SRR & CVR Government Degree College (A)

An Autonomous & ISO 9001: 2015 Certified Institution:: Ranked by NIRF in 101-150 band at NIRF-2020 & 151-200 band in NIRF 2019 NAAC accredited Institution with grade B+ with C.G.P.A 2.6 during March, 2017

Machavaram, Vijayawada, Krishna District, AP-520 004

BOARD OF STUDIES : AY-2022-23

BOTANY SEM I TO SEM IV

DEPARTMENT OF BOTANY

SRR & CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA-52004

An autonomous college in the jurisdiction of Krishna University, Machilipatnam. A.P.

I-BZC	BOTANY-I	SEM-I	Course code: BOT N-1321	2022-23	No. of Credits:4	No. of Hrs /Week:4

FUNDAMENTALS OF MICROBES AND NONVASCULAR PLANTS (VIRUSES, BACTERIA, FUNGI, LICHENS, ALGAE AND BRYOPHYTES)

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

CO1: Explain origin of life on the earth.
CO2: Illustrate diversity among the viruses and prokaryotic organisms and can categorize.
CO3: Classify non vascular plants based on their structure, reproduction and life cycles.
CO4: Analyze and ascertain the plant disease symptoms due to microbes and fungi.
CO5: Evaluate the ecological and economic value of microbes, thallophytes and bryophytes.

Unit-1: Origin of life and Viruses 12Hrs.

1. Origin of life, concept of primary Abiogenesis; Miller and Urey experiment. Five kingdom classification of R.H. Whittaker
2. Discovery of microorganisms, Pasteur experiments, germ theory of diseases.
3. Shape and symmetry of viruses; structure of TMV and Gemini virus; multiplication of TMV; A brief account of Prions and Viroids. 4. A general account on symptoms of plant diseases caused by Viruses. Transmission of plant viruses and their control.

Unit-2: Special groups of Bacteria and Eubacteria 12 Hrs.

1. Brief account of Archaebacteria, Actinomycetes and Cyanobacteria.
2. Eubacteria: Cell structure, nutrition and reproduction
3. Economic importance of Bacteria with reference to their role in Agriculture and industry (fermentation and medicine).
4. A general account on symptoms of plant diseases caused by Bacteria; Citrus canker.

Unit-3: Fungi & Lichens 12 Hrs.

1. General characteristics of fungi and Ainsworth classification (up to classes). 2. Structure, reproduction and life history of (a)*Rhizopus* (Zygomycota)and (b)*Puccinia* (Basidiomycota), economic uses of fungi in food industry, pharmacy and agriculture.
3. A general account on symptoms of plant diseases caused by Fungi; Blast of Rice.
4. Lichens- structure and reproduction; ecological and economic importance.

Unit -4: Algae **12 Hrs.**

1. General characteristics of Algae (pigments, flagella and reserve food material);Fritsch classification (up to classes).
2. Thallus organization and life cycles in Algae.
3. Occurrence, structure, reproduction and life cycle of (a) *Spirogyra* (Chlorophyceae) and(b) *Polysiphonia* (Rhodophyceae).
4. Economic importance of Algae.

Unit -5: Bryophytes **12 Hrs.**

1. General characteristics of Bryophytes
2. Classification of Bryophytes up to classes.
3. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life cycle of (a) *Marchantia* (Hepaticopsida) and (b) *Funaria* (Bryopsida).
4. General account on evolution of sporophytes in Bryophytes.

Text books:

1. Pandey, B.P. (2013). College Botany, Volume-I, S. Chand Publishing, New Delhi
2. Hait, G., Bhattacharya, K. and Ghosh, A.K. (2011). A Text Book of Botany, Volume-I, New Central Book Agency Pvt. Ltd., Kolkata 3. Bhattacharjee, R.N. (2017). Introduction to Microbiology and Microbial Diversity. Kalyani Publishers, New Delhi.

Books for Reference:

1. Dubey, R.C. and Maheswari, D.K. (2013). A Text Book of Microbiology, S.Chand & Company Ltd., New Delhi.
2. Presscott, L. Harley, J. and Klein, D. (2005). Microbiology, 6th edition, Tata McGraw –Hill Co. New Delhi.
3. John Webster & R. W. S. Weber. (2007). Introduction to Fungi,Cambridge University Press, New York
4. Shaw, A.J. & Goffinet, B. (2000). Bryophyte Biology. Cambridge University Press, New York.
5. Robert Edward Lee (2008). Phycology. Cambridge University Press, New York.

SRR & CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA-52004

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I-BZC	BOTANY-I	SEM-I	Course code: BOT N-1321P	2022-23	No. of Credits: 1	No. of Hrs /Week:2

FUNDAMENTALS OF MICROBES AND NONVASCULAR PLANTS

(VIRUSES, BACTERIA, FUNGI, LICHENS, ALGAE AND BRYOPHYTES) **Practical Syllabus**

1. Knowledge of Microbiology laboratory practices and safety rules.
2. Knowledge of different equipment for Microbiology laboratory
    a. Spirit lamp
    b. Inoculation loop
    c. Hot-air oven
    d. Autoclave/Pressure cooker
    e. Laminar air flow chamber and
    f. Incubator and their working principles.
3. Demonstration of Gram's staining technique for Bacteria.
4. Study of Viruses (Corona, Gemini and TMV) using electron micrographs/ models.
5. Study of Archaebacteria and Actinomycetes using permanent slides/ electron micrographs/diagrams.
6. Study of *Anabaena* and *Oscillatoria* using permanent/temporary slides.
7. Study of different bacteria (Cocci, Bacillus, Vibrio and Spirillum) using permanent or temporary slides/ electron micrographs/ diagrams.
8. Study/ microscopic observation of vegetative, sectional/anatomical and reproductive structures of the following using temporary or permanent slides/ specimens/ mounts :
    a. Fungi : *Pencillium, Rhizopus,* and *Puccinia*
    b. Lichens: Crustose, foliose and fruticose
    c. Algae : *Spirogyra*, *Ectocarpus* and *Polysiphonia*
    d. Bryophyta : *Marchantia* and *Funaria*
9. Study of specimens of Tobacco mosaic disease, Citrus canker and Blast of Rice.
10. Local visit to *Spirulina* cultivation and powder unit

SRR & CVR GOVERNMENT DEGREE COLLEGE (A),VIJAYAWADA
I. B.Sc., BOTANY SEMESTER END EXAMINATION; Course-I
(FUNDAMENTALS OF MICROBES AND NONVASCULAR PLANTS)
(VIRUSES, BACTERIA, FUNGI, LICHENS, ALGAE AND BRYOPHYTES)

Course Code: BOT N-1321 **Max. Marks: 60M**

Time: 3hrs **Pass Min: 24M**

MODEL QUESTION PAPER
SECTION-A

I. Answer any <u>five</u> of the following 5 X 4 = 20M

1. Structure of TMV
2. Prions and Viroids
3. Actinomycetes
4. Blast of rice
5. Pigments in Algae
6. Gemma cup
7. Asexual reproduction in Lichen
8. Nutrition in Bacteria
9. Lichen Apothecium
10. Cystocarp

II. Answer the following 5X8=40M

11.a) Describe R.H. Whittaker's five kingdom Classification of microorganisms in detail.

Or

b) Describe the Discovery of microorganisms, theories of the origin of life in detail.

12. a) Describe the Economic importance of Bacteria.

Or

b) Explain the Cell structure in Bacteria.

13. a) Describe the life cycle of *Puccinia* on the primary host.

Or

b) What are lichens? Give an account of different types of lichens.

14. a) Describe the range of thralls organization in Algae.

Or

b) Give an account of reproduction in Spirogyra.

15. a) Give an account of sporophyte evolution in Bryophytes.

Or

b) Describe the structure of the Funaria capsule.

SRR & CVR GOVERNMENT DEGREE COLLEGE (A): VIJAYAWADA
I. B.Sc., BOTANY EXTERNAL PRACTICAL EXAMINATION; Course-I
(FUNDAMENTALS OF MICROBES AND NONVASCULAR PLANTS)
(VIRUSES, BACTERIA, FUNGI, LICHENS, ALGAE AND BRYOPHYTES)

Course Code: BOT N-1321P **Max. Marks: 25M**

Time: 2hrs **Pass Min : 10M**

1. Take the T.S. of material 'A' (Fungi), make a temporary mount and identify giving reasons----------**4M**

2. Identify any 2 algae from the mixture (material 'B') given and specify reasons----------**4M**

3. Take the T.S. of material 'C' (Bryophyta), make a temporary mount and identify giving reasons----------**4M**

4. Identify the following with specific reasons----------**4x2=8M**

A. A laboratory equipment of Microbiology

B. Virus

C. Archaebacteria /Ascomycetes /Cyanobacteria/ Eu-Bacteria

D. Lichen

5. Record + Viva-voce **3+2 = 5 M**

SRR & CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA-52004

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I-BZC	BOTANY-I	SEM-I	Course code: BOT N-1321	2022-23	No. of Credits:4	No. of Hrs /Week:4

FUNDAMENTALS OF MICROBES AND NONVASCULAR PLANTS (VIRUSES, BACTERIA, FUNGI, LICHENS, ALGAE AND BRYOPHYTES)

QUESTION BANK

UNIT-I

Essays

1. Describe R.H. Whittaker's five kingdom Classification of microorganisms in detail.
2. Describe about Discovery of microorganisms, theories of origin of life in detail.
3. Give an account of Transmission of plant viruses and their control.

Short answers

13.Structure of TMV

14. Prions and Viroids
15. Gemini virus
16. Symptoms of viral diseases

UNIT-II

Essays

1. Describe the Economic importance of Bacteria.
2. Explain the Cell structure in Bacteria.
3. Give a brief account of Cyanobacteria.

Short answers

1. Citrus canker
2. Actinomycetes
3. Nutrition in Bacteria
4. Symptoms of Bacterial diseases

UNIT-III

Essays

1. Describe the life cycle of *Puccinia* on primary host.
2. Explain the uses of fungi in food industry, pharmacy and agriculture.
3. What are lichens? Give an account of different types of lichens.

Short answers

1. Blast of Rice
2. Asexual reproduction in *Rhizopus*
3. Asexual reproduction in Lichens
4. Special structures in fungi

UNIT-IV

Essay

1. Describe the range of thralls organization in Algae
2. Give an account of reproduction in Spirogyra.
3. Explain the post fertilization changes in *Polysiphonia.*

Short Answer

1. Algae in food industry
2. Pigments in algae
3. Tetra sporophyte
4. Diplontic life cycle

UNIT-V

Essay

1. Give an account of sporophyte evolution in Bryophytes.
2. Describe the structure of the Funaria capsule.
3. Write an essay on Antheridiophore and Archegoniophore in Marchantia.

Short Answer

1. Gemma cup
2. Antheridial head in Funaria
3. Anthoceropsida
4. Protonema

SRR & CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA-52004

An autonomous college in the jurisdiction of Krishna University, Machilipatnam. A.P.

I-BZC	BOTANY-II	SEM-II	Course code: BOT N-2321	2022-23	No. of Credits:4	No. of Hrs /Week:4

BASICS OF VASCULAR PLANTS AND PHYTOGEOGRAPHY

(PTERIDOPHYTES, GYMNOSPERMS, TAXONOMY OF ANGIOSPERMS & PHYTOGEOGRAPHY)

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

CO1: Classify & know morphology, anatomy, reproduction, life cycles and evolutionary trends in Pteridophytes

CO2: Classify, know morphology, anatomy, reproduction and life cycles of Gymnosperms and fossilization .

CO3: Able to recognize the Angiosperm plant families based on morphology of local plants

CO4: Evaluate the ecological, ethnic and economic value of tracheophytes for human welfare.

CO5: Can understand principles and regions of Phytogeography

Unit-1: Pteridophytes 12 Hrs.

1. General characteristics of Pteridophyta; classification of Smith (1955) up to divisions.
2. Occurrence, morphology, anatomy, reproduction (developmental details are not needed)and life history of (a) *Lycopodium* (Lycopsida) and (b) *Marsilea* (Filicopsida)
3. Stelar evolution in Pteridophytes
4. Heterospory and seed habit.

Unit-2: Gymnosperms 14 Hrs.

1. General characteristics of Gymnosperms; Sporne classification up to classes.
2. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life history of (a) *Pinus* (Coniferopsida) and (b) *Gnetum* (Gnetopsida)
3. Outlines of geological time scale.
4. A brief account on *Cycadeoidea*

Unit -3: Basic aspects of Taxonomy 13 Hrs.

1. Aim and scope of taxonomy; Species concept: Taxonomic hierarchy, species, genus and family
2. Plant nomenclature: Binomial system, ICN- rules for nomenclature 3. Herbarium Methodology, BSI herbarium and Kew herbarium; concept of digital herbaria
4. Bentham and Hooker system of classification

Unit-4: Systematic taxonomy **13 Hrs.**

1. Systematic description and economic importance of the following families: Annonaceae, Malvaceae, Cucurbitaceae
2. Systematic description and economic importance of the following families: Asteraceae, Asclepiadaceae, Euphorbiaceae, Orchidaceae, Poaceae
3. Outlines of Angiosperm Phylogeny Group (APG IV)
4. Vegetation types in Andhra Pradesh

Unit-5: Phytogeography **08 Hrs.**

1. Principles of Phytogeography, Distribution (wides, endemic, discontinuous species)
2. Endemism-types and causes.
3. Phytogeographic regions of the World.
4. Phytogeographic regions of India.

TEXT BOOKS:

1. Acharya, B.C. (2019). Archegoniates. Kalyani Publishers, New Delhi 2. Bhattacharya, K. Hait, G. & Ghosh, A. K. (2011). A Text Book of Botany, Volume-II, New Central Book Agency Pvt. Ltd., Kolkata 3. Pandey, B.P. (2013). College Botany, Volume-I, S. Chand Publishing, New Delhi.

REFERENCE BOOK:

1. Sharma, O.P.(2012). Pteridophyta. Tata McGraw-Hill, New Delhi. 2. Bhatnagar, S.P. & AlokMoitra (1996).Gymnosperms. New Age International, New Delhi.
3. Singh, G. (2012). Plant Systematics: Theory and Practice. Oxford & IBH Pvt. Ltd., NewDelhi.
4. Simpson, M.G. (2006). Plant Systematics. Elsevier Academic Press, San Diego, CA, U.S.A.
5. Good, R. (1997). The Geography of Flowering Plants (2nd Edn.)Longmans, Green & Co., Inc., London & Allied Science Publishers, New Delhi.

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I-BZC	BOTANY-II	SEM-II	Course code: BOT N-2321P	2022-23	No. of Credits:1	No. of Hrs /Week:2

BASICS OF VASCULAR PLANTS AND PHYTOGEOGRAPHY

(PTERIDOPHYTES, GYMNOSPERMS, TAXONOMY OF ANGIOSPERMS & PHYTOGEOGRAPHY)

Practical syllabus

1. Study/ microscopic observation of vegetative, sectional/anatomical and reproductive structures of the following using temporary or permanent slides/ specimens/ mounts :

a. Pteridophyta : *Lycopodium* and *Marselia*

b. Gymnosperms : *Cycas, Pinus* and *Gnetum*

2. Study of fossil specimens of *Cycadeoidea* (photographs /diagrams can be shown if specimens are not available).

3. Demonstration of herbarium techniques.

4. Systematic / taxonomic study of locally available plants belonging to the families prescribed in theory syllabus. (Submission of 30 Herbarium sheets of wild plants with the standard system is mandatory).

5. Mapping of phytogeographical regions of India and World.

SRR & CVR GOVERNMENT DEGREE COLLEGE (A): VIJAYAWADA I. B.Sc., BOTANY SEMESTER END EXAMINATION; Course-II
BASICS OF VASCULAR PLANTS AND PHYTOGEOGRAPHY
(PTERIDOPHYTES, GYMNOSPERMS, TAXONOMY OF ANGIOSPERMS AND PHYTOGEOGRAPHY)

Course Code : BOT N-2321 **Max. Marks: 60M**
Time: 3hrs **Pass Min: 24M**

MODEL QUESTION PAPER

SECTION-A

Answer any five of the following 5 X 4 = 20M

1. *Lycopodium* cone L.S.
2. Cycadeoidea
3. Typification
4. Head inflorescence
5. Grasslands of world
6. Vegetation of Andhra Pradesh
7. *Pinus* ovule
8. Digital herbaria
9. Wides
10. Flower in Orchidaceae

SECTION-B

Answer the following questions 5 x 8 = 40 M

11. a) Describe stelar evolution in Pteridophytes.

Or

b) Describe the internal structure of *Marselia* petiole and rhizome.

12. a) Describe the internal structure of the Pinus needle. Add a note on its xerophytic characters

Or

b) Give an account of geological time scale.

13. a) Describe the salient features of Bentham and Hooker's system of classification.

Or

b) Explain various steps involved in Herbarium preparation.

14. a) Describe the vegetative and floral characters of family Malvaceae.

Or

b) Give an account of floral characters of family Asclepiadaceae and add a note on its economic importance.

15. a) Describe the phytogeographical regions of India.

Or

b) Give an account of vegetation types of Andhra Pradesh

SRR & CVR GOVERNMENT DEGREE COLLEGE (A): VIJAYAWADA I. B.Sc., BOTANY EXTERNAL PRACTICAL EXAMINATION; Course-II (BASICS OF VASCULAR PLANTS AND PHYTOGEOGRAPHY)

(PTERIDOPHYTES, GYMNOSPERMS, TAXONOMY OF ANGIOSPERMS AND PHYTOGEOGRAPHY)

Course Code : BOT N-2321P **Max. Marks : 25M**

Time: 2hrs **Pass Min :10M**

1. Take T.S. of the material 'A' (Pteridophyta), make a temporary slide and justify the identification with apt points.----------**5M**

2. Take T.S. of the material 'B' (Gymnosperms), make a temporary slide and justify the identification with apt points.----------**5M**

3. Describe the vegetative and floral characters of the material 'C' (Taxonomy of Angiosperms) and derive its systematic position.----------**5M**

4. Write the Botanical name and family of herbarium sheet supplied to you ----------**2X2=2M**

5. Locate the specified phytogeographical regions in India map------**2X1=2M**

6. Record + Herbarium & Field note book----------**2+2 +2 = 6 M**

SRR & CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA-52004

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I-BZC	BOTANY-II	SEM-II	Course code: BOT N-2321	2022-23	No. of Credits:4	No. of Hrs /Week:4

BASICS OF VASCULAR PLANTS AND PHYTOGEOGRAPHY

(PTERIDOPHYTES, GYMNOSPERMS, TAXONOMY OF ANGIOSPERMS AND PHYTOGEOGRAPHY)

QUESTION BANK

UNIT-I

Essays

1. Describe stelar evolution in Pteridophytes.
2. Explain various types of prothallus in *Lycopodium.*
3. Describe the internal structure of *Marselia* petiole and rhizome.

Short answers

1. *Lycopodium* cone L.S.
2. Heterospory
3. *Marsilea* sporocarp

UNIT-II

Essays

1. Describe the internal structure of *pinus* needle and add a note on its xerophytic adaptations.
2. Describe male and female cone in *Pinus.*
3. Give an account of geological time scale.

Short answers

1. Morphology of ovuliferous scale in *Pinus*
2. Male cone in *Gnetum*
3. *Cycadeoidea*

UNIT-III

Essays

1. Describe the salient features of Bentham and Hooker's system of classification.
2. Give an account of ICN rules.
3. Explain various steps involved in Herbarium preparation.

Short answers

1. Binomial nomenclature
2. Concept of Digital herbaria
3. Typification

UNIT-IV

Essays

1. Describe the vegetative and floral characters off family Malvaceae. 2. Describe the floral characters of family Asclepiadaceae and add note on its economic importance
3. Give an account of floral characters of family Poaceae and add a note on its economic importance.

Short answers

1. Head inflorescence
2. Flower in Orchidaceae
3. Morphology of tendrils in Cucurbitaceae

UNIT-V

Essays

1. Describe the phytogeographical regions of India.
2. What is Endemism? What are the causes and types of endemism?
3. Give an account of Vegetation types of Andhra Pradesh.

Short answers

1. Discontinuous species
2. Grasslands of the world
3. Wides

SRR & CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA-52004

An autonomous college in the jurisdiction of Krishna University, Machilipatnam. A.P.

II-BZC	BOTANY-III	SEM-III	Course code: BOT N-3321	2022-23	No. of Credits:4	No. of Hrs /Week: 4

ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS, PLANT ECOLOGY AND BIODIVERSITY

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

CO1: Understand the various tissues, tissue systems and secondary growth in plants.

CO2: Able to learn male, female gametophytes, endosperm development and embryogeny

CO3: Able to understand the concept of ecosystem ,succession, role of Abiotic, biotic and edaphic factors on ecosystem,

CO4: Understand the concepts population, community, Production ecology and bio geo chemical cycles

CO5: Learn about the biodiversity , threats Hotspots and conservation

Unit-1: Anatomy of Angiosperms 12 Hrs.

1. Meristems: Organization of apical meristems: Apical cell theory, Tunica-corpus theory, Histogen theory and Korper-Kappe theory
2. Tissue systems-Epidermal, ground and vascular tissue system
3. Anomalous secondary growth in *Boerhaavia* and *Dracaena.*
4. Study of timbers of economic importance - Teak, Red sanders and Rosewood.

Unit-2: Embryology of Angiosperms 12 Hrs.

1. Structure of anther, anther wall, types of tapetum. Microsporogenesis and development of male gametophyte.
2. Structure of ovule, types of ovules, megasporogenesis; monosporic (*Polygonum*), bisporic (*Allium*) and tetrasporic (*Peperomia*) types of embryo sacs.
3. Endosperm-Types of endosperm- Free nuclear, cellular, helobial and ruminate.
4. Embryogeny: Development of Dicot (*Capsella bursa-pastoris*) embryo, Monocot (*Sagittaria sagittifolia*) embryo and Polyembryony

Unit-3: Basics of Ecology 12 Hrs.

1. Ecology: definition, branches and significance of ecology.
2. Ecological factors: Climatic (light and temperature), edaphic (Soil profile, Soil water, Humus only) and biotic factors.
3. Ecosystem: Concept and components, energy flow, food chain, food web, ecological pyramids.
4. Ecological succession: General process of succession, Hydrosere and Xerosere.

Unit-4: Population, Community and Production Ecology 12 Hrs.

1. Population ecology: Natality, mortality, Survivorship curves, growth curves, ecotypes, ecads
2. Community ecology: Quantitative characters- Frequency, density, cover, Qualitative characters-life forms, biological spectrum
3. Concepts of productivity: GPP, NPP, Secondary productivity
4. Biogeochemical cycles: CO2, Phosphorus and Hydrological

Unit-5: Basics of Biodiversity 12 Hrs.

1. Biodiversity: Levels of Biodiversity and value of Biodiversity 2. Biodiversity Hotspots in India. Biodiversity in North Eastern Himalayas and Western Ghats.
3. Threats to Biodiversity, IUCN threat-categories, RED data book
4. Principles of conservation: In-situ conservation (National parks, Wild life sanctuaries, Biosphere reserves), Ex-situ conservation (Botanical garden and seed banks). Role of NBPGR and NBA in the conservation of Biodiversity.

Text books:

1. Botany – III (Vrukshasastram-I): Telugu Akademi, Hyderabad
2. Botany – IV (Vrukshasastram-II): Telugu Akademi, Hyderabad

Books for Reference:

1. Esau, K. (1971). Anatomy of Seed Plants. John Wiley and Son, USA.
2. Bhojwani, S. S. and S. P. Bhatnagar (2000). The Embryology of Angiosperms (4th Ed.),Vikas Publishing House, Delhi.
3. Kormondy, Edward J. (1996) Concepts of Ecology,Prentice-Hall of India Private Limited, New Delhi .
4. Kumar H.D. (2000): Biodiversity & Sustainable Conservation Oxford & IBH Publishing Co Ltd. New Delhi.
5. Kumar, U. (2007). Biodiversity : Principles & Conservation, Agrobios (India), Jodhpur

II-BZC	BOTANY-III	SEM-III	Course code: BOT N-3321 P	2022-23	No. of Credits:1	No. of Hrs /Week:2

ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS, PLANT ECOLOGY AND BIODIVERSITY

1. Tissue organization in root and shoot apices using permanent slides.
2. Anomalous secondary growth in stems of *Boerhavia* and *Dracaena*.
3. Study of anther and ovule using permanent slides/photographs.
4. Study of pollen germination and pollen viability.
5. Structure of endosperm (nuclear and cellular) using permanent slides / Photographs.
6. Developmental stages of dicot and monocot embryos using permanent slides / photographs.
7. Ecology Instruments:
1. Soil thermometer 2. Maximum and minimum thermometer
3. Anemometer 4. Rain gauze 5. Lux meter.
8. Study of morphological and anatomical adaptations of hydrophytes and xerophytes (02 each).
9. Find out the alpha-diversity of plants in the area
10. Mapping of biodiversity hotspots of India.

II. B.Sc., BOTANY SEMESTER END EXAMINATION; Course-III
(ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS, PLANT ECOLOGY AND BIODIVERSITY)

Course Code : BOT N-3321 **Max. Marks: 60M**
Time: 3hrs **Pass Min: 24 M**

MODEL QUESTION PAPER
SECTION-A

I. Answer any five of the following 5 X 4 = 20M

1. Types of stomata
2. Types of ovules
3. Ecological pyramids
4. Raunkier's life form
5. IUCN categories
6. Rose wood
7. Photoperiodism
8. NBPGR
9. Tapetum
10. Xerosere

SECTION-B

II. Answer the following questions **5 x 8 = 40 M**

11. a) Describe vascular tissue system.
Or
b) Describe the process of anomalous secondary growth in *Boerhaavia.*

12. a) Explain various types of endosperm seen in angiosperms.

Or
b) Describe the process of Dicot embryo development with the help of suitable example

13. a) Describe the structure of a typical Ecosystem.
Or
b) Explain the process of plant succession in aquatic environment

14. (a) Explain characters of a population studied by you.
Or
(b) Give an account of productivity of an ecosystem.

15. (a) What are the major threats to loss of Biodiversity.
Or
(b) Discuss Biodiversity in North Eastern Himalayas and Western Ghats.

B.Sc., BOTANY EXTERNAL PRACTICAL EXAMINATION; Course-III
(ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS, PLANT ECOLOGY AND BIODIVERSITY)

Course Code: BOT N-3321P **Max. Marks: 25M**

Time: 2hrs **Pass Min: 10M**

1. Take the T.S of the given material **"A" (Anatomy).** Stain, mount and leave the slide for evaluation. Identify giving reasons with the help of labeled diagrams----------**5M**

2. Write the procedure for the experiment '**B**' **(Embryology)** and demonstrate the same----------**5 M**

3. Take the T.S of the given material **"C". (Ecology)** Stain, mount and leave the slide for evaluation. Identify giving reasons with the help of labeled diagrams----------**5M**

4. Identify the following with specific reasons----------4 x 2 = 8 M

D. Anatomy/Embryology

E. Embryology

F. Ecology specimen

G. Ecological instrument

5. Viva-voce 2 M

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II-BZC	BOTANY-III	SEM-III	Course code: BOT N-3321	2022-23	No. of Credits:4	No. of Hrs /Week:4

ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS, PLANT ECOLOGY AND BIODIVERSITY

QUESTION BANK

UNIT-I

Essays

1. Describe vascular tissue system.
2. Describe the process of anomalous secondary growth in *Boerhaavia.*
3. Explain various theories of shoot apical meristem organization.

Short answers

1. Types of stomata
2. Rose wood
3. Classification of meristems
4. Theories of root apical meristem

UNIT-II

Essays

1. Explain various types of endosperm seen in angiosperms.
2. Describe the process of Dicot embryo development with the help of suitable example
3. Explain various types of embryo sacs seen in angiosperms with one type each.

Short answers

1. Types of ovules
2. Tapetum
3. Polyembryony
4. Anther wall

UNIT-III

Essays

1. Describe the structure of a typical Ecosystem.
2. Explain the process of plant succession in aquatic environment.
3. Describe light as an ecological factor.

Short answers

1. Ecological pyramids
2. Soil profile
3. Food chains
4. General process of succession

UNIT-IV

Essays

1. Explain characters of a population studied by you.
2. Give an account of productivity of an ecosystem.
3. Describe quantitative characters of a Community

Short answers

1. Ecotypes
2. Biological spectrum
3. Ecads
4. Growth curves

UNIT-V

Essays

1. What are the major threats to loss of Biodiversity?

2. Discuss Biodiversity in North Eastern Himalayas and Western Ghats.

3. Explain the role of national parks, wild life sanctuaries and biosphere reserves in the conservation of Biodiversity.

Short answers

1. NBPGR
2. Western Ghats
3. Value of Biodiversity
4. Levels of Biodiversity

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II-BZC	BOTANY-IV	SEM-IV	Course code: BOT N-4321	2022-23	No. of Credits:4	No. of Hrs /Week:4

PLANT PHYSIOLOGY AND METABOLISM

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

CO1: Understand plant structures in the context of physiological functions of plants in relation to water
CO2: Unravel the concepts of Mineral nutrition , Respiration and Enzymes
CO3: Know the Concepts of Photosynthesis , Photosystems,Photorespiration and Carbon assimilation pathways.
CO4: Learn detailed pathway of Nitrogen and lipid metabolism
CO5: Learn about the growth and development, Physiological changes and effects of plant growth regulators

Unit-1: Plant-Water relations 10 Hrs.

1. Importance of water to plant life, physical properties of water, diffusion, imbibition, osmosis. Water potential, osmotic potential, pressure potential.
2. Absorption and lateral transport of water; Ascent of sap
3. Transpiration: stomata structure and mechanism of stomatal movements (K^+ ion flux).
4. Mechanism of phloem transport; source-sink relationships.

Unit-2: Mineral nutrition, Enzymes and Respiration 14 Hrs.

1. Essential macro and micro mineral nutrients and their role in plants; symptoms of mineral deficiency
2. Absorption of mineral ions; passive and active processes. 3. Characteristics, nomenclature and classification of Enzymes. Mechanism of enzyme action, enzyme kinetics.
4. Respiration: Aerobic and Anaerobic; Glycolysis, Krebs cycle; electron transport system, mechanism of oxidative phosphorylation

Unit-3: Photosynthesis and Photorespiration 12 Hrs.

1. Photosynthesis: Photosynthetic pigments, absorption and action spectra; Red drop and Emerson enhancement effect
2. Concept of two photosystems; mechanism of photosynthetic electron transport and evolution of oxygen; photophosphorylation 3. Carbon assimilation pathways (C3, C4 and CAM);
4. Photorespiration - C2 pathway

Unit-4: Nitrogen and lipid metabolism **12 Hrs.**

1. Nitrogen metabolism: Biological nitrogen fixation- asymbiotic and symbiotic nitrogen fixing organisms.
2. N2 cycle, Mechanism of nitrogen fixation
3. Lipid metabolism: Classification of Plant lipids, saturated and unsaturated fatty acids.
4. β-oxidation of fatty acids, Glyoxylate cycle.

Unit-5: Plant growth-development **12 Hrs.**

1. Growth and Development: Definition, phases and kinetics of growth.
2. Physiological effects of Plant Growth Regulators (PGRs)-auxins, gibberellins, cytokinins, ABA, ethylene and brassinosteroids. 3. Physiology of flowering: Photoperiodism, role of phytochrome in flowering.
4. Seed germination and senescence; physiological changes.

Text books:

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

Books for Reference:

1. Hopkins, W.G. & N.P.A. Huner (2014). Introduction to Plant Physiology, Wiley India Pvt. Ltd., New Delhi.
2. Noggle Ray & J. Fritz (2013). Introductory Plant Physiology, Prentice Hall (India), New Delhi.
3. Salisbury, Frank B. & Cleon W. Ross (2007). Plant Physiology, Thomsen & Wadsworth, Austalia &U.S.A

II-BZC	BOTANY-IV	SEM-IV	Course code: BOT N-4321P	2022-23	No. of Credits:1	No. of Hrs /Week:2

PLANT PHYSIOLOGY AND METABOLISM

1. Determination of osmotic potential of plant cell sap by plasmolytic method using *Rhoeo*/ *Tradescantia* leaves.
2. Calculation of stomatal index and stomatal frequency of a mesophyte and a xerophyte.
3. Determination of rate of transpiration using Cobalt chloride method / Ganong's potometer (at least for a dicot and a monocot).
4. Effect of Temperature on membrane permeability by colorimetric method.
5. Study of mineral deficiency symptoms using plant material/photographs.
6. Separation of chloroplast pigments using paper chromatography technique.
7. Demonstration of Polyphenol oxidase enzyme activity (Potato tuber or Apple fruit)
8. Anatomy of C3, C4 and CAM leaves
9. Minor experiments – Osmosis, Arc-auxanometer, ascent of sap through xylem, Cytoplasmic streaming.

B.Sc., BOTANY EXTERNAL PRACTICAL EXAMINATION; Course-IV
(PLANT PHYSIOLOGY AND METABOLISM)

Course Code : BOT N-4321 **Max. Marks: 60M**

Time: 3hrs **Pass Min: 24M**

MODEL QUESTION PAPER
SECTION-A

I. Answer any five of the following **5 X 4= 20M**

1. Water potential
2. Macronutrients
3. Photorespiration
4. Glyoxylate cycle
5. Senescence
6. Pentose phosphate pathway
7. Classification of lipids
8. Cytokinins.
9. Fermentation
10. Fruit ripening hormone

SECTION-B

II. Answer the following questions **5 x 8 = 40 M**

11. a) Explain various theories of Ascent of sap.

Or

b) Describe the opening and closing mechanism of stomata with suitable theories.

12. a) Explain the mechanism of enzyme enzyme action.

Or

b) Describe the reactions of Glycolysis.

13. a) Give an account of the photosynthetic carbon reduction pathway.

Or

b) Describe the mechanism of photosynthetic electron transport.

14. (a) Give an account of biological nitrogen fixation.

Or

(b) Describe β-oxidation pathway.

15. (a) Explain the role of phytochrome in flowering

Or

(b) Describe the physiological effects of Auxins.

SRR & CVR GOVERNMENT DEGREE COLLEGE (A): VIJAYAWADA II.
B.Sc., BOTANY EXTERNAL PRACTICAL EXAMINATION;
Course-IV (PLANT PHYSIOLOGY AND METABOLISM)

Course Code : BOT N-4321 **Max. Marks: 25M**
Time: 2hrs **Pass Min: 10 M**

1. Perform the experiment 'A' (Major experiment). Write aim, principle, material and apparatus/equipment, procedure, tabulate results and make conclusion----------**------8 M**

2. Demonstrate the experiment 'B' (Minor experiment). Write the principle, Procedure and give inference----------**6M**

3. Identify the following with giving reasons. **2 x 3 = 6 M**

C. Mineral nutrition deficiency
D. Cytoplasmic streaming/Polyphenol oxidase activity/growth measurement by Arc auxanometer

4. Record + Viva-voce **3 + 2 = 5 M**

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II-BZC	BOTANY-IV	SEM-V	Course code:	2022-23	No. of Credits:4	No. of Hrs /Week:4

CELL BIOLOGY, GENETICS AND PLANT BREEDING

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

CO1: Understand structure and composition of plant cell wall, plasma Membrane, Plastids
CO2: Understand the Morphology of chromosomes, aberrations and organization of DNA in chromosomes.
CO3: Understand Mendelian laws of inheritance , genetic interactions , concepts of Linkage and Crossing over , maternal inheritance
CO4: Understand Structure and functions of DNA, RNA , Genetic code , Translation , Regulation of gene expression
CO5: Understand the plant breeding methods and molecular breeding

Unit -1: The Cell 12 Hrs.

1. Cell theory; prokaryotic vs eukaryotic cell; animal vs plant cell; a brief account on the ultrastructure of a plant cell.
2. Ultrastructure of cell wall.
3. Ultrastructure of plasma membrane and various theories on its organization.
4. Polymorphic cell organelles (Plastids); ultrastructure of chloroplast. Plastid DNA.

Unit-2: Chromosomes 12 Hrs.

1. Prokaryotic vs eukaryotic chromosome. Morphology of a eukaryotic chromosome.Euchromatin and Heterochromatin; Karyotype and ideogram.
2. Special type of chromosomes-Lamp brush, Polytene and
B- Chromosome
3. Brief account of chromosomal aberrations - structural and numerical changes
4. Organization of DNA in a chromosome (solenoid and nucleosome models).

Unit-3: Mendelian and Non-Mendelian Genetics 14Hrs.

1. Mendel's laws of inheritance. Incomplete dominance and codominance; Multiple allelism.
2. Complementary, supplementary and duplicate gene interactions (plant based examples are to be dealt).
3. A brief account of linkage and crossing over; Chromosomal mapping - 2 point and 3 point test cross.
4. Concept of maternal inheritance (Corren's experiment on *Mirabilis jalapa*);

Mitochondrial DNA.

Unit-4: Structure and functions of DNA **12 Hrs.**

1. Watson and Crick model of DNA. Brief account on DNA Replication (Semi-conservative method).
2. Brief account on Transcription, types and functions of RNA. 3. Gene concept and genetic code and Translation.
4. Regulation of gene expression in prokaryotes - Lac Operon and Trp Operon

Unit-5: Plant Breeding **12 Hrs.**

1. Plant Breeding and its scope. Plant Introduction and acclimatization.

2. Definition, procedure, applications and uses; advantages and limitations of :(a) Mass selection, (b) Pure line selection and (c) Clonal selection.

3. Hybridization-Procedure, Advantages and Limitations; Heterosis (hybrid vigour).
4. A brief account on Molecular breeding – DNA markers in plant breeding. RAPD, RFLP.

Text Books :

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

Books for Reference:

1. Gupta, P.K. (2002). Cell and Molecular biology,Rastogi Publications, New Delhi
2. Singh, B.D. (2008) Genetics. Kalyani Publishers, Ludhiana. 3. Chaudhari, H.K.(1983). Elementary Principles of Plant Breeding, TMH publishers Co.,

II-BZC	BOTANY-IV	SEM-V	Course code:	2022-23	No. of Credits:1	No. of Hrs /Week:2

CELL BIOLOGY, GENETICS AND PLANT BREEDING

1. Study of ultrastructure of plant cell and its organelles using Electron microscopic Photographs/models.
2. Demonstration of Mitosis in *Allium cepa*/*Aloe vera* roots using squash technique; observation of various stages of mitosis in permanent slides
. 3. Demonstration of Meiosis in P.M.C.s of *Allium cepa* flower buds using squash technique; observation of various stages of meiosis in permanent slides.
4. Study of structure of DNA and RNA molecules using models.
5. Solving problems monohybrid, di-hybrid, back and test crosses.
6. Solving problems on gene interactions (at least one problem for each of the gene interactions in the syllabus).
7. Chromosome mapping using 3- point test cross data.
8. Demonstration of emasculation, bagging, artificial pollination techniques for hybridization.

Course-V (CELL BIOLOGY, GENETICS AND PLANT BREEDING)

Course Code : **Max. Marks: 60M**

Time: 3hrs **Pass Min: 24 M**

MODEL QUESTION PAPER

SECTION-A

I. Answer any five of the following 5 X 4= 20M

1. Cell wall
2. Euchromatin and Heterochromatin
3. Nucleosome model
4. Mitochondrial DNA
5. Types of RNA
6. DNA structure
7. Pure line selection
8. Lac operon
9. Incomplete dominance
10. Selection

SECTION-B

II. Answer the following questions 5 x 8 = 40 M

11. a) Describe the ultrastructure of the plasma membrane with the help of various theories.

Or

b) Give a brief account of the ultrastructure of the plant cell.

12. a) Write an account of chromosomal structural aberrations.

Or

b) Describe the morphology of the eukaryotic chromosome.

13. a) What are gene interactions? Give an account of Complementary genes.

Or

b) Explain di-hybrid cross with the help of checkerBoard.

14. a) Write an essay on translation.

Or

b) Explain the replication process of DNA.

15. a) Explain the role of Molecular markers in plant breeding.

Or

b) What is hybridization? Describe the procedure, advantages and limitations of Hybridization.

SRR & CVR GOVERNMENT DEGREE COLLEGE (A): VIJAYAWADA II. B.Sc., BOTANY EXTERNAL PRACTICAL EXAMINATION;

Course-V (CELL BIOLOGY, GENETICS AND PLANT BREEDING)

Course Code: **Max. Marks: 25M**

Time: 2hrs **Pass Min: 10 M**

1. Make a cytological preparation of given material 'A' (mitosis or meiosis in Onion) by squash technique, report any two stages, draw labeled diagrams and write the reasons.----------7 M

2. Solve the given Genetic problem (Dihybrid cross/ Interaction of genes/ 3-point test cross) 'B' and write the conclusions. ----------7 M

3. Identify the following and justify with apt reasons. ----------2 x 3 = 6 M
   C. Cell Biology (Cell organelle-Mitochondria, Chloroplast, Endoplasmic reticulum)
   D. Plant Breeding (Emasculation/Bagging)

4. Record + Viva-voce 3 + 2 = 5 M

II-BZC	BOTANY-V	SEM-IV	Course code:	2022-23	No. of Credits:4	No. of Hrs /Week:4

CELL BIOLOGY, GENETICS AND PLANT BREEDING

UNIT-I

Essays

1. Describe the ultrastructure of plasma membrane with the help of various theories.
2. Give a brief account of the ultrastructure of the plant cell. 3. Describe the ultrastructure of chloroplast with the help of a neat labelled diagram.

Short answers

1. Cell wall
2. Plastid DNA
3. Cell theory
4. Ribosomes

UNIT-II

Essays

1. Write an account of chromosomal structural aberrations.
2. Describe the morphology of the eukaryotic chromosome.
3. Give an account of special types of chromosomes

Short answers

1. Euchromatin and Heterochromatin
2. Karyotype
3. Nucleosome model
4. Polyploidy

UNIT-III

Essays

1. What are gene interactions? Give an account of Complementary genes.
2. Explain di-hybrid cross with the help of checker Board.
3. Explain various theories of crossing over

Short answers

1. Mitochondria DNA
2. Gametic coupling and repulsion
3. Incomplete dominance
4. 3-point test cross

UNIT-IV

Essays

1. Write an essay on translation.
2. Describe the process of DNA replication.
3. Give an account of Genetic code.

Short answers

1. Lac operon
2. Tryptophan operon
3. Types of RNA
4. Structure of DNA

UNIT-V

Essays

1. Explain the role of Molecular markers in plant breeding. 2. What is hybridization? Describe the procedure, advantages and limitations of Hybridization.
3. Give an account of procedure, applications, advantages and limitations of Pure line selection.

Short answers

1. Plant Introduction
2. Clonal selection
3. Heterosis
4. RAPD and RFLP

Board of Studies Composition - Botany & Horticulture

2022 - 2023

S.No	Name of the Resource person	Designation
1	Ms. G.Swapna In-charge of the Department Department of Botany	Chairman of BOS
2	Dr.T.Rose Mary HOD, Department of Botany Andhra Loyola College Vijayawada-08 Mobile: 9989892440	University Nominee
3	Mr. K.GaniRaju Lecturer in Botany Government College (A) Rajahmundry-533105 Mobile:9948088250	Subject Expert
4	Dr.R.V.Sujatha Associate Professor, Department of Agricultural Economics Dr.YSR Horticultural University Venkataramannagudem West Godavari District Mobile: 9666621341	Subject Expert
5	Dr.S. Siva Rama Krishna ((Industry nominee) Jeevaka Ayurveda, Tenali Mobile: 9441898805 e-mail:srksamala@gmail.com	Industrialist online Participation
6	Goriparthi Venkata Sai Ram Yadav Mobile: 9989059219	Alumni
7	V. Naga Padmavathi Lecturer in Botany Mobile: 9182179891	Member
8	Dr. Ch. Srinivasa Reddy Lecturer in Botany Mobile: 9908721905	Member

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III-BZC	BOTANY-VI	SEM-V	Course code: BOT	2022-23	No. of Credits:4	No. of Hrs /Week:4

PLANT TISSUE CULTURE

On successful completion of this course, the students 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.

Unit - 1: Basic concepts of plant tissue culture — 10 Hrs

1. Plant tissue culture: Definition, history, scope and significance.
2. Totipotency, differentiation, dedifferentiation, and redifferentiation; types of cultures.
3. Infrastructure and equipment required to establish a tissue culture laboratory.

Unit - 2: Sterilization techniques and culture media — 10 Hrs

1. Aseptic conditions – Fumigation, wet and dry sterilization, UV sterilization, ultrafiltration.
2. Nutrient media: Composition of commonly used nutrient culture media with respect to their contents like inorganic chemicals, organic constituents, vitamins, amino acids etc.
3. Composition and preparation of Murashige and Skoog culture medium.

Unit - 3: Callus culture technique- — 10Hrs

1. 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.
2. Callus culture: Definition, various steps in callus culture.
3. Initiation and maintenance of callus - Growth measurements and subculture; soma clonal variations.

Unit – 4: Micropropagation — 10Hrs

1. Direct and indirect morphogenesis, organogenesis, role of PGRs; somatic embryogenesis and synthetic seeds.
2. Greenhouse hardening unit operation and management; acclimatization and hardening of plantlets - need, process, packaging, exports.
3. Pathogen (Virus) indexing- significance, methods, advantages, applications.

Unit – 5: Applications of plant tissue culture **10 Hrs**

1. Germplasm conservation: cryopreservation methods, slow growth, applications and limitations; cryoprotectants.
2. Plant transformation techniques and bioreactors; production of secondary metabolites-optimization of yield, commercial aspects, applications, limitations.
3. Transgenic plants- gene transfer methods; BT cotton.

References:

1. Kalyan Kumar De (2001) An Introduction to Plant Tissue Culture, New Central Book Agency (P) Ltd., Calcutta
2. Razdan, M.K. (2005) Introduction to Plant Tissue Culture, Oxford & IBH Publishers, Delhi
3. Bhojwani, S.S. (1990) Plant Tissue Culture: Theory and Practical (a revised edition). Elsevier Science Publishers, New York, USA.
4. Vasil, I.K. and Thorpe, T.A. (1994) Plant Cell and Tissue Culture. Kluwer Academic Publishers, the Netherlands.
5. Web resources suggested by the teacher concerned and the college librarian including reading material.

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III-BZC	BOTANY-VI	SEM-V	Course code: BOT	2022-23	No. of Credits:2	No. of Hrs /Week:2

PLANT TISSUE CULTURE

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.

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SRR & CVR GOVERNMENT DEGREE COLLEGE (A): VIJAYAWADA
III. B.Sc., BOTANY SEMESTER END EXAMINATION; Course-VII
(MUSHROOM CULTIVATION)

Course Code : **Max. Marks: 60M**
Time: 3hrs **Pass Min: 24 M**

MODEL QUESTION PAPER
SECTION-A

I. Answer any five of the following **5 X 4 = 20M**

1. Totipotency
2. Dry sterilization
3. Somaclonal variations
4. Virus indexing
5. Cryoprotectants
6. Autoclave
7. Explant
8. Synthetic seeds
9. Morphogenesis
10. Bt Cotton

SECTION-B

II. Answer the following questions **5 x 8 = 40 M**

9. a) Explain the concepts differentiation, dedifferentiation, and Redifferentiation.

Or

b) Give an account of Infrastructure and equipment required to establish a tissue culture laboratory.

10. a) Explain various methods of sterilization.

Or

b) Give an account of the composition and preparation of MS media.

11. a) Explain various ways of surface sterilization of explants.

Or

b) Give an account of callus culture.

12. (a) Explain about somatic embryogenesis.

Or

(b) Give an account of Organogenesis in plant tissue culture.

13. (a) Give an account of secondary metabolite production through Bioreactors.

Or

(b) Give an account of gene transfer methods.

SRR & CVR GOVERNMENT DEGREE COLLEGE (A): VIJAYAWADA
III. B.Sc., BOTANY EXTERNAL PRACTICAL EXAMINATION; Course-VII
(PLANT TISSUE CULTURE)

Course Code: **Max. Marks: 25M**
Time: 2hrs **Pass Min: 10M**

1. Demonstration of a sterilization technique	'A'	4 M
2. Preparation of MS medium	'B'	5 M
3. Demonstration of callus culture technique/growth measurements	'C'-6M	
4. Scientific observation and data analysis	$4 \times 1^{1/2} = 6$ M	
D. Tissue culture equipment /photograph		
E. Morphogenesis or organogenesis - photograph		
F. Bioreactor/Secondary metabolite		
G. Transgenic plant/photograph		
5. Record		4M

SRR & CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA-52004

An autonomous college in the jurisdiction of Krishna University, Machilipatnam. A.P.

III-BZC	BOTANY-VI	SEM-V	Course code: BOT	2022-23	No. of Credits:4	No. of Hrs /Week:4

PLANT TISSUE CULTURE

QUESTION BANK

UNIT-I

Essays

1. Explain the concepts differentiation, dedifferentiation, and Redifferentiation.
2. Give an account of Infrastructure and equipment required to establish a tissue culture laboratory.
3. Give an account of types of cultures.

Short answers

1. Totipotency
2. Autoclave
3. Significance of Tissue culture

UNIT-II

Essays

1. Explain various methods of sterilization.
2. Give an account of the composition and preparation of MS media.
3. Write an essay on various organic constituents used in the preparation of media.

Short answers

1. Dry sterilization
2. Explant
3. Fumigation

UNIT-III

Essays

1. Explain various ways of surface sterilization of explants.
2. Give an account of callus culture.
3. Write an essay on growth measurements in callus culture.

Short answers

1. Somaclonal variations
2. Synthetic seeds
3. Different types of explants

UNIT-IV

Essays

1. Explain about somatic embryogenesis.
2. Give an account of Organogenesis in plant tissue culture.
3. Explain how virus free plants are produced through meristem culture.

Short answers

1. Virus indexing
2. Morphogenesis
3. Hardening of plants

UNIT-V

Essays

1. Give an account of secondary metabolite production through Bioreactors.
2. Give an account of gene transfer methods.
3. Explain various cryopreservation methods.

Short answers

1. Cryoprotectants
2. Bt Cotton
3. Applications of cryopreservation

SRR & CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA-52004

An autonomous college in the jurisdiction of Krishna University, Machilipatnam, A.P.

III-BZC	BOTANY-VII	SEM-V	Course code: BOT	2022-23	No. of Credits:4	No. of Hrs /Week:4

MUSHROOM CULTIVATION

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

CO1: Understand the structure and life of a mushroom and discriminate edible and poisonous mushrooms.
CO2: Identify the basic infrastructure to establish a mushroom culture unit.
CO3: Demonstrate skills preparation of compost and spawn
CO4: Acquire a critical knowledge on cultivation of some edible mushrooms.
CO5: Explain the methods of storage, preparation of value-added products and marketing.

Unit – 1: Introduction and value of mushrooms - **10 Hrs**

1. 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.
2. Morphological features of any four edible mushrooms, Button mushroom (*Agaric us Bosporus*), Milky mushroom (*Calocybe indica*), Oyster mushroom (*Pleurotus sajor-caju*) and Paddy straw mushroom (*Volvariella volvacea*).
3. Nutraceutical value of mushrooms; medicinal mushrooms in South India - *Ganoderma lucidum, Phellinus rimosus, Pleurotus florida and Pleurotus pulmonaris* – their therapeutic value; Poisonous mushrooms - harmful effects.

Unit – 2: Basic requirements of cultivation system **10 Hrs**

1. 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.
2. Compost and composting: Definition, machinery required for compost making, materials for compost preparation.
3. Methods of composting- long method of composting and short method of composting.

Unit – 3: Spawning and casing (10h)

1. Spawn and spawning: Definition, facilities required for spawn preparation; preparation of spawn substrate.
2. Preparation of pure culture, media used in raising pure culture; culture maintenance, storage of spawn
3. Casing: Definition, Importance of casing mixture, Quality parameters of casing soil, different types of casing mixtures, commonly used materials.

Unit – 4: Mushroom cultivation 10 Hrs

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

Unit – 5: Post harvest technology 10 Hrs

1. Shelf life of mushrooms; preservation of mushrooms - freezing, dry freezing, drying and canning.
2. Quality assurance and entrepreneurship - economics of different types of mushrooms; value added products of mushrooms.
3. Management of spent substrates and waste disposal of various mushrooms.

References:

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. Nita Bhal. (2000). Handbook on Mushrooms (Vol. I and II). Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi
4. Pathak, V. N. and Yadav, N. (1998). Mushroom Production and Processing Technology. Agrobios, Jodhpur.
5. Tripathi, D.P. (2005) Mushroom Cultivation, Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi.
6. Pathak V.N., Nagendra Yadav and Maneesha Gaur (2000), Mushroom Production and Processing Technology Vedams Ebooks Pvt. Ltd., New Delhi
7. Web resources suggested by the teacher concerned and the college librarian including reading material.

SRR & CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA-52004

An autonomous college in the jurisdiction of Krishna University, Machilipatnam, A.P.

III-BZC	BOTANY-VII	SEM-V	Course code: BOT	2022-23	No. of Credits:	No. of Hrs /Week:2

MUSHROOM CULTIVATION

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.

SRR & CVR GOVERNMENT DEGREE COLLEGE (A): VIJAYAWADA
III. B.Sc., BOTANY SEMESTER END EXAMINATION; Course-VII
(MUSHROOM CULTIVATION)

Course Code : **Max. Marks: 60M**
Time: 3hrs **Pass Min: 24 M**

MODEL QUESTION PAPER
SECTION-A

I. Answer any five of the following **5 X 4 = 20M**

1. Totipotency
2. Dry sterilization
3. Somaclonal variations
4. Virus indexing
5. Cryoprotectants
6. Autoclave
7. Explant
8. Synthetic seeds
9. Morphogenesis
10. Bt Cotton

SECTION-B

II. Answer the following questions **5 x 8 = 40 M**

9. a) Explain the concepts differentiation, dedifferentiation, and redifferentiation

Or

b) Give an account of Infrastructure and equipment required to establish a tissue culture laboratory.

10. a) Explain various methods of sterilization.

Or

b) Give an account of the composition and preparation of MS media.

11. a) Explain various ways of surface sterilization of explants.

Or

b) Give an account of callus culture.

12. (a) Explain about somatic embryogenesis.

Or

(b) Give an account of Organogenesis in plant tissue culture.

13. (a) Give an account of secondary metabolite production through Bioreactors.

Or

(b) Give an account of gene transfer methods.

SRR & CVR GOVERNMENT DEGREE COLLEGE (A): VIJAYAWADA
III. B.Sc., BOTANY EXTERNAL PRACTICAL EXAMINATION; Course-VII
(MUSHROOM CULTIVATION)

Course Code: **Max. Marks: 25M**
Time: 2hrs **Pass Min: 10M**

1. Demonstration of preparing pure culture/mother spawn 'A' 4 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' 6 M
4. Scientific observation and data analysis 4 x 11/2 = 6M
   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. Record 4M

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An autonomous college in the jurisdiction of Krishna University, Machilipatnam, A.P.

III-BZC	BOTANY-VII	SEM-V	Course code: BOT	2022-23	No. of Credits:4	No. of Hrs /Week:4

MUSHROOM CULTIVATION

QUESTION BANK

UNIT-I

Essays

1. Describe the life cycle of a mushroom.
2. Give an account of nutraceutical value of mushrooms.
3. Describe the morphological features of Paddy straw and oyster mushroom

Short answers

1. Button mushrooms
2. Poisonous mushrooms
3. Medicinal value of *Ganoderma*

UNIT-II

Essays

1. Explain various types of composting methods.
2. Give an account of machinery required for compost making.
3. Give an account of basic requirements of mushroom cultivation.

Short answers

1. Types of substrate for compositing
2. Small village unit
3. Layout of a mushroom farm

UNIT-III

Essays

1. What is casing? Explain different types of casing mixture and their Importance.
2. Explain the process of pure culture preparation.
3. Give an account of different types of media used for preparation of pure culture

Short answers

1. Preparation of spawn substrate
2. Casing soil
3. Facilities required for spawn preparation

UNIT-IV

Essays

1. Explain various steps involved in the cultivation of Paddy straw mushroom.

2. Give an account cultivation of Oyster mushroom.
3. Describe the process of cultivation of Milky mushroom.

Short answers

1. Weed mold in mushroom cultivation
2. Picking and packing of mushrooms
3. Button mushroom

UNIT-V

Essays

1. What is the shelf life of mushrooms? What are the conditions required to improve shelf life of mushrooms?
2. Explain how mushrooms are preserved through drying method?
3 Explain how mushrooms are preserved through Freeze drying method.

Short answers

1. novel Value Added Products of Mushrooms
2. Mushroom soup
3. Mushroom pickle

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III-BZC	BOTANY-VIA	SEM-V	Course code: BOT N	2022-23	No. of Credits: 4	No. of Hrs /Week:4

Course-6A: Plant Propagation

(Skill Enhancement Course (Elective), Credits: 05)

I. Learning Outcomes:

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

1. Explain various plant propagation structures and their utilization.
2. Understand advantages and disadvantages of vegetative, asexual and sexual plant propagation methods.
3. Assess the benefits of asexual propagation of certain economically valuable plants using apomictics and adventive polyembryony.
4. Demonstrate skills related to vegetative plant propagation techniques such as cuttings, layering, grafting and budding.
5. Apply a specific macro-propagation technique for a given plant species.

II. Syllabus: (Hours: Teaching: 50, Lab: 30, Field training: 05, others incl. unit tests: 05)

(*Syllabi of theory, practical and lab (skills) training together shall be completed in 80 hours*)

Unit – 1: Basic concepts of propagation (10h)

1. Propagation: Definition, need and potentialities for plant multiplication; asexual and sexual methods of propagation - advantages and disadvantages.
2. Propagation facilities: Mist chamber, humidifiers, greenhouses, glasshouses, cold frames, hot beds, poly-houses, phytotrons nursery - tools and implements.
3. Identification and propagation by division and separation: Bulbs, pseudobulbs, corms, tubers and rhizomes; runners, stolons, suckers and offsets.

Unit – 2: Apomictics in plant propagation (10h)

1. Apomixis: Definition, facultative and obligate; types – recurrent, non-recurrent, adventitious and vegetative; advantages and disadvantages.
2. Polyembryony: Definition, classification, horticultural significance; chimera and bud sport.
3. Propagation of mango, *Citrus* and *Allium* using apomictic embryos.

Unit – 3: Propagation by cuttings (10h)

1. Cuttings: Definition, different methods of cuttings; root and leaf cuttings.
2. Stem cuttings: Definition of stem tip and section cuttings; plant propagation by herbaceous, soft wood, semi hard wood, hard wood and coniferous stem cuttings.

3. Physiological and bio chemical basis of rooting; factors influencing rooting of cuttings; Use of plant growth regulators in rooting of cuttings.

Unit – 4: Propagation by layering (10h)

1. Layering: Definition, principle and factors influencing layering.
2. Plant propagation by layering: Ground layering – tip layering, simple layering, trench layering, mound (stool) layering and compound (serpentine layering).
3. Air layering technique – application in woody trees.

Unit – 5: Propagation by grafting and budding (10h)

1. Grafting: Definition, principle, types, graft incompatibility, collection of scion wood stick, scion-stock relationship, and their influences, bud wood certification; micrografting.
2. Propagation by veneer, whip, cleft, side and bark grafting techniques.
3. Budding: Definition; techniques of 'T', inverted 'T', patch and chip budding.

III. References:

1. Sharma RR and Manish Srivastav.2004. Plant Propagation and Nursery Management International Book Distributing Co. Lucknow.
2. Hartman, HT and Kester, D.E.1976. Plant Propagation: Principles and Practices, Prentice Hall of India Pvt. Ltd. Bombay.
3. Sadhu, M.K. 1996. Plant Propagation. New Age International Publishers, New Delhi.
4. Web resources suggested by the teacher concerned and college librarian including reading material.

SRR & CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA-52004

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III-BZC	BOTANY-VIA	SEM-V	Course code: BOT N	2022-23	No. of Credits :1	No. of Hrs /Week:2

Course -6A: Plant Propagation - Practical syllabus

IV. Learning Outcomes: On successful completion of this practical course, student will be
able to:

1. Make use of different plant propagation structures for plant multiplication.
2. Explore the specialized organs or asexual propagules in some plants for their proliferation.
3. Demonstrate skills on micropropagation of plants through vegetative propagation techniques.
4. Evaluate and use a suitable propagation technique for a given plant species.

.

V. Practical (Laboratory) syllabus: (30hrs): The following experiments/practices shall be
conducted by students in the lab.

1. Preparation of nursery beds – flat, raised and sunken beds.
2. Propagation through apomictic.
3. Propagation by separation and division technique.
4. Propagation by cuttings.
5. Propagation by layering
6. Propagation by grafting.
7. Propagation by budding.
8. Preparation of potting mixture, potting and repotting.

VI. Lab References:

1. Prasad, V. M. and Balaji Vikram, 2018. Practical Manual on Fundamentals of Horticulture and Plant Propagation, Write & Print Publications, New Delhi
2. Upadhyay S. K. (Ed.) 2013. Practical Manual Basic Horticulture-I, Akashdeep Printers, New Delhi
3. Web sources suggested by the teacher concerned.

VII. Co-Curricular Activities:

a) Mandatory: (*Lab/field training of students by teacher: (Lab: 10 + field: 05 hours):*

1. **For Teacher**: Training of students by the teacher in the laboratory/field for a total of not less than 15 hours on the field techniques/skills of different plant propagation structures, containers, preparation of soil, plant propagation through separation and division, apomictics, cuttings, layering, grafting and budding.

2. **For Student**: Students shall (individually) visit horticulture nurseries in a University/, research institute /private nursery and observe propagation structures, propagation techniques etc., write their observations and submit a hand-written

Fieldwork/Project work/Project work Report not exceeding 10 pages in the given format to the teacher.

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 experts in plant vegetative propagation methods.

2. Assignments (including technical assignments like identifying propagation structures and their operational techniques for a specific plant species.

3. Seminars, Group discussions, Quiz, Debates etc. (suggested topics):

4. Preparation of videos on plant propagation techniques in relation to different economically useful plants.

5. Collection of material/figures/photos related to plant propagation methods, writing and organizing them in a systematic way in a file.

6. Visits to Horticulture/Agriculture/Forest nurseries, research organizations, universities etc.

7. Invited lectures and presentations on related topics by experts in the specified area.

Model Question Paper pattern for Practical Examination

Semester – V/ Botany Skill Enhancement Course

Course -6A: Plant Propagation

Max. Time: 3 Hrs. Max. Marks: 50

1. Demonstration plant propagation using separation and division /apomictics 'A' 10
2. Demonstration plant propagation using cuttings/layering technique 'B' 10
3. Demonstration of plant propagation using grafting/budding technique 'C' 10
4. Scientific observation and data analysis 4 x 3 = 12

D. Plant propagation structure model/photograph

E. Plant Growth Regulator

F. Nursery bed model /photograph

G. Asexual propagule/container/pot mixture for propagation

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

SRR & CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA-52004

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III-BZC	BOTANY-VIIA	SEM-V	Course code	2022-23	No. of Credits :4	No. of Hrs /Week:4

Course-7A: Seed Technology

(Skill Enhancement Course (Elective), Credits: 05)

I. Learning outcomes:

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

1. Explain the causes for seed dormancy and methods to break dormancy.
2. Understand critical concepts of seed processing and seed storage procedures.
3. Acquire skills related to various seed testing methods.
4. Identify seed borne pathogens and prescribe methods to control them.
5. Understand the legislations on seed production and procedure of seed certification.

II. Syllabus: (Hours: Teaching: 50, Lab: 30, Field training: 05, others incl. unit tests: 05)

(*Syllabi of theory, practical and lab (skills) training together shall be completed in 80 hours*)

Unit - 1: Seed dormancy (10h)

1. Seed and grain: Definitions, importance of seed; structure of Dicot and Monocot seed.
2. Role and goals of seed technology; characteristics of quality seed material.
3. Dormancy: Definition, causes for seed dormancy; methods to break seed dormancy.

Unit – 2: Seed processing and storage (10h)

1. Principles of seed processing: seed pre-cleaning, precuring, drying, seed extraction; cleaning, grading, pre-storage treatments; bagging and labelling, safety precautions during processing.
2. Seed storage; orthodox and recalcitrant seeds, natural longevity of seeds.
3. Factors affecting longevity in storage; storage conditions, methods and containers.

Unit – 3: Seed testing (10h)

1. Definition of seed vigour, viability and longevity; seed sampling and equipment; physical purity analysis.
2. Seed moisture – importance – methods of moisture determination.
3. Seed germination tests using paper, sand or soil – standard germination test; TZ test to determine seed viability; seed health testing.

Unit – 4: Seed borne diseases (10h)

1. A brief account of different seed borne diseases and their transmission.

2. Different seed health testing methods for detecting microorganisms.

3. Management of seed borne diseases; seed treatment methods: spraying and dusting.

Unit – 5: Seed certification (10h)

1. Objectives - Indian seed Act; seed rules and seed order; new seed policy (1988).

2. Seed Inspector: Duties and responsibilities; classes of seeds, phases of certification standards (i.e., Land requirement, isolation distance) etc.

3. Issue of certificates, tags and sealing; pre and post control check: Genetic purity verification, certification, records and reporting.

III. References:

1. Umarani R, Jerlin R, Natarajan N, Masilamani P, Ponnuswamy AS 2006. Experimental Seed Science and Technology, Agrobios, Jodhpur

2. Agrawal, 2005. Seed Technology. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi

3. Desai B D 2004. Seeds Hand Book: Processing and Storage, CRC Press

4. Agarwal V K and J B Sinclair 1996, Principles of Seed Pathology, CRC Press

5. Tunwar NS and Singh SN. 1988. Indian Minimum Seed Certification Standards. CSCB, Ministry of Agriculture, New Delhi.

6. McDonald, M.B. and L.O. Copland. 1999. Seed Science and Technology Laboratory Manual. Scientific Publishers, Jodhpur

7. Web resources suggested by the teacher concerned and the college librarian including reading material.

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III-BZC	BOTANY-VIIA	SEM-V	Course code: BOT N-	2022-23	No. of Credits: 1	No. of Hrs /Week.2

Course -7A: Seed Technology Practical syllabus

IV. Learning Outcomes: On successful completion of this practical course, student will be able to:

1. Demonstrate skills on various methods to break the seed dormancy.
2. Determine seed moisture, seed germination percentage, seed viability and vigour.
3. Identify the seed borne pathogens and prescribe methods to prevent or control them.
4. Evaluate various methods to produce healthy seeds.

V. Practical (Laboratory) syllabus: (30hrs)

1. Determination of physical properties of seeds of 3 select local crops (1 each from cereals, millets, pulses and oil seeds).
2. Breaking seed dormancy in 3 select local crops.
3. Measurement of seed moisture content by O S W A or moisture meter or oven drying method.
4. Seed germination tests and evaluation.
5. Seed vigour - conductivity test.
6. Accelerated ageing tests.
7. Tetrazolium test.
8. Priming and invigoration treatments for improving germination and vigour.
9. Techniques of seed health testing - visual examination of seeds, washing test, incubation methods, embryo count method, seed soak method for the detection of certain seed borne pathogens.
10. Using various types of tools for dusting and spraying pesticides/insecticides.

VI. Lab References:

1. Sanjeev Kumar, 2019. Practical Manual Seed Technology of Vegetable Crops, M/s Asian Printery, Ahmedabad
2. Divakara Sastry, E.V., Dhirendra Singh and S.S.Rajput, 2013. Seed Technology: Practical Manual, Swami Keshwanand Rajasthan Agricultural University, Jobner
3. Web sources suggested by the teacher concerned.

VII. Co-Curricular Activities:

Mandatory: *(Lab/field training of students by teacher: (Lab: 10 + field: 05 hours)*

1. For Teacher: Training of students by the teacher in the laboratory/field for a total of not less than15 hours on the field techniques/skills of identifying and drawing seed structure, methods of breaking seed dormancy, seed cleaning, seed storage, identification of seed borne diseases, seed certification procedure.

2. **For Student**: Students shall (individually) visit horticulture/agriculture/ forest nursery/commercial seed production firms/ seed testing laboratories in government or private sector, observe seed production techniques, processing and storage, seed testing and certification procedures etc., write their observations and submit a hand-written Fieldwork/Project work Report not exceeding 10 pages in the given format to the teacher.

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).

a) Suggested Co-Curricular Activities:

1. Training of students by experts in seed technology.

2. Assignments (including technical assignments like seed processing and storage techniques, seed testing, seed certification, seed borne diseases- prevention and control).

3. Seminars, Group discussions, Quiz, Debates etc. (suggested topics):

4. Preparation of videos on various aspects related to seed technology.

5. Collection of material/figures/photos related to seed technology, writing and organizing them in a systematic way in a file.

6. Visits to seed production units in Industries/Horticulture/Agriculture/Forest universities/colleges; research organizations, seed testing laboratories etc.

7. Invited lectures and presentations on related topics by experts in the specified area.

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Model Question Paper pattern for Practical Examination

Semester – V/ Botany Skill Enhancement Course

Course – 7A: Seed Technology

Max. Time: 3 Hrs. Max. Marks: 25

1. Demonstration of a method to break seed dormancy 'A'
2. Determination of seed moisture content/ seed germination test 'B'
3. Demonstration of test for seed viability/ seed vigour 'C'
4. Scientific observation and data analysis

D. Monocot / Dicot seed

E. Seed sampling equipment

F. Seed borne pathogen specimen/photograph

G. Seed certification agency/procedure

4. Record + Viva-voce

SRR & CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA-52004

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III-BZC	BOTANY-VIB	SEM-V	Course code: BOT N	2022-23	No. of Credits:4	No. of Hrs /Week:4

Course 6B: Vegetable Crops – Cultivation Practices

(Skill Enhancement Course (Elective), Credits: 05)

I. Learning Outcomes:

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

1. Identify different vegetable plants and realize their value in human nutrition.
2. Analyse the types of soils to cultivate vegetable crops.
3. Demonstrate skills on agronomic practices for cultivation of vegetable crops.
4. Acquire knowledge on water, weed and disease managements in vegetable farming.
5. Comprehend aspects related to harvesting and storage of produce.

II. Syllabus: (Hours: Teaching: 50, Lab: 30, Field training: 05, others incl. unit tests: 05)

(*Syllabi of theory, practical and lab (skills) training together shall be completed in 80 hours*)

Unit – 1: Introduction to Olericulture (10h)

1. Vegetables and Olericulture: Definitions, nutritive value of vegetables and economic significance of vegetable farming.
2. Classification of vegetable crops (Botanical, based on climatic zones and economic parts used).
3. Types of vegetable gardens (kitchen gardening, terrace gardening, market gardening and truck gardening); implements used in vegetable gardening; vegetable forcing – a brief concept.

Unit – 2: Cultivation of leafy vegetables (10h)

1. Leafy vegetables: Definition and a brief account of locally cultivated crops.
2. Study of the following leafy vegetable crops: (a) *Amaranthus* (b) Palak (c) *Hibiscus cannabinus* (d) Fenugreek: systematic position, nutritive value, origin, area, production, improved varieties.
3. General cultivation practices such as sowing, planting distance, fertilizer requirements, irrigation, weed management, harvesting.
4. Crop specific yield, storage, disease and pest control and seed production.

Unit – 3: Cultivation of fruity vegetables (10h)

1. Fruity vegetables: Definition and a brief account of locally cultivated crops.
2. Study of the fruity vegetable crops: (a) Okra (b) Tomato (c) Chillies (d) Brinjal: systematic position, nutritive value, origin, area, production, improved varieties.
3. General cultivation practices such as sowing, planting distance, fertilizer requirements, irrigation, weed management, harvesting.
4. Crop specific yield- storage, disease and pest control and seed production

Unit – 4: Cultivation of peas and beans (10h)

1. A brief account of locally cultivated peas and beans.
2. Study of the following crops: (a) *Dolichos* (b) Cluster bean (c) French bean: Systematic position, nutritive value, origin, area, production, improved Varieties.
3. General cultivation practices such as sowing, planting distance, fertilizer requirements, irrigation, weed management, harvesting.
4. Crop specific yield, storage, disease and pest control and seed production.

Unit – 5: Cultivation of root and tuber crops (10h)

1. A brief account of locally cultivated root and tuber crops.
2. Study of the following crops: (a) Carrot (b) Radish (c) Sweet potato (d) Potato:

Systematic position, family, nutritive value, origin, area, production, improved varieties.

3. General cultivation practices such as sowing, planting distance, fertilizer requirements, irrigation, weed management, harvesting.
4. Crop specific yield, storage, disease and pest control and seed production.

III. References:

1. Bose T K et al. (2003) Vegetable crops, Naya Udhyog Publishers, Kolkata.
2. Singh D K (2007) Modern vegetable varieties and production, IBN Publisher Technologies, International Book Distributing Co, Lucknow.
3. Premnath, Sundari Velayudhan and D P Sing (1987) Vegetables for the tropical region, ICAR, New Delhi
4. Shanmugavelu, K. G. 1989. Production Technology of Vegetable Crops. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.
5. Rana MK. 2008. Scientific Cultivation of Vegetables. Kalyani Publ., New Delhi
6. Rubatzky VE and Yamaguchi M. (Eds.). 1997. World Vegetables: Principles, Production and Nutritive Values. Chapman & Hall, London.
7. Web resources suggested by the teacher concerned and the college librarian including reading material.

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III-BZC	BOTANY-VIB	SEM-V	Course code: BOT N	2022-23	No. of Credits:4	No. of Hrs /Week:4

Course 6B: Vegetable Crops – Cultivation Practices

(Skill Enhancement Course (Elective), Credits: 05)

I. Learning Outcomes:

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

1. Identify different vegetable plants and realize their value in human nutrition.
2. Analyse the types of soils to cultivate vegetable crops.
3. Demonstrate skills on agronomic practices for cultivation of vegetable crops.
4. Acquire knowledge on water, weed and disease managements in vegetable farming.
5. Comprehend aspects related to harvesting and storage of produce.

II. Syllabus: (Hours: Teaching: 50, Lab: 30, Field training: 05, others incl. unit tests: 05)

(*Syllabi of theory, practical and lab (skills) training together shall be completed in 80 hours*)

Unit – 1: Introduction to Olericulture (10h)

1. Vegetables and Olericulture: Definitions, nutritive value of vegetables and economic significance of vegetable farming.
2. Classification of vegetable crops (Botanical, based on climatic zones and economic parts used).
3. Types of vegetable gardens (kitchen gardening, terrace gardening, market gardening and truck gardening); implements used in vegetable gardening; vegetable forcing – a brief concept.

Unit – 2: Cultivation of leafy vegetables (10h)

1. Leafy vegetables: Definition and a brief account of locally cultivated crops.
2. Study of the following leafy vegetable crops: (a) *Amaranthus* (b) Palak (c) *Hibiscus cannabinus* (d) Fenugreek: systematic position, nutritive value, origin, area, production, improved varieties.
3. General cultivation practices such as sowing, planting distance, fertilizer requirements, irrigation, weed management, harvesting.
4. Crop specific yield, storage, disease and pest control and seed production.

Unit – 3: Cultivation of fruity vegetables (10h)

1. Fruity vegetables: Definition and a brief account of locally cultivated crops.
2. Study of the fruity vegetable crops: (a) Okra (b) Tomato (c) Chillies (d) Brinjal: systematic position, nutritive value, origin, area, production, improved varieties.
3. General cultivation practices such as sowing, planting distance, fertilizer requirements, irrigation, weed management, harvesting.
4. Crop specific yield- storage, disease and pest control and seed production

Unit – 4: Cultivation of peas and beans (10h)

1. A brief account of locally cultivated peas and beans.
2. Study of the following crops: (a) *Dolichos* (b) Cluster bean (c) French bean: Systematic position, nutritive value, origin, area, production, improved Varieties.
3. General cultivation practices such as sowing, planting distance, fertilizer requirements, irrigation, weed management, harvesting.
4. Crop specific yield, storage, disease and pest control and seed production.

Unit – 5: Cultivation of root and tuber crops (10h)

1. A brief account of locally cultivated root and tuber crops.
2. Study of the following crops: (a) Carrot (b) Radish (c) Sweet potato (d) Potato:

Systematic position, family, nutritive value, origin, area, production, improved varieties.

3. General cultivation practices such as sowing, planting distance, fertilizer requirements, irrigation, weed management, harvesting.
4. Crop specific yield, storage, disease and pest control and seed production.

III. References:

1. Bose T K et al. (2003) Vegetable crops, Naya Udhyog Publishers, Kolkata.
2. Singh D K (2007) Modern vegetable varieties and production, IBN Publisher Technologies, International Book Distributing Co, Lucknow.
3. Premnath, Sundari Velayudhan and D P Sing (1987) Vegetables for the tropical region, ICAR, New Delhi
4. Shanmugavelu, K. G. 1989. Production Technology of Vegetable Crops. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.
5. Rana MK. 2008. Scientific Cultivation of Vegetables. Kalyani Publ., New Delhi
6. Rubatzky VE and Yamaguchi M. (Eds.). 1997. World Vegetables: Principles, Production and Nutritive Values. Chapman & Hall, London.
7. Web resources suggested by the teacher concerned and the college librarian including reading material.

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III-BZC	BOTANY-VIB	SEM-V	Course code: BOT N	2022-23	No. of Credits:4	No. of Hrs /Week:4

Course-7A: Seed Technology

(Skill Enhancement Course (Elective), Credits: 05)

I. Learning outcomes:

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

1. Explain the causes for seed dormancy and methods to break dormancy.
2. Understand critical concepts of seed processing and seed storage procedures.
3. Acquire skills related to various seed testing methods.
4. Identify seed borne pathogens and prescribe methods to control them.
5. Understand the legislations on seed production and procedure of seed certification.

II. Syllabus: (Hours: Teaching: 50, Lab: 30, Field training: 05, others incl. unit tests: 05)

(Syllabi of theory, practical and lab (skills) training together shall be completed in 80 hours)

Unit - 1: Seed dormancy (10h)

1. Seed and grain: Definitions, importance of seed; structure of Dicot and Monocot seed.
2. Role and goals of seed technology; characteristics of quality seed material.
3. Dormancy: Definition, causes for seed dormancy; methods to break seed dormancy.

Unit – 2: Seed processing and storage (10h)

1. Principles of seed processing: seed pre-cleaning, precuring, drying, seed extraction; cleaning, grading, pre-storage treatments; bagging and labelling, safety precautions during processing.
2. Seed storage; orthodox and recalcitrant seeds, natural longevity of seeds.
3. Factors affecting longevity in storage; storage conditions, methods and containers.

Unit – 3: Seed testing (10h)

1. Definition of seed vigour, viability and longevity; seed sampling and equipment; physical purity analysis.
2. Seed moisture – importance – methods of moisture determination.
3. Seed germination tests using paper, sand or soil – standard germination test; TZ test to determine seed viability; seed health testing.

Unit – 4: Seed borne diseases (10h)

1. A brief account of different seed borne diseases and their transmission.
2. Different seed health testing methods for detecting microorganisms.

3. Management of seed borne diseases; seed treatment methods: spraying and dusting.

Unit – 5: Seed certification (10h)

1. Objectives - Indian seed Act; seed rules and seed order; new seed policy (1988).
2. Seed Inspector: Duties and responsibilities; classes of seeds, phases of certification standards (i.e., Land requirement, isolation distance) etc.
3. Issue of certificates, tags and sealing; pre and post control check: Genetic purity verification, certification, records and reporting.

III. References:

1. Umarani R, Jerlin R, Natarajan N, Masilamani P, Ponnuswamy AS 2006. Experimental Seed Science and Technology, Agrobios, Jodhpur
2. Agrawal, 2005. Seed Technology. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi
3. Desai B D 2004. Seeds Hand Book: Processing and Storage, CRC Press
4. Agarwal V K and J B Sinclair 1996, Principles of Seed Pathology, CRC Press
5. Tunwar NS and Singh SN. 1988. Indian Minimum Seed Certification Standards. CSCB, Ministry of Agriculture, New Delhi.
6. McDonald, M.B. and L.O. Copland. 1999. Seed Science and Technology Laboratory Manual. Scientific Publishers, Jodhpur
7. Web resources suggested by the teacher concerned and the college librarian including reading material.

SRR & CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA-52004

An autonomous college in the jurisdiction of Krishna University, Machilipatnam, A.P.

III-BZC	BOTANY-VIIA	SEM-V	Course code: BOT N	2022-23	No. of Credits:1	No. of Hrs /Week:2

Course -7A: Seed Technology Practical syllabus

IV. Learning Outcomes: On successful completion of this practical course, student will be able to:

1. Demonstrate skills on various methods to break the seed dormancy.
2. Determine seed moisture, seed germination percentage, seed viability and vigour.
3. Identify the seed borne pathogens and prescribe methods to prevent or control them.
4. Evaluate various methods to produce healthy seeds.

V. Practical (Laboratory) syllabus: (30hrs)

1. Determination of physical properties of seeds of 3 select local crops (1 each from cereals, millets, pulses and oil seeds).
2. Breaking seed dormancy in 3 select local crops.
3. Measurement of seed moisture content by O S W A or moisture meter or oven drying method.
4. Seed germination tests and evaluation.
5. Seed vigour - conductivity test.
6. Accelerated ageing tests.
7. Tetrazolium test.
8. Priming and invigoration treatments for improving germination and vigour.
9. Techniques of seed health testing - visual examination of seeds, washing test, incubation methods, embryo count method, seed soak method for the detection of certain seed borne pathogens.
10. Using various types of tools for dusting and spraying pesticides/insecticides.

VI. Lab References:

1. Sanjeev Kumar, 2019. Practical Manual Seed Technology of Vegetable Crops, M/s Asian Printery, Ahmedabad
2. Divakara Sastry, E.V., Dhirendra Singh and S.S.Rajput, 2013. Seed Technology: Practical Manual, Swami Keshwanand Rajasthan Agricultural University, Jobner
3. Web sources suggested by the teacher concerned.

VII. Co-Curricular Activities:

Mandatory: *(Lab/field training of students by teacher: (Lab: 10 + field: 05 hours)*

1. For Teacher: Training of students by the teacher in the laboratory/field for a total of not less than15 hours on the field techniques/skills of identifying and drawing seed structure, methods of breaking seed dormancy, seed cleaning, seed storage, identification of seed borne diseases, seed certification procedure.

2. **For Student**: Students shall (individually) visit horticulture/agriculture/ forest nursery/commercial seed production firms/ seed testing laboratories in government or private sector, observe seed production techniques, processing and storage, seed testing and certification procedures etc., write their observations and submit a hand-written Fieldwork/Project work Report not exceeding 10 pages in the given format to the teacher.

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).

a) Suggested Co-Curricular Activities:

1. Training of students by experts in seed technology.

2. Assignments (including technical assignments like seed processing and storage techniques, seed testing, seed certification, seed borne diseases- prevention and control).

3. Seminars, Group discussions, Quiz, Debates etc. (suggested topics):

4. Preparation of videos on various aspects related to seed technology.

5. Collection of material/figures/photos related to seed technology, writing and organizing them in a systematic way in a file.

6. Visits to seed production units in Industries/Horticulture/Agriculture/Forest universities/colleges; research organizations, seed testing laboratories etc.

7. Invited lectures and presentations on related topics by experts in the specified area.

Model Question Paper pattern for Practical Examination

Semester – V/ Botany Skill Enhancement Course

Course – 7A: Seed Technology

Max. Time: 3 Hrs. Max. Marks: 25

1. Demonstration of a method to break seed dormancy 'A'
2. Determination of seed moisture content/ seed germination test 'B'
3. Demonstration of test for seed viability/ seed vigour 'C'
4. Scientific observation and data analysis

D. Monocot / Dicot seed

E. Seed sampling equipment

F. Seed borne pathogen specimen/photograph

G. Seed certification agency/procedure

4. Record

SRR & CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA-52004

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III-BZC	BOTANY-VIIB	SEM-V	Course code: BOT N	2022-23	No. of Credits:4	No. of Hrs /Week:4

Course 7B: Vegetable Crops – Post Harvest Practices

(Skill Enhancement Course (Elective), Credits: 05)

I. Learning Outcomes:

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

1. Understand various practices for vegetable produce from harvesting to marketing.
2. Demonstrate skills on storage, processing and preservation of vegetables.
3. Summarize causes for spoilage of vegetables before and during storage and methods to prevent and control them.
4. Make use of preservation methods to reduce the loss of vegetable produce.
5. Explain about value added products, packaging and marketing of vegetables.

II. Syllabus: (Hours: Teaching: 50, Lab: 30, Field training: 05, others incl. unit tests: 05) (*Syllabi of theory, practical and lab (skills) training together shall be completed in 80 hours*)

Unit – 1: Introduction to Post Harvest Practices (10h)

1. Post-harvest technology: Definition; importance, scope and future status of post-harvest management of vegetables.
2. Study of maturity standards of vegetables; harvest techniques of vegetables, methods stages, signs of harvesting; harvesting and its relationship with quality, sorting and grading.
3. Careful handling of harvested vegetables; pre-harvest and post-harvest factors responsible for ripening.

Unit – 2: Methods of storage (10h)

1. Climacteric and non-climacteric types of vegetables.
2. Methods of storage to prolong shelf life of harvested vegetables; on-farm storage, evaporatively cooled stores, ventilated storage, pit storage etc.
3. Refrigerated storage, refrigeration cycle, controlled and modified atmosphere, hypobaric storage.

Unit – 3: Processing of vegetables (10h)

1. Causes for spoilage of vegetables and control measures during storage; post-harvest disease and pest management.
2. Techniques to prevent deterioration; vegetable processing equipment; minimal processing of vegetables.
3. Safe chemicals and microbial limits; application of growth regulators for quality assurance; grading.

Unit -4: Preservation and value-addition (10h)

1. Importance and scope of vegetable preservation in India; principles underlying general methods of preservation.
2. Methods of preservation; food additives and food colours.
3. Fried products, process of frying; dried vegetables; sauces and chutneys, pickles and salted vegetables; by-product and waste utilization.

Unit – 5: Marketing (10h)

1. Packing line operations, packaging of vegetables and their products; transportation; codex norms for export of perishables.
2. Demand supply analysis of important vegetables; market potential of various vegetables products.
3. Important marketing agencies and institutions; importance of cooperative marketing.

III. References:

1. Salunkhe DK and Kadam SS. (Ed.). 1998. Hand Book of Vegetable Science and Technology: Production, Composition, Storage and Processing. Marcel Dekker, New York.

2. Arthey D and Dennis C. 1996. Vegetable Processing. Blackie/Springer-Verlag, New York

3. Verma LR and Joshi VK. 2000. Post-harvest Technology of Fruits and Vegetables: Handling, Processing, Fermentation and Waste Management. Indus Publishing Company, New Delhi

4. Srivastava RP and Kumar S. 2003. Fruit and Vegetable Preservation: Principles and Practices. International Book Distribution Company, Lucknow.

5. Giridharilal GS, Siddappa and Tandon GL. 1986. Preservation of Fruits and Vegetables. ICAR, New Delhi.

6. Web resources suggested by the teacher concerned and the college librarian including reading material.

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III-BZC	BOTANY-VIIB	SEM-V	Course code: BOT N	2022-23	No. of Credits:1	No. of Hrs /Week:2

Course 7B: Vegetable Crops – Post harvest Practices – Practical syllabus

IV. Learning Outcomes: On successful completion of this practical course, student will be able to:

1. Identify stages of maturity in vegetable crops.
2. Handle material for storage of vegetables.
3. Identify physical and biological causes for spoilage of vegetables.
4. Make some value-added products of vegetables.

V. Practical (Laboratory) Syllabus: (30 hrs)

1. Maturity selection and harvest, harvesting practices.
2. List and cost of equipment, utensils, and additives required for small scale processing industry.
3. Study of different types of spoilages in fresh as well as processed vegetables.
4. Identification and classification of spoilage organisms.
5. Estimation of total carbohydrates (Anthrone method) in a stored vegetable and un-stored vegetable.
6. Estimatio of protein (Lowry method) in a stored vegetable and un-stored vegetable.
7. Sensory evaluation of fresh and processed vegetables.
8. Assessment of quality and grading, pre-packaging and protective treatments.
9. Identification of packaging materials, containers for packaging.
10. Preparation of pickle from a vegetable.
11. Preparation of tomato sauce, ketchup and chutney.

VI. Lab References:

1. Swati Barche, Reena Nair and P. K. Jain, 2016. A Practical Manual on Post Harvest Value Addition and Processing of Horticulture Crops. Agrobios (India), Jodhpur
2. Antonio L. Acedo Jr., Md. Atiqur Rahman, Borarin Buntong and Durga Mani Gautam, 2016. Vegetable Postharvest Training Manual, AVRDC - The World Vegetable Center, Taiwan
3. Akhilesh Sharma (Ed.), 2013. Practical Manual Olericulture-I, Sheel Packers, New Delhi
4. Biswajit Saha and Shri Dharampal Singh, 2013. Practical Manual Olericulture-I, Sheel Packers, New Delhi
5. Web sources suggested by the teacher concerned.

VII. Co-Curricular Activities:

a) Mandatory: *(Lab/ field training of students by teacher: (Lab: 10 + field: 05 hours)*

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 harvesting indices of vegetables, storage methods, tools and techniques for processing, causes for spoilage and methods to control, preservation methods, marketing chain and in making value added products.

2. **For Student**: Students shall (individually) visit any one of the places like horticulture university/ research station; vegetable storage units in public and private sector; vegetable processing industries in their locality and observe harvesting practices, storage methods, processing and preservation; grading, value added products and marketing. Write their observations 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.

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 or farmers.

2. Assignments (including technical assignments like tools and techniques for storage, processing and preservation, causes for spoilage and methods to avoid losses, value added products of some vegetables, packaging and marketing etc.)

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

4. Preparation of videos on cultivation practices for vegetable crops.

5. Collection of material/figures/photos related to harvesting, storage, processing and preservation of vegetable crop produce, writing and organizing them in a systematic way in a file.

6. Visits to horticulture universities, research organizations; storage, processing industries in public or private sector; industries making value added products of vegetables etc.

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

Model Question Paper Pattern for Practical Examination

Semester – V/ Botany Skill Enhancement Course

Vegetable Crops – Post Harvest Practices

Max. Time: 3 Hrs. Max. Marks: 50

1. Identification of organism(s) responsible for spoilage of vegetable 'A' 8
2. Assessment of quality and grading/ technique of packaging and protective treatment. 10
3. Estimation of carbohydrates/protein content in a vegetable sample 'C' 12
4. Scientific observation and data analysis 4 x 3 = 12

D. Identification of harvesting stage
E. Identification of equipment for processing
F. Identification of PGR/chemical used for PHT of vegetables.
G. Identification of a packaging material/value added product.

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

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III-BZC	BOTANY-VID	SEM-V	Course code: BOT N	2022-23	No. of Credits:4	No. of Hrs /Week:1

Course 6D: Gardening and Landscaping
(Skill Enhancement Course (Elective), Credits: 05)

I. Learning Outcomes:
Students at the successful completion of the course will be able to:
1. Acquire a critical knowledge about the aesthetic value, types and styles of gardens.
2. Perform filed operations in a garden by understanding the role of a gardener.
3. Identify various ornamental plants and explain the growth habits.
4. Propagate garden plants through various propagation techniques.
5. Demonstrate skills of designing and developing a garden.

II. Syllabus: (Hours: Teaching: 50, Lab: 30, Field training: 05, others incl. unit tests: 05) (*Syllabi of theory, practical and lab (skills) training together shall be completed in 80 hours*)

Unit -1: Basics of Gardening (10h)
1. Garden and gardening: Definitions, objectives and scope; types of gardens (domestic garden, flower garden, woodland garden, rock garden, water garden and herb and vegetable garden).
2. Speciality gardens (vertical garden, roof garden and scented garden); principles of gardening; garden components and adornments;
3. Styles of garden: formal, informal, free style and wild; some famous gardens of India.

Unit -2: Garden operations (10h)
1. Bio-aesthetic planning, eco-tourism, theme parks, indoor gardening, therapeutic gardening.
2. Gardening operations: soil laying, manuring, watering, management of pests and diseases and harvesting.
3. Lawn making, methods of designing rockery and water garden.

Unit-3: Ornamental plants (10h)
1. Ornamental plants: flowering annuals and perennials; climbers and creepers; shade and ornamental trees.
2. Bulbous and foliage ornamental plants; cacti and succulents; palms, ferns.
3. Bonsai: definition, types and styles, art of making bonsai.

Unit-4: Propagation techniques (10h)
1. Propagation of ornamental plants by rhizomes, corms tubers, bulbs and bulbils.

2. Vegetative propagation techniques – a brief account of cuttings, layering and grafting.
3. Types of seed beds; sowing of seeds and raising seedlings, transplanting of seedlings; growing plants in pots, potting and repotting.

Unit-5: Landscaping (10h) 27
1. Landscaping: definition, landscaping of parks and public gardens.
2. Urban planning and planting avenues; Landscaping highways and educational institutions; beautifying villages and colonies.
3. Computer Aided Designing (CAD) for outdoor and indoor-scaping.

III. References:
1. Bose T.K. and Mukherjee, D., 1972, Gardening in India, Oxford & IBH Publishing Co., New Delhi.
2. Sandhu, M.K. 1989 Plant Propagation, Wiley Eastern Ltd., Bengaluru.
3. Nambisan, K. M. P. 1992. Design Elements of Land Scape Gardening Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Bose, T. K. Malti, R. G. Dhua, R. S and Das, P. 2004. Floriculture and Landscaping. Nayaprakash, Calcutta.
5. Arora, J.S. 2006. Introductory Ornamental Horticulture. Kalyani Publishers, Ludhiana.
6. Web resources suggested by the teacher concerned and the college librarian including reading material.

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III-BZC	BOTANY-VID	SEM-V	Course code: BOT N	2022-23	No. of Credits:1	No. of Hrs /Week:2

Course 6D: Gardening and Landscaping – Practical syllabus

IV. Learning Outcomes: On successful completion of this practical course, student will be able to:

1. Perform various skills related to gardening.
2. Identify the living and non-living components required for garden development.
3. Identify the pests and diseases of garden plants and control the same.
4. Demonstrate skills of making bonsai and developing lawn.
5. Make landscape design using CAD.

V. Practical (Laboratory) Syllabus: (30 hrs)

1. Preparation of beds for growing nursery of herbs, shrubs and trees.
2. Tools, implements and containers used for propagation and nursery techniques.
3. Identification of different ornamental plants.
4. Demonstration of types and styles of gardens using photos or videos.
5. Gardening operations: soil laying, manuring, watering.
6. Identification of pathogenic and non-pathogenic diseases of garden plants and grasses.
7. Propagation by cutting, layering, budding and grafting.
8. Planning and designing of gardens, functional uses of plants in the landscape.
9. Preparation of land for lawn and planting.
10. Exposure to CAD (Computer Aided Designing)
11. Demonstration of bonsai making.
12. Making of topiaries.

VI. Lab References:

1. Paul Wagland, 2011. Garden Landscaping Manual: A Step-by-Step Guide to Landscaping & Building Projects in Your Garden, Haynes Publishing UK
2. Misra Kaushal Kumar, 2016. Practical Manual of Horticulture, Biotech Books, Open Library.org
3. Hemla Naik, B., S.Y. Chandrashekhar and M. Jawaharlal, 2013. Principles of Landscape Gardening, TNAU, Agrimoon.Com.
4. Web sources suggested by the teacher concerned.

VII. Co-Curricular Activities:

a) Mandatory: (*Lab/ field training of students by teacher: (Lab: 10 + field: 05 hours*)

1. **For Teacher**: Training of students by the teacher in the laboratory/field for a total of not less than 15 hours on the field techniques/skills of garden operations, lawn making, art of bonsai, plant propagation methods, Using CAD.

2. **For Student**: Students shall (individually) visit the parks in public and private places, study the living and non-living elements of gardening – landscaping; write their observations (on various plants, growth habit, propagation, design of garden etc.,) and submit a hand-written Fieldwork/Project work Report not exceeding 10 pages in the given format to the teacher.

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(s) 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 ornamental plants, types and styles of gardens, propagation of garden plants, landscaping)

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

4. Preparation of videos on plant propagation, garden operations, ornamental gardening.

5. Collection of material/figures/photos related to gardening and landscaping, writing and organizing them in a systematic way in a file.

6. Visits to gardens and parks in public places and/or private firms; famous gardens in A.P. and India etc.

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

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Model Question Paper Pattern for Practical Examination

Semester – V/ Botany Skill Enhancement Course

Gardening and Landscaping

Max. Time: 3 Hrs. Max. Marks: 25

1. Demonstration a vegetative propagation technique 'A'
2. Demonstration of bed making/ garden operations' 'B'
3. Demonstration of bonsai technique/ designing a landscape 'C'
4. Scientific observation and data analysis

D. Type or style of garden
E. Ornamental plant
F. Garden adornments
G. Pest or disease of garden plants

5. Record + Viva-voce

SRR & CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA-52004

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III-BZC	BOTANY-VIIA	SEM-V	Course code: BOT N	2022-23	No. of Credits:4	No. of Hrs /Week:4

Course 7D: Agroforestry

(Skill Enhancement Course (Elective), Credits: 05)

I. Learning Outcomes:

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

1. Understand the concepts and economic value of agroforestry.
2. Acquire a critical knowledge on systems and design of agroforestry.
3. Explain silviculture practices in relation to agroforestry.
4. Understand the role of agroforestry to reclaim the waste lands.
5. Perform skills in relation to tree measurement techniques.

II. Syllabus: (Hours: Teaching: 50, Lab: 30, Field training: 05, others incl. unit tests: 05)

(*Syllabi of theory, practical and lab (skills) training together shall be completed in 80 hours*)

Unit-1: Basic concepts of Agroforestry (10h)

1. Forest and Agroforestry. Definition, objectives, scope and advantages of agroforestry; classification of agroforestry; differences between social forestry and agroforestry.
2. Agroforestry practices as existing in India and Andhra Pradesh.
3. Criteria for selection and screening of tree species; design and diagnosis methodology in relation to agroforestry.

Unit-2: Systems of Agroforestry (10h)

1. Global agroforestry system: shifting cultivation, taungya cultivation, shelter belt and wind breaks, and energy plantation and homestead gardens.
2. Multipurpose tree species and their characteristics; criteria for selection of agroforestry design, role tree architecture and management in agroforestry.
3. Alley cropping, high density short rotation plantation systems, silvicultural woodlots, energy plantations.

Unit-3: Silviculture of Agroforestry trees (10h)

1. Silviculture: Definition, objectives and scope and its place in agroforestry.
2. Choice of species, site selection, and pure verses mixed crop, planting techniques and methods, protection of seedlings/ plantations from environmental and biological adversaries, tending operations, concept of coppice etc.
3. Silviculture of agroforestry trees with special reference to: (a) *Azadirachta indica*, (b) *Tectona grandis* (c) *Emblica officinalis* and (d) *Tamarindus indica*.

Unit-4: Waste land reclamation (10h)

1. Wasteland definition, types: ecological characteristics, landslides, soil erosion, hoods, drought, salinity, water logging and fire.
2. Biological causes of deforestation, grazing, shifting cultivation and faulty agricultural practices.
3. Reclamation of wastelands, scientific land use practices, afforestation, soil conservation practices, improvement of water catchment areas and development of recreational and amenity areas.

Unit-5: Measurements in Agroforestry (10h)

1. Tree measurement techniques: Instruments and methods for measurement of tree diameter, height, bark thickness, crown volume crown surface area.
2. Tree stem form, yield tables, volume tables, concept of sustained yield, and kind of tree rotation, increment and yield; estimation of biomass.
3. Determination of tree age and introduction of working plan.

III. References:

1. Dwivedi, A.P. 1992. Agroforestry: Principles and Practices. Oxford & IBH
2. Nair, P.K.R. 1993. An Introduction to Agroforestry. Kluwer.
3. Nair P.K.R., M.R. Rai and L.E.Buck, 2004. New Vistas in Agroforestry. Kluwer
4. Rajeshwar Rao G., M. Prabhakar, G. Venkatesh, I. Srinivas and K. Sammi Reddy (2018) Agroforestry Opportunities for Enhancing Resilience to Climate Change in Rainfed Areas, ICAR-CRIDA, Hyderabad
5. Young, A. 1997. Agroforestry for Soil Management. CABI
6. Web resources suggested by the teacher concerned and the college librarian including reading material.

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III-BZC	BOTANY-VIIA	SEM-V	Course code: BOT N	2022-23	No. of Credits: 1	No. of Hrs /Week: 2

Course 7D: Agroforestry – Practical syllabus

IV. Learning Outcomes: On successful completion of this practical course, student will be able to:

1. Identify suitable tree species for agroforestry and their products.
2. Demonstrate skills on raising tree species from seeds and by vegetative propagation.
3. Perform skills on measurements related to wood-based products.
4. Estimate biomass in an energy plantation.

V. Practical (Laboratory) Syllabus: (30 hrs)

1. Identification of agroforestry tree-species.
2. Identification of important major and minor agroforest products.
3. Collection and maintenance of agro-forest products and herbarium
4. Nursery lay out seed sowing and pre-sowing seed treatments.
5. Vegetative propagation techniques – hard wood cuttings and air layering.
6. Diameter measurements using calipers and tape; diameter measurements of forked, buttressed, fluted and leaning trees.
7. Height measurement of standing trees by shadow method, single pole method and hypsometer.
8. Volume measurement of logs using various formulae.
9. Biomass estimation in energy plantations.

VI. Lab References:

1. Meena, R. N. and R.K. Singh, 2014. A Practical Manual on Agroforesty. Srijan Samiti Publication, Varanasi
2. Dadhwal, K.S., P.Panwar, R.Kaushal, H.S.Saralch and R.Chauhan, 2014. Practical Manual
3. Sen, N. L., R. C. Dadheech, L. K. Dashora and T. S. Rawat, 2010. Manual of Agroforestry and Social forestry, Agrotech Publishing Academy, Udaipur
4. Web sources suggested by the teacher concerned.

VII. Co-Curricular Activities:

a) Mandatory: (*Lab/ field training of students by teacher: (Lab: 10 + field: 05 hours)*

1. **For Teacher**: Training of students by the teacher in the laboratory/field for not less than 15 hours on techniques like selection and screening of tree species, design and diagnosis methodology in agroforestry, silviculture practices for some selected tree species and measurements in agroforestry.

2. **For Student**: Students shall (individually) visit to nurseries of forest department, agroforestry division in Horticulture university/research station, agroforest/silviculture sites, write their observations on nursery practices, various species grown in an agroforest, growth habit, cultivation practices, measurements, products 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
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).

a) Suggested Co-Curricular Activities:

1. Training of students by related industrial experts.
2. Assignments (including technical assignments like criteria for selection of agroforestry tree species; silviculture practices in agroforests; measurements in agroforestry; economic, social, land use and cultural services of agroforestry)
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Preparation of videos on various agroforestry methods, silviculture practices, tree measurement techniques etc.,
5. Collection of material/figures/photos related to agroforestry, writing and organizing them in a systematic way in a file.
6. Visits to social forest nurseries, energy plantations and forest research centres; nearby agro-forest based industries in A.P.
7. Invited lectures and presentations on related topics by field/industrial experts

SRR & CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA-52004

An autonomous college in the jurisdiction of Krishna University, Machilipatnam. A.P.

III-BZC	BOTANY-VIIA	SEM-V	Course code: BOT N	2022-23	No. of Credits:1	No. of Hrs /Week:2

Model Question Paper Pattern for Practical Examination

Semester – V/ Botany Skill Enhancement Course

Agroforestry

Max. Time: 3 Hrs. Max. Marks: 50

1. Demonstration pre-sowing seed treatments 'A' 8
2. Demonstration of hard wood cutting/air layering technique 'B' 10
3. Demonstration of technique of diameter/height measurement 'C' 12
4. Scientific observation and data analysis 4 x 3 = 12

D. Agroforest plant

E. Agroforest product

F. A tool used for measurement

G. A herbarium specimen collected by him/her for identification

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

Suggested pattern for Question Paper of Theory Examination(s) at Semester end

Max. Time: 3 Hrs. Max. Marks: 75 M

Section – A

Answer all the following questions. 5 x 2 = 10 M

One question should be given from each Unit in the syllabus.

Section – B

Answer any Four of the following questions. Draw a labelled diagram wherever necessary 3 x 5 = 15 M

One question should be given from each Unit in the syllabus.

Section – C

Answer any five of the following questions. Draw a labelled diagram wherever necessary 5 x 10 = 50 M

Two questions (a & b) are to be given from each Unit in the syllabus (internal choice in each unit). Student has to answer 5 questions by choosing one from a set of questions given from a Unit.

Note: Questions should be framed in such a way to test the understanding, analytical and creative skills of the students. All the questions should be given within the frame work of the syllabus prescribed.

Board of Studies Composition - Botany & Horticulture

2022 - 2023

S.No	Name of the Resource person	Designation
1	Ms. G.Swapna In-charge of the Department Department of Botany	Chairman of BOS
2	Dr.T.Rose Mary HOD, Department of Botany Andhra Loyola College Vijayawada-08 Mobile: 9989892440	University Nominee
3	Mr. K.GaniRaju Lecturer in Botany Government College (A) Rajahmundry-533105 Mobile:9948088250	Subject Expert
4	Dr.R.V.Sujatha Associate Professor, Department of Agricultural Economics Dr.YSR Horticultural University Venkataramannagudem West Godavari District Mobile: 9666621341	Subject Expert
5	Dr.S. Siva Rama Krishna ((Industry nominee) Jeevaka Ayurveda, Tenali Mobile: 9441898805 e-mail:srksamala@gmail.com	Industrialist Online Participation
6	Goriparthi Venkata Sai Ram Yadav Mobile: 9989059219	Alumni
7	V. Naga Padmavathi Lecturer in Botany Mobile: 9182179891	Member
8	Dr. Ch. Srinivasa Reddy Lecturer in Botany Mobile: 9908721905	Member