

Lecture Plan		
Name of the College: Government College of Arts, Science and Commerce. Sanquelim - Goa		
Name of Faculty: Dr. Vaibhav Chindarkar	Subject: Zoology	
Paper code: ZOO-304 Genetic Engineering	Program: T.Y. BSc	Division: A
Academic year: 2025- 2026	Semester: VI	Total Lectures: 45
• Course Objectives: • 1. Acquainting students about the role of biotechnology in modern times. • 2. Providing students the basic knowledge in the field of Genetic engineering. • 3. Providing the learners with basic skills of microbiology and molecular biology. • 4. Perform basic experiments in biotechnology.		
Expected Course Outcome: At the end of this course, students will be able to:		
CO1: Explain the fundamental concepts, scope, and applications of biotechnology and genetic engineering, including the role of microorganisms—especially <i>E. coli</i> —as model systems and hosts in recombinant DNA technology.		
CO2: Describe the principles, mechanisms, and applications of enzymes used in genetic engineering, DNA labeling strategies, and the construction and screening of genomic and complementary DNA (cDNA) libraries.		
CO3: Explain the methodologies involved in DNA analysis, including polymerase chain reaction (PCR), DNA sequencing techniques, blotting methods, DNA fingerprinting, and the scientific strategies underlying the Human Genome Project.		

CO4:							
Evaluate modern genetic engineering applications such as DNA transfer methods, genetically modified organisms, transgenic technologies, gene therapy, CRISPR technology, and xenotransplantation, with reference to their scientific significance and societal impact.							
Month	Lecture From	Lecture To	No. of lectures allotted	Topic, Subtopic to be covered	Exercise/ Assignment	ICT Tools	Reference books
December	01-12-2025	06-12-2025	03	Introduction to Biotechnology: Concept, History, Disciplines		Power point presentation	1. R. C. Dubey, A textbook of Biotechnology, 5th Ed. S. Chand & Co. Pvt. Ltd. New Delhi, 2014. 2. R. C. Dubey, and D. K. Maheswari, Practical Microbiology, S. Chand & Co. Ltd, 2007.
				Contd.....			
				Importance and Scope of Biotechnology			
December	08-12-2025	13-12-2025	03	Introduction to microbes,		Power point presentation	R. C. Dubey, and D. K. Maheswari, Practical Microbiology, S. Chand & Co. Ltd, 2007.
				Contd.....			
				Classification of bacteria			
December	15-12-2025	20-12-2025	03	Classification of bacteria, Structure of bacterial cell		Power point	R. C. Dubey, and D. K. Maheswari, Practical Microbiology, S. Chand & Co. Ltd, 2007.
				Structure of bacterial cell, Nutritional requirements			
				Culturing bacteria (media),			

December	22-12-2025	24-12-2025	01	Bacteria in Biotechnology. <i>E.coli</i> as a model organism for Biotechnology		Power point presentation	R. C. Dubey, and D. K. Maheswari, Practical Microbiology, S. Chand & Co. Ltd, 2007.
January	02-01-2026	03-01-2026	01	Genetic Engineering- History and scope. Overview of the steps of Genetic Engineering.		Power point presentation Power point presentation Power point presentation Power point presentation	R. C. Dubey, A textbook of Biotechnology, 5th Ed. S. Chand & Co. Pvt. Ltd. New Delhi, 2014. S. B. Primrose, and R. M. Twyman, Principles of Gene Manipulation and Genomics - 7th Edition. Blackwell Publishing Company, 2006. T. A. Brown, Gene Cloning- an Introduction, VNR International Publications, 1990.
January	05-01-2025	10-01-2025	03	Phagemids, Shuttle Vectors, Lambda Bacteriophage			R. C. Dubey, A textbook of Biotechnology, 5th Ed. S. Chand & Co. Pvt. Ltd. New Delhi, 2014.
				M13, BAC, YAC, MAC,			
				pBR, pUC, SV40 and Expression vectors		Power point presentation Power point presentation Power point presentation Power point presentation	S. B. Primrose, and R. M. Twyman, Principles of Gene Manipulation and Genomics - 7th Edition. Blackwell Publishing Company, 2006. T. A. Brown, Gene Cloning- an Introduction, VNR International Publications, 1990.
January	12-01-2025	17-01-2025	03	Restriction enzymes: Nucleases			

				Exonucleases/ Endonucleases, Nomenclature, recognition sites, sequences, cleavage patterns		Power point presentation	R. C. Dubey, A textbook of Biotechnology, 5th Ed. S. Chand & Co. Pvt. Ltd. New Delhi, 2014.
				Contd.....			S. B. Primrose, and R. M. Twyman, Principles of Gene Manipulation and Genomics - 7th Edition. Blackwell Publishing Company, 2006.
				Contd.....			T. A. Brown, Gene Cloning- an Introduction, VNR International Publications, 1990.
January	19-01-2026	24-01-2026	03	DNA ligases, Polymerases		Power point presentation	R. C. Dubey, A textbook of Biotechnology, 5th Ed. S. Chand & S. B. Primrose, and R. M. Twyman, Principles of Gene Manipulation and Genomics - 7th Edition. Blackwell Publishing Company, 2006Co. Pvt. Ltd. New Delhi, 2014.
				Polymerases contd.....			
				Polynucleotide Kinases			
January	27-01-2026	31-01-2025	03	Alkaline Phosphatase and Nucleotidyl Transferase		Power point presentation	S. B. Primrose, and R. M. Twyman, Principles of Gene Manipulation and Genomics - 7th Edition. Blackwell Publishing Company, 2006
				CRISPR technology			R. C. Dubey, A textbook of Biotechnology, 5th Ed. S. Chand & Co. Pvt. Ltd. New Delhi, 2014.
				Radioactive and non-radioactive Labeling of DNA, Nick translation			
February	02-02-2026	07-02-2026	03	Contd.....		Power point presentation	S. B. Primrose, and R. M. Twyman, Principles of Gene Manipulation and Genomics - 7th Edition. Blackwell Publishing Company, 2006
				Colony Hybridization			
				Plaque hybridization			

							R. C. Dubey, A textbook of Biotechnology, 5th Ed. S. Chand & Co. Pvt. Ltd. New Delhi, 2014.
February	09-02-2026	14-02-2026	03	Blotting techniques		Power point presentation	S. B. Primrose, and R. M. Twyman, Principles of Gene Manipulation and Genomics - 7th Edition. Blackwell Publishing Company, 2006 R. C. Dubey, A textbook of Biotechnology, 5th Ed. S. Chand & Co. Pvt. Ltd. New Delhi, 2014.
				Contd.....			
				PCR technique			
February	16-02-2026	21-02-2026	03	Contd..... Sanger's DNA sequencing method		Power point presentation	S. B. Primrose, and R. M. Twyman, Principles of Gene Manipulation and Genomics - 7th Edition. Blackwell Publishing Company, 2006 R. C. Dubey, A textbook of Biotechnology, 5th Ed. S. Chand & Co. Pvt. Ltd. New Delhi, 2014.
				Contd....			
				Maxam Gilbert method of DNA sequencing			
February	23-02-2026	28-02-2026	03	Automated sequencing		Power point presentation	S. B. Primrose, and R. M. Twyman, Principles of Gene Manipulation and Genomics - 7th Edition. Blackwell Publishing Company, 2006 R. C. Dubey, A textbook of Biotechnology, 5th Ed. S. Chand & Co. Pvt. Ltd. New Delhi, 2014.
				Human Genome Project (HGP) – an overview of the project			
				Major scientific strategies & approaches used in HGP			
March	02-03-2026	07-03-2026	03	Contd.....Benefits of the project		Power point presentation	S. B. Primrose, and R. M. Twyman, Principles of Gene Manipulation and Genomics - 7th Edition. Blackwell Publishing Company, 2006
				DNA Fingerprinting technique.			

				Beta-oxidation of fatty acids			R. C. Dubey, A textbook of Biotechnology, 5th Ed. S. Chand & Co. Pvt. Ltd. New Delhi,
March	09-03-2026	14-03-2026	03	Transfer of DNA- natural and artificial methods.		Power point presentation	S. B. Primrose, and R. M. Twyman, Principles of Gene Manipulation and Genomics - 7th Edition. Blackwell Publishing Company, 2006
				Contd.....			
				Genetically modified organisms			
March	16-03-2026	21-03-2026	02	Contd.....		Power point presentation	S. B. Primrose, and R. M. Twyman, Principles of Gene Manipulation and Genomics - 7th Edition. Blackwell Publishing Company, 2006
				Transgenics			
				Concept of gene therapy			
March	23-03-2026	28-03-2026	02	Gene therapy contd.....		Power point presentation	S. B. Primrose, and R. M. Twyman, Principles of Gene Manipulation and Genomics - 7th Edition. Blackwell Publishing Company, 2006
				Xenotransplantation			
				Contd.....			

*** Assessment Rubrics**

Component	Max Marks
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ISA 1	7.5
ISA 2	7.5
ISA 3	7.5
Practical	25
Semester End Exam	75