Course Code   : PLB 303
Course Title   : Molecular and Population Genetics
Credit Hours   : 2 (2 + 0)   **Full Marks: 50**   **Theory: 50**   **Practical: 0**

OBJECTIVES:

Upon the completion of this course, the students will be able to understand quantitative and population genetics; chromosome and genetic, bioinformatics, genome and genomics.

I. SYLLABUS:

The nature of gene; Gene isolation and manipulation; Genetic engineering; Chromosome and genetic control mechanism in eukaryotes; Probability and Statistical testing; Quantitative genetics; Population Genetics

II. COURSE OUTLINE

A. Lecture

S. N.	Topics	No. of Lectures
1.	The nature of gene	3
	1.1 One gene one polypeptide hypothesis	
	1.2 Enzymatic explanation of genetic ratios	
	1.3 Genetic fine structures	
2.	Gene isolation and manipulation	5
	2.1 Restriction enzymes, identification and isolation of DNA	
	2.2 Gene cloning vectors	
	2.3 r-DNA technology and formation of r-DNA	
	2.4 Methods of cloning	
	2.5 PCR, Gel electrophoresis	
3.	Genetic engineering	2
	3.1 Definition, steps, methods of genetic engineering	
	3.2 Applications of genetic engineering for crop improvement	
4.	Chromosome and genetic control mechanism in eukaryotes	3
	4.1 Eukaryotic chromosomes and its types	
	4.2 Eukaryotic gene expression	
	4.3 Central dogma of molecular biology	
5.	Probability and Statistical testing	2
	5.1 Probability rules, calculation of genetic ratios	
	5.2 Chi square test	

6.	Quantitative genetics		7
	6.1	Heterosis and inbreeding	
	6.2	Johannsen's pureline theory, means, variance and regression analysis	
	6.3	Heritability and prediction of response to selection	
	6.4	Polygenes in discontinuous traits, quantitative traits and their inheritance	
	6.5	Genotype x Environment Interaction	
	6.6	Path Analysis	
	6.7	Combining ability analysis (GCA, SCA)	
7.	Population Genetics		8
	7.1	Population structures; evolution by natural selection	
	7.2	The Mendelian population, Gene pool and genes in populations	
	7.3	Gene frequency and genotype frequency	
	7.4	Hardy-Weinberg Law, factors affecting gene frequencies, mating Systems	
	7.5	Process that changes allelic frequencies: Selection, Migration, Mutation and Genetic drift	
	7.6	Multiple alleles and linkage of gene	
	7.7	Genetic diversity, genetic load and genetic death	
	7.8	Chromosome change in evolution; species isolation mechanisms	
	Total		**30**

REFERENCES

Dabholkar, A.R., 1999. Elements of Biometrical Genetics. Concept Publishing Company. New Delhi. India.

Gardner, E.J., M.J. Simmons and D.P. Snustad, 2011. Principles of Genetics (8th Ed.). John Wiley and Sons Pvt. Ltd. Singapore.

Griffiths, A.J.F., S.R. Wessler, S.B. Carroll and J. Doebley, 2012. An Introduction to Genetic Analysis (10th Ed.). W.H. Freeman and Company. New York. USA.

Hichey, G.I., H.L. Fletcher and P. Winter, 2010. Genetics (3rd Ed.). Taylor and Francis Group. USA.

Strickberger, M.W., 2012. Genetics (3rd Ed.).PHI Learning Private Limited. New Delhi. India.