**E.M.G. YADAVA WOMEN'S COLLEGE, MADURAI – 625 014.**
(*An Autonomous Institution – Affiliated to Madurai Kamaraj University*)
Re-accredited (3rd Cycle) with Grade A+ & CGPA 3.51 by NAAC

# DEPARTMENT OF ZOOLOGY

## ALLIED BOTANY

**CBCS** With OBE

**BACHELOR OF** SCIENCE

**PROGRAMME CODE - Z**

## COURSE STRUCTURE

(w.e.f. 2022 – 2023 Batch onwards)

Annexure 3a

# E.M.G. YADAVA WOMEN'S COLLEGE, MADURAI -14.

**(An Autonomous Institution – Affiliated to Madurai Kamaraj University)**
**Re-accredited (3rd Cycle) with Grade A+ & CGPA 3.51 by NAAC**
**CBCS with OBE**
**GENERIC ELECTIVE BOTANY**
**For III B.Sc. Zoology**
**(W.e.f. 2022 – 2023 onwards)**

## COURSE STRUCTURE – SEMESTER WISE

| Sem | Part | Course Code | Title of the Course | Teaching hrs. (Per week) | Duration of exam (Hrs.) | Marks Allotted | | | Credits |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CIA | SE | Total | |
| V | III | 22OUZOGEBO5 | **GEC: Botany – III** Taxonomy of Angiosperms & Plant Pathology | 4 | 3 | 25 | 75 | 100 | 4 |
| | | | **GEC: Botany Practical II** - Taxonomy of Angiosperms & Plant Pathology and Applied Botany | 2 | - | - | - | - | - |
| VI | III | 22OUZOGEBO6 | **GEC: Botany – IV** Applied Botany | 4 | 3 | 25 | 75 | 100 | 4 |
| | | 22OUZOGEBO6P | **GEC: Botany Practical II** – Taxonomy of Angiosperms & Plant Pathology and Applied Botany | 2 | 3 | 40 | 60 | 100 | 1 |

**Programme Specific Outcome (PSOs):**

| PSO | GRADUATE ATTRIBUTES | DESCRIPTION |
|---|---|---|
| PSO-1 | Knowledge | Explore and identify various plants and their parts to gather new ideas. |
| PSO-2 | Problem analysis | Students will be able to analyze the different functions of plant parts. |
| PSO-3 | Problem-Solving | Students will be able to compare and contrast the taxonomic position of the angiosperm plants based on their key factors. |
| PSO-4 | Modern tool usage | Ensure the use of contemporary tools and techniques in understanding the scope and significance of Botany. Apply appropriate techniques, resources, and modern ICT tools for understanding plant resources. |
| PSO-5 | The graduate and society | Enhanced capacity to think and explore how botany is applied in a social context. |
| PSO-6 | Environment and sustainability | Students will be able to communicate and collaborate within and outside of biology and tap into the interdisciplinary nature of science. |
| PSO-7 | Ethics and values | Follow professional ethics and bioethics norms for practicing the value of the plant kingdom. |
| PSO-8 | Leadership Quality & Communication | Effectively communicate with different stakeholders and the community to understand, write, and present reports proficiently. |

**Nature of the Course**
**Courses are classified according to the following nature**
1. Knowledge and skill oriented
2. Employability oriented
3. Entrepreneurship-oriented

**Outcome Based Education (OBE) & Assessment**
Students' understanding must be built on and assessed for a wide range of learning activities, which includes different approaches and are classified along several bases, such as:

1. **Based on purpose:**
   - Continuous Assessment (Internal Tests, Assignments, Seminars,
   - Quizzes, Documentation, Case lets, ICT based Assignments, Mini projects administered during the learning process)
   - External Assessment (Evaluation of students' learning at the end of the instructional unit)
2. **Based on Domain Knowledge: (for UG Up to K4 levels)**
   Assessment through K1, K2, K3, & K4

Annexure 3a

| Department of Zoology | | | | | Class : III B.Sc. | | | |
|---|---|---|---|---|---|---|---|---|
| **Sem.** | **Course Type** | **Course Code** | **Course Title** | **Credits** | **Contact Hours / Week** | **CIA** | **SE** | **Total** |
| I | Generic Elective: II | **22OUZOGEBO5** | Botany – III Taxonomy of Angiosperms & Plant Pathology | 4 | 4 | 25 | 75 | 100 |

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

**Course Objectives:**

1. To learn the morphology of flowering plants.
2. To know the economic values of plants in each family.
3. To bring awareness to the usage of economically useful plants.
4. To identify the plant diseases and the method of rectification.

**Course Content:**

**Unit I: Morphology of Flowering Plants:** Plant and its parts. Structure and function of root and stem. Leaf and its parts. Leaf types- simple and compound. Phyllotaxy and Venation types. Inflorescence – Racemose (Raceme, Panicle, Spike, Corymb and Umbel), Cymose (Solitary, Monochasial, Dichasial and Polychasial) and Special types (Verticillaster and Cyathium).

**Unit II: Plant Morphology -**Terminology concerning flower description. **Flower** – Parts of a typical flower, floral whorls a) **Calyx** – Types of Calyx b) **Corolla** – Forms – Cruciform, Papilionaceous, Infundibuliform and Bilabiate and Aestivation types. c) Sexuality of flower d) Merosity – Trimerous, Tetramerous and Pentamerous of flowers.

**c**) **Androecium** – Parts of stamen – Monadelphous, Diadelphous and Polyadelphous.

**d**) **Gynoecium** – Parts of carpel – Apocarpus and Syncarpous, types of placentation in ovules.

**Unit III: Taxonomy of Angiosperms -** Study the characters and plants of economic importance in the following families: Rutaceae, Caesalpiniaceae, Asclepiadaceae, Euphorbiaceae and Cannaceae.

**Unit IV: Economic Botany - Cereals – 1. Paddy (***Oryza sativa***)** Poaceae **2. Millets – Ragi (***Eleusine coracana***)** Poaceae **3. Pulses – Cowpea (***Vigna unguiculata***)** Fabaceae **4. Fruits - Banana- (***Musa paradisiaca***)** *Musaceae* - Ripe Fruit, Inflorescence, Pseudostem **5. Nuts- Cashew Nut- (***Anacardium occidentale***)** Anacardiaceae.

**Unit V: Plant Pathology -** The general account of Bacterial and Viral diseases – Symptoms, Causative organisms and control measures of the following diseases: **Viral disease** – Bunchy top of Banana; **Bacterial disease** –Canker of Citrus; **Fungal disease** – Tikka disease of groundnut.

**Books for Study:**


1. Annie Ragland. (2002). *Fundamentals of Botany*. Saras Publication, New Delhi.
2. Pandey, B.P. (2001). *A Textbook of Botany: Angiosperms - Taxonomy, Anatomy, Embryology and Economic Botany*. S. Chand Ltd. New Delhi.
3. Pandey, B. P. (2018). *Plant Pathology Pathogen and Plant Disease*. Sultan Chand & Company, New Delhi.
4. Singh, V and Jain D. K. (2009). *Taxonomy of Angiosperm*. Rastogi Publication, Meerut.
5. Singh, V. Pande, P.C. Jain, D.K. (2016). *Economic Botany*. Rastogi Publications, Meerut.


**Reference Books:**


1. Bendre, M. Ashok and Ashok Kumar, A. (2020). Text Book of Practical Botany 1 ($10^{th}$ ed). Rastogi Publications, Meerut.
2. Kochhar, S. L. (2018). Economic Botany*: A Comprehensive Study*, Cambridge University Press.
3. Mehrotra, R.S. and Aggarwal. (2003). *Plant Pathology*. Tata McGraw-Hill.
4. Sambamurty, A.V.S.S. (2019). *Taxonomy of Angiosperms*. Wiley Publication, Dreamtech Press.
5. Singh, V, Pande P.C. Jain, D.K. (2019). *A Text Book of Botany Angiosperms*. Rastogi Publication, Meerut,


**Web Resources:**

1. https://www.biologyonline.com/search/morphology+of+flowering+plants
2. https://www.biologyonline.com/search/taxonomy+of+angiosperms+
3. https://www.biologyonline.com/search/economic+botany+economic botany
4. https://www.slideshare.net/slideshow/tikka-disease-of-groundnutpptx/251823750?from_search=3
5. https://www.slideshare.net/slideshow/bunchy-top-of-bananapptx/251823491?from_search=8
6. https://www.slideshare.net/slideshow/citrus-cankerpptx/251823078?from_search=14
7. https://oercommons.org/courseware/lesson/72421
8. https://oercommons.org/courseware/lesson/74839

**Pedagogy:**

Chalk and Talk, PowerPoint presentations, Seminar, Group Discussions, and Quizzes

through ICT-Mode.

**The rationale for the nature of the Course:**

**Knowledge and Skill:**

Students can recall the Taxonomy of plants, understand the knowledge of different parts of plants, the taxonomy of angiosperms and their economic importance, and account for Viral, Bacterial and Fungal diseases of plants and their control measures.

**Activities to be given:**

Group study to explore the economic importance of various crops and to learn about plant diseases and regulatory methods. Each group will present their findings and discuss the economic significance of crops, as well as their ability to identify and manage plant diseases effectively.

**Course learning Outcomes (CLOs):**

| CLO | Course Outcomes statements | Knowledge According to Bloom's Taxonomy |
|---|---|---|
| CLO 1 | Identify and illustrate the different parts, types and functions of plants. | K1 to K3 |
| CLO 2 | Acquire and analyze the floral parts, types and arrangements | K1 to K3 |
| CLO 3 | Apply taxonomic principles to identify plants and analyse the economic importance of unique traits of the plants from each family | K1 to K4 |
| CLO 4 | Recall the botanical and economic characteristics of paddy, millets, pulses, fruits, and nuts. | K1 to K3 |
| CLO 5 | Apply knowledge of plant pathology to identify symptoms and suggest control measures for these diseases. | 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 |
|---|---|---|---|---|---|---|
| **CLO1** | 3 | 2 | 3 | 3 | 1 | 1 |
| **CLO2** | 3 | 2 | 3 | 1 | 2 | 1 |
| **CLO3** | 3 | 2 | 2 | 2 | 2 | 1 |
| **CLO4** | 2 | 3 | 3 | 2 | 1 | 2 |
| **CLO5** | 3 | 3 | 2 | 2 | 2 | 1 |

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

Annexure 3a

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

| UNIT | DESCRIPTION | Hrs. | MODE |
|---|---|---|---|
| I | **Morphology of Flowering Plants:** Plant and its parts. Structure and function of root and stem. Leaf and its parts. Leaf types- simple and compound. Phyllotaxy and Venation types. Inflorescence – Racemose (Raceme, Panicle, Spike, Corymb and Umbel), Cymose (Solitary, Monochasial, Dichasial and Polychasial) and Special types (Verticillaster and Cyathium). | 14 | Chalk and Talk, PPT, group discussions, presentations, quizzes, on-the-spot tests and Virtual Classes. |
| II | **Plant Morphology** -Terminology concerning flower description. **Flower** – Parts of a typical flower, floral whorls a) **Calyx** – Types of Calyx b) **Corolla** – Forms – Cruciform, Papilionaceous, Infundibuliform and Bilabiate and Aestivation types. c) Sexuality of flower d) Merosity – Trimerous, Tetramerous and Pentamerous of flowers. **c**) **Androecium** – Parts of stamen – Monadelphous, Diadelphous and Polyadelphous. **d**) **Gynoecium** – Parts of carpel – Apocarpus and Syncarpous, types of placentation in ovules. | 14 | Chalk and Talk, PPT, group discussions, presentations, quizzes, on-the-spot tests and Virtual Class. |
| III | **Taxonomy of Angiosperms -** Study the characters and plants of economic importance in the following families: Rutaceae, Caesalpiniaceae, Asclepiadaceae, Euphorbiaceae and Cannaceae. | 10 | Chalk and Talk, PPT, group discussions, presentations, quizzes, on-the-spot tests and Virtual Class. |
| IV | **Economic Botany - Cereals – 1. Paddy (***Oryza sativa***)** Poaceae **2. Millets – Ragi (***Eleusine coracana***)** Poaceae **3. Pulses – Cowpea (***Vigna unguiculata***)** Fabaceae **4. Fruits - Banana- (***Musa paradisiaca***)** *Musaceae* - Ripe Fruit, Inflorescence, Pseudostem **5. Nuts- Cashew Nut- (***Anacardium occidentale***)** Anacardiaceae. | 10 | Chalk and Talk, PPT, group discussions, presentations, quizzes, on-the-spot tests and Virtual Class. |
| V | **Plant Pathology -** The general account of Bacterial and Viral diseases – Symptoms, Causative organisms and control measures of the following diseases: **Viral disease** – Bunchy top of Banana; **Bacterial disease** –Canker of Citrus; **Fungal disease** – Tikka disease of groundnut. | 12 | Chalk and Talk, PPT, group discussions, presentations, quizzes, on-the-spot tests and Virtual Class. |

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

Annexure 3a

| Department of Zoology | | | | | Class : III B.Sc. | | | |
|---|---|---|---|---|---|---|---|---|
| **Sem** | **Category** | **Course Code** | **Course Title** | **Credits** | **Contact Hours / Week** | **CIA** | **SE** | **Total** |
| V | Generic Elective: II | **22OUZOGEBO6** | Botany – IV Applied Botany | 4 | 4 | 25 | 75 | 100 |

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

**Course Objective:**

1. To understand the basic concepts of plant breeding and its methods.
2. To learn plant propagation methods.
3. To know the plant tissue culture techniques and their importance
4. To acquire the therapeutic values of various medicinal plants.
5. To study the potential scopes of medicinal plants in nanotechnology.

**Course Content:**

**Unit I: Plant Breeding -** Objectives of plant breeding, Types, Methods of crop improvement –Mass selection, Hybridization Technique. Mutation and Polyploidy in plant breeding (Achievements only).

**Unit II: Horticulture - Methods of Propagation Vegetative:** – **a**) *Natural* – Rhizome, bulb, corm and sucker. **b**) *Artificial* – Stem Cutting (Herbaceous, Softwood, Semi – Hardwood and Hardwood cutting), advantages. **Layering** (Simple, Compound and Air Layering) Advantages. **Kitchen Garden** – aim, layout, choices of vegetable plants and advantages. **Greenhouse Structure** – **a**) Site selection and orientation **b**) Structure materials **c**) Covering materials **d**) Temperature and humidity control. Advantages of greenhouses in growing ornamental, vegetable, fruit, and medicinal plants.

**Unit III: Tissue Culture -** Laboratory requirements for plant tissue culture – Media: MS medium composition and preparation, Tissue culture techniques (Steps) – Types of culture of plant materials – Shoot, meristem and anther cultures, Applications of tissue culture.

**Unit IV: Medicinal Botany-** Description of the individual plant, Common name, Botanical name, Family, Morphology of the useful part, Chemical constituents and Medicinal uses of the following plants:-

- Turmaric (*Manjal*) – *Curcuma longa* – Zingiberaceae
- Nelavembu – *Andrographis paniculata* – Acanthaceae

- Tulsi – *Ocimum sanctum* – Lamiaceae
- Sotrukatrallai – *Aloe vera* – Liliaceae
- Perunelli – *Phyllanthus emblica* – Euphorbiaceae

Preparation method of powder and oil from medicinal plants.

**Unit V: Nanotechnology & IPR**

Introduction to nanotechnology, Types of nanoparticles - Fullerenes, Nanotechnology in Agricultural development **–** Nano-pesticides, and Nano-fertilizers. Intellectual Property Rights (IPR) – forms of protection and patenting of biological materials.

**Books for Study:**

1. Joshi S.G. (2018). Medicinal plants. Oxford & IBH Publishing,
2. Kumaresan, V. (2015). *Fundamentals of Horticulture and Plant Breeding*, Saras Publication.
3. Kumaresan, V. (2014). *Techniques in Biotechnology*. Saras Publication, Nagercoil.
4. Tiwari, M.D. (2008). *A modern dictionary of nanotechnology*. 1st edition, Deep and Deep Publications Pvt. Ltd., New Delhi.

**Reference Books**:

1. Bojwani, S.S. (2013). *Plant Tissue Culture*: *Applications and Limitations* (HB). Elsevier Science Publisher, Netherland.
2. Goodsell, D. S. (2004). *Bionanotechnology*, I Ed., Wiley Liss Publications, USA.
3. Singh B.D. (2022). *Plant Breeding Principles and Methods*. Med Tech Science Press.
4. Singh, J. (2018). *Fundamentals of Horticulture*. Kalyani Publishers.
5. Soni, N.K. and Vandana S. (2010). *Indian Medicinal Plants*. Tata McGraw Hill Education Private Ltd. New Delhi.
6. Wadehra, B.L. 2000. *Law relating to patents, trademarks, copyright designs and geographical indications*. Universal Law Publishing.

**Web Resource/e - Books:**

**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:**

Students can learn about Plant breeding, methods of plant propagation, Kitchen gardening, Construction of greenhouse for plant conservation, Laboratory requirements for plant tissue culture, Tissue culture technique and its application, Identification of medicinal plants and learning its uses.

**Activities to be given:**

- Students will start gardening projects in a small area on the college premises or in their residence.
- Provide students with fresh or dried medicinal plants to make herbal powders and oils, allowing for experimentation while emphasizing quality and safety standards

**Course Learning Outcomes (CLOs):**

| CLO | Course Outcomes Statement | Knowledge According to Bloom's Taxonomy |
|---|---|---|
| CLO 1 | Recall and identify plant breeding objectives, key crop improvement methods and its achievements | K1 to K3 |
| CLO 2 | Illustrate the horticultural propagation techniques, kitchen gardening and greenhouse construction for growing plants | K1 to K3 |
| CLO 3 | Apply the steps of preparing MS medium and setting up tissue culture laboratory requirements and demonstrate techniques for the shoot, meristem, and anther culturing. | K1 to K4 |
| CLO 4 | Compare the effectiveness of medicinal plants based on their chemical constituents and traditional uses & analyse contemporary medicine's role and economic importance. | K1 to K3 |
| CLO 5 | Evaluate the effectiveness and potential risks of using nano-pesticides and nano-fertilizers in crop production. Can appraise the ethical considerations and assess the forms of intellectual property rights (IPR) and their implications for the patenting of biological materials. | 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)**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|---|---|---|---|---|---|---|
| **CLO1** | 3 | 3 | 3 | 1 | 2 | 1 |
| **CLO2** | 3 | 3 | 2 | 2 | 2 | 1 |
| **CLO3** | 3 | 2 | 2 | 1 | 2 | 2 |
| **CLO4** | 3 | 3 | 3 | 2 | 2 | 2 |
| **CLO5** | 3 | 3 | 2 | 3 | 3 | 3 |

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

Annexure 3a

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

| UNIT | DESCRIPTION | Hrs. | MODE |
|---|---|---|---|
| I | **Plant Breeding:** Objectives of plant breeding, Types, Methods of crop improvement –Mass selection, Hybridization Technique. Mutation and Polyploidy in plant breeding (Achievements only). | 12 | Chalk and Talk, PPT, group discussions, presentations, quizzes, on-the-spot tests and Virtual Class. |
| II | **Horticulture Methods of Propagation Vegetative:** – a) Natural – Rhizome, bulb, corm and sucker. b) Artificial – Stem Cutting (Herbaceous, Softwood, Semi – Hardwood and Hardwood cutting), advantages. Layering (Simple, Compound and Air Layering) Advantages. Kitchen Garden – aim, layout, choices of vegetable plants and advantages. Greenhouse Structure – a) Site selection and orientation b) Structure materials c) Covering materials d) Temperature and humidity control. Advantages of greenhouses in growing ornamental, vegetable, fruit, and medicinal plants. | 12 | Chalk and Talk, PPT, group discussions, presentations, quizzes, on-the-spot tests and Virtual Class. |
| III | **Tissue Culture:** Laboratory requirements for plant tissue culture – Media: MS medium composition and preparation, Tissue culture techniques (Steps) – Types of culture of plant materials – Shoot, meristem and anther cultures, Applications of tissue culture. | 12 | Chalk and Talk, PPT, group discussions, presentations, quizzes, on-the-spot tests and Virtual Class. |
| IV | **Medicinal Botany:** Description of the individual plant, Common name, Botanical name, Family, Morphology of the useful part, Chemical constituents and Medicinal uses of the following plants:- ● Turmeric ● Nelavembu ● Tulsi ● Aloe vera ● Perunelli, Preparation method of powder and oil from medicinal plants. | 14 | Chalk and Talk, PPT, group discussions, presentations, quizzes, on-the-spot tests and Virtual Class. |
| V | **Nanotechnology & IPR:** Introduction to nanotechnology, Types of nanoparticles - Fullerenes, Nanotechnology in Agricultural development – Nano-pesticides, and Nano-fertilizers. Intellectual Property Rights (IPR) – forms of protection and patenting of biological materials. | 10 | Chalk and Talk, PPT, group discussions, presentations, quizzes, on-the-spot tests and Virtual Class. |

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

Annexure 3a

| Department of Zoology | | | Class: II B.Sc. | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Semester** | **Category** | **Course Code** | **Course Title** | **Credits** | **Hours** | **CIA** | **SE** | **Total** |
| V & VI | Generic Elective – II | 22OUZOGEBO6P | Practical – II Taxonomy of Angiosperms & Plant Pathology and Applied Botany | 1 | 2 | 40 | 60 | 100 |

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

1. Dissections of the floral parts of the given plants and technically describe its salient features.
2. Phyllotaxy and Venation types and Inflorescence (Racemose and Cyme)
3. **Spotter identification of economically important plants**
    - Paddy
    - Ragi
    - Cowpea
    - Banana
    - Cashew Nut
4. **Spotter identification of plant disease**
    - Bunchy top of banana
    - Citrus Canker
    - Tikka Disease
5. **Demonstration of hybridization technique**
    - Emasculation
6. **Demonstration of Horticulture techniques**
    - Vegetative propagation – Stem Cutting
    - Layering - Simple, Compound and Air Layering
7. Demonstration of Plant Tissue Culture technique.
8. **Spotter identification of the medicinal plant**
    - Turmeric
    - Nelavembu
    - Tulsi
    - Alo vera
    - Perunelli
9. Preparation method of powder and oil from medicinal plants.
10. Demonstration of Nanoparticle synthesis.

**Books for reference:**

1. Singh. G. (2018). *Plant Systematics Theory and Practice*. 3Ed, Oxford & IBH Publishing Co. Pvt. Ltd, Delhi.
2. Subramaniam, N.S. (1996). *Laboratory Manual of Plant Taxonomy*. VikasPublishing House Pvt. Ltd., New Delhi.
3. Bendre, K. (2010). *A Textbook of Practical Botany 2*. Rastogi Publication, New Delhi.

**Web Resources:**

1. 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=Roi0lwSXFnUC&redir_esc=y
3. https://biologywala.com/download-a-text-book-of-practical-botany-2-bendre-kumar-practical-botany-pdf-book/
4. http://assets.vmou.ac.in/MBO10.pdf
5. https://www.researchgate.net/publication/320754012_A_Practical_Manual_on_Synthesis_of_Nanoparticles_and_its_Applications_in_Biology
6. https://jru.edu.in/studentcorner/lab-manual/bpharm/6thsem/Herbal%20Drug%20Technology.pdf
7. https://www.ndsu.edu/pubweb/chiwonlee/plsc211/labmanual/plsc%20211-Lab%20manual09.pdf

**Pedagogy**

Chalk and talk, laboratory practices, Sectioning and mounting of plant samples, group discussion and Virtual Labs.

**LESSON PLAN FOR PRACTICAL (Total hours: 60)**

| S.No. | Description | Hours | Mode |
|---|---|---|---|
| 1. | **Morphology of Flowering Plants:**<br>i. Plant morphology – Herb, Shrub, Tree, Creeper<br>ii. Leaf types & Phyllotaxy<br>iii. Flower morphology<br>iv. Inflorescence Types – Raceme, Cymose, Special Types<br>v. Root Systems | 8 | Demonstration, Observation, Interpretation, Discussion and Virtual Labs. |
| 2. | **Taxonomy:**<br>Detail study of the following families:<br>(Dissect a flower, construct a floral diagram and write the floral formula)<br>i. Rutaceae – ***Citrus limon*** (Lemon)/ ***Murraya koenigii*** *(*Curry Leaf Plant)<br>ii. Caesalpinaceae – ***Cassia fistula*** (Golden Shower Tree)/***Delonix regia*** (Gulmohar or Flame Tree) | 8 | Demonstration, Observation, Interpretation, Discussion and Virtual Labs. |

| | | | |
|---|---|---|---|
| | iii. Asclepiadaceae – ***Calotropis gigantea*** (Giant Milkweed)/***Calotropis procera*** (Apple of Sodom)<br>iv. Euphorbeceae – ***Ricinus communis*** (Castor Oil Plant)/ ***Acalypha indica*** (Indian Acalypha)<br>v. Cannaceae – ***Canna indica*** (Indian Shot) | | |
| 3. | **Spotter identification of economically important plants:** Paddy, Ragi, Cowpea, Banana, and Cashew Nut. | 6 | Demonstration, Observation, Interpretation, and Discussion |
| 4. | **Spotter identification of plant disease:** Bunchy top of banana, Citrus canker and Tikka Disease. | 4 | Demonstration, Observation, Interpretation, and Discussion |
| 5. | Study the methods of the hybridization technique. | 4 | Demonstration, Observation, Interpretation, Discussion and Virtual Labs. |
| 6. | **Study the different types of Horticulture techniques:** Vegetative propagation and Layering. | 4 | Demonstration, Observation, Interpretation, Discussion and Virtual Labs. |
| 7. | Demonstration of Invitro plant tissue culture protocol. | 10 | Demonstration, Observation, Interpretation, Discussion and Virtual Labs. |
| 8. | **Spotter identification of the medicinal plant:** Turmeric, Nelavembu, Tulsi, Alo vera, Perunelli. | 6 | Demonstration, Observation, Interpretation, and Discussion |
| 9. | Preparation method of powder and oil from medicinal plants. | 4 | Demonstration, Observation, Interpretation, Discussion and Virtual Labs. |
| 10. | Demonstration of Nanoparticle synthesis | 6 | Demonstration, Observation, Interpretation, Discussion and Virtual Labs. |

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

Annexure 3a

## EVALUATION (PRACTICAL)

**Internal** (Formative) : 40 marks
**Externa**l (Summative) : 60 marks
Total :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 |
| | **Total** | **40** |

**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 |
| | **Total** | **60** |

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 **TANSCHE** norms are taken into consideration to suit the changing trends in the curriculum.