

Educational Objectives:

1. This course educates and develops skills in students who desire to work to solve problems related to genomics and proteomics by using bioinformatics tools. Offers students an opportunity to practice accessing and using online databases to engage in real-time discoveries using the same approach current scientist's use in their own research. Focuses on the process of doing genomic analysis and thinking from a genomics perspective.

2. **Course Outcomes:**

- a. The student should be able to use various softwares as tools of research.
- b. Be able to explore online databases for faster and quicker way to analyze genetic/proteomic results.
- c. Be able to design primers (online) for genomic analysis.

3. **Course Contents:**

- a. Introduction to genomics
 - (1) Gene Expression: Gene-chips/Microarrays, Technical methodology and analyses of microarray data; brief overview of proteomics
- b. How genomes are annotated
 - (2) Use of Genomics in biomedicine: Mutations, alleles and single nucleotide polymorphisms (SNPs), Genetic testing
- c. Overview of genomics projects
 - (3) Genome analysis: Bioinformatics, Data-mining, Prediction of open reading frames, Characteristic sequence features, and regulatory sequences; Familiarity with whole genome browsers
- d. Proteomics
- e. Transcriptomics

- f. Metabolomics
- g. Protein structures and function
- h. Molecular phylogeny and evolution
- i. Gene Finding and Sequence Annotation
- j. Bioinformatics for Cancer Genomics
- k. Homology modeling
- l. Predicting Protein Structure and Function from Sequence
- m. Data mining
- n. Applications of bioinformatics
- o. Ethical, social and philosophical considerations
 - (1) The Ultimate Genomic Phenotype- Death, Aging and the hidden costs for a prolonged life, Patent Law and Genomics, Genetically Modified Organisms

Recommended Books

1. **Beginning Perl for Bioinformatics** by James Tisdall. O'Reilly. 2001.
2. **Learning Perl - Making Easy Things Easy and Hard Things Possible** by Randal L. Schwartz, Tom Phoenix, brian d foy. O'Reilly. 2008.
3. **The processes of life: an introduction to molecular biology** by Lawrence Hunter. MIT Press, 2009.
4. **Essential Cell Biology** by Alberts et al. Garland Science. 3rd Edition.
5. **Molecular biology of the cell** by Bruce Alberts et al. Garland Science. 5th Edition.
6. **Bioinformatics** edited by Paul H. Dear. Method Express, 2007.
7. **Discovering Genomics, Proteomics, & Bioinformatics** by A. Malcolm Campbell and Laurie J. Heyer. Pearson. 2nd Edition, 2007.
8. **Genomics, Proteomics, & Bioinformatics** by Campbell and Heyer.