

**SARDAR PATEL UNIVERSITY**  
**Programme and Subject : B.Sc (Genetics)**  
**Semester : IV**  
**Paper code: US04CGEN21**  
**Total Credit: 4 (4 lectures/week)**  
**(Syllabus with effect from June -2019)**

**Title of paper: Principal of Genetics -II**

**UNIT I**

Extrachromosomal inheritance – Mechanism, coiling of shell in snail, Kappa particles in Paramecium, plastid inheritance, Iojob inheritance in corn, male sterility in plants, Genetically engineered Male sterility (Barnase/ Barstar system). Chloroplast genetics, mitochondrial genetics. Heredity of organelles in plants & animals.

Sex determination in animals

Chromosome theory of sex determination, Heterogametic and homogametic

Individuals. Environmental sex determination, Hormonal sex determination, Sex determination in plants and Drosophila, Gynandromorph, Dosage compensation, Genetic imprinting, Sex linked traits, Sex influenced traits, Sex limited traits, Non-disjunction of sex chromosome in drosophila, Disorders due to sex chromosomal aberrations.

**UNIT II**

Recombination and Repair of DNA, Models of DNA recombination, Recombination pathways involving “rec” genes, Site specific recombination, DNA repair mechanisms: Photoreactivation, Excision repair, Mismatch repair, Post replication repair, SOS repair. Transposable element - Discovery of transposable elements, simple & complex transposable elements of Bacteria, Structure & molecular basis of AC-DC transposition in Maize, P element of Drosophila, Yeast “Ty” element, Retrotransposons.

**UNIT III**

Mutations- Stages at which mutation occurs, Types of mutation- spontaneous Vs induced mutation, Mutagens - physical and chemical. Gene mutation, Chromosomal mutation duplication, translocation, inversion and insertion. Change in number (aneuploidy, euploidy with examples). sex-linked mutation methods for detection of sex-linked lethal mutation. Practical application of mutation

**UNIT-IV**

Correlation : Introduction, Types of correlation, Methods for study of correlation (Scattered diagram & Karl Pearson coefficient)Regression, Regression lines and its coefficient (Properties without proof)

Difference between Correlation and Regression

Attributes: Tabulation, Chi-square test for independence of two attributes

**References:**

1. Fundamentals of Genetics - B.D. Singh, Kalyani Publishers
2. Principles of Genetics – D. Peter Snustad & Michael J. Simmons, John Wiley & Sons. Inc.
3. Genetics - Strickberger 3rd Ed. Prentice Hall of India Pvt. Ltd.
4. Cell Biology, Genetics, Molecular Biology, Evolution & Ecology - Verma & Agarwal, S. Chand & Company
5. Genetics - Peter J. Russel 5th Ed. Benjamin Cummings Publishing Company.
6. Genetics - P.K. Gupta 3rd Ed. Rastogi Publications.
7. Fundamentals of Statistics - S.C.Gupta 11th Ed. Himalaya Publishing House.
8. Methods in Biostatistics - B.K. Mahajan 6th Ed. Jaypee Publishers
9. Statistics - D.C. Sancheti and V.K. Kapoor, Sultan Chand & Sons.
10. A handbook of Agricultural Statistics - S. R. S. Chandel, Anchal Prakashan, Mandir, Kanpur.
11. A textbook of Agricultural Statistics - R. Rangaswamy, New Age International Publications.
12. Introduction to Biostatistics - Pranab Kumar Banerjee, 3rd Ed. S. Chand & Company.

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**Title of paper: Molecular Genetics**

**UNIT I: Basics of microbes**

Introduction and History of Microbiology (Contributions of Redi, Spallanzani, Needham, Pasteur, Tyndal, Joseph Lister, Koch [Germ Theory], Edward Jenner and Flemming [Penicillin]), Classification of micro-organisms, Concept of Sterilization-Definition of sterilization, dry and moist heat, pasteurization, tyndalization; radiation, ultrasonication, filtration. Physical and Chemical methods of sterilization. Types of culture media- (bacteria and fungi) and conditions required for cultivation of bacteria. Methods of isolating pure cultures (Streak, Spread and Pour plate technique). Bacterial growth curve, Principles of staining of micro organisms.

**UNIT II: Genetic Recombination in Bacteria**

Discovery of gene transfer in bacteria (U tube. Lederberg & Tatum experiment), Transformation - Discovery and Mechanism of Transformation, Conjugation-unidirectional gene transfer F+, F-, HFr, Transduction-Generalized and Specialized, Introduction to viral genetics: Types and life cycle, Modern classification of viruses, plasmids its types (F, Col, R, Ti, Ri), Episomes. Definition of Plasmids, Physical Nature and Copy Number of Plasmids, Properties, Incompatibility.

**UNIT III: DNA replication, transcription & translation in Prokaryotes**

Unidirectional and bi-directional, Semi-conservative and discontinuous, Models of replication (Replication fork in detail, rolling circle, D-loop), Enzymes and proteins in replications, Transcription in prokaryotes, Processing of rRNA, tRNA, mRNA, Protein synthesis (Translation in prokaryotes). Replication of RNA and antisense RNA.

**UNIT IV: Gene concept**

Gene concept fine structure of gene .Classical concept (Gene and allele)  
Complementation and recombination test (Classical), Position effect (Bar eye in Drosophila)  
Pseudo-alleles and complex loci (lozenge locus), Cistron, recon and muton. Expression and regulation of genes. Operon concept *lac* and *trp* operon. Genetic code- Discovery and properties, wobble hypothesis, degeneracy of codon. Promoters, enhancers, exons, introns.

**References:**

1. Microbiology - Prescott, Harley & Kleins 7<sup>th</sup> Ed. McGraw-Hill Higher Education.
2. Experimental Microbiology (volume 1&2) - Rakesh Patel and Kiran Patel, Aditya Publications.
3. Principles of Genetics – D. Peter Snustad and Michael J. Simmons, John Wiley & Sons, Inc.
4. Genetics - Peter J. Russel 5<sup>th</sup> Ed. Benjamin Cummings Publishing Company.
5. Genetics - P.K. Gupta 3<sup>rd</sup> Ed. Rastogi Publications.
6. Principles of Biochemistry, Cox, M. M., & Nelson, D.L, Lehninger, W. H. Freeman & Co.
7. Genes VII - Benjamin Lewin, 10<sup>th</sup> Ed. Oxford University Press.
8. Molecular Biology of the Cell, 3<sup>rd</sup> Ed. Bruce Alberts, Dennis Bray, Julian Lewis, Martin Raff, Keith Roberts, and James D Watson, Garland Science.
9. Cell biology - Satyeshchandra Roy and K. K. De.
10. Cytology, genetics, evolution and plant breeding - P. K. Gupta, Rastogi Publications.

11. Fundamentals of Statistics - S.C.Gupta 11th Ed. Himalaya Publishing House.
12. Methods in Biostatistics - B.K. Mahajan 6th Ed. Jaypee Publishers
13. Statistics - D.C. Sancheti and V.K. Kapoor, Sultan Chand & Sons.
14. A handbook of Agricultural Statistics - S. R. S. Chandel, Anchal Prakashan
15. Mandir, Kanpur.
16. A textbook of Agricultural Statistics - R. Rangaswamy, New Age International
17. Publications.
18. Introduction to Biostatistics - Pranab Kumar Banerjee, 3rd Ed. S. Chand &
19. Company.
20. Statistics made Simple - K.V.S.Sharma, Prentice Hall of India.

**SARDAR PATEL UNIVERSITY**  
**Programme and subject : B.Sc (Genetics) Practical syllabus**  
**Semester : IV**  
**Paper code: US04CGEN23**  
**Total Credit: 2 (4 lectures/week)**  
**(Syllabus with effect from June -2019)**

1. Introduction to lab instruments(centrifuge, Electrophoresis, incubator ,Hot air oven, autoclave, pH meter, colony counter)
2. Demonstration of Barr bodies.
3. Induction of polyploidy.
4. Study of chromosomal aberration using chemical(EMS/MMS).
5. Effect of UV as a mutagen on *Serratia marcescens*.
6. Karyotypic studies of chromosomes and banding.
7. Methods of emasculation and crossing.
8. Field and industrial visit.
9. t – test.
10. F – test.
11. Correlation, Regression.

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1. Qualitative and quantitative analysis of soil microflora
2. Isolation of bacteria by streak plate method
3. Isolation of bacteria by spread plate method
4. Isolation of bacteria by pour plate method
5. Screening of amylase, protease and gelatinase producers from soil
6. Isolation of Rhizobia from root nodules
7. Extraction of DNA from *E.coli* by phenol extraction method
8. Extraction of Protein by TCA method