

<b>Programme</b>	Biotechnology	<b>Course Code</b>	<b>BT. 302</b>	<b>Credit Hours</b>	3
<b>Course Title</b>	<b>Genomics and Proteomics</b>				
<b>Course Introduction</b>					
<p>This course provides a comprehensive introduction to genomics and proteomics, focusing on the technologies, methodologies, and applications used to study genes, proteins, and their interactions. Students will gain hands-on experience with tools and develop an understanding of how these fields contribute to advancements in medicine, agriculture, and biotechnology.</p>					
<b>Learning Outcomes</b>					
<p>On the completion of the course, the students will:</p> <ul style="list-style-type: none"> <li>• Explain the principles and techniques used in genomics and proteomics.</li> <li>• Analyze genomic and proteomic data to identify gene and protein functions.</li> <li>• Discuss the applications of genomics and proteomics in biotechnology.</li> </ul>					
<b>Course Content</b>					
<ul style="list-style-type: none"> <li>• Introduction to Genomics and Proteomics</li> <li>• Overview of genomics and proteomics.</li> <li>• Applications in research, medicine, and industry.</li> <li>• Historical background and key milestones.</li> <li>• DNA Structure and Function</li> <li>• Molecular biology basics: DNA replication, transcription, and translation.</li> <li>• Gene structure and function.</li> <li>• Genomic Technologies</li> <li>• Introduction to Genome Organization</li> <li>• DNA sequencing technologies: Sanger sequencing, Next-Generation Sequencing (NGS).</li> <li>• Gene mapping</li> <li>• Exclusion mapping</li> <li>• Linkage mapping</li> <li>• Gene Expression Analysis</li> <li>• Methods for studying gene expression: qPCR Microarrays</li> <li>• Introduction to Proteomics</li> <li>• Protein structure and function.</li> <li>• Overview of mass spectrometry and its role in proteomics.</li> <li>• Proteomic Technologies</li> <li>• Mass spectrometry: principles, types, and data analysis.</li> <li>• Protein identification and quantification.</li> <li>• Protein-Protein Interactions</li> <li>• Techniques for studying protein interactions</li> <li>• yeast two-hybrid.</li> <li>• Advance Approaches in proteomics</li> </ul>					

- ICAT technique
- ITRAQ technique
- Applications in Medicine
- Genomic medicine; personalized medicine
- Proteomics in biomarker discovery and drug development.
- Applications in Agriculture and Biotechnology
- Genomics and proteomics in crop improvement.
- Biotechnology applications: synthetic biology, industrial enzymes.
- Ethical, Legal, and Social Implications
- Ethical issues in genomics and proteomics research.
- Data privacy and consent.
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- Data privacy and consent.

### **Textbooks and Reading Material**

Textbooks.

- Cecilia Saccone, Graziano Pesole (2003) “Handbook of comparative genomics: principles and methodology”. Published by Wiley-Liss.
- Functional genomics by Chris Town (2002). Published by Springer.
- T. Strachan, Andrew P (2004) Human Molecular Genetics-3. Read Published by Garland Science.
- Jones and Bartlett Publishers, (2007) Genes IX by Benjamin Lewin.
- 5 Systems Biology by Mohamed Al-Rubeai (2006), Martin Fussenegger Published by Springer
- Online Resources: NCBI, UniProt, Ensembl, KEGG Pathway Database

### **Teaching Learning Strategies**

- Lectures
- Assignments
- Visits to learn about advance equipment
- Discussions
- Exams

### **Assignments: Types and Number with Calendar**

- Quizzes
- Visit to SBS to learn about MALDI-TOF
- Project
- Presentation

Assessment			
Sr. No.	Elements	Weightage	Details
•	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
•	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
•	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.