

COURSE TITLE: BOTANY-III (CELL BIOLOGY, EVOLUTION AND GENETICS)

CREDIT HOURS: 3

Syllabus Outline:

An introduction to morphology and functioning of cell, cellular organelles and mechanisms of cell division. Study of genes and their inheritance patterns. Concept of evolution.

a) Cell Biology:

1. Structures and brief description of Bio-molecules
 - i) Carbohydrates
 - ii) Lipids
 - iii) Proteins
 - iv) Nucleic Acids
2. Cell: Physico-chemical nature of plasma membrane and cytoplasm.
3. Ultra structure of plant cell with a brief description and functions of the following organelles:
 - i) Endoplasmic reticulum
 - ii) Plastids
 - iii) Mitochondria
 - iv) Ribosomes
 - v) Dictyosomes
 - vi) Vacuole
 - vii) Microbodies (Glyoxysomes and Peroxisomes)
4. Nucleus: Nuclear membrane, nucleolus, ultrastructure and morphology of chromosomes, karyotype analysis.
5. Reproduction in somatic and embryonic cell, mitosis and meiosis, cell cycle.
6. Chromosomal aberrations; Changes in the number of chromosomes Aneuploidy and Euploidy. Changes in the structure of chromosomes, deficiency, duplication, inversion and translocation.

b) Genetics:

1. Introduction, Scope and brief history of Genetics. Mendelian Inheritance; Laws of Segregation and Independent Assortment, Back Cross, Test Cross, Dominance and Incomplete Dominance.
2. Sex linked inheritance, sex linkage in Drosophila and man (colour blindness), XO, XY, WZ mechanisms, sex limited and sex linked characters, sex determination.
3. Linkage and Crossing Over, Definition, Linkage of Groups, Construction of Linkage Maps, Detection of Linkage. Recombination
4. DNA Replication. Nature of gene, genetic code, transcription, translation, regulation of gene expression

5. Transmission of genetic material and Bacteria: Conjugation and gene recombination in co-transduction and transformation.
6. Principles of genetic engineering/biotechnology; Basic genetic engineering techniques.
7. A brief introduction of Gene Mutation.
8. Evolution
9. **Assessment Strategies (Theory) :**

Evaluation Criteria

Examination	Type	Marks
Internal Examination	Sessional Work	15%
	Mid-Semester	25%
External Examination	Final Semester	60%

BOOKS RECOMMENDED:

1. Bretscher, A. (2007).Molecular Cell Biology. W. H. Freeman and Company
2. Weaver, R.F. (2005).Molecular Biology. McGraw Hill, St. Louis.
3. Griffiths, J.F., Miller, J.H., Suzuki, D.T., Lewontin, R.C. and Gelbart, W.M. (2003).An Introduction to Genetic Analysis. W.H. Freeman and Company.
4. Sinha, U. and Sinha, S. (2003).Cytogenesis, Plant Breeding and Evolution. Vini Educational Books, New Delhi.
5. Strickberger, M.V. (2003).Genetics. MacMillan Press Ltd., London.
6. Karp, G. (2002).Cell and Molecular Biology. Concepts and Experiments. 4th Ed. John Wiley and Sons. New York.
7. Gilmartin, P.M. and Bowler. C. (2002).Molecular Plant Biology. vol 1 & 2. Oxford University Press. UK.
8. Carroll, S.B., Grenier, J.K. and Velnerbee, S.D. (2001).From DNA to Diversity— Molecular Genetics and the Evolution of Amino Acid Design. Blackwell Science.
9. Hoelzel, A.R. (2001).Conservation Genetics. Kluwer Academic Publishers.
10. Lodish. H. (2001).Molecular Cell Biology. W.H. Freeman and Company.
11. Dyonsager, V. R. (2000).Cytology and Genetics. (3rd Ed.), Tata and McGraw Hill Publication Co. Ltd, New Delhi.

COURSE TITLE: BOTANY LAB-III (CELL BIOLOGY, EVOLUTION AND GENETICS)

CREDIT HOURS: 1

Syllabus Outline:

Development of concepts about cell structure, chromosomal morphology, mechanisms of cell division, extraction of protein, DNA, RNA from plant sources, genetical problems related to transmission and distribution of genetic material.

a) Cell Biology:

1. Study of cell structure using compound microscope and elucidation of ultra structure from electron microphotographs.
2. Measurement of cell size.
3. Study of mitosis and meiosis by smear/squash method and from prepared slides.
4. Study of chromosome morphology and variation in chromosome number.
5. Extraction and estimation of carbohydrates, proteins, RNA and DNA from plant material.

b) Genetics:

1. General problems related to transmission and distribution of genetic material.
 2. Identification of DNA in plant material. Carmine/Orcein staining.
- Study of salivary gland chromosomes of *Drosophila*.

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3. Sinha, U. and Sinha, S. (2003). Cyto genesis, Plant Breeding and Evolution. Vini Educational Books, New Delhi.
4. Strickberger, M.V. (2003). Genetics. MacMillan Press Ltd., London.
5. Karp, G. (2002). Cell and Molecular Biology. Concepts and Experiments. 4th Ed. John Wiley and Sons. New York.

6. Gilmartin, P.M. and Bowler. C. (2002). *Molecular Plant Biology*. vol 1 & 2. Oxford University Press. UK.
 7. Lodish. H. (2001). *Molecular Cell Biology*. W.H. Freeman and Co.
- Dyonsager, V R. (2000). *Cytology and Genetics*. (3rd Ed.), Tata and McGraw Hill Publication Co. Ltd. New Delhi.