

**Shree Manibhai Virani and Smt.Navalben Virani Science College, Rajkot  
(Autonomous)**

**Affiliated to Saurashtra University, Rajkot**

**Department of Biochemistry**

**B.Sc. BIOCHEMISTRY**

**Revised Syllabus of Genetic Engineering and Biotechnology Course**

**For Students Admitted From A.Y.2017-2018 and Onwards**

<b>16UBCCC17</b>	<b>Core -13: Genetic Engineering and Biotechnology</b>	<b>4 Hrs/wk</b>	<b>4 Credits</b>
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**Objectives**

**To enable the students to**

1. Understand basic theoretical knowledge in the field of gene engineering
2. State creative use of modern tools and techniques for manipulation and analysis of genomic sequences.
3. Understand application of recombinant DNA technology in biotechnological research.

**Unit 1: Introduction to Biotechnology and DNA Cloning [10 Hrs]**

- Milestones in genetic engineering and biotechnology.
- 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: Terminal deoxynucleotidyl transferase, kinases and phosphatases, DNA ligases and DNA polymerases, reverse transcriptases, bacteriophage RNA polymerases, exonuclease III, S1 nuclease.
- Simple cloning of DNA fragments and their applications.

**Unit 2: Vectors in Recombinant DNA Technology [10 Hrs]**

- Vectors: Definition and properties. Plasmid vectors-pBR and pUC series, Bacteriophage lambda and M13 based vectors, Cosmids.
- Overview of Shuttle vectors-BACs, YACs.
- Baculovirus based vectors.
- Ti based vectors (Binary and Cointegrated vectors)

**Unit 3: Gene Delivery and Analytical Methods** [10 Hrs]

- Gene transfer methods : Bacterial Conjugation, Transformation, Transduction, Episomes, Microinjection, Electroporation, Shot Gun method, Ultrasonication, Liposome fusion and *Agrobacterium*-mediated delivery.
- Polymerase chain reaction – tools and mechanism, RT-PCR and Reverse transcription PCR.
- Overview of Agarose gel electrophoresis and SDS-PAGE
- Outline on Southern and Northern blotting techniques and Western blotting.
- Introduction to: Chromosome walking and jumping, DNA fingerprinting by RFLP and RAPD.
- DNA footprinting by DNase I, DNA microarray analysis.

**Unit 4: DNA Sequencing and Genomic libraries** [09 Hrs]

- Maxam-Gilbert's, Sanger's and Automated methods for DNA sequencing.
- Human genome sequencing project.
- Genomic and cDNA libraries: Preparation and uses.
- Screening of libraries by colony hybridization.

**Unit 5: Applications of genetic engineering** [09 Hrs]

- Applications of genetic engineering:  
In medicine, production of recombinant pharmaceuticals such as insulin, human growth hormone, factor VIII. Recombinant vaccines. Gene therapy.
- Applications in agriculture- GM crops for disease resistance, yield and quality improvement
- Applications in microbiology- environment, dairy, strain improvement.
- Biotechnology: Society, Risk and Ethics

**Text Books:**

1. Satyanarayan U. (2010). *Biotechnology*. Books and allied (P) ltd.
2. . Primrose, S. B., & Twyman, R. (2013). *Principles of Gene Manipulation and Genomics*. John Wiley & Sons.

**Reference Books:**

1. Brown, T. A. (2016). *Gene Cloning and DNA analysis: An Introduction*. John Wiley & Sons.
2. Weaver R F (2016), *Molecular Biology*. ( ed 6<sup>th</sup>), WCB/McGraw-Hill
3. Glick, B. R., Pasternak, J. J., & Patten, C. L. (2010). *Molecular Biotechnology: Principles and Applications of Recombinant DNA*. ASM Press