

(For 'AC'-Batch only)

ST. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
V SEMESTER **BOTANY** TIME: 3 Hrs/Week
B 5101(3) **CELL BIOLOGY, GENETICS & PLANT BREEDING** Max. Marks: 100
w.e.f 2017-2018 (15AC batch) **SYLLABUS**

OBJECTIVES: To enable the students to

- Understand the ultra structure of envelopes of plant cell, nucleus, chromosomes and cell division.
- Understand and comprehend the basic principles of heredity
- Acquire an insight of molecular biology.
- Comprehend the types of mutations and polyploidy
- Concepts, methods and recent trends of Plant Breeding

COURSE:

UNIT – I: CELL BIOLOGY:

1. Cell, the unit of life- Cell theory, Prokaryotic and eukaryotic cells; Eukaryotic cell components.
2. Ultra structure and functions of cell wall and cell membranes.
3. Chromosomes: morphology, organization of DNA in a chromosome - nucleosome & solenoid model, Euchromatin and heterochromatin, Karyotype
4. Cell Division: Cell cycle, Mitosis, Meiosis & their significance

UNIT – II: GENETIC MATERIAL:

1. DNA as the genetic material: Griffith's and Avery's transformation experiment, Hershey – Chase bacteriophage experiment.
2. DNA structure -Watson & Crick model and replication of DNA :semi-conservative method
3. Types of RNA - mRNA, tRNA, rRNA, their structure and function.

UNIT – III: MENDELIAN INHERITANCE:

1. Mendel's laws of Inheritance: Mono- and Di- hybrid crosses; backcross and test cross.
2. Chromosome theory of Inheritance.
3. Linkage: concept, complete and incomplete linkage, coupling and repulsion; linkage maps based on two and three factor crosses.
4. Crossing Over: concept & significance.

UNIT – IV: PLANT BREEDING: INTRODUCTION & METHODS

1. Introduction to plant breeding
2. Methods in plant breeding: outlines of Procedure, advantages and limitations of
 - i) Introduction
 - ii) Selection
 - iii) Hybridization
3. Hybrid Vigour, /Heterosis, inbreeding depression

UNIT – V: MUTATION BREEDING & BIOTECHNOLOGY IN CROP IMPROVEMENT:

1. Role of mutations in crop improvement.
2. Role of somaclonal variations in crop improvement.
3. Molecular breeding – use of DNA markers in plant breeding and crop improvement (RAPD, RFLP).
4. Genetically Modified (GM) Crops- Golden rice, BT Cotton; International & National Research Institutes – ICRISAT, IARI, ICAR

SUGGESTED ACTIVITY: Seminar, Debate, Quiz, observation of live cells and nucleus in Onion peels, observation of Meiotic nuclei in Maize pollen. Solving Genetics problems.

TEXT BOOKS:*VST Sai and K.Ramakrishna – (2011), A Text Book of Common Core Botany - Vol. IV – Sri Vikas Publications, Guntur. (*Subject to revision based on CBCS pattern)

REFERENCES:

1. Gupta, P.K.- (1999) – A Text Book of Cell and Molecular Biology, Rastogi Publications, Meerut.
2. Singh, B.D. – (1995) – Fundamentals of Genetics – Kalyani Publishers, New Delhi.
3. Sinnott, Dunn & Dobzhansky – (1999) Principles of Genetics. McGraw Hill Book & Co., New Delhi.
4. Snustad D.P. & Simmons M.J. – (2004) – Principles of Genetics ; John Wiley & Sons, Inc. New York.
5. Strickberger, M.W. – (1999) – Genetics – McMillan Publishing Corpn, New York.
6. Agarwal .V.K. (2006) Genetics. S.Chand & Co. New Delhi.
7. Allard R.W(1999): The Principles of Plant Breeding, John & Wiley and Sons.
8. Gupta, P.K., Plant breeding, Rastogi Publications, 2008
9. [Singh B.D., Plant Breeding principles & Methods , 2015](#)
10. [Plant Breeding by Chowdary](#)

OBJECTIVES : To enable the students to –

- Know the cytochemical methods of fixation and nuclear staining.
- Make suitable cytological preparations for study of mitosis, meiosis and karyotype.
- Solve problems in genetics.
- Understand principles and techniques of Plant Breeding

COURSE:

CELL BIOLOGY

1. Demonstration of Cytochemical methods: Fixation of plant material and nuclear staining.
2. Study of structure of plant cell through temporary mounts.
3. Study of effect of temperature & organic solvent on permeability of cell membrane.
4. Study of the structure of cell organelles through photomicrographs.
5. Study of different stages of Mitosis by squash preparations of Onion roots.
6. Preparation of karyotype slides from dividing root tip cells of Onion.
7. Study of different stages of Meiosis by squash preparations of anthers of Onion/Maize flower buds.
8. Study of DNA packing by micrographs.
9. Calorimetric estimation of DNA by diphenylamine method

GENETICS

Numerical problem solving in Mendel' Laws of inheritance

1. Problems on Monohybrid Ratio
2. Problems on Dihybrid Ratio
3. Problems on Incomplete Dominance
4. Chromosome mapping using 3 point test cross data.

PLANT BREEDING

1. Hybridization techniques
 - i) Emasculation
 - ii) Hybridization
 - iii) Bagging & tagging
2. Field visit to a plant breeding research station.

REFERENCE BOOKS:

1. Santra. S.C., Chatterjee, T.P and as A.P. (1989) College Botany Practical – Vol. I. New Central Book Agency, Calcutta.
2. Sharma, O.P. (2001) Experiments and techniques in Plant Sciences – Vol. II. Pragati Prakasan, Meerut
3. [Practical Handbook of Plant Breeding by Vikas Pal, 2016](#)

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ST. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM
V SEMESTER **BOTANY** TIME: 3Hrs/week
B 5102(3) **ECOLOGY & PHYTOGEOGRAPHY** Max. Marks: 100
W.e.f. (2017 – 2018) '15AC' Batch **SYLLABUS**

OBJECTIVES: To enable the students to

1. understand basic concepts of Ecology and environment.
2. understand the morphological, anatomical and physiological responses of plants to the environmental factors.
3. understand the importance of community ecology and ecological succession.
4. know the significance of Phytogeography and understand the phytogeographical regions of India

COURSE:

UNIT – I: Concepts and Ecosystem Ecology

1. Introduction to Ecology: definition, branches and significance of ecology.
2. Ecosystem Ecology
 - a. Concepts and components (Abiotic and biotic)
 - b. Food chains, Food webs, Ecological pyramids, Energy flow
 - c. Bio-geo-chemical cycles of carbon, nitrogen and phosphorus.
3. Productivity of ecosystem-Primary, Secondary and Net productivity.
4. Methods to estimate Primary productivity

UNIT – II: Elements of Ecology

1. Climatic Factors: Light, Temperature, precipitation.
2. Edaphic Factor: Origin, formation, composition and soil profile.
3. Biotic Factor: Interactions between plants and animals.
4. Ecological Adaptations of Plants
 - a) Hydrophytes
 - b) Xerophytes

UNIT – III: Population & Community Ecology

1. Population – Definition, Population Characteristics-Natality, Mortality, Growth curves, ecotypes, ecads
2. Plant Communities – characteristics of a community – Frequency, Density, Cover, and basal area, dominance, life forms, Biological spectrum, Important Value Index (IVI), competition
3. Methods to Study Plant Communities.

UNIT – IV: PHYTOGEOGRAPHY:

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

UNIT – V: PLANT BIODIVERSITY AND ITS IMPORTANCE

1. Definition, levels of biodiversity-genetic, species and ecosystem.
2. Biodiversity hotspots- Criteria, Biodiversity hotspots of India.
3. Loss of biodiversity – causes and conservation (*In-situ* and *ex-situ* methods).
4. Seed banks - conservation of genetic resources and their importance
5. Role of Organizations in the conservation of biodiversity – IUCN, UNEP, WWF, NBPGR, NBD.

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.

TEXT BOOK:

- *K. Ramakrishna & B.R.C Murthy (2011) Text Book of Common Core Botany – Vol.II – Vikas Publications. Guntur. (*Subject to revision in 2017)

REFERENCE BOOKS:

1. Plant Ecology – R.S. Ambast – Students friends & Co., Varanasi, India – 1988.
2. Ecology & Environment – P.D. Sharma – Rastogi Publications, Meerut – 2001.
3. A. Treatise on Plant Ecology – K.N. Bhatia & Sharma K.K. – Pradeep Publications, Jalandhar – 1991.
4. Textbook of Environmental Studies of Undergraduate Courses. Bharucha, E.Universities Press (I) Pvt.Ltd., Hyderabad 2005
5. Concepts of Ecology, Kormondy, E.Prentice Hall of India, New Delhi 1989
6. Ecology, Michael S. Oxford University Press, London 1996.
7. Basics of Ecology Odum, E.P. Saunders Intenational Students Edition, Philadephia 1983
8. Elements of Ecology, Sharma P.D. Rastogi Publications, Meerut 1989
9. Environmental Biology Singh H.R, .S.Chand & Co. Ltd. New Delhi 2005
10. Kochhar, P.L. (1975): Plant Ecology. (9th Edn.,) New Delhi, Bombay, Calcutta-226pp.,
11. Kumar, H.D. (1992): Modern Concepts of Ecology (7th Edn.,) Vikas Publishing Co., New Delhi.
12. Kumar H.D. (2000): Biodiversity & Sustainable Conservation Oxford & IBH Publishing 10. Co Ltd. New Delhi.
13. Chapman, J.L&M.J. Reiss (1992): ecology (Principles & Applications). Cambridge University Press, U.K.

OBJECTIVES: To enable the students

- learn the quantitative aspects of a plant community by quadrat method
- study various aspects of plant communities.
- Acquire knowledge of the Phytogeography and biodiversity of the region

COURSE:

1. Study of instruments used to measure microclimatic variables; soil thermometer, Maximum and Minimum thermometer, Anemometer, Psychrometer, Rain gauge, and Lux meter.
2. Permeability (percolation; total capacity as well as rate of movement) of different soil samples.
3. Determination of soil pH
4. Study of morphological and anatomical characteristics of hydrophytes and xerophytes
 - Hydrophytes - Hydrilla, Eichhornia, Pistia, Nymphaea, Utricularia, Vallisnaria
 - Xerophytes - Cocoloba, Opuntia, Euphorbia, Asparagus, Ruscus, Acacia melanoxylon, Casuarina
5. Quantitative Analysis of Herbaceous Vegetation: Study of frequency, density, abundance and biomass.
6. Study of Phytoplankton and macrophytes from water bodies.
7. Study of species diversity index of vegetation.
8. Estimation of Primary Productivity of an ecosystem
9. To study field vegetation with respect to stratification, canopy cover and composition.
10. To locate the hotspots, phyto geographical regions and distribution of endemic plants in the map of India.
11. The following practical should be conducted in the Field/lab with the help of photographs, herbarium, Floras, Red data book- Study of endangered plants species, critically endangered plants species, vulnerable plant species and monotypic endemic genera of India.
12. Minimum of two field visits to local areas of ecological / conservation of biodiversity importance (Sacred grove / reserved forest / botanical garden / zoo park / lake etc.)

REFERENCES:

1. Text book of Practical Botany (Vol .II) – Ashok Bendra & Kumar, Rastogi Publications, Meerut – 2001-2002
2. Practical Botany (Vol.II) – H.N. Srivastava, Pradeep Publications, Jalandhar – 200.
3. Modern Practical Botany – B.P.Pandey – S.Chand & Co., New Delhi – 1988.

