



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

(2)

Syllabus of Theory

Part 'A' – Introduction

Program: Class - B.Sc. Year IInd / IVth Sem Session : 2026-2027

Subject : Zoology

1	Course Code	
2	Course Title	Fundamentals of Cytology and Genetics
3	Course Type	Minor II (M-4)
4	Pre-requisite	Student must have had Zoology in B. Sc. Ist year
5	Course Learning Outcome (CLO)	Upon completion of the course students will be able to know : 1. Mapping of cellular structure and functions through the lens of Sankhya philosophy. 2. Detailed structure of Cell organelles. 3. Cellular processes of Division, Apoptosis, Stem cells and their correlation with Sankhya elements like Manas (Mind), Prāṇa (Vital energy), Buddhi (Intellect), Ahaṅkāra (Identity). 4. Mendel's Experiments and Laws of Inheritance. 5. Principles of Genetics and Philosophical Analogies. 6. To understand Linkage, crossing over, mutation, Sex linked inheritance, Sex determination.
6	Credit Value	03
7	Total Marks	Max marks: 30+70 Min. Passing Marks: 35

Signature	Signature	Signature
-----------	-----------	-----------

5.8.2026

Signature

Signature

Signature

Signature

Signature

Signature



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

PART 'B' – Content of the Course		
Total No. of Lectures – (3 hours per week)		
Total Lectures: 45 hours		
Unit	Topics	No. Of Lecture
I	Cell Organelles and their parallels in Sankhya and Dhatu Philosophy 1. Suksma Sarira – Indian Philosophical foundations of Cytology, Sankhya Philosophy, Suksma sarira -Organelles as Subtle elements of Consciousness, Dhatus of Ayurveda 2. Cell Structure and organelles 2.1 Comparison of Prokaryotic and Eukaryotic cell 2.2 Plasma membrane, Endoplasmic Reticulum, Ribosomes. 2.3. Golgi complex, Mitochondria, lysosomes, Centriole, Nucleus, Nucleolus. 2.4. Cytosol : Definition, Physical and Chemical Composition. Keywords: Sankhya Philosophy, Dhatu, Cell organelles Suggested Activities: 1. Charts and Models of cell organelles. 2. Write up on contributions of Indian Cytologists: Prof. Arun Kumar Sharma, Dr. Kamal Ranadive, Dr. Pushpa Bhargava's work on membrane	12
II	1. Cell Division: 1.1 Mitosis and Meiosis – Stages (G₀, G₁, S, G₂ and M) 1.2 Significance of Cell Cycle and Sāṅkhya Philosophy 2. Apoptosis – (Programmed Cell Death) 2.1 Mitochondrial Regulation of Apoptosis. 3. Stem Cells – 3.1 Introduction and concept as Beej (Dhatu) and Sankhya (avyakt transition to Vyakt) Theory. 3.2 Properties of Stem cells, Totipotent to Multipotent 3.3 Applied significance of stem cells. 4. Indian parallels (Philosophical reflection) 4.1 Tanmatra– Indriya mapping in Sāṅkhya. 4.2 Manas (Mind), Prāṇa (Vital energy), Buddhi (Intellect), Ahankāra (Identity), and their cytological concepts Key words: Mitosis and Meiosis, Apoptosis, Stem Cells, Totipotent, Multipotent, Tanmatra – Indriya. Suggested Activities : 1. Charts and Models of cell organelles, Cell divisions, Stem cells etc.	11

5.8.2026

Sonigadar



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

4

Unit	Topics	No. Of Lecture
III	1. Introduction to Genetics 1.1 Definition, Scope and importance of Genetics. 1.2. Structure, type and chemical composition of Chromosome. 1.3 Significance of chromosomes in Heredity Transmission. 2. Mendel's Life and Scientific Approach. 2.1 Mendel's Experiments and Laws of Inheritance. 2.2 Basic terminology in Genetics : Phenotypes, Genotypes, Test Cross, Back Cross, Alleles, Dominant, Recessive, Heterozygous, Homozygous, Gene. 2.3 Ayurvedic and philosophical concepts of Karmaja Vikara - (inherited recessive alleles) correlating Modern Genetic Principles. 3. Linkage and Crossing Over 3.1 Definition, Linked Genes, Chromosome theory of Linkage. 3.2 Complete and Incomplete Linkage, Significance of Linkage. 3.3 Introduction, definition and types of Crossing Over. 3.4 Cytological evidence (Stern's Experiment), Significance of crossing over, Factors controlling frequency of crossing over. Key words: Inheritance, Chromosome, Linked genes, Complete - Incomplete linkage, Crossing over, Stern's experiment, Karmaja Vikara. Suggested activities: 1. Examples using Batson Punnett Chaker Board, Back cross -Test cross, Charts showing complete and incomplete Linkage, Strength of linkage, Crossing over types, Gene mapping.	12

[Handwritten signatures and dates]

5.8.2026

[Signatures: Munish, Ruma, Soni Yadav]



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

IV	1. Mutation: 1.1 Concept of Beeja (Seed) as genes (Charak Sanhita), Beej dosh as Genetic Mutation. 1.2 Gene mutation, Chromosomal Mutation, Mutagenic agents. 1.3 Multiple alleles and Co-Dominance (Blood Group Inheritance). 2. Sex Determination: 2.1 Chromosomal mechanism of sex determination- Hetrogamesis theory, ZW Method. 2.2 Haplodiploidy sex determination (honey bee method) 2.3 Genic Balance theory, Hormonal (Freemartin) and Environmental influence on sex determination, 3. Sex Linked Inheritance –X –and Y linked-Inheritance 3.1 Color Blindness and Hemophilia 3.2 Y linked (Holandric) traits Key words: Mutation, Sex determination, Genic Balance theory, Sex linked inheritance. Suggested Activities: 1.Charts showing Haplodiploidy, ZW, XX-XY methods of sex determination, Inheritance of Colour Blindness, Hemophilia, Y- linked traits. 2. Give Contributions of Indian Scientists: Dr. S. K. Roy, and Dr. H.K. Mukerjee.	10
----	---	----

5.8.2026

[Signature]

[Signature]

[Signature]

[Signature]

[Signature]



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 Practical			
Part 'A' - INTRODUCTION			
Program :	Class: B.Sc.	Year: II nd Year	Session : 2026-2027
Subject : Zoology IV Sem.			
1	Course Code		
2	Course Title	Practical Cytology and Genetics	
3	Course Type	Minor - II (M-4)	
4	Pre-requisite	Student must have had Zoology in B.Sc. Ist year	
5	Course Learning Outcome (CLO)	Upon completion of the course student should be able to perform and Understand : 1. To differentiate between Prokaryotic and Eukaryotic Cell. 2. Different stages of Cell Division 3. Structure and types of Chromosomes 4. Mendelian Crosses through simulation experiments 5. Linkage, Crossing over, Sex Determination. 6. Blood group inheritance. 7. Barr Body detection in Buccal Epithelium 8. Problems based on Genetics	
6	Credit Value	01	
7	Total Marks	Max marks: 30+70	Min. Passing Marks: 35

PART 'B' - Content of the Course		
Total No. of Practical (2 hours per week)		
Total Lectures: 30 hours		
S.No.	Topics	No. Of Lecture
1	Observation of difference between Prokaryotic and Eukaryotic Cell.	2
2	Study of types of chromosomes through Charts.	2
3	Study of Mitosis and Meiosis by squash preparations Study of stages of cell Division in prepared slides and charts. Study of stages of cell Division in prepared slides and charts.	8
4	Mendelian Experiments of Monohybrid and dihybrid crosses Problems based on Test and back crosses.	4
5	Barr Body detection in Buccal Epithelium.	3
6	Blood group inheritance.	3
7	Problems based on Sex linked inheritance and Sex determination Study of sex determination in <i>Bonellia viridis</i>	8
Keywords/Tags: Prokaryotic, Eukaryotic, Mitosis, Meiosis, Monohybrid, Dihybrid, Back Cross, Test Cross, Blood groups Inheritance, Sex determination.		

5.8.2026

[Signatures]