

Department of Botany

Scheme of Examination and Syllabus for Under Graduate Program BSc Life Science (UTD) (Pool Courses) for 1st & 2nd Semester

Under Multiple Entry and Exit, Internship and CBCS-LOCF as per NEP-2020 w.e.f. session 2024-25 (in phased manner)

Subject: Botany



Guru Jambheshwar University of Science & Technology Hisar-125001, Haryana

(A+ NAAC Accredited State Govt. University)



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Scheme of Examination and Syllabus for Under Graduate Programme (Pool Courses) w.e.f. session 2024-25 For BSc Life Sciences Botany (UTD) according to National Education Policy-2020

Subject: Botany

SEMESTER-I

Type of Course	Course Code	Nomenclature of Paper/Course	Credits	Contact Hours	Internal Marks	External Marks	Total Marks	Duration of Exam (Hr)
Discipline Specific Course								
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Minor Course	24MIC0119T	Elementary Botany	2	2	15	35	50	2
Multidisciplinary	24MDC0105T	Basics of	3	3	25	50	75	2.5
Course		Botany						
Skill	24SEC0105T	Floriculture	2	2	15	35	50	2
Enhancement	24SEC0105P	Floriculture	1	2	10	15	25	3
Course		Lab						
Value Added Course	24VAC0104T	Plants in Every Day Life/EVS	2	2	15	35	50	2

SEMESTER-II

Course Code	Nomenclature of Paper/Course	Credits	Contact Hours	Internal Marks	External Marks	Total Marks	Duration of Exam (Hr)
24MIC0219T	Cell Biology	2	2	15	35	50	2
24MDC0205T	Nursery and	3	3	25	50	75	2.5
	Gardening						
24SEC0205T	Organic	2	2	15	35	50	2
	Farming						
24SEC0205P	Organic	1	2	10	15	25	3
	Farming Lab						
24VAC0104T	Plants in	2	2	15	35	50	2
	Every Day						
	Course Code 24MIC0219T 24MDC0205T 24SEC0205T 24SEC0205P 24VAC0104T	Course CodeNomenclatureofPaper/Course24MIC0219T24MIC0205T24MDC0205T24SEC0205T24SEC0205P <t< th=""><th>Course CodeNomenclature of Paper/CourseCreditsofPaper/CourseI24MIC0219TCell Biology224MIC0205TNursery and Gardening324SEC0205TOrganic Farming224SEC0205POrganic Farming Lab124VAC0104TPlants in Every Day Life/EVS2</th><th>Course CodeNomenclature of Paper/CourseCredits HoursDaper/CourseI24MIC0219TCell Biology224MIC0205TNursery and Gardening324SEC0205TOrganic Farming Lab224VAC0104TPlants in Every Day Life/EVS2</th><th>Course CodeNomenclature of Paper/CourseCreditsContact HoursInternal MarksPaper/CourseIIII24MIC0219TCell Biology221524MIC0205TNursery and Gardening332524SEC0205TOrganic Farming Lab21524VAC0104TPlants in Every Day Life/EVS215</th><th>Course CodeNomenclature of Paper/CourseCreditsContact HoursInternal MarksExternal MarksPaper/CourseIIIIIPaper/CourseIIIIIImage: CourseImage: CourseImage: CourseImage: CourseImage: CourseImage: CoursePaper/CourseImage: CourseImage: CourseImage: CourseImage: CourseImage: CourseImage: CoursePaper/CourseImage: CourseImage: CourseImage: CourseImage: CourseImage: CourseImage: CourseImage: CoursePaminCourseCell Biology221535Image: CourseImage: C</th><th>Course CodeNomenclature of Paper/CourseCreditsContact HoursInternal MarksExternal MarksTotal MarksPaper/Course</th></t<>	Course CodeNomenclature of Paper/CourseCreditsofPaper/CourseI24MIC0219TCell Biology224MIC0205TNursery and Gardening324SEC0205TOrganic Farming224SEC0205POrganic Farming Lab124VAC0104TPlants in Every Day Life/EVS2	Course CodeNomenclature of Paper/CourseCredits HoursDaper/CourseI24MIC0219TCell Biology224MIC0205TNursery and Gardening324SEC0205TOrganic Farming Lab224VAC0104TPlants in Every Day Life/EVS2	Course CodeNomenclature of Paper/CourseCreditsContact HoursInternal MarksPaper/CourseIIII24MIC0219TCell Biology221524MIC0205TNursery and Gardening332524SEC0205TOrganic Farming Lab21524VAC0104TPlants in Every Day Life/EVS215	Course CodeNomenclature of Paper/CourseCreditsContact HoursInternal MarksExternal MarksPaper/CourseIIIIIPaper/CourseIIIIIImage: CourseImage: CourseImage: CourseImage: CourseImage: CourseImage: CoursePaper/CourseImage: CourseImage: CourseImage: CourseImage: CourseImage: CourseImage: CoursePaper/CourseImage: CourseImage: CourseImage: CourseImage: CourseImage: CourseImage: CourseImage: CoursePaminCourseCell Biology221535Image: CourseImage: C	Course CodeNomenclature of Paper/CourseCreditsContact HoursInternal MarksExternal MarksTotal MarksPaper/Course

Programme Outcomes

- PO1. Fundamental knowledge of basic biological Sciences, life sciences and botany.
- **PO2**. Basic understanding: Knowledge regarding basic concepts and applied aspects of cell biology, Diversity of Microbes & Lower Cryptogams, basics of Botany, nursery, gardening and medicinal plants.
- PO3. Interdisciplinary approach: Learning the relationships among plants, microbes and environment.
- **PO4.** Practical learning: Perform procedures and analysis as per laboratory standards in the areas of cell biology and Botany.
- **PO5.** Strong understanding of molecular biology, cytogenetics, microbiology, biochemistry and allied subjects, preparing them for higher education, disciplinary & multidisciplinary research and to be a life-long learner.
- **PO6.** Analytical Thinking: Perceive things, events and framing ideas and decisions (intellectual, organizational, and personal) in the light of scientific principles.
- **PO7.** Effective Communication: Speak, read and write clearly and make personal growth by connecting with people, ideas, books, media and technology.

Botany Elementary Botany (Semester-I) Minor Course (MIC)

Paper Code: 24MIC0119T 30 Hrs (2 Hrs /Week) Credits: 2 Exam. Time: 2 Hrs

External Marks: 35 Internal Marks: 15 Total Marks: 50

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

Course Objectives:

- 1. Introduction to plant science and morphology of plants.
- 2. Abiotic factors and Adaptation in plants.
- 3. Introduction to physio-chemical processes in plants.
- 4. Mineral Nutrition and Plant growth regulators.
- 5. Economic importance of plants

UNIT -I

Botany: Definition, Aim and Scope of Botany, Plant diversity, Plant and Its parts, Morphology of angiosperms with general account of types of Habit, Root, Leaf, Shoot, Flower and Fruit. Adaptation in Plants, Abiotic Factors and their effects on Plants.

UNIT -II

Introduction to Plant Physiology, Basic concept and Importance of Photosynthesis Respiration. Mineral nutrition in Plants; Plant Growth Hormone: Auxin, Gibberellin, Abscisic acid and Ethylene. Ecological & Economic Importance of Plants.

Suggested Readings:

- 1. College Botany, Vol. I &II Ed. 2011, Gangule, Das & Datta, Publisher New Central Book Agency (P) Ltd., New Delhi.
- 2. Elementary Botany, Ed. 1898. Percy Groom, George Bell & Sons, London.
- 3. A text Book of Botany, Ed. 12th 2015, P.S. Trivedi & S.N. Pandey, Vikas Publishing.
- 4. Elementary Botany, Ed. I, 2020, Pushp Sharma: Agrobios.

Course Outcomes: The course outcomes of this course are as follows:

- CO1 Student will be able to understand the basics of plants and their parts like: Root, Stem, Leaves, Flowers and fruits.
- CO2 Student will acquire knowledge about various abiotic factors affecting plants and the adaptations plants acquire for their survival.
- CO3 Student will learn about process of photosynthesis and respiration in plants.
- CO4 Students will learn about the essential and non-essential elements plant growth regulators like: Auxin, ethylene, ABA, Gibberellin.
- CO5 Students will learn the Economic Importance of Plants.

Mapping of COs with POs:

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S	Μ	S
CO2	S	S	Μ	S	Μ	S	S
CO3	S	Μ	S	Μ	S	S	S
CO4	Μ	S	Μ	S	S	S	Μ
CO5	S	S	S	S	S	S	S

Botany Basics of Botany (Semester-I) Multidisciplinary Course (MDC)

Paper Code: 24MDC0105T 30 Hrs (2 Hrs /Week) Credits: 3 Exam. Time: 2.5 Hrs

External Marks : 50 Internal Marks : 25 Total Marks: 75

Note: The maximum time duration for attempting the paper will be of 2.5 hours. The examiner is required to set seven questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 2.5 marks each. In addition to that six more questions will be set, two questions from each unit. The students shall be required to attempt four questions in all selecting one question from each unit in addition to compulsory Question No. 1. All questions shall carry equal marks i.e. 12.5 marks.

Course Objectives:

- 1. Understanding subject, its scope and branches.
- 2. To make students aware about the diversity of plants.
- 3. To gain understanding of structure of plant and its parts.
- 4. To impart knowledge on how plants function and interact with environment and abiotic factors on plant growth.
- 5. Conservation of Plant species

UNIT I

Plant Diversity, morphology and pollination dynamics: Plant diversity, Plant and Human Life. Different forms of Plants, General account on Habit, Plant parts and their Functions. Morphology of plant parts in reference to Stem, Root, Leaf, Flower and Fruit. Pollination and Pollinating agents.

UNIT II

Basics of Plant physiology: Osmosis, Diffusion, Imbibition Introduction to Photosynthesis, Its site and Products, Importance of Photosynthesis, Transpiration and Its Significance.

UNIT III

Plant Adaptation, importance and their conservation: Xerophytes and Hydrophytes plants with common examples, Abiotic Factors affecting the Plants. Conservation, Botanical Garden, Ecological & Economic Importance of Plants.

Suggested Readings:

- 1. A Text Book of Botany Vol I & II, by Pandey S.N., Mishra S.P. & Trivedi P.S.
- 2. College Botany, by B.P. Pandey
- 3. Hopkins, W. G., Huner, N. P. A. (2009). Introduction to Plant Physiology, 4th edition. New Delhi, Delhi: Wiley India Pvt. Ltd.
- 4. Arjariya (2022). Basic Botany (In Hindi), Ram Prasad Publications

Course Outcomes: The course outcomes of this course are as follows:

- CO1 Student will learn the scope of botany.
- CO2 Students will be able to understand the diversity of plants.
- CO3 Students will develop a conceptual understanding of plant physiology
- CO4 Student will be able to know the parts of plants and effect of abiotic factors on plants.
- CO5 Economic and Ecological importance of plants.

Mapping of COs with POs:	
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Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S	Μ	S
CO2	S	S	S	S	Μ	S	S
CO3	S	Μ	S	S	S	S	S
CO4	S	S	М	М	S	М	S
CO5	S	S	S	S	S	S	Μ

Botany Floriculture (Semester-I) Skill Enhancement Course (SEC)

Paper Code: 24SEC0105T 30 Hrs (2 Hrs /Week) Credits: 2 Exam. Time: 2 Hrs

External Marks : 35 Internal Marks : 15 Total Marks: 50

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

Course Objectives:

- 1. Why the Need of Mushroom cultivation.
- 2. To know about Medicinal & Nutritional Mushroom.
- 3. To know about Mushroom cultivation steps.
- 4. To know about value added foods from Mushroom.
- 5. Self-employment & Environmental sustainability.

UNIT -I

Introduction, History, Nutritional and Medicinal value of Edible mushrooms, Poisonous Mushrooms. Introduction to Common edible Indian mushrooms - Button mushroom (*Agaricus bisporus*), Milky mushroom (*Calocybe indica*), Oyster mushroom (*Pleurotus sajor caju*) and Paddy straw mushroom (*Volvariella volvcea*). Research Centres, Food Preparation - Comments on Value added products of Mushroom.

UNIT -II

Mushroom Cultivation (Button Mushroom) - Composting (Long Method and Short Method), Bed preparation, Factors affecting the mushroom bed preparation - Low cost technology.

Spawning - Medium, Pure culture & Mother Culture, Commercial Spawn production.

Casing - Different types of Casing mixtures, Maintaining of Environment after casing.

Harvesting, Shortening and Grading, Packing, Marketing.

Problems in cultivation - Common diseases, Pests, Nematodes and Management.

Floriculture Lab

Course Code: 24SEC0105P 30 Hrs. (2 Hrs./Week) Credit : 1 Exam Time: 3 Hrs. External Marks :15 Internal Marks :10 Total Marks: 25

Note:

- 1. Students should draw Figures or diagrams and write related descriptions/ notes in their practical note books.
- 2. Report on excursion tours with photographs, collection, preservation.

List of Practical

- 1. Orientation to a Mushroom Farm/Field Visit.
- 2. Identification of various Mushroom through Photographs.
- 3. Study of various Equipment used in Mushroom Cultivation.
- 4. Preparation of Pure culture, Mother spawn, Commercial spawn.
- 5. Learn about various Compositing Methods.
- 6. Spawning, Casing, Cropping and Harvesting.
- 7. Cultivation of Button/Oyster Mushroom.
- 8. Identification of insects affecting Button mushroom.
- 9. Diseases caused by Fungi, Bacteria and Abiotic factors.
- 10. Market Survey and Cost benefit analysis.
- 11. Management of Spent mushroom substrate (sms).
- 12. Report preparation on Mushroom Cultivation.

Suggested Readings:

- 1. Kumaresan, V. 2018. Mushroom cultivation. Saras Publication.
- 2. Russell, S. 2014. The essential guide to cultivating mushrooms: Storey publishing LLC.
- 3. Gour, P.Y. 2010. Mushroom Production and Processing Technology. Agrobios India.
- 4. Powell, M. 2010. Medicinal Mushrooms: A clinical guide. Mycology Press.
- 5. Tripathi, D.P. 2005. Mushroom Cultivation. Oxford & IBH Publishing Co. Pvt.Ltd, New Delhi.
- 6. Dhar, B.L. 2005. Edible Mushrooms and their Cultivation. CRC Press.
- 7. Paul Stamets, J.S. & Chilton, J.S. 2004. Mushroom cultivation: A practical guide to growing mushrooms at home, Agarikon Press.
- 8. Chang, S.F. Miles, P.G. & Chang, S.T. 2004. Mushrooms Cultivation, Nutritional value, Medicinal effect and Environmental impact. CRC press.
- 9. Bahl, N. 2000. Handbook on Mushrooms. Oxford & IBH Publishing Co. Pvt. Ltd.

Course Outcomes: The course outcomes of this course are as follows:

- CO1 Students will be able to understand the nutritional and medicinal value of edible mushrooms.
- CO2 Students will develop a conceptual understanding of various procedure and techniques used for mushroom cultivation.
- CO3 Students will gain knowledge about the storage procedure of different types of edible mushrooms.
- CO4 Students will learn about different types of food prepared from mushrooms and their medicinal value.
- CO5 Students will gain knowledge of practical aspects of mushroom cultivation.

Mapping of COs with POs:

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S	Μ	S
CO2	S	S	S	S	S	S	S
CO3	S	Μ	S	S	S	S	S
CO4	S	S	S	М	S	М	S
CO5	S	S	Μ	S	Μ	S	М

Botany Plants in Every Day Life (Semester-I) Value Aided Courses (VAC)

Paper code: 24VAC0104T 30 Hrs. (2 Hrs /week) Credits: 2 Exam. Time: 2 Hrs

External Marks: 35 Internal Marks: 15 Total Marks: 50

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

Course Objectives:

- 1. To give an overview of how plants are indispensable to humans.
- 2. To gives an exposure to the various aspects of plant resource & its utilization.
- 3. To create awareness and interest among the students about plants.
- 4. Promotion of cultivation and conservation of plants.

UNIT I

Plant Services to Humans Welfare in Everyday Life: Introduction to science of Botany, Plant resources in everyday life. Role of plants: Air purifier (photosynthesis); Plants used in rituals/festivals; Pollution control: Plants used in Pollution control and Phytoremediation; Pollution indicator (lichens), Nutrient source (litter manure, organic manure), Aesthetic value of Plants.

UNIT II

Plant Resources and Utilization (brief description of plants and/or plant parts used). Cereals: Rice, Wheat, Legumes: Bengal gram (Chana), Green gram (Mung), Soybean, Spices: Turmeric, Beverages: Tea; Sugar yielding plant: Sugarcane, Medicinal plants: Tulsi, Neem, Giloy, Edible oils: Groundnut, Mustard, Fibres: Cotton, Jute

Suggested Readings:

- 1. Kochhar, SL (2012). Economic Botany in the Tropics. MacMillan India Ltd., New Delhi.
- 2. Hill, AF (1952). Economic Botany: A Textbook of Useful Plants and Plant Products. McGraw Hill Publishing Company Ltd., New Delhi.
- 3. Trivedi, PC (2006). Medicinal Plants: Ethnobotanical Approach. Agrobios, India.
- 4. Upadhyay, R (2023). Botany for B.Sc. students, Economic Botany, Ethnomedicine and phytochemistry/Commercial Botany and phytochemical Analysis. S. Chand and Company Ltd. Publishers, India.
- 5. Wickens, GE (2001). Economic Botany: Principles & Practices. Kluwer Academic Publishers, The Netherlands.

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S	Μ	S
CO2	S	S	S	S	S	S	S
CO3	S	S	Μ	S	S	S	S
CO4	Μ	Μ	S	S	S	Μ	S
CO5	S	S	Μ	S	Μ	S	S

Mapping of COs with POs:

Botany Cell Biology (Semester-II) Minor Course (MIC)

Paper Code: 24MIC0219T 30 Hrs (2 Hrs /Week) Credits: 2 Exam. Time: 2 Hrs

External Marks : 35 Internal Marks : 15 Total Marks: 50

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

Course Objectives:

- 1. Discovery and Types of the cells.
- 2. Structure and function of various cellular compartment and organelles.
- 3. Structure and role of Nucleus and Chromosome.
- 4. Structure of DNA.
- 5. Cell Division: Mitosis and Meiosis.

UNIT -I

Cell: Discovery, Basic Structure, Cell Theory, Types of cells : Prokaryotic and Eukaryotic. Cell Membrane and Cell Wall, Basic Structure and function of Ribosome, Endoplasmic Reticulum, Golgi Bodies and Lysosome.

UNIT -II

Basic Structure and Function of Nucleus, Mitochondria and Chloroplast. Structure of DNA, Chromosome, General account on Cellular Totipotency General account of cell Division: Mitosis and Meiosis.

Suggested Readings:

- 1. Cell biology. Ed. 2021. K.N. Bhatia and Neelam Dhand, A Trueman's Publication. Jalandhara.
- 2. Cell biology. Ed. 2022, P.S. Verma, S. Chand's Publications, New Delhi.
- 3. Karp, G., Iwasa, J. & Marshall, W. Karp's Cell and Molecular Biology (9th Ed.). John Wiley & Sons. 2020.
- 4. Alberts, B., Johnson, A.D., Lewis, J., Morgan, D., Raff, M., Roberts, K., & Walter, P. Molecular Biology of the cell (6th Ed.). Garland Science. 2014.

Course Outcomes: The course outcomes of this course are as follows:

- CO1 Student will be able to understand the discovery and structure of a cell.
- CO2 Student will acquire insight in various cellular organelles like: cell envelopes, Ribosome, Chloroplast, Mitochondria, ER.
- CO3 Student will learn about remote control of a cell and structure.
- CO4 Student will learn about importance of cellular totipotency.
- CO5 Students will understand the Cell growth and formation of new cells from existing cells.

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S	S	М
CO2	S	S	М	S	М	S	S
CO3	S	S	S	Μ	S	S	S
CO4	Μ	Μ	S	S	S	Μ	S
CO5	S	S	S	S	S	S	S

Mapping of COs with POs:

Botany Nursery and Gardening (Semester-II) Multidisciplinary Course (MDC)

Paper Code: 24MDC0205T 30 Hrs (2 Hrs /Week) Credits: 3 Exam. Time: 2.5 Hrs

External Marks: 50 Internal Marks: 25 Total Marks: 75

Note: The maximum time duration for attempting the paper will be of 2.5 hours. The examiner is required to set seven questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 2.5 marks each. In addition to that six more questions will be set, two questions from each unit. The students shall be required to attempt four questions in all selecting one question from each unit in addition to compulsory Question No. 1. All questions shall carry equal marks i.e. 12.5 marks.

Course Objectives:

- 1. Understanding the subject, its scope and branches.
- 2. To make students aware about the preparing plantlet from seeds.
- 3. To understand seed viability and common ornamental plants.
- 4. To impart knowledge on Methods of gardening
- 5. Regeneration of plants from vegetative propagation.

UNIT -I

Nursery Practices and Seed Science: Definition, Objectives, Scope and Building up of Infrastructure for Nursery. Planning and Seasonal activities: Planting, Direct seeding and Transplants.

Seed: Structure and Types, Seed dormancy, Causes and Methods of Breaking Dormancy. Factors affecting Seed viability, Seed testing.

UNIT II

Principles of Gardening and Maintenance: Definition, Objectives and Scope, Different types of gardening -Landscape and Home gardening. Gardening operations: Soil laying, Manuring, Watering, Management of Pests and Diseases.

UNIT III

Propagation Techniques and Greenhouse Practices: Vegetative propagation: Air-layering, Grafting, Cutting: Selection of cutting, Collecting season, Treatment of cutting, Rooting medium and Planting of cuttings. Hardening of plants: Green houses, Glass houses, Polyhouses and Shade houses. Know about Common Ornamental Garden Plants.

Suggested Readings:

1. Priya Lokare and Keshamma E, Plant Nursery Development & Management - An Innovative Way of Self Employment, Edition I, 2022, Notion Press Publication.

Course Outcomes: The course outcomes of this course are as follows:

- CO1 Student will learn the techniques for nursery and gardening.
- CO2 Students will be able to understand how to prepares plantlet from seed and seed behavior.
- CO3 Students will develop a conceptual understanding of seed viability and practical knowledge of ornamental plants.
- CO4 Students will be able to know various methods of gardening.
- CO5 Students will gain knowledge for practical utility of methods of vegetative reproduction.

Mapping of COs with POs:

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	М	S	S	S	S
CO2	S	S	S	S	S	S	Μ
CO3	S	S	S	Μ	Μ	S	S
CO4	S	Μ	S	S	S	Μ	S
CO5	S	S	S	S	S	S	S

Botany **Organic Farming (Semester-II) Skill Enhancement Course (SEC)**

Paper Code: 24SEC0205T 30 Hrs (2 Hrs /Week) Credits: 2 Exam. Time: 2 Hrs

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

Course Objectives:

- 1. To provide basic knowledge of concepts and principles related to organic farming.
- 2. To study the scope, applications and needs of organic farming.
- 3. To develop concepts of conventional farming and organic farming.
- 4. To help students understand various organic farming practices in the national and international level.
- 5. Types and principle of organic farming

UNIT -I

Basics of Organic Farming - Concept and Components of Organic Farming, Aims and Objectives, Need of Organic Farming, Pure organic farming and Integrated farming system, Status of organic farming in India

UNIT -II

Preparation, Nutrient content and Methods for use of following - FYM/Rural compost, Mulching, City compost, Oil cakes, Animal wastes, Vermi-composts, Vermi-wash, Jeevamrit, Beejamrit, Green manures, Bio-fertilizers.

Organic Farming Lab

Course Code: 24SEC0205P 30 Hrs. (2 Hrs./Week) Credit : 1 Exam Time: 3 Hrs.

External Marks :15 Internal Marks :10 Total Marks: 25

Note:

- 1. Students should draw Figures or diagrams and write related descriptions/ notes in their practical note books.
- 2. Report on excursion tours with photographs, collection, and preservation.

List of Practical

- 1. To study tools and instruments used in organic farming
- 2. Visit to organic farm to study the various components, identification and utilization of organic products.
- 3. Identification of different types of weeds
- 4. Vermicompost preparation
- 5. Soil analysis: pH determination
- 6. Identification of different types of fertilizers including biofertilizers
- 7. Practicing and experiencing in Farmer's Fields.
- 8. Assessment of plantation site, visit of nursery and plantations
- 9. Preparation of different types of nursery bed

Suggested Readings:

- 1. Arun K. Sharma. 2002. A Hand book of organic farming. Agrobios, India.
- 2. Balasubramanian, R., Balakrishnan, K and Siva Subramanian, K. 2013. Principles and practices of organic farming. Satish Serial Publishing House.
- 3. Tarafdar, J.C., Tripathi, K.P and Mahesh Kumar, 2009. Organic agriculture. Scientific Publishers, India.
- 4. Veeresh G.K. (2011). Organic Farming. Publisher: Foundation Books.
- 5. Reddy S. R. (2017). Principles of Organic Farming. Publisher: Kalavani,
- 6. Rateaver B. and Rateavar G (1993). Organic method primer update: A practical explanation: the how and why for the beginner and the experience (Conservation gardening and farming). Publisher: The Rateavers; Spl ed.

10

External Marks: 35 Internal Marks: 15 Total Marks: 50 **Course Outcomes:** The course outcomes of this course are as follows:

- CO1 Students will gain hands-on experience through fieldwork and farm visits.
- CO2 The course will address fair-trade practices, social responsibility, and community involvement.
- CO3 Students will gain knowledge about marketing of organic products and economic aspects of organic farming.
- CO4 Students will learn about the principles and philosophy behind organic farming.
- CO5 Learners will understand the importance of sustainability, biodiversity and sustainable development.

Mapping of COs with POs:

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	Μ
CO3	S	Μ	S	Μ	Μ	S	S
CO4	S	S	Μ	S	S	Μ	S
CO5	Μ	S	S	S	S	S	S

Botany Plants in Every Day Life (Semester-II) Value Aided Courses (VAC)

Paper code: 24VAC0104T 30 Hrs. (2 Hrs /week) Credits: 2 Exam. Time: 2 Hrs

External Marks: 35 Internal Marks: 15 Total Marks: 50

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

Course Objectives:

- 1. To give an overview of how plants are indispensable to humans.
- 2. To gives an exposure to the various aspects of plant resource & its utilization.
- 3. To create awareness and interest among the students about plants.
- 4. Promotion of cultivation and conservation of plants.

UNIT I

Plant Services to Humans Welfare in Everyday Life: Introduction to science of Botany, Plant resources in everyday life. Role of plants: Air purifier (photosynthesis); Plants used in rituals/festivals; Pollution control: Plants used in Pollution control and Phytoremediation; Pollution indicator (lichens), Nutrient source (litter manure, organic manure), Aesthetic value of Plants.

UNIT II

Plant Resources and Utilization (brief description of plants and/or plant parts used). Cereals: Rice, Wheat, Legumes: Bengal gram (Chana), Green gram (Mung), Soybean, Spices: Turmeric, Beverages: Tea; Sugar yielding plant: Sugarcane, Medicinal plants: Tulsi, Neem, Giloy, Edible oils: Groundnut, Mustard, Fibres: Cotton, Jute

Suggested Readings:

- 1. Kochhar, SL (2012). Economic Botany in the Tropics. MacMillan India Ltd., New Delhi.
- 2. Hill, AF (1952). Economic Botany: A Textbook of Useful Plants and Plant Products. McGraw Hill Publishing Company Ltd., New Delhi.
- 3. Trivedi, PC (2006). Medicinal Plants: Ethnobotanical Approach. Agrobios, India.
- 4. Upadhyay, R (2023). Botany for B.Sc. students, Economic Botany, Ethnomedicine and phytochemistry/Commercial Botany and phytochemical Analysis. S. Chand and Company Ltd. Publishers, India.
- 5. Wickens, GE (2001). Economic Botany: Principles & Practices. Kluwer Academic Publishers, The Netherlands.

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S	Μ	S
CO2	S	S	S	S	S	S	S
CO3	S	S	Μ	S	S	S	S
CO4	Μ	Μ	S	S	S	Μ	S
CO5	S	S	Μ	S	Μ	S	S

Mapping of COs with POs:



Department of Botany

Scheme of Examination and Syllabus for Under Graduate Program BSc Life Science (UTD) (Pool Courses) for 2nd & 3rd Years

Under Multiple Entry and Exit, Internship and CBCS-LOCF as per NEP-2020 w.e.f. session 2024-25 (in phased manner)

Subject: Botany



Guru Jambheshwar University of Science & Technology Hisar-125001, Haryana

(A+ NAAC Accredited State Govt. University)



Guru Jambheshwar University of Science and Technology Hisar-125001, Haryana ('A+' NAAC Accredited State Govt. University)



Scheme of Examination and Syllabus for Under Graduate Programme (Pool Courses) w.e.f. session 2024-25 For BSc Life Sciences Botany (UTD) according to NEP-2020 for 2nd and 3rd years (3rd to 6th Semesters)

Subject: Botany

SEMESTER-III

Type of Course	Course Code	Nomenclature of Paper/Course	Credits	Contact Hours	Internal Marks	External Marks	Total Marks	Duration of Exam (Hr)
Minor Course	24MIC0319T	Introductory Plant Pathology	4	4	30	70	100	3
Multidisciplinary Course	24MDC0305T	Biofertilizers	3	3	25	50	75	2.5
Skill Enhancement Course	24SEC0305T	Applied Microbiology	3	3	25	50	75	3
Value Added Course	24VAC0304T	Medicinal Botany	2	2	15	35	50	. 2

SEMESTER-IV

Type of Course	Course Code	Nomenclature of Paper/Course	Credits	Contact Hours	Internal Marks	External Marks	Total Marks	Duration of Exam (Hr)
Value Added Course	24VAC0304T	Medicinal Botany	2	2	15	35	50	2
Vocational Course	24VOC0419T	Introduction to Horticulture	2	2	15	35	50	2
	24VOC0419P	Introduction to Horticulture Lab	2	4	15	35	50	3

SEMESTER-V

Type of Course	Course Code	Nomenclature of Paper/Course	Credits	Contact Hours	Internal Marks	External Marks	Total Marks	Duration of Exam (Hr)
Vocational Course	24VOC0519T	Plant Tissue Culture	2	2	15	35	50	2
	24VOC0519P	Plant Tissue Culture Lab	2	4	15	35	50	3

Type of Course	Course Code	Nomenclature of Paper/Course	Credits	Contact Hours	Internal Marks	External Marks	Total Marks	Duration of Exam (Hr)
Minor Course	24MIC0619T	Plant Ecology and Taxonomy	4	4	30	70	100	3
Vocational Course	24VOC0619T	Mushroom Cultivation	2	2	15	35	50	2
	24VOC0619P	Mushroom Cultivation Lab	2	4	15	35	50	3

SEMESTER-VI

15/2.5/5/19

Programme Outcomes

PO1 Fundamental knowledge of basic biological Sciences, life sciences and botany.

PO2 Basic understanding: Knowledge regarding basic concepts and applied aspects of cell biology, Diversity of Microbes & Lower Cryptogams, basics of Botany, nursery, gardening and medicinal plants.

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PO3. Interdisciplinary approach: Learning the relationships among plants, microbes and environment.

- PO4. Practical learning: Perform procedures and analysis as per laboratory standards in the areas of cell biology and Botany.
- **PO5** Strong understanding of molecular biology, cytogenetics, microbiology, biochemistry and allied subjects, preparing them for higher education, disciplinary & multidisciplinary research and to be a life-long learner.
- PO6 Analytical Thinking: Perceive things, events and framing ideas and decisions (intellectual, organizational, and personal) in the light of scientific principles.
- PO7 Effective Communication: Speak, read and write clearly and make personal growth by connecting with people, ideas, books, media and technology.



Botany (Semester- 111) Introductory Plant Pathology Minor Course (MIC)

Course Code: 24MIC0319T Credit: 4 Exam Time: 3 Hrs

External Marks: 70 Internal Marks: 30 Total Marks: 100

Note: The maximum time duration for attempting the paper will be of 3 hours. The examiner is required to set seven questions in all. The first question will be compulsory consisting of seven short questions covering the entire syllabus consisting of 2 marks each. In addition to that six more questions will be set, two questions from each unit. The students shall be required to attempt four questions in all selecting one question from each unit in addition to compulsory Question No. 1. All questions shall carry equal marks i.e. 14 marks.

Course Objectives:

1. To know about the plant pathology.

- 2. To study about the classification of plant diseases.
- 3. To get knowledge about the characteristics and life cycle of different plant pathogens.

4. To study about the plant diseases management.

5. To get knowledge about different disease outbreaks.

UNIT-I

Introduction to Plant Pathology: Definition, history, and scope of plant pathology.

Importance of plant diseases in agriculture. Classification of plant diseases: Based on causal agents (fungi, bacteria, viruses, nematodes, etc.) and symptoms. Terminologies in plant pathology: Pathogen, host, infection, immunity, etc. Stages in disease development: Infection, colonization, reproduction, and dissemination.

UNIT-II

Pathogens and Disease Diagnosis: Fungi: Characteristics, structure, reproduction, and examples of fungal diseases. Bacteria: General characteristics, symptoms of bacterial diseases, and examples. Viruses: Structure, replication, and viral diseases in plants. Nematodes: Characteristics, life cycle, and nematode diseases. Methods of disease diagnosis in plants (visual and laboratory techniques).

UNIT-III

Management of Plant Diseases: Principles of plant disease management: Exclusion, eradication, protection, and therapy. Biological control: Use of bio-agents in disease control. Chemical control: Fungicides, bactericides, and nematicides (types and applications). Integrated Disease Management (IDM): Combining cultural, biological, and chemical methods. Role of resistance breeding in disease management.

UNIT-IV

Plant Disease Epidemiology: Meaning and importance of studying disease spread, Factors affecting disease development: Host, Pathogen, and Environment (disease triangle). Famous Plant Disease Epidemics: Irish Potato Famine (caused by late blight). Bengal famine in India, Papaya Ringspot Virus outbreak in Huawei.

Suggested Readings:

- 1. Agrios, G.N., (2005), Plant Pathology, Acad. Press, Inc. California.
- 2. Bilgrami, K.S. and Dube, H.C., (1990), *A Text Book of Modern Plant Pathology*, Vikas Publishing House, New Delhi.

- 3. Mehrotra, R.S. and Aggarwal, A., (2013), *Fundamentals of Plant Pathology*, Tata Mc Graw Hill Publ. Ltd., New Delhi.
- 4. Mehrotra, R.S. and Ashok Aggarwal (2017): *Plant Pathology*, Tata Mc Graw Hill Publ. Ltd., New Delhi.
- 5. Singh, R.S., (2018), Plant Disease, 9th Edition, Oxford, IBH Publ., New Delhi.
- 6. Singh, R.S., (2017), Principles of Plant Pathology, 5th Edition, Medtech.
- 7. Recent and important review articles from scientific journals.

Course Outcomes: The Learning Outcomes of this course are as follows:

CO1 Students will be able to understand the history, scope of plant pathology

- CO2 Students will understand the different type of plant pathogens and their general characteristics and life cycle
- CO3 Students will be able to know the management of plant diseases using biological and chemical control. CO4 Students will be able to understand the factors affecting plant diseases.

CO5 students will learn about the common plant disease caused by plant pathogens

Mapping of COs with POs:

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	P.07
COI	S	S	S	S	S	M	S
CO2	M	S	M	S	M	S	S
CO3	S	S	S	M	S	S	S
CO4	M	S	M	S	S	S	M
CO5	S	S	S	S	M	S	S

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Botany (Semester- III) Biofertilizers Multi-Disciplinary Course (MDC)

Course Code: 24MDC0305T Credit: 3 Exam Time: 2.5 Hrs

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External Marks: 50 Internal Marks: 25 Total Marks: 75

Note: The maximum time duration for attempting the paper will be of 2.5 hours. The examiner is required to set seven questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 2.5 marks each. In addition to that six more questions will be set, two questions from each unit. The students shall be required to attempt four questions in all selecting one question from each unit in addition to compulsory Question No. 1. All questions shall carry equal marks i.e. 12.5 marks. Course Objectives:

- 1. To understand the principles of different biofertilizers techniques
- 2. To understand the characteristics of different microbes used in biofertilizers
- 3. To study the role of different microbes in preparation of biofertilizers
- 4. To study the influence of biofertilizers on plant growth and crop yield
- 5. To understand the different association between microbes and crop plants.

UNIT-I

Rhizobium – isolation, identification, mass multiplication, carrier based inoculants, Actinorrhizal symbiosis. **Azospirillum**: isolation and mass multiplication – carrier based inoculant, associative effect of different microorganisms.

Azotobacter: classification, characteristics-crop response to Azotobacter inoculum, maintenance and mass multiplication.

UNIT-II

General account about the microbes: Microbes used as biofertilizer, Cyanobacteria (blue green algae), Azolla and Anabaena azollae association, nitrogen fixation, factors affecting growth, blue green algae and Azolla in rice cultivation.

UNIT-III

Symbiotic relationships: Mycorrhizal association, types of mycorrhizal association, taxonomy, occurrence and distribution, phosphorus nutrition, growth and yield – colonization of VAM – isolation and inoculum production of VAM, and its influence on growth and yield of crop plants.

Suggested Readings:

- 1. Dubey, R.C. (2005). A Text book of Biotechnology. S.Chand & Co, New Delhi.
- 2. Subha Rao, N.S. (2000). Soil Microbiology. Oxford & IBH Publishers, New Delhi.
- Vayas, S.C., Vayas, S. and Modi, H.A. (1998). Bio-fertilizers and organic Farming. Akta Prakashan, Nadiad
- 4. Kumaresan, V. (2005). Biotechnology. Saras Publications, New Delhi.
- 5. John Jothi Prakash, E. (2004). Outlines of Plant Biotechnology. Emkay Publication, New Delhi.
- 6. Sathe, T.V. (2004). Vermiculture and Organic Farming. Daya publishers

Course Outcomes: The Learning Outcomes of this course are as follows:

CO1: Students will acquire knowledge about the principles and techniques of various biofertilizers. CO2: Students will understand the characteristics and functions of different microbes used in biofertilizers.

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CO3: Students will explore the role of microbes in the formulation and application of biofertilizers.

CO4: Students will analyze the effects of biofertilizers on plant growth and crop yield.

CO5: Students will comprehend the diverse interactions between microbes and crop plants.

Mapping of COs with POs:

4

Outcomes	PO1	PO2	PO3	PO4	POS	PO6	PO7
CO1	S	S	S	S	S	M	S
CO2	S	S	M	S	M	S	S
CO3	M	M	S	M	S	S	S
CO4	S	S	M	S	S	S	M
CO5	S	S	S	S	S	S	S

S=Strong, M=Medium, W=Weak

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Botany (Semester-111) Applied Microbiology Skill Enhancement Course (SEC)

Paper Code: 24SEC0305T Credits: 3 Exam Time: 3 Hrs

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External Marks: 50 Internal Marks: 25 Total Marks: 75

Note: The maximum time duration for attempting the paper will be of 2.5 hours. The examiner is required to set seven questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 2.5 marks each. In addition to that six more questions will be set, two questions from each unit. The students shall be required to attempt four questions in all selecting one question from each unit in addition to compulsory Question No. 1. All questions shall carry equal marks i.e. 12.5 marks. Course Objectives:

- 1. To study the classification and types of microorganisms
- 2. To study the structure and growth of microorganisms
- 3. To get knowledge about the industrial use of microorganisms
- 4. To study the role of microorganisms in soil health.
- 5. To know about the microbial infections in humans.

UNIT-I

Introduction to Microbiology: Definition, history, and scope of microbiology. Classification and types of microorganisms (bacteria, fungi, viruses, algae, and protozoa). Basic structure and characteristics of prokaryotic and eukaryotic microorganisms. Microbial growth: Growth curve, factors affecting growth, and methods of measurement.

UNIT-II

Industrial Microbiology: Role of microorganisms in fermentation (e.g., alcohol, antibiotics, enzymes). Production of biofuels, organic acids, and vitamins.

Environmental Microbiology: Microorganisms in soil health and nutrient cycling (nitrogen fixation, decomposition). Bioremediation and wastewater treatment using microbes. Role of microbes in biodegradation and composting.

UNIT-III

Microbial diseases in humans: Bacterial, viral, and fungal infections. Antibiotics: Types, mechanisms of action, and resistance. Vaccines and probiotics: Role of microbes in health promotion.

Suggested Reading:

- 1. Aneja, K. R. (2008). A textbook of Basic and Applied Microbiology. New Age International
- 2. Willey, J. M., Sherwood, L. M., & Woolverton, C. J. (2014). Prescott's microbiology. McGraw-Hill.
- Glazer, A. N., & Nikaido, H. (2007). Microbial biotechnology: fundamentals of applied microbiology. Cambridge University Press.
- Buddolla, V. (Ed.). (2020). Recent Developments in Applied Microbiology and Biochemistry: Volume
 2.
- 5. Dubey, R. C., & Maheshwari, D. K. (2023). A textbook of microbiology. S. Chand Publishing

Course Outcomes: The Learning Outcomes of this course are as follows:

CO1: Students will be able to classify microorganisms based on their characteristics and types.

CO2: Students will develop an understanding of the structural features and growth mechanisms of microorganisms.

CO3: Students will explore the industrial applications of microorganisms and their significance in various processes.

CO4: Students will analyse the contribution of microorganisms to soil health and fertility.

CO5: Students will understand the impact of microbial infections on human health and their preventive measures.

Mapping of COs with POs:

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Outcomes	PO1	PO2	PO3	POA	POS	POG	POT
CO1	S	S	S	6	rus c	M	I C
CO2	S	S	M	S	M	S	6
CO3	M	М	S	M	S	S	S
CO4	S	S	M	S	S	S	M
CO5	S	S	S	S	S	S	S

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Botany (Semester-III) **Medicinal Botany** Value Aided Courses (VAC)

Paper code: 24VAC0304T Credits: 2 Exam. Time: 2 Hrs

External Marks: 35 **Internal Marks: 15 Total Marks: 50**

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

Course Objectives:

- 1. Promotion of cultivation and conservation of medicinal plants.
- 2. To create awareness and interest amongst the students about medicinal plants.
- 3. To increase public awareness about the efficacies of herbal drugs.
- 4. To identify Medicinal plant and Herbal drugs.
- 5. To develop awareness for utilization of herbal medicines for home remedies. And to create employment opportunities.

UNIT-I

Introduction to Medicinal plants - Definition, Importance, Present and Future needs of Medicinal plants. Brief account of Traditional Medicinal Systems - Ayurveda, Siddha, Unani and Homeopathy. Cultivation, Nursery Raising and Plantation of Medicinal Plant.

UNIT-II

Morphology and Medicinal importance: Turmeric, Ginger, Clove, and Elaichi. Tulsi, Aloe, Giloy, and Ashwagandha. Amla, Neem, Mulhethi, and Swanjana.

Suggested Readings:

- 1. Chaturvedi A. 2008. Ethnobotany and Taxonomy of Angiosperms. Rashtrasant Tukadoji Maharaj Nagpur University Press. 1-295.
- 2. Pandey B.P.1978.Economic Botany. S. Chand and Company LTD. Ram Nagar, New Delhi.1-534.
- 3. Panda H., Handbook of Ayurvedic Medicines, National Institute of Industrial Research, Delhi 7.
- 4. CSIR Cultivation and Utilization of Medicinal Plants.
- 5. Brahmvarchas, Ayurved kaPran: Vanoshadhivigyan, VedmataGayatri Trust, ShaktikunjHaridwar 2004.
- 6. Chaudhry R. D., Herbal Drug Industry, Eastern Publication
- 7. Atal C. K. and Kapoor B.M., Cultivation and Utilization of Medicinal Plants, RRL Jammu Tawi. 1982.
- 8. Raphael Ikan, Natural Products: A Lab Guide, Academic Press, 1991.
- 9. Dutt Ashwin, An Introduction to Medicinal Plants, Adhyayan Publishers and distributers, 2009.

Course Outcomes: The Learning Outcomes of this course are as follows:

- CO1 Students will be able to understand the medicinal value of some common medicinal plants,
- CO2 Students will develop a conceptual understanding of our traditional Medicinal systems.
- Students will be able to identify and characterize medicinal plants, particularly part of plants having CO3 medicinal significance.
- CO4 Cultivation methods of medicinal plants
- CO5 Morphology of medicinal plants

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M	M	S	1
C	C	34	-

PO2

S

S

PO3

S

S

PO4

S

S

PO5

S

S

S

S

M

PO6

M

S

S

M

S

PO7

S

S

S

S S

Mapping of COs with POs: Outcomes PO1

S

S

4

COI

CO2

CO3

CO4

CO5

Botany Medicinal Botany (Semester-IV) Value Aided Courses (VAC)

Paper code: 24VAC0304T Credits: 2 Exam. Time: 2 Hrs

6

External Marks: 35 Internal Marks: 15 Total Marks: 50

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

Course Objectives:

- 1. Promotion of cultivation and conservation of medicinal plants.
- 2. To create awareness and interest amongst the students about medicinal plants.
- 3. To increase public awareness about the efficacies of herbal drugs.
- 4. To identify Medicinal plant and Herbal drugs.
- 5. To develop awareness for utilization of herbal medicines for home remedies. And to create employment opportunities.

UNIT-I

Introduction to Medicinal plants - Definition, Importance, Present and Future needs of Medicinal plants. Brief account of Traditional Medicinal Systems - Ayurveda, Siddha, Unani and Homeopathy. Cultivation, Nursery Raising and Plantation of Medicinal Plant.

UNIT-II

Morphology and Medicinal importance: Turmeric, Ginger, Clove, and Elaichi. Tulsi, Aloe, Giloy, and Ashwagandha. Amla, Neem, Mulhethi, and Swanjana.

Suggested Readings:

- Chaturvedi A. 2008. Ethnobotany and Taxonomy of Angiosperms. Rashtrasant Tukadoji Maharaj Nagpur University Press. 1-295.
- 2. Pandey B.P.1978. Economic Botany. S. Chand and Company LTD. Ram Nagar, New Delhi.1-534.
- 3. Panda H., Handbook of Ayurvedic Medicines, National Institute of Industrial Research, Delhi 7.
- 4. CSIR Cultivation and Utilization of Medicinal Plants.
- 5. Brahmvarchas, AyurvedkaPran: Vanoshadhivigyan, VedmataGayatri Trust, Shaktikunj Haridwar 2004.
- 6. Chaudhry R. D., Herbal Drug Industry, Eastern Publication
- 7. Atal C. K. and Kapoor B.M., Cultivation and Utilization of Medicinal Plants, RRL Jammu Tawi. 1982.
- 8. Raphael Ikan, Natural Products: A Lab Guide, Academic Press, 1991.
- 9. Dutt Ashwin, An Introduction to Medicinal Plants, Adhyayan Publishers and distributers, 2009.

Course Outcomes: The Learning Outcomes of this course are as follows:

- CO1 Students will be able to understand the medicinal value of some common medicinal plants.
- CO2 Students will develop a conceptual understanding of our traditional Medicinal systems.
- CO3 Students will be able to identify and characterize medicinal plants, particularly part of plants having medicinal significance.
- CO4 Cultivation methods of medicinal plants
- CO5 Morphology of medicinal plants

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Mapping of COs with POs:

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S	M	S
CO2	S	S	S	S	S	S	S
CO3	S	S	M	S	S	S	S
CO4	M	M	S	S	S	M	S
CO5	S	S	M	S	M	S	S

S=Strong, M=Medium, W=Weak

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Botany (Semester-IV) Introduction to Horticulture Vocational Course (VOC)

Paper Code: 24VOC0419T Credits: 2 Exam. Time: 2 Hrs

External Marks: 35 Internal Marks: 15 Total Marks: 50

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

Course Objectives:

- 1. To understand the different scopes and importance of Horticulture
- 2. To know about different plant propagation techniques
- 3. To know about different techniques of nursery management
- 4. To know about pest and disease management techniques
- 5. To know about harvesting and post-harvesting management of crops

UNIT-I

Introduction to Horticulture: Definition, scope, and importance of horticulture. Branches of horticulture: Pomology, Olericulture, Floriculture, etc.

Classification of horticultural crops (based on climate, season, and utility).

Plant propagation methods: Sexual and asexual techniques.

Soil and climatic requirements for horticultural crops.

UNIT-II

Harvesting and Post Harvesting Management: Nursery management: Layout and techniques for healthy planting material.

Irrigation and fertilization methods (drip irrigation, organic fertilizers).

Cultural practices: Pruning, training, intercropping, and mulching.

Pest and disease management: Common pests, diseases, and IPM practices.

Harvesting: Maturity indices and handling techniques.

Post-harvest management: Grading, packaging, storage, and value addition.

Introduction to Horticulture Lab Vocational Course (VOC)

Course Code: 24VOC0419P Credit: 2 Exam Time: 3 Hrs. External Marks :35 Internal Marks :15 Total Marks: 50

Practical:

- 1. Identification and classification of horticultural crops.
- 2. Seed propagation and asexual propagation techniques.
- 3. Layout and management of nurseries.
- 4. Study of irrigation and fertilization techniques.
- 5. Identification of common pests and diseases in horticultural crops.
- 6. Preparation of value-added products (e.g., pickles, jams, dried flowers).

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Suggested Readings:

A

- 1. Srivastava, J. N., & Singh, A. K. (Eds.). (2022). Diseases of Horticultural Crops: Diagnosis and Management: Volume 1: Fruit Crops. CRC Press.
- 2. Rather, A. M. U. D., Hajam, M. A., Bhat, M. S. A., & Malik, M. I. (2023). Horticulture: Principles and practices. Academic Guru Publishing House.
- Preece, J. E., & Read, P. E. (2005). The biology of horticulture: An introductory textbook. John Wiley & Sons.
- 4. Nowick, E. A. (2002). Horticulture. In Using the Agricultural, Environmental, and Food Literature (pp. 305-328). CRC Press.
- 5. Peter, K. V. (2009). Basics of horticulture. New India Publishing.
- 6. Christopher, E. P. (2002). Introductory horticulture. Daya Books.

Course Outcomes: The Learning Outcomes of this course are as follows:

- CO1 Students will be able to identify and classify the horticultural crops.
- CO2 Students will learn about the asexual and seed propagation

CO3 Student will able to understand the layout and management of nurseries.

- CO4 Student will be able to understand the irrigation and fertilization techniques.
- CO5 Students will able to understand the pest and disease management of horticultural crops and preparation of value added products (e.g. pickles, jams, dried flowers)

Mapping of COs with POs:

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S	M	S
CO2	S	S	S	S	S	S	S
CO3	S	S	M	S	S	S	S
CO4	M	M	S	S	S	M	S
CO5	S	S	M	S	M	S	S

S=Strong, M=Medium, W=Weak

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Botany Plant Tissue Culture (Semester-V) Vocational Course (VOC)

Paper Code: 24VOC0519T Credits: 2 Exam. Time: 2 Hrs

4

External Marks: 35 Internal Marks: 15 Total Marks: 50

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

Course Objectives:

- 1. To know about the history and scope of Plant Tissue Culture
- 2. To know about Laboratory requirements and management of tissue culture
- 3. To know about different plant tissue culture techniques
- 4. To understand about micro propagation and its applications

UNIT-I

Introduction to Plant Tissue Culture: History of Plant Tissue Culture; Scope and Advantages of plant tissue culture; Laboratory Requirements (Washing and Storage Facilities; Media Preparation area; Inoculation area; Incubation area)

General Techniques: Composition of nutrient media, role of growth additives, Media Preparation,

UNIT-II

Callus Culture and Micropropagation: Totipotency; Organogenesis; Callus Culture; Somaclonal variation Micropropagation and its applications; Somatic embryogenesis and its applications

Plant Tissue Culture Lab Vocational Course (VOC)

Course Code: 24VOC0519P 4 Hrs./Week Credit: 2

Exam Time: 3 Hrs.

Practicals:

- 1) Laboratory requirements and general techniques for tissue culture
- 2) Nutrient Medium preparation and sterilization
- 3) Aseptic preparations of different explants and inoculations
- 4) Culture Initiation
- 5) Callus Culture
- 6) Organogenesis

Suggested Readings:

 Bhojwani, S.S. and Razdan, M.K. (1996), Plant Tissue Culture; Theroy and Practice. Elsevier Science Amsterdam. The Netherlands.
 D.A. Evans, W.R. Sharp, P.V. Ammirato, and Y. Yamada. 1983. Handbook of plant cell

2. D.A. Evans, w.R. Sharp, P.V. Ammirato, and Y. Yamada. 1983. Handbook of plant cell culture. Coolier MacMillan, London.

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External Marks :35 Internal Marks :15 Total Marks: 50 Stewart, C.N. Jr. (2008). Plant Biotechnology and Genetics: Principles, Techniques and Applications. John Wiley & Sons Inc. U.S.A.
 Smith, R.H. Plant Tissue Culture, Techniques and Experiments 2nd Ed. Academic Press,

Course Outcomes: The Learning Outcomes of this course are as follows:

CO1 Students will be able to understands the importance of tissue culture.

CO2 Students will get knowledge about the Laboratory requirements and management of tissue culture.

CO3 Students will learn about the different techniques used in plant tissue culture.

CO4 Students will be able to understand the application of micropropagation.

CO5 Student will get knowledge about the different sterilization techniques.

Mapping of COs with POs:

New York. 231pp. 2000.

POI	PO2	PO3	PO4	PO5	PO6	PO7
S	S	S	S	S	M	S
5	S	S	S	S	S	S
S	S	M	S	S	S	S
M	M	S	S	S	M	S
S	S	M	S	M	S	S
	PO1 S S S M S	PO1 PO2 S S S S S S M M S S	PO1 PO2 PO3 S S S S S S S S S S S M M M S S S M	PO1 PO2 PO3 PO4 S S S S S S S S S S S S S S S S S S S S M M S S S S M S	PO1 PO2 PO3 PO4 PO5 S S S S S S S S S S S S S S S S S S S S S M S S M M S S S S S M S M	PO1 PO2 PO3 PO4 PO5 PO6 S S S S S M S S S S S S M S S S S S S S S M M S S S M S S S S M S S M S S

S=Strong, M=Medium, W=Weak

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Botany Plant Ecology and Taxonomy (Semester- VI) Minor Course (MIC)

Course Code: 24MIC0619T Credit: 4 Exam Time: 3 Hrs

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External Marks: 70 Internal Marks: 30 Total Marks: 100

Note: The maximum time duration for attempting the paper will be of 3 hours. The examiner is required to set nine questions in all. The first question will be compulsory consisting of seven short questions covering the entire syllabus consisting of 2 marks each. In addition to that eight more questions will be set, two questions from each unit. The students shall be required to attempt four questions in all selecting one question from each unit in addition to compulsory Question No. 1. All questions shall carry equal marks i.e. 14 marks.

Course Objectives:

- Why the Need of Plant ecology and taxonomy?
- 2. To know about the soil profile and states of water in environment.
- 3. To know about the energy flow in ecosystem.
- 4. To know about identification and classification of plants
- 5. To get knowledge about principles of nomenclature.

UNIT-I

Ecological factors: Soil: Origin, formation, composition, soil profile. Water: States of water in the environment, precipitation types. Light and temperature: Variation Optimal and limiting factors; Shelford law of tolerance. Adaptation of hydrophytes and xerophytes.

UNIT-II

Ecosystem: Structure; energy flow trophic organisation; Food chains and food webs, Ecological pyramids production and productivity; Bio-geochemical cycling; Cycling of carbon, nitrogen and Phosphorous.

UNIT-III

Introduction of Taxonomy: Identification, Classification, Nomenclature. Documentation: Flora, Keys: single access and multi-access. Taxonomic Evidence: Taxonomic evidences from palynology, cytology, phytochemistry and molecular data.

Taxonomic Hierarchy: Ranks, categories and taxonomic groups.

UNIT-IV

Nomenclature: Principles and rules (ICN); ranks and names; binominal system, typification. Classification: Types of classification-artificial, natural and phylogenetic. Bentham and Hooker (upto series), Engler and Prantl (upto series).

Biometrics, numerical taxonomy and cladistics: Characters; variations; OTUs, character weighting and coding.

Suggested Readings:

- Singh, J.S., Singh S.P. and Gupta, S.R. Ecology, Environment Science and Conservation, S. Chand & Company, Private Ltd., New Delhi, 2014.
- 2. Sharma, P.D. (2010) Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.

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- Singh, G. (2012) Plant Systematics: Theory and Practice. Oxford & IBH Pvt. Ltd., New Delhi. 3rd edition.
- Ambasht, R.S. and Ambasht, N.K. (2011). A Text Book of Plant Ecology, 15th Edition, CBS Publishers & Distributors Pvt. Ltd. New Delhi
- 5. Kormondy, E.J. (1996). Concepts of Ecology. Prentice Hall, U.S.A. 4th edition.
- 6. Naik, V. N. (1984). Taxonomy of Angiosperms. The McGraw Hill, New Delhi.

Course Outcomes: The course outcomes of this course are as follows:

- CO1 Students will be able to understand the significance of plant ecology and taxonomy in understanding plant diversity, conservation, and ecological interactions.
- CO2 Students will develop a conceptual understanding of composition and layers of soil profiles
- CO3 Students will gain knowledge about flow of energy through different trophic levels in an ecosystem and evaluate its impact on ecological balance.
- CO4 Students will learn about the plant morphological and anatomical features for proper identification and classification of plant species.
- CO5 Students will gain knowledge of principles and rules of plant nomenclature and and categorize plant species following standard taxonomic practices.

Mapping of COs with POs:

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
COI	S	S	S	S	S	M	S
CO2	S	S	S	S	S	S	S
CO3	S	M	S	S	S	S	S
CO4	S	S	S	M	S	M	S
C05	S	S	M	S	M	S	M

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Botany Mushroom Cultivation (Semester-VI) Vocational Course (VOC)

Paper Code: 24VOC0619T Credits: 2 Exam. Time: 2 Hrs External Marks: 35 Internal Marks: 15 Total Marks: 50

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus consisting of 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one from each unit in consisting of 10 marks in addition to the compulsory Question No.1.

Course Objectives:

- 1. Why the Need of Mushroom cultivation?
- 2. To know about Medicinal & Nutritional Mushroom.
- 3. To know about Mushroom cultivation steps.
- 4. To know about value added foods from Mushroom.
- 5. Self-employment & Environmental sustainability.

UNIT –I

Introduction to Mushroom Cultivation: History, Nutritional and Medicinal value of Edible mushrooms, Poisonous Mushrooms.

Introduction to Common edible Indian mushrooms: Button mushroom (Agaricus bisporus), Milky mushroom (Calocybe indica), Oyster mushroom (Pleurotus sajor caju) and Paddy straw mushroom (Volvariella volvcea).

Research Centres, Food Preparation - Comments on Value added products of Mushroom.

UNIT -II

Principle and Methods Mushroom Cultivation: Button Mushroom cultivation - Composting (Long Method and Short Method), Bed preparation, Factors affecting the mushroom bed preparation - Low cost technology. Spawning - Medium, Pure culture & Mother Culture, Commercial Spawn production.

Casing - Different types of Casing mixtures, Maintaining of Environment after casing.

Harvesting, Shortening and Grading, Packing, Marketing.

Problems in cultivation - Common diseases, Pests, Nematodes and Management.

Mushroom Cultivation Lab

Course Code: 24VOC0619P Credit: 2 Exam Time: 3 Hrs. External Marks :35 Internal Marks :15 Total Marks: 50

Note:

- 1. Students should draw Figures or diagrams and write related descriptions/ notes in their practical note books.
- 2. Report on excursion tours with photographs, collection, preservation.

List of Practical

- 1. Orientation to a Mushroom Farm/Field Visit.
- 2. Identification of various Mushroom through Photographs.

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- 3. Study of various Equipment used in Mushroom Cultivation.
- 4. Preparation of Pure culture, Mother spawn, Commercial spawn.
- 5. Learn about various Compositing Methods.
- 6. Spawning, Casing, Cropping and Harvesting.
- 7. Cultivation of Button/Oyster Mushroom.
- 8. Identification of insects affecting Button mushroom.
- 9. Diseases caused by Fungi, Bacteria and Abiotic factors.
- 10. Market Survey and Cost benefit analysis.
- 11. Management of Spent mushroom substrate (sms).
- 12. Report preparation on Mushroom Cultivation.

Suggested Readings:

- 1. Kumaresan, V. 2018. Mushroom cultivation. Saras Publication.
- 2. Russell, S. 2014. The essential guide to cultivating mushrooms: Storey publishing LLC.
- 3. Gour, P.Y. 2010. Mushroom Production and Processing Technology. Agrobios India.
- 4. Powell, M. 2010. Medicinal Mushrooms: A clinical guide. Mycology Press.
- 5. Tripathi, D.P. 2005. Mushroom Cultivation. Oxford & IBH Publishing Co. Pvt.Ltd, New Delhi.
- 6. Dhar, B.L. 2005. Edible Mushrooms and their Cultivation. CRC Press.
- 7. Paul Stamets, J.S. & Chilton, J.S. 2004. Mushroom cultivation: A practical guide to growing mushrooms at home, Agarikon Press.
- Chang, S.F. Miles, P.G. & Chang, S.T. 2004. Mushrooms Cultivation, Nutritional value, Medicinal effect and Environmental impact. CRC press.
- 9. Bahl, N. 2000. Handbook on Mushrooms. Oxford & IBH Publishing Co. Pvt. Ltd.

Course Outcomes: The course outcomes of this course are as follows:

- CO1 Students will be able to understand the nutritional and medicinal value of edible mushrooms.
- CO2 Students will develop a conceptual understanding of various procedure and techniques used for mushroom cultivation.
- CO3 Students will gain knowledge about the storage procedure of different types of edible mushrooms.
- CO4 Students will learn about different types of food prepared from mushrooms and their medicinal value.
- CO5 Students will gain knowledge of practical aspects of mushroom cultivation.

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S	M	S
CO2	S	S	S	S	S	S	S
CO3	S	M	S	S	S	S	S
CO4	S	S	S	M	S	M	S
C05	S	S	M	S	M	S	M

Mapping of COs with POs: