

**DEPARTMENT OF BOTANY**

Teaching Plan 2022-2023

**TEACHING-LEARNING PEDAGOGY**

<b>Pedagogy</b>	<b>P<sub>1</sub></b>	General Lecture Using Blackboard and Chalk
	<b>P<sub>2</sub></b>	Demonstration
	<b>P<sub>3</sub></b>	Question and Answer
	<b>P<sub>4</sub></b>	Slide Share/PPT
	<b>P<sub>5</sub></b>	Group Discussion
	<b>P<sub>6</sub></b>	ICT (Virtual and online learning)
	<b>P<sub>7</sub></b>	Assignment (Written)
	<b>P<sub>8</sub></b>	Discovery - Story telling
	<b>P<sub>9</sub></b>	Seminar
	<b>P<sub>10</sub></b>	Guest Lecture
	<b>P<sub>X</sub></b>	Problem solving
	<b>P<sub>Q</sub></b>	Quiz
<b>P<sub>T</sub></b>	Written Test	
<b>External &amp; Internal Evaluation</b>	75:25	

Course: B.Sc., BZC	Year:I	Semester:I			
Subject	<b>FUNDAMENTALS OF MICROBES AND NON-VASCULAR PLANTS</b>				
Units	<ol style="list-style-type: none"> <li>1. Origin of life and Viruses</li> <li>2. Special groups of Bacteria and Eubacteria</li> <li>3. Fungi &amp; Lichens</li> <li>4. Algae</li> <li>5. Bryophytes</li> </ol>				
Duration	60hours				
LearningObjectives	<ul style="list-style-type: none"> <li>• To provide a comprehensive knowledge on various aspects related to microbes.</li> <li>• To deliver knowledge on latest developments in the field of Plant sciences with a practical approach.</li> <li>• To produce a student who thinks independently, critically and discuss various aspects of plantlife.</li> <li>• To enable the graduate to prepare and pass through national and international examinations related to Botany.</li> <li>• To empower the student to become an employee or an entrepreneur in the field of Botany</li> <li>• To impart knowledge on origin, evolution, structure, reproduction and interrelationships of microbes and early plant groups</li> <li>• . To provide knowledge on biology and taxonomy of true land plants within a phylogenetic framework.</li> <li>• To teach aspects related to anatomy, embryology and ecology of plants, and importance of Biodiversity.</li> <li>• To explain the structural and functional aspects of plants with respect to the cell organelles, chromosomes and genes, and methods of plant breeding.</li> <li>• To develop a critical understanding on SPAC, metabolism and growth and development in plants.</li> <li>• To enable the students proficient in experimental techniques and methods of analysis appropriate for various sub-courses in Botany.</li> </ul>				
Units	U1	U2	U3	U4	U5
Hours Split: Total: 60	12	12	12	12	12
Internal valuation: 40marks	8	8	8	8	8

**Resource  
Material:**

**Study Material(Handouts):**

**Reference Books:**

1. Dubey, R.C. &D.K.Maheswari (2013) *A Text Book of Microbiology*,S.Chand& Company Ltd.,New Delhi
2. Pelczar Jr., M.J., E.C.N. Chan &N.R.Krieg (2001)*Microbiology*, Tata McGraw- Hill Co, NewDelhi.
3. Presscott, L. Harley, J. and Klein, D. (2005)*Microbiology, 6th edition*, Tata McGraw –Hill Co.New Delhi.
4. Alexopoulos, C.J., C.W.Mims&M.Blackwell (2007) *Introductory Mycology*,Wiley& Sons, Inc.,New York

**YouTube Links:**

<https://youtu.be/-gEpG72KNsM>

**Power Point Presentations:**<https://slideplayer.com/slide/13104184/>

## Academic-Pedagogical-Evaluation:Unit-wisePedagogy

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	Origin of life, concept of primary Abiogenesis; Miller and Urey experiment. Five kingdom classification of R.H. Whittaker. Discovery of microorganisms, Pasteur experiments, germ theory of diseases. Shape and symmetry of viruses; structure of TMV and Gemini virus; multiplication of TMV; A brief account of Prions and Viroids. A general account on symptoms of plant diseases caused by Viruses. Transmission of plant viruses and their control. Significance of viruses in vaccine production, bio-pesticides and as cloning vectors	P1, P2, P3, P4, P5, P6	PQ,P6,PT
II	Brief account of Archaeobacteria, Actinomycetes and Cyanobacteria. Cell structure and nutrition of Eubacteria. Reproduction- Asexual (Binary fission and endospores) and bacterial recombination (Conjugation, Transformation, Transduction). Economic importance of Bacteria with reference to their role in Agriculture and industry (fermentation and medicine). A general account on symptoms of plant diseases caused by Bacteria; Citrus canker	P1, P3, P6, P4, P2, P5	PX,P6,PT
III	General characteristics of fungi and Ainsworth classification (upto classes). Structure, reproduction and life history of (a) <i>Rhizopus</i> (Zygomycota) and (b) <i>Puccinia</i> (Basidiomycota). Economic uses of fungi in food industry, pharmacy and agriculture. A general account on symptoms of plant diseases caused by Fungi; Blast of Rice. Lichens- structure and reproduction; ecological and economic importance.	P1, P2, P3, P6, P4, P5	PQ,PT
IV	General characteristics of Algae ( pigments, flagella and reserve food material) ; Fritsch classification (upto classes). Thallus organization and life cycles in Algae. Occurrence, structure, reproduction and life cycle of (a) <i>Spirogyra</i> (Chlorophyceae) and (b) <i>Polysiphonia</i> (Rhodophyceae). Economic importance of Algae.	P1, P3, P2, P4, P5, P6	PQ,P6,PT
V	General characteristics of Bryophytes; classification upto classes. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life cycle of (a) <i>Marchantia</i> (Hepaticopsida) and (b) <i>Funaria</i> (Bryopsida). General account on evolution of sporophytes in Bryophyta.	P1, P2, P3, P5, P6, P4	PQ,PT

Course: B.Sc.,BZC	Year:I	Semester:II			
Subject	Basics of Vascular plants and Phytogeography				
Units	<ol style="list-style-type: none"> <li>1. Pteridophytes</li> <li>2. Gymnosperms.</li> <li>3. Basic aspects of Taxonomy</li> <li>4. Systematic Taxonomy</li> <li>5. Phytogeography</li> </ol>				
Duration	60hours				
LearningObjectives	<ul style="list-style-type: none"> <li>• Classify and compare Pteridophytes and Gymnosperms based on their morphology, anatomy, reproduction and life cycles.</li> <li>• Justify evolutionary trends in tracheophytes to adapt for land habitat.</li> <li>• Explain the process of fossilization and compare the characteristics of extinct and extant plants.</li> <li>• Critically understand various taxonomical aids for identification of Angiosperms.</li> <li>• Analyze the morphology of the most common Angiosperm plants of their localities and recognize their families.</li> <li>• Evaluate the ecological, ethnic and economic value of different tracheophytes and summarize their goods and services for human welfare.</li> <li>• Locate different phytogeographical regions of the world and India and can analyze their floristic wealth.</li> </ul>				
Units	U1	U2	U3	U4	U5
Hours Split: Total: 60	10	12	14	10	14
Internal valuation: 40marks	8	8	8	8	8

Power point presentation: Evolutionary trends of tracheophytes

<https://www.slideshare.net/SabaIshfaq2/tracheophytes>

**Study Material(Handouts):**

**Reference Books:**

1. Smith, G.M. (1971)*Cryptogamic Botany Vol. II.*, Tata McGraw Hill, New Delhi
2. Sharma, O.P. (2012) *Pteridophyta*. Tata McGraw-Hill, New Delhi
3. Kramer, K.U. & P. S. Green (1990) *The Families and Genera of Vascular Plants, Volume-I: Pteridophytes and Gymnosperms* (Ed. K. Kubitzki) Springer-Verlag, New York
4. Bhatnagar, S.P. & Alok Moitra (1996) *Gymnosperms*. New Age International, New Delhi
5. Coulter, J.M. & C.J. Chamberlain (1910) *Morphology of Gymnosperms*, The University of Chicago Press, Chicago, Illinois

**YouTube Links:** <https://youtu.be/JvfwSdorthg>

**Resource  
Material:**

## Academic-Pedagogical- Evaluation :Unit-wise Pedagogy

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	General characteristics of Pteridophyta; classification of Smith (1955) up to divisions. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life history of (a) <i>Lycopodium</i> (Lycopsida) and (b) <i>Marsilea</i> (Filicopsida). Stellar evolution in Pteridophytes; Heterospory and seed habit.	P1, P2, P3, P4, P5, P6	PQ, P6, PT
II	General characteristics of Gymnosperms; Sporne classification up to classes. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life history of (a) <i>Cycas</i> (Cycadopsida) and (b) <i>Gnetum</i> (Gnetopsida). Outlines of geological time scale. A brief account on <i>Cycadeoidea</i> .	P1, P3, P6, P4, P2, P5	PX, P6, PT
III	Aim and scope of taxonomy; Species concept: Taxonomic hierarchy, species, genus and family. Plant nomenclature : Binomial system, ICBN- rules for nomenclature. Herbarium and its techniques, BSI herbarium and Kew herbarium; concept of digital herbaria. Bentham and Hooker system of classification; Systematic description and economic importance of the following families: Annonaceae (b) Curcubitaceae	P1, P2, P3, P6, P4, P5	PQ, PT
IV	Systematic description and economic importance of the following families (a) Asteraceae (b) Asclepiadaceae (c) Amaranthaceae (d) Euphorbiaceae (e) Arecaceae and (f) Poaceae Outlines of Angiosperm Phylogeny Group (APG IV).	P1, P3, P2, P4, P5, P6	PQ, P6, PT
V	Principles of Phytogeography, Distribution (wides, endemic, discontinuous species) Endemism – types and causes. Phytogeographic regions of World. Phytogeographic regions of India. Vegetation types in Andhra Pradesh	P1, P2, P3, P5, P6, P4	PQ, PT

Course: B.Sc.,BZC	Year:II	Semester:III			
Subject	Anatomy and Embryology of Angiosperms, Plant Ecology and Biodiversity				
Units	1. Anatomy of Angiosperms 2. Embryology of Angiosperms 3. Basics of Ecology 4. Population, Community and Production Ecology 5. Basics of Biodiversity				
Duration	60hours				
LearningObjectives	<ul style="list-style-type: none"> <li>• Understand on the organization of tissues and tissue systems in plants.</li> <li>• Illustrate and interpret various aspects of embryology.</li> <li>• Discuss the basic concepts of plant ecology, and evaluate the effects of environmental and bioticfactors on plant communities.</li> <li>• Appraise various qualitative and quantitative parameters to study the population and community ecology.</li> <li>• Correlate the importance of biodiversity and consequences due to its loss.</li> <li>• Enlist the endemic/endangered flora and fauna from two biodiversity hot spots in India and assess strategies for their conservation</li> </ul>				
Units	U1	U2	U3	U4	U5
Hours Split:Total: 60	10	14	12	12	12
Internal valuation:40marks	8	8	8	8	8

Powerpoint presentation: Population and community ecology

<https://www.slideshare.net/donnarpenton/characteristics-of-population>



**Study Material(Handouts):**

**Reference Books:**

1. Esau, K. (1971)*Anatomy of Seed Plants*. John Wiley and Son, USA.
2. Fahn, A. (1990)*Plant Anatomy*, Pergamon Press, Oxford.
3. Cutler, D.F., T. Botha & D. Wm. Stevenson (2008)*Plant Anatomy : An Applied Approach*,wiley,USA
4. Paula Rudall (1987)*Anatomy of Flowering Plants : An Introduction to Structure andDevelopment*. Cambridge University Press, London
5. Bhojwani, S. S. and S. P. Bhatnagar (2000)*The Embryology of Angiosperms (4<sup>th</sup>Ed.)*,VikasPublishing House, Delhi.

**Resource  
Material:**

**YouTube Links:**<https://youtu.be/cNoTVOD2ayg>

## Academic-Pedagogical- Evaluation :Unit-wise Pedagogy

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	Organization of apical meristems: Tunica-carpus theory and Histogen theory. Tissue systems–Epidermal, ground and vascular. Anomalous secondary growth in <i>Boerhaavia</i> and <i>Dracaena</i> . Study of timbers of economic importance - Teak, Red sanders and Rosewood.	P1, P2, P3, P4, P5, P6	PQ,P6,PT
II	Structure of anther, anther wall, types of tapetum. Microsporo genesis and development of male gametophyte. Structure of ovule, megasporogenesis; monosporic ( <i>Polygonum</i> ), bisporic ( <i>Allium</i> ) and tetrasporic ( <i>Peperomia</i> ) types of embryo sacs. Outlines of pollination, pollen – pistil interaction and fertilization. Endosperm - Types and biological importance - Free nuclear, cellular, helobial and ruminant. Development of Dicot ( <i>Capsella bursa-pastoris</i> ) embryo.	P1, P3, P6, P4, P2, P5	PX,P6,PT
III	Ecology: definition, branches and significance of ecology. Ecosystem: Concept and components, energy flow, food chain, food web, ecological pyramids. Plants and environment: Climatic (light and temperature), edaphic and biotic factors. Ecological succession: Hydrosere and Xerosere.	P1, P2, P3, P6, P4, P5	PQ,PT
IV	Population ecology: Natality, mortality, growth curves, ecotypes, ecads Community ecology: Frequency, density, cover, life forms, biological spectrum Concepts of productivity: GPP, NPP and Community Respiration Secondary production, P/R ratio and Ecosystems.	P1, P3, P2, P4, P5, P6	PQ,P6,PT
V	Biodiversity: Basic concepts, Convention on Biodiversity - Earth Summit. Value of Biodiversity; types and levels of biodiversity and Threats to biodiversity Biodiversity Hot spots in India. Biodiversity in North Eastern Himalayas and Western Ghats. Principles of conservation: IUCN threat-categories, RED data book Role of NBPGR and NBA in the conservation of Biodiversity	P1, P2, P3, P5, P6, P4	PQ,PT

Course: B.Sc.,BZC	Year:II	Semester:IV			
Subject	Plant Physiology and Metabolism				
Units	<ol style="list-style-type: none"> <li>1. Plant-Water relations</li> <li>2. Mineral nutrition, Enzymes and Respiration</li> <li>3. Photosynthesis and Photorespiration</li> <li>4. Nitrogen and lipid metabolism</li> <li>5. Plant growth - development and stress physiology</li> </ol>				
Duration	60hours				
LearningObjectives	<ul style="list-style-type: none"> <li>• Comprehend the importance of water in plant life and mechanisms for transport of water and solutes in plants.</li> <li>• Evaluate the role of minerals in plant nutrition and their deficiency symptoms.</li> <li>• Interpret the role of enzymes in plant metabolism.</li> <li>• Critically understand the light reactions and carbon assimilation processes responsible for synthesis of food in plants.</li> <li>• Analyze the biochemical reactions in relation to Nitrogen and lipid metabolisms.</li> <li>• Evaluate the physiological factors that regulate growth and development in plants.</li> <li>• Examine the role of light on flowering and explain physiology of plants under stress conditions</li> </ul>				
Units	U1	U2	U3	U4	U5
Hours Split: Total: 60	10	14	12	12	12
Internal valuation: 40marks	8	8	8	8	8

**Study Material(Handouts):**

**Reference Books:**

1. Aravind Kumar & S.S. Purohit (1998) *Plant Physiology – Fundamentals and Applications*, AgroBotanica, Bikaner
2. Datta, S.C. (2007) *Plant Physiology*, New Age International (P) Ltd., Publishers, New Delhi
3. Hans Mohr & P. Schopfer (2006) *Plant Physiology*, Springer (India) Pvt. Ltd., New Delhi
4. Hans-Walter heldt (2005) *Plant Biochemistry*, Academic Press, U.S.A.
5. Hopkins, W.G. & N.P.A. Huner (2014) *Introduction to Plant Physiology*, Wiley India Pvt. Ltd., New Delhi
6. Noggle Ray & J. Fritz (2013) *Introductory Plant Physiology*, Prentice Hall (India), New Delhi

**Resource Material:**

**YouTube Links:**

<https://youtu.be/mqkOv73N9U8>

**Power Point Presentations:** <https://www.easybiologyclass.com/plant-physiology-ppt-free-power-point-presentations-in-plant-physiology/>

**Question Bank:** [https://www.sscasc.in/wp-content/uploads/downloads/Botany/6-Sem-Botany\\_P-VII-Question-Bank.pdf](https://www.sscasc.in/wp-content/uploads/downloads/Botany/6-Sem-Botany_P-VII-Question-Bank.pdf)

## Academic-Pedagogical- Evaluation :Unit-wise Pedagogy

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	Importance of water to plant life, physical properties of water, diffusion, imbibition, osmosis. water potential, osmotic potential, pressure potential. Absorption and lateral transport of water; Ascent of sap Transpiration: stomata structure and mechanism of stomatal movements (K <sup>+</sup> ion flux). Mechanism of phloem transport; source-sink relationships.	P1, P2, P3, P4, P5, P6	PQ,P6,PT
II	Essential macro and micro mineral nutrients and their role in plants; symptoms of mineral deficiency Absorption of mineral ions; passive and active processes. Characteristics, nomenclature and classification of Enzymes. Mechanism of enzyme action, enzyme kinetics. Respiration: Aerobic and Anaerobic; Glycolysis, Krebs cycle; electron transport system, mechanism of oxidative phosphorylation, Pentose Phosphate Pathway (HMP shunt)	P1, P3, P6, P4, P2, P5	PX,P6,PT
III	Photosynthesis: Photosynthetic pigments, absorption and action spectra; Red drop and Emerson enhancement effect. Concept of two photosystems; mechanism of photosynthetic electron transport and evolution of oxygen; photophosphorylation Carbon assimilation pathways (C <sub>3</sub> , C <sub>4</sub> and CAM); Photorespiration - C <sub>2</sub> pathway	P1, P2, P3, P6, P4, P5	PQ,PT
IV	Nitrogen metabolism: Biological nitrogen fixation – asymbiotic and symbiotic nitrogen fixing organisms. Nitrogenase enzyme system. Lipid metabolism :Classification of Plant lipids, saturated and unsaturated fatty acids. Anabolism of triglycerides, $\beta$ -oxidation of fatty acids, Glyoxylate cycle.	P1, P3, P2, P4, P5, P6	PQ,P6,PT
V	Growth and Development: Definition, phases and kinetics of growth. Physiological effects of Plant Growth Regulators (PGRs) - auxins, gibberellins, cytokinins, ABA, ethylene and brassinosteroids. Physiology of flowering :Photoperiodism, role of phytochrome in flowering. Seed germination and senescence. Physiological changes during water stress	P1, P2, P3, P5, P6, P4	PQ,PT

Course: B.Sc.,BZC	Year:II	Semester:IV			
Subject	PAPER:V Cell Biology, Genetics and Plant Breeding				
Units	1. The Cell 2. Chromosomes 3. Mendelian and Non-Mendelian genetics 4. Structure and functions of DNA 5. Plant Breeding				
Duration	60hours				
Learning Objectives	<ul style="list-style-type: none"> <li>• Distinguish prokaryotic and eukaryotic cells and design the model of a cell.</li> <li>• Explain the organization of a eukaryotic chromosome and the structure of genetic material.</li> <li>• Demonstrate techniques to observe the cell and its components under a microscope.</li> <li>• Discuss the basics of Mendelian genetics, its variations and interpret inheritance of traits in living beings.</li> <li>• Elucidate the role of extra-chromosomal genetic material for inheritance of characters.</li> <li>• Evaluate the structure, function and regulation of genetic material.</li> <li>• Understand the application of principles and modern techniques in plant breeding.</li> <li>• Explain the procedures of selection and hybridization for improvement of crops.</li> </ul>				
Units	U1	U2	U3	U4	U5
Hours Split: Total: 60	10	14	12	12	12
Internal valuation: 40marks	8	8	8	8	8

Power point presentation: The structure, function and regulation of genetic material

<https://www.slideshare.net/MarwanAlhalabi/genetic-material-66443541>

**Study Material(Handouts):**

**Reference Books:**

1. S. C. Rastogi (2008)*Cell Biology*,New Age International (P) Ltd. Publishers, New Delhi
2. P. K. Gupta (2002)*Cell and Molecular biology*,Rastogi Publications, New Delhi
3. B. D. Singh (2008) *Genetics*,Kalyani Publishers, Ludhiana
4. A.V.S.S. Sambamurty (2007) *Molecular Genetics*,Narosa Publishing House,New Delhi
5. Cooper, G.M. & R.E. Hausman (2009)*The Cell – A Molecular Approach*, A.S.M. Press,Washington
6. Becker, W.M., L.J. Kleinsmith& J. Hardin (2007)*The World of Cell*, Pearson Education, Inc., NewYork

**Resource  
Material:**

**YouTube Links:**[https://youtu.be/-rZ\\_A2cZ\\_WU](https://youtu.be/-rZ_A2cZ_WU)

## Academic-Pedagogical- Evaluation :Unit-wise Pedagogy

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	Cell theory; prokaryotic vs eukaryotic cell; animal vs plant cell; a brief account on ultra-structure of a plant cell. Ultra-structure of cell wall. Ultra-structure of plasma membrane and various theories on its organization. Polymorphic cell organelles (Plastids); ultrastructure of chloroplast. Plastid DNA	P1, P2, P3, P4, P5, P6	PQ,P6,PT
II	Prokaryotic vs eukaryotic chromosome. Morphology of a eukaryotic chromosome. Euchromatin and Heterochromatin; Karyotype and ideogram. Brief account of chromosomal aberrations - structural and numerical changes Organization of DNA in a chromosome (solenoid and nucleosome models	P1, P3, P6, P4, P2, P5	PX,P6,PT
III	Mendel's laws of inheritance. Incomplete dominance and co-dominance; Multiple allelism. Complementary, supplementary and duplicate gene interactions (plant based examples are to be dealt). A brief account of linkage and crossing over; Chromosomal mapping - 2 point and 3 point testcross. Concept of maternal inheritance (Corren's experiment on <i>Mirabilis jalapa</i> ); Mitochondrial DNA.	P1, P2, P3, P6, P4, P5	PQ,PT
IV	Watson and Crick model of DNA. Brief account on DNA Replication (Semi- conservative method). Brief account on Transcription, types and functions of RNA. Gene concept and genetic code and Translation. Regulation of gene expression in prokaryotes - Lac Operon.	P1, P3, P2, P4, P5, P6	PQ,P6,PT
V	Plant Breeding and its scope; Genetic basis for plant breeding. Plant Introduction and acclimatization. Definition, procedure; applications and uses; advantages and limitations of : (a) Mass selection, (b) Pure line selection and (c) Clonal selection. Hybridization – schemes, and technique; Heterosis (hybrid vigour). brief account on Molecular breeding – DNA markers in plant breeding. RAPD, RFLP	P1, P2, P3, P5, P6, P4	PQ,PT



Course: B.Sc.,BZC	Year:III	Semester:V			
Subject	PAPER: (6C) PLANT TISSUE CULTURE				
<b>Units</b>	1. Basic concepts of plant tissue culture 2. Sterilization techniques and culture media 3. Callus culture technique 4. Micropropagation 5. Applications of plant tissue culture				
<b>Duration</b>	<b>60hours</b>				
<b>LearningObjectives</b>	<ul style="list-style-type: none"> <li>• On successful completion of this practical course, student will be able to:</li> <li>• List out, identify and handle various equipment in plant tissue culture lab.</li> <li>• Learn the procedures of preparation of media.</li> <li>• Demonstrate skills on inoculation, establishing callus culture andMicro propagation.</li> <li>• Acquire skills in observing and measuring callus growth.</li> <li>• 5.Perform some techniques related to plant transformation for secondaryMetabolite production</li> <li>•</li> </ul>				
<b>Units</b>	U1	U2	U3	U4	U5
<b>Hours Split:Total: 60</b>	10	14	12	12	12
<b>Internal valuation:40marks</b>	8	8	8	8	8

Powerpoint presentation: <https://www.slideshare.net/abhayjoshi25/plant-tissue-culture-71316417>

## Academic-Pedagogical- Evaluation :Unit-wise Pedagogy

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	<p><b>Basic concepts of plant tissue culture</b>            Plant tissue culture: Definition, history, scope and significance. Totipotency, differentiation, dedifferentiation, and redifferentiation; types of cultures.            Infrastructure and equipment required to establish a tissue culture laboratory</p>	P1, P2, P3, P4, P5, P6	PQ,P6,PT
II	<p><b>Sterilization techniques and culture media</b>            Aseptic conditions – Fumigation, wet and dry sterilization, UV sterilization, ultrafiltration.            Nutrient media: Composition of commonly used nutrient culture media with respect to their contents like inorganic chemicals, organic constituents, vitamins, amino acidsetc.            Composition and preparation of Murashige and Skoog culture medium.</p>	P1, P3, P6, P4, P2, P5	PX,P6,PT
III	<p><b>Callus culture technique</b>            Explant: Definition, different explants for tissue culture: shoot tip, axillary buds, leafdiscs, cotyledons, inflorescence and floral organs, their isolation and surface sterilization; inoculation methods            Callus culture: Definition, various steps in callus culture. Initiation and maintenance of callus - Growth measurements and subculture; somaclonal variations.</p>	P1, P2, P3, P6, P4, P5	PQ,PT
IV	<p><b>Micropropagation</b>            Direct and indirect morphogenesis, organogenesis            Greenhouse hardening unit operation and management; acclimatization and hardening of plantlets - need, process, packaging, exports.            Pathogen (Virus) indexing- significance, methods, advantages, applications.</p>	P1, P3, P2, P4, P5, P6	PQ,P6,PT
V	<p><b>Applications of plant tissue culture</b>            Germplasm conservation: cryopreservation methods, slow growth, applications and limitations; cryoprotectants.            Plant transformation techniques and bioreactors; production of secondary metabolites- optimization of yield, commercial aspects,</p>	P1, P2, P3, P5, P6, P4	PQ,PT

Course: B.Sc.,BZC	Year:III	Semester:VI			
Subject	PAPER: (7C) Mushroom cultivation				
Units	1. Introduction and value of mushrooms 2. Basic requirements of cultivation system 3. Spawning and casing 4. Mushroom cultivation 5. Post harvest technology				
Duration	60hours				
LearningObjectives	<ul style="list-style-type: none"> <li>• Understand the structure and life of a mushroom and discriminate edible and poisonous mushrooms.</li> <li>• Identify the basic infrastructure to establish a mushroom culture unit.</li> <li>• Demonstrate skills preparation of compost and spawn.</li> <li>• Acquire a critical knowledge on cultivation of some edible mushrooms.</li> <li>• Explain the methods of storage, preparation of value-added products and marketing.</li> </ul>				
Units	U1	U2	U3	U4	U5
Hours Split:Total: 60	10	14	12	12	12
Internal valuation:40marks	8	8	8	8	8

**Study Material(Handouts):**

**Reference Books:A  
textbook on Mushroom  
cultivation, Ashok  
agarwal Yashpal sharma,  
Eesha jangra**

**YouTube Links:**

<https://youtu.be/oiVZ2AP>

**Resource  
Material:**

## Academic-Pedagogical- Evaluation :Unit-wise Pedagogy

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	<p>Mushrooms: Definition, structure of a mushroom and a brief account of life cycle; historical account and scope of mushroom cultivation; difference between edible and poisonous mushrooms.</p> <p>Morphological features of any four edible mushrooms, Button mushroom (<i>Agaricus Bisporus</i>), Milky mushroom (<i>Calocybe indica</i>), Oyster mushroom (<i>Pleurotus sajor-caju</i>) and Paddy straw mushroom (<i>Volvariella volvacea</i>).</p> <p>Nutraceutical value of mushrooms; medicinal mushrooms in South India - <i>Ganoderma lucidum</i>, <i>Phellinus rimosus</i>, <i>Pleurotus florida</i> and <i>Pleurotus pulmonaris</i> – their therapeutic value; Poisonous mushrooms - harmful effects.</p>	P1, P2, P3, P4, P5, P6	PQ,P6,PT
II	<p><b>Basic requirements of cultivation system</b></p> <p>Small village unit and larger commercial unit; layout of a mushroom farm - location of building plot, design of farm, bulk chamber, composting, equipment and facilities, pasteurization room and growing rooms.</p> <p>Compost and composting: Definition, machinery required for compost making, materials for compost preparation.</p> <p>Methods of composting- long method of composting and short method of composting</p>	P1, P3, P6, P4, P2, P5	PX,P6,PT
III	<p><b>Spawning and casing</b></p> <p>Spawn and spawning: Definition, facilities required for spawn preparation; preparation of spawn substrate. Preparation of pure culture, media used in raising pure culture; culture maintenance, storage of spawn. Casing: Definition, Importance of casing mixture, Quality parameters of casing soil, different types of casing mixtures, commonly used materials.</p>	P1, P2, P3, P6, P4, P5	PQ,PT

<p><b>IV</b></p>	<p><b>Mushroom cultivation</b>  Raw material, compost, spawning, casing, cropping, and problems in cultivation (diseases, pests and nematodes, weed molds and their management strategies), picking and packing for any Four of the following mushrooms:  (a) Button mushroom (b) Oyster mushroom (c) Milky mushroom and (d) Paddy straw mushroom</p>	<p>P1, P3, P2, P4, P5,  P6</p>	<p>PQ,P6,PT</p>
<p><b>V</b></p>	<p><b>Post harvest technology</b>  Shelf life of mushrooms; preservation of mushrooms - freezing, dry freezing, drying and canning.  Quality assurance and entrepreneurship - economics of different types of mushrooms; value added products of mushrooms.  Management of spent substrates and waste disposal of various mushrooms</p>	<p>P1, P2, P3, P5, P6,  P4</p>	<p>PQ,PT</p>