GENETICS AND PLANT BREEDING

Course Code : PLB 101
Course Title : Introductory Genetics
Credit Hours : 3 (2 + 1)   Full Marks: 75   Theory: 50   Practical: 25

OBJECTIVES

Upon the completion of this course, the students will be able to understand the science of genetics in terms of chromosomal characters, the fundamental principles of genetics, and solve the numerical problems related to inheritance of qualitative, quantitative and cytoplasmic characters.

I. SYLLABUS

Introduction, scope, relationship with other sciences and history of genetics; Cell cycle and Cell division (mitosis and meiosis); Life cycles (maize, human, virus and bacteria); Mendelian genetics; Gene action and interactions; Probability and chi square testing; Linkage and crossing over; Sex determination and sex linkage; Extra nuclear/maternal/cytoplasmic inheritance; Nucleic acids; Gene regulation and transposable genetic elements; Mutation; Chromosomal aberrations.

II. COURSE OUTLINE

A. Lecture

S. N.	Topics	No. of Lectures
1.	Introduction, scope, relationship with other sciences and history of genetics	1
2.	Cell cycle and Cell division	2
	2.1 Mitosis	
	2.2 Meiosis	
3.	Life cycles	3
	3.1 Maize and human	
	3.2 Virus	
	3.3 Bacteria	
4.	Mendelian genetics	3
	4.1 Introduction to Mendelian genetics	
	4.2 Mendel's laws of inheritance	
	4.3 Back cross and test cross	
5.	Gene actions and interactions	2
	5.1 Gene actions	
	5.2 Gene interactions	
6.	Probability and chi square testing	2
	6.1 Probability	
	6.2 Chi square test	
7.	Linkage and crossing over	2
	7.1 Linkage	
	7.2 Crossing over	

8.	Sex determination and sex linkage	3
	8.1 Sex determination in animals	
	8.2 Sex determination in plants	
	8.3 Sex linkage	
9.	Extra nuclear/maternal/cytoplasmic inheritance	2
	9.1 Genes in organelles and maternal effects	
	9.2 Characteristics of cytoplasmic inheritance, male sterility, restorer and non-restorer Genes	
10.	Nucleic acids	4
	10.1 Introduction to nucleic acids and Structure of DNA	
	10.2 DNA replication	
	10.3 RNA and its types, transcription	
	10.4 Translation and genetic code	
11.	Gene regulation and transposable genetic elements	2
	11.1 Gene regulation	
	11.2 Transposable genetic elements	
12.	Mutation and mutagens	2
	12.1 Definition, characteristics and types of mutation	
	12.2 Mutagens and their types; applications/uses of mutation	
13.	Chromosomal aberrations	2
	13.1. Structural	
	13.2. Numeric	
	Total	**30**

B. Practical

S. N.	Topics	No. of practical
1.	Study of diagrams of mitosis	1
2.	Study of diagrams of meiosis	1
3.	Microscopic study of different stages of mitosis	1
4.	Microscopic study of different stages of meiosis	1
5.	Solution of numerical problems related to Mendel's law of segregation	
6.	Solution of numerical problems related to Mendel's law of independent assortment	1
7.	Solution of numerical problems related to gene actions	1
8.	Solution of numerical problems related to gene interactions	1
9.	Probability	1
10.	Chi square test	1
11.	Solution of numerical problems related to linkage	1
12.	Solution of numerical problems related to crossing over	1
13.	Solution of numerical problems related to sex determination and linkage	1
14.	Microscopic study of DNA and RNA	1
15.	Field demonstration of cytoplasmic/genetic male sterility	1
	Total	**15**

REFERENCES

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.

Singh, B.D., 2007. Fundamentals of Genetics (3rd Ed.). Kalyani Publishers. India.

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