

Course Objectives:

- To study the ultra structure of cell and cell organelles.
- To study the genetics and plant breeding.

Unit - 1 Cell Biology

(12 h)

1. Cell, the unit of life- Cell theory, Prokaryotic and eukaryotic cells.
2. Eukaryotic cell components, Ultra structure and functions of cell wall & cell membrane
3. Chromosomes: morphology of prokaryotic and eukaryotic chromosome.
4. Organization of DNA in a chromosome (nucleosome model), Euchromatin and heterochromatin.

Unit - 2 Genetic material

(12 h)

1. DNA structure (Watson & Crick model)
2. Replication of DNA (semi-conservative method)
3. Types of RNA (mRNA, tRNA, rRNA), their structure and functions.
4. Genetic code, Gene regulation - *Lac* operon

Unit - 3 Inheritance

(12 h)

1. Mendel's laws of Inheritance (Mono- and Di- hybrid crosses); backcross and test cross.
2. Interaction of genes -Typical dihybrid, complementary, epistasis (dominant and recessive), inhibitory, duplicate Gene Interactions.
3. Linkage: Introduction, complete and incomplete linkage and Significance.
4. Crossing over: Introduction, types and Mechanism

Unit - 4 Plant breeding

(12 h)

1. Introduction and Objectives of plant breeding.
2. Methods of crop improvement: Procedure, advantages and limitations of (i) Introduction, (ii) Selection - Mass, Pureline and Clonal (iii) Hybridization.

Unit - 5 Breeding, and Crop improvement

(12 h)

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).

Additional inputs for CIA

1. Solenoid Model
2. Mutations, Types, and it's Significance
3. Chromosomal Mapping - 2 Point & 3 Point Test Cross (Assignment/PPT/Model preparation)

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Text Books for Botany - 5

- A text book for BOTANY – V Semester : Telugu Akademi, Hyderabad

Suggested readings for Botany - 5

- **S. S. Purohit (2010)** B.Sc., *Unified Botany Volume –III, Cell Biology (Genetics, Ecology and Biodiversity)*, Saraswati Purohit for Student Edition, Jodhpur
- **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
- **R. C. Chaudhary (1996)** *Introduction to Plant Breeding*, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi
- **B. D. Singh (1999)** *Plant Breeding*, Kalyani publishers, Ludhiana

Reference books for Botany - 5

- **Cooper, G.M. & R.E. Hausman (2009)** *The Cell – A Molecular Approach*, A.S.M. Press, Washington
- **Becker, W.M., L.J. Kleinsmith & J. Hardin (2007)** *The World of Cell*, Pearson Education, Inc., New York
- **De Robertis, E.D.P. & E.M.F. De Robertis Jr. (2002)** *Cell and Molecular Biology*, Lippincott Williams & Wilkins Publ., Philadelphia
- **Robert H. Tamarin (2002)** *Principles of Genetics*, Tata Mc Graw –Hill Publishing Company Limited, New Delhi.
- **Gardner, E.J., M. J. Simmons & D.P. Snustad (2004)** *Principles of Genetics*, John Wiley & Sons Inc., New York
- **Micklos, D.A., G.A. Freyer & D.A. Cotty (2005)** *DNA Science: A First Course*, I.K. International Pvt. Ltd., New Delhi
- **B.D.Singh (2001)** *Plant Breeding : Principles and Methods*, Kalyani Publishers, Ludhiana
- **Mandal, A.K., P.K.Ganguli and S.P. Banerjee (1991)** *Advances in Plant Breeding, Volumes I & II*, CBS Publishers & Distributors, New Delhi (India)
- **Bahar A. Siddiqui & S. Khan (1997)** *Plant Breeding & In Vitro culture*, CBS Publishers & Distributors, New Delhi (India)

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Learning outcomes:

- Students can acquire the knowledge about the cell and its structure.
- Students can gain the knowledge about the functional role of cell in metabolism.
- Students can acquire knowledge about the structure of chromosome, DNA and its replication, transcription and translation processes involved in the expression of phenotypic characters.
- Students can acquire knowledge about the process of plant breeding programme to produce a new variety useful in agriculture and horticulture.

Employability:

- Students can create their opportunities in the field of agriculture and Horticulture by studying the process of plant breeding in developing new varieties.
- Knowledge of plant breeding creates opportunities in agriculture sector

BOT-128
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

III B.Sc., Botany Practical Paper - V Practical Syllabus (w.e.f. 2018-19)
(Cell Biology, Genetics and Plant breeding)

Total hours of laboratory Exercises 30hrs @ 2 per week

Credits 2

1. Study of the structure of cell organelles through photomicrographs.
2. Study of various stages of mitosis using cytological preparation of Onion root tips.
3. Study of structure of chromosomes (typical and special types).
4. Numerical problems solving Mendel's Laws of inheritance.
5. Numerical problems solving interaction of genes.
6. Floral biology of Rice, Maize, Pigeon pea, cotton.
7. Hybridization techniques – emasculation, bagging (for demonstration only).
8. Field visit to a plant breeding research station

Objectives:

- To study and understand Ecology and eco-systems.
- To study and observe the phytogeographic regions of India and World.

Unit - 1 Elements of Ecology (12 h)

1. Ecology: Introduction, Scope, Importance.
2. Light Factors.
3. Temperature Factors.
4. Edaphic Factor: Origin, formation, composition and soil profile.
5. Biotic Factor: Interactions between plants and animals.

Unit - 2 Ecosystem (12 h)

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

Unit - 3 Population and Community Ecology (12 h)

1. Population Ecology, Introduction, characteristics and importance.
2. Ecads and Ecotypes (Outline)
3. Plant communities- characters of a community, Frequency, density, cover, life forms (Raunkiaer Classification) and competition.
4. Interaction between plants growing in a community.

Unit - 4 Phytogeography (12 h)

1. Principles of Phytogeography, Distribution (wides, endemic, discontinuous species).
2. Phytogeographic regions of India
3. Phytogeographic regions of World
4. Endemism - Introduction, types and causes, Endemic Species and Their Conservation.(out Lines)

Unit - 5 Plant Biodiversity (12 h)

1. Biodiversity - Introduction, Earth summit, Levels of biodiversity - genetic, species and Ecosystem.
2. Biodiversity hotspots of India.
3. Loss of biodiversity - causes and conservation (*In-situ* and *ex-situ* methods).
4. Role of UNDP, UNEP, NBA

Additional Inputs:

1. Endemic Gymnosperms and Angiosperms of India
2. Cartagena and Nagoya Protocols
3. Seed banks - conservation of genetic resources and their importance.

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Text Books for Botany - 6

- A text book for BOTANY – V Semester : Telugu Akademi, Hyderabad

Suggested readings for Botany - 6

- N.S.Subrahmanyam & A.V.S.S. Sambamurty (2008) *Ecology* Narosa Publishing House, New Delhi
- P.D.Sharma (2012) *Ecology and Environment*, Rastogi Publications, New Delhi
- A. K. Agrawal & P.P. Deo (2010) *Plant Ecology*, Agrobios (India), Jodhpur
- U. Kumar (2007) *Biodiversity : Principles & Conservation*, Agrobios (India), Jodhpur

Reference books for Botany - 6

- Edward J. Kormondy (1996) *Concepts of Ecology*, Prentice-Hall of India Private Limited, New Delhi
- Begon, M., J.L. Harper & C.R. Townsend (2003) *Ecology*, Blackwell Science Ltd., U.S.A.
- Eugene P. Odum (1996) *Fundamentals of Ecology*, Natraj Publishers, Dehradun
- Kumar, H.D. (1992): *Modern Concepts of Ecology (7th Edn.,)* Vikas Publishing Co., New Delhi.
- Kumar H.D. (2000): *Biodiversity & Sustainable Conservation* Oxford & IBH Publishing Co Ltd. New Delhi.
- Newman, E.I. (2000): *Applied Ecology* Blackwell Scientific Publisher, U.K.
- Chapman, J.L. & M.J. Reiss (1992): *Ecology (Principles & Applications)*. Cambridge University Press, U.K.
- Cain, S.A. (1944): *Foundations of Plant Geography* Harper & Brothers, N.Y.
- Mani, M.S (1974): *Ecology & Biogeography of India* Dr. W. Junk Publishers, The Hague
- Good, R. (1997): *The Geography of flowering Plants (2nd Edn.)* Longmans, Green & Co., Inc., London & Allied Science Publishers, New Delhi

Learning Outcomes:

- Students can acquire the knowledge about ecological factors like light, temperature, air, water and soil
- Students can acquire knowledge about the structure of Ecosystem, Ecological pyramids, food web, food chain and energy flow in an ecosystem.
- Students can know the importance of biodiversity and its conservation strategies.
- Students can acquire knowledge about the phytogeographical zone of world and India.

1. Study of instruments used to measure microclimatic variables; soil thermometer, maximum and minimum thermometer, anemometer, 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 adaptations of hydrophytes and xerophytes (4 each)
5. Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus by species area curve method
6. Study of Phytoplankton and macrophytes from water bodies.
7. To study field vegetation with respect to stratification, canopy cover and composition.
8. Study of plants included in agro forestry and social forestry.
9. To locate the hotspots, phyto geographical regions and distribution of endemic plants in the map of India.
10. Field trip to a place of ecological importance or Biodiversity significance,