



**ST ALOYSIUS**  
(DEEMED TO BE UNIVERSITY)  
MANGALURU 575003-INDIA

**Course structure and syllabus of**

**B.Sc.  
BOTANY**

**Semester I and II**

**Under NEP Regulations**

**2024 ONWARDS**

# ST ALOYSIUS

(DEEMED TO BE UNIVERSITY)

MANGALURU 575003 – INDIA

School of Life Sciences

## BOS MEETING

BOS meeting of School of Life Sciences was held on 22<sup>th</sup> April 2024, at 9.30 am in Applied Biology Laboratory

### LIST OF MEMBERS OF THE BOS IN LIFE SCIENCES

Sl no	Members with Address	Designation
1.	Dr Hemachandra <a href="mailto:hemachandra_amin@stalloysius.edu.in">hemachandra_amin@stalloysius.edu.in</a> 9035961509	Dean, School of Life Sciences
2.	Dr Renita Maria Dsouza <a href="mailto:renita@stalloysius.edu.in">renita@stalloysius.edu.in</a> 9945923172	Associate Dean, School of Life Sciences
3.	Dr Lyned Dafny Lasrado <a href="mailto:lyneddafny@stalloysius.edu.in">lyneddafny@stalloysius.edu.in</a> 9686021928	Assistant Dean, School of Life Sciences
4.	Dr Jyothi Miranda Department of Botany <a href="mailto:jyothi@stalloysius.edu.in">jyothi@stalloysius.edu.in</a> 7022560938	Professor
5.	Dr Asha Abraham Department of Post Graduate Studies & Research in Biotechnology <a href="mailto:drashaabraham@stalloysius.edu.in">drashaabraham@stalloysius.edu.in</a> 9449555802	Associate Professor
6.	Dr Hariprasad Shetty Department of Zoology <a href="mailto:shettyhariprasad@stalloysius.edu.in">shettyhariprasad@stalloysius.edu.in</a> 9945886947	Associate Professor
7.	Dr S N Raghavendra Department of Post Graduate Studies & Research in Food Science <a href="mailto:raghavendra_sn@stalloysius.edu.in">raghavendra_sn@stalloysius.edu.in</a> 9945888845	Assistant Professor
8.	Dr Santhosh Wilson Goveas	Assistant Professor

	Department of Post Graduate Studies & Research in Biotechnology <a href="mailto:santhoshgoveas@stalloysius.edu.in">santhoshgoveas@stalloysius.edu.in</a> 9448724682	
9.	Dr Chandrashekara G Joshi Chairperson Department of Biochemistry Mangalore University <a href="mailto:josheejoshee@gmail.com">josheejoshee@gmail.com</a> 9448446641	Subject expert in Biochemistry
10.	Dr Shyama Prasad Sajankila Department of Biotechnology NMAMIT, Nitte, Karkala <a href="mailto:shyama.sajankila@nitte.edu.in">shyama.sajankila@nitte.edu.in</a> 9611202842	Subject expert in Biotechnology & Microbiology
11.	Dr Smitha Hegde Professor & Deputy Director NUCSER, Nitte University Deralakatte <a href="mailto:smitha.hegde@nitte.edu.in">smitha.hegde@nitte.edu.in</a> 9886036077	Subject expert in Biotechnology & Zoology
12.	Dr Archana Prabhat Professor & Coordinator Department of PG Studies in Food Science & Nutrition Alva's College (Autonomous), Moodbidri <a href="mailto:drarchanaprabhat@gmail.com">drarchanaprabhat@gmail.com</a> 9986665759	Subject expert in Food Science
13.	Dr Giby Kuriakose Assistant Professor PG Department of Botany, Sacred Heart College Kochi, Kerala-670106 <a href="mailto:giby.kuriakose@shcollege.ac.in">giby.kuriakose@shcollege.ac.in</a> 7012608038	Subject expert in Botany
14.	Dr Shreelalitha Suvarna Assistant Professor <a href="mailto:shreelalitha_suvarna@stalloysius.edu.in">shreelalitha_suvarna@stalloysius.edu.in</a> 9964215205	HOD UG & PG Biotechnology
15.	Dr Swarnalatha Assistant Professor <a href="mailto:swarnalatha@stalloysius.edu.in">swarnalatha@stalloysius.edu.in</a> 9900284662	HOD UG & PG Biochemistry
16.	Mrs. Shilpa B Assistant Professor <a href="mailto:shilpa_botany@stalloysius.edu.in">shilpa_botany@stalloysius.edu.in</a> 9535887279	HOD Botany
17.	Dr Daniella Ann L Chyne Assistant Professor <a href="mailto:daniella_chyne@stalloysius.edu.in">daniella_chyne@stalloysius.edu.in</a>	HOD UG & PG Food Science

	9676389466	
<b>18.</b>	Dr Vaishali Rai Assistant Professor <a href="mailto:vaishali_rai@staloysius.edu.in">vaishali_rai@staloysius.edu.in</a> 9980313361	HOD Microbiology

## I SEMESTER

Paper	Instructions hours/ week		Duration of exam hours	Marks		Total Marks	Credits
	Theory	Practical		CIA*	Exam		
Paper code <b>(Theory)</b> <b>MICROBIAL DIVERSITY AND TECHNOLOGY</b>	4	-	2.5	40	60	100	4
Paper code <b>(Practical)</b> <b>MICROBIAL DIVERSITY AND TECHNOLOGY</b>	-	4	3	25	25	50	2
Paper code <b>(Open Elective)</b> <b>PLANTS FOR HUMAN WELFARE</b>	3	-	2.5	40	60	100	3

\*Continuous internal assessment

## II SEMESTER

Paper	Instructions hours/ week		Duration of exam hour	Marks		Total Marks	Credits
	Theory	Practical		CIA*	Exam		
Paper code <b>(Theory)</b> <b>DIVERSITY OF NON-FLOWERING PLANTS</b>	4	-	2.5	40	60	100	4
Paper code <b>(Practical)</b> <b>DIVERSITY OF NON-FLOWERING PLANTS</b>	-	4	3	25	25	50	2
Paper code							

<b>(Open Elective) PLANT PROPAGATION, NURSERY MANAGEMENT AND GARDENING</b>	3	-	2.5	40	60	100	3
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\*Continuous internal assessment

### **PROGRAMME OUTCOMES (PO)**

By the end of this programme, students will be able to

**PO1:** Enhance their knowledge in the field of microbiology and are able to handle laboratory equipment and experimentation for higher education leading to research.

**PO 2:** Get an opportunity in further studies, research and employment in various areas of plant sciences.

**PO 3:** Enhance the scope of employability by obtaining all-round knowledge in the allied subjects along with Botany.

**PO 4:** Equip themselves for competitive examinations.

**PO 5:** Promote and popularize the study of Botany for its importance and its social relevance.

**PO 6:** Inculcate an interest for nature and the need to preserve the nature by maintaining green house, herbal gardens in the campus and environs.

## **I Semester B.Sc. Botany**

### Core Course Content

#### **(Paper Code) Microbial Diversity and Technology**

Credits: **4**

Total hours: **56**

#### **Course outcomes**

At the completion of this course, students will be able to

**CO1:** Disseminate the fascinating diversity, evolution, and significance of microorganisms.

**CO2:** Comprehend the systematic position, structure, physiology and life cycles of microbes and their impact on humans and environment.

**CO3:** Should be able to operate microscopy, microbial cultures, staining, identification and preservation of microbes.

**CO4:** Apply the principles and techniques in research and industry.

**UNIT 1: Microbial diversity, history, development of microbiology and Microscopy**

**14 Hours**

Introduction to microbial diversity; Hierarchical organization and positions of microbes in the living world: Whittaker's five-kingdom system and Carl Richard Woese's three-domain system. Habitats of microbes: soil, air, food and water. Significance of microbes. Microbiologists and contributions of Louis Pasteur, Robert Koch, other major contributions of Leeuwenhoek, Joseph Lister, Dmitri Iwanowski, Sergius Winogradsky and M W Beijerinck and Paul Ehrlich. Working principle and applications of light, dark field, phase contrast and electron microscopes (SEM and TEM). Principles of staining -Simple, Gram's and differential staining.

**UNIT 2: Microbial Growth, Media and Culture Centers**

**14 Hours**

Culture media, nutritional composition of culture media, Natural and synthetic media, a brief account of routine media -basal media, enriched media, selective media with examples. Methods of disinfection: antiseptic, tyndallisation and Pasteurization. Wet and dry methods, UV light, filtration. Microbial growth and measurement. Nutritional types of Microbes- autotrophs and heterotrophs, phototrophs and chemotrophs; lithotrophs and organotrophs. Microbial cultures. Pure culture and axenic cultures, subculturing. Preservation methods-overlaying cultures with mineral oils, lyophilisation. Microbial culture collections and their importance. A brief account on ITCC, MTCC and ATCC.

**UNIT 3: Viruses, Viroids, Prions and Bacteria**

**14 Hours**

General structure and classification of Viruses; ICTV system of classification. Structure and multiplication of TMV and Bacteriophage (T2), structure of SARS-COV-2. Significance of viruses and vaccines. Viroids- general characteristics. Prions - general characters and diseases. General characteristics and classification introduction to Bergey's Manual. Archaeobacteria and Eubacteria. Ultrastructure of Bacteria; Reproduction in bacteria- asexual method and genetic recombination. Study of *Rhizobium* and its applications. A brief account of Actinomycetes, Mycoplasmas and Phytoplasmas - General characteristics and diseases.

**UNIT 4: Fungi, Mycorrhizae and Microbial plant diseases**

**14 Hours**

General characteristics and classification (Alexopoulos classification). Thallus organization, modification of mycelia and nutrition in fungi. Reproduction in fungi (asexual and sexual with specific type study example.). Heterothallism and parasexuality. Type study: Morphology of *Rhizopus*, *Saccharomyces*, *Penicillium* and *Puccinia*. Life cycle of *Puccinia*. Economic importance of Fungi. Mycorrhizae types - ecto and endo mycorrhizae, VAM fungi and their significance. Causative organism, symptoms, control measures of Koleroga of

Areca nut, Blast Disease of paddy; Black stem rust of wheat; Red rot of sugarcane, Sandal Spike, Citrus Canker, Bunchy top of Banana.

### **Recommended Textbooks and References**

1. Ananthnarayan R and Panikar (2020). Textbook of Microbiology. Eleventh edition, Universities Press (India) Pvt. Ltd.
2. Arora DR. (2004). Textbook of Microbiology, CBS, New Delhi.
3. William CG. (1989). Understanding microbes. A laboratory textbook for Microbiology. W.H. Freeman and Company. New York.
4. Dubey RC and Maheshwari DK. (2007). A textbook of Microbiology, S. Chand and Company, New Delhi.
5. Dubey RC and Maheshwari DK. (2002). A textbook of Microbiology, S. C. Chand and Company, Ltd. Ramnagar, New Delhi.
6. Sharma R. (2006). Textbook of Microbiology. Mittal Publications. New Delhi. 305pp.
7. Sharma PD. (1999). Microbiology and Plant Pathology. Rastogi publications. Meerut, India.
8. Vasanthkumari R. (2007). A textbook of Microbiology, BI Publications Pvt. Ltd., New Delhi.
9. Alexopoulos CJ and Mims CW. (1989). Introductory Mycology, Wiley Eastern Ltd., New Delhi.
10. Allas RM. (1988). Microbiology: Fundamentals and Applications, Macmillan publishing co. New York.
11. Brook TD, Smith DW and Madigan MT. (1984). Biology of Microorganisms, 4<sup>th</sup> ed. Eaglewood Cliffs. N.J. Prentice- Hall. New Delhi.
12. Burnell JH and Trinci APJ. (1979). Fungal walls and hyphal growth, Cambridge University Press. Cambridge.
13. Jayaraman J. (1985). Laboratory Manual of Biochemistry, Wiley Eastern Limited. New Delhi.
14. Ketchum PA. (1988). Microbiology, concepts and applications. John Wiley and Sons. New York.
15. Michel J, Pelczar Jr. EC and Krieg CR. (2005). Microbiology, Mc. Graw-Hill, New Delhi.
16. Powar CB and Dagainawala. (1991). General Microbiology, Vol – I and Vol – II Himalaya publishing house, Bombay.
17. Reddy S and Ram. (2007). Microbial Physiology. Scientific Publishers, Jodhpur, 385pp.
18. Sullia SB and Shantharam S. (1998). General Microbiology. Oxford and IBH publishing Co. Pvt. Ltd. New Delhi.
19. Schlegel HG. (1986). General Microbiology. Cambridge. University Press. London, 587pp.



20. Roger S, Ingrahan Y, Wheelis JL, Mark L and Page PR. (1990). Microbial World 5th edition. Prentice-Hall India, Pvt. Ltd. New Delhi.

21. Sullia SB. and Shantharam S. (2005). General Microbiology, Oxford and IBH, New Delhi.

## I Semester B.Sc. Botany

### Core Lab Course Content

#### (Paper Code) Microbial Diversity and Technology

4 Hours/week

Credits: 2

Total hours: 48

#### Course outcomes

At the completion of this course, students will be able to

**CO1:** equip with microscopy techniques, slide preparation, and micrometry, facilitating the study of bacterial and fungal strains.

**CO2:** enhance knowledge about microbial culture media.

**CO3:** gain practical skills in experimental design and interpretation.

**CO4:** apply the knowledge of economically important microbes for commercial purpose.

#### List of Experiments

1. Safety measures in microbiology laboratory and study of equipment/appliances used for microbiological studies - Microscopes, Hot air oven, Autoclave/Pressure Cooker, Inoculation needles/loop, Petri plates.
2. Safety measures in microbiology laboratory and study of equipment/appliances used for microbiological studies - Incubator, Laminar flow hood, Colony counter, Haemocytometer, Micrometry.
3. Preparation of culture media (NA/PDA) sterilization, inoculation, incubation of *E coli* / *B. subtilis*/ Fungi and study of cultural characteristics.
4. Enumeration of soil/food /seed microorganisms by serial dilution technique. Preparation of agar slants, inoculation, incubation, pure culturing and preservation of microbes by oil overlaying.
5. Simple staining of bacteria (Crystal violet /Nigrosine blue) / Gram's staining of bacteria.
6. Isolation and study of morphology of *Rhizobium* from root nodules of legumes.
7. Preparation of spawn and cultivation of paddy straw (Oyster) mushroom.
8. Study of vegetative structures and reproductive structures of any six of the following: *Phytophthora*, *Rhizopus*, *Saccharomyces*, *Puccinia*, *Penicillium*, (Depending on local availability)
9. Study of koleroga of Arecanut, Blast Disease of Rice; Black stem rust of wheat, red rot of sugarcane,

10. Study of Sandal Spike, Citrus Canker, Tobacco mosaic virus, Bunchy top of Banana.
12. Visit to water purification units/Composting/ microbiology labs/dairy and farms to understand the role of microbes in day today life. Field study report is to be documented in the practical record only.

### **Recommended Textbooks and References**

1. Microbiology: A Laboratory Manual; Authors, James G. Cappuccino, Chad T. Welsh; Edition 11; Publisher, Pearson Education, (2016); ISBN, 0134298594.
2. Textbook of Medical Laboratory Technology Ramnik Sood, (2006). Edition1, Jaypee Brothers Medical Publishers, ISBN: 9788180615917.
3. Practical Microbiology (PB) by D K Maheshwari and R C Dubey, (2012), S Chand Publishing, ISBN 9788121921534.
4. Sharma PD. (1999). Microbiology and Plant Pathology. Rastogi publications. Meerut, India.
5. Prescott's Microbiology by Willey, J, M. et al, (2017). Mcgraw Hill publisher.

## **I Semester B.Sc. Botany**

### Open Elective Course Content

#### **(Paper Code) Plants for Human Welfare**

Credits: 3

Total hours: 42

#### **Course Outcomes**

On completion of this course, the students will be able to

- CO 1.** enhance knowledge on the economic importance of diverse plants that offer resources to human life.
- CO 2.** identify the plants used as food, medicinal value and also plant sources of different economic value.
- CO 3.** comprehend the importance of plants in today's life, conservation, ecosystem and sustainability.
- CO 4.** armed with cultivation techniques, pest and disease management, soil fertility enhancement, and genetic engineering for desirable traits yield.

#### **UNIT 1: Cultivated plants, Cereals, Pulses and Millets**

**14 Hours**

Introduction, Origin of Cultivated Plants. Concept of Centers of Origin, their importance with reference to Vavilov's work. Examples of major plant introductions. Crop domestication and loss of genetic diversity (Only conventional plant breeding methods). Importance of plant bio-diversity and conservation. Concept of Genetically Modified plants. Wheat and Paddy (origin, evolution, morphology, post-harvest processing & uses). Green revolution. Brief account of millets (mention names) and their nutritional importance. General account of legumes (including chief pulses grown in Karnataka- red gram, green gram, chick pea, soybean). Importance to man and ecosystem.

**UNIT 2: Fruits, Beverages, Spices, oils and fats****14 Hours**

Introduction, types of fruits - tropical and temperate (with examples), concept of climacteric and non-climacteric fruits. Mango, grapes and citrus (Origin, morphology, cultivation, varieties, processing and value-added products). Tea, Coffee (morphology, processing & value-added products). Spices- introduction. Listing of important spices, their family and parts used, economic importance with special reference to Karnataka. Study of fennel, clove, black pepper and cardamom. Oils and fats- general description, classification, extraction, their uses and health implications; groundnut, coconut, sunflower and mustard (Botanical name, family & uses). Non-edible oil yielding trees and importance as biofuel. Neem oil and applications.

**UNIT 3: Cash crops, fibers, drug and essential oils yielding plants****14 Hours**

Cash crops - introduction, morphology, new varieties and processing of sugarcane, products and by-products of the sugarcane industry. Natural Rubber –cultivation, tapping and processing. Fibers- introduction, classification based on the origin of fibers; Cotton and jute (origin morphology, processing and uses). Drug-yielding plants: Therapeutic and habit-forming drugs with special reference to *Cinchona*, *Digitalis*, *Aloe vera* and *Cannabis*. Essential Oils - general account. Extraction methods of sandal wood oil, rosa oil and eucalyptus oil. Economic importance as medicine, perfumes and insect repellents.

**Recommended Textbooks and References**

- 1.Kochhar, S.L. (2012). Economic Botany in Tropics. New Delhi, India: MacMillan & Co.
- 2.Wickens, G.E. (2001). Economic Botany: Principles & Practices. The Netherlands: Kluwer Academic Publishers.
- 3.Chrispeels, M.J. and Sadava, D.E. (1994). Plants, Genes and Agriculture. Jones & Bartlett - Publishers.
- 4.Verma, V. (2009). Textbook of Economic Botany. Tuli offset Printers Pvt. Ltd., New Delhi.
5. A Text Book of Modern Economic Botany, (2016). 11th Edition A.V.S.S Sambamurthy and N.S. Subrahmanyam, CBS Publishers & Distributors.

**II Semester B.Sc. Botany**

## Core Course Content

**(Paper Code) DIVERSITY OF NON- FLOWERING PLANTS**

Credits: 4

Total hours: 56

**Course Outcomes:**

Upon completion of this course, students will be able to

**CO1:** recognize the diversity and affinities among Algae, Bryophytes, Pteridophytes and Gymnosperms.

**CO2:** understand the morphology, anatomy, reproduction and life cycle across Algae, Bryophytes, Pteridophytes and Gymnosperms.

**CO3:** know the ecological and evolutionary significance.

**CO4:** apply laboratory skills and explore non-flowering plants for their commercial applications.

**UNIT 1: Algae****14 Hours**

Algae: Introduction and historical development in algology. Distribution of Algae. General characteristics, classification of algae by Fritsch. Diversity- habitat, thallus organization, and alternation of generation in Algae. Morphology and reproduction of *Nostoc*, *Oedogonium*, *Chara*, *Sargassum* and *Polysiphonia*. Economic importance of algae: Algal products- Food, carrageenin, alginate, fodder, diatomite, fertilizers, medicines. Algal blooms and toxins.

**UNIT 2: Bryophytes****14 Hours**

General characteristics and classification (Roth Maler) of Bryophytes. Morphology, anatomy, reproduction of *Riccia*, *Anthoceros*, and *Funaria*. Ecological and economic importance of Bryophytes.

**UNIT 3: Pteridophytes****14 Hours**

General characteristics and classification (Smith); Morphology, anatomy, reproduction in *Selaginella*, *Pteris* and *Marsilea*. Brief account of heterospory and seed habit. Stellar evolution in Pteridophytes. Affinities and evolutionary significance of Pteridophytes. Ecological and economic importance.

**UNIT 4: Gymnosperms****14 Hours**

General characteristics. Distribution and classification of Gymnosperms (Sporne). Study of Morphology, anatomy and reproduction in *Cycas*, *Pinus* and *Gnetum*. Affinities and evolutionary significance of Gymnosperms. Economic importance of Gymnosperms - food, timber, industrial uses and medicines.

**Recommended Textbooks and References**

1. Chopra, G.L. (2012). A textbook of Algae. Rastogi & Co., Meerut, Co., New Delhi, Depot.  
Allahabad.
2. Johri, Lata and Tyagi, (2012). A Textbook of, Vedam e Books, New Delhi.

3. Sharma, O.P. (1990). Textbook of Pteridophyta. McMillan India Ltd. New Delhi.
4. Sharma, O.P. (1992). Textbook of Thallophytes. McGraw Hill Publishing Co. New Delhi.
5. Sharma, O.P., (2017). Algae Singh-Pande-Jain 2004-05. A Text Book of Botany. Rastogi Publication, Meerut.
6. Simpson M.G. (2019). Plant Systematics, III edition. Academic Press.
7. Sambamurty, A.V.S.S. A Textbook of Algae. I.K. International Private Ltd., New Delhi.
8. Agashe, S.N. (1995). Paleobotany. Plants of the past, their evolution, paleoenvironment and Allied plants. Hutchinson & Co., Ltd., London.
9. Anderson R.A. (2005). Algal culture Techniques, Elsevier, London. Publication, Application in exploration of fossil fuels. Oxford & IBH., New Delhi.37
10. Eams, A.J., (1974). Morphology of vascular plants - Lower groups. Tata Mc Grew-Hill Publishing Co. New Delhi, Freeman & Co., New York.
11. Fritze, R.E. (1977). Structure and reproduction of Algae. Cambridge University Press.
12. Goffinet B and Shaw A.J. (2009). Bryophyte Biology, 2nd ed. Cambridge University Press, Cambridge. Gymnosperms
13. Srivastava, H N, (2003). Algae Pradeep Publication, Jalandhar, India.
14. Kakkar, R.K. and B. R. Kakkar (1995). The Gymnosperms (Fossils and Living) Central Publishing House, Allahabad.
15. Kumar H. D., (1999). Introductory Phycology, Affiliated East-West Press, Delhi.
16. Lee, R.E., (2008). Phycology, Cambridge University Press, Cambridge. 4<sup>th</sup> edition. McGraw Hill Publishing Co., New Delhi.
17. Parihar, N.S. (1970). An Introduction to Embryophyta. Vol. I. Bryophyta. Central Book, Allahabad.
18. Parihar, N.S. (1976). An Introduction to Pteridophytes, Central Book Depot, Allahabad.
19. Parihar, N.S. (1977). The Morphology of Pteridophytes. Central Book Depot, Allahabad. Press, Cambridge.
20. Rashid, A. (1998). An Introduction to Pteridophyta. II ed., Vikas Publishing House, New Delhi.
21. Smith, G.M. (1971). Cryptogamic Botany. Vol. II. Bryophytes & Pteridophytes. Tata McGraw Hill Publishing, New Delhi.

22. Smith, G.M. (1971). Cryptogamic Botany. Vol. I Algae & Fungi. Tata McGraw Hill Publishing. New Delhi.

## II Semester B.Sc. Botany

### Core Lab Course Content

#### (Paper Code) DIVERSITY OF NON- FLOWERING PLANTS

4 Hours/week

Credits: 2

Total hours: 48

#### Course Outcomes:

Upon completion of this course, students will be able to

**CO1:** enhance the knowledge of anatomical organization and functioning in higher plants.

**CO2:** gain knowledge of taxonomy of non-flowering plants enabling the significance of evolution.

**CO3:** apply laboratory skills of non-flowering plants for commercial purpose.

**CO4:** understand the structural differences between non-flowering and higher plants.

#### List of Experiments:

1. Study of morphology, systematic position and reproductive structures in *Nostoc*, *Oedogonium*.
2. Study of morphology, systematic position and reproductive structures in *Chara*.
3. Study of morphology, systematic position and reproductive structures in *Sargassum*.
4. Study of morphology, systematic position and reproductive structures in *Polysiphonia*.
5. Study of morphology, systematic position and reproductive structures in *Riccia*/*Anthoceros*. (Any one locally available moss).
6. Study of morphology, systematic position, anatomy and reproductive structures in *Selaginella*.
7. Study of morphology, systematic position, anatomy and reproductive structures in *Pteris*.
8. Study of morphology, systematic position, anatomy and reproductive structures in *Marsilea*.
9. Study of morphology, systematic position, anatomy and reproductive structures in *Cycas*.
10. Study of morphology, systematic position, anatomy and reproductive structures in *Pinus*.
11. Study of morphology, systematic position, anatomy and reproductive structures in

*Gnetum*.

12. Visit to algal cultivation units/lakes with algal blooms/Fern house/ Nurseries/Geology Museum/lab to study plant fossils and the report is to be documented in the practical record.

### **Recommended Textbooks and References**

1. Parihar, N.S. (1977). The Morphology of Pteridophytes. Central Book Depot., Allahabad. Press, Cambridge.
2. Smith, G.M. (1971). Cryptogamic Botany. Vol. II. Bryophytes & Pteridophytes. Tata McGraw Hill Publishing, New Delhi.
3. Sharma, O.P., (2017). Algae Singh-Pande-Jain 2004-05. A Text Book of Botany. Rastogi Publication, Meerut.
4. Goffinet B and Shaw A.J. (2009). Bryophyte Biology, 2nd ed. Cambridge University Press, Cambridge. Gymnosperms.
5. 16. Lee, R.E., (2008). Phycology, Cambridge University Press, Cambridge. 4th edition. McGraw Hill Publishing Co., New Delhi.

## **II Semester B.Sc. botany**

Open Elective Course Content

### **(Paper Code) PLANT PROPAGATION, NURSERY MANAGEMENT AND GARDENING**

Credits: **3**

Total hours: **42**

#### **Course Outcomes:**

Upon completion of this course, students will be able to

**CO1:** advance knowledge of gardening, cultivation, multiplication, raising of seedlings of garden plants.

**CO2:** expand knowledge of new and modern techniques of plant propagation.

**CO3:** enhance interest in nature, plant life and practice sustainable use of plant resources.

**CO4:** application in floriculture, agriculture and medicine fields.

#### **UNIT 1: Nursery**

**14 Hours**

Definition, objectives and scope and general practices and building up of infrastructure for nursery, planning and seasonal activities. Planting - direct seeding and transplants, Soil free/soilless/ synthetic growth mediums for pots and nursery. Vegetative propagation:

Air-layering, cutting, selection of cutting, collecting season, treatment of cutting, rooting medium and planting of cuttings. Hardening of plants. Green house, mist chamber, shed roof, shade house and glass house.

## **UNIT 2: Seed**

**14 Hours**

Seed: Structure and types, Seed dormancy; causes and methods of breaking dormancy. Seed storage- Seed banks, factors affecting seed viability, genetic erosion. Seed production technology- Seed testing and certification, marketing procedures.

## **UNIT 3: Gardening**

**14 Hours**

Gardening: Definition, objectives and scope. Different types of gardening - landscape and home/terrace gardening, parks and its components. Plant materials and design. Computer applications in landscaping, Gardening operations: soil laying, manuring, watering, management of pests and diseases and harvesting. Developing and maintenance of different types of lawns. Bonsai technique.

### **Recommended Textbooks and References**

1. Agrawal, P.K. 1993. Handbook of Seed Technology. New Delhi, Delhi: Dept. of Agriculture and Cooperation, National Seed Corporation Ltd.
2. Bose T.K., Mukherjee, D. 1972. Gardening in India. New Delhi, Delhi: Oxford & IBH Publishing Co.
3. Jules, J. 1979. Horticultural Science, 3rd edition. San Francisco, California: W.H. Freeman and Co.
4. Kumar, N. 1997. Introduction to Horticulture. Nagercoil, Tamil Nadu: Rajalakshmi Publications.
5. Musser E., Andres. 2005. Fundamentals of Horticulture. New Delhi, Delhi: McGraw Hill Book Co.
6. Sandhu, M.K. 1989. Plant Propagation. Madras, Bangalore: Wile Eastern Ltd.

### **ASSESSMENT CRITERIA**

**Theory: 60:40; Practicum: 50:50 converted as 25+25=50**

#### **1. Ratio of weightage (marks) between Internal & End Semester Examinations for**

**THEORY: 60:40**

**THEORY INTERNAL COMPONENT: 40**

- Two internal tests:  $10 \times 2 = 20$
- Assignment: **05**
- Attendance: **05**
- Continuous Unit wise tests (objective/MCQ): **05**
- Group projects: **05**



## **2. Practicum component marks: 50**

**The internal component of practicum:50 (converted to 25)**

### **Internal:**

- Continuous Assessment of all practical experiments: **15**
- Attendance: **05**
- Model practical Test: **20**
- Maintenance of Records: **05**
- Viva: **05**

**End semester Practicum: 50 (converted to 25)**

**Theory End Semester Examination Question Paper Pattern.**

**Time 2.5 hours**

End Semester Theory Examinations will be common for all science departments.

The duration of the examination is **2.5** hours carrying **60 marks**.

The question paper is divided into **Part–A, Part – B, and Part C**.

**Part –A** -Objective type carrying from each unit - **20** marks.

**Part-B** -Analytical questions carrying from each unit - **20** marks

**Part –C**- Descriptive answer for **20** marks.

### **Question Paper Pattern Sample**

**I. Section-A –Any 10 out of 12                    2 x 10=20 marks.**

**Q. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12**

**II. Section-B -Answer any 4 out of 6        5 x 4=20 marks**

**Q. 1, 2, 3, 4, 5, 6**

**III. Section-C -Answer any 2 out of 4    10 X 2 =20 marks**

**Q. 1, 2, 3, 4**

**\* \* \* \* \***

<b>Paper Code</b>	<b>Reg. No.:</b>									
<b>St Aloysius (Deemed to be University)</b>										
<b>Mangaluru 575003-India</b>										
<b>End Semester Exam – Month Year</b>										
<b>B.Sc. - Semester – I</b>										
<b>Paper – I</b>										
<b>Paper Title</b>										
<b>Time: 2½ hrs.</b>						<b>Max Marks: 60</b>				
<b>Instructions: Draw Diagrams wherever necessary.</b>										
<b>Answer all three sections- A, B, and C.</b>										
<b>SECTION-A</b>										
1.	<b>Define/Answer any TEN of the following:</b>									<b>(2x10=20)</b>
a)										
b)										
c)										
d)										
e)										
f)										
g)										
h)										
i)										
j)										
k)										
l)										
<b>SECTION – B</b>										
	<b>Answer any FOUR of the following</b>									<b>(5x4=20)</b>
1.										
2.										
3.										
4.										
5.										
6.										
<b>SECTION – C</b>										
	<b>Answer any TWO of the following</b>									<b>(10x2=20)</b>
1.										
2.										
3.										
4.										
*****										

**Practical End Semester Examination Question Paper Pattern.**

**Time 3 Hours**

Q1. Major Experiment A- Experiment to be conducted and result to be reported

**10 Marks**

Q2. Minor Experiment B- Experiment to be conducted and result to be reported

**6 Marks**

Q3. Identification and Comment of Spotters C, D and E

**3 x 3 = 09 Marks**

**Total -25 Marks**