

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

Paper Code: PS01CGEN02	Total Credits: 4
Title Of Paper: Fundamentals of Genetics	

Unit	Description in detail	Weightage (%)
1	<p>Mendelian Genetics: Law of segregation, Independent Assortment, Monohybrid Cross, Dihybrid Cross, trihybrid Cross, Test cross, back cross.</p> <p>Gene Interaction and Multiple Alleles: Types of gene interactions, Molecular basis of gene interaction; Epistasis; Dominance: complete dominance, incomplete dominance, codominance, overdominance; Molecular basis of dominance, Lethal genes and their action; Pleiotropy; Multiple alleles: ABO blood groups in human, Rh blood group system, Fur colour in rabbits, characteristics of multiple alleles.</p>	25 %
2	<p>Linkage, Crossing over and Chromosome mapping Linkage; Crossing-over: cytological basis of crossing-over, molecular mechanism of crossing-over; chromosome mapping: two factor crosses, three factor crosses, interference, chromosome maps. Sex determination and sex linkage: Mechanism of sex determination, Environmental factors and sex determination, molecular basis of sex determination, sex differentiation: Chlamydomonas, sex linked inheritance.</p> <p>Recombination: Types of recombination, Models for homologous recombination, molecular mechanism of homologous recombination, Mating type switching, molecular mechanism for site specific recombination;</p> <p>Recombination in Fungi: Tetrad analysis, detection of linkage, Gene conversion, parasexual cycle; Recombination in Bacteria: Transformation, Conjugation, Transduction: generalized and specialized Transduction.</p> <p>Gene fine structure / Bacteriophage genetics: Phage mutants, rapid lysis and host-range mutants, conditional lethal mutants, complementation and gene fine structure analysis Quantitative Genetics: Multiple factor hypothesis, predicting phenotypes, Transgressive segregation, Effects of environment on quantitative traits, Quantitative Trait Loci (QTLs).</p>	25 %
3	<p>Mutation: Spontaneous mutation (random v/s adaptive nature of mutation) Luria and Delbruck experiment, Newcombe experiment, Lederberg's experiment, Mutation rate and its determination, origin of spontaneous mutation, DNA damages (deamination of bases, alkylation, damages due to reactive oxygen, UV induced damage) and its repair pathways (Methyl directed mismatch repair, nucleotide excision repair, recombinational repair, SOS inducible repair, specific repair for oxidative DNA damage, pyrimidine dimers and alkylation induced damage and adaptive response).</p>	25 %
4	<p>Transposable elements: Types of transposable elements, structure, genetic organization and mechanism of transposition of Tn5, Tn3 and related transposons. Bacteriophage Mu, Tn7 and IS911, Integrons, Retrotransposons, Conjugative and mobilizable transposons, assay of transposition.</p> <p>Extrachromosomal Inheritance: Criteria for extrachromosomal inheritance, Cytoplasmic organelles and symbionts; maternal effects in snails, streptomycin resistance in Chlamydomonas, Mitochondrial mutations in yeast, Kappa particles in Paramecium, plasmid inheritance in Mirabilis jalpa, male sterility in plants</p>	25 %



Basic Text & Reference Books:

- Strickberger M.W. Genetics. Third Edition. Prentice-Hall of India Pvt. Ltd, New Delhi, 2005. ISBN: 81-203-0949-9.
- Emund W. Sinnott, L. C. Dunn & T. Dobzhansky. Principles of Genetics, Tata Mcgraw Hill Publishing Company Limited, New Delhi, ISBN: 978-0070994133.
- P. K. Gupta, Genetics. Rastogi Publications, Meerut, India., ISBN: 81-7133-842-9.
- Gardner E. J., Simmons M. J. & Snustad D. P. Principles of Genetics. Eighth edition. John Wiley & Sons Inc. ISBN 9971-51-346-3.
- Klug W. S. & Cummings M. R. Concepts of Genetics. Seventh edition. Pearson Education. ISBN 81-317-0811-X.
- Stent G. S. & Calendar R. Molecular Genetics: An Introductory Narrative. Second edition CBS Publishers and Distributors, New Delhi ISBN 81-239-0857-1.
- Streips U. And Yasbin R. Modern Microbial genetics, Wiley-Liss, USA. ISBN: 0-471-38665-0.
- Molay S., Cronan J. & Frifelder, D. Microbial Genetics Narosa Publishing House, New Delhi. ISBN: 81-7319-697-4.

