1T766: Genomics : Concepts, Methods and Applications (GCMA)
3 Credits

Examination: Midsem (10 assignments + 40) & Final (10 assignments+ 40)

Prerequisites: Must complete the 1st semester and at least credited the course on "Computational Biology & Bioinformatics". Must have basic knowledge of Molecular Biology and Recombinant DNA Technology.

Objective: This course is an integrated presentation of genome organization, genome sequencing and characterization, comparative genomics, transcriptomics and introductory genomic data analysis. The course objective is to instill sufficient knowledge to the students to be conversant in all of the areas of genomics and provide a knowledge base that enables the student to successfully move on and master advanced topics in genomics. On the whole, the course will enhance the students' overall comprehension of the subject, improve their computational skills and eventually assist in proper planning, execution and analysis of their research work.

Course content:

Next Generation Sequencing Technologies: Methods and applications (4)

Whole Genome Sequencing and Analysis: Concept, methods, assembly (de novo and reference-based), genome annotation (structural and functional), comparative genomics (10)

Highthroughput Transcriptome Profiling: Concept, methods and applications; transcriptome construction (de novo and reference-based), differential gene expression (10)

Noncoding RNAs: Small RNAs, miRNAs, long non-coding RNAs; sequencing and prediction methods; biological relevance (10)

Single nucleotide polymorphisms: Genome resequencing; data processing and SNP prediction; applications in agriculture/human health (6)

Suggested readings:
1. Review and research articles in national and international journals
2. Online webpages/videos of various databases and sequencing platforms.
3. Principles of genome analysis and genomics - Sandy B. Primrose, Richard M. Twyman
4. Introduction to Bioinformatics: A theoretical and practical approach - Stephen A. Krawetz, David D. Wonmble
5. Fundamentals of data mining in genomics and proteomics - Werner Dubitzky, Martin Granzow, Daniel Berrar
6. A primer of genome science - Greg Gibson, Spencer V. Muse
7. Metzker ML (2010) Sequencing Technologies—The Next Generation. Nature Reviews Genetics 11: 31 PMID: 19997069
8. Mardis ER. (2008) Next-generation DNA sequencing methods. Annu Rev Genomics Hum Genet. 2008;9:387-402.