

St. Aloysius College (Autonomous), Jabalpur
Department of Higher Education, Govt. of M.P.

Under Graduate Syllabus for B.Sc. (Bio)

As recommended by Central board of Studies in Zoology

Class - B.Sc. III Year

(Session 2023-24)

Theory Paper

Part A Introduction

Program: Degree	Calss : B.Sc	Year :III	Session :2023-24
Subject : Zoology			
1	Course Code	S3-ZOOL2T	
2	Course Title	Genetics	
3	Course Type (Core Course /Elective/Generic Elective/ Vocational/...)	Minor/Elective	
4	Pre-requisite (if any)	To study this course, a student must have had the subject Zoology in Diploma.	
5	Course Learning Outcome (CLO)	<p>On successful completion of this course, the students will be able to</p> <ol style="list-style-type: none">1. Gain knowledge of basic principles of inheritance and variations, DNA, RNA and their function.2. Deeper understanding of linkage, Sex determination, Chromosomes, Mutations and mutagens.3. Gain knowledge of human karyotype, Genome project, Inheritance of blood group and genetic diseases in human.4. Demonstrate gene therapy, PCR, DNA fingerprinting techniques and their application.5. Find Job Opportunities in Hospitals, Pharmaceutical Companies and other health services, Forensic Science Research Associates, Genetic Counselor, Clinical Research Associate, Animal Breeder, Genetic Laboratory Technician	
6	Credit Value	4	
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 hour per week): L-T-P: 30

Unit	Topic	No. Lectu
I	<p>Overview of Genetics</p> <ol style="list-style-type: none"> 1. Introduction and Historical background of genetics 2. Definition, Scope and Importance of Genetics 3. Chromosomes: Transmitters of Heredity <ol style="list-style-type: none"> 3.1. Structure and Organization of Chromosomes 3.2. Types of Chromosomes 3.3. Chemical composition of chromosomes 4. Nucleocytoplasmic Interaction 5. Mendel's laws of Heredity 6. Variations: Types and genetic basis of Variations on <p>Keywords: Heredity, Chromosome, Variation, Genetics, Nucleocytoplasmic Interaction</p>	12
II	<p>Gene and Genetic Material</p> <ol style="list-style-type: none"> 1. Chemistry of Gene - Nucleic acids and their structure 2. Concept of DNA replication 3. Nucleosome (Solenoid Model) 4. Types of genes: Split genes, Overlapping genes and Pseudogenes 	12

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	<p>5. Genetic code</p> <p>Keywords: Nucleic acids, DNA replication, Nucleosome, Pseudogenes, Split genes, Genetic code</p>	
III	<p>Linkage and Chromosomal Aberrations</p> <p>1. Gene linkage and recombination</p> <p>2. Sex-determination.</p> <p>3. Sex-linked Inheritance</p> <p>4. Structural changes in chromosomes: Deficiency, Duplication, Translocation and Inversion</p> <p>5. Numerical changes in chromosomes: Aneuploidy, Polyploidy</p> <p>6. Mutation: Types of mutations and mutagens</p> <p>Keywords - Linkage, Recombination, Sex-determination, Sex-linked Inheritance, Mutation, Mutagens, Polyploidy</p>	12
IV	<p>Human Genetics</p> <p>1. Human chromosomes: Human Karyotype and Human Genome Project</p> <p>2. Common genetic disorders</p> <p>3. Multiple factors and blood groups .</p>	12

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	<p>4. Twins: Fraternal, Maternal and Siamese twins</p> <p>5. Transgenic and knockout animals and their applications</p> <p>Keywords: Karyotype, Genetic disorders, Transgenic, Knockout animals</p>	
V	<p>Genetic Engineering</p> <p>1. Gene Therapy:- Germline, and Somatic cell gene therapy.</p> <p>2. Recombinant DNA technology</p> <p>3. Gene cloning</p> <p>4. Gene library 5. PCR and Hybridization techniques</p> <p>6. DNA finger printing</p> <p>Keywords: Genetic Engineering. Gene Therapy Recombinant DNA, Gene cloning Gene library, PCR, DNA finger printing.</p>	12

Program: Degree	Calss : B.Sc	Year :III	Session :2023-24
Subject : Zoology			
1	Course Code	S3-ZOOL2P	
2	Course Title	Experimental Genetics(Paper-I)	
3	Course Type (Core Course /Elective/Generic Elective/ Vocational/...)	Minor/Elective	
4	Pre-requisite (if any)	To study this course ,a student must have had the subject Zoology in Diploma.	
5	Course Learning Outcome (CLO)	<p>Upon completion of the course students will be able to</p> <ol style="list-style-type: none"> 1. Gain knowledge of basic principles of inheritance and variations, DNA, RNA and their function. 2. Gain knowledge of Sex-linked inheritance, Inheritance of blood group and genetic diseases in human. 3. Learn about Mendelian genetics. 4. Learn pedigree analysis of human traits 5. Identify gene therapy, PCR, DNA fingerprinting techniques and their application. 6. Find Job Opportunities in Hospitals, Pharmaceutical Companies and other health services, Forensic Science Research Associates, Genetic Counselor, Clinical Research Associate, Animal Breeder, Genetic Laboratory Technician 	
6	Credit Value	2	
7	Total Marks	Max. Marks : 100	Min. Passing Marks – 35

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Suggested Continuous Evaluation Methods:

S.No.	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 Visits Survey/Industrial Visit		Table work/Experiments	
			Total	100

Remark:

Part B- Content of the Course

Total No. of Lectures – Tutorials – Practical (2 hour per week): L-T-P: 30

Unit	Topic	No. of Lectures
I	Study of special types of chromosomes through model, charts and photographs	02
II	Study of DNA and RNA through model, charts and photographs	03
III	Mendelian Experiments: 1. Monohybrid and Dihybrid Cross 2. Verification of Mendelian Ratio	05
IV	Study of genetic disease in humans (through internet and photographs) 1. Gene related disorder (Sickle cell Anemia, Thalassemia, Retinoblastoma, Goitre cretinism, Albinism) 2. Multiple factorial Diseases (Schizophrenia, Diabetes, Asthma, Depression, Heart Diseases, Thyroidism) 3. Chromosomal Disorders (Down syndrome, Edward syndrome, Patau syndrome, Turner syndrome, Klinefelter syndrome) 4. Mitochondrial genetic inheritance disease (Leigh syndrome, MELAS, Neurological disorder, Dementia)	05
V	Problems related to sex-linked inheritance (Colour blindness and Haemophilia)	06
VI	Exercise based on inheritance of Blood groups	04
VII	<ul style="list-style-type: none"> Study and e-demonstration of PCR and DNA fingerprinting techniques Study of Principle and Working of Gradient PCR Comparative analysis of short DNA sequences using PCR thermocycler Study of Human Karyotype under Phase Contrast Microscope 	05

Keywords: Chromosome, DNA, RNA, Sex-linked Inheritance, Blood group, Linnaea, Genetic Disease, Cytoplasmic Inheritance

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