



Code	Subject Title	Cr. Hrs	Semester
BOT-201	Botany-III (Cell Biology, Genetics and Evolution)	3	III
Year	Discipline		
2	Botany, Zoology, Chemistry-I		

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.

Course Outline:

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. Ultrastructure 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 Embryogenic 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 (Color Blindness), XO, XY, WZ Mechanisms, Sex Limited and Sex Linked Characters, Sex Determination.
3. Linkage and Crossing Over, Definition, Linkage Groups, Construction of Linkage Maps, Detection of Linkage. Recombination.
4. DNA Replication, Nature of Gene, Genetic Code, Transcription, Translation, Regulation of Gene Expression (*e.g. lac operon*).
5. Transmission of Genetic Material in 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

Module Aims: To introduce the students to basic aspects of Cell Biology, Genetics and Evolution to provide the students with fundamental knowledge of these courses for the understanding applied aspects of this course.

Learning Strategies:

1. Lectures
2. Group Discussion
3. Laboratory work
4. Seminar/ Workshop

Learning Outcome: On successful completion of this module students will be able to describe, apply and integrate the basic concepts of Cell Biology including Genetics and Evolution, Structure and Functions of Organisms.



Assessment Strategies:

1. Lecture Based Examination (Objective and Subjective)
2. Assignments
3. Class discussion
4. Quiz
5. Tests

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 Vernerbee, S.D. (2001).** *From DNA to Diversity—Molecular Genetics and the Evolution of Animal 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.