

**FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)**  
**DEPARTMENT OF ZOOLOGY**  
**COURSE CURRICULUM**

<b>PART- A: Introduction</b>			
Program: Bachelor in Life Science (Degree / Honors)		Semester - VI	Session: 2024-2025
1	Course Code	ZOSC-06T	
2	Course Title	Genetics	
3	Course Type	Discipline Specific Course	
4	Pre-requisite (if, any)	As per Program	
5	Course Learning Outcomes (CLO)	<p><b>After successfully completing this course, the students will be able to:</b></p> <ul style="list-style-type: none"> <li>➤ Understand and grasp the principles of Mendelian inheritance and interaction of genes.</li> <li>➤ Understand the sources and consequences of genetic variation, including mutations, genetic recombination, and gene flow.</li> <li>➤ Know various methods of sex determination in animal kingdom.</li> <li>➤ Analyse the cause and effect of alterations in chromosome number and structure</li> <li>➤ Understand DNA structure and function, gene expression, and genetic inheritance patterns</li> <li>➤ Know the Recent Assisted Reproductive Techniques</li> </ul>	
6	Credit Value	3 Credits	Credit = 15 Hours - learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40
<b>PART -B: Content of the Course</b>			
Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course contents)		No. of Period
I	<p><b>Concept of Genes and Genomics:</b> Scope and importance. Elements of heredity and variation: Classical and Modern concept of Gene (Cistron, Muton, Recon), Alleles. Mendel's laws of inheritance, Chromosomal basis of inheritance and its applications. Exceptions to Mendelian Inheritance: Incomplete dominance, Codominance, Multiple allelism. Ineraction of Gene-Lethal alleles, Pleiotropy, Epistasis- Dominant and Recessive, Supplimentary, Complementary, Inhibitory gene and polygene. Define Penetrance, Expressivity and Phenocopy.</p>		12
II	<p><b>The recombination and interaction of Genes:</b>Linkage and crossing over, cytological basis of crossing over. Organelle inheritance (Mitochondrial), Sex Chromosomes and sexlinked Gene X-linked dominant and X-linked recessive. Sex determination: Theories of sex determination: Chromosomal Theory ( XX/XO, XX/XY, ZZ/ZW, ZZ/ZO), Genetic balance theory, intersex, Haplodiploidy, Gynandromorphs. Hormonal influence on sex determination-Freemartin and sex reversal. Role of environmental factors- Bonellia and Crocodile. Eugenics. Mutation, Chromosomal and Gene Mutation, Structural and numerical alterations of chromosomes.</p>		11
III	<p><b>Regulation of Gene expression, regulation and mapping:</b> Gene Expressions and regulation: One gene-one enzyme hypothesis /one polypeptide hypothesis. Concept of operon of bacteria (Lac Operon) and bacteriophages. Bacterial transposons. Vertical and horizontal gene transfer. Transformation, transfection and transduction. Genetic mapping. RNA-inheritance, FLP-FRT. Utility of the model organisms: Escherichia coli, <i>Drosophila melanogaster</i> &amp; <i>Mus musculus</i></p>		11
IV	<p><b>Population Genetics and Genetic Counselling:</b> Human Genetics: Pedigree analysis; Karyotype, <b>Genetic disorders: chromosomal aneuploidy</b> (Down, Edward, Patau, Turner and Klinefelter syndromes), chromosome translocation (Chronic Myeloid Leukemia) and deletion ("cry of cat" syndrome). Single Gene Disorder: gene mutation (sickle cell anemia,) and Genetic counselling, Gene isolation Manipulation and techniques. Basic concept of Polymerase Chain Reaction. DNA Sequencing; Southern, Western &amp; Northern Blots. In situ Hybridization, FISH, RFLPs and Oligonucleotide arrays. Gene Cloning vs Animal Cloning, Nuclear transplantation,</p>		11
<b>Keywords</b>	Genetics, Mendel's law, Interaction of Gene, Sex Linkage, Sex Determination, Operon, Genetic Screening, Pedigree Analysis, Aneuploidy		
<b>Signature of Convener &amp; Members (CBoS) :</b>			

## PART-C: Learning Resources

### Text Books, Reference Books and Others

#### Text Books Recommended –

- Arora M.P. and Sandhu G.S. Genetics, Himalayan Publishing House
- Winter P.C. Et al, Genetics Viva Publication
- Gupta P.K., Cell and Molecular Biology Rastogi Publication

#### Reference Books Recommended –

- Gardner, E.J. *et al.* (2006) Principles of Genetics (John Wiley).
- Russell, P.J. (2010) Genetics (Benjamin Cummings).
- Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). Principles of Genetics. (VIII edition) Wiley India.
- Snustad, D.P. and Simmons, M.J. (2009). Principles of Genetics. (V edition) John Wiley and Sons Inc.
- Klug, W.S., Cummings, M.R. and Spencer, C.A. (2012). Concepts of Genetics. (X edition) Benjamin Cummings.
- Carroll S.B.; Doebley J.; Griffiths, A.J.F. and Wessler, S.R. (2018) An Introduction to Genetic Analysis. W. H. Freeman and Co. Ltd.
- Campbell, N. and Reece, J. (2014) Biology (10th edition). Benjamin Cummings

#### Online Resources–

- National digital Library.
- <http://ndl.iitkgp.ac.in/document/Rm5qb3lqRngwWDZ2Tnl6UXI4VU9YR201R0cwYXJHV25HSHFacGxtS1h3REZGd1ByL28xcmlleEFFZU5najlCZl1HdXBBTzBlTBVVRGIDSFhkMEtuUkE9PQ>
- E-PG Pathshala.
- <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2rAs1Puvga4LW93zMe83aA>
- eGyankosh- Genetics and Evolutionary Biology
- eGyanKosh: BZYCT-137 Genetics and Evolutionary Biology

## PART -D: Assessment and Evaluation

### Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

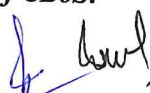
End Semester Exam (ESE): 70 Marks

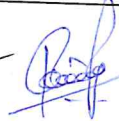
<b>Continuous Internal Assessment (CIA):</b> (By Course Teacher)	Internal Test / Quiz-(2): 20 +20	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment / Seminar - 10 Total Marks - 30	
<b>End Semester Exam (ESE):</b>	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20 Marks Section B: Descriptive answer type qts., 1out of 2 from each unit-4x10=40 Marks	

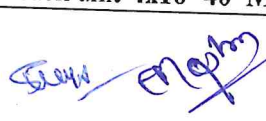
Name and Signature of Convener & Members of CBoS:











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<b>Program: Bachelor in Life Science</b> <i>(Degree / Honors)</i>		<b>Semester - VI</b>	<b>Session: 2024-2025</b>
1	Course Code	ZOSC- 06P	
2	Course Title	Genetics	
3	Course Type	Discipline Specific Lab Course	
4	Pre-requisite (if, any)	<i>As per Program</i>	
5	Course Learning Outcomes (CLO)	After successfully completing this course, the students will be able to- <ul style="list-style-type: none"> <li>➤ Able to understand and explain Mendel's Law of Inheritance</li> <li>➤ Capable to analyze inheritance of gene by pedigree analysis.</li> <li>➤ Know laboratory culture of <i>Drosophila</i>.</li> <li>➤ Understand and configuration for animal life.</li> <li>➤ Capable to understand Human karyotype and Numerical alteration in chromosomes</li> </ul>	
6	Credit Value	1 Credits	<i>Credit =30 Hours Laboratory or Field learning/Training</i>
7	Total Marks	Max. Marks: 50	Min Passing Marks: 20
<b>PART -B: Content of the Course</b>			
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)			
Module	Topics (Course contents)		No. of Period
Lab./Field Training/ Experiment Contents of Course	<ul style="list-style-type: none"> <li>➤ Application of probability in the law of segregation with coin tossing.</li> <li>➤ Study of mode of inheritance of the following traits by pedigree charts – attached ear lobe, widow's peak.</li> <li>➤ Familiarization with techniques of handling <i>Drosophila</i>, identifying males and females; observing wild type and mutant (white eye, wing less) flies, and setting up cultures.</li> <li>➤ Study of human karyotypes and numerical alterations (Down syndrome, Klinefelter syndrome and Turner syndrome).</li> <li>➤ Demonstration of law of segregation (monohybrid and test cross) sex-linked inheritance in <i>Drosophila</i> making a cross between white eye dumpy winged or sepia eyed and wild type flies (criss-cross inheritance) Explain with Model</li> <li>➤ Study of structural chromosome aberrations (dicentric, ring chromosomes and inversions in polytene chromosomes) from prepared slides/photograph</li> <li>➤ Extraction of Genomic DNA from bacteria.</li> <li>➤ Group discussion/ Seminar/ Quiz presentation on one or two related topics</li> </ul>		30
Keywords	Mendel's Law, Human Karyotype, <i>Drosophila</i> Culture, Pedigree		
Signature of Convener & Members (CBoS) :			

*S. K. Kulkarni*

*by*

*Prof. [Signature]*

*[Signature]*

*[Signature]*

## PART-C: Learning Resources

### Text Books, Reference Books and Others

#### Text Books Recommended –

- Practical Hand Book of Genetics: Vikas Pali Kalyani Publication
- Essential Practical Handbook of Cell Biology & Genetics, Biometry & Microbiology, A Laboratory Manual Debarati Das, Academic Publishers.
- Cytogenetics: Mohan P Arora, Himalayan Publishing House

#### Reference Books Recommended –

- Klug, W.S., Cummings, M.R. and Spencer, C.A. (2012). Concepts of Genetics. (X edition) Benjamin Cummings.
- Carroll S.B.; Doebley J.; Griffiths, A.J.F. and Wessler, S.R. (2018) An Introduction to Genetic Analysis. W. H. Freeman and Co. Ltd.

#### Online Resources–

- <https://jru.edu.in/studentcorner/lab-manual/agriculture/Fundamentals%20of%20Genetics.pdf>

## PART -D: Assessment and Evaluation

### Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 35 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10	Better marks out of the two Test / Quiz . + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar + Attendance - 05 Total Marks - 15	
End Semester Exam (ESE):	Laboratory / Field Skill Performance: On spot Assessment	Managed by Course teacher as per lab. status
	A. Performed the Task based on lab. work - 20 Marks	
	B. Spotting based on tools & technology (written) – 10 Marks C. Viva-voce (based on principle/technology) - 05 Marks	

Name and Signature of Convener & Members of CBoS:







