

Semester	<b>6</b>
Course	<b>Major</b>
Paper Code	
Paper Title	<b>Recombinant DNA Technology &amp; Basic Spectroscopy in Biology</b>
No. of Credits	<b>4</b>
Theory / Practical / Composite	<b>THEORY</b>
Minimum No. of preparatory hours per week a student has to devote	4 hours/week
Number of Modules	No modules
Syllabus	<p><b>Unit 1: Molecular Cloning- Tools and Strategies:</b>  <b>Cloning Tools:</b> Restriction modification systems: Types I, II and III. Mode of action, nomenclature, applications of Type II restriction enzymes in genetic engineering, DNA modifying enzymes and their applications, DNA Polymerases, Terminal deoxynucleotidyl transferase, Kinases and Phosphatases, and DNA ligases  <b>Cloning Vectors:</b> Definition and Properties, Plasmid vectors: pBR and pUC series Bacteriophage lambda and M13 based vectors, Cosmids, BACs, YACs  Use of linkers and adaptors, Homopolymer tailing  <b>Expression vectors:</b> <i>E.coli</i> lac and T7 promoter-based vectors, Cloning in eukaryotes: Yeast vectors, Baculovirus based vectors, Mammalian SV40-based expression vectors.</p> <p><b>Unit 2: DNA Amplification and DNA sequencing:</b>  PCR: Basics of PCR, RT-PCR, Real-Time PCR  Sanger's method of DNA Sequencing: traditional and automated sequencing Primer walking and Shotgun sequencing.</p> <p><b>Unit 3: Methods in Molecular Cloning:</b>  Transformation of DNA: Chemical method, Electroporation, Gene delivery and gene therapy methods: <i>Agrobacterium</i> - mediated delivery. Nucleic acid and protein blotting techniques, DNA microarray analysis, Subtractive Hybridization, <i>in vitro</i> Translation.</p> <p><b>Unit 4: Construction and Screening of Genomic and cDNA libraries</b>  Genomic and cDNA libraries: Preparation and uses, Screening of libraries: Colony hybridization and colony PCR, Chromosome walking and chromosome jumping, 5' and 3' RACE, RFLP and VNTR in disease diagnosis and DNA fingerprinting.</p> <p><b>Unit 5: Applications of Recombinant DNA Technology:</b>  Products of recombinant DNA technology: Products of human therapeutic interest, Brief idea of transgenic organisms, gene therapy, recombinant vaccines, concept of protein engineering, CRISPR-CAS mediated genetic engineering.</p> <p><b>Unit 6: Basics of Spectroscopy:</b>  Basics properties of light used in spectroscopy. Chemistry of chromophores and fluorophores. Absorption spectroscopy:</p>

	UV-Vis spectroscopy-instrumentation and application. IR spectroscopy: IR absorption, instrumentation and application.  <b>Emission spectroscopy:</b> Fluorescent spectroscopy- Introduction to fluorescence, fluorescence quenching and photo bleaching, instrumentation of a fluorimeter, biological applications and specialized technique- Fluorescence Resonance Energy Transfer.	
Learning Outcomes	<ul style="list-style-type: none"> <li>To understand the different methods employed in producing Recombinant DNA molecules.</li> <li>Different applications of RDT</li> <li>Concise knowledge about principle and use of major types of spectroscopy in understanding various property of biomolecules.</li> </ul>	
Reading/Reference Lists	<ol style="list-style-type: none"> <li>1. Brown TA. (2010). Gene Cloning and DNA Analysis. 6th edition. Blackwell Publishing, Oxford, U.K.</li> <li>2. Clark DP and Pazdernik NJ. (2009). Biotechnology: Applying the Genetic Revolution. Elsevier Academic Press, USA</li> <li>3. Primrose SB and Twyman RM. (2006). Principles of Gene Manipulation and Genomics, 7th edition. Blackwell Publishing, Oxford, U.K.</li> <li>4. Sambrook J and Russell D. (2001). Molecular Cloning- A Laboratory Manual. 3rd edition. Cold Spring Harbor Laboratory Press</li> <li>5. Wiley JM, Sherwood LM and Woolverton CJ. (2008). Prescott, Harley and Klein's Microbiology. McGraw Hill Higher Education</li> <li>6. Brown TA. (2007). Genomes-3. Garland Science Publishers</li> <li>7. Primrose SB and Twyman RM. (2008). Genomics: Applications in human biology. Blackwell Publishing, Oxford, U.K.</li> <li>8. Fundamentals of bioanalytical techniques and instrumentation by Ghosal and Srivastava, PHI learning Pvt Ltd.</li> <li>9. Biophysical chemistry-principles and application by Upadhyay, Upadhyay and Nath. Himalaya Publishing House.</li> </ol>	
Evaluation	Theory CIA: 30 Semester Exam:70	Practical (if applicable) CA: Semester Exam:
Paper Structure for Theory Semester Exam	<b>Full marks 70</b> Short questions: 10 (each 2 marks) from 12 (10x2=20) Long questions: 5 (each 10 marks) from 7 (5x10=50)	