



GENOME EDITING AND ENGINEERING

PROF. UTPAL BORA

Department of Biosciences and Bioengineering
IIT Guwahati

PRE-REQUISITES : 10+2 with Biology and Chemistry

INTENDED AUDIENCE : UG/PG/PhD/Scientist in industry

COURSE OUTLINE :

This course is designed for UG & PG students, research scholars and young scientists to introduce them to basics and applications of genome editing and engineering. The course starts with understanding of basic organization and structure of genome. It gives a brief overview on different DNA strand breaks and their repair mechanism. It introduces learners to theoretical basics of genetic engineering and discusses its limitations in tackling genetic problems of animals and plants. The key concepts of Genome editing are discussed thoroughly with emphasis on the major genome editing tools ZFN, TALEN and CRISPR/Cas9. It discusses the biochemical basis of development of the genome editing tools, their design and their applications in various genetic conditions. It also discusses the scope and prospect of using these technologies in solving major genetic disease of human. The learners will also be acquainted with the ethical concerns associated with applications of genome editing and engineering in germline.

ABOUT INSTRUCTOR :

Prof. Utpal Bora is Professor in Department of Biosciences and Bioengineering and adjunct professor in Centre for the environment at IIT Guwahati. Prof. Bora received his PhD from Institute of Genomics and Integrative Biology, Delhi. Prof. Bora teaches Research Methodology, Genome editing and engineering, Advance genetic engineering to undergraduate and postgraduate students of IIT Guwahati. Prof. Bora has an extensive research experience in the areas of Seri-biotechnology, Tissue engineering, genetic engineering and aptamer based molecular diagnostics.

COURSE PLAN :

Week 1:Introduction to genetics and genetic engineering

Week 2:Breakage and Repair Of Genomic DNA

Week 3:Recombination

Week 4:Targeted genetic modification

Week 5:Zinc Finger Nuclease (ZFN) Technology

Week 6:Transcription activator-like effector nuclease (TALEN) Technology

Week 7:Clustered regularly interspaced short palindromic repeats (CRISPR)/Cas9 technology

Week 8:Applications of genome editing in treating human diseases

Week 9:Genome engineered Disease modeling

Week 10:Engineered immune cells for cancer therapy

Week 11:Personalized therapy; Challenges: safety and specificity

Week 12:Ethical concerns: Germ line gene editing