

Department of Biotechnology
St. Xavier's College, Ranchi

Course title: Genomics and its application

No. of class: 30

Course Coordinator: Dr Alfred Besra

Introduction:

Genomics is the study of an organism's entire genetic material, known as the genome. It involves analyzing DNA sequences to understand genes, their functions, and interactions. This field has revolutionized medicine, agriculture, and biotechnology by enabling advancements like personalized medicine, gene editing, and improved crop breeding. Genomics also plays a crucial role in disease research, helping scientists identify genetic factors contributing to illnesses such as cancer and genetic disorders. The rapid evolution of sequencing technologies continues to expand the possibilities in this fascinating area of science.

Objective: This course provides students with a foundational understanding of genomics, its applications in various fields, and hands-on experience in genomic data analysis.

1: Introduction to genomics

Scope of genomics, database of genomics, sequencing techniques: Sangers, Maxam-Gilbert, Pyrosequencing, genome assembler

2: Tools to understand genomics

Genome Browsers, NCBI, UCSC, ENSEMBL, VISTA

3: Genomics & Biotechnology

PCR, Codon optimization, gene editing, gene expression study, Genome Annotation

4: Practical approach in genomics

Understanding plant genomics, Crop Improvement, molecular mimicry

Practical's

1. Use of NCBI BLAST to align sequences
2. Use of SNP database (NCBI)
3. Construction of Phylogenetic tree
4. Protein structure prediction

Program outcome

- Students will gain knowledge of genome sequencing methods and bioinformatics tools for genome assembly and annotation

- Students will learn how genomics is used in disease research, drug development, and synthetic biology
- Students will develop skills in analyzing genomic data, identifying genetic variants, and interpreting transcriptomics results

Target Group:

- UG and PG students of Zoology, Botany and Biotechnology.
- Limited to **30 participants** on a first-come, first-served basis.

Commencement of Classes:

- From 18th August onwards, 2025

Course Duration:

- 30 hours (including lectures, demonstrations, hands-on sessions). (**Theory 14 hours + practical 16 hours**)

Certification:

- A certificate of completion will be issued to participants who attend at least 80% of the sessions and complete the final assessment.

Course Fee:

- Rs. 2000/- per participant

Final Assessment

- **Written exam 50 marks + practical exam 50 marks**

How to Apply:

- Interested candidates must fill out the online registration form (link to be provided by department of biotechnology/college).
- Pay the course fee via UPI/Bank transfer (details to be shared in the registration form).
- Confirmation email with schedule and instructions will be sent upon successful registration.

Dr. Fr. Pradeep R. Kujur, s. j. (Principal)

Dr. Shiv Kumar (IQAC Coordinator)

Dr. Sanyukta Kumar (Head, Dept. of Biotech.)

Dr. Alfred Besra (Course Coordinator)