

**SARDAR PATEL UNIVERSITY**  
**Programme: MSc (Genetics)**  
**Semester: IV**  
**Syllabus with effect from: June 2010**

<b>Paper Code:</b> PS04EGEN01	<b>Total Credits: 4</b>
<b>Title Of Paper:</b> Microbial Genetics	

Unit	Description in detail	Weightage (%)
<b>1</b>	<p><b>Mutation and DNA Repair:</b> Mutation, Spontaneous mutations (Random v/s adaptive nature of mutation, Luria and Delbruck experiment, Newcombe experiment, Lederberg's experiment. Mutation rate and its determination, Origin of spontaneous mutations), DNA damages (Deamination of bases, alkylation, damage due to reactive oxygen, UV induced damage) and its repair pathways (Methyl-directed mismatch repair, Nucleotide excision repair, Base excision repair, recombinational repair, SOS inducible repair, specific repair for oxidative DNA damage, pyrimidine dimers and alkylation induced damage and adaptive response).</p> <p><b>Plasmid Biology:</b> Types, compatibility, replication, control of copy number and plasmid segregation</p>	<b>25 %</b>
<b>2</b>	<p><b>Recombination:</b> Types of recombinations, Models for Homologous recombination, Molecular mechanism of homologous recombination, Homologous recombination in eukaryotes, Mating – type switching. Molecular mechanism for site – specific recombination, Biological roles of site-specific recombination.</p> <p><b>Conjugation:</b> Conjugation by E.coli F factor (Structure of F-Factor fertility, establishment of cell contact, DNA mobilization and transfer and separation of mating pair, Hfr conjugation and chromosomal transfer, F-Prime conjugation and mero-diploids, conjugation of fertility inhibited F-like Plasmids, Nonconjugative, mobilizable plasmids, Broad Host Range self-transmissible plasmids, Chromosome mobilization by Non – F plasmids, Plasmids based conjugation in other bacteria (Salmonella, Pseudomonas, Streptomyces and Streptococcus. Interrupted mating and conjugational mapping.</p> <p><b>Agrobacterium genetics:</b> Ti-plasmid, Interkingdom gene transfer (Key early experiments, vir regulon, protein secretion apparatus, conjugation model of T-DNA transfer, Integration products).</p>	<b>25 %</b>
<b>3</b>	<p><b>Transformation:</b> Mechanism of Natural competence and transformation in Bacillus subtilis, streptococcus pneumoniae and Haemophilus influenzae. Transformation by inducing artificial competence, Gene linkage and mapping by transformation.</p> <p><b>Transduction:</b> Generalized transduction in P22, P1, T4, <math>\lambda</math> and MU bacteriophages, homologous recombination with recipient's chromosome, measuring transduction (cotransduction of markers, marker effects, abortive transduction, transduction of plasmids) Applications of generalized transduction. Specialized transduction in <math>\lambda</math> and its applications</p> <p>Viral genetics: Bacteriophages (T-series, <math>\lambda</math>-biology, Miniphages (M-13, X 174, Mu), Bacteriophage recombination (complementation, fine structure analysis.)</p>	<b>25 %</b>
<b>4</b>	<p><b>Fungal Genetics:</b> Tetrad analysis and Mitotic recombination</p> <p><b>Restriction – Modification systems:</b> Role of Restriction – Modification systems, Types of RM systems, Modification, Restriction and Regulation.</p> <p><b>Transposable elements:</b> Types of transposable elements, Structure, genetic</p>	<b>25 %</b>



	organization and mechanism of transposition of Tn5, Tn3 and related transposons, Bacteriophage Mu, Tn7 and IS911, Integrons, Retrotransposons, Conjugative and Mobilizable transposons, Assays of transposition. Molecular Biology of Tumor: Control of cell proliferation, oncogene activation, role of tumor suppressor genes. Apoptosis	
--	--	--

**Basic Text & Reference Books:**

- Genes IX: Lewin
- Molecular Biology of the Gene: Watson et al V<sup>th</sup> edition.
- Modern Microbial Genetics: Uldis Streips and Ronald Yasbin.
- Microbial genetics: Stanley Molay, John Cronan and David Freifelder.
- Molecular Genetics of Bacteria: Snyder and Champness.
- Molecular Genetics: Stent and Calendar
- Principles of Genetics: Snustad and Simmons
- Molecular Biology of the Cell: Alberts et al.

