

II Semester /Botany Core Course – 2
Basics of Vascular plants and Phytogeography
(Pteridophytes, Gymnosperms, Taxonomy of Angiosperms and Phytogeography)
(Total hours of teaching – 60 @ 02 Hrs./Week)

Theory:

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

- Classify and compare Pteridophytes and Gymnosperms based on their morphology, anatomy, reproduction and life cycles.
- Justify evolutionary trends in tracheophytes to adapt for land habitat.
- Explain the process of fossilization and compare the characteristics of extinct and extant plants.
- Critically understand various taxonomical aids for identification of Angiosperms.
- Analyze the morphology of the most common Angiosperm plants of their localities and recognize their families.
- Evaluate the ecological, ethnic and economic value of different tracheophytes and summarize their goods and services for human welfare.
- Locate different phytogeographical regions of the world and India and can analyze their floristic wealth.

Unit – 1: Pteridophytes

12 Hrs.

- June 31 } 1. General characteristics of Pteridophyta; classification of Smith (1955) into divisions.
- 4.12 } 2. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life history of (a) *Lycopodium* (Lycopsida) and (b) *Marsilea* (Filicopsida).
- 5.12 } 3. Stellar evolution in Pteridophytes;
4. Heterospory and seed habit.

Unit – 2: Gymnosperms

14 Hrs.

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

Unit – 3: Basic aspects of Taxonomy

13 Hrs.

- 5.12 } 1. Aim and scope of taxonomy; Species concept: Taxonomic hierarchy, species, genus and family.
2. Plant nomenclature : Binomial system, ICBN- rules for nomenclature.
3. Herbarium and its techniques. BSI herbarium and Kew herbarium; concept of digital herbaria.
- AUG - 21

~~24~~ Bentham and Hooker system of classification;

~~4/5~~ Systematic description and economic importance of the following families:

(a) Annonaceae (b) Curcubitaceae

Unit – 4: Systematic Taxonomy

13 Hrs.

~~5/6~~ 1. Systematic description and economic importance of the following families:

(a) Asteraceae (b) Asclepiadaceae (c) Amaranthaceae (d) Euphorbiaceae

(e) Arecaceae and (f) Poaceae

2. Outlines of Angiosperm Phylogeny Group (APG IV).

Unit – 5: Phytogeography

08 Hrs.

1. Principles of Phytogeography. Distribution (wides, endemic, discontinuous species)

2. Endemism – types and causes.

3. Phytogeographic regions of World.

4. Phytogeographic regions of India.

5. Vegetation types in Andhra Pradesh.

Text books :

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

Books for Reference:

- Smith, G.M. (1971) *Cryptogamic Botany Vol. II.*, Tata McGraw Hill, New Delhi
- Sharma, O.P. (2012) *Pteridophyta*. Tata McGraw-Hill, New Delhi
- Kramer, K.U. & P. S. Green (1990) *The Families and Genera of Vascular Plants, Volume -I: Pteridophytes and Gymnosperms* (Ed. K. Kubitzki) Springer-Verlag, New York
- Bhatnagar, S.P. & Alok Moitra (1996) *Gymnosperms*. New Age International, New Delhi
- Coulter, J.M. & C.J. Chamberlain (1910) *Morphology of Gymnosperms*, The University of Chicago Press, Chicago, Illinois
- Govil, C.M. (2007) *Gymnosperms : Extinct and Extant*. KRISHNA Prakashan Media (P) Ltd. Meerut & Delhi
- Sporne, K.R. (1971) *The Morphology of Gymnosperms*. Hutchinsons Co. Ltd., London
- Arnold, C.A., (1947) *An introduction to Paleobotany* McGraw – Hill Book Company, INC, New York
- Stewart, W.N., and G.W. Rothwell (2005) *Paleobotany and the evolution of plants* Cambridge University Press, New York

Practical syllabus of Botany Core Course – 2/ Semester – II
Basics of Vascular plants and Phytogeography
 (Pteridophytes, Gymnosperms, Taxonomy of Angiosperms and Phytogeography) (Total
 hours of laboratory exercises 30 Hrs. @ 02 Hrs./Week)

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

1. Demonstrate the techniques of section cutting, preparing slides, identifying of the material and drawing exact figures.
2. Compare and contrast the morphological, anatomical and reproductive features of vascular plants.
3. Identify the local angiosperms of the families prescribed to their genus and species level and prepare herbarium.
4. Exhibit skills of preparing slides, identifying the given twigs in the lab and drawing figures of plant twigs, flowers and floral diagrams as they are.
5. Prepare and preserve specimens of local wild plants using herbarium techniques.

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* and *Gnetum*
2. Study of fossil specimens of *Cycadeoidea* and *Pentoxylon* (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 number of Herbarium sheets of wild plants with the standard system is mandatory).
5. Mapping of phytogeographical regions of the globe and India.

Model Question Paper for Practical Examination

Semester – II/ Botany Core Course – 2

Basics of Vascular plants and Phytogeography

(Pteridophytes, Gymnosperms, Taxonomy of Angiosperms and Phytogeography)

Max. Time : 3 Hrs.

Max. Marks : 50

1. Take T.S. of the material 'A' (Pteridophyta), make a temporary slide and justify the identification with apt points. 10 M
2. Take T.S. of the material 'B' (Gymnosperms), make a temporary slide and justify the identification with apt points. 10 M
3. Describe the vegetative and floral characters of the material 'C' (Taxonomy of Angiosperms) and derive its systematic position. 10 M
4. Identify the specimen 'D' (Fossil Gymnosperm) and give specific reasons. (5 M) 4
5. Locate the specified phytogeographical regions (2x2M) in the world / India (E) map supplied to you. 4 M
6. Record + Herbarium & Field note book + Viva-voce 5 + 4 + 3 = 12 M

Model Question Paper for Practical Examination
Semester – II/ Botany Core Course – 2

Basics of Vascular plants and Phytogeography

(Pteridophytes, Gymnosperms, Taxonomy of Angiosperms and Phytogeography)

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3. Describe the vegetative and floral characters of the material 'C' (Taxonomy of Angiosperms) and derive its systematic position. 10 M
4. Identify the specimen 'D' (Fossil Gymnosperm) and give specific reasons. 5 M 4
5. Locate the specified phytogeographical regions (2x2M) in the world / India (E) map supplied to you. 4 M
6. Record + Herbarium & Field note book + Viva-voce 5 +4+3 = 12 M

Suggested co-curricular activities for Botany Core Course 2 in Semester II.

IV Semester/ Botany Core Course – 4
Plant Physiology and Metabolism
 (Total hours of teaching – 60 @ 04 Hrs./Week)

Theory:

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

- Comprehend the importance of water in plant life and mechanisms for transport of water and solutes in plants.
- Evaluate the role of minerals in plant nutrition and their deficiency symptoms.
- Interpret the role of enzymes in plant metabolism.
- Critically understand the light reactions and carbon assimilation processes responsible for synthesis of food in plants.
- Analyze the biochemical reactions in relation to Nitrogen and lipid metabolisms.
- Evaluate the physiological factors that regulate growth and development in plants.
- Examine the role of light on flowering and explain physiology of plants under stress conditions.

Unit – 1 : Plant-Water relations

10 Hrs.

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

Unit – 2 : Mineral nutrition, Enzymes and Respiration

14 Hrs.

- May 2nd* } 1. Essential macro and micro mineral nutrients and their role in plants; symptoms of mineral deficiency
- May 2nd* } 2. Absorption of mineral ions; passive and active processes.
- May 3rd* } 3. Characteristics, nomenclature and classification of Enzymes. Mechanism of enzyme action, enzyme kinetics.
- May 3rd* } 4. Respiration: Aerobic and Anaerobic; Glycolysis, Krebs cycle; electron transport system, mechanism of oxidative phosphorylation, Pentose Phosphate Pathway (HMP shunt).

Unit – 3 : Photosynthesis and Photorespiration

12 Hrs.

- May 4th* } 1. Photosynthesis: Photosynthetic pigments, absorption and action spectra; Red drop and Emerson enhancement effect
- May 4th* } 2. Concept of two photosystems; mechanism of photosynthetic electron transport and evolution of oxygen; photophosphorylation

- June 17/18
3. Carbon assimilation pathways (C3, C4 and CAM);
 4. Photorespiration - C2 pathway

Unit - 4 : Nitrogen and lipid metabolism

12 Hrs.

- June 20/21
1. Nitrogen metabolism: Biological nitrogen fixation – asymbiotic and symbiotic nitrogen fixing organisms. Nitrogenase enzyme system.
 2. Lipid metabolism : Classification of Plant lipids, saturated and unsaturated fatty acids.
 3. Anabolism of triglycerides, β -oxidation of fatty acids, Glyoxylate cycle.

June 30/1

Unit - 5 : Plant growth - development and stress physiology 12 Hrs.

- June 1/2
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.
 5. Physiological changes during water stress.
- June 5/6

Text books :

Underlined

Practical Syllabus of Botany Core Course – 4 / Semester – IV
Plant Physiology and Metabolism
(Total hours of laboratory exercises 30 Hrs. @ 02 Hrs./Week)

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

1. Conduct lab and field experiments pertaining to Plant Physiology, that is, biophysical and biochemical processes using related glassware, equipment, chemicals and plant material.
2. Estimate the quantities and qualitative expressions using experimental results and calculations
3. Demonstrate the factors responsible for growth and development in plants.

Practical Syllabus

1. Determination of osmotic potential of plant cell sap by plasmolytic method using *Rhoeol 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. Demonstration of amylase enzyme activity and study the effect of substrate and Enzyme concentration.
7. Separation of chloroplast pigments using paper chromatography technique.
8. Demonstration of Polyphenol oxidase enzyme activity (Potato tuber or Apple fruit)
9. Anatomy of C₃, C₄ and CAM leaves
10. Estimation of protein by biuret method/Lowry method
11. Minor experiments – Osmosis, Arc-auxonometer, ascent of sap through xylem, cytoplasmic streaming.

MODEL QUESTION PAPER
CORE COURSE : BOTANY

Semester: II

Course -2 : Basics of Vascular plants and Phytogeography

Time: 3 hours

Max Marks: 75M

SECTION – A

Answer any 5 questions. Each question carries 5 marks

(5 X 5M = 25M)

(Total 8 questions and at least two questions should be given from each unit)

1. (a) Eusporangium (b) Leptosporangium
2. Geological time scale.
3. Binomial system
4. (a) Synandrous condition (b) Syngenesious condition
5. Essential organs in flower of Aceptiadaeeae family
6. Economic importance of Arecaceae family
7. (a) Wides (b) Discontinuous species
8. Vegetation types in Andhra Pradesh

SECTION – B

Answer all the questions. Each question carries 10 marks.

(5 X 10M = 50M)

9. Describe the sexual reproduction in Lycopodium with neat labeled diagrams.

(OR)

10. Explain the stellar evolution in Pteridophytes with neat labeled diagrams and suitable examples.

11. Write an essay on general characteristics of Gymnosperms.

(OR)

12. Discuss the structure of ovule in *Gnetum* with a neat labeled diagram.

13. What is a herbarium? Explain the techniques of herbarium.

(OR)

14. Discuss the vegetative and floral characters of Annonaceae family. Add a note on economic importance of that family.

(OR)

15. Discuss the vegetative and floral characters of Asteraceae family.

(OR)

16. Discuss the vegetative and floral characters of Poaceae family. Add a note on economic importance of that family.

17. Explain different types Endemism and causes for it.

(OR)

18. Describe different phytogeographic regions of India with examples of flora.

MODEL QUESTION PAPER
CORE COURSE : BOTANY
Semester: IV

Course -4 : Plant Physiology and Metabolism

Time: 3 hours

SECTION – A

Max Marks: 75M

Answer any 5 questions. Each question carries 5 marks

(5 X 5M = 25M)

(Total 8 questions and at least two questions should be given from each unit)

1. (a) Diffusion (b) Imbibition
2. (a) Macro nutrients (b) Micro nutrients
3. (a) Anaerobic respiration (b) Aerobic respiration
4. (a) Absorption spectrum (b) Action spectrum
5. C₂ pathway
6. Fatty acids
7. Physiological effects of Brassinosteroids
8. Sigmoid growth curve

SECTION – B

Answer all the questions. Each question carries 10 marks.

(5 X 10M = 50M)

9. Explain how ascent of sap occur in plants with suitable theory.

(OR)

10. Discuss the phloem transport in plants. Add a note on source-sink relationship.

11. Write an essay on classification of enzymes.

(OR)

12. Describe the Krebs cycle with the help of schematic diagram.

13. Define photophosphorylation. Explain the non-cyclic photophosphorylation with the help of a schematic diagram.

(OR)

14. Discuss the carbon assimilation in CAM plants.

15. Write an essay on biological nitrogen fixation.

(OR)

16. Describe the Glyoxylate cycle with the help of a schematic diagram.

17. Define photoperiodism. Write an essay on role of phytochrome in photoperiodic responses of plants.

(OR)

18. Discuss the physiological changes in plants during water stress.

Model Question Paper for Practical Examination

Semester – II/ Botany Core Course – 2

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4. Identify the specimen 'D' (Fossil Gymnosperm) and give specific reasons. 5 M
5. Locate the specified phytogeographical regions (2x2M) in the world / India (E) map supplied to you. 4 M
6. Record + Herbarium & Field note book + Viva-voce 5 + 4 + 3 = 12 M

Model Question Paper for Practical Examination
Semester – IV/ Botany Core Course – 4
Plant Physiology and Metabolism

Max. Time : 3 Hrs.

Max. Marks : 50

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1. Conduct the experiment 'A' (Major experiment), write aim, principle, material and apparatus/equipment, procedure, tabulate results and make conclusion. 20 M
 2. Demonstrate the experiment 'B' (Minor experiment) , write the principle, procedure and give inference. 10 M
 3. Identify the following with apt reasons. 3 x 4 = 12 M
 - C. Plant water relations / Mineral nutrition
 - D. Plant metabolism
 - E. Plant growth and development
 4. Record + Viva-voce 5 + 3 = 8 M