

Course contents for Techniques in Genetic Engineering**1. Faculty:** FLSB**2. Course Code:****3. Course Title:** Techniques in Genetic Engineering**4. Number of Credits:** Four**5. Course objectives:**

This course will be an interactive course involving blackboard teaching, discussions and presentations. The students will also be exposed to hands-on training in few techniques in the laboratory. Emphasis will be given to learning the new cutting-edge techniques and technologies in genetic engineering and their applications. The student at the end of this course will have comprehensive knowledge to apply Genetic Engineering techniques to any area of research to be undertaken during PhD.

6. Minimum prerequisites for taking this course, if any:

Basic knowledge in Molecular Biology.

7. Course structure with units, if applicable:

- a. Restriction Enzymes: Basic principles and applications
- b. PCR and its variants; site-directed mutagenesis
- c. Basic principles of Gene cloning, expression and purification: construction of gDNA and cDNA libraries; in vitro/in vivo labelling DNA, RNA, Proteins
- d. Vector-Host systems: Bacteria, Phage, Yeast, Mammalian, Virus, Insect and Plants (Agrobacterium based vectors; Ti plasmids)
- e. Strategies of gene cloning : Conventional and site-specific recombination based cloning methods (Gateway Technology)
- f. Transcript profiling using Microarray, SAGE, Dot-blot analysis, Northern, Semi-quantitative RT-PCR, Real-time PCR/qRT-PCR.
- g. Techniques to study DNA-Protein, Protein-Protein interactions: EMSA, DNase Foot printing, Modification interference assay, CHIP, Yeast 2 Hybrid, Co-immunoprecipitation, Phage Display, BiFC; Tilling and eco-tilling, T-DNA insertion mutants, Activation tagging, Enhancer Trap
- h. Applications of recombinant DNA technology in Medicine, Research and Forensic Sciences:
- i. Gene editing technologies: RNAi technology, miRNA, ZFNs, TALIN, CRISPR-CAS9.

8. Suggested Readings:

- Principles of gene manipulation and Genomics: Primrose and Twyman
- Molecular cloning- A Laboratory Manual: Sambrook and Russell
- Gene Cloning and Manipulation: Christower Howe
- An Introduction to Genetic Engineering: Desmond ST Nicholl
- Gene Cloning and DNA Analysis: TA Brown
- Research and Review articles (will be given during course work)

9. Evaluation:

Written Examination	: 50% Marks
Practical Examination	: 30% Marks
Quiz/Assignment/Paper Presentations/other	: 20% Marks