# D.K.GOVT.COLLEGE FOR WOMEN (A), SPSR NELLORE-524003

Re-accredited by NACC with A Grade Recognized by UGC as

"College with Potential for Excellence"

# BOARD OF STUDIES
# DEPARTMENT OF BOTANY
# 2021-2022

Credits-03

S0102

**D.K. GOVT COLLEGE FOR WOMEN (A), SPSR NELLORE.**
**CBCS / Semester System (w.e.f. 2020-'21 Admitted Batch**
**I Semester /Botany Core Course -1, 2021-22**
**Fundamentals of Microbes and Non-vascular Plants**
**(Viruses, Bacteria, Fungi, Lichens, Algae and Bryophytes)**
**(Total hours of teaching –60@ 04Hrs./Week)**

**Theory**

**Learning Outcomes:**

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

- Explain origin of life on the earth.
- Analyze the differences between prokaryotes and eukaryotes of nature
- Acquire awareness about economic importance of micro organisms
- 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. Five kingdom classification of R.H.Whittaker
2. Discovery of microorganisms, 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 Archaebacteria, 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** **12Hrs.**

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 only, ecological and economic importance.

**Unit –4: Algae** **12Hrs.**

1. General characteristics of Algae (pigments, flagella and reserve food material); Fritsch classification (upto classes).
2. Brief account of thallus organization in Algae.
3. Occurrence, structure, reproduction and life cycle of Spirogyra (Chlorophyceae)
4. Occurrence, structure, reproduction and life cycle of Polysiphonia (Rhodophyceae).
5. Economic importance of Algae.

**Unit –5: Bryophytes** **12Hrs.**

1. General characteristics of Bryophytes; classification upto classes.
2. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life cycle of Marchantia (Hepaticopsida).
3. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life cycle of Funaria (Bryopsida).
4. General account on evolution of sporophytes in Bryophyta.
5. Economic importance of bryophytes

**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.

Credits-03

S0202

**D.K. GOVT. COLLEGE FOR WOMEN (A), NELLORE.**
**CBCS / Semester System (w.e.f. 2020-'21 Admitted Batch)**
**II Semester /BotanyCoreCourse –2, 2021-22**
**Basics of Vascular plants and Phytogeography**
**(Pteridophytes, Gymnosperms,Taxonomy of Angiosperms and Phytogeography)**
**(Total hours of teaching –60@ 02Hrs./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.
- Analyze and know the connecting links of cryptogams and phenorogams (gymnosperms)
- Justify evolutionary trends in tracheophytes to adapt for land habitat. Explain the process of fossilization and compare the characteristics of extinct and extant plants.
- To know the stellar evolution and seed harvest
- Analyze the morphology of the most common Angiosperm plants of their localities and recognize their families.
- Understand the anatomical tissues of plants
- Locate different phytogeographical regions of the world and India and can analyze their floristic wealth.

**Unit –1:Pteridophytes** **12Hrs.**

1. General characteristics of Pteridophyta; classificationof Smith (1955) upto divisions.
2. Occurrence, morphology, anatomy, reproduction (developmental details are notneeded) and life history of Lycopodium (Lycopsida) and Marsilea (Filicopsida).
3. Stelar evolution in Pteridophytes;
4. Heterospory and seed habit.

**Unit –2:Gymnosperms** **12Hrs.**

1. General characteristics of Gymnosperms; Sporne classification up to classes.
2. Occurrence, morphology, anatomy, reproduction (developmental details are not needed)and life history of Cycas (Cycadopsida)
3. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life history of Gnetum (Gnetopsida).
4. A brief account on Cycadeoidea.

**Unit –3: Basic aspects of Taxonomy** **12Hrs.**

1. Aim and scope of taxonomy; Species concept: Taxonomic hierarchy, species, genus and family.
2. Plant nomenclature: Binomial system, ICN-rules for nomenclature. Herbarium and its techniques,
3. Bentham and Hooker system of classification;
4. Systematic description and economic importance of the following families:
   (a) Annonaceae (b) Curcurbitaceae

**Unit –4: Systematic Taxonomy** **12Hrs.**

1. Systematic description and economic importance of the following families
   (a) Asteraceae and (b) Asclepiadaceae
2. Systematic description and economic importance of the following families
   (a) Amaranthaceae and (b) Euphorbiaceae
3. Systematic description and economic importance of the following families
   (a) Arecaceae and (b) Poaceae
4. Outlines of Angiosperm Phylogeny Group (APG IV).

**Unit –5: Phytogeography** **12 Hrs.**

1. Principles of Phytogeography, Distribution (wide, endemic, discontinuous species)
2. Endemism –types and causes.
3. Phytogeographic regions of India.
4. 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) *Archchegoniates,* 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

& A. K. Ghosh (2011) *A Text Book of Botany, Volume-I,* New Central

**D.K. GOVT COLLEGE FOR WOMEN (A), NELLORE.**
**CBCS / Semester System (w.e.f. 2020-'21 Admitted Batch)**
**Semester-III /Botany Core Course - 3**
**Anatomy and Embryology of Angiosperms, Plant Ecology and Biodiversity**
(Total hours of teaching – 60 @ 04 Hrs./Week)
**Theory-2021-22**

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**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. Meristems: Types of meristems based on position, Tunica-carpus theory and Histogen theory (only definition)
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.

**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*)
3. Pollen – pistil interaction and fertilization.
4. Endosperm - Free nuclear, cellular, helobial.

**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. Hydrosere and Xerosere.

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

1. Population ecology: Natality, mortality, growth curves, population age group, Frequency, density.
2. Community ecology: Life forms, biological spectrum
3. Concepts of productivity: GPP, NPP and Secondary production
4. Ecosystems: Grassland and pond ecosystem

**Unit – 5: Basics of Biodiversity** **12 Hrs.**

1. Biodiversity: Basic concepts, Earth Summit.
2. Value of Biodiversity; levels of biodiversity and Threats to biodiversity
3. Biodiversity : Hot spots in India. Biodiversity in North Eastern Himalayas and Western Ghats.
4. 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:**


- 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
- S. S. and S. P. Bhatnagar (2000)*The Embryology of Angiosperms (4th Ed.),* Vikas

**D.K. GOVT COLLEGE FOR WOMEN (A), NELLORE.**
**CBCS / Semester System (w.e.f. 2020-'21 Admitted Batch)**
**IV Semester/ Botany Core Course – 4**
**Plant Physiology and Metabolism**
(Total hours of teaching – 60 @ 04 Hrs./Week)
**Theory: 2021-22**

**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** **12 Hrs.**

1. Diffusion, imbibition, osmosis, water potential, osmotic potential, pressure potential.
2. Ascent of sap
3. Transpiration: stomata structure and mechanism of stomatal movements (K+ ion flux).
4. Source-sink relationships.

**Unit – 2: Mineral nutrition, Enzymes and Respiration** **12 Hrs.**

1. Essential macro and micro mineral nutrients and their role in plants; symptoms of mineral deficiency
2. Absorption of mineral ions; passive and active processes.
3. Characteristics of Enzymes. Mechanism of enzyme action.
4. Respiration: Anaerobic, Glycolysis, Krebs cycle; electron transport system

**Unit – 3: Photosynthesis and Photorespiration** **12 Hrs.**

1. Photosynthesis: Photosynthetic pigments, absorption and action spectra; Red drop and Emerson enhancement effect
2. Concept of two photosystems, mechanism of photosynthetic electron transport and evolution of oxygen; photo-phosphorylation
3. Carbon assimilation pathways in C3 plants.

4. Carbon assimilation pathways in C4 and CAM plants

**Unit – 4: Nitrogen and lipid metabolism** **12 Hrs.**

1. Nitrogen metabolism: Biological nitrogen fixation – asymbiotic and symbiotic nitrogen fixing organisms. Nitrogen cycle
2. Lipid metabolism: Classification of Plant lipids.
3. Anabolism of β-oxidation of fatty acids.
4. Outline of Protein synthesis.

**Unit – 5: Plant growth - development** **12 Hrs.**

1. Growth and Development: Definition, phases in plant growth.
2. Physiological effects of Plant Growth Regulators (PGRs) - auxins, gibberellins, cytokinins, ABA and ethylene.
3. Physiological of flowering: Photoperiodism, role of phytochrome in flowering.
4. Seed- germination and dormancy

**Text books:**


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


**Books for Reference:**


- Aravind Kumar & S.S. Purohit (1998) *Plant Physiology – Fundamentals and Applications,*AgroBotanica, Bikaner
- Datta, S.C. (2007) *Plant Physiology,*New Age International (P) Ltd., Publishers, New Delhi
- Hans Mohr & P. Schopfer (2006)*Plant Physiology*, Springer (India) Pvt. Ltd., New Delhi
- Hans-Walter heldt (2005) *Plant Biochemistry,*Academic Press, U.S.A.
- Hopkins, W.G. & N.P.A. Huner (2014)*Introduction to Plant Physiology,* Wiley India Pvt. Ltd., New Delhi
- (2012)*Introductory Plant Physiology*, Prentice Hall (India), New

D.K. GOVT COLLEGE FOR WOMEN (A), NELLORE.
CBCS / Semester System (w.e.f. 2020-'21 Admitted Batch)
IV Semester / Botany
Core Course –5, 2021-22

# CELL BIOLOGY, GENETICS AND PLANT BREEDING

(Total hours of teaching – 60 @ 04 Hrs./Week)

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

- Distinguish prokaryotic and eukaryotic cells and design the model of a cell.
- Explain the organization of a eukaryotic chromosome and the structure of genetic material.
- Demonstrate techniques to observe the cell and its components under a microscope.
- Discuss the basics of Mendelian genetics, its variations and interpret inheritance of traits in living beings.
- Elucidate the role of extra-chromosomal genetic material for inheritance of characters.
- Evaluate the structure, function and regulation of genetic material.
- Understand the application of principles and modern techniques inplant breeding.
- Explain the procedures of selection and hybridization for improvement of crops.

## Unit – 1: The Cell — 12 Hrs.

1. Cell theory; prokaryotic vs eukaryotic cell; animal vs plant cell.
2. Ultra-structure of cell wall.
3. Ultra-structure of plasma membrane and various theories on its organization.
4. Polymorphic cell organelles (Plastids); ultra structure of chloroplast. Plastid DNA.

## Unit – 2: Chromosomes — 12 Hrs.

1. Prokaryotic vs eukaryotic chromosome. Morphology of a eukayotic chromosome.
2. Euchromatin and Heterochromatin; Karyotype and ideogram.
3. Brief account of chromosomal aberrations - structural and numerical changes
4. Organization of DNA in a chromosome (solenoid and nucleosome models).

## Unit – 3: Mendelian and Non-Mendelian genetics — 12Hrs.

1. Mendel's laws of inheritance: Mono and Dihybrid
2. Complementary, supplementary gene interactions (plant based examples are to be dealt).
3. A brief account of linkage and crossing over; Chromosomal mapping - 2 point and 3 point test cross.
4. Concept of maternal inheritance (Corren's experiment on *Mirabilis jalapa*); Mitochondrial DNA.

**Unit – 4: Structure and functions of DNA** **12 Hrs.**

1. Watson and Crick model of DNA. Brief account on DNA Replication (Semi- conservative method).
2. Brief account on Transcription, types and functions of RNA.
3. Gene concept and genetic code and Translation.
4. Regulation of gene expression in prokaryotes - Lac Operon.

**Unit – 5: Plant Breeding** **12 Hrs.**

1. Plant Breeding and its scope; Genetic basis for plant breeding. Plant Introduction and acclimatization.
2. Definition, procedure; applications and uses; advantages and limitations of :(a) Mass selection, (b) Pure line selection and (c) Clonal selection.
3. Hybridization – schemes, and technique; Heterosis(hybrid vigour).
4. DNA markers in plant breeding. RAPD, RFLP.

**Text books :**


- Botany – III (Vrukshasastram-I) : Telugu Akademi, Hyderabad
- Pandey, B.P. (2013) *College Botany, Volume-III,* S. Chand Publishing, New Delhi
- Ghosh, A.K., K.Bhattacharya&G. Hait (2011) *A Text Book of Botany, Volume-III,* New Central Book Agency Pvt. Ltd., Kolkata
- Chaudhary, R. C. (1996) *Introduction to Plant Breeding,* Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi


**Books for Reference:**


- S. C. Rastogi (2008)*Cell Biology,*New Age International (P) Ltd. Publishers, New Delhi
- P. K. Gupta (2002)*Cell and Molecular biology,*Rastogi Publications, New Delhi
- B. D. Singh (2008) *Genetics,*Kalyani Publishers, Ludhiana
- A.V.S.S. Sambamurty (2007) *Molecular Genetics,*Narosa Publishing House,New Delhi
- Cooper, G.M. & R.E. Hausman (2009)*The Cell – A Molecular Approach,* A.S.M. Press, Washington

...Hardin (2007)*The World of Cell,* Pearson Education, In

Credits-03

S05602

# D.K.GOVT COLLEGE FOR WOMEN (A). NELLORE.
## III B. Sc - SEMESTER-V: BOTANY THEORY SYLLABUS, 2021-22
## PAPER-VI: PLANT ECOLOGY& PHYTOGEOGRAPHY

Total hours of teaching 60 hrs @ 3 hrs per week

**Learning Outcomes:**

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

1. Understand the ecosystems and biotic interactions
2. Acquire and know the population ecology
3. Acquire and know the bio diversity and Hot spots of India
4. Understand the global distribution of plants

### UNIT – I. Elements of Ecology (12 hrs)

1. Ecology: definition, branches and significance of ecology.
2. **Abiotic** Factors: Light and Temperature, Origin, formation and soil profile only.
3. Biotic Factor: Interactions between plants and animals.

### UNIT– II. Ecosystem Ecology (12 hrs)

1. Ecosystem: Concept and components, energy flow, Food chain, Food web, Ecological pyramids.
2. Productivity of ecosystem-Primary, Secondary and Net productivity.
3. Biogeochemical cycles- Carbon, Nitrogen and Phosphorous.

### UNIT – III Population &Community Ecology (12 hrs)

1. Population -definition, characteristics and importance, outlines –ecotypes.
2. Biotic communities- characters of a Biotic community, outlines – Frequency, density, cover, life forms, competition.

### UNIT – IV Phytogeography (12 hrs)

1. Principles of Phytogeography, Distribution (wides, endemic, discontinuous species)
2. Phytogeographic regions of India.
3. Endemism – Basic types and causes

### UNIT- V: Plant Biodiversity and its importance (12 hrs)

1. Definition, levels of biodiversity-genetic, species and ecosystem.
2. Biodiversity major hotspots- Biodiversity hotspots of India. Eastern Himalayas and Western Ghats
3. Loss of biodiversity – causes and conservation (*In-situ* and *ex-situ* methods).

**Suggested activity** :Collection of different soils, studying their texture, observing polluted water bodies, student study projects, debates on man's activity on ecosystem and biodiversity conservation methods, visiting a nearest natural vegetation area. Visit to NGO, working in the field of biodiversity and report writing; to study Honey Bees and plants yielding honey.

**Books for Reference:**


1. Daubenmire, R.F. ( ): Plants & Environment (2nd Edn.,) John Wiley & Sons., New York
2. Puri, .G.S. (1960): Indian Forest Ecology (Vol.I & II) Oxford Book Co., New Delhi & Calcutta.
3. Billings, W.B. (1965): Plants and the Ecosystem Wadsworth Publishing Co., Inc., Belmont.
4. Misra, R. (1968): The Ecology work Book Oxford & INH Publishing Co., Calcutta
5. Odum E.P. (1971): Fundamentals of Ecology (2nd Edn.,) Saunders & Co., Philadelphia & Natraj Publishers, Dehradun.
6. Odum E.P. (1975): Ecology By Holt, Rinert & Winston.
7. Oosting, H.G. (1978): Plants and Ecosystem Wadworth Belmont.
8. Kochhar, P.L. (1975): Plant Ecology. (9th Edn.,) New Delhi, Bombay, Calcutta-226pp.,
9. Kumar, H.D. (1992): Modern Concepts of Ecology (7th Edn.,) Vikas Publishing Co., NewDelhi.
10. Kumar H.D. (2000): Biodiversity & Sustainable Conservation Oxford & IBH Publishing Co Ltd. New Delhi.
11. Newman, E.I. (2000): Applied Ecology Blackwell Scientific Publisher, U.K.
12. Chapman, J.L&M.J. Reiss (1992): ecology (Principles & Applications). Cambridge University Press, U.K.
13. Cain, S.A . (1944): Foundations of Plant Geography Harper & Brothers, N.Y.
14. Mani, M.S (1974): Ecology & Biogeography of India Dr. W. Junk Publishers, The Haque
15. Good, R. (1997): The Geography of flowering Plants (2nd Edn.) Longmans, Green & Co., [illegible] Publishers, New Delhi

Cresits-03

S06702

# D.K. GOVT COLLEGE FOR WOMEN (A), NELLORE.
## III B. Sc - BOTANY SYLLABUS, SEMESTER- VI, 2021-22.
## PAPER – VII B– ELECTIVE
### Nursery, Gardening and Floriculture.

Total hours of teaching 60hrs @ 3hrs per week

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**Learning Outcomes:**

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

1. Develop an understanding of nursery business management (financial, marketing, personnel).
2. The student will acquire the required skills over a period of time.
3. Develop skills necessary to manage a wholesale nursery.
4. Acquire knowledge regarding theory and practice of cultural and production techniques and methods.
5. Describe basic green roof design, construction and maintenance techniques
6. Identify the relationships between soil, water, insects, diseases and weeds in agricultural systems.
7. Student is effectively managed Vegetable Nursery Management and cultivation as a small business enterprise.

**Unit I: Nursery:** **(12 hrs.)**

1. Nursery Management, infrastructure and Garden Operations.
2. Planning and seasonal activities - Planting - direct seeding and transplants.

**Unit II: Gardening** **(12 hrs.)**

1. Different types of gardening. **Some Famous gardens of India.**
2. Landscaping and types of gardens

**Unit III: Propagation methods** **(12 hrs.)**

1. Sowing/raising of seeds and seedlings, transplanting of seedlings
2. Propagation of ornamental plants by rhizomes, corms tubers, bulbs and bulbils.
3. .Green house - mist chamber, shade house and glass house for propagation.

**Unit IV: Floriculture:** **( 12 hrs.)**

1. Ornamental Plants: Flowering annuals; herbaceous, perennials.
2. Ornamental foliage plants, Cacti and succulents.
3. Cultivation of plants in pots; Indoor gardening; Bonsai.

**Unit V: Commercial Floriculture** **( 12 hrs.)**

1. Production and packaging of cut flowers; Flower arrangements; Methods to prolong vase life of flowers

2. Cultivation of Important cut flowers (Aster, Dahlia, Gerbera, Rose, Lilium)

3. Management of pests, diseases.

4. Methods of flower harvesting.

**Books for Reference:**


1. Bose T.K. & Mukherjee, D., 1972, Gardening in India, Oxford & IBH Publishing Co., New Delhi.
2. Sandhu, M.K., 1989, Plant Propagation, Wile Eastern Ltd., Bangalore, Madras.
3. Kumar, N., 1997, Introduction to Horticulture, Rajalakshmi Publications, Nagercoil. institution)
4. Randhawa, G.S. and Mukhopadhyay, A. 1986. Floriculture in India. Allied Publishers.


**Suggested Activities:** Raising a nursery, managing it, studying and drawing various land scaping designs, practicing layering methods, using shade nets to protect horticultural crops, practicing indoor gardening techniques, visiting florists and recording their methods of prolonging vase life of commercial cut flowers.