



ST. ALOYSIUS' COLLEGE (AUTONOMOUS), JABALPUR

Reaccredited 'A++' Grade by NAAC (CGPA: 3.58/4.00)
College with Potential for Excellence by UGC
DST-FIST Supported & STAR College Scheme by DBT

Syllabus of Theory

PART 'A' - Introduction			
Program: Certificate Course		Class: B.Sc.	Semester :II
Session: 2026-27			
Subject: Zoology			
1	Course Code:		
2	Course Title:	Cell Biology and Genetics	
3	Course Type:	Major II	
4	Pre-requisite:	To study this course, a student must have had the subject Biology in Class 12 th	
5	Course Learning Outcome (CLO):	Upon completion of the course students should be able to: 1. Learn about historical background of Cell biology and Genetics and its importance in Indian knowledge System (IKS). 2. Learn Structural and Functional organization of Cell. 3. Understand Cell division, cell cycle and cell signaling. 4. Get the knowledge about Principle of Genetics & genetic disorders, linkage & crossing over. 5. Job Prospects: Genetic Counselor, Lab Technician, Forensic Scientist.	
6	Credit Value:	4+2	
7	Total Marks:	Max Marks: 30+70	Min. Passing Marks: 35

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PART 'B' - Content of the Course

Total No. of Lectures - Tutorials - Practical (in hours per week) 02 hours /Week L - T - P

Total Lectures: 60 hours

Unit	Topics	No. of Lectures
I	<u>Introduction of Cell and its historical background:</u> 1. Concept of cell (Reference: Bhagwat Mein Vigyan and Bhagavad Gita-Chapter-13, Verse-34) 2. Contribution of Indian Scientists in the field of Cell Biology and Genetics. 2.1. Dr. Har Gobind Khurana 2.2. Dr. Jagdish Chandra Bose 2.3. Dr. Lalji Singh 2.4. Dr. Harswarup 3. History of cell biology 4. The Cell - Definition, size, shape and ultrastructure of Cell 5. Prokaryotic and Eukaryotic: Basic difference between Prokaryotic and Eukaryotic Cell 6. Cytoplasmic matrix - Chemical organization of cytosol and its inorganic compounds. <u>Keywords:</u> Genetics, Cytosol, Mahabharata, Bhagavad Gita, Regeneration, Prokaryotic, Eukaryotic cell <u>Suggested Activity:</u> Write biography of any one Indian scientist given above and paste his photo.	12
II	<u>Dynamics of Eukaryotic Cell:</u> 1. Panchabhuta: The Concept of five fundamental elements (Earth, Water, Fire, Air and Ether) and basic components of living cell (Water, Organic molecules and energy) 2. Structural and Functional Organization of Intracellular Cell organelles: Plasma membrane, Protoplasm. 2.1. Mitochondria, Endoplasmic Reticulum, Golgi Complex. 2.2. Lysosomes, Ribosomes, Centriole and nucleus 3. Bio membranes: Chemical composition and functions of Plasma Membrane Models of Plasma membrane, membrane permeability. <u>Keywords:</u> Panchbhuta, Plasma membrane, Golgi Complex, Centriole, ER <u>Suggested Activity:</u> Poster making on "Origin of Universe"; depicting five fundamental elements (Earth, water, fire, air and ether or sky)	12

III	<u>Cell Signaling, Cell Division and Cell Cycle</u> 1. Tridosha: The three humors (Vata, Pitta, Kapha) and its relation to process like metabolism, and Homeostasis (Yajurveda) 2. Cell Division: Mitosis and Meiosis its stages and its Significance. 3. Cell cycle: G1, S, G2 and M phase, Components of cell cycle and its control, 4. Programmed Cell Death (Apoptosis). Concept of cell regeneration and youthfulness during ancient times and modern biology (Reference: King Yayati in Mahabharat's Aadi Parva, Bhagavad Purana and Matsya Purana). 5. Cell Signaling - Signaling molecules, Types and functions of cell signaling. Keywords: Tridosha, Humors, apoptosis, Cell Signaling, Mahabharata, Bhagavad Purana Suggested Activity: Group discussion (GD) on Tridoshas the three important humors Vata, Pitta and kapha	12
IV	<u>Genetics its Introduction and and Ancient Indian Concepts:</u> 1. Concept of "Vansha", "kula" and "Gotra" to eradicate genetic disorder 1.1. Concept of 'Prakruti' and " Vikruti" - Heredity and Health (Yajurveda) 1.2. Beej or 'Beejbhag' - as genes (Charak Samhita) 1.3. Dissemination of genetic characters after 6th generation (Reference: Charak Samhita, Sutrasthana; Chapter 7, Verse 30) 2. Introduction, definition and importance of Genetics. 3. Chromosomes: Structure, types and its significance as transmitter of heredity. 4. Mendel's Laws of Inheritance and Genetic Variation 5. Linkage and crossing over: Definition, mechanism and significance 6. Human Karyotype Keywords: Vansha, Kula, Beej, Chromosomes, Mendel, Heredity, Variation Suggested Activity: Draw chart of Human Karyotype	12

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V	Principles of Genetics and Genetic material 1. Concept of Jataka, nadi-dosha, Janamkundli and 3 Ganas-Rakshasa, Manushya and Deva in Indian Mythology (Reference: Rigveda (10.92.7), Yajurveda (3.3.12) Shiv Puran (2.3.12-14) and Jyotish shastra) 2. Sex Determination and sex linkage 3. Chemistry of nucleic acids - DNA and RNA 4. Gene Linkage and recombination 5. Mutations, mutagens and genetic disorders 6. Genetic code	12
	Keywords: Jataka, Janamkundli, Nucleic acid, Gene linkage, Recombination, Mutagens. Suggested Activity: Physical or virtual visit to Hindi Granth Academy	Ganas,

Part C-Assessment and Evaluation		
Suggested Continuous Evaluation Methods: Maximum Marks: 100 Continuous Comprehensive Evaluation (CCE): 30 Marks University Exam (UE): 70 Marks		
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Class Test Assignment/Presentation	30
External Assessment: University Exam Section Time: 03.00 Hours	Section(A): Very Short Questions Section (B): Short Questions Section (C): Long Questions	70
Any remarks/ suggestions:		

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Syllabus of Practical

Part - A: Introduction

Program: Certificate Course		Class: B.Sc.	Semester :II	Session: 2026-27
Subject: Zoology				
1	Course Code:			
2	Course Title:	Cell Biology and Genetics		
3	Course Type:	Major II		
4	Pre-requisite:	To study this course, a student must have had the subject Biology in Class 12 th		
5	Course Learning Outcome (CLO):	Upon completion of the course student will be able to perform and learn: 1. Differentiate between Prokaryotic and Eukaryotic Cell. 2. Divisional stages of cell divisions: Mitosis and Meiosis. 3. Structure and types of Chromosomes. 4. Problems based on Genetics.		
6	Credit Value:	2		
7	Total Marks:	Max Marks: 30+70	Min. Passing Marks: 35	

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Part B - Content of the Course

Total No. of Lectures – Tutorials – Practical (2 hours per week):

L-T-P: Total No. of Practical = 30

S.No.	Topics	No. of Lectures
1	Principle and utility of microscopy	02
2	Observation of distinguishing features of prokaryotic and eukaryotic cell	02
3	Study of divisional stages of Mitosis and Meiosis (Prepared slides)	02
4	Squash preparation of onion root tip for mitotic stages/Grasshopper testes for meiotic stages	05
5	Study of types of Chromosomes through chart & models	04
6	Mendelian Experiments: Monohybrid and Dihybrid cross.	05
7	Problems based on Genetics: Sex linked disease (Color blindness and Hemophilia)	05
8	Exercises based on inheritance of blood group.	05

Keywords/Tags: Microscopy, Prokaryotic, Eukaryotic, Mitosis, Meiosis, monohybrid, Dihybrid, inheritance.

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Part-C: Assessment & Evaluation (Practical)

Suggested Continuous Evaluation Methods:

	Internal Assessment	Marks	External Assessment	Marks
1	Class Interaction/Quiz	30	Viva Voce on Practical	70
2	Attendance		Practical Record File	
3	Assignments (Charts/Model Seminar/Rural Service /Technology Dissemination/ Report of Excursion /Lab Visit/Survey/ Industrial visit)		Table work/Experiments	
	Total	30		70

Any remarks/Suggestions: e- Demonstrations & e- procedures can be opted.

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