

CHEN 4700. Principles of Genomic Technologies (Points: 3)

Course Description

This lecture course provides a comprehensive approach to integrate chemical science, engineering and biological science to study the structure, assembly and the function of the genome. The emphasize is on the understanding of how chemistry and molecular engineering is utilized in living systems to synthesize, replicate, modify and regulate the genome, and the molecular mechanism to translate the genetic information in the genome to the functional molecule of proteins. This knowledge provides the molecular basis for using organic synthesis and biophysical methods to modify, label and dissect the components involved in the genomic process, which allows the development of new approaches to sequence the genome, detect mutation, and measure gene expression at the genomic scale.

Outline of Course Content

Chemical and physical aspects of genome structure and organization, genetic information flow from DNA to RNA to Protein. Nucleic acid hybridization and sequence complexity of DNA and RNA. Genome mapping and sequencing methods. The engineering of DNA polymerase for DNA sequencing and polymerase chain reaction. Fluorescent DNA sequencing and high-throughput DNA sequencer development. Construction of gene chip and microarray for gene expression analysis. Technology and biochemical approach for functional genomics analysis. Gene discovery and genetics database search method. The application of genetic database for new therapeutics discovery.