

<b>Programme</b>	BS Biotechnology	<b>Course Code</b>	BT. 202	<b>Credit Hours</b>	3(3+0)
<b>Course Title</b>	<b>Recombinant DNA Technology</b>				
<b>Course Introduction</b>					
<p>The course discusses molecular biology of the gene and the cell along with the recent advancement and applications of recombinant DNA technology. Candidates interested to work in Biotechnology research labs or pharmaceuticals must equip themselves with the knowledge of Recombinant DNA Technology.</p>					
<b>Learning Outcomes</b>					
<p>By the end of this course, students will be able to:</p> <ul style="list-style-type: none"> <li>• Describe the principles and techniques of recombinant DNA technology.</li> <li>• Design strategies for cloning, expressing, and analyzing recombinant genes.</li> <li>• Evaluate the applications of genetic engineering in research and industry.</li> </ul>					
<b>Course Content</b>					
<b>Theory Unit</b>					
<ul style="list-style-type: none"> <li>• Introduction and Historical Perspectives to Recombinant DNA technology. The Basic Principles of gene cloning and DNA analysis. Importance of Gene Cloning and DNA Analysis</li> <li>• Methods for the purification of DNA and RNA from living cells, gel electrophoresis.</li> <li>• Methods for the purification of DNA and RNA from living cells, gel electrophoresis.</li> <li>• Enzymes for Genetic manipulation, polymerases, nucleases, ligases etc. Restriction endonucleases; discovery, types and restriction mapping.</li> <li>• Vectors types; plasmid, cosmids, bacteriophages and other cloning vectors. Characteristics of Cloning vectors; selectable markers and reporter genes; steps involve in gene cloning.</li> <li>• Expression vectors and their control elements. Methods to transfer rDNAs into living systems.</li> <li>• Purification strategies of recombinant proteins from cloned genes. Fusion tags for solubilization and purification of recombinant proteins.</li> <li>• Polymerase chain reaction, Principle of PCR, Components and steps of PCR reaction. Variants and applications of PCR technology.</li> <li>• Construction and applications of Genomic libraries. Construction and applications of cDNA libraries.</li> <li>• Sequencing of genes and genomes, Overview of methods. Sanger method of DNA sequencing.</li> <li>• Pyrosequencing and next generation sequencing strategies. Applications of next generation and third generation sequencing strategies in genomics</li> <li>• Site directed mutagenesis methods. Applications of Site directed mutagenesis</li> <li>• Gene therapy and its applications. Viral vectors in gene therapy</li> </ul>					

- Applications of recombinant DNA technology in agriculture. Applications of recombinant DNA technology in health and medicine
- Applications of recombinant DNA technology in environment. Applications of recombinant DNA technology in environment.
- Plant and animal transgenics for biotechnological applications. Ethical and legal issues in rDNA technology.
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### Textbooks and Reading Material

- Cheryl L. P. & Bernard R. G. (2022). *Molecular Biotechnology: Principles and Applications of Recombinant DNA*. (6<sup>th</sup> 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.
- 5. 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

- Lectures
- Quizzes
- Case Studies
- Assignment
- Class discussions

### Assignments: Types and Number with Calendar

- 1<sup>st</sup> Quiz in 4<sup>th</sup> Week of 5 marks
- 2<sup>nd</sup> Quiz in 10<sup>th</sup> Week of 5 marks
- 3<sup>rd</sup> Quiz in 14<sup>th</sup> Week of 5 marks
- Assignment in 8<sup>th</sup> 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.