Lecture Plan

Name of the college: Government College of Arts, Science and Commerce, Sanquelim, Goa.

Name of Faculty: Ms. Shubha Shivdas Kauthankar	**Subject:** Botany	
Paper code: BOC 108- Cytogenetics and Plant Breeding	**Program: T.Y.B.Sc.**	**Division: -**
Academic year: 2024- 2025	**Semester: VI**	**Total Lectures: 60**

Course Objectives: This course deals with basic and advanced concepts in cytogenetics and plant breeding along with their applications.

Laboratory exercises provide training in understanding genetics through problem solving and skills of plant breeding such as emasculation and artificial pollination and its relevant applications in crop improvement.

Course Outcome: 1. Gain knowledge of the concepts used in Cytogenetics.

2. Apply the principles of inheritance as formulated by Mendel.
3. Explain plant breeding methods.
4. Apply the knowledge of plant breeding in crop improvement.

Student Learning Outcome: Gain knowledge in basic and advanced concepts in cytogenetics.

Understand Mendelian genetics through problem solving exercises and apply the knowledge of cytogenetics in plant breeding.

Understand the molecular basis of mutation and its phenotypic effect on the organism. Learn about the various methods of crop improvement.

Develop skills in plant breeding such as emasculation, artificial pollination and induction of polyploidy.

Month	Lecture From	Lecture To	No. of lectures allotted	Topic, Subtopic to be covered	Exercise/ Assignment	ICT Tools	Reference books
December 2024	09/12/2024	14/12/2024	3	Unit 1: Cell cycle (Mitosis) Meiosis I. Meiosis II and its Significance	To study various stages of mitosis and meiosis	Powerpoint presentation,	Verma, P.S. and Agarwal, V.K. 2009. Genetics. 9th revised edition. S. Chand & Co., New Delhi. Goswami, H.K. and Goswami, R. 1993. Practical Cytology, Applied Genetics and Biostatistics. 2nd revised edition. Himalaya Publishing House, Mumbai.
December 2024	16/12/2024	21/12/2024	2	Unit 2: Mendelian genetics and its extension Mendelism: History; Principles of inheritance Chromosome theory of inheritance; Backcross and test cross	To solve the problems on monohybrid and dihybrid cross	Powerpoint presentation	
January 2025	02/01/2025	04/01/2025	2	Incomplete dominance, co-dominance lethal alleles	To solve the problems on codominance	Powerpoint presentation	
January 2025	06/01/2025	11/01/2025	4	Gene interactions (Epistasis) – Dominant, Recessive Complementary, Supplementary, Multiple alleles (blood groups in humans, self-incompatibility in plants) Duplicate epistasis; Pleiotropy, Penetrance and Expressivity.	To solve the problems on various types of gene interaction	-	
January 2025	13/01/2025	18/01/2025	4	Unit 3: Extrachromosomal inheritance-Characteristics of extrachromosomal inheritance	To solve the problems on types of	-	

				Cytoplasmic inheritance in Mirabilis jalapa; Kappa particles in Paramecium; Mitochondria in yeast Maternal effects in snail (shell coiling).	cytoplasmic inheritence		Shukla, R.S. and Chandel, P.S. 2013. Cytogenetis, Evolution, Biostatistics and Plant Breeeding. 5th edition. S. Chand & Company Pvt. Ltd., New Delhi. Singh, B.D. 2005. Plant Breeding: Principles and Methods. 7th edition. Kalyani Publishers, Ludhiana.
January 2025	20/01/2025	25/01/2025	4	Unit 4: Linkage, crossing over and chromosome mapping: Linkage concept Crossing over types and significance, Cytological basis of crossing over ISA 01 (assignment) Recombination frequency, two-point test cross	To understand the concept of linkage and crossing over.		
January/ February 2025	27/01/2025	01/02/2025	4	Three-point test crosses and their significance in chromosome mapping; Three-point test crosses and their significance in chromosome mapping Interference and coincidence. Unit 5: Autosomes and sex chromosomes: Mechanisms of sex determination	To solve the problems on three- point test cross.	Powerpoint presentation	
February 2025	03/02/2025	08/01/2025	4	Balance concept of sex determination in Drosophila Sex linked inheritance; Sex-limited characters. Unit 6: Alteration in chromosome number and structure- Deletion, Duplication	To understand the typesof chromosome alteration		

				Inversion		
February 2025	10/02/2025	15/01/2025	4	Translocation Meiosis in structural heterozygote Position effect Euploidy and Aneuploidy	To study the various types of position effect	
February 2025	17/02/2025	22/01/2025	4	Unit 7: Gene mutations- Types of mutations Mutagens - physical Chemical mutagens (Base analogs deaminating, alkylating and intercalating agents) Molecular basis of Mutations	To list out types of physical and chemical mutagens	
February/ March 2025	24/02/2025	01/03/2025	4	Detection of mutations: ClB method. Unit 8: Introduction to plant breeding- Introduction and objectives; important achievements and undesirable consequences of plant breeding. Centres of origin and domestication of crop plants. Centres of origin and domestication of crop plants.	To list out various centres of origin with examples of plants.	

March 2025	03/03/2025	08/03/2025	4	Unit 9: Methods of crop improvement- Introduction and acclimatization Selection methods for self-pollinated, plants Selection methods for cross-pollinated plants Selection methods for vegetatively propagated plants	To understand the concept of self and cross pollination with examples.	-
March 2025	10/03/2025	15/03/2025	3	Hybridization: For self- pollinated plants – Procedure, advantages and limitations. Hybridization: For cross-pollinated plants – Procedure, advantages and limitations. Role of mutation and Polyploidy	To understand the concept of hybridization	-
March 2025	17/03/2025	22/03/2025	4	Distant hybridization in crop improvement. Unit 10: Quantitative inheritance- Concept. Quantitative inheritance- mechanism Monogenic v/s Polygenic Inheritance. Examples - Inheritance of kernel colour in wheat.	To list the differences between monogenic and polygenic inheritance.	-
March 2025	24/03/2025	29/03/2025	4	Monogenic v/s Polygenic Inheritance. Examples - Inheritance of ear length in maize. Unit 11: Inbreeding depression and heterosis	To list the causes of inbreeding depression in plants	Powerpoint presentation

				Inbreeding depression Heterosis; Applications.			
March/ April 2025	31/03/2025	05/04/2025	3	Revision	-	-	
April 2025	07/03/2025	11/04/2025	3	Revision	-	-	

*** Assessment Rubrics**

Component	Max Marks
ISA 1	10
ISA 2	10
Practical	50
Project	-
Semester End Exam	80