

# **BOTANY**

**Syllabus for  
B. Sc. (Basic / Hons) Programme**

**Under  
NATIONAL EDUCATION POLICY -2020**

**Submitted to**



**Registrar  
TUMKUR UNIVERSITY**

**Submitted by**

**Board of Studies in Botany  
Tumkur University**

# BOTANY

## Semester - 1

Number of Theory Credits	Number of Lecture hours/semester	Number of Practical credits	Number of Practical hours/semester
4	56	2	56

<b>Content of Theory Course-1: BOTDSCo1</b>	<b>Hours</b>
<b>Microbial Diversity and Technology</b>	
<b>UNIT 1</b>	<b>15 Hrs</b>
<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.	<b>5 Hrs</b>
<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)	<b>5 Hrs</b>
<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.	<b>5 Hrs</b>
<b>UNIT 2</b>	<b>15 Hrs</b>
<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.	<b>5 Hrs</b>

<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	<b>5 Hrs</b>
<b>Chapter No.6: Microbial Growth</b> - Microbial growth and measurement. Nutritional types of Microbes - autotrophs and heterotrophs, phototrophs and chemotrophs; lithotrophs and organotrophs	<b>5 Hrs</b>
<b>UNIT 3</b>	<b>11 Hrs</b>
<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.	<b>5 Hrs</b>
<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). Cultivation of viruses. Vaccines and types.	<b>4 Hrs</b>
<b>Chapter No. 9: Viroids</b> - general characteristics and structure of Potato Spindle Tuber Viroid (PSTVd); Prions - general characters and Prion diseases. Economic importance of viruses.	<b>2 Hrs</b>
<b>UNIT 4</b>	<b>15 Hrs</b>
<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.	<b>5 Hrs</b>
<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>	<b>5 Hrs</b>
<b>Chapter No. 12: Lichens</b> – Structure and reproduction. VAM Fungi and their	<b>5 Hrs</b>

significance. **Fungal 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.

### **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, New Delhi.
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.

<b>Content of Practical Course 1: BOTDSC01P</b> <b>For 1<sup>st</sup> Semester</b> <b>Microbial Diversity and Technology</b>	
<b>List of Experiments to be conducted</b>	
<p><b>Practical 1:</b> 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, Coony counter, Haemocytomer, Micrometer etc.).</p> <p><b>Practical 2:</b> Enumeration of soil / food /seed microorganisms by serial dilution technique.</p> <p><b>Practical 3:</b> Preparation of culture media (NA/PDA) sterilization, inoculation, incubation of <i>E coli</i> / <i>B. subtilis</i>/ Fungi and study of cultural characteristics.</p> <p><b>Practical 4:</b> Determination of cell count by using Haemocytometer and determination of microbial cell dimension by using Micrometer.</p> <p><b>Practical 5:</b> Simple staining of bacteria (Crystal violet /Nigrosine blue) / Gram's staining of bacteria.</p> <p><b>Practical 6:</b> Isolation and study of morphology of <i>Rhizobium</i> from root nodules of legumes</p>	

**Practical 7:** Preparation of spawn and cultivation of paddy straw (Oyster) mushroom.

**Practical 8:** 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 9:** Preparation of agar slants, inoculation, incubation, pure culturing and preservation of microbes by oil overlaying.

**Practical 10:** Study of late blight of Potato, Downy mildew of Bajra, Citrus canker, Tobacco mosaic disease, Sandal spike disease.

**Practical 11:** Study of well-known microbiologists and their contributions through charts and photographs.

**Practical-12:** 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)

# BOTANY

## Semester - 2

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: BOTDSCo2 Diversity of Non- Flowering Plants	56 Hrs
<b>UNIT 1</b>	<b>15 Hrs</b>
<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.	<b>5 Hrs</b>
<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.	<b>5 Hrs</b>
<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.	<b>5 Hrs</b>
<b>UNIT 2</b>	<b>15 Hrs</b>
<b>Chapter No. 4:</b> Bryophytes – General characteristics and classification of Bryophytes, Diversity-habitat, thallus structure, Gametophytes and sporophytes.	<b>5 Hrs</b>
<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.	<b>5 Hrs</b>
<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> .	<b>5 Hrs</b>
<b>UNIT 3</b>	<b>15 Hrs</b>
	<b>5 Hrs</b>

<b>Chapter No. 7:</b> A brief account of heterospory and seed habit. Stellar evolution in Pteridophytes. Affinities and evolutionary significance of Pteridophytes. Ecological and economic importance.	
<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> .	<b>5 Hrs</b>
<b>Chapter No. 9:</b> Affinities and evolutionary significance of Gymnosperms. Economic importance of Gymnosperms - food, timber, industrial uses and medicines.	<b>5 Hrs</b>
<b>UNIT 4</b>	<b>11 Hrs</b>
<b>Chapter No. 10: Origin and evolution of Plants:</b> Origin and evolution of plants through Geological Time scale.	<b>2 Hrs</b>
<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.	<b>5 Hrs</b>
<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.	<b>4 Hrs</b>
<p><b>Text Books</b></p> <ol style="list-style-type: none"> <li>1. Chopra, G.L. A text book of Algae. Rastogi &amp; Co., Meerut, Co., New Delhi, Depot. Allahabad.</li> <li>2. Johri, Lata and Tyagi, 2012, A Text Book of, Vedam e Books, New Delhi.</li> <li>3. Sharma, O.P. 1990. Text Book of Pteridophyta. McMillan India Ltd. New Delhi.</li> <li>4. Sharma, O.P. 1992. Text Book of Thallophytes. McGraw Hill Publishing Co. New Delhi.</li> <li>5. Sharma, O.P., 2017, Algae Singh-Pande-Jain 2004-05. A Text Book of Botany. Rastogi Publication, Meerut.</li> </ol>	
<p><b>References</b></p> <ol style="list-style-type: none"> <li>1. Sambamurty, A.V.S.S.. A Text Book of Algae. I.K. International Private Ltd., New Delhi.</li> <li>2. Agashe, S.N. 1995. Paleobotany. Plants of the past, their evolution, paleoenvironment and Allied plants. Hutchinson &amp; Co., Ltd., London.</li> <li>3. Anderson R.A. 2005, Algal cultural Techniques, Elsevier, London.</li> <li>4. Publication, Application in exploration of fossil fuels. Oxford &amp; IBH., New Delhi.</li> <li>5. Eams, A.J., (1974) Morphology of vascular plants - Lower groups. Tata Mc Grew-Hill Publishing Co. New Delhi, Freeman &amp; Co., New York</li> </ol>	

7. Fritze, R.E. 1977. Structure and reproduction of Algae. Cambridge University Press
8. Goffinet B and Shaw A.J. 2009, Bryophyte Biology, 2nd ed. Cambridge University Press, Cambridge.Gymnosperms.
9. Srivastava, H N, 2003. Algae Pradeep Publication, Jalandhar, India.
10. Kakkar, R.K. and B.R.Kakkar ( 1995) The Gymnosperms (Fossils and Living) Central Publishing House, Allahabad.
11. Kumar H. D., 1999, Introductory Phycology, Affiliated East-West Press, Delhi.
12. Lee, R.E., 2008, Phycology, Cambridge University Press, Cambridge. 4th edition.McGraw Hill Publishing Co., New Delhi.
13. Parihar, N.S. 1970. An Introduction to Embryophyta. Vol. I. Bryophyta. Central Book, Allahabad.
14. Parihar, N.S. (1976) An Introduction to Pteridophytes, Central Book Depot, Allahabad.
15. Parihar, N.S. 1977. The Morphology of Pteridophytes. Central Book Depot., Allahabad.Press, Cambridge.
16. Rashid, A. 1998. An Introduction to Pteridophyta. II ed., Vikas Publishing House, New Delhi.
17. Smith, G.M. 1971. Cryptogamic Botany. Vol. II. Bryophytes & Pteridophytes. Tata Tata McGraw Hill Publishing, New Delhi.
18. Smith, G.M. 1971. Cryptogamic Botny. Vol.I Algae & Fungi. Tata McGraw Hill Publishing. New Delhi.
19. Sporne, K.R. 1965. The Morphology of Gymnosperms. Hutchinson & Co., Ltd., London.
20. Stewart, W.M. 1983. Paleobotany and the Evolution of Plants, Cambridge University Cambridge.
21. Sundarajan, S. 1997. College Botany Vol. I. S Chand & Co. Ltd., New Delhi.
22. Vanderpoorten, A. and Goffinet, B. 2009, Introduction to Bryophytes, Cambridge University Press, Cambridge
23. Vashista, B.R. 1978. Bryophytes. S Chand & Co. Ltd., New Delhi.

<b>Content of Practical Course 2: BOTDSCo2P</b> <b>2<sup>nd</sup> Semester</b> <b>Diversity of Non- Flowering Plants</b>	
<b>List of Experiments to be conducted</b>	
<p><b>Practical-1:</b> Study of morphology, classification, reproduction and lifecycle of <i>Nostoc/Oscillatoria</i>.</p> <p><b>Practical-2:</b> Study of morphology, classification, reproduction and life-cycle of <i>Oedogonium &amp; Chara, Sargassum, Batrachospermum / Polysiphonia</i>.</p> <p><b>Practical-3:</b> Study of morphology, classification, reproduction and life-cycle of <i>Riccia &amp; Anthoceros</i>.</p> <p><b>Practical-4:</b> Study of morphology, classification, anatomy, reproduction and life-cycle of <i>Selaginella and Equisetum</i>.</p> <p><b>Practical -5:</b> Study of morphology, classification, anatomy, reproduction and life-cycle of <i>Pteris, Azolla</i>.</p> <p><b>Practical -6:</b> Study of morphology, classification, anatomy and reproduction in <i>Cycas</i>.</p> <p><b>Practical -7:</b> Study of morphology, classification &amp; anatomy, reproduction in <i>Pinus</i>.</p> <p><b>Practical -8:</b> Study of morphology, classification &amp; anatomy, reproduction in <i>Gnetum</i>.</p> <p><b>Practical -9:</b> Study of important blue green algae causing water blooms in the lakes.</p> <p><b>Practical -10:</b> Study of different methods of cultivation of ferns in a nursery.</p> <p><b>Practical -11:</b> Preparation of natural media and cultivation of <i>Azolla</i> in artificial ponds.</p> <p><b>Practical -12:</b> Media preparation and cultivation of <i>Spirulina</i>.</p> <p><b>Practical -13:</b> Study different algal products and fossils impressions and slides.</p> <p><b>Practical-14:</b> 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)</p>	

# BOTANY

No. of Credits	No. of Lecture Hours
3	30

	<b>BOTOECO1: Content of OEP – Natural Resource and Management [Non Practical]</b>	<b>30 Hours</b>
<b>UNIT 1</b>	<b>Introduction and types of Natural Resources:</b> Renewable and Non-Renewable, Landslides, desertification, Soil types: sand, silt, clay loamy. Soil properties based on texture, Soil PH, Soil microbes, Soil mining, Soil erosion and conservation	<b>10 Hrs</b>
<b>UNIT 2</b>	<b>Water resources:</b> Fresh water and marine. Global water budget, Threats to water resources: Urbanisation, Population explosion and Industrialisation. Rain water harvesting, Watershed management, Hydrological cycle, Water pollution: causes, effects and control measures. Case study - Pollution of River Cauvery	<b>10 Hrs</b>
<b>UNIT 3</b>	<b>Forest resources:</b> Timbers and medicinal treasure. Types of forests, Threats: over exploitation, forest fire, hunting and poaching. Conservation of forest: afforestation, vanamahostava, social forestry. Forest movement - Chipko. Climate change: Global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture. Environment Protection Act: Water (Prevention and control of Pollution) Act: Forest Conservation Act.	<b>10 Hrs</b>
<p><b>References</b></p> <ul style="list-style-type: none"> <li>• Gadgil, M., &amp; Guha, R. (1993). This Fissured Land: An Ecological History of India. Univ. of California Press.</li> <li>• Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. (2006). Principles of Conservation Biology. Sunderland: Sinauer Associates.</li> <li>• McNeill, John R. (2000). Something New Under the Sun: An Environmental History of the Twentieth Century.</li> <li>• Odum, E.P., Odum, H.T. &amp; Andrews, J. (1971). Fundamentals of Ecology. Philadelphia:</li> </ul>		

Saunders.

- Pepper, I.L, Gerba, C.P. & Brusseau, M.L. (2011). Environmental and Pollution Science. Academic Press.
- Rosencranz, A., Divan, S., & Noble, M. L. (2001). Environmental law and policy in India. Tripathi 1992.
- Singh, J.S., Singh, S.P. and Gupta, S.R. (2014). Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.
- Thapar, V. (1998). Land of the Tiger: A Natural History of the Indian Subcontinent. Warren, C. E. (1971). Biology and Water Pollution Control. WB Saunders.

## BOTANY

No. of Credits	No. of Lecture Hours
3	30

	<b>Content of OEP – BOTOECO2: Horticultural Practices [Non Practical]</b>	<b>30 Hours</b>
<b>UNIT 1</b>	<b>Fundamentals of Horticulture:</b> Scope and Branches. Horticultural Research Institute in Karnataka. Vegetative propagation: Aims and objectives. Methods: Natural - Rhizome, Tuber and Bulb. Artificial - Cutting, Grafting and Layering. Propagation Structures: Greenhouses, glasshouses, poly-houses. Gardening: Land scaping, Types of Gardening: Formal, Informal and Free style. Garden components: garden wall, gates, fence and flower beds. An account of kitchen gardening, Terrarium.	<b>10 Hrs</b>
<b>UNIT 2</b>	<b>Floriculture:</b> Scope and importance. Classification [annual, biannual and perennial], Tools used in floriculture. Methods of cultivation. Floriculture nursery. Production techniques of commercial flower crops - Gerbera, Asparagus, Gladiolus, Rose, Chrysanthemum and Jasmine, Postharvest management of flower crops and marketing. Status of floriculture in India. Weed management: Introduction, methods of control of weed: chemical and biological. Importance of weeds: beneficial and harmful.	<b>10 Hrs</b>

<p><b>UNIT 3</b></p>	<p><b>Post harvest technology:</b> Importance and status. Post-harvest losses and factors responsible for deterioration of horticulture produce; physiological and biochemical changes during ripening process, delaying of ripening process. Packaging: types, recent advances in packaging, modes of transportation, Marketing of fresh produce, post-harvest treatments for extending storage life; Principles and methods of storage. Storage diseases of Horticultural crops: Fruits - Bacterial canker of Lemon, Bunchy top of Banana. Vegetables - Soft rot of Carrot, Late blight of Potato.</p>	<p><b>10 Hrs</b></p>
<p><b>References</b></p> <ul style="list-style-type: none"> <li>• Post Harvest Technology of Horticultural Crops: 07: Horticulture Science Series: K.P. Sudheer and V. Indira</li> <li>• Recent Initiatives in Horticulture Chandha K. L.</li> <li>• Objective Horticulture Dr. V. R. Sagar Dr. Uadal Singh</li> <li>• Hand book of Horticulture 2nd Revised edn . Kusum Lata Chadha</li> <li>• Handbook for Skill Development: Nursery Management of Horticulture Crops by Deepa H. Dwivedi and Navaldey Bhart</li> </ul>		

# BOTANY

No. of Credits	No. of Lecture Hours
3	30

<b>Content of Skill Enhancement Course [SEC] – BOTSECo1: Tribal Medicine and Economic Botany [ Practical Based]</b>		<b>30 Hours</b>
<b>UNIT 1</b>	<b>Tribal medicine:</b> Introduction, scope and importance. Role in human life. Concept of Indian medicine: ayurveda and siddha. Prevailing diseases of tribals. Tribal attitude towards disease diagnosis and treatment. Tribal knowledge of plant conservation. Tribal pharmacology.	<b>10 Hrs</b>
<b>UNIT 2</b>	<b>Medicinal Plants:</b> Brief account of medicinal plants in daily life [Botanical name, family, part used and medicinal uses / value need to be studied] Ocimum, Vinca, Nerium, Hibiscus white variety, Argemone, Tinospora, Aloe vera, Goseberry, Coriandrum, Ashwagandha, Cympopogon, Turmeric, Gymnema, Adathoda, Coleus, Hemidesmus, Sesbenia, Ginger , Ficus and Centella	<b>10 Hrs</b>
<b>UNIT 3</b>	<b>Economic Botany:</b> Role and importance of plant products to mankind [carbohydrates, fats, mucilages, proteins, essential oils, pigments, tannins, resins, latex, waxes, alkaloids, organic acids, enzymes, vitamins and hormones]. Comprehensive account of the following [Botanical name, family, part used and uses need to be studied] Cereals: rice, wheat. Millets: ragi, maize. Pulses: pigeon pea, green gram. Fibre yielding plants: jute, cotton. Oil yielding plants: ground nut, coconut. Timber yielding plants: teak wood rose wood. Rubber yielding plants: havea, indian rubber. Beverages: coffea, cocoa. Spices and condiments: clove, black pepper. Narcotic plants: opium, heroin	<b>10 Hrs</b>
<b>References</b> <ul style="list-style-type: none"> <li>• Tribal medicine D C Pal and K Jain</li> <li>• Plants that Heal Dr J C Kurian</li> <li>• Tribal Medicine J J Roy Burman</li> </ul>		

- Indigenous Herbal Medicines: Tribal Formulations and Traditional Herbal Practices D. Acharya
- Compendium of Bangladesh Folk and Tribal Medicinal Plants, Volume-1 Dr. Mohammed Rahmatullah and Dr. Rownak Jahan
- Economic Botany Albert F, Hill
- Economic Botany Pandey B.P
- Economic Botany S. L. Kochhar

### **Skill Enhancement Course**

#### **BOTSECo2: Tribal Medicine and Economic Botany**

##### **List of Experiments to be conducted**

**Practical-1** Preparation of decoction or juice of Adathoda, Ocimum, Aloe and Cympopogon

**Practical-2:** Study of Ethno botanically important plants studied in theory (Mention the Common name or Vernacular name, Botanical name, Family, Part used and therapeutic values).

**Practical-2:** Study of economically important plants covered in theory and identify with botanical names, families, part used and uses.

**Practical-3:** Submission of five herbarium specimens (Locally available 5 tribal medicinal plants)

# BOTANY

No. of Credits	No. of Lecture Hours
3	30

<b>Content of OEP – BOTOECO3: Mushroom Culture Technology [Non Practical]</b>		<b>30 Hours</b>
<b>UNIT 1</b>	<p><b>Mushroom Morphology:</b> Parts of a typical Mushroom, Difference between edible and poisonous mushroom, Classification - based on Occurrence: Epigenous and Hypogenous. Habit and Habitats: Humicolous, Lognicolous and Coprophylous. Biology: Distinguishing characteristics, Spore germination and life cycle.</p>	<b>10 Hrs</b>
<b>UNIT 2</b>	<p><b>Cultivation Techniques:</b> Fundamentals of cultivation system. Principles of mushroom farm layout: location of building plot, design of farm. Composting: Machinery and materials required for compost making. Methods of composting: long and short methods. Infrastructure for cultivation: substrate spawns (seeds) polythene bag, vessels, inoculation hook, loop, stove, culture rack, thatched house, water sprayer and tray. Mushroom bed preparation: paddy straw, sugarcane trash, maize straw.</p>	<b>10 Hrs</b>
<b>UNIT 3</b>	<p><b>Nutritional importance,</b> Medicinal value and health benefits of edible mushrooms: antiviral, antibacterial, antitumor, renal and therapeutic values. Short term storage [refrigeration], long term storage [canning, pickels and papads]. Drying, storage in salt solution. Export value, marketing in India and abroad.</p>	<b>10 Hrs</b>
<p><b>References</b></p> <ul style="list-style-type: none"> <li>• Mushroom cultivation, Tripathi D. P. 2005. Oxford and IBH publishing Co. Pvt. Ltd. New Delhi</li> <li>• Mushroom production and processing technology. Pathak Yadav Gour (2010) Agrobios Publisher, New Delhi, India.</li> <li>• Hand book of edible Mushroom, S. Kannaiyan and K. Ramaswamy. 1980. Today and Tomorrow printers, New Delhi.</li> </ul>		

- Hand book on Mushrooms, Nita Bahl. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.

## BOTANY

No. of Credits	No. of Lecture Hours
3	30

<b>Content of OEP</b>		<b>30 Hours</b>
<b>BOTOECO4: Vermicomposting Technology [Non Practical]</b>		
<b>UNIT 1</b>	<p><b>Introduction to Vermicomposting:</b> Concept, scope &amp; objectives. Properties of Vermicompost: physical, chemical and biological. Physical parameters of vermicompost. Effect of vermicompost on soil, Vermicomposting for organic farming- an eco friendly approach. Significance of vermicompost in agri-horticultural practices.</p>	<b>10 Hrs</b>
<b>UNIT 2</b>	<p><b>Vermicomposting Methods:</b> Collection, segregation &amp; processing of raw materials. Bed preparation for composting [aerobic and anaerobic], vermicompost devices, application of earthworms on bed, watering, air drying, sieving, composition and technique of vermi-wash production, precautions of vermicomposting. Methods of vermicomposting: small scale [indoor method] and large scale [outdoor method]. Maintenance, harvesting, packaging, transport and storage of vermicompost. Conventional method of vermicomposting: bed and pit methods.</p>	<b>10 Hrs</b>
<b>UNIT 3</b>	<p><b>Vermicomposting Potentials and Economics:</b> Vermicomposting from agricultural and biodegradable wastes. Nutritional composition of vermicompost. Applications of vermicompost and its role in agriculture. Prospects of vermicompost in India. Vermicomposting - a self employment venture. Field visit to Vermicomposting unit.</p>	<b>10 Hrs</b>
<p><b>References</b></p> <ul style="list-style-type: none"> <li>• The Text book of Vermicompost, Vermiwash and Biopesticides: Keshav Singh. Biotech books publisher</li> <li>• Handbook of Organic farming and Organic foods with Vermicomposting Neem.</li> </ul>		

Engineers India Research Institute Publisher

- A Text book of Vermitechnology and Vermicomposting. 3<sup>rd</sup> edition. Seethalakshmi. 2012.
- The complete Text Book on Vermiculture and Vrmicompost. 2006. NIIR Board, New Delhi.