

### **Composition of Board of Studies in Botany**

<b>Sl.No.</b>	<b>Name and Address</b>	
1.	M.M. Swamy JSS College for Women, Saraswathipuram, Mysuru	Chairperson
2.	Dr. K.N. Amurthesh Professor of Botany University of Mysore	University Nominee
3.	Dr. M. K. Mahesh Professor of Botany Yuvaraja's College, Mysuru	Academic Council Nominee
4.	Dr. N Suresh Associate Professor of Botany Maharani's Science College for Women, Mysuru	Academic Council Nominee
5.	Dr. G. M. Sindhu Assistant Professor JSSCAC S , Mysuru	Alumna
6.	Chandana C Assistant Professor JSS College for Women, Saraswathipuram, Mysuru	Faculty

### **Assessment: (Teaching, Learning and Evaluation)**

#### **Weightage for assessments (in percentage)**

<b>Type of Course</b>	<b>Formative Assessment / IA C1 and C2</b>	<b>Summative Assessment</b>
<b>Theory</b>	<b>40</b>	<b>60</b>
<b>Practical</b>	<b>25</b>	<b>25</b>

#### **ELIGIBILITY TO APPEAR FOR PRACTICAL EXAMINATION**

1. 80% Attendance (All Sem.)
2. Certified Bona-fide Record (All Sem.)
3. Herbarium and Field Book (Respective Sem.)
4. Field Study Reports (Respective Sem.)
5. Certified Bona-fide Project Report (Eighth Sem.)
6. Report on Experiential Learning (Internships etc.) (Eighth Sem.)

## **DISCIPLINE CORE PAPERS (DSC)**

<b>Sl. No.</b>	<b>Semester Details</b>	<b>Subject</b>	<b>Paper No</b>
1	Semester I	Microbial Diversity and Technology	<b>A-1</b>
2	Semester II	Diversity and Conservation of Non Flowering Plants	<b>A-2</b>
3	Semester III	Plant Anatomy and Development Biology	<b>A-3</b>
4	Semester IV	Ecology and Conservation Biology	<b>A-4</b>
5	Semester V	Plant taxonomy and Resource Botany	<b>A-5</b>
		Genetics and Cell Biology	<b>A-6</b>
6	Semester VI	Plant Physiology and Biochemistry	<b>A-7</b>
		Plant Biotechnology	<b>A-8</b>
7	Semester VII	Molecular Biology	<b>A-9</b>
		Seed Biology and Seed Technology	<b>A-10</b>
		Plant Health Technology	<b>A-11</b>
8	Semester VIII	Medicinal Plants and Phytochemistry	<b>A-12</b>
		Bioinformatics and Computational Biology	<b>A-13</b>
		Research Methodology	<b>A-14</b>

**CORE SPECIFIC ELECTIVE PAPERS  
(DSE)**

<b>Sl No.</b>	<b>Semester Details</b>	<b>Subject: Botany</b>	<b>Credits</b>	<b>Paper No</b>
1	Semester V	<b>DSE 1:</b> Algal and Fungal Biotechnology	03	E-1
2	Semester VI	<b>DSE 2:</b> Herbal Technology	03	E-2
3	Semester VII	<b>DSE 3:</b> Plant Propagation and Tissue Culture	03	E-3
4	Semester VIII	<b>DSE 4:</b> Landscaping, Gardening and Green House Technology	03	E-4

## B.Sc. BOTANY: Semester - 1

### Title of the Course: Microbial Diversity and Technology

Number of Theory Credits	Number of lecture hours/semester	Number of practical Credits	Number of practical hours / semester
4	56	2	56
Content of Theory Course 1			56 Hrs
Unit –1			15
<b>Chapter No. 1: Microbial diversity</b> -Introduction to microbial diversity; Methods of estimation; Hierarchical organization and positions of microbes in the living world. Whittaker's five-kingdom system and Carl Richard Woese's three-domain system. Distribution of microbes in soil, air, food and water. Significance of microbial diversity in nature.			5
<b>Chapter No. 2 History and developments of microbiology</b> -Microbiologists and their contributions (Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Dmitri Iwanowski, Sergius Winogradsky and M W Beijerinck and Paul Ehrlich).			5
<b>Chapter No. 3 Microscopy</b> -Working principle and applications of light, dark field, phase contrast and electron microscopes (SEM and TEM). Microbiological stains (acidic, basic and special) and Principles of staining. Simple, Gram's and differential staining.			5

<b>Unit – 2</b>	15
<b>Chapter No. 4. Culture media for Microbes</b> -Natural and synthetic media, Routine media -basal media, enriched media, selective media, indicator media, transport media, and storage media.	5
<b>Chapter No. 5. Sterilization methods</b> -Principle of disinfection, antiseptic, tyndallisation and Pasteurization, <b>Sterilization</b> -Sterilization by dry heat, moist heat, UV light, ionization radiation, filtration. Chemical methods of sterilization-phenolic compounds, anionic and cationic detergents.	5
<b>Chapter No. 6. Microbial Growth</b> -Microbial growth and measurement. Nutritional types of Microbes- autotrophs and heterotrophs, phototrophs and chemotrophs; lithotrophs and organotrophs.	5
<b>Unit – 3</b>	11
<b>Chapter No. 7 Microbial cultures and preservation</b> -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.	5
<b>Chapter No. 8. Viruses</b> - General structure and classification of Viruses; ICTV system of classification. Structure and multiplication of TMV, SARS-COV-2, and Bacteriophage (T2). Vaccines and types.	4
<b>Chapter No. 9. Viroids</b> - general characteristics and structure of Potato Spindle	2

Tuber Viroid (PSTVd); Prions - general characters and Prion diseases. Economic importance of viruses.	
<b>Unit – 4</b>	15
<p><b>Chapter No. 10. Bacteria-</b> General characteristics and classification. Archaeobacteria and Eubacteria. Ultrastructure of Bacteria; Bacterial growth and nutrition. Reproduction in bacteria- asexual and sexual methods. Study of <i>Rhizobium</i> and its applications. A brief account of Actinomycetes and Cyanobacteria. Mycoplasmas and Phytoplasmas- General characteristics and diseases. Economic importance of Bacteria.</p>	5
<p><b>Chapter No. 11. Fungi-</b>General characteristics and classification. Thallus organization and nutrition in fungi. Reproduction in fungi (asexual and sexual). Heterothallism and parasexuality. Type study of <i>Phytophthora</i>, <i>Rhizopus</i>, <i>Neurospora</i>, <i>Puccinia</i>, <i>Penicillium</i> and <i>Trichoderma</i>.</p>	5
<p><b>Chapter No. 12. Lichens</b> – Structure and reproduction. <b>VAM Fungi</b> and their significance. <b>Plant diseases</b>-Late Blight of Potato, Black stem rust of wheat; Downy Mildew of Bajra, Grain smut of Sorghum, Sandal Spike, Citrus Canker, Root Knot Disease of Mulberry. Economic importance of Fungi.</p>	5

### Text Books

1. Ananthnarayan R and Panikar JCK. 1986. Text book of Microbiology. Orient Longman ltd. New Delhi.
2. Arora DR. 2004. Textbook of Microbiology, CBS, NewDelhi.

3. William CG. 1989. Understanding microbes. A laboratory text book for Microbiology. W.H. Freeman and Company. New York.
4. Dubey RC and Maheshwari DK. 2007. A textbook of Microbiology, S. Chand and Company, NewDelhi.
5. Dubey RC and Maheshwari DK. 2002. A Text book of Microbiology, S.C.Chand and Company, Ltd. Ramnagar, New Delhi.
6. Sharma R. 2006. Text book 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.

## References

1. Alexepoulos CJ and Mims CW. 1989. Introductory Mycology, Wiley Eastern Ltd., NewDelhi.
2. Allas RM. 1988. Microbiology: Fundamentals and Applications, Macmillan publishing co. New York.
3. Brook TD, Smith DW and Madigan MT. 1984. Biology of Microorganisms, 4<sup>th</sup> ed. Eaglewood Cliffts. N.J.Prentice- Hall. New Delhi.
4. Burnell JH and Trinci APJ. 1979. Fungal walls and hyphal growth, Cambridge UniversityPress. Cambridge.
5. Jayaraman J. 1985. Laboratory Manual of Biochemistry, Wiley Eastern Limited. New Delhi.
6. Ketchum PA. 1988. Microbiology, concepts and applications. John Wiley and Sons. New York.
7. Michel J, Pelczar Jr.EC and Krieg CR. 2005. Microbiology, Mc.Graw-Hill, New



Delhi.

8. Powar CB and Dagainawala. 1991. General Microbiology, Vol – I and Vol – II Himalaya publishing house, Bombay.
9. Reddy S and Ram. 2007. Microbial Physiology. Scientific Publishers, Jodhpur, 385pp.
10. Sullia SB and Shantharam S. 1998. General Microbiology. Oxford and IBH publishing Co.Pvt.Ltd. New Delhi.
11. Schlegel HG. 1986. General Microbiology. Cambridge. University Press. London, 587pp.
12. Roger S, Ingrahan Y, Wheelis JL, Mark L and Page PR. 1990. Microbial World 5<sup>th</sup> edition. Prentice-Hall India, Pvt. Ltd. New Delhi.
13. Sullia SB. and Shantharam S. 2005. General Microbiology, Oxford and IBH, New Delhi.

#### **Pedagogy:**

Lectures, Practicals, Field and laboratory visits, Participatory Learning, Seminars, Assignments, specimen submission etc

<b>Formative Assessment</b>	
<b>Assessment Occasion/ type</b>	<b>Weightage in Marks</b>
I TEST – C1 + Assignment	20
II TEST - C2 + Seminar/Viva-voce	20
<b>Total</b>	40

## **Content of Practical Course 1: List of Experiments to be conducted**

**Practical 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, Haemocytometer, Micrometer etc.).

**Practical 2:** Enumeration of soil/food /seed microorganisms by serial dilution technique.

**Practical 3:** Preparation of culture media (NA/PDA) sterilization, inoculation, incubation of *E coli* / *B. subtilis*/ Fungi and study of cultural characteristics.

**Practical 4:** Determination of cell count by using Haemocytometer and determination of microbial cell dimension by using Micrometer.

**Practical 6:** Simple staining of bacteria (Crystal violet /Nigrosine blue) / Gram's staining of bacteria.

**Practical 7:** Isolation and study of morphology of *Rhizobium* from root nodules of legumes

**Practical 8:** Preparation of spawn and cultivation of paddy straw (Oyster) mushroom.

**Practical 9:** Study of vegetative structures and reproductive structures - *Albugo*, *Phytophthora*/*Pythium*, *Rhizopus*/*Mucor*, *Saccharomyces*, *Neurospora*/*Sordaria*, *Puccinia*, *Agaricus*, *Lycoperdon*, *Aspergillus*/*Penicillium*, *Trichoderma*. (Depending on local availability)

**Practical 10:** Preparation of agar slants, inoculation, incubation, pure culturing and preservation of microbes by oil overlaying.

**Practical 11:** Study of late blight of Potato, Downy mildew of Bajra, Citrus canker, Tobacco mosaic disease, Sandal spike disease.

**Practical 12:** Study of well-known microbiologists and their contributions through charts and photographs.

**Practical-13:** Visit to water purification units/Composting/ microbiology labs/dairy and farms to understand role of microbes in day today life.

(Note: Botanical study tour to a floristic rich area for 1-2 days and submission of study report is compulsory)

## B.Sc. BOTANY: Semester – 2

**Title of the Course: Diversity of Non- Flowering Plants**

Number of Theory Credits	Number of lecture hours/semester	Number of practical Credits	Number of practical hours/semester
4	56	2	56
Content of Theory Course 2			56Hrs
Unit –1			15
<b>Chapter No. 1</b> Algae –Introduction and historical development in algology. General characteristics and classification of algae, Diversity- habitat, thallus organization, pigments, reserve food, flagella types, life-cycle and alternation of generation in Algae. Distribution of Algae.			5
<b>Chapter No. 2</b> Morphology and reproduction and life-cycles of <i>Nostoc</i> , <i>Oedogonium</i> , <i>Chara</i> , <i>Sargassum</i> and <i>Batrachospermum</i> . Diatoms and their importance. Blue-green algae-A general account. Algal blooms and toxins.			5
<b>Chapter No. 3</b> Algal cultivation- Cultivation of microalgae- <i>Spirulina</i> and <i>Dunaliella</i> ; Algal cultivation methods in India. Algal products- Food and Nutraceuticals, Feed stocks, food colorants; fertilizers, aquaculture feed; therapeutics and cosmetics; medicines; dietary fibres from algae and uses.			5
Unit – 2			15

<b>Chapter No. 4.</b> Bryophytes – General characteristics and classification of Bryophytes, Diversity-habitat, thallus structure, Gametophytes and sporophytes.	5
<b>Chapter No. 5</b> Distribution, morphology, anatomy, reproduction and life-cycles of <i>Riccia</i> , <i>Anthoceros</i> , and <i>Funaria</i> . Ecological and economic importance of Bryophytes. Fossil Bryophytes.	5
<b>Chapter No. 6. . Pteridophytes-</b> General characteristics and classification; Structure of sporophytes and life-cycles. Distribution, morphology, anatomy, reproduction and life-cycles in <i>Selaginella</i> , <i>Equisetum</i> , <i>Pteris</i> and <i>Salvinia</i> .	5
<b>Unit – 3</b>	15
<b>Chapter No. 7</b> A brief account of heterospory and seed habit. Stelar evolution in Pterodophytes. Affinities and evolutionary significance of Pteridophytes. Ecological and economic importance.	5
<b>Chapter No. 8. Gymnosperms-</b> General characteristics. Distribution and classification of Gymnosperms. Study of the habitat, distribution, habit, anatomy, reproduction and life-cycles in <i>Cycas</i> , <i>Pinus</i> and <i>Gnetum</i> .	5
<b>Chapter No. 9.</b> Affinities and evolutionary significance of Gymnosperms. Economic importance of Gymnosperms - food, timber, industrial uses and medicines.	5
<b>Unit – 4</b>	11

<b>Chapter No. 10. Origin and evolution of Plants:</b> Origin and evolution of plants through Geological Time scale.	2
<b>Chapter No. 11. Paleobotany-</b> Paleobotanical records, plant fossils, Preservation of plant fossils - impressions, compressions, petrification's, moulds and casts, pith casts. Radiocarbon dating.	5
<b>Chapter No. 12.</b> Fossil taxa- <i>Rhynia</i> , <i>Lepidodendron</i> , <i>Lepidocarpon</i> , <i>Lyginopteris</i> and <i>Cycadeoidea</i> . Exploration of fossil fuels. Birbal Sahni Institute of Paleosciences.	4

### Text Books

- 1) Chopra, G.L. A text book of Algae. Rastogi & Co., Meerut, Co., New Delhi, Depot. Allahabad.
- 2) Johri, Lata and Tyagi, 2012, A Text Book of, Vedame Books, New Delhi.
- 3) Sharma, O.P. 1990. Text Book of Pteridophyta. McMillan India Ltd. New Delhi.
- 4) Sharma, O.P. 1992. Text Book 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.

### References

1. Sambamurty, A.V.S.S.. A Text Book of Algae. I.K. International Private Ltd., New Delhi.
2. Agashe, S.N. 1995. Paleobotany. Plants of the past, their evolution, paleoenvironment and Allied plants. Hutchinson & Co., Ltd., London.
3. Anderson R.A. 2005, Algal cultural Techniques, Elsevier, London.
4. Publication, Application in exploration of fossil fuels. Oxford & IBH., New Delhi.

5. Eams, A.J., (1974) Morphology of vascular plants - Lower groups. Tata Mc Grew-Hill Publishing Co. New Delhi, Freeman & Co., New York.
6. Fritze, R.E. 1977. Structure and reproduction of Algae. Cambridge University Press.
7. Goffinet B and Shaw A.J. 2009, Bryophyte Biology, 2nd ed. Cambridge University Press, Cambridge. Gymnosperms.
8. Srivastava, H N, 2003. Algae Pradeep Publication, Jalandhar, India.
9. Kakkar, R.K. and B.R.Kakkar ( 1995) The Gymnosperms (Fossils and Living) Central Publishing House, Allahabad.
10. Kumar H. D., 1999, Introductory Phycology, Affiliated East-West Press, Delhi.
11. Lee, R.E., 2008, Phycology, Cambridge University Press, Cambridge. 4th edition. McGraw Hill Publishing Co., New Delhi.
12. Parihar, N.S. 1970. An Introduction to Embryophyta. Vol. I. Bryophyta. Central Book, Allahabad.
13. Parihar, N.S. (1976) An Introduction to Pteridophytes, Central Book Depot, Allahabad.
14. Parihar, N.S. 1977. The Morphology of Pteridophytes. Central Book Depot., Allahabad. Press, Cambridge.
15. Rashid, A. 1998. An Introduction to Pteridophyta. II ed., Vikas Publishing House, New Delhi.
16. Smith, G.M. 1971. Cryptogamic Botany. Vol. II. Bryophytes & Pteridophytes. Tata Tata McGraw Hill Publishing, New Delhi.
17. Smith, G.M. 1971. Cryptogamic Botny. Vol. I Algae & Fungi. Tata McGraw Hill Publishing. New Delhi.

18. Sporne, K.R. 1965. The Morphology of Gymnosperms. Hutchinson & Co., Ltd., London.
19. Stewart, W.M. 1983. Paleobotany and the Evolution of Plants, Cambridge University Cambridge.
20. Sundarajan, S. 1997. College Botany Vol. I. S Chand & Co. Ltd., New Delhi.
21. Vanderpoorten, A. and Goffinet, B. 2009, Introduction to Bryophytes, Cambridge University Press, Cambridge.
22. Vashista, B.R. 1978. Bryophytes. S Chand & Co. Ltd., New Delhi.

**Pedagogy:** Lectures, Practicals, Field and laboratory visits, participatory learning, seminars, assignments, MOOCs and specimen preparation and submission.

<b>Formative Assessment</b>	
<b>Assessment Occasion/ type</b>	<b>Weightage in Marks</b>
I TEST – C1 + Assignment	20
II TEST - C2 + Seminar/Viva-voce	20
<b>Total</b>	40

## **Content of Practical Course 2: List of Experiments to be conducted**

**Practical-1:** Study of morphology, classification, reproduction and lifecycle of *Nostoc/Oscillatoria*.

**Practical-2:** Study of morphology, classification, reproduction and life-cycle of *Oedogonium & Chara*, *Sargassum*, *Batrachospermum/ Polysiphonia*.

**Practical-3:** Study of morphology, classification, reproduction and life-cycle of *Riccia & Anthoceros*.

**Practical-4:** Study of morphology, classification, anatomy, reproduction and life-cycle of *Selaginella and Equisetum*.

**Practical -5:** Study of morphology, classification, anatomy, reproduction and life-cycle of *Pteris, Azolla*..

**Practical -6:** Study of morphology, classification, anatomy and reproduction in *Cycas*.

**Practical -7:** Study of morphology, classification & anatomy, reproduction in *Pinus*.

**Practical -8:** Study of morphology, classification & anatomy, reproduction in *Gnetum*.

**Practical -9:** Study of important blue green algae causing water blooms in the lakes.

**Practical -10:** Study of different methods of cultivation of ferns in a nursery.

**Practical -11:** Preparation of natural media and cultivation of *Azolla* in artificial ponds.

**Practical -12:** Media preparation and cultivation of *Spirulina*.

**Practical -13:** Study different algal products and fossils impressions and slides.

**Practical-14:** Visit to algal cultivation units/lakes with algal blooms/Fern house/Nurseries/Geology museum/lab to study plant fossils.

(Note: Botanical study tour to a floristic rich area for 1-2 days and submission of study report is compulsory)