Programme	BS Biotechnology	Course Code	BT. 304	Credit Hours	3(0+3)
Course Title	**Methods in Molecular Biology**				

Course Introduction

This course will provide in-depth knowledge about modern molecular research through an introduction to basic techniques in molecular biology and their applications in experimental settings. This course will help students to get hands-on experience in cutting-edge methodologies, spanning DNA manipulation, protein analysis, and genetic engineering.

Learning Outcomes

On completion of the course student will be able to:

- Understand fundamental molecular biology techniques.
- Interpret experimental data from molecular biology assays.
- Design molecular biology experiments to investigate gene function and expression

Course Content

Practical Unit-I

- Extraction of genomic DNA from mammalian, plant tissue and bacteria and its analysis by agarose gel electrophoresis and spectrophotometer.
- Extraction of total RNA from tissue/blood sample & determination of concentration and purity of RNA. Analysis of RNA by formaldehyde agarose gel electrophoresis.
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- Synthesis of cDNA
- Primer designing and preparation of working solutions of primers
- Amplification of target gene by polymerase chain reaction (PCR) and analysis of amplicon by agarose gel electrophoresis
- Gel purification and restriction analysis
- Ligation reaction, preparation of competent cells and transformation
- Plasmid isolation and electrophoretic analysis
- Western blot analysis
- DNA sequencing data analysis

Textbooks and Reading Material

- Cheryl L. P. & Bernard R. G. (2022). Molecular Biotechnology: Principles and Applications of Recombinant DNA. (6th ed.). ASM Press, USA
- Robert, F. W. (2021). Molecular Biology (7th ed.). McGraw-Hill
- Michael, S. (2019). Genetic Engineering (3rd ed.). Cambridge University Press, UK.
- Primrose, S. B. & Twyman, R. M. (2014). Gene Manipulation and Genomics (8th ed.). Blackwell Publishing
- Michael M. C., Jennifer A. D. and Michael O'D. (2016). Molecular Biology: Principles and Practice (1st Ed.). W.H. Freeman.
- Alberts, B. et al. (2021). Molecular Biology of the Cell. (6th Ed.). Garland Science.
- Heather, M. (2020). Molecular Biology Techniques. (4th Ed). Academic Press.

- 8. Green, M. and Sambrook, J. (2012) *Molecular Cloning: A Laboratory Manual*. 4th Edition, Vol. II, Cold Spring Harbor Laboratory Press, New York.

Teaching Learning Strategies

- Lecture presentations
- Quizzes
- Written Assignment
- Class activities and discussions

Assignments: Types and Number with Calendar

- 1st Quiz in 4th Week of 5 marks
- 2nd Quiz in 10th Week of 5 marks
- 3rd Quiz in 14th Week of 5 marks
- Assignment in 8th Week of 10 marks

Assessment

Sr. No.	Elements	Weightage	Details
1	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
2	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
3	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.