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| **B.Sc.** | **Semester - III** | **Credits: 4** |
| **Course: 3** | **Anatomy and Embryology of Angiosperms, Plant Ecology and****Biodiversity** | **Hrs/Wk: 4** |

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

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

## UNIT I: 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 II: 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,helobialand ruminate.
5. Development of Dicot (*Capsella bursa-pastoris*) embryo.

**UNIT III: Basics of Ecology 12 Hrs.**

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

**UNIT IV: Population, Community and Production Ecology 12 Hrs.**

1. Population ecology: Natality, 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 V: 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 :

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

## REFERENCE BOOKS:

1. Esau, K. (1971)*Anatomy of Seed Plants.* John Wiley and Son, USA.
2. Fahn, A. (1990)*Plant Anatomy*, Pergamon Press, Oxford.
3. Cutler, D.F., T. Botha & D. Wm. Stevenson (2008)*Plant Anatomy : An Applied Approach,*

Wiley, USA.

1. Paula Rudall (1987)*Anatomy of Flowering Plants : An Introduction to Structure and Development.* Cambridge University Press, London
2. Bhojwani, S. S. and S. P. Bhatnagar (2000)*The Embryology of Angiosperms (4thEd.),*Vikas Publishing House, Delhi.
3. Pandey, A. K. (2000) *Introduction to Embryology of Angiosperms*. CBS Publishers & Distributors Pvt. Ltd. , New Delhi
4. Maheswari, P. (1971)*An Introduction to Embryology of Angiosperms*. McGraw Hill Book Co., London.
5. Johri, B.M. (2011)*Embryology of Angiosperms.* Springer-Verlag, Berlin
6. Pandey, B.P. (2013)*College Botany, Volume-III,* S. Chand Publishing, New Delhi
7. Bhattacharya, K., A. K. Ghosh, & G. Hait (2011) *A Text Book of Botany, Volume- IV,* New Central Book Agency Pvt. Ltd., Kolkata
8. Kormondy, Edward J. (1996) *Concepts of Ecology,*Prentice-Hall of India Private Limited, New Delhi
9. Begon, M., J.L. Harper & C.R. Townsend (2003) *Ecology,* Blackwell Science Ltd., U.S.A
10. Eugene P. Odum (1996)*Fundamentals of Ecology,*Natraj Publishers, Dehradun
11. Sharma, P.D. (2012) *Ecology and Environment*. Rastogi Publications, Meerut, India.
12. N.S.Subrahmanyam& A.V.S.S. Sambamurty (2008)*Ecology*Narosa Publishing House, New Delhi
13. A. K. Agrawal& P.P. Deo (2010) *Plant Ecology,*Agrobios (India), Jodhpur
14. Kumar, H.D. (1992) *Modern Concepts of Ecology (7th Edn.,)*Vikas Publishing Co., New Delhi.
15. Newman, E.I. (2000): *Applied Ecology*Blackwell Scientific Publisher, U.K.
16. Chapman, J.L&M.J. Reiss (1992): *Ecology - Principles & Applications.*Cambridge University Press, U.K.
17. Kumar H.D. (2000)*Biodiversity & Sustainable Conservation* Oxford & IBH Publishing Co Ltd. New Delhi.
18. U. Kumar (2007) *Biodiversity : Principles & Conservation,*Agrobios (India), Jodhpur

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| **B.Sc.** | **Semester - III** | **Credits: 1** |
| **Course: 3(L)** | **Anatomy and Embryology of Angiosperms, Plant Ecology and****Biodiversity Lab** | **Hrs/Wk: 2** |

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

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

**Practical Syllabus**

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. Dissection and observation of Embryo sac haustoria in *Santalum* or *Argemone.*
6. Structure of endosperm (nuclear and cellular) using permanent slides / Photographs.
7. Dissection and observation of Endosperm haustoria in *Crotalaria* or *Coccinia*.
8. Developmental stages of dicot and monocot embryos using permanent slides / photographs.
9. Study of instruments used to measure microclimatic variables; soil thermometer, maximum and minimum thermometer, anemometer, rain gauze, and lux meter. (visit to the nearest/local meteorology station where the data is being collected regularly and record the field visit summary for the submission in the practical).
10. Study of morphological and anatomical adaptations of hydrophytes and xerophytes (02 each).
11. Quantitative analysis of herbaceous vegetation in the college campus for frequency, density and abundance.
12. Identification of vegetation/various plants in college campus and comparison with Raunkiaer’s frequency distribution law.
13. Find out the alpha-diversity of plants in the area
14. Mapping of biodiversity hotspots of the world and India.

**Model paper for Practical Examination**

Semester – III/ BotanyCore Course – 3

**Anatomy and Embryology of Angiosperms, Plant Ecology and Biodiversity**

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

1. Take T.S. of the material ‘A’ (Anatomy), prepare a temporary slide and justify the identification with specific reasons. 10 M
2. Write the procedure for the experiment ‘B’ (Embryology) and demonstrate the same. 10 M
3. Take T.S. of the material ‘C’, prepare a temporary slide and justify the identification with specific reasons. 10 M
4. Identify the following with specific reasons. 4 x 3 = 12 M
	1. Anatomy/Embryology
	2. Ecology instrument
	3. Mapping of Biodiversity hot spot
	4. Endemic/endangered plant/animal
5. Record + Viva-voce 5 + 3 = 8 M

**Suggested co-curricular activities for Botany CoreCourse-3 in Semester-III :**

1. **Measurable :**
	1. **Student seminars :**
		1. Anatomy in relation to taxonomy of Angiosperms.
		2. Nodal anatomy
		3. Floral anatomy
		4. Embryology in relation to taxonomy of Angiosperms.
		5. Apomictics and polyembryony.
		6. Biogeochemical cycles- Carbon, Nitrogen and Phosphorous.
		7. Deforestation and Afforestation.
		8. Green house effect and ocean acidification.
		9. The Montreal protocol and the Kyoto protocol.
		10. Productivity of aquatic ecosystems.
		11. Mangrove ecosystems in India.
		12. Kollerulake – Ramsar site.
		13. Biodiversity hotspots of the world.
		14. Origin of Crop plants - Vavilov centers
		15. Agrobiodiversity
		16. International organizations working on conservation of Biodiversity
		17. Nagoya protocol – ABS system.
		18. Endemic and endangered plants in Andhra Pradesh.
	2. **Student Study Projects :**
		1. Stomata structure in plants from college campus/ their native place.
		2. Report on xylem elements in plants using maceration technique.
		3. Collection of information on famous herbaria in the world and preparation of a report.
		4. Microscopic observations on pollen morphology from plants in college campus/ their native locality.
		5. Study report on germination and viability of pollen in different plants.
		6. Observation of anthesis time in different plants and their pollinators.
		7. A report on autecology and synecology of some plants in college campus or their native place.
		8. Collection of photos of endemic/endangered plant and animal species to makean album.
		9. Biodiversity of the college or their own residential/ native area.
		10. Collection of seeds/vegetative organs of rare plant species from their localities and to raise/grow in college garden
	3. **Assignments**: Written assignment at home / during ‘0’ hour at college; preparation of charts with drawings, making models etc., on topics included in syllabus.
2. **General :**
3. Visit to an arboretum/silviculture station/Forest research institute to see the live timber yielding plants or to visit a local timber depot. to observe various woods.
4. Field visit to a nearby ecosystem to observe the abiotic-biotic relationships.
5. Visit to National park/Sanctuary/Biosphere reserve etc., to observe in-situ conservation of plants and animals.
6. Visit to a Botanical garden or Zoo to learn about ex-situ conservation of rare plants or animals.
7. Group Discussion (GD)/ Quiz/ Just A Minute (JAM) on different modules in syllabus of the course.

## MODEL QUESTION COURSE (Sem - End)

**B. Sc DEGREE EXAMINATION**

**SEMESTER: II**

Semester – II/ Botany Core Course – 2

## Course 3 : Anatomy and Embryology of Angiosperms, Plant Ecology and Biodiversity

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

## SECTION - A

**Answer any FIVE questions. Each question carries 5 marks 5 x 5 =25M**

1. (a) Xylem tracheids (b) Xylem vessels
2. (a) Periplasmodial tapetum (b) Glandular tapetum
3. (a) Helobial endosperm (b) Ruminate 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 5X10 =50M**

1. a)Write an essay on organization of apical meristems with theories proposed.

(OR)

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

1. a)Explain monosporic and bisporic types of embryosac development in angiosperms.

(OR)

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

1. a) Explain various effects of light factor plants and their communities?

(OR)

b) Define ecological succession. Discuss hydrosere with suitable diagrams and examples.

1. a) Describe Raunkiaer’s life forms with suitable examples.

(OR)

b) Write an essay on primary productivity.

13.a)Write an essay on value of biodiversity with appropriate examples.

(OR)

b)Define biodiversity hotspot. Discuss the biodiversity in Western Ghats of India