

ODD SEMESTER LECTURE PLAN (AY 2026-2027)							
Name of the college: Government College of Arts, Science and Commerce, Sanquelim Goa							
Name of Faculty: Dr. Nisha Kevat			Subject: Cytogenetics and Plant Breeding (THEORY)				
Paper code: BOT 301			Program/Course: T.Y B.Sc.		Division: - --		
Academic year: 2026 - 2027			Semester: V		Total Lectures: 45 (Theory)		
Course Objectives: 1. Provide knowledge about cell cycle, concepts of heredity and plant breeding. 2. Enable students to apply principles of heredity to solve genetic problems. 3. Familiarize students with understanding the causes of gene mutations and its impact on chromosome structure and number. 4. Impart knowledge and skill in methods of breeding, selection and hybridization for crop improvement.							
Course Learning Outcome: 1. Recall concepts in cytogenetics and crop improvement. 2. Understand Mendelian genetics through problem solving exercises. 3. Apply the principles of genetics in plant breeding. 4. Develop skills in plant breeding such as emasculation, pollination and induction of polyploidy.							
Month	Lectures From: To:		No. of lectures allotted	Topic, Subtopic to be covered	Exercise/Assignments	ICT Tools	Reference books
June 2026	22/06/	27/06	03	Lecture 1: Overview of the Cell Cycle	Draw and label the phases of the cell cycle.	Power Point Presentation, Chalk And Board, You Tube Study Videos	1. Acquaah, G (2007). Principles of Plant Genetics and Breeding. 2nd edition.
				Lecture 2: Mitosis and its Significance	Write one function of mitosis in multicellular organisms.		
				Lecture 3: Meiosis and its Significance	List two differences between mitosis and meiosis.		

June/ July 2026	29/06/	04/07	03	Lecture 4: Mendel's Principles of Inheritance	State Mendel's three laws with examples.	Power Point Presentation, Chalk And Board, You Tube Study Videos	Blackwell Publishing, Maryland, USA. 2. Chaudhary, RC (2017). Introductory Principles of Plant Breeding. CBS Publishers & Distributors, New Delhi.
				Lecture 5: Monohybrid and Dihybrid Crosses	Solve a dihybrid cross and calculate phenotypic ratio.		
				Lecture 6: Test Cross and Backcross	Differentiate between test cross and backcross.		
July 2026	06/07/	11/07	03	Lecture, 7: Incomplete Dominance	Explain incomplete dominance with a flower color example.	Power Point Presentation, Chalk And Board, You Tube Study Videos	3. Gardner, EJ, Simmons, MJ and Snustad, DP (1991). Principles of Genetics. 8th edition. John Wiley & Sons, India.
				Lecture 8: Codominance	Describe codominance with human blood group example.		
				Lecture 9: Lethal Alleles	Give one example of a lethal allele and its inheritance pattern.		
July 2026	13/07/	18/07	03	Lecture 10: Gene Interactions – Dominant & Recessive Epistasis	Diagrammatically explain any one gene interaction type	Power Point Presentation, Chalk And Board, You Tube Study Videos	4. Griffiths, AJF, Wessler, SR, Carroll, SB and Doebley, J (2010). Introduction to Genetic Analysis. 10th edition. W. H. Freeman and Co., USA.
				Lecture 11: Gene Interactions – Complementary, Duplicate & Supplementary	Match gene interactions with phenotypic ratios. .		
				Lecture 12: Multiple Alleles: Blood Groups in Humans	List the genotypes for all four blood groups.		
July 2026	20/07/	25/08	03	Lecture 13: Multiple Alleles: Self-incompatibility in Plants	Explain how multiple alleles affect self-incompatibility.	Power Point Presentation, Chalk And Board, You Tube Study Videos	5. Goswami, HK and
				Lecture 14: Cytoplasmic Inheritance: Mirabilis jalapa, Kappa particles	Briefly describe one example of cytoplasmic inheritance		
				Lecture 15: Maternal Effects (Shell coiling in snails)	Explain how maternal genotype affects shell coiling in snails.		

July/August 2026	27/07/	01/08	03	Lecture 16: Linkage – Definition and Types	Define linkage and give one classical example.	Power Point Presentation, Chalk And Board, You Tube Study Videos	Goswami, R (1993). Practical Cytology, Applied Genetics and Biostatistics. 2nd revised edition. Himalaya Publishing 6. Klug, WS, Cummings, MR and Spencer, CA (2009). Concepts of Genetics. 9th edition. Benjamin Cummings, USA. 7. Pandey, BP (2007). Botany for Degree Students - Year I. S. Chand Limited, India. 8. Rastogi, VB (2020). A Text Book of Cell Biology and Genetics. Kedar Nath Ram Nath, Meerut. 9. Shukla, RS and
				Lecture 17: Linkage Significance and Examples	Explain the significance of linkage in inheritance.		
				Lecture 18: Crossing Over – Mechanism	Diagrammatically show crossing over during meiosis.		
August 2026	03/08/	08/08	03	Lecture 19: Types of Crossing Over	Describe single and double crossing over.	Power Point Presentation, Chalk And Board, You Tube Study Videos	
				Lecture 20: Recombination Frequency and Its Calculation	Solve a problem to calculate recombination frequency.		
				Lecture 21: Two-point Test Cross	Map genes using a two-point cross example.		
August 2026	10/08/	15/08	03	Lecture 22: Three-point Test Cross	Solve a three-point cross to determine gene order.	Power Point Presentation, Chalk And Board, You Tube Study Videos	
				Lecture 23: Chromosome Mapping	Construct a gene map based on recombination data.		
				Lecture 24: Interference and Coincidence	Define and differentiate between interference and coincidence.		
August 2026	17/08/	22/08	03	Lecture 25: Gene Mutations – Types (Point, Frame shift, etc.)	List two types of gene mutations with examples.	Power Point Presentation, Chalk And Board, You Tube Study Videos	
				Lecture 26: Physical Mutagens	Describe the effect of UV or X-rays on DNA.		
				Lecture 27: Chemical Mutagens	Explain base analogs and intercalating agents.		
August 2026	24/08/	29/08	03	Lecture 28: Detection of Mutations (Stadler’s Method)	Write one method for detecting mutations in plants.	Power Point Presentation, Chalk And Board, You Tube Study Videos	
				Lecture 29: Chromosomal Aberrations – Deletion, Duplication	Sketch chromosomal changes due to deletion/duplication		

				Lecture 30: Inversion, Euploidy, Translocation, Aneuploidy	Differentiate euploidy and aneuploidy with one example each.		Chandel, PS (2013). Cytogenetics, Evolution, Biostatistics and Plant Breeding. 5th edition. S. Chand & Company Pvt. Ltd., New Delhi. 10. Singh, BD (2005). Plant Breeding: Principles and Methods. 7th edition. Kalyani Publishers, Ludhiana. 11. Singh, BD (2020). Fundamentals of Genetics. 6th edition. Medtech Science Press, New Delhi. 12. Snustad, DP and Simmons, MJ (2009). Principles of Genetics. 5th edition. John Wiley & Sons Inc., India.
August 2026	25/08/	26/08	02	Lecture 31: Introduction to Plant Breeding	State two major objectives of plant breeding.	Power Point Presentation, Chalk And Board, You Tube Study Videos	
				Lecture 32: Achievements and Limitations	List two achievements and one drawback of plant breeding..		
August/ September 2026	31/08/	05/09	03	Lecture 33: Centers of Origin of Crop Plants	Mention the primary center of origin for wheat or rice.	Power Point Presentation, Chalk And Board, You Tube Study Videos	
				Lecture 34: Domestication and Acclimatization	Define acclimatization and give one example.		
				Lecture 35: Selection Methods for Self-Pollinated Plants	Briefly describe pure line selection.		
September 2026	07/09/	12/09	03	Lecture 36: Selection Methods for Cross-Pollinated Plants	Explain mass selection with one example.	Power Point Presentation, Chalk And Board, You Tube Study Videos	
				Lecture 37: Selection in Vegetatively Propagated Crop	Give two examples of crops improved by clonal selection.		
				Lecture 38: Hybridization – Concepts and Steps	List major steps in hybridization.		
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September 2026	21/09/	26/09	03	Lecture 39: Hybridization in Self vs Cross Pollinated Plants	Compare the approach in self- and cross-pollinated plants.	Power Point Presentation, Chalk And Board, You Tube Study Videos	13. Verma, PS and Agarwal, VK (2009). Genetics. 9th Revised edition. S. Chand Limited, India.
				Lecture 40: Role of Mutation and Polyploidy in Improvement	Name one crop improved by induced mutation.		
				Lecture 41: Role of Distant Hybridization	Define distant hybridization and give one example.		
September 2026	22/09/	27/09/	03	Lecture 42: : Inbreeding Depression ;	What is inbreeding depression? Give one consequence.	Power Point Presentation, Chalk And Board, You Tube Study Videos	
				Lecture 43: Heterosis and Its Applications	Define heterosis and give one example in crops.		
				Lecture 44: Quantitative Inheritance – Concept	Differentiate monogenic and polygenic inheritance.		
September/O ctober, 2026	28/09/	3/10	03	Lecture 45: Examples: Kernel Color in Wheat, Ear Length in Maize	Solve a problem related to quantitative traits.	Power Point Presentation, Chalk And Board, You Tube Study Videos	
				Lecture 46: REVISION	REVISION		
				Lecture 47: REVISION	REVISION	Power Point Presentation, Chalk And Board, You Tube Study Videos	
October 2026	5/10/	10/10	03	Lecture 48: REVISION	REVISION	Power Point Presentation, Chalk And Board, You Tube Study Videos	
				Lecture 49: REVISION	REVISION		
				Lecture 50: REVISION	REVISION		

*Note: Data filled in the above form is sample data.

*** Assessment Rubrics**

Component	Max Marks
ISA 1	7.5
ISA 2	7.5
ISA 3 (Best 2 of 3)	7.5
Practical	NA
Project	NA
Semester End Exam	80