

2021-2024

Semester III

Course Title	PLANT DIVERSITY & PHYTOPATHOLOGY 50%
Total Hours	60
Hrs/Week	4T+2P
Sub. Code	21UABT31
Course Type	Allied
Credits	3
Marks	100

General Objective:

To educate students on plant-biodiversity for higher academic pursuits, especially in the field of Biological Sciences, environment and conservation.

Course Objectives: The learners will be able to:

CO. No.	Course Objectives
CO-1	Understand the origin and evolution of life with reference to lower plants ranging from various groups such as algae and fungi and their economic importance.
CO-2	Develop knowledge of the plant groups such as lichens, bryophytes and their economic importance and to enable students understand the relevance of environment and human well-being.
CO-3	Explain the structure and their economic importance of pteridophytes and gymnosperms.
CO-4	Identify nomenclature and classify the plants by determining the morphology, its salient features and the economic importance of angiosperms.
CO-5	Examine the concepts and principles of phytopathology.

UNIT I - Algae & Fungi

Algae - General characteristics; Economic importance; Morphology, Structure, Reproduction & life cycle in *Sargassum*. Fungi - General characters; Economic importance; Morphology, Structure, Reproduction & life cycle in *Puccinia*.

UNIT II – Lichens and Bryophytes

Lichens- General characteristics; Economic importance; Types – Crustose, Foliose, Frustricose. Bryophytes- General characters; Economic importance; Morphology, Structure, Reproduction & life history in *Marchantia*-.

UNIT III – Pteridophytes & Gymnosperms

Pteridophytes- General characteristics; Economic importance; Morphology, Structure, Reproduction & life cycle in *Lycopodium* and (*Adiantum*). Gymnosperms – General characteristics; Economic importance; Morphology, Structure, Reproduction & life cycle in *Pinus*.

UNIT IV – Plant Taxonomy

Brief account on Classification: Natural – Bentham & Hooker. Morphology and reproductive characters of flowering plants (Phyllotaxy and inflorescence) (Study of the following families – Fabaceae, Asteraceae, Solanaceae) and Poaceae.

UNIT V – Phytopathology

Terms and concepts; pertaining to phytopathology; Disease cycle and (environmental relation) prevention and control of plant diseases. Fungal diseases – (Early blight of potato, White rust of crucifers). Bacterial diseases – Citrus canker and (angular leaf spot of cotton). Viral diseases – Tobacco Mosaic viruses.

TEXT BOOKS:

1. Pandey B.P. 2001. College Botany Vol. I: Algae, Fungi, Lichens, Bacteria, Viruses, Plant Pathology, Industrial Microbiology and Bryophyta. S. Chand & Company Ltd, New Delhi.
2. Pandey. B.P. 1997 – Taxonomy of Angiosperms – S. Chand & Co., New Delhi
3. Vashishta, B.R. 2008. Botany for Degree Students – Vol I Algae.
4. Sethi, I.K. and Walia, S.K. 2011. Text Book of Fungi and Their Allies, Macmillan Publishers Pvt.Ltd. Delhi.
5. Sharma, P.D. (2011). Plant Pathology, Rastogi Publication, Meerut, India.
6. Vashishta, P.C., Sinha, A.K., Kumar, A. (2010). Pteridophyta. S. Chand. Delhi, India.

REFERENCE BOOKS:

1. Parihar. N. S. 2001. Bryophyta - Central Book Depot Publications in Botany, Allahabad
2. Vashista. B R .1997, The Algae, S .Chand & Co. Ltd... New Delhi
3. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology. 4th edition. John Wiley & Sons (Asia) Singapore.
4. Webster, J. and Weber, R. (2007). Introduction to Fungi. 3rd edition. Cambridge University Press, Cambridge.
5. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi and Their Allies, Macmillan Publishers India Ltd.

Semester IV

Course Title	PLANT ANATOMY, PHYSIOLOGY & BIOTECHNOLOGY
Total Hours	60
Hrs/Week	4T+2P
Sub. Code	21UABT41
Course Type	Allied
Credits	3
Marks	100

General Objective:

To learn the concepts, scope, instrumentation, basic requirements and applied aspects of plant tissue culture besides plant physiology and anatomy in detail.

Course Objectives: The learners will be able to:

CO	Course Objectives
CO-1	Understand the primary, secondary and anomalous, anatomical structure of plants besides inculcating the primary tissues.
CO-2	Develop the knowledge in physiological process and learn the physiological mechanisms.
CO-3	Determine the scope and importance of assimilatory function of plants.
CO-4	Apply the knowledge in understanding about respiration and the physiological effects of hormones in plant growth.
CO-5	Develop knowledge on plant tissue culture techniques and organize themselves to become entrepreneurs with the knowledge of bio-fertilizers in large scale.

UNIT I- PLANT ANATOMY

Root and shoot apical meristems; Simple and complex tissues. Primary structure of dicot and monocot stem, root. Secondary growth in dicot stem. Anomalous secondary growth- *Boerhaavia*. Annual ring.

UNIT II- PLANT PHYSIOLOGY

Importance of water, water potential and its components; Diffusion, Imbibition & Osmosis. Absorption of water – Mechanism of water absorption – active and passive. Ascent of sap – Path and Mechanism, Cohesion theory. Root pressure and guttation. Transpiration -Types – Cellular, Stomatal, Lenticular and its significance; Factors affecting transpiration;- Mechanism of Stomatal Transpiration. (Theories not needed). Antitranspirant.

UNIT III

Photosynthesis – Ultra Structure of Chloroplast. Photosynthetic Pigment systems I and II. 'Z' scheme of electron transport – C₃ Cycle, factors affecting photosynthesis – significance of photosynthesis.

UNIT IV

Respiration – Ultra Structure of Mitochondria. Types – Aerobic & Anaerobic, Glycolysis – Krebs's cycle. Growth Hormones – Discovery and Physiological role of Auxins and Gibberellin.)

UNIT V- PLANT BIOTECHNOLOGY

Plant tissue culture: Definition, Historical perspective, Scope & importance. Totipotency, Callus & Meristem Culture. Application of tissue culture. Biofertilizer – General account about the following microbes used as biofertilizer – *Rhizobium* – isolation, identification, mass multiplication of *Rhizobium* (BGA – *Spirulina*.)

TEXT BOOKS:

1. Jain V. K. 1996 - Fundamentals of Plant Physiology 5th edition - S Chand & Co., New Delhi.
2. Kumar H. D. 1998 - Modern Concept of Biotechnology, Vikas Publishing House Ltd., New Delhi.

REFERENCE BOOKS:

1. Dubey R.C. 2001 A Text Book of Biotechnology, S. Chand & Co., New Delhi.
2. Thakur. K. and Bassi. K, 2007. Diversity of microbes and cryptogams. S.Chand & company Ltd. New Delhi.
3. M.S. Tayal, Plant Anatomy, Rostegi Publication. Meerat.
4. Bajracharya, D., (1999). Experiments in Plant Physiology- A Laboratory Manual. Narosa Publishing House, New Delhi.
5. Frank B. Salisbury, Cleon W. Ross. 1985. Plant Physiology. Wadsworth Publishing Company. University of Minnesota.

Semester III

Course Title	PLANT DIVERSITY AND PHYTOPATHOLOGY PRACTICALS 50
Total Hours	30
Hrs/Week	2
Sub. Code	21UABT3P1
Course Type	Allied (Practical)
Credit	1
Marks	100

General Objective:

To study about the various groups of non-flowering plants in developing skill to identify from the flowering plants to species level.

Course Objectives: The learners will be able to:

CO	Course Objectives
CO-1	Observe and understand the internal organization of plant body such as primary, secondary and anomalous, anatomical structure of stem and root.
CO-2	Identify and describe the specimens belonging to higher cryptogams.
CO-3	Categorize the sections of plant materials of anatomical and morphological interest for identification.
CO-4	Summarize the features of plant taxonomy.
CO-5	Distinguish the plant diseases and casual organisms.

DIVERSITY OF PLANT LIFE & PHYTOPATHOLOGY

1. Micropreparation & Identification of the following:
 - Sargassum – Thallus.
 - Marchantia - Thallus.
2. Observation and Identification of Permanent slide –
 - Sargassum – Male and female conceptacles.
 - Marchantia sporophyte.
 - (Puccinia – Permanent Slide.)

3. Micropreparation & Identification of Lycopodium and (Adiantum Stem) & Pinus needle.
4. (Study of vegetative and floral characters of the following families prescribed in the theory syllabus) (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification):
5. (Identification of plant diseases prescribed in the syllabus) - Specimen/Photograph.
6. Field trip for specimen collection.

REFERENCE BOOKS:

1. Gunasekaran, P., 1996. Lab Manual in Microbiology. New Age International (P), Ltd., Publishers, New Delhi.
2. Parihar, N.S. 19985, The Biology and Morphology of Pteridophytes, Central Book Department, Allahabad.
3. Sporne, K.R. 1971, The Morphology of Gymnosperms, Hutchinson University library London.
4. Pandey, B.P. 2010. Modern Practical Volume - 1. S.Chand & company Ltd. New Delhi.
5. Santra. S.C, Chatterjee, T.P and Das, A.P. 2001. College botany practical - Vol. II. New Central Book Agency (p) Ltd. India.

Course Outcomes: The learners would have learnt to:

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Discuss the structure and reproduction of select algae, fungi and bryophytes.	1,2	Understanding
CO-2	Examine the structures of morphology and the internal structures of the select species of pteridophyte and gymnosperms.	1,2,4	Applying
CO-3	Analyze the importance of plant diversity.	1,2	Analyzing
CO-4	Distinguish various angiosperm plant habits by comprehending the concepts of plant taxonomy and classification of angiosperms.	1,4	Evaluating
CO-5	Assess the bacterial and fungal disease of crop plants.	1,2,5	Evaluating

Semester IV

Course Title	PLANT ANATOMY, PHYSIOLOGY AND BIOTECHNOLOGY PRACTICALS 201.
Total Hours	30
Hrs/Week	2
Sub. Code	21UABT3P1
Course Type	Allied (Practical)
Credit	1
Marks	100

General Objective:

To identify the various groups of non-flowering and flowering plants by taking sections of plant materials in anatomical and morphological interest.

Course Objectives: The learners will be able to:

CO	Course Objectives
CO-1	Define the internal structures of stem and root.
CO-2	Associate themselves with fundamentals of the major physiological aspects of plants.
CO-3	Explain the basic knowledge of physiological activities of plants.
CO-4	Assess the scope of biotechnology in the light of recent developments.
CO-5	Predict the issues pertaining to plant tissue culture techniques.

Plant Anatomy:

1. Micropreparation and Identification of
 - a. Dicot Stem
 - b. Monocot Stem
 - c. Dicot Root
 - d. Monocot Root.
2. To observe and identify the following slides showing
 - a. Meristems – Shoot apex and root apex
 - b. Simple tissues.

Plant Physiology:

To demonstrate simple set up in Plant Physiology.

1. DPD (Diffusion Pressure Deficit)- Gravimetric Method. Transpiration Ganong's potometer experiment.
2. To demonstrate plasmolysis by using Tradescantia leaf.
3. Ganong's light screen experiment.
4. Transpiration- Stomatal Index.

Plant Biotechnology:

Photograph / model in Biotechnology.

1. Biofertilizer – Rhizobium/B.G.A./*(Spirulina)*
2. Tissue culture - Photograph (Callus & Meristem culture).
3. Industrial visit.

REFERENCES:

1. Pandey, B.P. 2010. Modern Practical Volume –III. S.Chand & company Ltd. New Delhi.
2. Pandey, B.P. 2010. Botany for degree students. S.Chand & Company Ltd. New Delhi.
3. Santra. S.C, Chatterjee, T.P and Das, A.P. 2005. College botany practical – Vol. I. New Central Book Agency (p) Ltd. India.

Course Outcomes: The learners would have learnt to:

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Understand the anatomical features of stem and root during sectioning besides identifying the various plant tissues.	1,2,3	Understanding
CO-2	Demonstrate DPD, plasmolysis and transpiration in Plant Physiology.	1,2,3,4	Applying
CO-3	Apply the basic knowledge of Ganong's light experiment and Transpiration-stomatal index in Plant Physiology.	1,2,4	Applying
CO-4	Differentiate the plant tissue culture techniques such as callus and meristem culture.	2,3,4	Analyzing
CO-5	Compare the various bio-fertilizers.	1,3,4,5	Evaluating

Semester III

Course Title	NURSERY AND GARDENING
Total Hours	30
Hrs/Week	2
Sub. Code	21USBT61
Course Type	SEC-I
Credits	2
Marks	100

General Objective:

To gain knowledge of gardening, cultivation, multiplication and raising seedlings of ornamental plants.

Course Objectives: The learners will be able to:

CO	Course Objectives
CO-1	Understand the methods to prepare nursery plants.
CO-2	Develop themselves to do vegetative propagation.
CO-3	Plan to know about landscaping design.
CO-4	Predict the design and components of parks and to develop the knowledge about the soil condition for seedling, manuring and harvesting.
CO-5	Recommend the storage of seeds and know about the methods of marketing.

UNIT I

Nursery: definition, objectives and scope and building up of infrastructure for nursery, planning and seasonal activities - Planting - direct seeding and transplants.

UNIT II

Vegetative propagation: Air layering, cutting, grafting, budding. Hardening of plants - green house, shade house and glass house.

UNIT III

Gardening: definition, objectives and scope - different types of gardening - landscape and home gardening

UNIT IV

Parks and its components - plant materials and design - (soil laying) manuring, watering, management of pests and diseases and harvesting.

UNIT V

Sowing/raising of seeds and seedlings - Transplanting of seedlings - Study of cultivation of different vegetables: cabbage, brinjal, onion. Storage and marketing procedures.

TEXT BOOKS

1. Kumar, N., 1997, Introduction to Horticulture, Rajalakshmi Publications, Nagercoil

REFERENCE BOOKS:

1. Bose T.K. & Mukherjee, D., 1972, Gardening in India, Oxford & IBH Publishing Co., New Delhi.
2. Sandhu, M.K., 1989, Plant Propagation, Wile Eastern Ltd., Bangalore, Madras.
3. Edmond Musser & Andres, Fundamentals of Horticulture, McGraw Hill Book Co., New Delhi.
4. Agrawal, P.K. 1993, Hand Book of Seed Technology, Dept. of Agriculture and Cooperation, National Seed Corporation Ltd., New Delhi.
5. Janick Jules. 1979. Horticultural Science. (3rd Ed.), W.H. Freeman and Co., San Francisco, USA.

Course Outcomes: The learners would have learnt to:

CO No.	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Explain how nursery of the plants is prepared.	1,3,4	Understanding
CO-2	Determine the various resources required for the development of vegetative propagation.	1,3,4,5	Applying
CO-3	Develop knowledge to distinguish among the different forms of sowing and growing of plants.	2,3,4	Analyzing
CO-4	Summarize the process of vegetative propagation by appreciating the diversity of plants and the selection of gardening.	2,3,4	Evaluating
CO-5	Choose the methods of cultivation of different vegetables and growth of plants in nursery and gardening.	2,3,4,5	Evaluating

Semester IV

Course Title	HERBAL MEDICINE
Total Hours	30
Hrs/Week	2
Sub. Code	21USBT62
Course Type	SEC III
Credits	2
Marks	100

General Objectives:

To explore the uses of plants as medicine ranging from traditional to modern pharmaceutical methods in treating ailments besides creating awareness about the rich diversity of medicinal plants in India.

Course Objectives: The learners will be able to:

CO	Course Objectives
CO-1	Discuss the history and relevance of medicinal plants in Indian system of medicine and subsequent marketing.
CO-2	Understand the constraints in promotion and learning the therapeutical and pharmaceutical uses of medicinal plants.
CO-3	Categorize the plants according to the treatment of various diseases.
CO-4	Experiment with the cultivation of some important medicinal plants.
CO-5	Plan the cultivation of medicinal plants.

UNIT I

Scope and importance of medicinal plants in the traditional systems of medicine and modern medicine- cultivation - harvesting - processing - storage - marketing and utilization of medicinal plants.

UNIT II

Therapeutic and pharmaceutical uses of important plants used in the Ayurveda system of medicine. Concept of Rasayana drugs. Siddha. Origin, concepts, therapeutic and pharmaceutical uses of important plants used in Siddha system of medicine. Unani: History, concept of Umoor-e-Tabiya (Fundamentals)

UNIT III

Plants used for the treatment of hepatic disorders, cardiac diseases, infertility, diabetes, blood pressure, cancer and skin diseases. Role of AYUSH in the promotion of medicinal plants.

UNIT IV

Study of morphology, cultivation and medicinal uses of the following plants; Root-*Gloriosa*, Leaf-Neem.

UNIT V

Study of morphology, cultivation and medicinal uses of the following plants; stem-turmeric, flower-catharanthus.

Guest Lecturer on commercial utilization of herbal medicine.

TEXT BOOKS:

1. R.N. Chopra, S.L.Nayar and I.C.Chopra, 1956. Glossary of Indian medicinal plants, C.S.I.R, New Delhi.
2. Verma V 2009. Text book of Economic Botany. Ane Book.

REFERENCE BOOKS:

1. Kanny, Lall, Dey and Raj Bahadur, 1984. The Indigenous Drugs of India. International Book Distributors.
2. V.V. Sivarajan and Balachandran Indra 1994, Ayurvedic Drugs and their Plant Source. Oxford IBH publishing Co.
3. Miller, Light and Miller, Bryan, 1998. Ayurveda and Aromatherapy. Banarsidass, Delhi.
4. Anne Green, 2000. Principles of Ayurveda. Thomsons, Lon.

MUSHROOM CULTURE TECHNOLOGY

50%

Credit - 2 Total 3-36
Hr/week - 2
RIUSBT63

SEC V

Marks - 100

UNIT - I

15 (Introduction and history of mushroom cultivation in India) Medicinal value of Mushrooms; Edible & Poisonous Mushrooms in India. Research centers-- National level and regional level.) 15

UNIT - II

15 Cultivation technology, spawn preparation, mushroom bed preparation (Factors affecting the mushroom bed preparation -- (low cost technology) (composting technology in mushroom production- spent mushroom substrate (SMS).) 15

UNIT - III

Cultivation technology of Oysters, Button and Milky mushrooms.

UNIT - IV

20 (Nutrition of mushroom- proteins, amino acids, mineral elements nutrition- carbohydrates, crude fibre content- vitamins) Storage - short term storage, long term storage drying. 20

UNIT - V

Food preparation, Types of food prepared from mushroom - Mushroom sabji, Mushroom Achar, Mushroom soup, Mushroom Cutlet, Samosa, Curry, Soup Powder and Idly chutney powder.

Field visit to Mushroom farm and One day Training on Mushroom cultivation.

Guest Lecturer on Mushroom Cultivation

TEXT BOOK:

1. Nita Bahl (1984-1988) Hand book of Mushrooms, II Edition, Vol. I & Vol. II.

REFERENCES:

1. Marimuthu, T. Krishnamoorthy, A.S. Sivaprakasam, K. and Jayarajan. R (1991) Oyster Mushrooms, Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.
2. Swaminathan, M. (1990) Food and Nutrition. Bappco, The Bangalore Printing and Publishing Co. Ltd., No. 88, Mysore Road, Bangalore - 560018.
3. Paul Stamets, J.S. and Chilton, J.S. (2004). Mushroom Cultivator: A practical guide to growing mushrooms at home, Agarikon Press.
4. Shu-Ting Chang, Philip G. Miles, Chang, S.T. (2004). Mushrooms: Cultivation, nutritional value, medicinal effect and environmental impact, 2nd ed, CRC press.
5. Tewari, Pankaj Kappor, S.C. (1998) Mushroom cultivation, Mittal Publications, Delhi.

Semester III

Course Title	ECONOMIC BOTANY
Total Hours	30
Hrs/Week	2
Sub. Code	21UNBT31
Course Type	NME2A
Credits	2
Marks	100

General Objectives:

To teach students about economic botany, its principles, comprehensive knowledge of usefulness of plant resources, practices and how plants and societies are related.

Course Objectives: The learners will be able to:

Co.	Course Objectives
CO-1	Understand the economic importance of food plants, their life cycle, processing, plant part used for the production of plant resources and production of new varieties.
CO-2	Give examples of plants used as fiber resources.
CO-3	Explain various plant resources concerning timber.
CO-4	Discover the specific roles of plant as beverage and address the emerging environmental issues.
CO-5	Compile the knowledge of plants' usefulness as a spice and condiments for human welfare.

A Study on the following with references to their botanical name, morphology of useful part, family and economic importance.

UNIT I

Plant resources as food: Cereals; Origin, Morphology & uses- Rice, Wheat; Millets - Ragi; (General account with special reference to Gram.) Vegetables - lady; Fruits - Mango, Banana.

UNIT II

Plant resources as fibers – Classification – Surface fibers – Cotton (Coir) Soft fibers – Jute, Aloe, banana.

UNIT III

Plant resources as timbers – Wood Classification, properties (Mechanical, Physical) – Teak, Pine; Gums – Gum Arabic; Resin – Oleoresin.

UNIT IV

Plant resources as beverages – Coffee, Tea – (morphology, processing, uses).

UNIT V

Plant resources as Spices and Condiments – General account with special reference to (Botanical name, family, part used, morphology and uses) Seed – Cardamom; Bark – Cinnamon; Fruit – Coriander, Leaves – Mint, Flower – Clove, Rhizome – Zinger, Root – *Withania*.

TEXT BOOKS:

1. Pandey, B.P. 1997. Economic Botany–S. Chand & company Ltd. New Delhi.
2. Verma, V. 198.Economic Botany – Emkay publication, New Delhi.

REFERENCE BOOKS:

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.

Course Outcomes: The learners would have learnt to:

CO	Course Outcomes	PSOs Addressed	Cognitive Level
CO-1	Understand the core concepts of Economic Botany and relate with food plants, environment, populations, communities, and ecosystems.	1,2,3,4	Understanding
CO-2	Develop the knowledge of plant resource as fibre.	1,2,3,4	Applying
CO-3	Distinguish and demonstrate the botanical name, family, and morphology of specific plant resources as timbers.	1,2,3,4	Analyzing
CO-4	Analyze the cultivation practice of beverages.	1,2,3,4	Analyzing
CO-5	Assess the opportunity in plant resource as spices and condiments.	1,2,3,4,5	Evaluating