

**A.G& S.G.SIDDHARTHA DEGREE COLLEGE OF ARTS &
SCIENCE**

VUYYURU-521165, KRISHNA Dt., A.P.(Autonomous)

Accredited by NAAC with "A" Grade

2022-2023



DEPARTMENT OF BOTANY

MINUTES OF BOARD OF STUDIES

OOD SEMESTER

27-10-2022

**ADUSUMILLI GOPALAKRISHNAIAH & SUGAR CANE GROWERS SIDDHARTHA DEGREE
COLLEGE OF ARTS & SCIENCE, VUYYURU-521165, KRISHNA Dt., A.P. (AUTONOMOUS).**

NAAC recredited at 'A' level
Autonomous –ISO 9001-2015 Certified

**DEPARTMENT OF BOTANY
BOARD OF STUDIES MEETING: 27th October 2022**

The Board of studies meeting of Department of Botany was convened at 2:00 pm on 27/10/2022 under the chairmanship of Smt.Ch.Beulah Ranjani Head of the Department .The members present have discussed various aspects such as changes to be made in the syllabi, scheme of Evaluation and Blue print both for theory and practical papers, Departmental activities for 2022-2023 ,Estimated Budget proposals 2022-2023 for implementing them effectively during the I,III,& V semester for the academic year 2022-2023 onwards.

The following members were present.

S.No	Name	Designation	signature
1.	Smt. Ch. Beulah Ranjani Head, Department of Botany A.G&S.G.S Degree College Vuyyuru.	Chair person	CH-Beulah Ranjani
2	prof. Avasan Maruthi Bio Sciences & Bio technology Krishna University Machilipatnam.	University Nominee	J. Maruthi
3.	Sri Dr. Ch. Srinivasa Reddy Lecturer in Botany SRR & CVR Govt. Degree College, Vijayawada.	Subject Expert	Ch Srinivasa Reddy
4.	P. Srinivasa Rao Department of Botany, P.B. Siddhartha College,	Subject Expert	P. Srinivasa Rao
5.	Sri. S. Krishna Suman, Natural farmer, yakamuru Vuyyuru.	Industrialist	S. Krishna Suman
6.	Sri. N. Ramana Rao Lecturer in Botany, A.G &S.G.S Degree College Vuyyuru.	Member	N Ramana Rao.
7.	Miss. G. Rebecca Rachel Lecturer in Botany, A.G&S.G.S Degree College Vuyyuru.	Member	G.Rebecca Rachel
8.	Miss. K. Anusha Lecturer in chaitnya college, Gudiwada.	Student Represent	K. Anusha

Agenda for B.O.S Meeting.

1. To recommend the syllabi (Theory & Practical), Model question paper for I Semester of I B.Sc (B.Z.C, Aqua) for the academic year 2022 - 2023.
2. To recommend the syllabi (Theory & Practical), Model question paper for III Semester of II B.Sc (B.Z.C, Aqua) for the academic year 2022 - 2023.
3. To introduce Skill enhancement Course the syllabi (Theory & Practical), Model question paper for V Semester of III B.Sc (B.Z.C, Aqua) for the academic year 2022 - 2023.
4. To recommend the Blue print for the semester end exam for I, III & V semester of I,II, III B.Sc (B.Z.C, Aqua) for the academic year 2022 - 2023.
5. To recommend the teaching and evolution methods to be followed under Autonomous status.
6. Any other matter.

RESOLUTIONS

1. It is resolved to continue the same syllabi (Theory & Practical), model question paper & guide lines to be followed by the question paper setters of Botany of I semester of I B.Sc. (B.Z.C, Aqua) under Choice Based Credit System (CBCS) approved by the Academic Council of 2022 – 2023
2. It is resolved to implement the syllabi (Theory & Practical), model question paper & guide lines to be followed by the question papers under Choice Based Credit System (CBCS) setters of Botany of III Semester of II B.Sc. (B.Z.C, Aqua) approved by the Academic Council of 2022 –2023.
3. It is resolved to implement changed syllabi & model papers under Choice Based Credit System (CBCS) Setters of Botany of V semester SEC 6C (Plant tissue culture) and SEC 7C (Mushroom cultivation) of III B.Sc. (B.Z.C, Aqua) approved by the Academic Council of 2022-2023.
4. It is resolved to Continue the same Blue prints of I, III, & V Semesters of B.Sc Botany for the Academic year 2022-2023.
5. is resolved to continue the following teaching & evolution methods for the Academic year 2022-23.
6. Any other matter.

Teaching methods:

Besides the conventional methods of teaching, we use modern technology i.e. Using of OHP and LCD projector to display on U boards etc; for better understanding of concepts.

Evaluation of a student is done by the following procedure:

Internal Assessment Examination:

- Out of maximum 100 marks in each paper for I, III B.Sc, 30 marks shall be allocated for internal assessment.
- Out of these 30 marks, 20 marks are allocated for announced tests (i.e . IA-1& IA-2). Two announced tests will be conducted and average of these two tests shall be deemed as the marks obtained by the student, 5 marks are allocated on the basis of candidate's percentage of attendance and remaining 5 marks are allocated for the assignment for I, III B.SC.
- Out of maximum 100 marks in each paper for II B.Sc, 25 marks shall be allocated for internal assessment.
- Out of these 25 marks, 15 marks are allocated for announced tests (i.e . IA-1& IA-2). Two announced tests will be conducted and average of these two tests shall be deemed as the marks obtained by the student, 5 marks allocated on the basis of candidate's percentage of attendance / assignment for II semester.
- There is no pass minimum for internal assessment for I, II, III B.Sc.

- **Semester – End Examination:**

- The maximum mark for II (BZC) semester – End examination shall be 75 marks and duration of the examination shall be 3 hours.
- The maximum mark for I, III B.Sc semester- End examination shall be 70 marks and duration of the examination shall be 3 hours. Even through the candidate is absent for two IA exams / obtain zero marks the external marks are considered (if the candidate gets 40/70) and the result shall be declared as “PASS”
- Semester – End examination shall be conducted in theory papers at the end of every semester, while in practical papers, these examinations are conducted at the end of I, III, & V semester for I, II & III B.Sc.
- Discussed and recommended for organizing Seminars, Guest lectures, Work – Shops to upgrade the Knowledge of students, for the approval of the Academic Council.

CH. Beulah Rajani
Chairman

Course Structure of BZC, AQUA Syllabus

year	semester	Paper code	Title of the paper	Marks(100)		Credits
				Internal assessment	End semester	
I	I	BOTIIA	Fundamentals of Microbes and Non-vascular plants	30	70	3
			Practical-I	10	40	2
II	III	BOTT31A	Anatomy of angiosperms, Plant Ecology and Biodiversity	25	75	3
			Practical-III	25	25	2
III	V	BOT-501	Plant tissue culture.	30	70	3
			Practical-v – 501	25	25	2
III	V	BOT-502	Mushroom Cultivation	30	70	3
			Practical-v- 502	25	25	2

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Title of the Paper: **Fundamentals of Microbes and Non-vascular Plants**

Semester: - I

Course Code	BOTT11A	Course Delivery Method	Class Room/Blended Mode - Both
Credits	3	CIA Marks	30
No. of Lecture Hours/ Week	4	Semester End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Year of Introduction : 2021-22	Year of Offering 2021-2022	Year of Revision –	Percentage of Revision: 0%

Course Prerequisites: Knowledge of microbes, thallophytes and Bryophytes at +2 level

Course Description: This course emphasizes the student to understand origin of life on earth and analyze structure, disease symptoms and transmission of plant viruses. Enhance one with the knowledge in diversity and characteristics of prokaryotes, characteristics of fungi and lichens, algae and bryophytes.

Course Objectives:

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

1. To understand origin of life on the earth and analyze structure, disease symptoms and transmission of plant viruses.
2. To understand the diversity and characteristics of Prokaryotes.
3. To understand the characteristics of Fungi and Lichens.
4. To understand the characteristics of Algae.
5. To understand the characteristics of Bryophyta.

Course Outcomes: At the end of this course, students should be able to:

CO1: Explain origin of life on the earth.

CO2: Illustrate diversity among the viruses and prokaryotic organisms and can categorize them.

CO3: Analyze and ascertain the plant disease symptoms due to viruses, bacteria and fungi.

CO4: Classify fungi, lichens, algae and bryophytes based on their structure, reproduction and life cycles.

CO5: Evaluate the ecological and economic value of microbes, thallophytes and bryophytes.

Syllabus

Course Details

Unit	Learning Units	Hours
I	Origin of life and viruses Origin of life, concept of primary Abiogenesis; Miller and Urey experiment. Five kingdom classifications of R.H. Whittaker. Discovery of micro- organisms, 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.	12
II	Special groups of Bacteria and Eubacteria Brief account of Archaeobacteria, Actinomycetes and Cyano bacteria. 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.	12
III	Fungi & Lichens General characteristics of fungi and Ainsworth classification (up to 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.	12
IV	Algae General characteristics of Algae (pigments, flagella and reserve food material), Fritsch classification (up to 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.	12
V	Bryophytes General characteristics of Bryophytes; classification up to 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.	12

Textbook:

1. Botany – I (Vrukshasastram-I): Telugu Akademi, Hyderabad
2. Pandey, B.P. (2013) *College Botany, Volume-I*, S. Chand Publishing, New Delhi

Recommended Reference book:

1. Prescott, L. Harley, J. and Klein, D. (2005) *Microbiology, 6th edition*, Tata McGraw –Hill Co. New Delhi.
2. Alexopoulos, C.J., C.W.Mims&M.Blackwell(2007)*Introductory Mycology*, Wiley& Sons, Inc., New York.
3. Fritsch, F.E. (1945) *The Structure & Reproduction of Algae (Vol. I &Vol.II)* Cambridge University Press Cambridge, U. K.

Course Delivery method: Face-to-face / Blended.

Course has focus on: Foundation.

Websites of Interest:

<https://www.youtube.com/watch?v=SkClCX9FfiY>

<https://www.youtube.com/watch?v=h57UuVdyyLk>

<https://www.youtube.com/watch?v=OBej7rFyN7U>

https://www.youtube.com/watch?v=7sZ5Nz8_cfc

Co-curricular Activities:

1. Question and answer session at the end of class.
2. Observing animations.
3. Written assignments.
4. Collection and identification of Algae from Fresh water.
5. Collection and identification of diseased plant parts.
6. Group Discussion (GD)/ Quiz.
7. Power Point Presentations.

TITLE OF THE PAPER: Fundamentals of Microbes and Non-vascular Plants

(Viruses, Bacteria, Fungi, Lichens, Algae and Bryophytes)

Max. Time: 3 Hrs.

Course Code: BOTT11A

Max. Marks: 70M

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Section-A

1. (a) i) Give an account of structure and multiplication of TMV? **(10M) CO1- L2.**
ii) Five kingdom classification of Whittaker. **(4M) CO1-L2.**
OR
b) i) Explain the significance of viruses in vaccine production, bio-pesticides and as cloning vectors. **(10M) CO1-L2.**
ii) Germ theory of diseases. **(4M) CO1-L2.**
2. (a) i) whether bacteria exhibit sexual reproduction or not? Elucidate different methods of bacterial recombination. **(10M)CO2 - L2.**

ii) What are the symptoms of citrus canker? Mention the causal organism of citrus canker. . **(4M) CO2 - L2**
OR
b) i) Explain the role of bacteria in agriculture and industry. **(10M)CO2 - L2.**

ii) General characters of blue – green algae. . **(4M) CO-3 L2**
- 3(a) i) Why *Puccinia* is called as macro cyclic rust? Explain the stages of the fungus on Primary host. **(10M) CO3-L1.**

ii) Ainsworth classification of fungi **CO-3 L2 .(4M)**
OR
b) i) Why lichens are considered as ‘pioneers of colonization’? Give an account of ecological and economic Importance of lichens. **CO3 -L1. (10M)**

ii) Why lichens are considered as unique and composite organisms? **CO-3 L1. .(4M)**
- 4.(a)i) What is thallus? Describe various types of thalli found in algae. **(10M) CO4 -L2.**
ii) General characters of algae. **CO-3 L2.(4M)**

OR
b) i) Explain life cycle of *Spirogyra* .**CO-4 L2. (10M)**

ii) Explain about Cystocarp. **CO-4 L2. .(4M)**
- 5(a)i) Describe morphological and anatomical features of *Marchantia*. **CO5- L2. (10M)**
ii) Vegetative reproduction in Bryophytes. **CO5 - L2. .(4M)**

OR
b) i) Give account on of sporophyte evolution in Bryophytes. **CO5 -L 2 (10M).**
ii) Describe the gametophyte phase in *Funaria* **CO5- L2. .(4M)**

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Practical Syllabus

SEMESTER- I

PAPER- I

CREDITS : 02

BOTANY	BOTT11A	WEF: 2021-2022	B. Sc (BZC), AQUA
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Title of the paper: Fundamentals of Microbes and Non-vascular Plants

(Viruses, Bacteria, Fungi, Lichens, Algae and Bryophytes)

NO OF HOURS: 30

Course Prerequisites: Knowledge of microbes, thallophytes and Bryophytes at +2 level

Course Description: This course emphasizes the student to understand origin of life on earth, analyze and identify the structure, disease symptoms and transmission of plant viruses. Enhance one with the skill in identifying diversity and characteristics of prokaryotes, characteristics of fungi and lichens, algae and bryophytes.

Course Objectives:

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

1. To understand origin of life on the earth and analyze structure, disease
2. Symptoms and transmission of plant viruses.
3. To understand the diversity and characteristics of Prokaryotes.
4. To understand the characteristics of Fungi and Lichens.
5. To understand the characteristics of Algae.
6. To understand the characteristics of Bryophyta.

Course Outcomes: At the end of this course, students should be able to:

CO1: Explain origin of life on the earth.

CO2: Illustrate diversity among the viruses and prokaryotic organisms and can categorize them.

CO3: Analyze and ascertain the plant disease symptoms due to viruses, bacteria and fungi.

CO4: Classify fungi, lichens, algae and bryophytes based on their structure, reproduction and life cycles.

CO5: Evaluate the ecological and economic value of microbes, thallophytes and bryophytes.

Syllabus

Course Details:

Unit	Learning Units	Lecture Hours
I	<p>Knowledge of Microbiology laboratory practices and safety rules. Knowledge of different equipment for Microbiology laboratory (Spirit lamp, Inoculation loop, Hot-air oven, Autoclave/Pressure cooker, Laminar air flow chamber and Incubator) and their working principles. (In case of the non- availability of the laboratory equipment the students can be taken to the local college/clinical lab. with required infrastructural facilities or they can enter a linkage with the college/lab for future developments and it will fetch credits during the accreditation by NAAC).</p> <p>Demonstration of Gram's staining technique for Bacteria.</p> <p>Study of Viruses (Corona, Gemini and TMV) using electron micrographs/ models.</p>	6
II	<p>Study of Archaeobacteria and Actinomycetes using permanent slides/ electron micrographs/diagrams.</p> <p>Study of <i>Anabaena</i> and <i>Oscillatoria</i> using permanent/temporary slides.</p> <p>Study of different bacteria (Cocci, Bacillus, Vibrio and Spirillum) using permanent or temporary slides/ electron micrographs/ diagrams.</p>	4
III	<p>Study/ microscopic observation of vegetative, sectional/anatomical and reproductive structures of the following using temporary or permanent slides/ specimens/ mounts: a. Fungi: <i>Rhizopus</i>, <i>Penicillium</i> and <i>Puccinia</i> Lichens: Crustose, foliose and fruticose.</p>	10
IV	<p>Algae: <i>Volvox</i>, <i>Spirogyra</i>, <i>Ectocarpus</i> and <i>Polysiphonia</i>. Bryophyta: <i>Marchantia</i> and <i>Funaria</i> Study of specimens of Tobacco mosaic disease, Citrus canker and Blast of Rice.</p>	10

Recommended Reference book:

1. Vasista, B.R. (2018). Botany for degree students - Algae - S. Chand and company Ltd., New Delhi.
2. Dubey, H.C (2018). A text book of Fungi, bacteria and Viruses. Vikas publishing House, New Delhi.
3. Smith, G.M (1955). Cryptogamic Botany (Vol. I Algae, Fungi, & Lichens) McGraw-Hill Book Co., New York.

Course Delivery method: Face-to-face / Blended.

Course has focus on: Skill Development.

Websites of Interest:

<https://youtu.be/KXtGkIXMCQU>

<https://youtu.be/u3BVke4C8Sc>

<https://youtu.be/q7vwDDKugN0>

<https://youtu.be/1VXSjF16KXg>

<https://youtu.be/xtf0suS4vek>

<https://youtu.be/o77dGAToV3U>

<https://youtu.be/Edmev8lQxLM>

https://youtu.be/ks8j2_iawVU

<https://youtu.be/n4jtCgpXZVI>

<https://youtu.be/2kY7uzeYWFc>

<https://youtu.be/fvEJpipMWUs>

https://youtu.be/KAlvzK_391s

Co-curricular Activities:

1. Question and answer session at the end of class.
2. Observing animations.
3. Collection and identification of Algae from Fresh water.
4. Collection and identification of diseased plant parts.
5. Group Discussion (GD)/ Quiz.
6. Power Point Presentations.

Model Question Paper Structure for SEE

Max: 40 Marks

Min. Pass: 16 Marks

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1. Take the T.S. of material 'A' (Fungi), make a temporary mount and make comments about identification.....8M.
 2. Identify any 2 algae from the mixture (material 'B') given with specific comments about identification.....8M
 3. Take the T.S. of material 'C' (Bryophyta), make a temporary mount and make comments about identification.....8M
 4. Identify the following with specific reasons.....4X2=8M
 - A. laboratory equipment of Microbiology
 - B. Virus
 - C. Archaeobacteria /Ascomycete /Cyanobacteria/ Eu-Bacteria
 - D. Lichen
 1. Record + Viva-voce.....5+3 = 8M
- CIA 10 M**

**ADUSUMILLI GOPALAKRISHNAIAH & SUGAR CANE GROWERS SIDDHARTHA
DEGREE COLLEGE OF ARTS & SCIENCE, VUYYURU-521165, KRISHNA Dt., A.P.
(AUTONOMOUS).**

Title of the Paper: **(Anatomy and Embryology of Angiosperms, Plant Ecology and Biodiversity)**

Semester: - III

Course Code	BOTT31A	Course Delivery Method	Class Room/Blended Mode - Both
Credits	3	CIA Marks	25
No. of Lecture Hours/ Week	4	Semester End Exam Marks	75
Total Number of Lecture Hours	60	Total Marks	100
Year of Introduction : 2021-22	Year of Offering 2021-2022	Year of Revision –	Percentage of Revision: 0%

Course Prerequisites: Knowledge of Anatomy and Embryology of angiosperms, Plant Ecology and Biodiversity at +2 level.

Course Description: This course will provide one with a basic and comprehensive understanding of anatomical structure and functions. Enable the student with depth of topics and helps them to gain an appreciation in the embryology of Angiosperms. On the other hand, importance of understanding plant ecology and biodiversity provides an extensive knowledge to the student.

Course Objectives:

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

1. To understand the Anatomy of Angiosperms.
2. To understand the Embryology of Angiosperms.
3. To understand the Basics of Ecology.
4. To understand the Population Community and Production Ecology.
5. To understand the Basics of Biodiversity.

Course Outcomes: At the end of this course, students should be able to:

CO1: Understand on the organization of tissues and tissue systems in plants.

CO2: Illustrate and interpret various aspects of embryology.

CO3: Discuss the basic concepts of plant ecology, and evaluate the effects of environmental and Biotic factors on plant communities.

CO4: Appraise various qualitative and quantitative parameters to study the population and community ecology.

CO5: Correlate the importance of biodiversity and consequences due to its loss and enlist the Endemic /endangered flora and fauna from two biodiversity hot spots in India and assess strategies for their conservation.

Syllabus

Course Details

Unit	Learning Units	Lecture Hours
I	Anatomy of Angiosperms Organization of apical meristems: Tunica-carpus theory and Histogen theory. Tissue systems–Epidermal, ground and vascular. Anomalous secondary growth in <i>Boerhavia</i> and <i>Dracaena</i> . Study of timbers of economic importance -Teak, Redsanders and Rosewood.	12
II	Embryology of Angiosperms History of embryology, Structure of anther, types of tapetum. Micro sporogenesis and development of male gametophyte. Structure of ovule, megaspore genesis; monosporic (<i>Polygonum</i>), bi sporic (<i>Allium</i>) and tetra sporic (<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.	12
III	Basics of Ecology 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.	12
IV	Population, Community and Production Ecology Population ecology: Natalty, 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.	12
V	Basics of Biodiversity 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 Eastern Ghats and Western Ghats. Principles of conservation: IUCN threat-categories, RED data book. Role of NBPGR and NBA in the conservation of Biodiversity.	12

Textbook:

- Botany–III(Vrukshasastram-I) : Telugu Akademi, Hyderabad
- Botany–IV(Vrukshasastram-II) : Telugu Akademi, Hyderabad
- Pandey,B.P. (2013)*CollegeBotany, Volume-II*, S. Chand Publishing, NewDelhi
- Pandey,B.P. (2013)*CollegeBotany, Volume-III*,S. Chand Publishing, New Delhi

Recommended Reference book:

- Esau, K. (1971) *Anatomyof Seed Plants*.JohnWileyand Son, USA.
- Fahn, A.(1990) *Plant Anatomy*, Pergamon Press,Oxford.
- Cutler, D.F., T.Botha& D. Wm. Stevenson (2008) *Plant Anatomy: An Applied Approach*, Wiley, USA.
- Paula Rudall(1987) *Anatomyof Flowering Plants: An Introduction to Structure and Development*.CambridgeUniversityPress,London.

Course Delivery method: Face-to-face / Blended.

Course has focus on: Foundation **Websites of Interest:**

<https://byjus.com/biology/tissues-anatomy-of-angiosperms/>

https://onlinecourses.swayam2.ac.in/cec21_bt22/preview

<https://explorenaturalcommunities.org/ecology-basics#:~:text=Ecology%20is%20the%20science%20of,and%20with%20their%20physical%20environment.>

[https://en.wikipedia.org/wiki/Community_\(ecology\)](https://en.wikipedia.org/wiki/Community_(ecology))

https://ec.europa.eu/environment/basics/natural-capital/biodiversity/index_en.htm#:~:text=%22Biodiversity%22%20is%20a%20word%20we,their%20habitats%20and%20their%20genes.&text=Much%20food%20production%20is%20only,that%20pollinate%20plants%20and%20trees.

Co-curricular Activities:

Question and answer session at the end of class. Observing animations.

Written assignments.

Preparation of models.

Making charts

Group Discussion (GD) /

Quiz.

Power Point

Presentations.

A .G & S .G. SIDDHARTHA DEGREE COLLEGE OF ARTS AND SCIENCE, VUYYURU

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TITLE OF THE PAPER: Anatomy and Embryology of Angiosperms, Plant Ecology and Biodiversity.

Model Question Paper Structure for SEE

Max. Time: 3 Hrs.

Course Code: BOTT31A

Max. Marks: 75M

Section-A

Answer Any Five at least one from each unit

5 x 5M = 25Marks

1. Tunica corpus theory. **CO1L1**
2. Rose wood. **CO1L2**
3. Nemec phenomenon. **CO2L2**
4. Ruminant endosperm. **CO2L2**
5. Food chain & Food web. **CO3L1**
6. Ecads. **CO4L2**
7. Earth summit. **CO5L1**
8. Identify Biodiversity hot spots of India **CO5L3**.

Section-B

Answer the following questions

5 x 10M = 50Marks

9. (a) Describe the epidermal tissue system. **CO1L1**
or **Unit I**
(b) What is anomalous secondary growth? Describe the anomalous secondary growth in *Boerhavia* stem. **CO1L1**
10. (a) What is embryosac? How many types are there? Explain the development of embryosac studied by you. **CO2L2, Unit II**
or
(b) Explain the development of embryo **CO2L2**
11. (a) What is an ecosystem? Give an account of structure of an ecosystem studied by you. **CO3L1**
or **Unit III**
(b) What is succession? Give account of xerosere. **CO3L1**
12. (a) What is population ecology? Explain characters of a population studied by you. **CO4L2**
or **Unit IV**
(b) List out the quantitative and qualitative characters of community. Explain? Qualitative characters of a plant community. **CO4L2**
13. (a) Classify and analyse main values of biodiversity. **CO5L4**
or **Unit V**
(b) Analyse the major threats to biodiversity. **CO5L4**

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Practical Syllabus

SEMESTER- III

PAPER- III

CREDITS: 02

BOTANY	BOTT3IA	WEF: 2022-2023	B. Sc (BZC), AQUA
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Title of the paper:: Anatomy and Embryology of Angio sperms, Plant Ecology and Biodiversity

NO OF HOURS: 30

Course Prerequisites: Knowledge of Anatomy and Embryology of angiosperms, Plant Ecology and Biodiversity at +2 level.

Course Description: This course will provide one with a basic and comprehensive understanding and skill of identifying anatomical structure and functions. Enable the student with depth of topics and helps them to gain an appreciation in the embryology of Angiosperms. On the other hand, importance of understanding plant ecology and biodiversity provides an extensive knowledge to the student.

Course Objectives:

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

1. To understand the Anatomy of Angiosperms.
2. To understand the Embryology of Angiosperms.
3. To understand the Basics of Ecology.
4. To understand the Population Community and Production Ecology.
5. To understand the Basics of Biodiversity.

Course Outcomes:

On successful completion of this practical course students shall be able to:

1. Get familiarized with techniques of section making, staining and microscopic study of vegetative, anatomical and reproductive structure of plants.
2. Observe externally and under microscope, identify and draw exact diagrams of the material in the lab.
3. Demonstrate application of methods in plant ecology and conservation of biodiversity and Qualitative and quantitative aspects related to populations and communities of plants.

Syllabus

Course Details:

Unit	Learning Units	Lecture Hours
I	Tissue organization in root and shoot apices using permanent slides. Anomalous secondary growth in stems of <i>Boerhavia</i> and <i>Dracaena</i> .	4
II	Study of anther and ovules using permanent slides/photographs. Study of pollen germination and pollen viability. Dissection and observation of Embryo sac haustoria in <i>Santalum</i> or <i>Argemone</i> . Structure of endosperm (nuclear and cellular) using permanent slides / Photographs. Dissection and observation of Endosperm haustoria in <i>Crotalaria</i> or <i>Coccinia</i> . Developmental stages of dicot and monocot embryos using permanent slides /photographs.	12
III	Study of instruments used to measure microclimatic variables; soil thermometer, maximum and minimum thermometer, anemometer, rain gauge, and luxmeter. (Visit to the nearest/local meteorology station where the data is being collected regularly and record the field visit summary for the submission in the practical). Study of morphological and anatomical adaptations of hydrophytes and xerophytes (02 each).	6
IV	Quantitative analysis of herbaceous vegetation in the college campus for frequency, density and abundance. Identification of vegetation/various plants in college campus and comparison with Raunkiaer's frequency distribution law.	6
V	Find out the alpha- diversity of plants in the area.	2

Recommended Reference book:

1. Practical Botany volume II- Bendra and Kumar.
2. Practical Botany volume II-O.P.Sharma.
3. Practical Botany volume III-H.N.Srivastava.
4. Khasim SM., Botanical Microtechnique- Principles & Practice, Capital Publishing Company.

Course Delivery method: Face-to-face / Blended.

Course has focus on: Skill Development.

Websites of Interest:

<https://youtu.be/iA5EqQm3hqw>
https://youtu.be/_3K2qLw_z_U
<https://youtu.be/ZIF4NTDL14U>
<https://youtu.be/qPUPw7iS86Q>
https://youtu.be/qGLo_cUMlHU
<https://youtu.be/SpI9GWgXJPQ>.

<https://youtu.be/ifAdxMspJGY>
<https://youtu.be/K86XXQdwIB4>
<https://youtu.be/c83EtBUrWsk>
<https://youtu.be/enD2OwXBhCM>
<https://youtu.be/M-TczeGvCCg>
<https://youtu.be/dDrrTbi88zE>
<https://youtu.be/aX58F5jWxU8>
<https://youtu.be/rSsFn1GEuyw>

Co-curricular Activities:

Question and answer session at the end of class.
Observing animations.
Written assignments. Preparation
of temporary slides. Group
Discussion (GD)/ Quiz.
Power Point Presentations.

Practical Model Question Paper

Max.: 40 Marks

Min. Pass: 16 Marks

.....

1. Take T.S of the given material 'A' (Anatomy), prepare a temporary slide and justify the identification with specific reasons.....**8M**
2. Write the procedure for the experiment 'B' (Embryology) and demonstrate the same...**8M**
3. Take T.S of the material 'C'. Prepare a temporary slide and justify the identification with specific reasons.....**8M**
4. Identify the following with specific reasons.....**4x2=8**

-
- D. Anatomy/Embryology
 - E. Ecology instrument
 - F. Mapping of Biodiversity hot spot.
 - G. Endemic/endangered plant/animal

-
5. Record +Viva-voce.....**5+3=8 M**

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(AUTONOMOUS).**

NAAC recredited at 'A' level
Autonomous –ISO 9001-2015 Certified

Title of the Paper: **Plant tissue culture**

Semester: - **V**

Course Code	BOT 501	Course Delivery Method	Class Room/Blended Mode - Both
Credits	3	CIA Marks	30
No. of Lecture Hours/ Week	3	Semester End Exam Marks	70
Total Number of Lecture Hours	50	Total Marks	100
Year of Introduction : 2022-23	Year of Offering 2022-2023	Year of Revision –	Percentage of Revision: 0%

Type of the Course: Skill Enhancement Course (Elective: Theory),

Course Outcomes: Students at the successful completion of the course will be able to:

CO1: Comprehend the basic knowledge and applications of plant tissue culture.

CO2: Identify various facilities required to set up a plant tissue culture laboratory.

CO3: Acquire a critical knowledge on sterilization techniques related to plant tissue culture.

CO4: Demonstrate skills of callus culture through hands on experience.

CO5: Understand the biotransformation technique for production of secondary metabolites.

Syllabus

Course Details:

Unit	Learning Units	Lecture Hours
I	Basic concepts of plant tissue culture (10h) 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.	10
II	Sterilization techniques and culture media (10h) 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 acids etc. Composition and preparation of Murashige and Skoog culture medium	10
III	Callus culture technique (10h) Explant: Definition, different explants for tissue culture: shoot tip, axillary buds, leaf discs, 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.	10
IV	Micropropagation (10h) Direct and indirect morphogenesis, organogenesis, role of PGRs; somatic embryogenesis and synthetic seeds. Greenhouse hardening unit operation and management; acclimatization and hardening of plantlets - need, process, packaging, exports. Pathogen (Virus) indexing- significance, methods, advantages, applications.	10
V	Applications of plant tissue culture (10h) Germplasm conservation: cryopreservation methods, slow growth, applications and limitations; cryoprotectants. Plant transformation techniques and bioreactors; production of secondary metabolites-optimization of yield, commercial aspects, applications, limitations. Transgenic plants- gene transfer methods; BT cotton.	10

- References/TextBook/ e-books/websites:

1. Razdan, M.K. (2005) Introduction to Plant Tissue Culture, Oxford & IBH Publishers, Delhi
2. Bhojwani, S.S. (1990) Plant Tissue Culture: Theory and Practical (a revised edition). Elsevier Science Publishers, New York, USA.

ReferenceMaterials ontheWeb/web links:

<https://www.youtube.com/watch?v=dFrX-t5J0PA>

<https://www.youtube.com/watch?v=A6qEgc6Jt3Q>

Co-CurricularActivities

(a) Mandatory:(Training of students by teacher in field related skills:(lab:10 + field: 05)

1. **For Teacher:** Training of students by teacher in the laboratory/field for a total of not less than 15 hours on the field techniques/skills of sterilization procedures, preparation of media, establishment of callus culture, growth measurements; morphogenesis and organogenesis; acclimatization and hardening of plantlets.

2. **For Student:** Students shall (individually) visit anyone of plant tissue culture laboratories in universities/research organizations/private facilities, write their observations on tools, techniques, methods and products of plant tissue culture; and submit a hand-written Fieldwork/Project work Report not exceeding 10 pages to the teacher in the given format.

3. Max marks for Fieldwork/Project work Report: 05

4. Suggested Format for Fieldwork/Project work Report: Title page, student details, index page, details of place visited, observations, findings and acknowledgements.

5. Unit tests (IE).

b) Suggested Co-Curricular Activities:

1. Training of students by related industrial experts.
2. Assignments (including technical assignments like identifying tools in plant tissue culture and their handling, operational techniques with safety and security, IPR)
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Preparation of videos on tools and techniques in plant tissue culture.
5. Collection of material/figures/photos related to products of plant tissue culture, writing and organizing them in a systematic way in a file.
6. Visits to plant tissue culture/biotechnology laboratories in universities, research organizations, private firms, etc.
7. Invited lectures and presentations on related topics by field/industrial experts.

TITLE OF THE PAPER: PLANT TISSUE CULTURE

Model Question Paper

Max. Time: 3 Hrs.

Course Code: BOT-501

Max. Marks: 70M

SECTION – A

Answer any FOUR of the following questions.

4x5=20 Marks

(Draw diagrams wherever necessary)

1. What is totipotency? Explain.
2. Describe the method of dry sterilization.
3. Enumerate the somaclonal variations.
4. Discuss about the virus indexing.
5. Prepare a note on cryoprotectants.
6. State a note on UV sterilization
7. What is an explant? Describe.
8. Describe the synthetic seeds in detail.

SECTION - B

Answer any Five of the following questions.

5x10 =50M.

(Draw diagrams wherever necessary)

9. Enumerate an account of Infrastructure and equipment required to establish a tissue culture laboratory.
10. Explain various methods of sterilization.
11. Discriminate an account of the composition and preparation of MS media.
12. Summarize an account of callus culture.
13. Paraphrase various ways of surface sterilization of explants
14. Illustrate about somatic embryogenesis.
15. Memorize the gene transfer methods.
16. State an account on secondary metabolite production through Bioreactors

Guide lines for paper setter: (for Paper V-BOT-501) W.e.f. 2022-23

1. In Section A: Unit II, III, VI, must carry Two questions from each unit. Unit I, V must carry one question.
2. In section-B: Set minimum two questions from Unit II, III & V and Set One Question from I, IV.
3. See the following table and Model paper.
4. Please provide the scheme of valuation for the paper.
5. Question paper should be both in English and Telugu media.

Unit	Section – A		Section - B		Weightage in
	Questions	Marks	Questions	Marks	Marks
Unit – I	1		1		
		5		10	15
Unit – II	2		2		
		10		20	30
Unit – III	2		2		
		10		20	30
Unit-IV	2		1		
		10		10	20
Unit-V	1		2		
		5		20	25
Max. Q & marks	8	(x 5) = 40	8	(x 10) = 80	(Total questions = 16) Marks 120
Max. Q and marks for Valuation	Questions	Marks	Questions	Marks	Max. marks
	4		5		
		(4 x 5) = 20		(5 x 10) = 50	70

INTERNAL EXAMS – 30 Marks

(20 marks for unit tests, 5 marks for assignments and remaining 5 marks for seminar etc.)

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Practical Syllabus

SEMESTER- III

PAPER- II

CREDITS: 02

BOTANY	BOT- 501	WEF: 2022-2023	B. Sc (BZC), AQUA
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Title of the paper: PLANT TISSUE CULTURE

NO OF HOURS: 30

Type of the Course: Skill Enhancement Course (Elective: Practical),

I. Course Outcomes: Students at the successful completion of the course will be able to:

- CO1: Demonstrate the applications of autoclave, laminar airflow, hot air oven.
- CO2: Sterilize the glassware and tools used for tissue culturing.
- CO3: Prepare different stock solutions, media.
- CO4: Measure the growth of callus formed.
- CO5: Demonstrate the hardening and acclimatization in green house.

II: Practical (Laboratory) Syllabus:(30Periods):Atleast8Practicals....

1. Principles and applications of- Autoclave, Laminar Airflow, Hot Air Oven.
2. Sterilization techniques for glass ware, tools etc.,
3. MS medium - Preparation of different stock solutions; media preparation
4. Explant preparation, inoculation and initiation of callus from carrot.
5. Callus formation, growth measurements.
6. Induction of somatic embryos, preparation of synthetic seeds.
7. Multiplication of callus and organogenesis.
8. Hardening and acclimatization in green house.

III. Lab References:

1. Reinert, J. and M.M. Yeoman, 1982. Plant Cell and Tissue Culture - A Laboratory
2. Manual, Springer-Verlag Berlin Heidelberg
3. Robert N. Trigiano and Dennis J. Gray, 1999. Plant Tissue Culture Concepts and Laboratory Exercises. CRC Press, Florida
4. Ashok Kumar, 2018. Practical Manual for Biotechnology, College of Horticulture & Forestry, Jhalawar, AU, Kota
5. Chawla, H.S., 2003. Plant Biotechnology: A Practical Approach, Nova Science Publishers, New York
6. Web sources suggested by the teacher concerned.

Practical Question Paper

Time : 3hrs

Max.Marks:50

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- | | | |
|--|-----|--------------------|
| 1. Demonstration of a sterilization technique | 'A' | 5 M |
| 2. Preparation of MS medium | 'B' | 5 M |
| 3. Demonstration of callus culture technique/growth measurements | 'C' | 5M |
| 4. Scientific observation and data analysis | | 4 x 2 = 8 M |
| D. Tissue culture equipment /photograph | | |
| E. Morphogenesis or organogenesis - photograph | | |
| F. Bioreactor/Secondary metabolite | | |
| G. Transgenic plant/photograph | | |
| 5. Viva voce | | 2M |

Internals:

- | | |
|----------------------------|------|
| 1. Record | .05M |
| 2. Project work..... | 10M |
| 3. Field trip | .5M |
| 4. Internal practical exam | 05M |

Total Marks: 25

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Title of the Paper: **mushroom cultivation (7C)**

Semester: - V

Course Code	BOT 501	Course Delivery Method	Class Room/Blended Mode - Both
Credits	3	CIA Marks	30
No. of Lecture Hours/ Week	3	Semester End Exam Marks	70
Total Number of Lecture Hours	50	Total Marks	100
Year of Introduction : 2022-23	Year of Offering 2022-2023	Year of Revision –	Percentage of Revision: 0%

Course Outcomes: Students at the successful completion of the course will be able to:

CO1: Comprehend the value of mushrooms.

CO2: Identify the methods of composting and the materials required.

CO3: Acquire a critical knowledge on spawning and casing.

CO4: Demonstrate skills in cultivation of various mushrooms.

CO5: Understand the Post-harvest technology.

Syllabus: (Total Theory Hours: 45 including Unit tests etc.)UNIT-I-Introduction and value of mushrooms .

Course Details:

Unit	Learning Units	Lecture Hours
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>Agaricusbisporus</i>), Milky mushroom (<i>Calocybe indica</i>), Oyster mushroom (<i>Pleurotussajor-caju</i>) and Paddy straw mushroom (<i>Volvariellavolvacea</i>). Nutritional 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>	10
II	<p>Basic requirements of cultivation system</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>	10
III	<p>Spawning and casing</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.</p> <p>Casing: Definition, Importance of casing mixture, Quality parameters of casing soil, different types of casing mixtures, commonly used materials.</p>	10
IV	<p>Mushroom cultivation</p> <p>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>	10
V	<p>Post harvest technology</p> <p>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.</p> <p>Management of spent substrates and waste disposal of various mushrooms.</p>	10

References/TextBook/ e-books/websites

1. Tewari Pankaj Kapoor, S. C. (1988). Mushroom Cultivation. Mittal Publication, New Delhi.
2. Pandey R.K, S. K Ghosh, (1996). A Hand Book on Mushroom Cultivation. Emkey Publications
3. Web resources suggested by the teacher concerned and the college librarian including reading material.

Reference Materials on the Web/web links:

<https://www.youtube.com/watch?v=DwMCw14khIU>

<https://www.youtube.com/watch?v=vggMIUelsoU>

IV Co-Curricular Activities

(a) Mandatory: (Training of students by teacher in field related skills: (lab: 10 + field: 05))

1. **For Teacher:** Training of students by teacher in the laboratory/field for not less than 15 hours on the field techniques/skills of identification of edible and poisonous mushrooms, basic facilities of a mushroom culture unit, preparation of compost and spawn, cultivation practices of edible mushrooms, storage and marketing of produce.

2. **For Student:** Students shall (individually) visit mushroom culture units in universities/research organizations/private sector write their observations on infrastructure, cultivation practices and products of a mushroom culture unit etc., and submit to the teacher a hand-written Fieldwork/Project work Report not exceeding 10 pages in the given format.

3. Max marks for Fieldwork/Project work Report: 05.

6. Suggested Format for Fieldwork/Project work Report: Title page, student details, index page, details of place visited, observations, findings and acknowledgements.

4. Unit tests (IE).

b) Suggested Co-Curricular Activities: 1. Training of students by related industrial experts.

2. Assignments (including technical assignments like identifying various mushrooms, tools and techniques for culture, identification and control of diseases etc.,

3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).

4. Preparation of videos on tools and techniques in mushroom culture.

5. Collection of material/figures/photos related to edible and poisonous mushrooms, cultivation of mushrooms in cottage industries, writing and organizing them in a systematic way in a file.

6. Visits to mushroom culture units in universities, research organizations, private firms, etc.

7. Invited lectures and presentations on related topics by field/industrial experts.

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TITLE OF THE PAPER: Mushroom Cultivation

Model Question Paper Structure for SEE

Max. Time: 3 Hrs.

Course Code: BOT-502

Max. Marks: 70M

SECTION – B

Answer any FOUR of the following questions.

4x5=20 Marks

(Draw diagrams wherever necessary)

1. Extend the medicinal value of *Ganoderma*.
2. Describe the small village unit.
3. List the facilities required for spawn preparation.
4. Explain weed mold in mushroom cultivation.
5. Illustrate the Novel Value Added Products of Mushrooms.
6. Enumerate the Poisonous mushrooms.
7. Summarize Layout of a mushroom farm.
8. Explain about the Casing oil.

SECTION – B

5x10 =50M

Answer all questions.

(Draw diagrams wherever necessary)

9. Describe the life cycle of a mushroom.
10. Describe the morphological features of Paddy straw and oyster mushroom.
11. Explain various types of composting methods.
12. Point out basic requirements of mushroom cultivation.
13. What is casing? Explain different types of casing mixture and their Importance.
14. Summarize the process of cultivation of Milky mushroom.
15. Extend an account cultivation of Oyster mushroom.
16. What are the conditions required to improve shelf life of mushrooms?

Guide lines for paper setter: (for Paper V-BOT-502) W.e.f. 2022-23

6.In Section A: Unit I, II, III, must carry Two questions from each unit. UnitI VI& V must carry one question.

7.In section-B: Set minimum two questions from Unit I, II & IV and Set One Question from III & V.

8.See the following table and Model paper.

9.Please provide the scheme of valuation for the paper.

10. Question paper should be both in English and Telugu media.

Unit	Section – A		Section - B		Weightage in
	Questions	Marks	Questions	Marks	Marks
Unit – I	2		2		
		10		20	30
Unit – II	2		2		
		10		20	30
Unit – III	2		1		
		10		10	20
Unit-IV	1		2		
		5		20	25
Unit-V	1		1		
		5		10	15
Max. Q & marks	8	(x 5) = 40	8	(x 10) = 80	(Total questions = 16) Marks 120
Max. Q and marks for Valuation	Questions	Marks	Questions	Marks	Max. marks
	4		5		
		(4 x 5) = 20		(5 x 10) = 50	70

INTERNAL EXAMS – 30 Marks

(20 marks for unit tests, 5 marks for assignments and remaining 5 marks for seminar etc.)

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Practical Syllabus

SEMESTER- V (7C)

PAPER- V

CREDITS: 02

BOTANY	BOT-502	WEF: 2022-2023	B. Sc (BZC), AQUA
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MUSHROOM CULTIVATION

Type of the Course: Skill Enhancement Course (Elective: Practical),

I. Course Outcomes: Students at the successful completion of the course will be able to:

CO1: Identify different types of mushroom.

CO2: Demonstrate preparation of pure culture of an edible mushroom.

CO3: Prepare compost and casing mixture.

CO4: Crop and harvest mushrooms.

CO5: Prepare value-added products.

II: Practical (Laboratory) Syllabus :(30Periods):Atleast8Practicals....

1. Identification of different types of mushrooms.
2. Preparation of pure culture of an edible mushroom.
3. Preparation of mother spawn.
4. Production of planting spawn and storage.
5. Preparation of compost and casing mixture.
6. Demonstration of spawning and casing.
7. Hands on experience on cropping and harvesting.
8. Demonstration of storage methods.
9. Preparation of value-added products.

III. Lab References:

1. Sushma Sharma Sapna Thakur Ajar NathYadav, 2018. Mushroom Cultivation: A Laboratory Manual, Eternal University, Sirmour, H.P.
2. Kadhila -Muandingi, N.P., F. S. Mubiana and K. L. Halueendo, 2012. Mushroom Cultivation: A Beginners Guide, The University of Namibia
3. Gajendra Jagatap and UtpalDey, 2012. Mushroom Cultivation:Practical Manual, LAMBERT Academic Publishing, Saarbrücken, Germany
4. Deepak Som, 2021. A Practical Manual on Mushroom Cultivation, P.K.Publishers& Distributors, Delhi
5. Web sources suggested by the teacher concerned.

Question Paper Pattern: Practicals

Time: 3 hrs

Max.Marks:50

-
1. Demonstration of preparing pure culture/mother spawn 'A' 5 M
 2. Preparation method for planting spawn and storage/compost and casing material 'B' 5 M
 3. Demonstration of spawning and casing/storage and making a value- added product 'C' 5 M

4. Scientific observation and data analysis

4 x 2 = 08M

- D. Edible/poisonous mushroom specimen/photograph
- E. Infrastructure/tool used in mushroom cultivation
- F. Material for compost/casing
- G. Storage practice/ a value-added product
5. Viva Voce

2M

Internals:

1. Record .05M
2. Project work..... 10M
3. Field trip .5M
4. Internal practical exam 05M

Total Marks: 25
