

**ST JOSEPH'S UNIVERSITY
BENGALURU-27**



BOTANY SYLLABUS

**FOR UNDERGRADUATE PROGRAMME
CBZ (CHEMISTRY, BOTANY, ZOOLOGY)
(AS PER SEP 2026-29)**

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

Semester	I- CBZ
Paper Code	BO 1126
Paper Title	Microbiology, Mycology and Plant Pathology
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)	<p>The course aims to:</p> <ol style="list-style-type: none"> 1. Provide a basic understanding of contributions of key microbiologists in shaping the field. 2. Explain the components, working principles, and applications of light and electron microscopes. 3. Explain the preparation and application of basal, enriched, selective, indicator, transport, and storage media. 4. Appreciate the diversity and significance of viruses in biological systems. 5. Evaluate the economic importance of bacteria in industry, agriculture, and medicine. 6. Appreciate the significance of plant pathology in agriculture and food security.
LEARNING OUTCOMES (LO)	<p>After completion of the course, the students will be able to</p> <ol style="list-style-type: none"> 1. Explain the historical development of microbiology and describe the contributions of key microbiologists in the field. 2. Demonstrate understanding of microscopy and microbial culture techniques, including preparation, sterilization, and maintenance of culture media. 3. Describe the structure, classification, and reproduction of microorganisms such as viruses, bacteria, and fungi, and their economic significance in industry, agriculture, and medicine. 4. Apply laboratory skills in microbial staining, cell counting, and identification of fungi and plant pathogens using appropriate microbiological techniques. 5. Analyze major plant diseases caused by microbes, explain their causal organisms, symptoms, and control measures in the context of plant pathology.

BO 1126: Microbiology, Mycology and Plant Pathology

Units	Title of Contents	Hrs (45)
UNIT I	History and recent developments of microbiology - Microbiologists and their contributions (Leeuwenhoek, Louis Pasteur, Robert Koch, Edward Jenner and Alexander Fleming). Nobel laureates in Physiology and medicine	2
UNIT II	Microscopy – <i>History of microscopy (self study)</i> . Components, working principle and applications of light (<i>simple and compound</i>) (<i>self study</i>) and fluorescence, DIC, electron microscopes (SEM and TEM).	3+2
UNIT III	<u>Culture media for Microbes - Natural and synthetic media, Routine media -basal media, enriched media, selective media, indicator media, transport media, and storage media (Self study)</u>	2
UNIT IV	Sterilization methods - Principle of disinfection, antiseptic and Pasteurization, Sterilization - Sterilization by dry heat, moist heat, UV light, ionization radiation, filtration. Chemical methods of sterilization - phenolic compounds, anionic and cationic detergents.	4
UNIT V	Viruses - General structure and Baltimore system of classification, classification of viruses based on Nucleic acids (ssDNA, dsDNA, ssRNA, and dsRNA). Structure and multiplication of TMV.	3
UNIT VI	Bacteria – General account on Archaeobacteria 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. <i>Economic importance of Bacteria (Industry, agriculture and Medicine) – (Self study)</i>	13+1
UNIT VII	Fungi - General characteristics and thallus organization and nutrition in fungi. Reproduction in fungi (asexual and sexual). Type study of; <i>Pythium, Rhizopus, Puccinia</i> and <i>Penicillium</i> . <i>Economic importance of fungi (Industry, agriculture, medicine, as endophytes) Self study</i> Lichens – Structure, types and reproduction.	9+1
UNIT VIII	Plant Pathology –Introduction, General account of plant pathogens, mode of infection, transmission, and disease triangle. Brief account of the following diseases: Tomato Leaf Curl, Citrus Canker, Tat ipaka disease, Club Root of Crucifer, Smut of Jowar, Blast of Arecanut, Red Rot of Sugarcane.	5

BO 1P1 26: Microbiology, Mycology and Plant Pathology

11 Sessions – 3 Hours/ Week

LIST OF EXPERIMENTS	
Practical 1	Safety measures in microbiology laboratory and study of equipments used for microbiological studies (Microscopes, Hot air oven, Autoclave/Pressure Cooker, Inoculation needles/loop, Petri plates, Incubator, Laminar flow hood, Colony counter, Glass bead sterilizer).
Practical 2	Preparation of culture media (NA/PDA) sterilization, inoculation. Enumeration of soil/water microorganisms by serial dilution technique.
Practical 3	Gram's staining of bacteria
Practical 4	Determination of cell count by using Haemocytometer.
Practical 5	Determination of microbial cell dimension by using Micrometer.
Practical 6	Study of vegetative structures and reproductive structures – <i>Stemonitis</i> , <i>Pythium</i> , <i>Rhizopus</i>
Practical 7	Study of vegetative structures and reproductive structures- <i>Puccinia</i> , <i>Penicillium</i>
Practical 8	Study of vegetative structures and reproductive structures- <i>Trichoderma</i> and <i>Agaricus</i>
Practical 9	Study of Tomato Leaf Curl, Citrus Canker, Sandal Spike, Club Root of Crucifer.
Practical 10	Study of Smut of Jowar, Blast of Rice, Red Rot of Sugarcane and Tikka disease of Groundnut.
Practical 11	Revision

References

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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	02	04
II	05	10
III	02	04
IV	04	08
V	03	06
VI	14	24
VII	10	20
VIII	05	10
TOTAL	45	86
Note: Maximum marks for the paper (Excluding bonus question): 60		

PRACTICAL EXAMINATION QUESTION PAPER PATTERN

ST. JOSEPH'S UNIVERSITY, BENGALURU - 560027
SCHOOL OF LIFE SCIENCES, DEPARTMENT OF BOTANY
B.Sc. (B O T A N Y) I SEMESTER - CBZ
BO 1P1 26- MICROBIOLOGY, MYCOLOGY AND PLANT PATHOLOGY
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

B.Sc. BOTANY – I SEMESTER, CBZ

SEMESTER EXAMINATION

BO 1126: MICROBIOLOGY, MYCOLOGY AND PLANT PATHOLOGY

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.
- 6.
- 7.
- 8.
- 9.
- 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.

Semester	II-CBZ
Paper Code	BO 2126
Paper Title	Algae, Bryophytes and Pteridophytes
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)	<p>CO1: Recall the general characteristics, classification systems, life cycles, and distribution patterns of Algae, Bryophytes, and Pteridophytes.</p> <p>CO2: Explain the morphology, anatomy, and reproductive features of representative plant groups such as - Algae (members of Cyanophyceae, Chlorophyceae, Xanthophyceae, Phaeophyceae and Rhodophyceae), diatoms; Bryophytes (<i>Marchantia</i>, <i>Anthoceros</i>, and <i>Sphagnum</i>); and Pteridophytes (<i>Psilotum</i>, <i>Lycopodium</i>, <i>Selaginella</i>, <i>Equisetum</i>, and <i>Marsilea</i>).</p> <p>CO3: Apply the knowledge of alternation of generations, heterospory, stelar evolution, and seed habit to understand evolutionary trends in plant groups.</p> <p>CO4: Analyze the affinities and differences among Algae, Bryophytes, Pteridophytes, Gymnosperms, and Angiosperms with respect to structural organization and reproductive strategies.</p> <p>CO5: Evaluate the ecological roles of Algae, Bryophytes and Pteridophytes in ecosystem functioning, carbon sequestration, ecological succession, and climate regulation.</p> <p>CO6: Integrate botanical knowledge to assess conservation challenges, climate change impacts, and the significance of bioactive compounds and bioremediation studies in environmental monitoring.</p>
LEARNING OUTCOMES (LO)	<p>After successful completion of this course, the student will be able to</p> <p>LO1: Recall fundamental botanical terms; describe the diversity, general characters and classification of algae, diatoms bryophytes and pteridophytes with suitable examples.</p> <p>LO2: Explain the organization of thallus/plant body, cell structure, pigments and reserve food materials in major cryptogamic plant groups.</p> <p>LO3: Compare reproductive methods and life cycles of algae, bryophytes and pteridophytes, highlighting alternation of generations.</p> <p>LO4: Analyze evolutionary trends from aquatic algae to early land plants, emphasizing adaptations for terrestrial life.</p> <p>LO5: Identify and illustrate important genera of algae, bryophytes and pteridophytes based on morphological and reproductive features.</p> <p>LO6: Integrate botanical knowledge to formulate explanations, solve biological problems, and propose of conservation or environmental strategies.</p>

BO 2126: Algae, Bryophytes and Pteridophytes

Unit No.	ALGAE	15 Hours
Unit I	Algae – Diversity of Algae with respect to habitat, Algal cell structure, thallus organization and reproduction. <u>Classification of algae (up to classes) by Fritsch (self study)</u>	04 + <u>01</u>

Unit II	Systematic position, structure and reproduction of the following forms: <i>Anabaena</i> , <i>Volvox</i> (focus on evolution of multicellularity), <i>Spirogyra</i> , <i>Vaucheria</i> , <i>Sargassum</i> , <i>Batrachospermum</i> . A brief account of diatoms. Origin and phylogenetic relationships between algae and bryophytes. <u>Algae as source of biofertilizers and biofuel.</u>	09 + <u>01</u>
BRYOPHYTES		15 Hours
Unit III	Bryophytes - distribution, general characters, alternation of generations, and classification of Bryophytes by Proskauer (1957).	03
Unit IV	Morphology, anatomy, and reproduction of <i>Marchantia</i> , <i>Anthoceros</i> , and <i>Sphagnum</i> (developmental details not required). <i>Marchantia</i> as model organism in plant biology research.	06
Unit V	Ecological Implications of Bryophytes - Bryophytes for microhabitat creation (algae, fungi, higher plants insects and microorganisms) <u>Bryophytes as indicators of pollution(self -study)</u> <u>Economic importance of Bryophytes (self -study)</u>	04 + 02
PTERIDOPHYTES		15 Hours
Unit VI	A general account of characteristic features, distribution, and affinities of Pteridophytes with Bryophytes. <u>Classification (Smith, 1955).</u>	02+01
Unit VII	Systematic position , sporophytic structure, anatomy, reproduction, and life cycle of <i>Psilotum</i> , <i>Lycopodium</i> , <i>Equisetum</i> , and <i>Marsilea</i> . Study of fossil Pteridophytes – <i>Rhynia</i> and <i>Lepidodendron</i> .	09
Unit VIII	Heterospory and seed habit. Stellar evolution in Pteridophytes. <u>Bioactive compounds of pteridophytes and their use.</u>	02 + 01

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

BO 2P226: Algae, Bryophytes and Pteridophytes (CBZ)
Total: 33 Hours (11 Sessions and 3 hours per week)

LIST OF EXPERIMENTS	
1	Study of morphology, anatomy, and reproductive structures of <i>Anabaena</i> , <i>Scytonema</i> , <i>Volvox</i>
2	Study of morphology, anatomy, and reproductive structures of <i>Spirogyra</i> , <i>Chara</i> , <i>Vaucheria</i>
3	Study of morphology, anatomy, and reproductive structures of <i>Sargassum</i> , <i>Batrachospermum</i>
4	Study of morphology, anatomy, and reproductive structures of <i>Marchantia</i>

5	Study of morphology, anatomy, and reproductive structures of <i>Anthoceros</i> , <i>Funaria</i>
6	Study of morphology, anatomy, and reproductive structures of <i>Psilotum</i> , <i>Selaginella</i>
7	Study of morphology, anatomy, and reproductive structures of <i>Lycopodium</i> .
8	Study of morphology, anatomy, and reproductive structures of <i>Equisetum</i> . Temporary slide preparation of <i>Equisetum</i> stem.
9	Study of morphology, anatomy, and reproductive structures of <i>Marsilea</i> .
10	Extraction and separation of photosynthetic pigments from an algal sample
11	Revision/Makeup lab/Attestation of records.

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BLUEPRINT OF THEORY QUESTION PAPER

Course code: BO 2126, Course title: Algae, Bryophytes and Pteridophytes

Chapter number	Number of hours	Total marks for which the questions are to be asked (including bonus questions)
1	05	10
2	10	18
3	03	06
4	06	11
5	06	11
6	03	06
7	09	18
8	03	06
TOTAL	45	86
Note: Maximum marks for the paper (Excluding bonus question): 60		

PRACTICAL EXAM QUESTION PAPER PATTERN

**ST JOSEPH'S UNIVERSITY, BENGALURU - 560027
SCHOOL OF LIFE SCIENCES, DEPARTMENT OF BOTANY
I B.Sc., II SEMESTER (CBZ)
BO 2P226: ALGAE, BRYOPHYTES AND PTERIDOPHYTES**

Time: 3 hrs

Max. Marks: 25

1.	Identify the specimens A, B, and C , give classification and comment.	3x3=9 marks
2.	Identify the slides D, E, F and G , draw neat labeled diagrams and comment.	4x2=8 marks
3.	Prepare a temporary slide/ Separate the algal pigments using paper chromatography and determine their Rf values: of the given material H & I . Comment with a neat labeled diagram and leave the preparation for evaluation.	2x4=8 marks

Scheme:

1. A. Algae – 3 marks
B. Bryophytes – 3 marks
C. Pteridophytes – 3 marks
2. D. Algae – 2 marks
E. Bryophytes – 2 marks
F. Pteridophytes – 2 marks
G. Fossils; Pteridophytes – 2 marks
3. H. Algae specimen/ Chromatography of the algal pigment extract – 4 marks
I. Pteridophyte specimen – 4 marks

ST JOSEPH'S UNIVERSITY, BENGALURU - 560027
I B.Sc. BOTANY – II SEMESTER, CBZ
SEMESTER EXAMINATION
BO 2126: ALGAE, BRYOPHYTES AND PTERIDOPHYTES
(Only for current CBZ students)

Time: 2 Hours

Max Marks: 60

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

A. Answer any TEN of the following

10 × 2 = 20

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

B. Answer any FIVE of the following

5 × 6 = 30

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

C. Answer any ONE of the following

1 × 10 = 10

- 20.
- 21.