Composition of Board of Studies in Botany

Sl .No.	Name and Address	
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)

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

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)

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

CORE SPECIFIC ELECTIVE PAPERS (DSE)

Sl No.	Semester Details	Subject: Botany	Credits	Paper No
1	Semester V	**DSE 1:** Algal and Fungal Biotechnology	03	E-1
2	Semester VI	**DSE 2:** Herbal Technology	03	E-2
3	Semester VII	**DSE 3:** Plant Propagation and Tissue Culture	03	E-3
4	Semester VIII	**DSE 4:** 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
Chapter No. 1: Microbial diversity-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
Chapter No. 2 History and developments of microbiology-Microbiologists and their contributions **(**Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Dmitri Iwanowski, Sergius Winogradsky and M W Beijerinck and Paul Ehrlich**).**	5
Chapter No. 3 Microscopy-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

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

Tuber Viroid (PSTVd); Prions - general characters and Prion diseases**.** Economic importance of viruses.	
Unit – 4	15
Chapter No. 10. Bacteria- General characteristics and classification. Archaebacteria and Eubacteria. Ultrastructure of Bacteria; Bacterial growth and nutrition. Reproduction in bacteria- asexual and sexual methods. Study of *Rhizobium* and its applications. A brief account of Actinomycetes and Cyanobacteria. Mycoplasmas and Phytoplasmas- General characteristics and diseases. Economic importance of Bacteria.	5
Chapter No. 11. Fungi-General characteristics and classification. Thallus organization and nutrition in fungi. Reproduction in fungi (asexual and sexual). Heterothallism and parasexuality. Type study of *Phytophthora, Rhizopus, Neurospora, Puccinia, Penicillium and Trichoderma*.	5
Chapter No. 12. Lichens – Structure and reproduction. **VAM Fungi** and their significance. **Plant diseases**-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.	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, 4th 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 Daginawala. 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 5th edition. Prentice-Hall India, Pvt. Ltd. New Delhi.
13. Sullia SB. and Shantharam S. 2005. General Microbiology, Oxford and IBH, NewDelhi.

Pedagogy:

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

Formative Assessment	
Assessment Occasion/ type	**Weightage in Marks**
I TEST – C1 + Assignment	20
II TEST - C2 + Seminar/Viva-voce	20
Total	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, Haemocytomer, 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 ofstudy 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
Chapter No. 1 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
Chapter No. 2 Morphology and reproduction and life-cycles of Nostoc, *Oedogonium, Chara, Sargassum and Batrachospermum*. Diatoms and their importance. Blue-green algae-A general account.Algalblooms and toxins.	5
Chapter No. 3 Algal cultivation- Cultivation of microalgae-*Spirulina* and *Dunaliella;* 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

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

Chapter No. 10. Origin and evolution of Plants: Origin and evolution of plants through Geological Time scale.	2
Chapter No. 11. Paleobotany- Paleobotanical records, plant fossils, Preservation of plant fossils - impressions, compressions, petrification's, moulds and casts, pith casts. Radiocarbon dating.	5
Chapter No. 12. Fossil taxa- *Rhynia*, *Lepidodendron*, *Lepidocarpon*,*Lyginopteris and Cycadeoidea*. 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 anf Tyagi, 2012, A Text Book of, Vedam e 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, Elsievier, 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 Unversity 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 Unversity Press, Cambridge. 4th edition.McGraw Hill Publishing Co., New Delhi.
12. Parihar, N.S. 1970. An Introduction to Embryophyta. Vol. I. Bryophyta. Central Book, Allhabad.
13. Parihar, N.S. (1976) An Introduction to Pteridophytes, Central Book Depot, Allhabad.
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 Unversity 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.

Formative Assessment	
Assessment Occasion/ type	**Weightage in Marks**
I TEST – C1 + Assignment	20
II TEST - C2 + Seminar/Viva-voce	20
Total	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 Cy*cas*.

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 reportis compulsory)

B.Sc. BOTANY: Open Elective Course (OE-1)

I Semester

Title of the Course: Plants and Human Welfare

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

1. To make the students familiar with economic importance of diverse plants that offer resources to human life.
2. To make the students known about the plants used as-food, medicinal value and also plant source of different economic value .
3. To generate interest amongst the students on plants importance in day today life, conservation, ecosystem and sustainability.

Number of Theory Credits	Number of lecture hours/semester	Number of practical Credits	Number of practical hours / semester
3	30	0	00

Content of Theory Course 1	30 Hrs
Unit I	
Origin of Cultivated Plants. Concept of Centres 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.	2
Unit II	
Cereals: Wheat and Rice (origin, evolution, morphology, post-harvest processing & uses).Green revolution. Brief account of millets and their nutritional importance.	3
Unit III	
Legumes: General account (including chief pulses grown in Karnataka- red gram, green gram, chick pea, soybean). Importance to man and ecosystem.	2
Unit IV	
Fruits: Mango,grapes and Citrus (Origin, morphology,cultivation ,processing and uses)	02

Unit V	
Cash crops: Morphology, new varieties and processing of sugarcane, products and by-products of sugarcane industry. Natural Rubber –cultivation, tapping and processing.	03.
Unit VI	
Spices: Listing of important spices, their family and parts used, economic importance with special reference to Karnataka. Study of fennel, clove, black pepper and cardamom.	03
Unit VII	
Beverages: Tea,Coffee(morphology,processing&uses)	02
Unit VIII	
Oils and fats: General description, classification, extraction, their uses and health implications; groundnut, coconut, sunflower and mustered (Botanical name, family & uses). Non edible oil yielding trees and importance as biofuel. Neem oil and applications.	02
Unit IX	
Essential Oils: General account. Extraction methods of sandal wood oil, rosa oil and eucalyptus oil. Economic importance as medicine, perfumes and insect repellents.	02
Unit X	
Drug-yielding plants: Therapeutic and habit-forming drugs with special reference to Cinchona, Digitalis, Aloe vera and Cannabis.	03
Unit XI	
Fibers: Classification based on the origin of fibers; Cotton and jute (origin morphology, processing and uses).	03
Unit XII	

Forests: Forest and forest products. Community forestry. Concepts of reserve forests, sanctuaries and national parks with reference to India. Endangered species and red data book.	03

Text Books 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.

Pedagogy:

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

Formative Assessment	
Assessment Occasion/ type	**Weightage in Marks**
I TEST	10
II TEST	10
ASSIGNMENT	10
Total	30

Date **Course Co-ordinator** **Subject Committee Chairperson**

B.Sc. BOTANY: Open Elective Course(OE-2)

II Semester

Title of the Course: Plant Propagation, Nursery management and Gardening

Paper Outcome:

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

1. To gain knowledge of gardening, cultivation, multiplication, raising of seedlings of garden plants.
2. To get knowledge of new and modern techniques of plant propagation.
3. To develop interest in nature and plant life.
4.

Number of Theory Credits	Number of lecture hours/semester	Number of practical Credits	Number of practical hours / semester
3	30	0	00

Content of Theory Course 1	36 Hrs
Unit I	
Nursery: 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.	04
Unit II	
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.	06
Unit III	
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 root, shade house and glass house.	06
Unit IV	

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.	08
Unit V	
Sowing/raising of seeds and seedlings - Transplanting of seedlings - Study of cultivation of different vegetables and flowering plants: cabbage, brinjal, lady's finger, tomatoes, carrots, bougainvillea, roses, geranium, ferns, petunia, orchids etc. Storage and marketing procedures. Developing and maintence of different types of lawns. Bonsai technique.	06

Text Books and References

1. Agrawal, P.K. (1993). Hand Book 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.

Additional Resources:

1. Musser E., Andres. (2005). Fundamentals of Horticulture. New Delhi, Delhi: McGraw Hill Book Co.
2. Sandhu, M.K. (1989). Plant Propagation. Madras, Bangalore: Wile Eastern Ltd.

MUSHROOM CULTIVATION TECHNOLOGY

3hrs/week **30 hrs**

Paper Outcome

Unit I: Introduction; Nutritional and medicinal value of edible mushrooms; Poisonous mushrooms and their characteristics. Types of edible mushrooms available in India- *Volvariella Volvacea*, *Pleurotus citrinopileatus, Agaricus bisporus*

Unit II: Cultivation Technology : Infrastructure: Substrates (locally available) Polythene bag, vessels, Inoculation hook, inoculation loop, low cost stove, sieves, culture rack, mushroom unit (Thatched house) water sprayer, small polythene bag. Pure culture: Medium, sterilization, preparation of spawn, mulitiplication. Mushroom bed preparation – paddy straw, sugarcane trash, maize straw, banana leaves. Factors affecting the production;

Unit III: Storage and nutrition; Short- term storage(Refrigeration- upto 24 hours) Long term acids, mineral elements nutrition – Carbohydrates, Crude fiber content – Vitamins;

Unit IV: Food Preparation : Types of foods prepared from mushroom. Research Centres – National level and Regional level. Cost benefit ration – Marketing in India and abroad, Export Value.

References

1. Marimuthu, T. et al. (1991). Oyster Mushroom. Department of Plant Pathology. Tamil Nadu Agricultural University, Coimbatore.

2. Nita Bhal. (2000). Handbook on Mushrooms. 2nd ed. Vol. I and II. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi

3. Pandey R.K, S. K Ghosh, 1996. A Hand Book on Mushroom Cultivation. Emkey Publications.

4. Pathak, V. N. and Yadav, N. (1998). Mushroom Production and Processing Technology. Agrobios, Jodhpur.

5.Tewari Pankaj Kapoor, S. C. (1988). Mushroom Cultivation. Mittal Publication, New Delhi.

6. Tripathi, D.P. (2005) Mushroom Cultivation, Oxford & IBH Publishing Co. PVT.LTD, New Delhi.

7. V.N. Pathak, Nagendra Yadav and Maneesha Gaur, Mushroom Production and Processing Technology/ Vedams Ebooks Pvt Ltd., New Delhi (2000)

Additional Resources:

1. Mushroom Production and Processing Technology, Pathak Yadav Gour (2010) Published by Agrobios (India).

2. A hand book of edible mushroom, S.Kannaiyan& K.Ramasamy (1980). Today & Tomorrows printers & publishers, New Delhi 3.Handbook on Mushrooms, Nita Bahl, oxford & IBH Publishing Co.

MEDICINAL AND ORNAMENTAL PLANTS

Paper II

Course Outcome:

- The role, contributions and usefulness of medicinal plants in tackling the diseases of public health
- It emphasis on the current strategic approaches to disease prevention.
- It gives knowledge on propagation of ornamental plants and also enhances the aesthetic value of landscapes by cultivation.

Unit I: Brief history, Scope and Importance of Medicinal Plants. Pharmacognosy, Pharmacology. Indigenous Medicinal Sciences – Definition and Scope-Ayurveda, Siddha and Unani.

Unit II: Classification of drugs based on the source. Common medicinal plants, parts used and their uses: *Melia azadiracthta (Azadirachta indica), Terminalia chebula, T. bellarica, Withania somnifera, Curcuma longa, Zingiber officinale, Cinnamomum zeylanicum, Saraca asoca, Aloe vera, Phyllanthus emblica, P. Amarus, Piper longum, P. nigraum, Catharanthus roseus, Tinospora cardifolia, Asparagus racemosus, Boerhaavia diffusa, Centella asiatica, Ocimum sanctum, Plectranthus amboinicus,*

Unit III: Ornamental plants: Flowering annuals; Herbaceous perennials; Divine vines; Shades and ornamental trees; Ornamental bulbous and foliage plants; Cacti and succulents; Palms and Cycads; Ferns and Selaginellas; Cultivation of plants in pots; Indoor gardening;

Unit IV: Floriculture: Factors affecting flower production; Production and packaging of cut flowers; Flower arrangement; Methods to prolong vase life; Cultivation of Important cut flowers (Carnation, Aster, Chrysanthemum, Dahlia, Gerbera, Gladiolous, Marigold, Rose, Lilium, Orchids); Bonsai and Terrariums.

Text Books and References

1. Bose T.K., Mukherjee, D. (1972). Gardening in India. New Delhi, Delhi: Oxford & IBH Publishing Co.
2. Jules, J. (1979). Horticultural Science, 3rd edition. San Francisco, California: W.H. Freeman and Co.

3. Kumar, N. (1997). Introduction to Horticulture. Nagercoil, Tamil Nadu: Rajalakshmi Publications.

Additional Resources:

1. Musser E., Andres. (2005). Fundamentals of Horticulture. New Delhi, Delhi: McGraw Hill Book Co.
2. Sandhu, M.K. (1989). Plant Propagation. Madras, Bangalore: Wile Eastern Ltd.

Pedagogy:

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

Formative Assessment	
Assessment Occasion/ type	Weightage in Marks
I TEST	10
II TEST	10
ASSIGNMENT	10
Total	30

B.Sc. BOTANY: Semester – III

Title of the Course: Plant Anatomy and Developmental Biology

Number of Theory Credits	Number of lecture hours/semester	Number of practical Credits	Number of practical hours / Semester
4	56	2	52

Course outcome:

- 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.
- Skill development for the proper description of internal structure using botanical terms, their identification and further classification.
- Induction of the enthusiasm on internal structure of locally available plants.
- Understanding various levels of organization in a plant body with an outlook in the relationship between the structure and function through comparative studies.
- Observation and classification of the floral variations from the premises of college and house.
- Understanding the various reproductive methods sub-stages in the life cycle of plants.
- Observation and classification of the embryological variations in angiosperms.
- Enthusiasm to understand evolution based on the variations in reproduction among plants.

Content of Theory Course 56 hrs

Unit-1 **15 hrs**

Angiosperm Anatomy, Plant Cell Structure and Tissues 10 hrs

Introduction, objective and scope of Plant Anatomy, Plant cell structure –nature of plant cell wall.

Tissue and tissue systems - meristematic tissue, permanent tissue and secretary cells. Classification of meristem: (apical, intercalary and lateral), primary and secondary meristems.

Apical meristem: Theories on organization of meristem (apical cell theory, Tunica-Corpus theory, Histogen theory and Korper-Kappe theory).

Types of vascular bundles and Vascular cambium, Origin, development, arrangement and diversity in size and shape of leaves.

Unit-II 12 hrs

Angiosperm Anatomy

Structure of Dicot root: primary structure and secondary growth (Sunflower), Structure of monocot root (Maize).

Structure of Dicot stem: Primary structure and secondary growth (Sunflower), Structure of Monocot stem (Maize).

Structure of Dicot leaf: Primary structure (Sunflower), primary structure of Monocot leaf (Maize), Stomatal types.

Anomalous secondary growth: Boerhaavia (dicot stem) Dracaena (monocot stem)

Applications in Systematics, Forensics and Pharmacognosy.

Unit-III 14 hrs

Developmental Biology, Morphogenesis and Differentiation

Morphogenesis in plants -

Differentiation and cell polarity in acellular (*Dictyostelium*), Unicellular (*Acetabularia*) and multicellular system (root hair and stomata formation)

Organogenesis: Differentiation of root, stem, leaf and axillary bud.

Mechanism of leaf primordium initiation, development and Phyllotaxis (Diversity in size and shape of leaves)

Root cap, quiescent centre and origin of lateral roots. Transition from vegetative apex into reproductive apex

Developmental patterns at flowering apex: ABC model specification of floral organs. Modification of gene action by growth hormones and cellular differences between floral organs. Senescence – a general account.

Unit-IV 20 hrs

Reproductive Biology

Introduction, Scope and contributions of Indian embryologists: P. Maheswari, B G L Swamy, B.M Johri, M.S. Swaminathan and K.C. Mehta.

Microsporangium: Development and structure of mature anther, Anther wall layers, Tapetum - types, structure and functions and sporogenous tissue.

Microsporogenesis- Microspore mother cells, microspore tetrads, Pollinia.

Microgametogenesis– Formation of vegetative and generative cells, structure of male gametophyte. Pollen embryosac (Nemec phenomenon).

Megasporangium – Structure of typical Angiosperm ovule. Types of ovule: (Anatropous, Orthotropous, Amphitropous, Hemianatropous, Campylotropous, Circinotropous).

Megagametogenesis– Types and development of Female gametophyte/embryosac- monosporic- *Polygonum* type, bisporic – *Allium* type, tetrasporic - *Fritillaria* type. Structure of mature embryosac.

Pollination and Fertilization: Structural and functional aspects of pollen, stigma and style. Post pollination events; Current aspects of fertilization and Significance of double fertilization, Post fertilization changes.

Endosperm – Types and its biological importance. Free nuclear (*Cocos nucifera*) cellular (*Cucumis),* helobial types. Ruminate endosperm.

Embryogenesis – Structure and development of Dicot (*Capsella bursa- pastoris)* and Monocot (*Najas),* embryo. Polyembryony, Apomixis and Parthenocarpy.

Content of Practical Course 3: List of Experiments to be conducted

Practical 1: i. Study of meristems (Permanent slides/ Photographs).

ii. Study of Simple Tissues (Parenchyma, Collenchyma and Sclerenchyma) and ComplexTissues (xylem and phloem).

Practical 2, 3 & 4: Maceration technique to study elements of xylem and phloem, Study of primary structure of dicot root (Cicer), stem (Tridax) and leaf (Datura/Zinnia)) and monocot root (Maize), stem (Grass) and leaf (Grass).

Practical 5: Anomalous secondary growth: *Boerhaavia* (dicot stem) *Dracaena* (monocot stem)

Practical No. 6: Study of trichomes (any three types) and stomata (any three types) with the help of locallyavailable plant materials

Practical No. 7: Permanent slides of Microsporogenesis and male gametophyte, Mounting of Pollen grains of Grass and Hibiscus and Pollinia of Calotropis

Practical No. 8: Pollen germination by hanging drop method

Practical No. 9: Permanent slides: T.S of Tricarpellary and pentacarpellary ovary, Matured ovule, Placentation types: Axile, Marginal and Parietal types.

Practical No. 10: Mounting of embryo: Tridax /Cyamopsis/Crotolaria, Mounting of endosperm: Cucumis

Practical No. 11 & 12:

Mini project work in groups of 3-5 students, from the following list

a. Study of pollen morphology of different flowers with respect to shape, colour, aperture etc.
b. Pollen germination of different pollen grains and calculate percentage of germination.
c. Calculate the percentage of germination of one particular type of pollen grain collected from different localities/ under different conditions
d. Study of placentation of different flowers.
e. Any other relevant study related to Anatomy / Embryology

Text Books and References:

1) Bhojwani and Bhatnagar, Introduction to Embryology of Angiosperms –Oxford &IBH, Delhi
2) Bhojwani Sant Saran, 2014. Current Trends in the Embryology of Angiosperms, Woong-Young Soh, Springer Netherlands
3) Coulter E. G., 1969. Plant Anatomy – Part I Cells and Tissues – Edward Arnold, London.
4) Dickison, W.C. (2000). Integrative Plant Anatomy, Harcourt Academic Press, USA
5) Eames A. J. - Morphology of Angiosperms - Mc Graw Hill, New York.
6) Esau, K. 1990. Plant Anatomy, Wiley Eastern Pvt Ltd New Delhi.
7) Evert, R.F. (2006) Esau's Plant Anatomy: Meristem, Cells, and Tissues of the Plant Body:
8) their Structure, Function and Development. John Wiley and Sons, Inc
9) Fahn, A.1992. Plant Anatomy, Pergamon Press, USA
10) Johri, B.M. l., 1984.Embryology of Angiosperms, Springer-Verlag, Netherlands
11) Karp G., 1985. Cell Biology; Mc.Graw Hill Company
12) Maheshwari,P 1950. An introduction to the embryology of angiosperms. New York: McGraw-Hill
13) Mauseth, J.D. (1988). Plant Anatomy, the Benjammin/Cummings Publisher, USA.
14) Nair P .K .K - Pollen Morphology of Angiosperms - Scholar Publishing House,Lucknow.
15) Pandey S.N. 1997, Plant Anatomy and Embryology .A. Chadha, Vikas Publication House Pvt Ltd;
16) Pandey, B. P., 1997. Plant Anatomy, S. Chand and Co. New Delhi
17) Raghavan, V., 2000. Developmental Biology of Flowering plants, Springer, Netherlands.
18) Saxena M. R. – Palynology – A treatise - Oxford & I. B .H., New Delhi.
19) Shivanna, K.R., 2003. Pollen Biology and Biotechnology. Oxford and IBH Publishing Co. Pvt. Ltd. Delhi.
20) Vashishta .P.C .,1984. Plant Anatomy – Pradeep Publications – Jalandhar
21) Vashishta, P.C. 1997. Plant Anatomy, Pradeep Publications

B.Sc. BOTANY: Open Elective Course (OE-3)

III Semester

Course outcome:

Title of the Course: Community Forestry

- Understand community forestry and its conservation
- Examine the use of trees and community forestry
- Interpret the role of indigenous / tribal people in conservation of forest
- Examine the role of various community forestry conservation programs
- Measure the different properties of trees such as wood volume, age, height, volume etc.

Unit I **14 hrs**

Defining community forestry and conservation, Indigenous community-based forestry systems and their changes, Case studies of indigenous forest management systems: India., History of commercial forestry in India, Diseases of commercial forestry, maintenance of forests, Protection form fire, illicit felling, Measurement of Trees- Height, girth, wood density, wood quality, clear and selective felling.

Unit II **14 hrs**

Role of community forestry in Environmental conservation, Water shed management, soil management and poverty reduction, Trees as a forest management tool managing vegetation to modify climate, soil conditions & ecological processes, Social considerations on land-uses.

Unit III **14 hrs**

State-sponsored community forestry and conservation programs, Changing paradigms in forestry and environmental conservation, Community-managed commercial timber harvesting. Community based forestry and collaborative conservation in India, factors contributing to the rise of community forestry, Role of tribes in Forest and management.

Text Books for Reference:

1. Agrawal, A and C.C. Gibson. (2001). Introduction: The Role of Community in Natural Resource Conservation. In: Agrawal, A and C. C. Gibson (eds).Communities and the Environment. NJ: Rutgers University Press
2. Mosse, D.(2001).'People's knowledge', participation and patronage: operations and representations in rural development. In: Cook, B & Kothari, U (eds), Participation the newtyranny? Zed Press
3. Ong, C.K. & Huxley, P.K. (1996). Tree Crop Interactions–A Physiological Approach. ICRAF.
4. Robinson, D. (2018). The Economic Theory of Community Forestry (Routledge Explorations in Environmental Economics) Routledge.
5. Sagreiya, K.P. (1979). Forests and Forestry. National Book Trust, India, New Delhi, P1-307.

B.Sc. BOTANY: Open Elective Course (OE-3)

III Semester

Course outcomes:

Title of the Course: Landscaping and Gardening

- Apply the basic principles and components of gardening
- Conceptualize flower arrangement and bio-aesthetic planning
- Design various types of gardens according to the culture and art of bonsai
- Distinguish between formal, informal and free style gardens
- Establish and maintain special types of gardens for outdoor and indoor land scaping

Unit I — 14 hrs

Principles of gardening, garden components, adornments, lawn making, methods of designing rockery, water garden, etc. Special types of gardens, their walk-paths, bridges, constructed features. Green house. Special types of gardens, trees, their design, values in land scaping, propagation, planting shrubs and herbaceous perennials. Importance, design values, propagation, plating, climbers and creepers, palms, ferns, grasses and cacti succulents.

Unit II — 14 hrs

Flower arrangement: importance, production details and cultural operations, constraints, post-harvest practices. Bio-aesthetic planning, definition, need, round country planning, urban planning and planting avenues, schools, villages, beautifying railway stations, dam sites, hydroelectric stations, colonies, river banks, planting material for play grounds.

Unit III — 14 hrs

Vertical gardens, roof gardens. Culture of bonsai, art of making bonsai. Parks and public gardens. Land scape designs, Styles of garden, formal, informal and freestyle gardens, types of gardens, Urban land scaping, Land scaping for specific situations, institutions, industries, residents, hospitals, road sides, traffic islands, dam sites, IT parks, corporate. Establishment and maintenance, special types of gardens, Bio-aesthetic planning, eco-tourism, indoor gardening, therapeutic gardening, non-plant components, water-scaping, xeri-scaping, hardscaping; Computer Aided Designing (CAD) for outdoor and indoor scaping Exposure to CAD (Computer Aided Designing)

Text Books and References:

1) Berry, F. and Kress, J. (1991). Heliconia: An Identification Guide. Smithsonian Book
2) Butts, E. and Stensson, K. (2012). Sheridan Nurseries: One hundred years of People, Plans, and Plants. Dundurn Group Ltd.
3) Russell, T.(2012). Nature Guide: Trees: The world in your hands (Nature Guides).

B.Sc. BOTANY: Open Elective Course (OE-3)

III **Semester**

Title of the Course: Algal Cultivation and its Applications

Course outcome:

- Understand core concepts and fundamentals of various levels of algal growth
- Translate various algal technologies for benefit of ecosystem
- Demonstrate algal growth in different types of natural water.
- Analyze emerging areas of Algal Biotechnology for identifying commercial potentials of algal products & their uses.

Unit I 14 hrs

A brief account of culture techniques and media for algal research. Measurement of algal growth: lag phase, log phase, stationary phase and death phase using biomass, chlorophyll content. Limits to algal growth in natural waters. Dynamics and consequences of marine & freshwater algal blooms;

Unit II 14 hrs

Causative factors for eutrophication and its impact on algal blooms. Algal immobilization: methods and applications, Algal technologies for the restoration/maintenance of soil fertility; reclamation of usar soils. Restoration of degraded aquatic systems through algae; High rate algal ponds for the treatment of wastewaters for the production of useful biomass & fuels.

Unit III 14 hrs

Emerging areas of Algal Biotechnology: Single cell proteins, bio-fertilizers, Algae as food, medicine, feed, Biofuel, industrial products such as phyco-colloid (Agar-agar, Algin, Carrageenan, Diatomite); A brief account of commercial potentials of algal products & theiruses. Algae as indicators of pollution. Biofouling, Sewage disposal.Waste-land reclamation. Use of Algae in experimental studies. Algae in space. Algal toxins.

Textbooks and References

1. Hoek, C. and Van D. (2009) Algae: An Introduction to Phycology. Cambridge University Pres

2. Bast, F. (2014). An Illustrated Reviewon Cultivation and Life History of Agronomically Important Seapl ants. In Seaweed: Mineral Composition, Nutritional and Antioxidant Benefits and Agricultural Uses, Eds. Vitor Hugo Pomin, 39-70. Nova Publishers, New York ISBN:978-1-63117-571-8

3. Kumar, H.D.(1999). Introductory Phycology. Affiliated East-West Press, Delhi

4. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International, NewDelhi.

5. Bast, F. (2014). Seaweeds: Ancestors of land plants with rich diversity. Resonance,19 (2)1032-1043*ISSN*:0971-8044

B.Sc. BOTANY: Semester – IVTitle

of the Course: Ecology and Conservation Biology

Number of Theory Credits	Number of lecture hours/semester	Number of practical Credits	Number of practical hours / semester
4	56	2	52

Course outcome:

- Understanding the fundamental concepts in ecology, environmental science and phytogeography.
- Concept development in conservation, global ecological crisis, Sustainable development and pros and cons of human intervention.
- Enable the student to appreciate bio diversity and the importance of various conservation strategies, laws and regulatory authorities and global issues related to climate change and sustainable development.

Content of Theory Course **56 hrs**

Unit-1 **15 hrs**

Ecology and Conservation Biology **15 hrs**

Introduction to Ecology and Conservation Biology:

Definitions, Principles of Ecology, Brief History, Major Indian Contributions, Scope and importance. Ecological levels of organisation.

Ecological factors: Climatic factors: light, temperature, precipitation and humidity.

Edaphic factors: Soil and its types, soil texture, soil profile, soil formation; soilpH, soil aeration, soil water, soil humus and soil microorganisms.

Topographic Factors: Altitude and Slope, Biotic factors: A brief account

Ecological groups of plants and their adaptations: Morphological and anatomical adaptations of hydrophytes, xerophytes, epiphytes and halophytes.

Unit-II **15 hrs**

Ecosystem Ecology Ecosystem Ecology: Introduction, types of ecosystems with examples - terrestrial and aquatic, natural and artificial.

Structure of ecosystem: Biotic and Abiotic components, detailed structure of a pond ecosystem.

Ecosystem functions and processes: Food chain, Food web and Ecological pyramids, energy flow in an ecosystem.

Bio-geo chemical cycles: Gaseous cycles -carbon and nitrogen, Sedimentary cycle- Phosphorus.

Ecological succession: Definition, types- primary and secondary. General stages of succession. Hydrosere and xerosere.

Community Ecology: Community and its characteristics – frequency, density, Abundance, cover and basal area, phenology, stratifications, life-forms. Concept of Ecotone and Ecotypes. Intra-specific and Inter-specific interactions with examples.

Ecological methods and techniques: Methods of sampling plant communities – transects and quadrates. Remote sensing as a tool for vegetation analysis, land use land cover mapping.

Population Ecology: Population and its characteristics – Population density, natality, mortality,age distribution, population growth curves and dispersal.

Unit-III **15 hrs**

Phytogeography and Environmental issues

Theory of land bridge, theory of continental drift, polar oscillations and glaciations. Centre of origin of plant – Vavilov's concept, types. Phytogeographical regions – concept, phytogeographical regions of India.

Vegetation types of Karnataka – Composition and distribution of evergreen, semi-evergreen, deciduous, scrub, mangroves, shola forests and grasslands. An account of the vegetation of the Western Ghats.

Pollution: Water pollution: Causes, effect, types; water quality indicators, water quality standards in India, control of water pollution (Waste water treatment). Water pollution disasters – National mission on clean Ganga, Minimata, Pacific gyre garbage patch, Exxon valdez oil spill.

Air pollution: Causes, effect, air quality standards, acid rain, control.

Soil pollution: Causes, effect, solid waste management, control measures of soil pollution.

Unit-IV **15 hrs**

Biodiversity and its Conservation

Biodiversity: Definition, types of biodiversity - habitat diversity, species diversity and genetic diversity, Global and Indian species diversity. SDG's in biodiversity conservation.

Values of Biodiversity – Economic and aesthetic value, Medicinal and timber yielding plants. NTFP. Threats to biodiversity.

Concept of Biodiversity Hotspots, Biodiversity hot spots of India. Concept of endemism and endemic species.

IUCN plant categories with special reference to Karnataka/ Western Ghats.

Biodiversity Conservation-Indian forest conservation act, Biodiversity bill(2002).

Conservation methods – *In-situ* and *ex-situ* methods

In-situ methods –Biosphere reserves, National parks, Sanctuaries, Sacred grooves.

Ex-situ methods-Botanical gardens, Seed bank, Gene banks, Pollen banks, Culture collections, Cryopreservation.

Content of Practical Course 4: List of Experiments to be conducted

Practical No.	Experiments
1	Determination of pH of different types of Soils, Estimation of salinity of soil/water samples.
2	Study of Ecological instruments – Altimeter, Hygrometer, Soil thermometer, Rain Gauge, Barometer, etc
3	Hydrophytes: Morphological adaptations in *Pistia, Eichhornia, Hydrilla, Nymphaea.* Anatomical adaptations in *Hydrilla* (stem) and *Nymphaea* (petiole).
4	Xerophytes: Morphological adaptations in *Asparagus, Casuarina, Acacia arabica, Aloe vera, Euphorbia tirucalli.* Anatomical adaptations in phylloclade of *Casuarina.*
5	Epiphytes: Morphological adaptations in *Acampe, Bulbophyllum, Drynaria*. Anatomical adaptations in epiphytic root of *Acampe/ Vanda.* Halophytes: study of Vivipary in mangroves, Morphology and anatomy of Pneumatophores. Parasites- Morphological and Anatomical adaptations in Cuscuta and Viscum
6	Study of a pond/forest ecosystem and recording the different biotic and abiotic Components
7	Demonstration of different types of vegetation sampling methods – transects and quadrats. Determination of Density and frequency.
8	Application of remote sensing to vegetation analysis using satellite imageries
9	Field visits to study different types of local vegetations/ecosystems and the report to be written in practical record book.
10	Determination of water holding capacity of soil samples
11	Determination of Biological oxygen demand (BOD)
12	Determination of Chemical oxygen demand (COD)
13	Determination of soil texture of different soil samples.

Text Books and References:

Sharma, P.D. 2018. Fundamentals of Ecology. Rastogi Publications.

1) Odum E.P. (1975): Ecology By Holt, Rinert& Winston.
2) Oosting, H.G. (1978): Plants and Ecosystem Wadworth Belmont.
3) Kochhar, P.L. (1975): Plant Ecology. (9th Edn.,) New Delhi, Bombay, Calcutta-226pp.,
4) Kumar, H.D. (1992): Modern Concepts of Ecology (7th Edn.,) Vikas Publishing Co., New Delhi.

5) Kumar H.D. (2000): Biodiversity & Sustainable Conservation. Oxford & IBH Publishing Co Ltd. New Delhi.
6) Newman, E.I. (2000): Applied Ecology, Blackwell Scientific Publisher, U.K.
7) Chapman, J.L&M.J. Reiss (1992): Ecology (Principles & Applications). Cambridge University Press, U.K.
8) Malcolm L. Hunter Jr., James P. Gibbs, Viorel D. Popescu, 2020. Fundamentals of ConservationBiology, 4th Edition. Wiley-Blackwel.
9) Saha T. K., 2017. Ecology and Environmental Biology. Books and Allied Publishers.

B.Sc. BOTANY: Open Elective Course (OE-4)

IV **Semester**

Title of the Course: Plant Diversity and Human Welfare

Paper IV

Course outcome:

- Develop understanding of the concept and scope of plant biodiversity
- Identify the causes and implications of loss of biodiversity
- Apply skills to manage plant biodiversity
- Utilize various strategies for the conservation of biodiversity
- Conceptualize the role of plants in human welfare with special reference to India

Unit I: Plant Diversity and its Scope 14 hrs

Levels of biodiversity: Genetic, Species and Ecosystem; Agro-biodiversity and cultivated plant taxa and related wild taxa. Values and uses of Biodiversity, Methodologies for valuation, Ethical and aesthetic values, Uses of plants; Ecosystem services.

Unit II: Loss of Biodiversity and Management of Plant Biodiversity 14 hrs

Loss of biodiversity-causes and implications, Hotspots of biodiversity, extinction of species, projected scenario for biodiversity loss. Organizations associated with biodiversity management, IUCN, UNEP, WWF, UNESCO, NBPGR; Methodology for execution; Biodiversity legislation; Information management and communication.

Unit III: Conservation of Biodiversity, Role of Plants in Relation to Human Welfare 14hrs

Conservation of genetic, species and ecosystem diversity, *In situ* and *ex situ* conservation strategies, India's biodiversity and its conservation Social approaches to conservation, Biodiversity awareness programmes, Sustainable development. Importance of forestry their utilization and commercial aspects; Avenue trees; Ornamental plants of India; Alcoholic beverages; Fruits and nuts; Wood and its uses; their commercial importal,

Textbooks and References

1. Krishnamurthy, K.V. (2004). An Advanced Text Book of Biodiversity-Principles and Practices. Oxford and IBH Publications Co. Pvt. Ltd. New Delhi.

2. Singh, J. S., Singh, S.P. and Gupta, S. (2006). Ecology Environment and Resource Conservation. Anamaya Publications, New Delhi, India.

3. Reddy, K.V. and Veeraiah, S. (2010). Biodiversity and Plant Resources. Aavishkar publication, New Delhi.

4. Heywood, V.H. and Watson, R.T. (1995). Global biodiversity and Assessment. Cambridge University Press.

B.Sc. BOTANY: Open Elective Course (OE-4)

IV Semester

Title of the Course: Medicinal Plants in Health Care

Course outcome

- Recognize the basic medicinal plants
- Apply techniques of conservation and propagation of medicinal plants.
- Setup process of harvesting, drying and storage of medicinal herbs
- Propose new strategies to enhance growth of medicinal herbs considering the practical issues pertinent to India

Unit I: History and Traditional System of Medicine **14 hrs**

History, Scope and Importance of Medicinal Plants; Traditional systems of medicine; Definition and Scope.

Ayurveda: History, origin, panchamahabhutas, saptadhatu and tridosha concepts, Rasayana, plants used in ayurvedic treatments,

Siddha: Origin of Siddha medicinal systems, Basis of Siddha system, plants used in Siddha medicine.

Unani: History, concept: Umoor-e-tabiya, tumors treatments / therapy, polyherbal formulations.

Unit II: Conservation, Augmentation and Ethnobotany and Folk Medicine 14 hrs

Conservation of Eendemic and endangered medicinal plants, Red list criteria; *In situ* conservation: Biosphere reserves, sacred groves, National Parks; *Ex situ* conservation: Botanic Gardens, Ethnomedicinal plant Gardens.

Propagation of Medicinal Plants: Objectives of the nursery, its classification, important components of a nursery, sowing, pricking, use of greenhouse for nursery production, propagation through cuttings, layering, grafting and budding.

Ethnobotany and Folk medicines. Definition; Ethnobotany in India: Methods to study ethnobotany; Applications of Ethnobotany: National interacts, Palaeo-ethno-botany. Folk medicines of ethnobotany, ethnomedicine, ethnoecology, ethnic communities of India.

Unit III: Medicinal Plants 14 hrs

Brief description of selected plants and derived drugs, namely Guggul (*Commiphora*) for hypercholesterolemia, *Boswellia* for inflammatory disorders, Arjuna (*Terminalia arjuna*) for cardioprotection, turmeric (*Curcuma longa*)f or wound healing, antioxidant and anticancer

properties, Kutaki (*Picrorhiza kurroa*) for hepatoprotection, Opium Poppy for analgesic and antitussive, Salix for analgesic, Cincona and Artemisia for Malaria, Rauwolfia as tranquilizer, Belladona as anticholinergic, Digitalis as cardiotonic, Podophyllum as antitumor.

Textbooks and References:

1. Akerele, O., Heywood, V. and Synge, H. (1991). The Conservation of Medicinal Plants. Cambridge University Press.
2. AYUSH (www.indianmedicine.nic.in). About the systems—An overview of Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy. New Delhi: Department of Ayurveda, Yogaand Naturopathy, Unani, Siddha and Homoeopathy (AYUSH), Ministry andFamily Welfare, Government of India.
3. CSIR- Central Institute of Medicinal and Aromatic Plants, Lucknow (2016). *Aush Gyanya*: Handbook of Medicinal and Aromatic Plant Cultivation.
4. Dev, S. (1997). Ethno-therapeutics and modern drug development: The potential of Ayurveda. *Current Science* 73:909–928.
5. Evans, W.C. (2009). Trease and Evans Pharmacognosy, 16thedn. Philadelphia, PA: Elsevier Saunders Ltd.
6. Jain, S.K. and Jain, Vartika. (eds.) (2017). Methods and Approaches in Ethnobotany: Concepts, Practices and Prospects. Deep Publications, Delhi
7. Kapoor, L.D. (2001). Handbook of Ayurvedic medicinal plants. Boca Raton, FL: CRC Press.
8. Saroya, A.S. (2017). Ethnobotany. ICAR publication.
9. Sharma, R.(2003). Medicinal Plants of India-An Encyclopaedia. Delhi: Daya Publishing House.
10. Sharma, R. (2013) Agro Techniques of Medicinal Plants. Daya Publishing House, Delhi.
11. Thakur, R.S., H.S. Puri, and Husain, A. (1989). Major medicinal plants of India. Central Institute of Medicinal and Aromatic Plants, Lucknow, India.

B.Sc. BOTANY: Open Elective Course (OE-4)

IV Semester

Title of the Course: Floriculture

Course outcome:

- Develop conceptual understanding of gardening from historical perspective
- Analyze various nursery management practices with routine garden operations.
- Distinguish among the various Ornamental Plants and their cultivation
- Evaluate garden designs of different countries
- Appraise the landscaping of public and commercial places for floriculture.
- Diagnoses the various diseases and uses of pests for ornamental plants.

Unit I 14 hrs

Introduction: Importance and scope of floriculture and landscape gardening. Nursery Management and Routine Garden Operations: Sexual and vegetative methods of propagation; Soil sterilization; Seed sowing; Pricking; Planting and transplanting; Shading; Stopping or pinching; Defoliation; Wintering; Mulching; Topiary; Role of plant growth regulators.

Unit II 14 hrs

Ornamental Plants: Flowering annuals; Herbaceous perennials; Divine vines; Shade and ornamental trees; Ornamental bulbous and foliage plants; Cacti and succulents; Palms and Cycads; Ferns and fern allies; Cultivation of plants in pots; Indoor gardening; Bonsai. Principles of Garden Designs: English, Italian, French, Persian, Mughal and Japanese gardens; Features of a garden (Garden wall, Fencing, Steps, Hedge, Edging, Lawn, Flowerbeds, Shrubbery, Borders, Water-garden. Some Famous gardens of India. Floriculture and green house technology. Commercial aspects and exporting of flowers and ornamental plants. Quranatine and testing requirements.

Unit III 14 hrs

Landscaping Places of Public Importance: Landscaping highways And Educational institutions. Commercial Floriculture: Factors affecting flower production; Production and packaging of cut flowers; Flower arrangements; Methods to prolong vase life; Cultivation of Important cut flowers (Carnation, Aster, Chrysanthemum, Dahlia, Gerbera, Gladiolus, Marigold, Rose, Lilium, Orchids). Diseases and Pests of Ornamental Plants

Textbooks and References

1. Randhawa, G.S. and Mukhopadhyay, A. (1986).Floriculture in India. Allied Publishers.

2. Adams, C., M. Early and J. Brrok (2011). Principles of Horticulture. Routledge, U.K

SCHEME OF BOTANY PRACTICAL EXAMINATION

SEMESTER I

Title of the Paper: MICROBIAL DIVERSITY AND TECHNOLOGY

Time: 3 Hours **Max Marks- 25**

I. Write critical notes on **A, B** & **C** **3X2=6 Marks**

A and B- Microbial Instruments (As mentioned in the syllabus)
C- Microbiologists (As mentioned in the Syllabus)
(Identification- 1 mark, Application/Contribution- 1Mark)

II. Bacterial staining **D** -Simple / Gram's staining **5 Marks**
(Preparation- 3 Marks Flow chart- 2 Marks)

III. Prepare a temporary stained slide **E** of the given material and leave the preparation for evaluation. **5 Marks**
(Rhizobium, Rhizopus, Saccharomyces, Penicillium)
(Identification- 1 Mark, Mounting- 2 Marks, Diagram with reasons- 2 Marks)

IV. Identify the Specimens **F & G** **2X3=6 Marks**
(F- Albugo, Phytophthora, Agaricus, Lycoperdon)
(G - Plant Diseases (As Mentioned in the Syllabus))
(Identification with Diagram - 2 Marks, Reason – 1Mark

V. Identify the Permanent Slide **J** **3 Marks**
(Fungi/Pathology)
(Identification & Diagram- 2 Marks, reasons- 1 Marks)

SCHEME OF BOTANY PRACTICAL EXAMINATION

SEMESTER II

Title of the Paper: DIVERSITY OF NON- FLOWERING PLANTS

Time: 3 Hours **Max Marks- 25**

I. Prepare a temporary stained slide of the given material **A** and leave the preparation for evaluation **5 Marks**
Algae (*Nostoc, Oedogonium, Chara, Batrachospermum / Polysiphonia*)
(Preparation - 2 Mark, Diagram-1 Marks, Identification with Reasons- 2 Marks)

II. Identify the given specimens **B & C** **2X3=6 Marks**
B- Bryophytes (*Marchantia* and *Anthoceros*)
C- Pteridophytes (*Selaginella*, *Equisetum*, *Pteris* , *Azolla,)*

(Identification- 1 Mark, Diagram with reasons- 2 Marks)

III. Identify the Permanent Slides **D, E, F & G** **4X2=8 Marks**
(One each from Algae, Bryophyte, Pteridophyte and Gymnosperms)
(Identification- 1 Mark, Diagram with Reasons-1 Marks)

IV. Comment on **H & I** **2X3=6 Marks**
H- Gymnosperm
I - Fossils
(Identification- 1 Mark, Diagram with Reasons- 2 Marks

SCHEME OF BOTANY PRACTICAL EXAMINATION

SEMESTER III

Title of the Paper: PLANT ANATOMY AND DEVELOPMENTAL BIOLOGY

Time: 3 Hours **Max Marks- 25**

I. Prepare a temporary stained slide of the given material **A**. Leave the preparation for evaluation **5 Marks**
(Root, Stem, Leaf)
(Preparation -2 Marks, Identification -1, Diagram with Reasons- 2Marks)

II. Identify the given slides **B, C** & **D** **3X3=9 Marks**
(**B** from Tissues, **C** from Anatomy, **D** from Embryology)
(Identification-1 Mark, Diagram with reasons – 2 Marks)

III. Mount the material **E** **3 Marks**
(Pollen grain/Stomata/Trichomes)
(Mounting - 2 Mark, Diagram with Reasons-1 Marks)

IV. Pollen germination of **F** by hanging drop method. **5 Marks**
(Preparation - 3 Marks, Procedure-2 Marks)

V. Mount the material of **G** **3 Marks**
(Endosperm / Embryo)

SCHEME OF BOTANY PRACTICAL EXAMINATION

SEMESTER IV

Title of the Paper: ECOLOGY AND CONSERVATION BIOLOGY

Time: 3 Hours **Max Marks- 25**

I. Conduct the experiment **A**. **6 Marks**
(COD/Water holding capacity of soil/Salinity of soil/Water sample)
(Requirements - 1Mark, Procedure -3 marks, Result - 2Marks)

II. Write the ecological adaptations of **B & C** **2X3=6 Marks**
(Hydrophytes, Xerophytes, Epiphyte, Halophyte, Parasite)
(Identification-1 Mark, Diagram with reasons – 2 Marks)

III. Prepare a temporary stained slide of the given material **D.** Leave the preparation for evaluation. **5 Marks**
(Hydrilla/Nymphaea/Casuarina/Orchid root)
(Mounting -2 Mark, Identification-1, Diagram with Reasons-2 Marks)

IV. Comment on **E** (Ecological instruments) **3 Marks**
(Instruments studied in Practicals)

V. Identify the slides/Chart **F** & **G** **2 X 2.5=5 Marks**
(One from adaptations, One from Quadrants/Remote sensing of Satellite image)

SCHEME OF BOTANY THEORY EXAMINATION

QUESTION PAPER PATTERN

Time: 3 Hours **Max Marks- 60**

Instructions: Draw neat labelled diagrams wherever necessary

I. Define/Explain any Four of the following: **2X4=8 Marks**

1.

2.

3.

4.

5.

6.

II. Answer any Four of the following: **5X4=20 Marks**

7.

8.

9.

10.

11.

12.

III. Answer any Four of the following: **8X4=32 Marks**

13.

14.

15.

16.

17.

18.

Weightage of Marks				
Units	**2 marks**	**5 marks**	**8 marks**	**Total Mks.**
I	**2X2=4**	**5X2=10**	**8X1=08**	**22**
II	**2X1=2**	**5X1=05**	**8X2=16**	**23**

III	**2X2=4**	**5X1=05**	**8X1=08**	**17**
IV	**2X1=2**	**5X2=10**	**8X2=16**	**28**
	12 Marks	**12 Marks**	**12 Marks**	**12 Marks**

Panel of Examiners:

Sl.No	Name	Designation	Address
1	Dr. M. K. Mahesh	Associate Professor	Yuvaraja's College, Mysuru
2	Dr. C. R. Vijay	Associate Professor	Maharani's Science College for Women, Mysuru
3	Dr. B. S. Ravikumar	Associate Professor	A. V.K College for Women, Hassan
4	Dr. S. Prathibha	Associate Professor	JSS College of Arts, Commerce and Science, Mysuru
5	Mallikarjunaiah	Associate Professor	Yuvaraja's College, Mysuru
6	M. M. Swamy	Assistant Professor	JSS College for women, Saraswathipuram, Mysuru
7	Dr. K. Krishna	Assistant Professor	Yuvaraja's College, Mysuru
8	Dr. Sharvani	Assistant Professor	Yuvaraja's College, Mysuru
9	Dr. Shivalingaiah	Assistant Professor	Maharani's Science College for Women, Mysuru
10	Dr. Thoyajaksha	Assistant Professor	Govt. Science College for Women, Hassan
11	G. Krishnamurthy	Assistant Professor	Yuvaraja's College, Mysuru
12	Dr. R. Sowmya	Assistant Professor	Yuvaraja's College, Mysuru
13	Dr. Suresh N. S	Assistant Professor	Maharani's Science College for Women, Mysuru
14	Dr. Sandhyarani	Assistant Professor	Maharani's Science College for Women, Mysuru
15	Dr. Devaki	Assistant Professor	Sarada vilas College, Mysuru
16	N. Gayathridevi	Assistant Professor	JSS College, Chamarajanagara
17	Revanamba	Assistant Professor	JSS College, Chamarajanagara
18	Dr. Lalitha	Assistant Professor	Maharani's Science College for Women, Mysuru
19	Dr. Usha N	Assistant Professor	JSS College for women, Saraswathipuram, Mysuru
20	B. L. Kiran	Assistant Professor	JSS College of Arts, Commerce and Science, Mysuru
21	Girijamba	Assistant Professor	Maharani's Science College for Women, Mysuru

22	Dr. A. L. Veerabhadraswamy	Assistant Professor	JSS College of Arts, Commerce and Science, Mysuru
23	Nayana	Assistant Professor	Maharani's Science College for Women, Mysuru
24	Chandana. C	Assistant Professor	JSS College for women, Saraswathipuram, Mysuru
25	Anusha	Assistant Professor	JSS College for women, Saraswathipuram, Mysuru
26	Poornima. U	Assistant Professor	JSS College for women, Saraswathipuram, Mysuru