BANGALORE UNIVERSITY

DEPARTMENT OF BOTANY

JNANABHARATHI CAMPUS

BENGALURU – 560 056

SYLLABUS FOR I & II SEMESTER

B. Sc., BOTANY

UNDER GRADUATE (UG) PROGRAMME

FRAMED ACCORDING TO STATE EDUCATION POLICY (SEP) 2024

JULY 2024

PROCEEDINGS OF THE BOARD OF STUDIES IN BOTANY (UG) MEETING HELD ON 08-07-2024 IN THE DEPARTMENT OF BOTANY, BANGALORE UNIVERSITY, BENGALURU.

The Chairman welcomed the expert committee members for the BOS meeting to discuss and finalize the SEP syllabus of I & II Semester, B. Sc., Botany for the academic year 2024-25 and thereafter the agenda was taken up for discussion.

MINUTES OF THE BOS (UG) MEETING

1. Discussed and finalized the SEP syllabus of I and II semester B.Sc., Botany both (Theory & Practicals) question paper pattern, blue print of question paper, Formative assessment and scheme of valuation for choice based credit system of SEP Programme.
2. The overall SEP Module for B.Sc., Botany was discussed, finalized and accepted with modifications wherever necessary.
3. The Chairperson is authorized to change / incorporate corrections as per the direction of University.

The meeting ended with a vote of thanks by the Chairman.

Professor & Chairman
Department of Botony
Bangalore University
Jnanabharathi Campus
Bengaluru - 560 056.

Proceedings of the **Board of Studies in Botany (UG)** meeting held on **08-07-2024** in the Department of Botany, Bangalore University, Bangalore to discuss and finalize the syllabus of **I** and **II Sem** B.Sc., Botany (SEP) and other issues as per the agenda.

Members Present

Sl. No	Names	Members	Signature
1	**Dr. H. R. Raveesha** Professor & Chairman, Dept. of Botany, Bangalore University, Bengaluru	**Chairperson**	
2	**Dr. Ushamalini** Professor, Dept. of Botany GFGC, Chennapatna	**Member**	
3	**Dr. Kempegowda M S** Professor, Dept. of Botany RCK, Kanakapura	**Member**	
4	**Dr. Shubha** Professor Dept. of Botany GFGC, Vijayanagar, Bengaluru	**Member**	
5	**Dr Mamatha N** Associate Professor, Dept. of Botany, GFGC, Vijayanagar, Bengaluru	**Member**	
6	**Dr Venkateshappa S M** Associate Professor, Dept. of Botany, East West First Grade College, Anjana nagara, Bengaluru	**Member**	
7	**Dr. Manjula S** Associate Professor, Dept. of Botany, GFGC, Ramanagara	**Member**	
8	**Rathna Kumari B M** Assistant Professor, Dept. of Botany, GFGC, Vijayanagar, Bengaluru	**Member**	
9	**Dr. Sharanappa**, P Professor, Dept. of Botany, Hassan University, Hassan	**External Member**	
Members Absent			
1	**Roopashree M G** Associate Professor, Dept. of Botany, KLE society's Nijalingappa college, Bengaluru	**Member**	ABSENT

8/7/24

Dr. H. R. RAVEESHA
Professor & Chairman

Professor & Chairman
Department of Botony
Bangalore University
Jnanabharathi Campus
Bengaluru - 560 056.

Preamble

The B.Sc. Botany undergraduate syllabus embodies a fusion of traditional botanical knowledge with modern advancements in biochemistry, molecular biology and biotechnology. Over time, the field of plant science has expanded exponentially, driven by extensive research contributions across its diverse disciplines. Plant biologists have played a pivotal role in assessing and conserving global plant diversity, while taxonomists have continually refined classification methodologies.

Recent advancements in botanical research have provided profound insights into the functional and structural aspects of plant development, facilitated by innovative tools and techniques. Emerging challenges in ecology and reproductive biology underscore the curriculum's dynamic and forward-looking approach.

In response to the escalating concerns of pollution and climate change, the curriculum emphasizes the critical role of plants in environmental sustainability and adaptation. The revised syllabus, effective from the 2024-25 academic session, has been meticulously crafted to provide a comprehensive foundation in plant science. It encompasses essential disciplines such as plant diversity, physiology, biochemistry, molecular biology, reproduction, anatomy, taxonomy, ecology, economic botany, plant physiology, plant biotechnology and the influence of environmental factors on plant growth.

Furthermore, the curriculum integrates practical applications and hands-on experiences through applied courses, aiming to nurture students' proficiency in modern research methodologies and enhance their readiness for professional endeavours.

Ultimately, the B.Sc. Botany undergraduate syllabus aims to equip students with a robust understanding of plant biology, preparing them to address contemporary challenges and opportunities in the field of botany with confidence and expertise.

Professor & Chairman
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Bangalore University
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COURSE PATTERN AND SCHEME OF EXAMINATION FOR B. Sc. AS PER SEP (2024-25 ONWARDS)															
SUBJECT: BOTANY (SUBJECT CODE: BUBOT)															
Sl. No	Semester	Course Code	Title of the Paper	Teaching hours	Hours/ Week		Examination pattern Marks / Paper				Duration of exam (hours)		Total marks / paper	Credits	
					Theory	Practical	Theory		Practical		Theory	Practical		Theory	Practical
							Max	IA	Max	IA					
1	I	BOTT-101	Microbial diversity and Phycology	56	4		80	20			3		100	4	
		BOTP-102	Microbial diversity and Phycology	56		4			40	10		3	50		2
2	II	BOTT-201	Mycology, Plant pathology, Bryophytes and Plant anatomy	56	4		80	20			3		100	4	
		BOTP-202	Mycology, Plant pathology, Bryophytes and Plant anatomy	56		4			40	10		3	50		2

The aims of the syllabus describe the B. Sc. in Botany. These aims outline the educational context in which syllabus content should be viewed.

Program outcomes (PO's)

By the end of the program the students will able to

PO1: The goal is to equip students with holistic knowledge, competencies, professional skills and a strong positive mind-set that they can leverage while navigating the current stiff challenges of the job market.

PO2: Knowledge about the role of microbes, their impact on humans and environment, culture collection centers & their role.

PO3: Gain laboratory skills such as sterilization techniques, microscopy, microbial cultures & staining techniques.

PO4: Knowledge on the bacterial & viral diseases, their economic importance & Vaccine types.

PO5: Identification and preservation of microbes for their applications in research and industry.

PO6: Comprehend the morphological & anatomical structures of algae along with reproduction life cycles, the economic importance of cyanobacteria & algae in industry, agriculture, biotechnology and medicine.

PO7. Understand the importance of Bio-pesticides & their applications.

PO8. Understand the structure, reproduction of Bryophytes with their economic importance.

PO9. Understand the structure & importance of Meristems, secretory cells, simple & permanent tissues of plants.

PO10. Observation of variations that exist in internal structure of various parts of a plant and as well as among different plant groups in support for the evolutionary concept.

PO11. Obtain laboratory skills/explore non-flowering plants for their commercial applications.

PO12. Aware of Mushroom cultivation techniques.

BOTANY CURRICULUM

PAPER - I:
MICROBIAL DIVERSITY AND PHYCOLOGY (THEORY)

Programme Name	**B.Sc./ BOTANY**	**Semester**	**I**
Course Title	**Paper – I: Microbial Diversity and Phycology (Theory)**		
Course Code	**BOTT-101**	**No. of Credits**	**4**
Contact Hours	**56 Hours**	**Duration of Exam**	**3 Hours**
Formative Assessment Marks	**20**	Summative Assessment Marks	**80**

Course Outcomes (CO's):

CO1. To understand microbial diversity through isolation techniques from various environments, mastering methods of sterilization and learning microbial culture and preservation techniques.

CO2. Students will explore the structure, classification and multiplication of viruses like TMV, SARS-CoV-2 and Bacteriophage-2, along with the economic importance of viruses and vaccination strategies.

CO3. The course also covers bacterial characteristics, reproduction, plasmid biology and bacterial diseases such as Citrus canker and Mycoplasma-related diseases.

CO4. Additionally, students will study Cyanobacteria, Algae (Phycology) & their economic roles and the environmental applications of Algae in industries and agriculture.

CO5. The students will be exploring the fascinating diversity, evolution, significance of microorganisms and also comprehend the systematic position, structure, physiology and life cycles of microbes.

UNIT: I	**INTRODUCTION TO MICROBIOLOGY -** Isolation of microbes from soil, water and air. Sterilization methods - physical and chemical. Microbial cultures and preservation - pure culture, sub culturing, overlaying cultures with mineral oils, lyophilisation. Microbial culture collection centres: ITCC, MTCC and ATCC. **Viruses and Viroids:** general structure and classification of viruses. Structure and multiplication of TMV, SARS-CoV2 and Bacteriophage-2. Culture of viruses, Economic Importance of viruses. **Vaccines and their types.** **Viroids:** A brief account of PSTVD **Prions**.	**14 hrs**

UNIT: II	**STUDY OF BACTERIA** Introduction, occurrence, size and shape, arrangement of flagella, classification and structure of Bacterial cell. Archaebacteria and eubacteria. Ultrastructure of endospore. **Reproduction -** Binary fission and genetic recombination. Brief account on transposons and multidrug resistance. **Plasmids -** Definition, properties and types, structure and importance of Ti-plasmid, **Nutrition**: Phototrophs and chemotrophs. *Rhizobium* and its applications. **Bacterial disease** - Citrus canker A brief account of actinomycetes **General account of Mycoplasma** – Sandal spike disease.	**14 hrs**
UNIT: III	**STUDY OF CYANOBACTERIA AND PHYCOLOGY** **Cyanobacteria:** Introduction, general characteristics, classification, thallus structure, ultra-structure of a cell, reproduction and economic importance of Cyanobacteria, as SCP & Biofertilizers. **Structure and reproduction:** *Anabaena, Spirulina, Scytonema.* **Phycology**: Introduction, diversity of habitat, general characteristics and range of thallus organisation, pigmentation, outlines of classification (Fritsch – 1947) and reproduction.	**14 hrs**
UNIT: IV	**STRUCTURE, REPRODUCTION AND APPLIED PHYCOLOGY** **Morphology, reproduction and life cycle**: *Chlamydomonas, Volvox, Oedogonium, Chara, Sargassum and Polysiphonia.* Diatoms and their importance. **Applied Phycology**: Role of algae in the environment, agriculture, medicine, Biotechnology and Industry. Algal blooms.	**14 hrs**

PRACTICAL PAPER – I

	BOTP-102: MICROBIAL DIVERSITY AND PHYCOLOGY	15 Units
1.	**Study of instruments**: Autoclave, Inoculation chamber, Hot air oven, Incubator and inoculation loop. Sterilization of glassware's and media preparation (Nutrient agar) Isolation of Bacteria from soil, water and air by pour, spread and streak plate method.	2 Units
2.	Colony characteristics of Bacteria to identify the colonies obtained. **Plant diseases**: Bacterial disease - Citrus canker Mycoplasmal disease- Sandal spike	1 Unit
3.	Plant viral disease – Tobacco Mosaic Viral disease	1 Unit
4.	**Gram staining**: a) *Rhizobium* from root nodules b) *Lactobacillus* from curds. Endospore staining. Measurement of cell count – yeast cells / fungal spores using Haemocytometer.	2 Units
5.	**Type study of Cyanobacteria:** *Anabaena, Spirulina, Scytonema.*	1 Unit
6.	**Type study of algae:** *Chlamydomonas, Volvox, Oedogonium, Chara, Sargassum, Polysiphonia* and *Diatoms*	6 Units
7.	**Field visit** - Algal collection and cultivation of *Spirulina*	2 Units

PRACTICAL QUESTION PAPER-I: MICROBIAL DIVERSITY AND PHYCOLOGY

Max Marks – 40

1.	Identify and classify the given specimens **A, B, C & D** with reasons	4X3=12 Marks
2.	Prepare a temporary slide of **E,** sketch, label and identify with reasons. Leave the preparation for evaluation.	6 Marks
3.	Stain the given material **F** by Gram staining, write the procedure and identify with reasons. Leave preparation for evaluation. OR Calculate the population of fungal spores / yeast cells **F** using haemocytometer.	5 Marks
4.	Identify the slides **G**, **H** and **I** with labelled diagrams and reasons.	2X3=6Marks
5.	Submission of two algal specimens	2X3=6Marks
6.	Submission of class record	5 Marks
	Total marks	**40**

SCHEME OF VALUATION

1.	Four specimens **A, B, C, D** - two from algae, one from Cyanobacteria and one from diseases / Herbarium. (Identification and classification – **1** mark, labelled diagram with reasons - **2** marks)
2.	Specimen **E** from algae - mounting – **2** marks. Identification and diagram – **2** marks, reasons **2** marks)
3.	Specimen **F** – Gram staining (Staining - 2 marks, Procedure and result – 3 marks). **or** Calculation of fungal spores / yeast cells using haemocytometer (Procedure **1** mark, calculation – **2** marks)
4.	Three permanent slides **G**, **H and I**, two from algae and one from Cyanobacteria (Identification –**1** mark, sketch with reasons **2** marks)
5.	Submission of two algal specimens - **6** Marks
6.	Record – **5** marks

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs 1-15)

Course Outcomes (COs) / Program Outcomes (POs)	Program Outcomes (POs)											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2	2									
CO2		2	2	2		1						
CO3				2								
CO4					2	3						
CO5					2							

Pedagogy: Lectures, Field and laboratory visits, Participatory Learning, Seminars, Assignments etc.

Formative Assessment for Theory	
Assessment	**Marks**
Attendance	5 Marks
Assignment/Seminar	5 Marks
Two tests	10 Marks
Total	**20 Marks**

Formative Assessment for Practical

Assessment	**Marks**
Attendance/continuous assessment	5 Marks
Test	5 Marks
Total	**10 Marks**

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PAPER – II: MYCOLOGY, PLANT PATHOLOGY, BRYOPHYTES AND PLANT ANATOMY (THEORY)

Programme Name	**B.Sc./ BOTANY**	**Semester**	**II**
Course Title	**Paper – II: Mycology, Plant Pathology, Bryophytes and Plant Anatomy (Theory)**		
Course Code	**BOTT-201**	**No. of Credits**	**4**
Contact Hours	**56 Hours**	**Duration of Exam**	**3 Hours**
Formative Assessment Marks	**20**	Summative Assessment Marks	**80**

Course Outcome:

CO1: Understand the basics of mycology and bryophytes covering the characteristics, occurrence, organization, reproduction, and classification of fungi.

CO2: Explore the economic roles of fungi in medicine, agriculture, and industry, and investigate lichens for their structure, reproduction, ecological significance, and economic uses.

CO3: Analyse *Pichia pastoris* as a genetic model organism, understanding its applications in research and biotechnology.

CO4: In plant pathology, examine fungal diseases, focusing on symptoms, causes, and management strategies.

CO5: Explore meristematic tissues, apical meristem organization and the roles of shoot and root apical meristems. Study the development of floral organs using the ABC model.

UNIT: I	**MYCOLOGY:** Introduction**, g**eneral characters, occurrence, thallus organisation, reproduction and classification. Structure, reproduction and life cycle of *Rhizopus*, *Peziza, Penicillium, Puccinia* and *Cercospora*. **Economic importance:** Role of fungi in Medicine, Agriculture and Industries. **Lichens:** General account, classification, structure and reproduction. Ecological and Economic importance. AM fungi and their significance.	**14 hrs**
UNIT: II	**PLANT PATHOLOGY** General account, symptoms, pathogen etiology, mode of infection. **Management of fungal diseases**: Koleroga, Coffee rust, Grain smut of Sorghum, Blast disease of Rice and Red rot of Sugarcane. **A brief account of Biopesticides:** Neem, *Trichoderma* and *Bacillus thuringiensis.* Mycotoxins: Aflatoxins; A brief account.	**14 hrs**

UNIT: III	**BRYOPHYTES** General characters. Study of distribution, structure, reproduction, classification and alternation of generation in *Marchantia, Anthoceros* and *Funaria.* Ecological and Economic importance of Bryophytes.	**14 hrs**
UNIT: IV	**PLANT ANATOMY** **Meristematic tissues:** Structure, function, classification, organisation of Apical Meristems: Tunica-corpus theory and Histogen theory. Shoot Apical Meristem (SAM) and Root Apical Meristem (RAM), Quiescent centre and root cap. Transition from vegetative apex into reproductive apex. Developmental pattern at flowering apex: ABC model specification of floral organs. **Secretary cells and tissues:** Structure, classification and significance. Simple and permanent tissues (structure, components and functions). **Primary and Secondary growth:** Dicot stem (Tridax). A**nomalous Secondary growth**: A general account (*Dracaena and Boerhaavia*).	**14 hrs**

PRACTICAL PAPER – II

	BOTP-202: MYCOLOGY, PLANT PATHOLOGY, BRYOPHYTES AND PLANT ANATOMY	**15 Units**
1.	Identification and classification of fungal members included in the theory	3 Units
2	Study of lichens and Mycorrhiza	1 Unit
3.	Study of plant diseases included in the theory	1 Unit
4.	Study of Bryophytes forms included in the theory	3 Units
5.	Normal and Anomalous secondary growth in stem Ex. *Tridax, Dracaena* and *Boerhaavia* stem.	2 Units
6	Demonstration of mushroom cultivation	2 Units
7.	Preparation of permanent slides	1 Unit
8.	Isolation of fungi from infected fruits and vegetables	2 Units

PRACTICAL QUESTION PAPER-II: MICROBIAL DIVERSITY AND PHYCOLOGY

Max. Marks – 40

1.	Identify given specimens **A, B, C & D** with labelled diagrams and reasons	4X3=12 Marks
2.	Prepare a temporary stained T.S of the material '**E'** Sketch, label and identify with reasons, leave the preparation for evaluation.	6 Marks
3.	Write critical note on '**F'**	3 Marks
4.	Identify Slide **G, H** and **I** with labelled diagram with reasons.	3X3= 9 Marks
5.	Submission of pathology specimens/ permanent slides/ report on mushroom cultivation	5 Marks
6.	Submission of class record	5 Marks
	Total marks	**40**

SCHEME OF VALUATION

1.	Four specimens **A, B, C, D** - two from fungi, one from bryophytes and one specimen of diseases / Herbarium. (Identification and classification – **2** marks, labelled diagram with reasons **2** marks)
2.	**E** Staining and mounting – **2** marks. Identification and diagram – **2** marks, reasons **2** marks)
3	**F** - Lichen, Identification - **01** Mark, critical notes - **02** Marks
4.	Three permanent slides **G**, **H and I** - one from fungi, one from anatomy & one from bryophytes- (Identification – **1** mark, Labelled diagram with reasons - **2** marks)
5.	Submission of three pathology specimens/ 2 permanent slides/ report on mushroom cultivation - **5** Marks
6.	Record – **5** marks

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs 1-12)

Course Outcomes (COs) / Program Outcomes (POs)	Program Outcomes (POs)											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	2							2			2	
CO2											2	
CO3		2										2
CO4	2	2	2	2			2					
CO5					3				3	3		

Pedagogy: Lectures, Field and laboratory visits, participatory learning, seminars, assignments etc.

Formative Assessment for Theory	
Assessment	**Marks**
Attendance	5 Marks
Assignment/Seminar	5 Marks
Two tests	10 Marks
Total	**20 Marks**

Formative Assessment for Practical

Assessment	**Marks**
Attendance/continuous assessment	5 Marks
Test	5 Marks
Total	**10Marks**

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SCHEME OF THEORY AND PRACTICALS

(Effective from 2024-25) Scheme SEP

I. Continuous Internal Assessment (CIA): Marks: 20

Two tests of 5 marks each with proper record for assessment: 10 marks
Assignments/ Seminars : 5 marks
Attendance : 5 marks

Distribution of Marks for Attendance

Sl. No.	% of Attendance	Marks
1	75-80	1
2	81-85	2
3	86-90	3
4	91-95	4
5	96-100	5

II. **End Semester Examination (ESE) scheme**

Marks for each question	**Number of questions to be**		**Total Marks**
	Answered	**Out of**	
A. 2	**10**	**12**	**20**
B. 5	**4**	**6**	**20**
C. 10	**4**	**6**	**40**
		Total	**80**

B. Sc., Degree Theory Examination Model Question Paper Pattern
(Credit Based Semester Scheme)
BOTANY

Time: 3 hours **Max. Marks: 80**

PART - A

1. Explain / Define any **ten** of the following in two or three sentences: **(10 x 2 = 20)**

a.
b.
c.
d.
e.
f.
g.
h.
i.
j.
k.
l.

Section - B

Write critical notes on any **four** of the following: **(4 x 5 = 20)**

2.
3.
4.
5.
6.
7.

Section-C

Give a comprehensive account on any **four** of the following: **(4 x 10 = 40)**

8.
9.
10.
11.
12.
13.