

Title: Genetic Engineering [3-0-0-3]

Pre-requisites, if any: Molecular Biology (BB415) or Biology (BB101)

Content (*List of the topics/sub-topics to be covered in the lectures/practicals/assignments*):

- Introduction to Genetic Engineering
- Vectors: Plasmids, phagemids, cosmids, bacteriophages as vectors, cloning vectors, expression vectors (pET series, pBAD series, pGEX series etc. as examples), mammalian expression vectors, Baculovirus and Pichia vector system
- Polymerase chain reaction: Principles of PCR, primer designing, components of PCR reactions, Properties of DNA polymerases, Different types of PCR (multiplex, nested, touchdown, hotstart, quantitative PCR)
- DNA modifying enzymes: Restriction Endonucleases, DNA ligase, T4 DNA polymerase, Polynucleotide kinase, Terminal transferase
- Different cloning strategies: Restriction cloning, TA cloning, Linkers, Adaptors
- Cloning and analysis of genes from RNA: Reverse transcription, qRT-PCR
- Construction of libraries: genomic DNA library, cDNA library, library screening
- Mutagenesis: Site directed mutagenesis, different approaches for random mutagenesis, directed evolution, protein engineering
- Genome editing and gene silencing technologies: homologous recombination, siRNA technology, TALENS, CRISPR-Cas9 system
- Selected applications of the above techniques

Texts / References:

- Old, R. W., Primrose, S. B., & Twyman, R. M. (2001). Principles of Gene Manipulation: an Introduction to Genetic Engineering. Oxford: Blackwell Scientific Publications.
- Green, M. R., & Sambrook, J. (2012). Molecular Cloning: a Laboratory Manual. Cold Spring Harbor, NY: Cold Spring Harbor Laboratory Press.
- Selected papers from scientific journals, particularly Nature & Science.
- Technical Literature from Stratagene, Promega, Novagen, New England Biolabs etc.