SEMESTER-V

COURSE 14: GENE BIOTECHNOLOGY

Theory Credits: 3 3 hrs/week

I. LEARNING OUTCOMES

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

1. Learn about history and concept of genetic material
2. Learn about Mendel laws and their deviations
3. Learn about chromosome alterations and mutations
4. Learn about microbial genetics
5. Learn about banding techniques

II. Syllabus

UNIT I

1. History of Classical and Modern Genetics, Concept and organization of Genetic material in Bacteria, Plant and Animal;
2. Structure, types, forms and functions of DNA and RNA.
3. Genetic model organisms and their significance (*E.coli, Arabidopsis thaliana, Caenorhabditis elegans*).

UNIT II

1. Mendelian laws of inheritance; Non-Mendelian inheritance;
2. Chromosomal theory of inheritance. Back cross and Test cross.
3. Linkage and crossing over. Epistasis. Concept of multiple alleles.

UNIT III

1. Structural and numerical alterations of chromosome - Deletion, inversion, duplication, translocation. Ploidy and their genetic implications.
2. Mutation- (Spontaneous and Induced) mutagen. Biochemical basis of mutation.
3. Light induced repair, excision repair and mismatch repair, post replication repair, Rec gene and its role in DNA repair SOS repair and SOS response.

UNIT IV

1. Microbial Genetics: Methods of Gene transfer – Transformation, Transduction
2. Mapping genes by interrupted Matting, fine structure analysis of genes.
3. Retroposans , repeated sequences

UNIT V

1. Human karyotype, Banding techniques, Human genetic diseases. Pedigree analysis
2. Karotype in man, in herited disorders: Allosomal & autosomal. Banding techniques
3. Structure and Molecular basis of AC-DS transposition in maize, “P” element of Drosophila and hybrid dysgenesis, Yeast “T_7” element

III . Skills Outcome

On Successful Completion of this Course, Student shall be able to

1. Identify different stages of mitosis
2. Identify the chromosomal aberrations
3. Identify the pedigree charts

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Practical Credits: 1 2 hrs/week

1. Study of different phases of mitosis in onion root tips.
2. Mutation of DNA by UV light
3. Problems and assignments in Mendilian genetics.
4. Chemical induced mutation in bacteria.
5. Induction of chromosomal aberrations by chemical mutagenesis in any plant.
6. Isolation of auxotrophic mutants (plants or insects).
7. Repair of DNA by Photo activation of Photolyase in bacteria.
8. Mutation of bacteria by UV.
9. Karyotype
10. Pedigree analysis

V. REFERENCES

1. Human Genetics: Concept and Application by Ricki Lewis 10th Edition
2. Vogel and Motulsky's Human Genetics: Problems and Approaches
3. The Principles of Clinical Cytogenetics by Steven L. Gersen, Martha B. Keagle 3rd edition.
4. Human Cytogenetics: Constitutional Analysis: a Practical Approach by Denise E. Rooney.

VI. CO-Curricular Activities

a) **Suggested Co-Curricular Activities**

1 Assignments
2. Seminars, Group Discussions on related topics
3. Charts on pedigree analysis and karyotyping