ST JOSEPH'S UNIVERSITY

BENGALURU-27

Re-accredited with 'A++' GRADE with 3.79/4 CGPA by NAAC
Recognized by UGC as College of Excellence

BOTANY SYLLABUS

FOR UNDERGRADUATE
PROGRAMME - CBBT

(AS PER SEP 2024-25)

ST JOSEPH'S UNIVERSITY
SCHOOL OF LIFE SCIENCES
DEPARTMENT OF BOTANY
BENGALURU 560 027

Semester	I- CBBT
Paper Code	BO 1224
Paper Title	Virology, Bacteriology, Mycology and Phytopathology
Number of teaching hours per week	03
Total number of teaching hours of theory per semester	45
Number of theory credits	03
Total number of teaching hours of practicals per semester	33
Number of practical credits	02

COURSE OBJECTIVES (CO)	The course aims to: 1. Evaluate the general structure and classification of viruses based on nucleic acid types. 2. Appreciate the diversity and significance of viruses in biological systems. 3. Describe the ultrastructure of bacterial components, including capsule, flagella, pili, and endospore. 4. Evaluate the economic importance of bacteria in industry, agriculture, and medicine. 5. Identify and describe major plant diseases affecting crops. 6. Appreciate the significance of plant pathology in agriculture and food security.
LEARNING OUTCOMES (LO)	After completion of the course, the students will be able to 1. Learn the general structure and classification of viruses based on their nucleic acids (ssDNA, dsDNA, ssRNA, and dsRNA). 2. Understand the role of viruses in disease and biotechnology. 3. Assess the economic importance of bacteria and fungi in industry, agriculture, and medicine. 4. Describe the general characteristics, thallus organization, and nutrition of fungi. 5. Identify the causative agents, symptoms, and control measures for major plant diseases 6. Explain the impact of plant diseases on agriculture and food security.

BO1224: Virology, Bacteriology, Mycology and Phytopathology

Units	Title of Contents	Hrs (45)
UNIT 1	**Virology:** General structure and Baltimore classification. Replication in Viruses: Lytic cycle (T2 phage) and Lysogenic cycle (lambda phage). Structure and multiplication of TMV and CaMV. *Brief account of Viroids and Prions (Self study).*	7+*1*
UNIT 2	**Bacteriology:** General account on Archaebacteria and Eubacteria. General characteristics and classification of bacteria based on shape and flagellation. Ultrastructure of Bacteria - Structure of capsule, flagella, pili and endospore. (Ultrastructure of flagella and endospore only), Physical and chemical structure of Gram positive and Gram-negative bacterial cell walls. Reproduction by binary fission. Genetic recombination by conjugation (F+ and F-, Hfr types), Transduction (generalized and specialized types) and Transformation. *Economic importance of Bacteria (Industry, agriculture and Medicine) - (Self study).*	11+*1*
UNIT 3	**Mycology:** General characteristics and thallus organization and nutrition in fungi. Reproduction in fungi (asexual and sexual). Type study of; *Pythium*, *Rhizopus*, *Puccinia*, *Peziza* and *Penicillium*. *Economic importance of fungi (Industry, agriculture and medicine) - (Self study).* **Lichens** – Structure, Classification and reproduction. *Economic importance of lichens - (Self study).*	13+*2*
UNIT 4	**Phytopathology:** *Introduction, brief history and classification based on symptoms - (Self study).* Brief account of the following diseases: Tomato Leaf Curl, Citrus Canker, Sandal Spike, Club Root of Crucifer, Smut of Jowar, Blast of Rice, Red Rot of Sugarcane.	8+*2*

BO 21P24: Virology, Bacteriology, Mycology and Phytopathology

11 Sessions – 3 Hours/ Week

Sl. No.	Experiment	Units/ Sessions
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, Incubator, Laminar flow hood, Colony counter).	1
2	Preparation of culture media (NA/PDA) sterilization, inoculation. Enumeration of soil/water microorganisms by serial dilution technique.	1
3	Gram's staining of bacteria	1
4	Determination of cell count by using Haemocytometer.	1
5	Determination of microbial cell dimension by using Micrometer.	1
6	Study of vegetative structures and reproductive structures – *Stemonitis*, *Pythium*, *Rhizopus*	1
7	Study of vegetative structures and reproductive structures- *Puccinia, Penicillium*	1
8	Study of vegetative structures and reproductive structures- *Trichoderma* and Peziza	1
9	Study of Tomato Leaf Curl, Citrus Canker, Sandal Spike, Club Root of Crucifer.	1
10	Study of Smut of Jowar, Blast of Rice, Red Rot of Sugarcane and Tikka disease of Groundnut. Revision.	2

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ST. JOSEPH'S UNIVERSITY, BENGALURU - 560027
SCHOOL OF LIFE SCIENCES, DEPARTMENT OF BOTANY
I B.Sc. I SEMESTER - CBBT
BO21P24 – VIROLOGY, BACTERIOLOGY, MYCOLOGY AND PHYTOPATHOLOGY
BOTANY PRACTICAL EXAMINATION

MAX. MARKS: 25 **TIME: 3 HOURS**

I	Perform the Gram's staining for **A.** Write the principle, identify with reasons and leave the preparation for evaluation	2+2=4
II	Calculate the population of yeast cells using haemocytometer/ measure cell dimensions using micrometer in the given sample **B**. Briefly describe the instrument and tabulate the result.	2+2=4
III	Identify and classify the specimens **C** and **D** with reasons.	2X2.5=5
IV	Identify the slides **E** and **F** with labeled diagrams and reasons.	2X3=6
V	Comment on spotters **G, H** and **I**	2X3=6

KEY

A – Curd sample/Root nodule extract

B – Haemocytometry - Yeast cells. Micrometry - Pollen or Epidermal cells or Fungal spores

C & D – Fungal specimens

E & F – Fungal slides

G, H and I – Plant pathology specimen/ slide, Microbiological instrument, Serial dilution/ Culture plate

THEORY QUESTION PAPER PATTERN

ST JOSEPH'S UNIVERSITY, BENGALURU - 560027
I B.Sc. BOTANY – I SEMESTER, CBBT
SEMESTER EXAMINATION
BO 1224: VIROLOGY, BACTERIOLOGY, MYCOLOGY AND PHYTOPATHOLOGY

Time: 2 Hours **Max Marks: 60**

The paper contains TWO printed pages and THREE parts
Draw diagrams and provide examples wherever necessary

A. Answer ANY TEN of the following in 2 or 3 sentences **10 × 2 = 20**

1.
2.
3.
4.
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10.
11.
12.

B. Write critical notes on ANY FIVE of the following **5 × 6 = 30**

13.
14.
15.
16.
17.
18.
19.

C. Give a comprehensive account on ANY ONE of the following **1 × 10 = 10**

20.
21.

BLUEPRINT OF THEORY EXAMINATION QUESTION PAPER PATTERN

Unit number	Number of hrs.	Total marks for which the questions are to be asked (including bonus questions)
I	08	16
II	12	22
III	15	28
IV	10	20
TOTAL	**45**	**86**
Note: Maximum marks for the paper (Excluding bonus question): **60**		

ST JOSEPH'S UNIVERSITY
SCHOOL OF LIFE SCIENCES
DEPARTMENT OF BOTANY
BENGALURU – 560027

Semester	II – CBBT
Paper Code	BO 2224
Paper Title	Applied Phycology and Bryophytes
Number of teaching hours per week	03
Total number of teaching hours per semester	45
Number of theory credits	03
Total number of teaching hours of practicals per semester	33
Number of practical credits	02

COURSE OBJECTIVES (CO)	The course aims to 1. Analyze the diversity, habitat, thallus organization, and reproductive strategies of algae, including a classification of algae up to the class level. 2. Understand and describe the morphology, anatomy, and reproductive processes of a species 3. Assess the economic and ecological importance of algae and bryophytes, focusing on their applications in biofertilizers, biodiesel production, and water quality indicators. 4. Investigate the evolutionary relationships between algae and bryophytes, emphasizing their phylogenetic connections and ecological roles. 5. Explore the impact of pollution on bryophytes, their stress tolerance mechanisms, and conservation strategies for algae and bryophytes in a changing environment.
LEARNING OUTCOMES (LO)	After completion of the course, the students will be able to 1. Identify and explain the key features of algae, including their diversity, reproductive types, and classification systems. 2. Examine and describe the systematic position, structure, and reproductive methods of various algae species such as Anabaena, Volvox, and Sargassum. 3. Demonstrate an understanding of the life cycle, morphological

	characteristics, and classification of bryophytes, with specific focus on Proskauer's system. 4. Understand the methods of algal biodiesel production and the applications of algae as biofertilizers, and compare their benefits with traditional agricultural practices. 5. Investigate the bioactive compounds derived from bryophytes, including their pharmacological properties such as antimicrobial and antioxidant activities, and explore their potential applications in the cosmetic industry.

BO2224 – Applied Phycology and Bryology

Units	Title of Contents	Hours (45)
UNIT 1	**Algae – General concepts** Diversity of Algae with respect to habitat, thallus organization and reproduction. *Classification of algae (upto classes) by Fritsch (self study).*	**5 + *2***
UNIT 2	**Algae – Type study** Systematic position, structure and reproduction of the following forms: *Anabaena, Volvox, Spirogyra, Vaucheria, Sargassum, Batrachospermum*.	**7**
UNIT 3	**Bryophytes – General concepts** Bryophytes: Distribution, general characters, alternation of generation and classification of Bryophytes by Proskauer (1957).	**4**
UNIT 4	**Bryophytes – Type study** Morphology, anatomy and reproduction of *Marchantia, Anthoceros and Sphagnum* (developmental details not required).	**6**
UNIT 5	Origin and phylogenetic relationships between algae and bryophytes.	**3**
UNIT 6	Algal immobilization and its applications, Blue-green algal bio-fertilizer: Method of preparation (Trough/ Tank method, Pit method). Applications and advantages of biofertilizers over inorganic fertilizers	**3**
UNIT 7	Fuels- Renewable and Non – renewable. Algal biodiesel; Cultivation and extraction methods. *Advantages over other sources of biodiesel (Self study)*	**2 + *1***
UNIT 8	*Algae as water quality indicators; Algal blooms-causes and effects (Self study)*	***2***
UNIT 9	Bioactive compounds from bryophytes: phytochemicals from bryophytes and their bioactivity. Pharmacological activity of bryophytes - antimicrobial activity, antifungal activity, cytotoxic activity, antioxidant activity *Bioactive ingredients from Bryophytes for the cosmetic industry (self study).*	**3 + *1***
UNIT 10	Bryophytes in a changing world – impact of pollution on bryophytes, application to bioindication, adaptation to a changing environment. Stress tolerance in bryophytes. Conservation biology for algae and bryophytes – threats, need for conservation and conservation strategies. Role of peat in soil less plant growth.	**6**

BO 2P1: Applied Phycology and Bryophytes

11 Sessions – 3 Hours/ Week

Sl. No.	Experiment	Units/ Sessions
1	Type study of *Anabaena, Scytonema, Volvox*	1
2	Type study of *Spirogyra, Chara, Vaucheria*	1
3	Type study of *Sargassum, Batrachospermum*	1
4	Type study of *Marchantia*	2
5	Type study of *Anthoceros*	1
6	Type study of *Funaria*	1
7	Isolation of algae from water samples by serial dilution method	1
8	Demonstration of algal culture using Chu10 medium	1
9	Extraction and separation of photosynthetic pigments from an algal sample	1
10	Institutional visit to study culturing of microalgae	1

References:

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2. Trivedi, PC. 2001. Algal biotechnology, Pointer publishers, Jaipur, India.
3. Bold and Wynee, 1985. Introduction to Algae- structure and reproduction; Prentice hall,India.
4. Vashishta, BR. 1976. Botany for degree students Part 1.Algae,S.Chand and company, New Delhi.
5. Parihar, NS.1962. Bryophyta, Central book depot, Allahabad.
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ST. JOSEPH'S UNIVERSITY, BENGALURU - 560027
SCHOOL OF LIFE SCIENCES, DEPARTMENT OF BOTANY
I B.Sc. II SEMESTER - CBZ
BO2P124 – PHYCOLOGY AND BRYOLOGY
BOTANY PRACTICAL EXAMINATION

MAX. MARKS: 25 TIME: 3 HOURS

I	Identify specimens A and B with classification and reasons	2 × 3 = 6
II	Prepare a temporary slide of C, identify, comment and leave the preparation for evaluation	5
III	Separate the photosynthetic pigments from the given algal sample D and calculate the Rf values. Write the principle and discuss the results.	5
III	Identify the slides E, F and G with labeled diagrams and reasons	3 × 3 = 9

KEY

A and B– Algae and Bryophyte specimens

C – Algae specimen

D – Algae sample

E, F, G – Algae and Bryophyte slides

THEORY QUESTION PAPER PATTERN

ST JOSEPH'S UNIVERSITY, BENGALURU - 560027

I B.Sc. BOTANY – I SEMESTER, CBBT

SEMESTER EXAMINATION

BO 2124: PHYCOLOGY AND BRYOLOGY

Time: 2 Hours **Max Marks: 60**

The paper contains TWO printed pages and THREE parts

Draw diagrams and provide examples wherever necessary

A. Answer ANY TEN of the following in 2 or 3 sentences **10 × 2 = 20**

1.
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B. Answer ANY FIVE of the following **5 × 6 = 30**

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19.

C. Give a comprehensive account on ANY ONE of the following **1 × 10 = 10**

20.
21.

BLUEPRINT OF THEORY EXAMINATION QUESTION PAPER PATTERN

Unit number	Number of hours	Total marks for which the questions are to be asked (including bonus questions)
I	7	13
II	7	13
III	4	8
IV	6	11
V	3	6
VI	3	6
VII	3	6
VIII	2	4
IX	4	8
X	6	11
TOTAL	45	86
Note: Maximum marks for the paper (Excluding bonus question): 60		

ST JOSEPH'S UNIVERSITY
BENGALURU-27

BOTANY - SYLLABUS

FOR UNDERGRADUATE PROGRAMME - CBBT
(AS PER SEP 2025-26)

3rd Semester B.Sc. Botany syllabus (SEP)

BO 3225: Plant Anatomy, Paleobotany and Palynology (for CBBT course)

Course Outcomes and Course Content

Semester	III
Paper Code	BO 3225
Paper Title	Plant Anatomy, Paleobotany and Palynology (CBBT)
Number of teaching hours per week	03
Total number of teaching hours of theory per semester	45
Number of theory credits	03
Total number of teaching hours of practical per semester	33
Number of practical credits	02

COURSE OBJECTIVES **(CO)**	**CO1:** To gain a comprehensive understanding of the structure and function of plant cells, tissues, and organs, focusing on ultrastructural organization of plant cell walls, meristems, and vascular tissues. **CO2:** To understand the organization and functional significance of apical and lateral meristems, the theories of shoot and root apical meristem organization, and the role of secondary growth in plants. **CO3:** To study specialized plant structures to gain insight into their roles in protection, transport, and environmental interaction. **CO4:** To acquire knowledge in the identification, preservation, and analysis of plant fossils and pollen, including modern techniques for studying ancient plant life, their economic importance, and their relevance in understanding past climates and ecosystems.
LEARNING OUTCOMES **(LO)**	After completion of the course - **LO1:** Students will be able to explain the structural organization of plant cells, tissues, organs and specialized structures like stomata and secretory cells. **LO2:** Students will be able to describe the theories of shoot and root apical meristem organization and understand how secondary growth occurs in plants, including anomalous growth.

	LO3: Students will gain the ability to classify various types of plant fossils and explain the fossilization process. They will also be proficient in different fossil preparation techniques, such as thin sectioning, maceration, and X-ray imaging, and understand their significance in reconstructing plant evolution and paleoecology. **LO4:** Students will acquire knowledge of pollen grain morphology, including aperture patterns and exine ornamentation, and will be able to identify and classify pollen using the NPC system. They will also understand the applications of palynology.

BO 3225: PLANT ANATOMY, PALEOBOTANY AND PALYNOLOGY - 45 Hours		
	UNIT 1: PLANT ANATOMY	**25 hours**
Chapter 1	Introduction and scope of plant anatomy. **Plant cell**: Ultra-structural organization - primary and secondary wall layers of plant cell wall and its functions.	3
Chapter 2	*Meristems and its types.* Structural organization of Shoot Apical Meristem (SAM) - Theory of organization (Tunica-Corpus). Organization of Root apical meristem (Korper-Kappe theory) and quiescent center concept.	2+*2*
Chapter 3	Simple and complex permanent tissues. Anatomy of dicot and monocot leaf, *stem and root.* Types of vascular bundles. Secondary growth of dicot stem (*Helianthus*) and dicot root (*Cicer*); Anomalous secondary growth in the stem of *Boerhaavia* and *Dracaena*.	6 + *2*
Chapter 4	**Wood:** Ray and axial parenchyma; Sapwood and heartwood; Ring and diffuse porous wood; Early and late wood, tyloses; Dendrochronology. **Periderm:** Development and composition of periderm, rhytidome and lenticels	6
Chapter 5	**Variations of adaptive and protective systems:** epidermis, cuticle, epicuticular waxes and stomata. **Secretory structures in plants:** External secretory structures: Glandular trichomes, colleters, stinging hair, nectaries, hydathodes, salt glands, oil cavities, resin ducts and laticifers. Internal secretory structures: Idioblasts and cystoliths	4

	UNIT 2: PALEOBOTANY	**9 hours**
Chapter 6	Introduction to Paleobotany **General account on plant fossils and its** types - impressions, compressions, petrification, nodules, moulds, casts coal balls, compactions and ambers. **Techniques to study fossils:** ground thin section technique, peel technique, transfer technique, maceration technique, X-ray technique, microtomy technique. Determination of the age of fossils by carbon dating and radioisotope dating. *Economic importance of fossils.*	8+*1*
	UNIT 3: PALYNOLOGY	**11 hours**
Chapter 7	Introduction, scope and branches of palynology - brief concept of Mellissopalynology. Morphology of pollen grain: pollen wall structure, polarity, symmetry, size and shape, apertural pattern, exine stratification and ornamentation of pollen wall. NPC system of classification. Pollen bank. *Methods in palynology: Acetoylsis technique.* **Forensic palynology:** introduction, spores and pollens, abundance, dispersal, sample collection, identification of pollen, preservation, non-palynological remains associated with samples and applications. **Palaeopalynology:** introduction, palaeopalynology in geochronology, biostratigraphy and paleoecology. Distribution, abundance and durability of palynomorphs, disadvantages and limitations.	10+*1*

NOTE: Portions that are underlined are meant for self-study

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BLUEPRINT

Unit/ Chapter number	Number of hrs.	Total marks for which the questions are to be asked (including bonus questions)
1	03	6
2	04	8
3	08	15
4	06	11
5	04	8
6	09	17
7	11	21
TOTAL	**45**	**86**

Note: Maximum marks for the paper (Excluding bonus question): **60**

BO 3P1:Plant Anatomy, Paleobotany and Palynology (CBBT) **Total: 33 Hours (11 Sessions and 3 hours per week)**	
LIST OF EXPERIMENTS	
Practical 1	Anatomy of dicot and monocot leaf.
Practical 2	Anatomy of dicot and monocot stem.
Practical 3	Anatomy of dicot and monocot root.
Practical 4	Study of secretory systems in plants: glandular, non-glandular trichomes and colleters.
Practical 5	Adaptive anatomy of *Nerium* and *Hydrilla*.
Practical 6	Anatomy of anomalous secondary growth in *Boerhaavia* and *Dracaena*.
Practical 7	Study of permanent slides – xylary elements.
Practical 8	Study of types of fossil specimens.
Practical 9	Study of pollen grain morphology.
Practical 10	Semi-permanent slide preparation of pollen grains using Wodehouse technique.
Practical 11	Revision/Makeup lab/Attestation of records.

PRACTICAL QUESTION PAPER PATTERN

ST JOSEPH'S UNIVERISTY, BENGALURU – 560 027
SCHOOL OF LIFE SCIENCES, DEPARTMENT OF BOTANY
2nd B.Sc., 3rd SEMESTER (CBBT)
BO 3P1: PLANT ANATOMY, PALEOBOTANY AND PALYNOLOGY

MAX. MARKS: 25 **TIME: 2 HOURS 40 MINUTES**

1. Prepare a temporary section of sample **A**, identify and comment ……....**5x1=5**
2. Mount semi-permanent slides of sample **B and C**, identify and comment…...**4x2=8**
3. Identify the permanent slide **D** and comment ……..……**4x1=4**
4. Identify and comment on the permanent slide/specimens **E** and **F**…..... **4x2=8**

Scheme

1. **A:** Stem/Root/Leaf of Dicot or Monocot
2. **B** and **C:** Any 2 types of pollen
3. **D:** Xylary elements/ Anomalous secondary growth
4. **E** and **F:** Fossil specimens/ Secretory structures

THEORY QUESTION PAPER PATTERN

ST JOSEPH'S UNIVERSITY, BENGALURU - 560027
II B.Sc. BOTANY – III SEMESTER, CBBT
SEMESTER EXAMINATION
BO 3225: PLANT ANATOMY, PALEOBOTANY AND PALYNOLOGY

Time: 2 Hours **Max Marks: 60**

The paper contains TWO printed pages and THREE parts
Draw diagrams and provide examples wherever necessary

A. Answer ANY TEN of the following in 2 or 3 sentences **10 × 2 = 20**

1.
2.
3.
4.
5.
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10.
11.
12.

B. Write critical notes on ANY FIVE of the following **5 × 6 = 30**

13.
14.
15.
16.
17.
18.
19.

C. Give a comprehensive account on ANY ONE of the following **1 × 10 = 10**

20.
21.

ST JOSEPH'S UNIVERSITY
SCHOOL OF LIFE SCIENCES
DEPARTMENT OF BOTANY
BENGALURU 560 027

Semester	IV - CBBT
Paper Code	BO 4225
Paper Title	Pteridophytes and Gymnosperms
Number of teaching hours per week	03
Total number of teaching hours of theory per semester	45
Number of theory credits	03
Total number of teaching hours of practicals per semester	33
Number of practical credits	02

COURSE OBJECTIVES **(CO)**	The course aims to: 1. Provide a basic understanding of Pteridophytes and Gymnosperms, including their characteristics, distribution, and affinities. 2. Explain the sporophyte and gametophyte stages, reproductive mechanisms, and life cycles of selected forms. 3. Analyze stelar variations in Pteridophytes and understand the seed habit phenomenon. 4. Explore fossil records, geological time scales, and the evolutionary significance of ancient Pteridophytes and Gymnosperms. 5. Understand these plant groups' bioprospecting opportunities, ecological roles, and economic uses. 6. Familiarize students with preserved and live specimens, enabling hands-on experience in identifying and studying selected species.
LEARNING OUTCOMES **(LO)**	After completion of the course, the students will - 1. Learn about the characteristics, distribution, and relationships of Pteridophytes and Gymnosperms. 2. Study the sporophyte and gametophyte stages, along with reproductive strategies. 3. Differentiate stelar types and understand the evolution of seed habit in Pteridophytes. 4. Learn about the geological time scale and fossil records related to these plant groups. 5. Explore Pteridophytes and Gymnosperms' economic and medicinal importance. 6. Gain hands-on experience with preserved and live specimens of selected species.

BO4225: PTERIDOPHYTES AND GYMNOSPERMS		
UNIT NO.	**CONTENT**	**45 HOURS**
	Pteridophytes	
Unit I	A general account of characteristic features, distribution, and affinities of Pteridophytes with Gymnosperms. Classification (Smith, 1955).	04+01
Unit II	Systematic position, sporophytic structure, anatomy, reproduction, and life cycle of *Psilotum, Lycopodium, Selaginella, Equisetum, and Marsilea.* Study of fossil Pteridophyte – *Rhynia, Lepidodendron* and *Calamites.*	15
Unit III	A brief account of seed. Heterospory and seed habit. A brief account of stele. Stelar evolution in Pteridophytes.	05+02
Unit IV	Bioactive Compounds of Pteridophytes; Anticancer Properties of Pteridophytes and Derived Compounds; Pteridophytes as Ecological Indicators. A brief account of *Azolla* cultivation.	02+01
	Gymnosperms	
Unit V	A general account of characteristics, distribution, and affinities of Gymnosperms with Angiosperms. Classification (Sporne, 1965). Salient features of Cycadales, Coniferales, and Gnetales.	04+01
Unit VI	Systematic position, sporophytic structure, anatomy, reproduction, and life cycle of *Pinus* and *Gnetum*. Bioactive Compounds of Gymnosperms Economic importance of Gymnosperms.	09+01

NOTE: Portions that are underlined are meant for self-study

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BLUEPRINT OF THEORY EXAMINATION QUESTION PAPER PATTERN

Unit number	Number of hrs.	Total marks for which the questions are to be asked (including bonus questions)
I	03	06
II	16	30
III	09	18
IV	02	04
V	05	10
VI	10	18
TOTAL	**45**	**86**
Note: Maximum marks for the paper (Excluding bonus question): **60**		

A. 2-mark questions: Answer any 10 out of 12. | 2x10 = **20 marks**
B. 6-mark questions: Answer any 5 out of 7. | 6x5= **30 marks**
C. 10-mark questions: Answer any 10 out of 2. | 10x1= **10 marks**

BO4P225: PTERIDOPHYTES AND GYMNOSPERMS Total: 33 Hours (11 Sessions and 3 hrs. per week)	
LIST OF EXPERIMENTS	
Practical 1:	Study of morphology, anatomy, and reproductive structures of *Psilotum.*
Practical 2:	Study of morphology, anatomy, and reproductive structures of *Lycopodium.*
Practical 3:	Study of morphology, anatomy, and reproductive structures of *Selaginella.*
Practical 4:	Study of morphology, anatomy, and reproductive structures of *Equisetum.* Temporary slide preparation of *Equisetum* stem.
Practical 5:	Study of morphology, anatomy, and reproductive structures of *Marsilea.*
Practical 6:	Study of morphology and anatomy in *Pinus.* Temporary slide preparation of *Pinus* needle.
Practical 7:	Study of reproduction in *Pinus* and morphology of *Gnetum.*
Practical 8:	Study of anatomy and reproductive structures of *Gnetum.*
Practical 9:	Demonstration of *Azolla* cultivation.
Practical 10:	Study of fossil genera: *Rhynia, Glossopteris,* and *Pentoxylon.*
Practical 11:	Revision/Makeup lab/Attestation of records.

PRACTICAL EXAMINATION QUESTION PAPER PATTERN

St Joseph's University, Bengaluru - 560027

III Semester, B.Sc. Botany Practical Examination

BO4P225: Pteridophytes and Gymnosperms

Time: 3hrs Max. Marks: 25

1. Identify specimens **A, B, C** and comment.	3x3=9 Marks
2. Identify slides **D, E,** and **F,** Classify, draw neat labeled diagrams and comment.	3x3=9 Marks
3. Prepare a temporary slide of **G.** Comment with a neat labeled diagram and leave the preparation for evaluation.	1x5=5 Marks
4. Submission of one Pteridophyte/Gymnosperm specimen	2 Marks

Scheme

- **A.** Pteridophytes – 3 marks
- **B.** Pteridophytes – 3 marks
- **C.** Gymnosperms – 3 marks
- **D.** Pteridophyte – 3 marks
- **E.** Fossils; Pterophytes/Gymnosperms – 3 marks
- **F.** Gymnosperms – 3 marks
- **G.** Gymnosperms/Pteridophytes – 5 marks
- **Submission** – 2 marks