

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

| PART- A: Introduction | | | |
|---|---|--|---|
| Program: Bachelor in Life Science <i>(Honors/ Honors with Research)</i> | | Semester - VIII | Session: 2024-2025 |
| 1 | Course Code | ZOSE-12T | |
| 2 | Course Title | Molecular Biology | |
| 3 | Course Type | Discipline Specific Elective | |
| 4 | Pre-requisite (if, any) | <i>As per Program</i> | |
| 5 | Course Learning Outcomes (CLO) | <p>After successfully completing this course, the students will be able to-</p> <ul style="list-style-type: none"> ➤ Develop an understanding of concepts, mechanisms and evolutionary significance and relevance of molecular biology in the current scenario. ➤ Get well versed in recombinant DNA technology which holds application in biomedical & genomic science, agriculture, environment management, etc. Therefore, a fundamental understanding of Molecular Biology will help in career building in all these fields. ➤ Apply their knowledge in problem solving and future course of their career development in higher education and research. ➤ Get new avenues of joining research in related areas such as therapeutic strategies or related opportunities in industry. | |
| 6 | Credit Value | 3 Credits | <i>Credit = 15 Hours - learning & Observation</i> |
| 7 | Total Marks | Max. Marks: 100 | Min Passing Marks: 40 |
| PART -B: Content of the Course | | | |
| Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours) | | | |
| Unit | Topics (Course contents) | | No. of Period |
| I | Chromosomes and Nucleic Acids: Chromosomes structure: Chromatin (Euchromatin and heterochromatin), Types of chromosomes. Histones, Histone-modifications. Structure of Nucleic acids: Structure and functions of DNA, DNA forms: Plasmid DNA, Genomic DNA and Repetitive DNA. DNA polymorphisms. DNA modifications. Structure and Function of RNA: Ribosomal RNA (rRNA), Transfer RNA (tRNA), Messenger RNA (mRNA), Noncoding RNA. RNA Induced Silencing Complex and CRISPR Technology. Mutation: Chromosomal and gene mutation. | | 11 |
| II | Central dogma and DNA replication: Central dogma of Molecular Biology. DNA methylation. DNA-Protein interaction. DNA Replication, plasmid DNA replication and genomic DNA replication, Centromeric and Telomeric DNA replication, DNA replication and cell cycle regulation. DNA polymerases. DNA-damaging agents. DNA repairing. | | 11 |
| III | Transcription: Concept of Transcription, RNA polymerase I, II, III, transcription factors. RNA processing, splicing of hnRNA into mRNA, 5'-capping and 3'-polyadenylation of mRNA, rRNA and tRNA modifications and processing. RNA editing, alternative splicing, trans-splicing, miRNA, siRNA, piRNA, lncRNA, RNA-protein complex. | | 11 |
| IV | Translation: Structure of Ribosomes, Genetic Code, triplet codons, Wobble base, synonymous codons, degeneracy of codon. Translation in prokaryotic and Eukaryotic cells (Aminoacylation of tRNA, initiation, elongation, peptide bond formation, translocation, termination, recycling of ribosome). Post-translational modifications and processing of proteins, large protein-protein complexes and protein trafficking Reregulation of protein synthesis in prokaryotic and eukaryotic cell. | | 12 |
| Keywords | <i>Chromosomes, Nucleic Acids, CRISPR, tRNA, Transcription, Translation, Central dogma</i> | | |
| Signature of Convener & Members (CBoS) : | | | |

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- Chaudhari K, Molecular Biology Text book IFAS Publication
- Verma P.S., Agrawal V.K., Molecular Biology S Chand

Reference Books Recommended –

- Watson, J.D. *et al.* (2013) Molecular Biology of the Gene (7th edition) CSHL Press Pearson.
- Green, M. R and Sambrook, J. (2012) Molecular Cloning: a Laboratory Protocol (4th edition) CSHL Press.
- Walter, P. (2007) Molecular Biology of the Cell (5th edition) Garland Science.
- Cell Biology by De Roberties
- Gene by Lewine 7th to 11th edition

Online Resources–

- https://tripurauniv.ac.in/Page/SubjectWiseOnline_EBooks_Cell_Molecular_Biology,
- <https://www.tezu.ernet.in/Library/index.php/e-journals/55-microbiology-and-molecular-biology-education-0a>

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

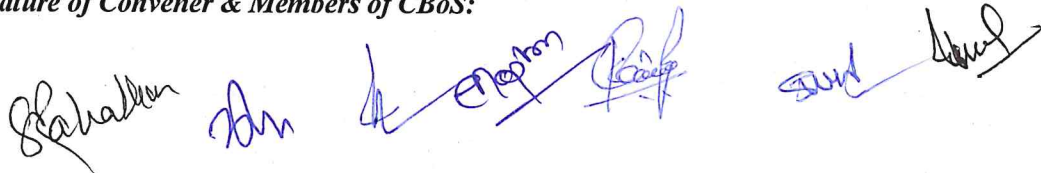
Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

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| Continuous Internal Assessment (CIA): (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 | |
| End Semester Exam (ESE): | 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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| PART- A: Introduction | | | |
|---|---|---|---|
| Program: Bachelor in Life Science <i>(Honors/ Honors with research)</i> | | Semester VIII | Session: 2024-2025 |
| 1 | Course Code | ZOSE-12P | |
| 2 | Course Title | Molecular Biology | |
| 3 | Course Type | Discipline Specific Elective Lab Course | |
| 4 | Pre-requisite (if, any) | <i>As per Program</i> | |
| 5 | Course Learning Outcomes (CLO) | <p>After successfully completing this course, the students will be able to-</p> <ul style="list-style-type: none"> ➤ Mastery of fundamental laboratory techniques used in molecular biology, such as DNA extraction, PCR (Polymerase Chain Reaction), gel electrophoresis, DNA sequencing, and cloning. ➤ Ability to design experiments, including selecting appropriate methodologies, controls, and troubleshooting potential issues that may arise during experiments. ➤ Proficiency in analyzing experimental data, including interpreting ➤ Development of critical thinking skills to evaluate experimental results. | |
| 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 |
| PART -B: Content of the Course | | | |
| 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"> ➤ Preparation of ball and stick model for B-DNA molecule (A=T and G=C base pairs). ➤ Preparation of RNA model for tRNA, mRNA and rRNA molecule (A=U and G=C base pairs) ➤ Preparation of Central dogma model with reference to Replication, Transcription and Translation i.e., Linear flow of genetic information. ➤ Isolation of genomic DNA by ethanol precipitation method. ➤ Preparation of model pBR322 ➤ Agarose gel electrophoresis of the plasmid DNA and the genomic DNA. ➤ Chromosomal staining ➤ Temporary slide preparation of Salivary gland chromosome from drosophila larva. ➤ Group discussion/Quiz/Seminar presentation on related topics. ➤ Practical Record or Lab assignment. | 30 | |
| Keywords | Molecular Biology, DNA model, Central Dogma, Agrose Gel electrophoresis, chromosome, salivary gland chromosomes of Drosophila | | |
| Signature of Convener & Members (CBoS) : | | | |

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- Sarma. PVGK, Molecular Biology Practical Manual, MJP Publisher
- Pranav Kumar, Fundamentals and Techniques of Biophysics and Molecular Biology, Pathfinder Publication

Reference Books Recommended

- Green, M. R and Sambrook, J. (2012) Molecular Cloning: a Laboratory Protocol (4th edition) CSHL Press.

Online Resources–

- http://ndl.iitkgp.ac.in/he document/inflibnet epgp/inflibnet epgp/IN I e P P 1 Z 512 96 P 1 M e b 51376 51377?e=16*|||
- <http://ndl.iitkgp.ac.in/he document/swayam prabha/ke040dcj 84>

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

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| 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 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 | Managed by Course teacher as per lab. status |

Name and Signature of Convener & Members of CBoS: