Answer ALL questions<br>Each question carries 1 marks         |
|                                                                                    | Four questions from each UNIT                                                            |
|                                                                                    | Questions 1 to Questions 20                                                              |
| Description/Application (problem)                                                  | Part- B (5×4=20 marks)<br>Answer ALL questions<br>Each question carries 4 marks          |
|                                                                                    | <b>Either-or-Type</b><br>Both parts of each question from the same Unit                  |
|                                                                                    | Questions 21 (a) or 21 (b)<br>to<br>Questions 25 (a) to 25 (b)                           |
| Analysis/ Create/Evaluation                                                        | Part- C (3×10=30 marks)<br>Answer ANY THREE questions<br>Each question carries 10 marks  |
|                                                                                    | There shall be FIVE questions covering all the five units                                |
|                                                                                    | Question 26 to Question 30                                                               |

Each question should carry course outcomes and cognitive level For instance:

1. [CO1 : BL<sub>2</sub>] Question xxxx
2. [CO3 : BL<sub>1</sub>] Question xxxx

## CORE - I PLANT DIVERSITY I - ALGAE

|                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                            |          |         |              |                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----------|---------|--------------|---------------------|
| Title of the Course                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | PLANT DIVERSITY I – ALGAE                                                  |          |         |              |                     |
| Paper Number                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | CORE I                                                                     |          |         |              |                     |
| Category                                                                                                                                                                                               | Core                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Year                                                                       | I        | Credits | 5            | Course Code         |
|                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Semester                                                                   | I        |         |              | 26UBOCC1            |
| Instructional Hours per week                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Lecture                                                                    | Tutorial |         | Lab Practice | Total               |
|                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 5                                                                          | -        |         | -            | 5                   |
| Pre-requisite                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Students should be familiar with the basics of different classes of algae. |          |         |              |                     |
| Learning Objectives                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                            |          |         |              |                     |
| C1                                                                                                                                                                                                     | To provide a comprehensive knowledge on the biology of algae.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                            |          |         |              |                     |
| C2                                                                                                                                                                                                     | To provide a basis for better understanding of the evolution of higher plants.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                            |          |         |              |                     |
| C3                                                                                                                                                                                                     | To understand reproductive biology, ecology of plants by studying the simpler systems in algae.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                            |          |         |              |                     |
| C4                                                                                                                                                                                                     | To understand the role of algae in ecosystems as primary producers of nutrition.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                            |          |         |              |                     |
| C5                                                                                                                                                                                                     | To understand importance of algae to animals and humans.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                            |          |         |              |                     |
| Course Outcomes :<br>On completion of this course, students will be able to: CO                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                            |          |         |              | Knowledge Level     |
| 1. Describe the characteristic features, classification, distribution, habitat, thallus organization and life cycle patterns of algae.                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                            |          |         |              | K1, K2, K3, K4 & K5 |
| 2. Explain the morphology, reproduction and life history of representative genera of Algae.                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                            |          |         |              |                     |
| 3. Compare the thallus organization, modes of reproduction and life history of representative genera of Algae.                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                            |          |         |              |                     |
| 4. Analyze the nutritional requirements, cultivation methods, production systems and harvesting techniques of algae for value-added products.                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                            |          |         |              |                     |
| 5. Evaluate the ecological, industrial and commercial applications of algae and assess the role of Artificial Intelligence in algal identification, biotechnology and sustainable resource management. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                            |          |         |              |                     |
| UNIT                                                                                                                                                                                                   | CONTENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                            |          |         |              |                     |
| I                                                                                                                                                                                                      | Definition of algae. Characteristic features of Algae w.s.r.t. cell wall, flagella eye spot, pigmentation and reserve food materials in algae. Algal distribution. Habit and Habitat (Hydrophytes: Benthophytes, Epactiphytes, Thermophytes, planktophytes, Halophytes, Epizoophytes; Edaphophytes: Saprophytes, Cryptophytes; Aerophytes; Symbionts; Endozoophytes; Parasites; Fluviatile). Thallus organization: (unicellular, colonial-filamentous – siphonous - parenchymatous). Reproduction and life history: (haplontic, diplontic, diplohaplontic and diplobiontic). Classification (Fritsch-1935-1945), criteria for classification. |                                                                            |          |         |              |                     |

|                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>II</b>                                                                                                                              | A general study of Thallus organization; Reproduction-Vegetative, asexual, sexual reproduction and life histories of the following genera: <i>Anabaena</i> , <i>Chlorella</i> , <i>Volvox</i> , <i>Oedogonium</i> , <i>Chara</i> .                                                                                                                                                                                                                                                                                                        |
| <b>III</b>                                                                                                                             | A general study of Thallus organization; Reproduction-Vegetative, asexual, sexual reproduction and life histories of the following genera: <i>Caulerpa</i> , <i>Ulva</i> , Diatoms, <i>Sargassum</i> , <i>Gracilaria</i> .                                                                                                                                                                                                                                                                                                                |
| <b>IV</b>                                                                                                                              | Inorganic nutritional requirements of algae and algal culture media. Algal cultivation methods indoor cultivation methods and large-scale cultivation of algae, Algal production systems; harvesting of algae and value added products.                                                                                                                                                                                                                                                                                                   |
| <b>V</b>                                                                                                                               | Algae as food and feed: Agar-agar, Alginic acid and Carrageenan; Diatomite. Resource potential of algae: Application of algae as fuel, agriculture and pharmaceutical. Phyco remediation. Role of algae in CO <sub>2</sub> sequestration, Algae as indicator of water pollution, algal bioinoculants, Bioluminescence. <b>AI Application in Phycology:</b> Introduction to Artificial Intelligence (AI); AI in identification of algae using images. Future scope of AI in Algal Studies.                                                 |
| Extend Professional component (is a part of internal component only, Not to be included in the External Examination on question paper) | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour)                                                                                                                                                                                                                                                                                                                                                 |
| Skills acquired from this course                                                                                                       | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Recommended Texts</b>                                                                                                               | <ol style="list-style-type: none"> <li>1. Dehradun. Edwardlee, R. 2018. Phycology, 5<sup>th</sup> Ed., Cambridge University Press, London.</li> <li>2. Kumar, H.D. 1999. Introductory Phycology. Affiliated East-West Press, Delhi</li> <li>3. Singh, Pandey and Jain. 2020. A text book of Botany, 5th Edition, Rastogi Publication, Meerut.</li> <li>4. Vashishta, P.C. 2014. S.Chand&amp; Company Ltd, New Delhi.</li> <li>5. Ian Morris. 1977. An introduction to the algae. Hutchinson &amp; Co (Publishers) Ltd. London.</li> </ol> |

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>References Books</b> | <ol style="list-style-type: none"> <li>1. Aziz, F and Rasheed, R. 2019. A Course Book of Algae. Publisher: University of Sulaimani. ISBN: 978-9922-20-391-1.</li> <li>2. Mihir Kumar, D. 2010. Algal Biotechnology. Daya Publishing House, New Delhi</li> <li>3. Chapman V.J. and Chapman D.J, 2013. The Algae. Alpha Numera.</li> <li>4. Fritsch, F.E. 1945. Structure and reproduction of Algae. Cambridge University press.</li> <li>5. Round, FE. 1984. The Ecology of Algae. Cambridge University Press.</li> <li>6. Lee, R.D. 2008. Phycology 4th Edition, Cambridge University Press, New York.</li> <li>7. Bold, H.C and Wynne, M.J. 1978. Introduction to the Algae: Structure and Function. Prantice Hall of India New Delhi.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Web Resources</b>    | <ol style="list-style-type: none"> <li>1. <a href="https://www.crcpress.com/Therapeutic-and-Nutritional-Uses-of-Algae/Pereira/p/book/9781498755382">https://www.crcpress.com/Therapeutic-and-Nutritional-Uses-of-Algae/Pereira/p/book/9781498755382</a></li> <li>2. <a href="https://www.crcpress.com/Therapeutic-and-Nutritional-Uses-of-Algae/Pereira/p/book/9781498755382">https://www.crcpress.com/Therapeutic-and-Nutritional-Uses-of-Algae/Pereira/p/book/9781498755382</a></li> <li>3. <a href="https://www.crcpress.com/Algae-Anatomy-Biochemistry-and-Biotechnology-Second-Edition/Barsanti-Gualtieri/p/book/9781439867327">https://www.crcpress.com/Algae-Anatomy-Biochemistry-and-Biotechnology-Second-Edition/Barsanti-Gualtieri/p/book/9781439867327</a></li> <li>4. <a href="https://www.crcpress.com/Marine-Algae-Biodiversity-Taxonomy-Environmental-Assessment-and-Biotechnology/Pereira-Neto/p/book/9781466581678">https://www.crcpress.com/Marine-Algae-Biodiversity-Taxonomy-Environmental-Assessment-and-Biotechnology/Pereira-Neto/p/book/9781466581678</a></li> <li>5. <a href="https://www.kopykitab.com/Botany-For-Degree-Students-ALGAE-by-B-R-Vashishta-Dr-A-K-Sinha-Dr-V-P-Singh">https://www.kopykitab.com/Botany-For-Degree-Students-ALGAE-by-B-R-Vashishta-Dr-A-K-Sinha-Dr-V-P-Singh</a></li> <li>6. <a href="https://www.wileyindia.com/a-textbook-of-algae.html">https://www.wileyindia.com/a-textbook-of-algae.html</a></li> <li>7. <a href="https://www.kobo.com/in/en/ebook/algae-biotechnology">https://www.kobo.com/in/en/ebook/algae-biotechnology</a></li> <li>8. <a href="https://www.ikbooks.com/books/book/life-sciences/botany/a-textbook-algae/9788188237449/">https://www.ikbooks.com/books/book/life-sciences/botany/a-textbook-algae/9788188237449/</a></li> </ol> |

### Mapping with Programme Outcomes:

| COs  | PO1 | PO2 | PO3 | PO4 | PO5 | PSO6 | PSO7 | PSO8 | PSO9 | PSO10 |
|------|-----|-----|-----|-----|-----|------|------|------|------|-------|
| CO1  | 3   | 3   | 1   | 3   | 2   | 1    | 2    | 2    | 2    | 1     |
| CO 2 | 3   | 3   | 2   | 2   | 3   | 3    | 2    | 1    | 3    | 3     |
| CO 3 | 2   | 2   | 1   | 1   | 2   | 2    | 1    | 3    | 2    | 2     |
| CO 4 | 3   | 3   | 3   | 3   | 3   | 2    | 3    | 3    | 3    | 2     |
| CO 5 | 3   | 3   | 2   | 3   | 2   | 3    | 3    | 3    | 2    | 3     |

S - Strong (3)      M - Medium (2)      L – Low (1)

## PLANT DIVERSITY I - ALGAE - PRACTICAL

|                                                                                                                                                                                                               |                                                                                                        |                                                                                                                                                                                           |   |          |                    |             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|----------|--------------------|-------------|
| Title of the Course                                                                                                                                                                                           | PLANT DIVERSITY I – ALGAE – PRACTICAL                                                                  |                                                                                                                                                                                           |   |          |                    |             |
| Paper Number                                                                                                                                                                                                  | CORE PRACTICAL                                                                                         |                                                                                                                                                                                           |   |          |                    |             |
| Category                                                                                                                                                                                                      | Core                                                                                                   | Year                                                                                                                                                                                      | I | Credits  | 2                  | Course Code |
|                                                                                                                                                                                                               |                                                                                                        | Semester                                                                                                                                                                                  | I |          |                    | 26UBOCCQ1   |
| Instructional Hours per week                                                                                                                                                                                  |                                                                                                        | Lecture                                                                                                                                                                                   |   | Tutorial | Lab Practice       | Total       |
|                                                                                                                                                                                                               |                                                                                                        | -                                                                                                                                                                                         |   | -        | 4                  | 4           |
| Pre-requisite                                                                                                                                                                                                 |                                                                                                        | Students should be familiar with the basics of algae.                                                                                                                                     |   |          |                    |             |
| Learning Objectives                                                                                                                                                                                           |                                                                                                        |                                                                                                                                                                                           |   |          |                    |             |
| C1                                                                                                                                                                                                            | To develop skills to identify algae based on habitat, thallus structure and the internal organization. |                                                                                                                                                                                           |   |          |                    |             |
| C2                                                                                                                                                                                                            | To identify microalgae in a mixture.                                                                   |                                                                                                                                                                                           |   |          |                    |             |
| C3                                                                                                                                                                                                            | To develop skills to prepare the micro slides of algae.                                                |                                                                                                                                                                                           |   |          |                    |             |
| C4                                                                                                                                                                                                            | To study the economic importance of few species.                                                       |                                                                                                                                                                                           |   |          |                    |             |
| C5                                                                                                                                                                                                            | To understand importance of algae to animals and humans                                                |                                                                                                                                                                                           |   |          |                    |             |
| Course Outcomes:<br>On completion of this course, the students will be able to : CO                                                                                                                           |                                                                                                        |                                                                                                                                                                                           |   |          | Programme Outcomes |             |
| 1. Recall and identify algae using key identification characters.                                                                                                                                             |                                                                                                        |                                                                                                                                                                                           |   |          | K1                 |             |
| 2. Demonstrate practical skills in preparation of fresh mount and identification of algal forms from algal mixture.                                                                                           |                                                                                                        |                                                                                                                                                                                           |   |          | K2                 |             |
| 3. Describe the internal structure of algae prescribed in the syllabus                                                                                                                                        |                                                                                                        |                                                                                                                                                                                           |   |          | K3                 |             |
| 4. Decipher the algal diversity in fresh/marine water and their economic significance.                                                                                                                        |                                                                                                        |                                                                                                                                                                                           |   |          | K4                 |             |
| 5. Evaluate the various techniques used to culture algae for commercial purposes                                                                                                                              |                                                                                                        |                                                                                                                                                                                           |   |          | K5                 |             |
| EXPERIMENTS                                                                                                                                                                                                   |                                                                                                        |                                                                                                                                                                                           |   |          |                    |             |
| 1. Micro-preparation of the types prescribed in the syllabus.                                                                                                                                                 |                                                                                                        |                                                                                                                                                                                           |   |          |                    |             |
| 2. Identifying the micro slides relevant to the syllabus.                                                                                                                                                     |                                                                                                        |                                                                                                                                                                                           |   |          |                    |             |
| 3. Identifying types of algal mixture.                                                                                                                                                                        |                                                                                                        |                                                                                                                                                                                           |   |          |                    |             |
| 4. Economic importance of Algae as: (i) Food (ii) Feed (iii) Biofertilizers (iv) Seaweed liquid fertilizer (v) Hydrogen production by algae (vi) SCP (vii) Agar Agar (viii) Alginate (ix) Diatomaceous earth. |                                                                                                        |                                                                                                                                                                                           |   |          |                    |             |
| 5. Field visit to study fresh water/marine water algal habitats.                                                                                                                                              |                                                                                                        |                                                                                                                                                                                           |   |          |                    |             |
| 6. Visit to nearby industry actively engaged in algal technology and the incorporation of AI in their industry.                                                                                               |                                                                                                        |                                                                                                                                                                                           |   |          |                    |             |
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)                                                                         |                                                                                                        | Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour) |   |          |                    |             |

|                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Skills acquired from this Course | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable skill                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Recommended Texts</b>         | <ol style="list-style-type: none"> <li>1. Kumar, H.D. 1999. Introductory Phycology. Affiliated East-West Press, Delhi.</li> <li>2. Bendre, M. Ashok and Ashok Kumar, A. 2020. Text Book of Practical Botany-1 (10<sup>th</sup>ed).Rastogi Publications, Meerut.</li> <li>3. Round, FE. 1984. The Ecology of Algae. Cambridge University Press.</li> <li>4. Aziz, F and Rasheed, R. 2019. A Course Book of Algae. Publisher: University of Sulaimani.ISBN: 978-9922-20-391-1.</li> <li>5. Singh, Pandey and Jain. 2020. A text book of Botany, 5th Edition, Rastogi Publication, Meerut.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Reference Books</b>           | <ol style="list-style-type: none"> <li>1. Nancy Serediak and M. Huynh. 2011. Algae identification lab Guide. Accompanying</li> <li>2. Manual to algae identification field guide, Ottawa Agriculture and Agri food Canada publisher.</li> <li>3. Chapman, V.J and Chapaman, D.J. 1960.The Algae, ELBS &amp; MacMillan, London.</li> <li>4. Lee, R.D. 2008.Phycology 4th Edition, Cambridge University Press, New York.</li> <li>5. Dehradun. Edwardlee, R. 2018. Phycology, 5<sup>th</sup> Ed., Cambridge University Press, London.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Web Resources</b>             | <ol style="list-style-type: none"> <li>1. <a href="https://www.amazon.in/Practical-Manual-Algae-SundaraRajan/dp/8126106492">https://www.amazon.in/Practical-Manual-Algae-SundaraRajan/dp/8126106492</a></li> <li>2. <a href="https://books.google.co.in/books/about/Practical_Manual_of_Algae.html?id=8d5DAAAACAAJ&amp;redir_esc=">https://books.google.co.in/books/about/Practical_Manual_of_Algae.html?id=8d5DAAAACAAJ&amp;redir_esc=</a></li> <li>3. <a href="https://freebookcentre.net/biology-books-download/Concepts-ofBotany-Algae-(PDF-21P).html">https://freebookcentre.net/biology-books-download/Concepts-ofBotany-Algae-(PDF-21P).html</a></li> <li>4. <a href="https://www.ebooks.com/en-in/book/210152662/algae/sachin-kumarmandotra/">https://www.ebooks.com/en-in/book/210152662/algae/sachin-kumarmandotra/</a></li> <li>5. <a href="https://books.google.co.in/books/about/Algae.html?id=s1P855ZWc0kC&amp;redir_esc=y">https://books.google.co.in/books/about/Algae.html?id=s1P855ZWc0kC&amp;redir_esc=y</a></li> </ol> |

### Mapping with Programme Outcomes:

| COs  | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------|-----|-----|-----|-----|-----|------|------|------|------|------|
| CO1  | 3   | 3   | 1   | 3   | 2   | 1    | 2    | 3    | 2    | 1    |
| CO 2 | 3   | 3   | 2   | 2   | 3   | 3    | 2    | 3    | 3    | 3    |
| CO 3 | 2   | 2   | 3   | 3   | 1   | 2    | 1    | 3    | 1    | 2    |
| CO 4 | 3   | 3   | 3   | 3   | 3   | 2    | 3    | 3    | 3    | 2    |
| CO 5 | 3   | 3   | 2   | 2   | 2   | 3    | 3    | 3    | 2    | 3    |

**S - Strong (3)      M - Medium (2)      L – Low (1)**

## Generic Elective-I: Zoology-I SEMESTER – I

| Course Code         | Course Name                                                                                                                                                                                                                  | Category | L | T | P | S | Credits      | Inst. Hours       | Marks |          |       |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---|---|---|---|--------------|-------------------|-------|----------|-------|
|                     |                                                                                                                                                                                                                              |          |   |   |   |   |              |                   | CIA   | External | Total |
| 26UBOZGEC1          | Generic Elective-I: Zoology-I                                                                                                                                                                                                | Core     | Y | - | - | - | 3            | 3                 | 30    | 70       | 100   |
| Learning Objectives |                                                                                                                                                                                                                              |          |   |   |   |   |              |                   |       |          |       |
| CO1                 | To acquire a basic knowledge of diversity and organization of Protozoa, Coelenterata, Helminthes and Annelida                                                                                                                |          |   |   |   |   |              |                   |       |          |       |
| CO2                 | To acquire a basic knowledge of diversity and organization of Arthropoda, Mollusca and Echinodermata                                                                                                                         |          |   |   |   |   |              |                   |       |          |       |
| CO3                 | To comprehend the taxonomic position and diversity among Protochordata, Pisces and Amphibia                                                                                                                                  |          |   |   |   |   |              |                   |       |          |       |
| CO4                 | To comprehend the taxonomic position and diversity among Reptilia, Aves and Mammalia                                                                                                                                         |          |   |   |   |   |              |                   |       |          |       |
| CO5                 | To acquire detailed knowledge of select invertebrate and chordate forms                                                                                                                                                      |          |   |   |   |   |              |                   |       |          |       |
| UNIT                | Details                                                                                                                                                                                                                      |          |   |   |   |   | No. of Hours | Course Objectives |       |          |       |
| I                   | Invertebrata - Principles of taxonomy. Criteria for classification – Symmetry and Coelom – Binomial nomenclature. General characters and Structure of Protozoa - Paramecium, Porifera - Leucosolenia, Coelenterata – Aurelia |          |   |   |   |   | 9            | CO1               |       |          |       |
| II                  | General characters and Structure of Helminthes - Fasciola hepatica and Annelid - Leech, Arthropoda – Cockroach, Mollusca - Fresh water mussel and Echinodermata - Starfish.                                                  |          |   |   |   |   | 9            | CO2               |       |          |       |
| III                 | Classification and External characters of Prochordata – Cephalochordata - Amphioxus, Pisces- Shark and Amphibia - Frog.                                                                                                      |          |   |   |   |   | 9            | CO3               |       |          |       |
| IV                  | Classification and External characters of Reptilia - Calotes, Aves - Pigeon and Mammalia - Rabbit.                                                                                                                           |          |   |   |   |   | 9            | CO4               |       |          |       |
| V                   | Animal organization - Structure and organization of Earthworm, Fish & Rat                                                                                                                                                    |          |   |   |   |   | 9            | CO5               |       |          |       |
| Total               |                                                                                                                                                                                                                              |          |   |   |   |   | 45           |                   |       |          |       |

| Course Outcomes                                                                                 |                                                                                                               |               |           |
|-------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|---------------|-----------|
| Course Outcomes                                                                                 | On completion of this course, students will be able to;                                                       |               |           |
| CO1                                                                                             | Recall the characteristic features invertebrates and chordates                                                | PO1           | K1        |
| CO2                                                                                             | Classify invertebrates up to class level and chordates up to order level.                                     | PO1, PO2      | K2        |
| CO3                                                                                             | Explain and discuss the structural and functional Organisation of some invertebrates and chordates            | PO4, PO6      | K2        |
| CO4                                                                                             | Relate the adaptations and habits of animals to their Habitat                                                 | PO4, PO5, PO6 | K3        |
| CO5                                                                                             | Analyse the taxonomic position of animals.                                                                    | PO3, PO8      | K4        |
| Text Books<br>(Latest Editions)                                                                 |                                                                                                               |               |           |
| 1.                                                                                              | Ekambaranatha Iyer, Outlines of Zoology Viswanathan Publication                                               |               |           |
| References Books<br>(Latest editions, and the style as given below must be strictly adhered to) |                                                                                                               |               |           |
| 1.                                                                                              | Ekambaranatha Iyar and T.N.Ananthakrishnian - A Manual of Zoology Invertebrata–VolI:Viswanathan Publishers.   |               |           |
| 2.                                                                                              | Ekambaranatha Iyar and T.N.Ananthakrishnan, - A Manual of Zoology-Invertebrata–VolII: Viswanathan Publishors. |               |           |
| 3.                                                                                              | Ekambaranatha Iyar and T.N.Ananthakrishnan,- A Manual of Zoology: Chordata Viswanathan Publishers.            |               |           |
| 4.                                                                                              | Jordan E.L.and P.S. Verma-Invertebrate Zoology, S.Chand &Co.                                                  |               |           |
| Web Resources                                                                                   |                                                                                                               |               |           |
| 1.                                                                                              | <a href="http://www.sanctuaryasia.com">www.sanctuaryasia.com</a>                                              |               |           |
| 2.                                                                                              | <a href="http://www.iaszoology.com">www.iaszoology.com</a>                                                    |               |           |
| Methods of Evaluation                                                                           |                                                                                                               |               |           |
| Internal Evaluation                                                                             | Continuous Internal Assessment Test                                                                           |               | 30 Marks  |
|                                                                                                 | Assignments                                                                                                   |               |           |
|                                                                                                 | Seminars                                                                                                      |               |           |
|                                                                                                 | Attendance and Class Participation                                                                            |               |           |
| External Evaluation                                                                             | End Semester Examination                                                                                      |               | 70 Marks  |
|                                                                                                 | Total                                                                                                         |               | 100 Marks |
| Methods of Assessment                                                                           |                                                                                                               |               |           |
| Recall (K1)                                                                                     | Simple definitions, MCQ, Recall steps, Concept definitions                                                    |               |           |
| Understand/ Comprehend (K2)                                                                     | MCQ, True/False, Short essays, Concept explanations, Short summary or overview                                |               |           |

|                         |                                                                                                                 |
|-------------------------|-----------------------------------------------------------------------------------------------------------------|
| <b>Application (K3)</b> | Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain                          |
| <b>Analyze (K4)</b>     | Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge |
| <b>Evaluate (K5)</b>    | Longer essay/ Evaluation essay, Critique or justify with pros and cons                                          |
| <b>Create (K6)</b>      | Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations                        |

**Mapping with Programme Outcomes:**

|             | <b>PO 1</b> | <b>PO 2</b> | <b>PO 3</b> | <b>PO 4</b> | <b>PO 5</b> | <b>PO 6</b> | <b>PO 7</b> | <b>PO 8</b> |
|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <b>CO 1</b> | S           | L           | L           | L           | L           | L           | L           | L           |
| <b>CO 2</b> | M           | S           | L           | L           | L           | L           | L           | L           |
| <b>CO 3</b> | L           | L           | L           | S           | L           | S           | L           | L           |
| <b>CO 4</b> | L           | L           | L           | S           | S           | M           | L           | L           |
| <b>CO 5</b> | L           | L           | S           | L           | L           | L           | L           | S           |

**S-Strong (3)**

**M-Medium (2)**

**L-Low (1)**

**GENERIC ELECTIVE ZOOLOGY LAB COURSE (PRACTICAL)**  
**SEMESTER – I & II**

| Course Code                                                                                     | Course Name                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Category | L | T | P | S | Credits      | Inst. Hours | Marks             |          |       |
|-------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---|---|---|---|--------------|-------------|-------------------|----------|-------|
|                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |          |   |   |   |   |              |             | CIA               | External | Total |
| 26UBOZGECQ                                                                                      | LAB COURSE –<br>GENERIC ELECTIVE<br>ZOOLOGY                                                                                                                                                                                                                                                                                                                                                                                                                               | Core     | Y | - | - | - | 4<br>(2+2)   | 2           | 40                | 60       | 100   |
| Learning Objectives                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |          |   |   |   |   |              |             |                   |          |       |
| CO1                                                                                             | 1. Learn and be familiar with the Laboratory techniques.<br>2. To understand the taxonomic position, body organization and evolutionary relationship of animals.<br>3. To inculcate the significance of various non chordates and chordates.                                                                                                                                                                                                                              |          |   |   |   |   |              |             |                   |          |       |
| Expected Course Outcomes - On the successful completion of the course, student will be able to: |                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |          |   |   |   |   |              |             |                   |          |       |
| 1                                                                                               | Familiar with practical skills in the use of tools, technologies and methods common to microbiology and physiology.                                                                                                                                                                                                                                                                                                                                                       |          |   |   |   |   |              |             |                   |          |       |
| 2                                                                                               | Apply knowledge and come to know how to handle different organisms.                                                                                                                                                                                                                                                                                                                                                                                                       |          |   |   |   |   |              |             |                   |          |       |
| 3                                                                                               | Analyze and to observe various specimens by using Microscope.                                                                                                                                                                                                                                                                                                                                                                                                             |          |   |   |   |   |              |             |                   |          |       |
| UNIT                                                                                            | Details                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |   |   |   |   | No. of Hours |             | Course Objectives |          |       |
| MAJOR<br>(20 Marks)                                                                             | 1.Cockroach/Fish –Digestive System.<br>2.Qualitative detection of excretory products (Ammonia, Urea, Uric acid).                                                                                                                                                                                                                                                                                                                                                          |          |   |   |   |   | 12<br>12     |             | CO1               |          |       |
| MINOR<br>(10 Marks)                                                                             | 1.Mouth parts of Honey Bee, Mosquito.<br>3.Fish – Earthworm Body Setae.<br>4.ABO blood group                                                                                                                                                                                                                                                                                                                                                                              |          |   |   |   |   | 12<br>12     |             | CO2               |          |       |
| SPOTTERS<br>(20 Marks)                                                                          | Invertebrata: Amoeba, Paramecium, Trypanosoma, Euglena, Plasmodium, Leucosolenia, Sycon sponge, Aurelia, Obelia, Liver fluke, Tapeworm, Earthworm, Nereis, Leech, Cockroach, Prawn, Scorpion, Grasshopper, Fresh water mussel, Pila, Starfish.<br>Protochordata and Vertebrata: Amphioxus, Shark, Fish, Frog, Salamander, Calotes, Chamaeleon, Turtle, Cobra, Viper, Pigeon, Rat, Bat, Rabbit.<br>Larval forms: Zoea larva, Mysis larva, Bipinneria larva, Tadpole larva. |          |   |   |   |   | 12           |             | CO3               |          |       |
|                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |          |   |   |   |   | 60           |             |                   |          |       |

| Text Book(s) |                                                                                                                               |
|--------------|-------------------------------------------------------------------------------------------------------------------------------|
| 1            | Arumugam N. (2013). <i>Developmental Zoology</i> , Saras Publication, Nagercoil, Tamilnadu, India.                            |
| 2            | Das S. (2020). <i>Microbiology Practical Manual</i> , CBS Publication, Delhi.                                                 |
| 3            | Jayasurya, Arumugam N, Dulsy Fatima. (2013). <i>Practical Zoology Vol 3</i> , Saras Publication, Nagercoil, Tamilnadu, India. |
| 4            | Singh HR and Neeraj kumar. (2014). <i>Animal Physiology and Biochemistry</i> , Vishal Publishing Co. Jalandhar, Delhi.        |

**Mapping with Programme Outcomes:**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| CO1 | S   | L   | M   | S   | L   | M   | S   | L   |
| CO2 | L   | S   | L   | M   | M   | L   | L   | L   |
| CO3 | S   | S   | L   | L   | L   | L   | L   | L   |

\*S-Strong; M-Medium; L-Low

**NON - MAJOR ELECTIVE - I**  
**NURSERY AND LANDSCAPING**

|                                                                                                     |                                                                                                                                     |                                                                                 |          |         |                 |             |
|-----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|----------|---------|-----------------|-------------|
| Title of the Course                                                                                 |                                                                                                                                     | NURSERY AND LANDSCAPING                                                         |          |         |                 |             |
| Paper Number                                                                                        |                                                                                                                                     | Non-Major Elective-I                                                            |          |         |                 |             |
| Category                                                                                            | Elective                                                                                                                            | Year                                                                            | I        | Credits | 2               | Course Code |
|                                                                                                     |                                                                                                                                     | Semester                                                                        | I        |         |                 | 26UBOSECI   |
| Instructional Hours per week                                                                        |                                                                                                                                     | Lecture                                                                         | Tutorial |         | Lab Practice    | Total       |
|                                                                                                     |                                                                                                                                     | 2                                                                               | -        |         | -               | 2           |
| Pre-requisite                                                                                       |                                                                                                                                     | Students should know about the fundamental concepts of nursery and landscaping. |          |         |                 |             |
| Learning Objectives                                                                                 |                                                                                                                                     |                                                                                 |          |         |                 |             |
| C1                                                                                                  | To recognize the importance of growing plants and practice the knowledge gained by developing kitchen garden and ornamental garden. |                                                                                 |          |         |                 |             |
| C2                                                                                                  | To be able to design gardens and become entrepreneur in Horticulture.                                                               |                                                                                 |          |         |                 |             |
| C3                                                                                                  | To study the methods of propagation.                                                                                                |                                                                                 |          |         |                 |             |
| C4                                                                                                  | To know about nursery structure.                                                                                                    |                                                                                 |          |         |                 |             |
| C5                                                                                                  | To learn about gardening.                                                                                                           |                                                                                 |          |         |                 |             |
| Course Outcomes:<br>On completion of this course, the students will be able to:CO                   |                                                                                                                                     |                                                                                 |          |         | Knowledge Level |             |
| 1. Recognize the basic principles and components of gardening.                                      |                                                                                                                                     |                                                                                 |          |         | K1              |             |
| 2. Explain about bio- aesthetic planning and conceptualize flower arrangement.                      |                                                                                                                                     |                                                                                 |          |         | K2              |             |
| 3. Apply techniques for design various types of gardens according to the culture and art of bonsai. |                                                                                                                                     |                                                                                 |          |         | K3 & K6         |             |
| 4. Compare and contrast different garden styles and landscaping patterns.                           |                                                                                                                                     |                                                                                 |          |         | K4              |             |
| 5. Establish and maintain special types of gardens for outdoor and indoor landscaping.              |                                                                                                                                     |                                                                                 |          |         | K5 & K6         |             |
| UNIT                                                                                                | CONTENTS                                                                                                                            |                                                                                 |          |         |                 |             |
| I                                                                                                   | Introduction, prospects and scope of nursery and landscaping.                                                                       |                                                                                 |          |         |                 |             |
| II                                                                                                  | Methods of Propagation – cutting, layering, grafting, budding, Floriculture – Rose, Chrysanthemum, Jasmine – cultivation.           |                                                                                 |          |         |                 |             |
| III                                                                                                 | Gardening – formal garden, informal garden, vegetable garden, landscaped layout designing – formation and maintenance of lawn.      |                                                                                 |          |         |                 |             |
| IV                                                                                                  | Nursery structures – Green house – Shade house, Mist chamber – Topiary, Bonsai Culture.                                             |                                                                                 |          |         |                 |             |
| V                                                                                                   | Planning residential and non-residential landscape: Site analysis, Assessment of the area, Designing. Examples – House, College.    |                                                                                 |          |         |                 |             |

|                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | Questions related to the above topics, from various competitive examinations UPSC/ TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Skills acquired from this course                                                                                                      | Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Recommended Texts</b>                                                                                                              | <ol style="list-style-type: none"> <li>1. Amarnath V. 2006. Nursery and Landscaping, M/s IBD Publishers, New Delhi.</li> <li>2. Butts, E and Stensson, K. 2012. Sheridan Nurseries: One hundred years of People, Plans, and Plants. Dundurn Group Ltd.</li> <li>3. Russell, T. 2012. Nature Guide: Trees: The world in your hands(Nature Guides). Mukherjee D. Gardening in India, Oxford IBH publishing co, New Delhi.</li> <li>4. Kumar, N. 1997. Introduction to Horticulture, Rajalakshmi Publications, Nagercoil.</li> <li>5. Butts, E. and Stensson, K. 2012.Sheridan Nurseries: One hundred years of People,Plans, and Plants. Dundurn Group Ltd.</li> </ol>                                                                                                                                                                                                                                                                                           |
| <b>Reference Books</b>                                                                                                                | <ol style="list-style-type: none"> <li>1. Edmond Musser and Andres, Fundamentals of Horticulture, McGraw Hill Book Co. New Delhi.</li> <li>2. Agrawal, P.K. 1993. Hand Book of Seed Technology, Dept. of Agriculture and Cooperation, National Seed Corporation Ltd., New Delhi.</li> <li>3. Janick Jules. 1979. Horticultural Science. (3<sup>rd</sup> Ed.), W.H. Freeman and Co., San Francisco, USA.</li> <li>4. Singh, J. 2018. Fundamentals of Horticulture. Kalyani Publishers.</li> <li>5. Sharma V. K. 1999. Encyclopaedia of Practical Horticulture, Vol I – IV, Deep and Deep Publ. Pvt. Ltd.</li> </ol>                                                                                                                                                                                                                                                                                                                                            |
| <b>Web Resources</b>                                                                                                                  | <ol style="list-style-type: none"> <li>1. <a href="https://www.kopykitab.com/higher-education-ebooks/higher-education- ebooks/Agricultural-Industry-agriculture-eBooks/Nursery-And- Landscaping-by-V-Amarnath">https://www.kopykitab.com/higher-education-ebooks/higher-education- ebooks/Agricultural-Industry-agriculture-eBooks/Nursery-And- Landscaping-by-V-Amarnath</a></li> <li>2. <a href="https://www.amazon.in/Nursery-Landscaping-Veena- Amarnath/dp/8177542788">https://www.amazon.in/Nursery-Landscaping-Veena- Amarnath/dp/8177542788</a></li> <li>3. <a href="https://www.amazon.in/Gardening/b?ie=UTF8&amp;node=1637077031">https://www.amazon.in/Gardening/b?ie=UTF8&amp;node=1637077031</a></li> <li>4. <a href="https://in.pinterest.com/pin/496733033900458021/?lp=true">https://in.pinterest.com/pin/496733033900458021/?lp=true</a><br/> <a href="https://www.gardenvisit.com/ebooks">https://www.gardenvisit.com/ebooks</a></li> </ol> |

**Mapping with Programme Outcomes:**

| <b>Cos</b> | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> | <b>PSO1</b> | <b>PSO2</b> | <b>PSO3</b> | <b>PSO4</b> | <b>PSO5</b> |
|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| <b>CO1</b> | 3          | 2          | 1          | 3          | 2          | 1           | 2           | 2           | 1           | 3           |
| <b>CO2</b> | 3          | 3          | 2          | 2          | 3          | 3           | 2           | 2           | 2           | 2           |
| <b>CO3</b> | 2          | 2          | 3          | 1          | 1          | 1           | 1           | 3           | 3           | 1           |
| <b>CO4</b> | 3          | 2          | 2          | 1          | 3          | 2           | 1           | 3           | 2           | 1           |
| <b>CO5</b> | 3          | 3          | 2          | 3          | 2          | 1           | 2           | 3           | 2           | 3           |

**S-Strong (3)****M-Medium (2)****L-Low (1)**

## FOUNDATION COURSE FOR BOTANY – BASICS OF BOTANY

|                                                                                     |                                                                                                                                                                                |                                                           |                 |                |                     |                    |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|-----------------|----------------|---------------------|--------------------|
| <b>Title of the Course</b>                                                          | <b>BASICS OF BOTANY</b>                                                                                                                                                        |                                                           |                 |                |                     |                    |
| <b>Paper Number</b>                                                                 | Foundation Course                                                                                                                                                              |                                                           |                 |                |                     |                    |
| <b>Category</b>                                                                     | Skill Enhancement                                                                                                                                                              | <b>Year</b>                                               | I               | <b>Credits</b> | 2                   | <b>Course Code</b> |
|                                                                                     |                                                                                                                                                                                | <b>Semester</b>                                           | I               |                |                     | 26UBOSEFC          |
| <b>Instructional Hours per week</b>                                                 |                                                                                                                                                                                | <b>Lecture</b>                                            | <b>Tutorial</b> |                | <b>Lab Practice</b> | <b>Total</b>       |
|                                                                                     |                                                                                                                                                                                | 2                                                         | -               |                | -                   | 2                  |
| <b>Pre-requisite</b>                                                                |                                                                                                                                                                                | To recall the students about the basic aspects of botany. |                 |                |                     |                    |
| <b>Learning Objectives</b>                                                          |                                                                                                                                                                                |                                                           |                 |                |                     |                    |
| C1                                                                                  | To learn about the classification, distinguishing traits, geographic distribution, and reproductive cycle of algae, fungi, lichens, and bryophytes.                            |                                                           |                 |                |                     |                    |
| C2                                                                                  | To understand the biodiversity by describing and explaining the morphology and reproductive processes of algae, fungi, bryophytes and microorganisms.                          |                                                           |                 |                |                     |                    |
| C3                                                                                  | To investigate the classification, distinctive traits, distribution and reproduction and life history of the various classes and major types of Pteridophytes and Gymnosperms. |                                                           |                 |                |                     |                    |
| C4                                                                                  | Enable to learn various cell structures and functions of prokaryotes and eukaryotes and understand the salient features and functions of cellular organelles.                  |                                                           |                 |                |                     |                    |
| C5                                                                                  | Understanding of laws of inheritance, genetic basis of loci and alleles.                                                                                                       |                                                           |                 |                |                     |                    |
| Course Outcomes :<br>On completion of this course, the students will be able to: CO |                                                                                                                                                                                |                                                           |                 |                | Knowledge Level     |                    |
| 1.                                                                                  | Increase the awareness and appreciation of human friendly algae and their economic importance.                                                                                 |                                                           |                 |                | K1                  |                    |
| 2.                                                                                  | Develop an understanding of microbes and fungi and appreciate their adaptive strategies                                                                                        |                                                           |                 |                | K2                  |                    |
| 3.                                                                                  | Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms.                                                           |                                                           |                 |                | K3                  |                    |
| 4.                                                                                  | Compare the structure and function of cells and explain the development of cells.                                                                                              |                                                           |                 |                | K4                  |                    |
| 5.                                                                                  | Understand the core concepts and fundamentals of plant biotechnology and genetic engineering.                                                                                  |                                                           |                 |                | K5                  |                    |

| UNIT                                                                                                                                  | CONTENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I                                                                                                                                     | <p>BIODIVERSITY</p> <p>Systematics : Two Kingdom and Five Kingdom systems - Salient features of various Plant Groups : Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms- Viruses - Bacteria.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| II                                                                                                                                    | <p>CELL BIOLOGY</p> <p>Cell as the basic unit of life - Prokaryotic and Eukaryotic Cell (Plant Cell) - Light Microscope and Electron Microscope Ultra Structure of Prokaryotic and Eukaryotic Cells - Cell Wall - Cell Membrane Plastids, Ribosomes.</p>                                                                                                                                                                                                                                                                                                                                                                                                               |
| III                                                                                                                                   | <p>PLANT MORPHOLOGY</p> <p>Structure and Modification of Root, Stem and Leaf - Structure and Types of Inflorescences - Structure and Types of Flowers, Fruits and Seeds.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| IV                                                                                                                                    | <p>GENETICS</p> <p>Concept of Heredity and Variation - Mendel's Laws of Inheritance.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| V                                                                                                                                     | <p>PLANT PHYSIOLOGY</p> <p>Cell as a Physiological Unit : Water relations -Absorption and movement : Diffusion, Osmosis, Plasmolysis, Imbibition -Permeability, Water Potential - Transpiration - Movement - Mineral Nutrition</p>                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) | <p>Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Skills acquired from this course                                                                                                      | <p>Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Recommended Texts</b>                                                                                                              | <ol style="list-style-type: none"> <li>1. Singh, V., Pande, P.C and Jain, D.K. 2021. A Text Book of Botany. Rastogi Publications, Meerut.</li> <li>2. Bhatnagar, S.P and Alok Moitra. 2020. Gymnosperms, New Age International (P) Ltd., Publishers, Bengaluru.</li> <li>3. Sharma, O.P. 2017. Bryophyta, MacMillan India Ltd. Delhi.</li> <li>4. Lee, R.E. 2008. Phycology, IV Edition, Cambridge University Press, New Delhi.</li> <li>5. Pandey B.P. 1986, Text Book of Botany (College Botany) Vol I and II, S.Chand and Co. New Delhi.</li> <li>6. Rao, K., Krishnamurthy, K.V and Rao, G.S. 1979. Ancillary Botany, S. Viswanathan Pvt. Ltd., Madras.</li> </ol> |

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Reference books</b> | <ol style="list-style-type: none"> <li>1. Parihar, N.S. 2012. An introduction to Embryophyta –Pteridophytes - Surjeet Publications, Delhi.</li> <li>2. Alexopoulos, C.J. 2013. Introduction to Mycology. Willey Eastern Pvt. Ltd.</li> <li>3. Vashishta, P.C. 2014. Botany for Degree Students Gymnosperms. Chand &amp; Company Ltd, Delhi.</li> <li>4. Coulter, M. Jhon, 2014. Morphology of Gymnosperms. Surjeet Publications, Delhi.</li> <li>5. Vashishta, P.C. 2014. Botany for Degree Students Algae. 2014. Chand &amp; Company Ltd, Delhi.</li> <li>6. Parihar, N.S. 2013. An introduction to Embryophyta – Bryophytes -, Surjeet Publications, Delhi.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Web Resources</b>   | <ol style="list-style-type: none"> <li>1. <a href="https://www.kobo.com/us/en/ebook/the-algae-world">https://www.kobo.com/us/en/ebook/the-algae-world</a></li> <li>2. <a href="http://www.freebookcentre.net/biology-books-download/Fungi-(PDF-15P).html">http://www.freebookcentre.net/biology-books-download/Fungi-(PDF-15P).html</a></li> <li>3. <a href="http://scitec.uwichill.edu.bb/bcs/bl14apl/bryo1.htm">http://scitec.uwichill.edu.bb/bcs/bl14apl/bryo1.htm</a></li> <li>4. <a href="https://www.toppr.com/guides/biology/plant-kingdom/pteridophytes/">https://www.toppr.com/guides/biology/plant-kingdom/pteridophytes/</a></li> <li>5. <a href="https://arboretum.harvard.edu/wp-content/uploads/2013-70-4-beyond-pine-cones-an-introduction-to-gymnosperms.pdf">https://arboretum.harvard.edu/wp-content/uploads/2013-70-4-beyond-pine-cones-an-introduction-to-gymnosperms.pdf</a></li> <li>6. <a href="https://www.us.elsevierhealth.com/medicine/cell-biology">https://www.us.elsevierhealth.com/medicine/cell-biology</a></li> <li>7. <a href="https://www.us.elsevierhealth.com/medicine/genetics">https://www.us.elsevierhealth.com/medicine/genetics</a></li> <li>8. <a href="https://www.kobo.com/us/en/ebook/plant-biotechnology-1">https://www.kobo.com/us/en/ebook/plant-biotechnology-1</a></li> </ol> |

### Mapping with Programme Outcomes:

| Cos        | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------------|-----|-----|-----|-----|-----|------|------|------|------|------|
| <b>CO1</b> | 3   | 3   | 3   | 3   | 3   | 3    | 3    | 3    | 3    | 3    |
| <b>CO2</b> | 3   | 3   | 3   | 3   | 3   | 3    | 3    | 3    | 3    | 3    |
| <b>CO3</b> | 2   | 3   | 3   | 3   | 3   | 1    | 3    | 3    | 1    | 3    |
| <b>CO4</b> | 3   | 3   | 2   | 3   | 3   | 3    | 3    | 2    | 3    | 3    |
| <b>CO5</b> | 3   | 2   | 2   | 2   | 2   | 2    | 2    | 1    | 2    | 2    |

**S-Strong(3)**

**M-Medium(2)**

**L-Low(1)**