MMB - C202
MICROBIAL GENETICS AND GENOMICS

L T Credit
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Learning objectives:

- To know the Genetic constitutents of bacteria with special emphasis on inheritance and mutations
- To know the mechanism of genetic transfers in microbes
- To know the different techniques used to study the microbial genetics and utilizing the microbial phenomenon in different biotechnological applications.
- To make the students to understand genome analysis, sequence analysis and protein analysis
- To make the students to know the tools used in Bioinformatics

Learning outcomes:

At the end of course student will be able to

- Explain why DNA is the genetic material of bacteria.
- Explain the application of genetic engineering techniques in basic and applied experimental biology.
- Use Plasmids as cloning vector and its applications.
- Use the computational tools used for sequence analysis tools
- Construct phylogenetic tree and how to access NCBI to use BLASTA and FASTA

UNIT - I

Essentials of Genetics: Genetic notations- prototrophs, auxotrophs, diploid, and electroporation; Gene as unit of mutation and recombination, molecular nature of mutation, origin of resistance due to spontaneous mutation.Model organisms and genetic analysis of bacteria and yeast;locating a genes on a DNA molecule. **(14 Lectures)**

UNIT - II

Gene transfer mechanisms-Bacterial transformation (detection of transformation, development of competence, mechanism of transformation, transfection); conjugation- and compatibility, the F-factor, the conjugal transfer process; high frequency recombination (Hfr) strains; the order of chromosome transfer; formation of F prime (F'); transduction - generalized transduction; abortive transduction; specialized transduction, sexduction. **(14 Lectures)**

UNIT - III

Genetic recombination– Mechanism of recombination, Holliday model for general recombination; non-reciprocal general recombination; site specific recombination; transposable elements – classes of transposable elements; nomenclature of transposable elements, insertion sequence (IS elements), transposon family (structure, mechanism of transposition) **(12 Lectures)**

UNIT - IV

Microbial genomics- Introduction - functional and comparative genomics, proteomics, environmental genomics, genome evolution in microbes, phylogenetic trees.,whole genome shotgun sequencing, library construction **(10 Lectures)**

UNIT - V

Bioinformatics - -Introduction, gene anotation, random sequencing, fragment alignment and gap closure, editing;databases, database similarity search BLAST, FASTA, metagenomics: basic concepts, application, bioinformatics. **(10 Lectures)**

Suggested Reading

1. David Friefelder, Microbial Genetics, Narosa Publishing House.
2. Gardner, Principle of Genetics, Wiley
3. Dubey, R.C. *Advanced Biotechnology*. S. Chand & Co. P Ltd, New Delhi, p. 1161; ISBN: 81:219-4290-X.
4. Lehninger, Nelson and Cox. Principles of Biochemistry, WH Freeman; 7th ed, ISBN:978-1319108243

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