

**E.M.G. YADAVA WOMEN'S COLLEGE, MADURAI -14.****(An Autonomous Institution – Affiliated to Madurai Kamaraj University)****Re-accredited (3<sup>rd</sup> Cycle) with Grade A<sup>+</sup> & CGPA 3.51 by NAAC****TANSCHÉ - CBCS with OBE****GENERIC ELECTIVE BOTANY****For II B.Sc. Zoology****(W.e.f. 2023 – 2024 onwards)****COURSE STRUCTURE – SEMESTER WISE**

Sem	Part	Course Code	Course Title	Teaching hrs. (Per week)	Duration of exam (Hrs.)	Marks allotted			Credits
						CIA	SE	Total	
III	III	23OUZOGEB03	GEC 5: Plant Biology - I	4	3	25	75	100	3
		23OUZOGEB03P	GEC 6: Lab for Plant Biology - I	2	3	40	60	100	2
IV	III	23OUZOGEB04	GEC 7: Plant Biology - II	4	3	25	75	100	3
		23OUZOGEB04P	GEC 8: Lab for Plant Biology - II	2	3	40	60	100	2

Department of Zoology					Class : II B.Sc.			
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
I	Generic Elective: II	23OUZOGEB03	Plant Biology – I (Plant Diversity)	3	4	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship Oriented
✓		

### Course Objective:

- To understand cell structures, division processes, and Mendelian genetics.
- To explore the ecological and economic importance of algae and their reproductive strategies.
- To study viruses, bacteria, and fungi characteristics and their impact on human activities.
- To examine the characteristics and roles of Bryophytes, Pteridophytes, and Gymnosperms.
- To comprehend plant tissue culture, genetic modification, and their applications in crop improvement and conservation through biotechnology.

### Course Content:

**Unit - I : Cell Biology & Genetics:** Prokaryotic and Eukaryotic cell- structure /organization. Cell organelles - ultrastructure and function of chloroplast, mitochondria and nucleus. Cell division - mitosis and meiosis. Mendelism - Law of dominance, Law of segregation, Incomplete dominance. Law of independent assortment. Monohybrid and dihybrid crosses - Test cross - Back cross.

**Unit - II Algae:** General characters of algae – salient features of major groups – Cyanophyceae, Chlorophyceae, Phaeophyceae, and Rhodophyceae - structure, reproduction and life cycle of the following genera – *Anabaena*, *Sargassum* and economic importance of algae.

**Unit – III Virus, Bacteria and Fungi:** Virus - general characters, Structure of TMV, Structure of bacteriophage. Bacteria - general characters, structure, and reproduction of *Escherichia coli* and economic importance of bacteria. General characters of fungi, structure, reproduction, and life cycle of the following genera – *Penicillium*, *Agaricus* and economic importance of fungi.

**Unit - IV Bryophytes, Pteridophytes, and Gymnosperms:** General characters of Bryophytes, Structure and life cycle of Funaria. General characters of Pteridophytes, Structure and life cycle of Lycopodium. General characters of Gymnosperms, Structure and life cycle of Cycas.

**Unit - V : Plant Biotechnology:** Principles of tissue culture, Basic requirements, Totipotency, Explant, Surface Sterilization, Inoculation, Regeneration, Incubation, Callus, Micropropagation, Invitro culture methods, Genetic modification in plants (Bt Cotton), and the role of tissue culture in crop improvement and conservation.

**Books for Study:**

1. Pandey, B.P. 2022. *Algae, Fungi, Lichens, Bacteria, Viruses, Plant Pathology, Industrial Microbiology and Bryophyta. College Botany Vol. 1*, S. Chand and Company Limited, Uttar Pradesh.
2. Pandey, B.P. 2022. *Pteridophyta, Gymnosperms, Paleobotany and Angiosperms. College Botany Vol. 2*, S. Chand and Company Limited, Uttar Pradesh.
3. Sing, B.D. 2022. *Plant Biotechnology*, MedTech Publication, Delhi.
4. Singh, B.D. 2022. *Fundamentals of Genetics*, MedTech Publication, Delhi.
5. Singh, V., Pande, P.C and Jain, D.K. 2021. *A Text Book of Botany*. Rastogi Publications, Meerut.

**Books for Reference:**

1. Parihar, N.S. 2013. *An introduction to Embryophyta - Pteridophytes*. Surjeet Publications, Delhi.
2. Pandey, B.P. 1986. *Text Book of Botany (College Botany) Vol. I & II*, S.Chand and Co. New Delhi.
3. Vashishta, P.C. 2014. *Botany for Degree Students Gymnosperms*. Chand & Company Ltd. Delhi.
4. Vashishta, P.C. 2014. *Botany for Degree Students Algae*. 2014. Chand & Company Ltd. Delhi.
5. Chawla, H.S. 2020. *Introduction to Biotechnology*, Oxford & IBH Publishing Co. Pvt. Ltd. Delhi.
6. Prakash Reddy, R. 2020. *Key Notes on Genetics and Plant Breeding*, Daya Publishing House, New Delhi.

**Web Resources:**

1. <https://www.kobo.com/us/en/ebook/the-algae-world>
2. [http://www.freebookcentre.net/biology-books-download/Fungi-\(PDF-15P\).html](http://www.freebookcentre.net/biology-books-download/Fungi-(PDF-15P).html)
3. <http://scitec.uwichill.edu.bb/bcs/bl14apl/bryo1.htm>
4. <https://www.toppr.com/guides/biology/plant-kingdom/pteridophytes/>
5. <https://arboretum.harvard.edu/wp-content/uploads/2013-70-4-beyond-pinecones-anintroduction-to-gymnosperms.pdf>
6. <https://www.us.elsevierhealth.com/medicine/cell-biology>
7. <https://www.us.elsevierhealth.com/medicine/genetics>

8. <https://www.kobo.com/us/en/ebook/plant-biotechnology-1>

**Pedagogy:**

Chalk and Talk, PowerPoint presentations, Seminars, Group Discussions, Quiz through ICT Mode

**Rationale for the nature of Course:**

**Knowledge and Skill:**

Students can gain knowledge about Problem-solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.

**Activities to be given:**

Field trip to a botanical garden to study Algae, bryophytes, pteridophytes, and gymnosperms. Analyze case studies of genetically modified plants like Bt cotton, focusing on genetic modification processes, benefits, and controversies.

**Course learning Outcomes (CLOs):**

CLO	Course Outcomes statements	Knowledge According to Bloom's Taxonomy
CLO 1	Compare the structure and function of cells and explain the development of cells, as well as core concepts and fundamentals of Genetics.	K1 to K3
CLO 2	Increase the awareness and appreciation of human-friendly algae and their economic importance.	K1 to K3
CLO 3	Develop an understanding of microbes and Fungi and appreciate their adaptive strategies and economic importance.	K1 to K4
CLO 4	Develop a critical understanding of morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms.	K1 to K3
CLO 5	Understand the core concepts and fundamentals of plant biotechnology.	K1 to K4

K1- Remembering and recalling facts with specific answers.

K2- Basic understanding of facts and stating main ideas with general answers.

K3- Application oriented- Solving Problems.

K4- Examining, analyzing, presenting and making inferences with evidence.

**Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)**

	PO1	PO2	PO3	PO4	PO5	PO6
<b>CLO1</b>	3	3	2	2	2	2
<b>CLO2</b>	3	3	2	3	3	2
<b>CLO3</b>	3	3	2	3	3	2
<b>CLO4</b>	3	3	2	2	3	2
<b>CLO5</b>	3	3	2	3	3	2

**1- Basic Level**

**2 - Intermediate Level**

**3 - Advanced Level**

**LESSON PLAN: TOTAL HOURS (60 Hrs.)**

UNIT	DESCRIPTION	Hrs.	MODE
I	<b>Cell Biology &amp; Genetics:</b> Prokaryotic and Eukaryotic cell- structure /organization. Cell organelles - ultrastructure and function of chloroplast, mitochondria and nucleus. Cell division - mitosis and meiosis. Mendelism - Law of dominance, Law of segregation, Incomplete dominance. Law of independent assortment. Monohybrid and dihybrid cross - Test cross - Back cross.	14	Chalk and Talk, PPT, group discussions, presentations, quizzes, and Virtual Classes.
II	<b>Algae:</b> General characters of algae – Salient features of major groups – Cyanophyceae, Chlorophyceae, Phaeophyceae, and Rhodophyceae - structure, reproduction and life cycle of the following genera – Anabaena, Sargassum and economic importance of algae.	14	Chalk and Talk, PPT, group discussions, presentations, quizzes, and Virtual Class.
III	<b>Virus, Bacteria and Fungi:</b> Virus - general characters, structure of TMV, structure of bacteriophage. Bacteria - general characters, structure, and reproduction of Escherichia coli and economic importance of bacteria. General characters of fungi, structure, reproduction, and life cycle of the following genera - Penicillium and Agaricus and economic importance of fungi.	10	Chalk and Talk, PPT, group discussions, presentations, quizzes, and Virtual Class.
IV	<b>Bryophytes, Pteridophytes, and Gymnosperms:</b> General characters of Bryophytes, Structure and life cycle of Funaria. General characters of Pteridophytes, Structure and life cycle of Lycopodium. General characters of Gymnosperms, Structure and life cycle of Cycas.	10	Chalk and Talk, PPT, group discussions, presentations, quizzes, and Virtual Class.
V	<b>Plant Biotechnology:</b> Principles of tissue culture, Basic requirements, Totipotency, Explant, Surface Sterilization, Inoculation, regeneration, incubation, Callus, Micropropagation, Invitro culture methods, genetic modification in plants(Bt Cotton plants), and the role of tissue culture in crop improvement and conservation.	12	Chalk and Talk, PPT, group discussions, presentations, quizzes, and Virtual Class.

**Course Designer**  
**Dr.(Mrs.)V.Vijaya**

Department of Zoology			Class: II B.Sc.					
Semester	Category	Course Code	Course Title	Credits	Hours	CIA	SE	Total
III	Generic Elective – II	22OUZOGEB03P	Lab for Plant Biology – I (Plant Diversity)	1	2	40	60	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓	✓	

### Course Objectives:

- To gain familiarity with cell structure and organizations.
- To understand the laws of inheritance and the genetic basis of loci and alleles.
- To enhance knowledge of the skill-based detection of the morphology and microstructure of viruses, bacteria, algae, and fungi.
- To comprehend the fundamental concepts and methods used to identify Bryophytes, Pteridophytes, and Gymnosperms through morphological changes, evolution, anatomy, and reproduction.
- To learn about plant invitro culture methods.

### Experiments:

#### 1. Cell Biology:

- i. Study of prokaryotic and eukaryotic plant cells.
- ii. Study of plant organelles – Mitochondria, Chloroplast and Nucleus.
- iii. Study of Mitosis and Meiosis using onion root tip.

#### 2. Genetics:

- i. Monohybrid, Back Cross, Test Cross and Incomplete dominance.

#### 3. Virus -Page and Bacteria:

- i. Study the structure of virus - Phage & Escherichia coli. using photographs.

#### 4. Algae Study:

- i. Microscopic analysis of *Anabaena*.
- ii. Study the morphology of *Sargassum*.

#### 5. Fungi:

- i. Microscopic observation of *Penicillium*.
- ii. Morphological observation of *Agaricus*.

#### 6. Bryophyte:

- i. Study the morphology of *Funaria*

**7. Pteridophyte:**

- i. Study the morphology of *Lycopodium*.

**8. Gymnosperm:**

- i. Study the vegetative and reproductive structure of *Cycas*.

**9. Plant Biotechnology:**

- i. Demonstration of Invitro plant tissue culture protocol.

**Books for Study:**

1. Benjamin, A. Pierce. 2012. *Genetics- A Conceptual Approach*. W.H. Freeman and Company, New York, England.
2. Bendre, A. & Kumar, A. 2010. *A Textbook of Practical Botany 1*. Rastogi Publication, New Delhi.
3. Bendre, A. & Kumar, A. 2010. *A Textbook of Practical Botany 2*. Rastogi Publication, New Delhi.
4. Sharma, O.P. 2017. *Bryophyta*, MacMillan India Ltd, New Delhi.
5. Sharma, O.P. 2012. *Pteridophyta*, Tata McGraw-Hills Ltd, New Delhi.
6. Santosh, N. & Madhavi, A. 2010. *Practical Book of Biotechnology and Plant Tissue Culture*. S Chand & Co Ltd. Uttar Pradesh

**Books for References:**

1. Strickberger, M.W. 2005. *Genetics (III Ed)*. Prentice Hall, New Delhi, India.
2. Nancy Serediak and M. Huynh. 2011. *Algae identification lab Guide. Accompanying manual to algae identification field guide*, Ottawa Agriculture and Agri-food Canada publisher.
3. Mohammed Gufran Khan, Shite Gatew and Bedilu Bekele. 2012. *Practical manual for Bryophytes and Pteridophytes*. Lambert Academic Publishing.
4. Punia, M.S. 2018. *Plant Biotechnology and Molecular Biology A Laboratory Manual*. Scientific Publishers, India.

**Web Resources:**

1. <https://www.amazon.in/Practical-Manual-Pteridophyta-Rajan-Sundara/dp/8126106883>
2. <https://www.google.co.in/books/edition/Gymnosperms/3YrT5E3Erm8C?hl=en&gbpv=1&dq=gy mnosperms&printsec=frontcover>
3. <https://medlineplus.gov/genetics/understanding/basics/cell/>
4. <https://apan.net/meetings/apan45/files/17/17-01-01-01.pdf>
5. [http://www.cuteri.eu/microbiologia/manuale\\_microbiologia\\_pratica.pdf](http://www.cuteri.eu/microbiologia/manuale_microbiologia_pratica.pdf)
6. <https://www.amazon.in/Manual-Practical-Bryophyta-Suresh-Kumar/dp/B0072GNFX4>
7. <https://biologywala.com/download-a-text-book-of-practical-botany-2-bendre-kumar-practical-botany-pdf-book/>

**Pedagogy**

Sectioning and mounting of plant samples, Observation, Interpretation, Discussion and Virtual Labs.

## LESSON PLAN FOR PRACTICAL (30 Hrs.)

S.No.	Description	Hours	Mode
1.	<b>Cell Biology:</b> i. Study of prokaryotic and eukaryotic plant cells. ii. Study of plant organelles – Mitochondria, Chloroplast and Nucleus. iii. Study of Mitosis and Meiosis using onion root tip.	4	Observation, Interpretation, Discussion and Virtual Labs.
2.	<b>Genetics:</b> i. Monohybrid, Back Cross, Test Cross and Incomplete dominance.	4	Observation, Interpretation, Discussion and Virtual Labs.
3.	<b>Virus – Phage:</b> i. Identification of TMV and bacteriophage.	2	Observation, Interpretation, Discussion and Virtual Labs.
4.	<b>Bacteria:</b> i. Study the structure of Escherichia coli.	2	Observation, Interpretation, Discussion and Virtual Labs.
5.	<b>Algae Study:</b> i. Microscopic analysis of Anabaena. ii. Study the morphology of Sargassum.	2	Mounting of plant samples, Observation, Interpretation, Discussion and Virtual Labs.
6.	<b>Fungi:</b> i. Microscopic observation of Penicillium. ii. Morphological observation of Agaricus.	3	Observation, Interpretation, Discussion and Virtual Labs.
7.	<b>Bryophyte:</b> i. Study the morphology of Funaria	2	Observation, Interpretation, Sectioning and mounting of plant samples, Observation, Interpretation, Discussion and Virtual Labs.
8.	<b>Pteridophyte:</b> Study the morphology of Lycopodium.	2	Observation, Interpretation, Discussion and Virtual Labs.
9.	<b>Gymnosperm:</b> i. Study the vegetative and reproductive structure of Cycas.	2	Demonstration, Observation, Interpretation, Discussion and Virtual Labs.
10.	<b>Plant Biotechnology:</b> i. Demonstration of Invitro plant tissue culture protocol.	4	Demonstration, Observation, Interpretation, Discussion and Virtual Labs.
11.	Model Practical Exam	3	

**Course Designer**  
**Dr.(Mrs.)V.Vijaya**



**EVALUATION (PRACTICAL)**

<b>Internal</b> (Formative)	: 40 marks
<b>External</b> (Summative)	: 60 marks
<b>Total</b>	:100 marks

**Question Paper Pattern for Internal Practical Examination: 40 Marks**

S.No.	Components	Marks
1.	Dissection	10
2.	Spotter Identification	10
3.	Model exam	10
4.	Viva	10
	<b>Total</b>	<b>40</b>

**Question Paper Pattern for External Practical Examination: 60 Marks**

S.No.	Components	Marks
1.	Dissection	20
2.	Spotter Identification	20
3.	Viva	10
4.	Record book	10
	<b>Total</b>	<b>60</b>

In respect of external examinations passing minimum is **35% for Undergraduate** Courses and in total, an **aggregate of 40%**.

The latest amendments and revisions as per **UGC** and **TANSICHE** norms are taken into consideration to suit the changing trends in the curriculum.

Department of Zoology					Class : II B.Sc.			
Sem	Category	Course Code	Course Title	Credits	Contact Hours / Week	CIA	SE	Total
II	Generic Elective: II	22OUZOGEB04	<b>Plant Biology - II</b> (Plant Morphology, Taxonomy, Anatomy, Embryology, Physiology)	3	4	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓	✓	

**Course Objective:**

- To be familiar with the basic concepts and principles of plant systematics.
- To learn the importance of plant anatomy in plant production systems.
- To understand the mechanism underlying the shift from the vegetative to the reproductive phase.
- To learn about the physiological processes that underlie plant metabolism.
- To know the energy production and its utilization in plants.

**Course Content:****Unit I: Morphology of Flowering Plants:**

Plant parts. Structure and function of root, stem, and leaf. Leaf types - simple and compound. Phyllotaxy and types. Inflorescence - Racemose, Cymose and Special types. Terminology concerning flower description.

**Unit II: Taxonomy:**

Study the morphological characters and economic importance of plants in the following families: Rutaceae, Caesalpinaceae, Asclepiadaceae, Euphorbiaceae and Cannaceae.

**Unit III: Anatomy**

Tissue and tissue systems: Simple and complex tissues. Anatomy of monocot and dicot roots - anatomy of monocot and dicot stems - anatomy of dicot and monocot leaves.

**Unit IV: Embryology**

Structure of mature anther and ovule - Types of ovules, structure of embryo sac, pollination- double fertilization, structure of dicotyledonous and monocotyledonous seeds.

**Unit V: Plant Physiology**

Water & nutrient requirements, Absorption of water. photosynthesis - light reaction - Calvin cycle. Respiration - Glycolysis - Krebs cycle - electron transport system. Growth hormones - auxins and cytokinin and their applications.

**Books for Study:**

1. Sharma, O.P. 2017. *Plant Taxonomy. (II Edition)*. The McGraw Hill Companies.
2. Bhojwani, S.S and Bhatnagar, S.P. 2000. *The Embryology of Angiosperms* (4th revised and enlarged edition). Vikas Publishing House, New Delhi.
3. Jain, V.K. 2006. *Fundamentals of Plant Physiology*, S.Chand and CompanyLtd., New Delhi.
4. Pandey, B.P. 2021. *Plant Anatomy*, S.Chand and CompanyLtd., New Delhi.

**Reference Books:**

1. Lawrence, G.H.M. 1985. *An Introduction to Plant Taxonomy*, Central BookDepot, Allahabad.
2. Rajni Gupta. 2012. *Plant Taxonomy: Past, Present and Future*. Vedams (P) Ltd., New Delhi.
3. Maheshwari, P. 1963. *Recent Advances in Embryology of Angiosperms*. Intl. Soc. Plant Morphologists, New Delhi.
4. Pandey, B.P. 2012. *Plant Anatomy*. S Chand Publishing. NewDelhi.
5. Verma, S.K. 2006. *A Textbook of Plant Physiology*, S.K. Chand & Co., NewDelhi.

**Web Resource:**

1. [https://books.google.co.in/books/about/Plant\\_Taxonomy.html?id=0bYs8F0Mb9gC&redir\\_esc=y](https://books.google.co.in/books/about/Plant_Taxonomy.html?id=0bYs8F0Mb9gC&redir_esc=y)
2. [https://books.google.co.in/books/about/PLANT\\_TAXONOMY\\_2E.html?id=Roi0lwSXFuUC&redir\\_esc=y](https://books.google.co.in/books/about/PLANT_TAXONOMY_2E.html?id=Roi0lwSXFuUC&redir_esc=y)
3. <https://archive.org/EXPERIMENTS/plantanatomy031773mbp>
4. <https://www.amazon.in/Embryology-Angiosperms-6th-S-P-Bhatnagar-ebook/dp/B00UN5KPQG>
5. <https://www.crcpress.com/Plant-Physiology/Stewart-Globig/p/book/9781926692692>

**Pedagogy:**

Chalk and Talk method, PowerPoint presentations, Seminars, Group discussions, and quizzes through ICT-Mode.

**The rationale for the nature of the Course:****Knowledge and Skill:**

Knowledge, Problem-Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

**Activities to be given:**

Make a list of plants in their residential area to identify the common, and scientific names of the plants. Preparation of 5 herbarium sheets.

**Course learning Outcomes (CLOs):**

<b>CLO</b>	<b>Course Outcomes Statement</b>	<b>Knowledge According to Bloom's Taxonomy</b>
CLO 1	Understand the fundamental concepts of plant anatomy and embryology	K1 to K3
CLO 2	Classify plant systematics and recognize the importance of herbarium and virtual herbarium.	K1 to K3
CLO 3	Analyze and recognize the different organs of plants and secondary growth.	K1 to K4
CLO 4	Understand the water relation of plants to various physiological processes	K1 to K3
CLO 5	Classify plant hormones and applications, aerobic and anaerobic respiration.	K1 to K4

K1- Remembering and recalling facts with specific answers.

K2- Basic understanding of facts and stating main ideas with general answers.

K3- Application oriented- Solving Problems.

K4- Examining, analysing, presenting and making inferences with evidence.

**Mapping, of Course, Learning Outcomes (CLOs) with Programme Outcomes (POs)**

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>
<b>CLO1</b>	3	3	3	3	3	2
<b>CLO2</b>	3	3	3	3	3	2
<b>CLO3</b>	3	3	3	3	3	2
<b>CLO4</b>	3	3	2	3	3	2
<b>CLO5</b>	3	2	2	2	2	2

**1-Basic Level    2- Intermediate Level    3- Advanced Level**

**LESSON PLAN: TOTAL HOURS (60 Hrs.)**

<b>UNIT</b>	<b>DESCRIPTION</b>	<b>Hrs.</b>	<b>MODE</b>
I	<b>Morphology of Flowering Plants:</b> Plant and its parts. Structure and function of root and stem. Leaf and its parts. Leaf types- simple and compound. Phyllotaxy and types. Inflorescence - Racemose, Cymose and Special types. Terminology concerning flower description.	12	Chalk and Talk, PPT, group discussions, presentations, quizzes, and Virtual Class.
II	<b>Taxonomy:</b> Study of the range of characters and plants of economic importance in the following families: Rutaceae, Caesalpinaceae, Asclepiadaceae, Euphorbiaceae and Cannaceae.	12	Chalk and Talk, PPT, group discussions, presentations, quizzes, and Virtual Class.
III	<b>Anatomy:</b> Tissue and tissue systems: Simple and complex tissues. Anatomy of monocot and dicot roots - anatomy of monocot and dicot stems - anatomy of dicot and monocot leaves	12	Chalk and Talk, PPT, group discussions, presentations, quizzes, and Virtual Class.
IV	<b>Embryology:</b> Structure of mature anther and ovule - Types of ovules, structure of embryosac, pollination- double fertilization, structure of dicotyledonous and monocotyledonous seeds.	14	Chalk and Talk, PPT, group discussions, presentations, quizzes, and Virtual Class.
V	<b>Plant Physiology:</b> Absorption of water, photosynthesis - light reaction - Calvin cycle; respiration - Glycolysis - Krebs cycle - electron transport system. Growth hormones - auxins and cytokinin and their applications.	10	Chalk and Talk, PPT, group discussions, presentations, quizzes, and Virtual Class.

**Course Designer**  
**Dr.(Mrs.)V.Vijaya**

Department of Zoology			Class: II B.Sc.					
Semester	Category	Course Code	Course Title	Credits	Hours	CIA	SE	Total
IV	Generic Elective – II	22OUZOGEB06P	Lab for Plant Biology – II (Plant Morphology, Taxonomy, Anatomy, Embryology, Physiology)	1	2	40	60	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✓	✓	

### Course Objective:

- To enhance information on the identification of each taxonomical group by developing the skill-based detection of the morphology and microstructure of
- To learn about the physiological processes that underlie plant metabolism.
- To study morphological and anatomical adaptations of plants of various habitats.
- To carry out experiments related to plant physiology.
- To perform biochemistry experiments.

### Course Content:

#### 1. Morphology of Flowering Plants:

- Plant morphology – Herb, Shrub, Tree, Creeper
- Leaf types & Phyllotaxy
- Flower morphology
- Inflorescence Types – Raceme, Cymose, Special Types
- Root System

#### 2. Taxonomy:

- Detail study of the following families:  
(Dissect a flower, construct a floral diagram and write the floral formula)
  - Rutaceae – *Citrus limon* (Lemon)/ *Murraya koenigii* (Curry Leaf Plant)
  - Caesalpinaceae – *Cassia fistula* (Golden Shower Tree)/ *Delonix regia* (Gulmohar or Flame Tree)
  - Asclepiadaceae – *Calotropis gigantea* (Giant Milkweed)/ *Calotropis procera* (Apple of Sodom)
  - Euphorbeceae – *Ricinus communis* (Castor Oil Plant)/ *Acalypha indica* (Indian Acalypha)
  - Cannaceae – *Canna indica* (Indian Shot)

#### 3. Anatomy:

To make suitable micro preparations of anatomy materials prescribed in the syllabus.

- Anatomy of Monocot Root - *Zea mays* (Corn), *Oryza sativa* (Rice)
- Dicot Root - *Hibiscus rosa-sinensis* (Hibiscus), *Solanum melongena* (Eggplant)

- iii. Monocot Stem - Zea mays (Corn), Oryza sativa (Rice)
- iv. Dicot Stem - Mangifera indica (Mango), Rosa spp. (Rose)
- v. Monocot Leaf - Zea mays (Corn), Cocos nucifera (Coconut)
- vi. Dicot Leaf - Ficus religiosa (Peepal Tree), Hibiscus rosa-sinensis (Hibiscus)

#### 4. Embryology:

- i. Structure of Anther - Datura metal
- ii. Ovule - Piper nigrum (Black Pepper)
- iii. Monocot - Zea mays (Corn), Oryza sativa (Rice)
- iv. Dicot seeds - Vigna radiata (Mung Bean), Cicer arietinum (Chickpea)

#### 5. Plant Physiology:

Demonstration of Physiology experiments

- i. Photosynthesis - O<sub>2</sub> evolution
- ii. Transpiration - Bell Jar Experiment
- iii. Respiration - Ganong's Respiroscope

#### Book for Study:

1. Subramaniam, N.S. (1996). *Laboratory Manual of Plant Taxonomy*. VikasPublishing House Pvt. Ltd., New Delhi.
2. Bendre, K. (2010). *A Textbook of Practical Botany 2*. Rastogi Publication, New Delhi.
3. Noggle G.R and G.J. Fritz. (2002). *Introductory Plant Physiology*. Prentice Hall of India, New Delhi.

#### Books for References:

1. Singh. G. (2018). *Plant Systematics Theory and Practice 3Ed*, Oxford & IBH Publishing Co Pvt. Ltd, Delhi.
2. Steward, F.C. (2012). *Plant Physiology Academic Press, US*.
3. Sundara Rajan, S. (2003). *Practical Manual of Plant Anatomy and Embryology*. Anmol Publications Pvt. Limited, Delhi.

#### Web Resources:

1. [https://books.google.co.in/books/about/Plant\\_Taxonomy.html?id=0bYs8F0Mb9\\_gC&redir\\_esc=y](https://books.google.co.in/books/about/Plant_Taxonomy.html?id=0bYs8F0Mb9_gC&redir_esc=y)
2. [https://books.google.co.in/books/about/PLANT\\_TAXONOMY\\_2E.html?id=Roi0lwSXFuUC&redir\\_esc=y](https://books.google.co.in/books/about/PLANT_TAXONOMY_2E.html?id=Roi0lwSXFuUC&redir_esc=y)
3. <https://archive.org/EXPERIMENTS/plantanatomy031773mbp>
4. <https://www.amazon.in/Embryology-Angiosperms-6th-S-P-Bhatnagar-ebook/dp/B00UN5KPQG>
5. <https://www.crcpress.com/Plant-Physiology/Stewart-Globig/p/book/9781926692692>
6. <https://biologywala.com/download-a-text-book-of-practical-botany-2-bendre-kumar-practical-botany-pdf-book/>

#### Pedagogy

Field observations, technical descriptions, Sectioning and mounting of plant samples, lab experiments, and group discussion.

## LESSON PLAN FOR PRACTICAL (30 Hrs.)

S.No.	Description	Hou rs	Mode
1.	<b>Morphology of Flowering Plants:</b> i. Plant morphology – Herb, Shrub, Tree, Creeper ii. Leaf types & Phyllotaxy iii. Flower morphology iv. Inflorescence Types – Raceme, Cymose, Special Types v. Root System	6	Field observations, technical descriptions, Sectioning and mounting of plant samples, group discussion.
2.	<b>Taxonomy:</b> Detailed study of the following families: (Dissect a flower, construct a floral diagram and write the floral formula) i. Rutaceae – Citrus limon (Lemon)/ Murraya koenigii (Curry Leaf Plant) ii. Caesalpinaceae – Cassia fistula (Golden Shower Tree)/Delonix regia (Gulmohar or Flame Tree) iii. Asclepiadaceae – Calotropis gigantea (Giant Milkweed)/Calotropis procera (Apple of Sodom) iv. Euphorbeceae – Ricinus communis (Castor Oil Plant)/ Acalypha indica (Indian Acalypha) v. Cannaceae – Canna indica (Indian Shot)	6	Observations, technical descriptions, Sectioning and mounting of plant samples, group discussion.
3.	<b>Anatomy:</b> To make suitable micro preparations of anatomy materials prescribed in the syllabus. i. Anatomy of Monocot Root - Zea mays (Corn), Oryza sativa (Rice) ii. Dicot Root - Hibiscus rosa-sinensis (Hibiscus), Solanum melongena (Eggplant) iii. Monocot Stem - Zea mays (Corn), Oryza sativa (Rice) iv. Dicot Stem - Mangifera indica (Mango), Rosa spp. (Rose) v. Monocot Leaf - Zea mays (Corn), Cocos nucifera (Coconut) vi. Dicot Leaf - Ficus religiosa (Peepal Tree), Hibiscus rosa-sinensis (Hibiscus)	8	Observations, technical descriptions, Sectioning and mounting of plant samples, discussion.
4.	<b>Embryology:</b> i. Structure of Anther - Datura metal ii. Ovule - Piper nigrum (Black Pepper) iii. Monocot - Zea mays (Corn), Oryza sativa (Rice) iv. Dicot seeds - Vigna radiata (Mung Bean), Cicer arietinum (Chickpea)	4	Observations, technical descriptions, Sectioning and mounting of plant samples, group discussion.
5.	<b>Plant Physiology:</b> Demonstration of Physiology Experiments i. Photosynthesis - O <sub>2</sub> evolution ii. Transpiration - Bell Jar Experiment iii. Respiration - Ganong's Respiroscope	3	Demonstration, observations, group discussion.
6.	Model Practical Exam	3	

**Course Designer**  
**Dr.(Mrs.)V.Vijaya**



**EVALUATION (PRACTICAL)**

<b>Internal</b> (Formative)	: 40 marks
<b>External</b> (Summative)	: 60 marks
<b>Total</b>	:100 marks

**Question Paper Pattern for Internal Practical Examination: 40 Marks**

S.No.	Components	Marks
1.	Dissection	10
2.	Spotter Identification	10
3.	Model exam	10
4.	Viva	10
	<b>Total</b>	<b>40</b>

**Question Paper Pattern for External Practical Examination: 60 Marks**

S.No.	Components	Marks
1.	Dissection	20
2.	Spotter Identification	20
3.	Viva	10
4.	Record book	10
	<b>Total</b>	<b>60</b>

In respect of external examinations passing minimum is **35% for Undergraduate** Courses and in total, an **aggregate of 40%**.

The latest amendments and revisions as per **UGC** and **TANSICHE** norms are taken into consideration to suit the changing trends in the curriculum.