

CBCS / Semester System (w.e.f. 2020-'21 Admitted Batch)
I Semester /Botany Core Course - 1
Fundamentals of Microbes and Non-vascular Plants
(Viruses, Bacteria, Fungi, Lichens, Algae and Bryophytes)
(Total hours of teaching – 60 @ 04 Hrs./Week)

Theory:

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

- Explain origin of life on the earth.
- Illustrate diversity among the viruses and prokaryotic organisms and can categorize them.
- Classify fungi, lichens, algae and bryophytes based on their structure, reproduction and life cycles.
- Analyze and ascertain the plant disease symptoms due to viruses, bacteria and fungi.
- Recall and explain the evolutionary trends among amphibians of plant kingdom for their shift to land habitat.
- 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.
5. Significance of viruses in vaccine production, bio-pesticides and as cloning vectors.

Unit – 2: Special groups of Bacteria and Eubacteria

12Hrs.

1. Brief account of Archaeobacteria, Actinomycetes and Cyanobacteria.
2. Cell structure and nutrition of Eubacteria.
3. Reproduction- Asexual (Binary fission and endospores) and bacterial recombination (Conjugation, Transformation, Transduction).
4. Economic importance of Bacteria with reference to their role in Agriculture and industry (fermentation and medicine)
5. 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 (upto classes).
2. Structure, reproduction and life history of (a) *Rhizopus* (Zygomycota) and (b) *Puccinia* (Basidiomycota).
3. Economic uses of fungi in food industry, pharmacy and agriculture.
4. A general account on symptoms of plant diseases caused by Fungi; Blast of Rice.
5. 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 (upto 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; classification upto classes.
2. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life cycle of (a) *Marchantia* (Hepaticopsida) and (b) *Funaria* (Bryopsida).
3. General account on evolution of sporophytes in Bryophyta.

Text books :

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

Books for Reference:

- Dubey, R.C. & D.K. Maheswari (2013) *A Text Book of Microbiology*, S. Chand & Company Ltd., New Delhi
- Pelczar Jr., M.J., E.C.N. Chan & N.R. Krieg (2001) *Microbiology*, Tata McGraw-Hill Co, New Delhi
- Prescott, L. Harley, J. and Klein, D. (2005) *Microbiology, 6th edition*, Tata McGraw – Hill Co. New Delhi.

III Semester /Botany Core Course - 3
Anatomy and Embryology of Angiosperms, Plant Ecology and Biodiversity
(Total hours of teaching – 60 @ 04 Hrs./Week)

Theory:

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

- Understand on the organization of tissues and tissue systems in plants.
- Illustrate and interpret various aspects of embryology.
- Discuss the basic concepts of plant ecology, and evaluate the effects of environmental and biotic factors on plant communities.
- Appraise various qualitative and quantitative parameters to study the population and community ecology.
- Correlate the importance of biodiversity and consequences due to its loss.
- Enlist the endemic/endangered flora and fauna from two biodiversity hot spots in India and assess strategies for their conservation.

Unit – 1: Anatomy of Angiosperms

12 Hrs.

1. Organization of apical meristems: Tunica-carpus theory and Histogen theory.
2. Tissue systems—Epidermal, ground and vascular.
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, megasporogenesis; monosporic (*Polygonum*), bisporic (*Allium*) and tetrasporic (*Peperomia*) types of embryo sacs.
3. Outlines of pollination, pollen – pistil interaction and fertilization.
4. Endosperm - Types and biological importance - Free nuclear, cellular, helobial and ruminant.
5. Development of Dicot (*Capsella bursa-pastoris*) embryo.

Unit – 3 : Basics of Ecology

12 Hrs.

1. Ecology: definition, branches and significance of ecology.
2. Ecosystem: Concept and components, energy flow, food chain, food web, ecological pyramids.
4. Plants and environment: Climatic (light and temperature), edaphic and biotic factors.
5. Ecological succession: Hydrosere and Xerosere.

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

1. Population ecology: Natalty, mortality, growth curves, ecotypes, ecads
2. Community ecology: Frequency, density, cover, life forms, biological spectrum
3. Concepts of productivity: GPP, NPP and Community Respiration
4. Secondary production, P/R ratio and Ecosystems.

Unit – 5: Basics of Biodiversity 12 Hrs.

1. Biodiversity: Basic concepts, Convention on Biodiversity - Earth Summit.
2. Value of Biodiversity; types and levels of biodiversity and Threats to biodiversity
3. Biodiversity Hot spots in India. Biodiversity in North Eastern Himalayas and Western Ghats.
4. Principles of conservation: IUCN threat-categories, RED data book
5. Role of NBPGR and NBA in the conservation of Biodiversity.

Text books :

- Botany – III (Vrukshasastram-I) : Telugu Akademi, Hyderabad
- Botany – IV (Vrukshasastram-II) : Telugu Akademi, Hyderabad
- Pandey, B.P. (2013) *College Botany, Volume-II*, S. Chand Publishing, New Delhi
- Pandey, B.P. (2013) *College Botany, Volume-III*, S. Chand Publishing, New Delhi
- Bhattacharya, K., G. Hait & Ghosh, A. K., (2011) *A Text Book of Botany, Volume-II*, New Central Book Agency Pvt. Ltd., Kolkata

Books for Reference:

- Esau, K. (1971) *Anatomy of Seed Plants*. John Wiley and Son, USA.
- Fahn, A. (1990) *Plant Anatomy*, Pergamon Press, Oxford.
- Cutler, D.F., T. Botha & D. Wm. Stevenson (2008) *Plant Anatomy : An Applied Approach*, Wiley, USA.
- Paula Rudall (1987) *Anatomy of Flowering Plants : An Introduction to Structure and Development*. Cambridge University Press, London
- Bhojwani, S. S. and S. P. Bhatnagar (2000) *The Embryology of Angiosperms (4th Ed.)*, Vikas Publishing House, Delhi.
- Pandey, A. K. (2000) *Introduction to Embryology of Angiosperms*. CBS Publishers & Distributors Pvt. Ltd., New Delhi
- Maheswari, P. (1971) *An Introduction to Embryology of Angiosperms*. McGraw Hill Book Co., London.
- Johri, B.M. (2011) *Embryology of Angiosperms*. Springer-Verlag, Berlin
- Pandey, B.P. (2013) *College Botany, Volume-III*, S. Chand Publishing, New Delhi
- Bhattacharya, K., A. K. Ghosh, & G. Hait (2011) *A Text Book of Botany, Volume-IV*, New Central Book Agency Pvt. Ltd., Kolkata
- Kormondy, Edward J. (1996) *Concepts of Ecology*, Prentice-Hall of India Private Limited, New Delhi
- Begon, M., J.L. Harper & C.R. Townsend (2003) *Ecology*, Blackwell Science Ltd., U.S.A.

A.P. State Council of Higher Education
Semester-wise Revised Syllabus under CBCS, 2020-21

Course Code:

Four-year B.Sc. (Hons)
Domain Subject: **BOTANY**
IV Year B. Sc. (Hons) – Semester – V

Max Marks: 100

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.

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
CORE COURSE : BOTANY
Semester: I

Course -1 : Fundamentals of Microbes and Non-vascular Plants

Time: 3 hours

Max Marks: 75M

Answer any 5 questions. Each question carries 5 marks.
(Total 8 questions and at least two questions should be given from each unit)

SECTION – A

(5 X 5M = 25M)

1. (a) Prions (b) Viroids ✓
2. Archaeobacteria
3. (a) Basidiocarp (b) Ascocarp ✓
4. Economic importance of Lichens
5. Reserve food material in Algae
6. (a) Scalariform conjugation (b) Lateral conjugation
7. General characteristics of Bryophytes
8. Anatomy of thallus in *Marchantia*

SECTION – B

Answer all the questions. Each question carries 10 marks.

(5 X 10M = 50M)

9. Describe the structure of TMV and Gemini virus with neat labeled diagrams.
(OR)
10. Write a general account on symptoms of plant diseases caused by Viruses.
11. Describe the cell structure of a eubacterium with neat labeled diagram.
(OR)
12. Discuss the economic importance of bacteria in agriculture and industrial sectors with suitable examples.
13. Explain the life cycle in *Puccinia* with the help of a schematic diagram.
(OR)
14. Discuss the economic uses of fungi in food industry, pharmacy and agriculture.
15. Write an essay on sexual reproduction in *Polysiphonia*.
(OR)
16. Discuss the economic importance of Algae with suitable examples.
17. Describe the sexual reproduction in *Funaria* with neat labeled diagrams.
(OR)
18. Write an essay on classification of Bryophytes upto classes.

MODEL QUESTION PAPER
CORE COURSE : BOTANY
Semester: III

Course -3 : Anatomy and Embryology of Angiosperms, Plant Ecology and Biodiversity
Time: 3 hours

Max Marks: 75M

SECTION – A

Answer any 5 questions. Each question carries 5 marks
(Total 8 questions and at least two questions should be given from each unit)

(5 X 5M = 25M)

1. (a) Xylem tracheids (b) Xylem vessels
2. (a) Periplasmodial tapetum (b) Glandular tapetum
3. (a) Helobial endosperm (b) Ruminant endosperm
4. Pyramids of numbers
5. (a) Ecotypes (b) Ecads
6. P/R ratio
7. Earth Summit.
8. Role of NBPGR in conservation of Biodiversity

SECTION – B

Answer all the questions. Each question carries 10 marks.

(5 X 10M = 50M)

9. Write an essay on organization of apical meristems with theories proposed.

(OR)

10. Discuss the anomalous secondary growth in stem of *Boerhaavia* with the help of a neat labeled diagram.

11. Explain monosporic and bisporic types of embryo sac development in angiosperms.

(OR)

12. Describe the embryogeny in a dicot plant with neat labeled diagrams.

13. Explain various effects of light factor plants and their communities?

(OR)

14. Define ecological succession. Discuss hydrosere with suitable diagrams and examples.

15. Describe Raunkiaer's life forms with suitable examples.

(OR)

16. Write an essay on primary productivity.

17. Write an essay on value of biodiversity with appropriate examples.

(OR)

18. Define biodiversity hotspot. Discuss the biodiversity in Western Ghats of India.

MODEL PAPER

B.Sc.

COURSE : BOTANY

Semester-V

SEED TECHNOLOGY

Time:3 Hours]

Max : 75 Marks]

Section A (5 × 5 = 25 Marks)

Answer any **Five** of the following questions .

Each question carries **Five** Marks.

Q. 1. Monocot Seed.

Refer to Q. 1, Study Material, Page 3

Q. 2. Characteristics of Quality Seed Material.

Refer to Q. 3, Study Material, Page 10

Q. 3. Recalcitrant Seeds.

Refer to Q. 9, Study Material, Page 33

Q. 4. Seed Viability.

Refer to Q. 2, Study Material,, Page 65

Q. 5. TZ Test.

Refer to Q. 5, Study Material, Page 53

Q. 6. Seed Treatment Methods.

Refer to Q. 1, Study Material, Page 71

Q. 7. Genetic Purity Verification.

Refer to Q. 12, Study Material, Page 107

Q. 8. Seed Inspector.

Refer to Q. 6, Study Material, Page 100

Section B (5 × 10 = 50 Marks)

Answer *All* of the following questions.

Each question carries **10** Marks.

Q. 9 (a) What is Seed ? Describe the Structure Monocot Seed.

Refer to Q. 1, Study Material, Page 1

(Or)

(b) What is Seed Dormancy ? Discuss the causes of Seed Dormancy and write any two methods to break it.

Refer to Q. 2, Study Material, Page 4

Refer to Q. 4, Study Material, Page 7

Q. 10(a) Explain Various steps in Seed Processing.

Refer to Q. 2, Study Material, Page 17

(Or)

(b) What are the factors affecting the longevity in seed storage.

Refer to Q. 10, Study Material, Page 34.

Q.11(a) Write about the importance of Seed moisture and the methods to determine it.

Refer to Q. 3, Study Material, Page 48

(Or)

(b) Explain the Standard Seed germination Test.

Refer to Q. 1, Study Material, Page 45

Q.12(a) Write a brief account of Seed Borne. Diseases and their transmission.

Refer to Q. 2, Study Material, Page 72

(Or)

(b) What are the different Seed health testing methods for detecting Microorganisms.

Refer to Q. 5, Study Material, Page 79

Q.13(a) What is Seed Certification ? Write its Objectives.

Refer to Q. 9, Study Material, Page 103

(Or)

(b) What are different classes of Seeds. Explain the phases of certification Standards.

Refer to Q. 3, Study Material, Page 95

Refer to Q. 3, Study Material, Page 109

Model Question Paper pattern for Practical Examination
Semester – V/ Botany Skill Enhancement Course
Course – 7A: Seed Technology

Max. Time: 3 Hrs.

Max. Marks: 50

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- | | |
|--|------------|
| 1. Demonstration of a method to break seed dormancy 'A' | 10 |
| 2. Determination of seed moisture content/ seed germination test 'B' | 10 |
| 3. Demonstration of test for seed viability/ seed vigour 'C' | 10 |
| 4. Scientific observation and data analysis | 4 x 3 = 12 |
| D. Monocot / Dicot seed | |
| E. Seed sampling equipment | |
| F. Seed borne pathogen specimen/photograph | |
| G. Seed certification agency/procedure | |
| 4. Record + Viva-voce | 5+3 = 8 |

MODEL PAPER-1

B.Sc.

COURSE : BOTANY

Semester-V

PLANT PROPAGATION

Time:3 Hours]

[Max : 75 Marks

Section A (5 × 5 = 25 Marks)

Answer any **Five** of the following questions .

Each question carries **Five** Marks.

Q. 1. Mist Chamber.

Refer to Q. 5, Study Material, Page 29

Q. 2. Polyhouse.

Refer to Q. 3, Study Material, Page 3

Q. 3. Polyembryony.

Refer to Q. 2, Study Material, Page 34

Q. 4. Stem tip cutting.

Refer to Q. 1, Study Material,, Page 46

Q. 5. Serpentine Layering. (Or) Compound layering.

Refer to Q. 3, Study Material, Page 62

Q. 6. Trench Layering.

Refer to Q. 1, Study Material, Page 65

Q. 7. Bud Wood Certification.

Refer to Q. 9, Study Material, Page 93

Q. 8. Micrografting.

Refer to Q. 8, Study Material, Page 91

Section B (5 × 10 = 50 Marks)

Answer **All** of the following questions.

Each question carries **10** Marks.

Q. 9 (a) Define Plant Propagation ? Explain the Sexual method of plant propagation ? Add a note on its advantages and disadvantages.

Refer to Q. 5, Study Material, Page 16

Refer to Q. 8, Study Material, Page 31

Refer to Q. 2, Study Material, Page 2

(Or)

(b) Write in detail about the Plant Propagation by means of Bulbs, Tubers and Rhizomes.

Refer to Q. 5, Study Material, Page 16

Q. 10(a) Define Apomixis and Explain the types of Apomixis.

Refer to Q. 1, Study Material, Page 32

(Or)

(b) Describe the propagation of Mango and Citrus using Apomictic Embryos.

Refer to Q. 4, Study Material, Page 38

Q.11(a) What are Cuttings ? Write about different methods of Cuttings ?

Refer to Q. 1, Study Material, Page 44

(Or)

(b) Write an account on the role of Plant Growth regulators in rooting of Cuttings.

Refer to Q. 3, Study Material, Page 50

Q.12(a) Define Layering. Explain the Principle and Factors influencing Layering.

Refer to Q. 1, Study Material, 58

(Or)

(b) Explain in detail about the Air Layering and its application in Woody Trees.

Refer to Q. 3, Study Material, Page 62

Q.13(a) Write an essay on different Grafting Techniques.

Refer to Q. 2, Study Material, Page 73

(Or)

(b) What is Budding ? Describe the various Techniques of Budding.

Refer to Q. 1, Study Material, Page 68