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|---|----------|----------|----------|----------|-----------------------------|---|
| <b>Computational Analysis of OMICS data<br/>DSE 4, VI. 5.5.</b> | <b>4</b> | <b>0</b> | <b>0</b> | <b>4</b> | <b>12<sup>th</sup> Pass</b> | <b>One programming language, Basic knowledge of statistics and biology.</b> |
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### **Learning Objectives**

#### **This module is designed to:**

- Introduce students the basic tools and processes of genetic engineering
- Introduce students to basic tools of genomics and proteomics
- Introduce students to building and analyzing networks involving complex biological data.

### **Learning outcomes**

#### **After studying this course, the students will be able to:**

- develop skills in understanding the advancement of the genomic and proteomics branches of Sciences and their importance in manipulating genome and proteome.
- handle genome and proteome data.
- do mathematical prediction of high throughput data

### **SYLLABUS**

**(120 hours)**

#### **Practicals-**

1. Computational analysis of genomics / proteomics / Metabolomics data
2. Large scale genome sequencing strategies and interpretation of results
3. Handling microarray data, SNPs and OMIMs
4. Transcriptome Analysis: Databases and basic tools: Gene Expression Omnibus (GEO)
5. Array Express, SAGE databases
6. RNA Sequencing
7. Active site prediction
8. Machine learning tools, such as Neural network, SVM etc.
9. Protein MS applications: Identifying unknown proteins by peptide mass fingerprinting; de novo sequencing of peptides from fragment ion spectra obtained by tandem MS; Protein arrays: basic principles.
10. Using bioinformatics tools for proteomics: SEQUEST, MASCOT etc.

#### **Essential Readings**

- Gary Hardiman, Ed, Systems Analytics and Integration of Big Omics Data, 2020, SBN 978-3-03928-744-4, <https://doi.org/10.3390/books978-3-03928-745-1>
- Bioinformatics for Omics Data Methods and Protocols, Edited by Bernd Mayer, emergentec biodevelopment GmbH, Vienna, Austria, Humana Totowa, NJ, 2011, 978-1-61779-027-0Published: 03 March 2011
- Omics Approaches, Technologies and Applications, Integrative Approaches For Understanding OMICS Data, Edited by Preeti Arivaradarajan, Gauri Misra, 2018, Springer Nature, <https://doi.org/10.1007/978-981-13-2925-8>
- Big data in OMICS and Imaging, Momiao Xiong, Chapman and Hall/CRC, 2017.