Bijoy Krishna Girls' college

Department of Zoology in Collaboration with Department of Microbiology , Mathematics Computer Science & R&D cell, IQAC

Certificate course -2024-2025
Course Title: *"Computational Biology"*

CODE: ZOO CB
Duration: 30 hours   **Admission fees: Nil**
Course fees: Nil   **Eligibility: Any UG student of BKGC**
Capacity: 60   **Admission: First Come First Serve**

Summary of the course:

The **Certificate Course in Computational Biology** is designed to introduce undergraduate students to essential computational and bioinformatics approaches used in modern biological research. This course bridges the gap between biological data and computational analysis, equipping students with practical skills to explore genomic and proteomic information.

Students will learn how to navigate genomic databases, identify genetic variants, and design primers for experimental applications. They will gain insights into protein structure analysis, ligand interactions, and visualization techniques. The course also covers molecular docking using AutoDock Vina to understand precision drug-target interactions.

Additionally, fundamental concepts of bio-mathematics will be introduced to strengthen students' quantitative and analytical skills, providing a holistic understanding of computational approaches in biology.

By the end of the course, students will have hands-on experience with widely used bioinformatics tools and a strong conceptual understanding of how computational methods support biological research and biotechnology applications.

Objective of the course/ Course Outcome:
After completing this course, students will be able to:

1. **Navigate and interpret genomic databases**

   o   Access and analyze genome sequences.

   o   Perform variant identification using bioinformatics tools.

   o   Design primers for gene amplification and cloning.

2. **Explore protein structures and ligand interactions**

   o   Retrieve and curate protein structure data from major databases.

- o Visualize and analyze 3D protein conformations.
- o Understand the basics of ligand-binding mechanisms.

3. **Apply molecular docking techniques**

- o Learn the principles of computational docking.
- o Perform docking simulations using AutoDock Vina.
- o Interpret docking results for protein-ligand binding affinity.

4. **Develop basic bio-mathematical skills**

- o Understand mathematical concepts relevant to biological systems.
- o Apply statistical and computational reasoning in biological research.

5. **Gain hands-on experience with bioinformatics tools**

- o Work with user-friendly software and web-based tools.
- o Integrate computational biology concepts with experimental biology.

6. **Build a foundation for research and career advancement**

- o Prepare for further studies in bioinformatics, computational biology, or biotechnology.
- o Enhance problem-solving skills for modern biological data analysis.

Syllabus:

- ✓ Navigating the Genome: Data Browsing, variant identification, Bioinformatic Tools, and Primer Designing
- ✓ Exploring Proteins and ligands: Structure Analysis, Database Curation,and Visualization Tools
- ✓ Precision Binding: Understanding Molecular Docking Techniques with AutoDock Vina
- ✓ Basics of Bio Mathematics

Computational Biology; Certificate Course
Department of Zoology with Microbiology, Mathematics,Computer Science & R&D Cell IQAC

- Title:Computational Biology
- Date: 1st to 8th April
- Organizer(s): **Department of Zoology** with Microbiology, Mathematics & Computer Science in association with R & D Cell, IQAC
- **Syllabus Framed by: Dr.Papiya Ghosh; Dr.Susanto Sadhukhan; Dr.Sayak Bhattacharyya; Biswajit Saha**

Funding (with proof): Funded by DBT STAR College Scheme,IFD, DBT, vide their SAN No. Project no. **HRD-11011/26/2024-HRD-DBT: Dated 30.09.2024**.

- **Collaborators (with proof):** NIL
- **Resource Persons:**
- **External:**
  For 1st phase / Inaugural session : Dr. Mainak Sengupta,Assistant Professor ,Department of Genetics, University of Calcutta
  For 2nd phase
  1.Dr.Samudra Paul, Assistant Professor; Department of Biotechnology ,School of Life Sciences; Swami Vivekananda University
  2. Dr.R. Das, Associate Professor, Mathematics ;Serampore college
  Internal:
  Biswajit Saha ; Dr.Susanto Sadhukhan ;Dr.Sayak Bhattacharrya ;Dr.Saurav Dutta; Joy Adhikary
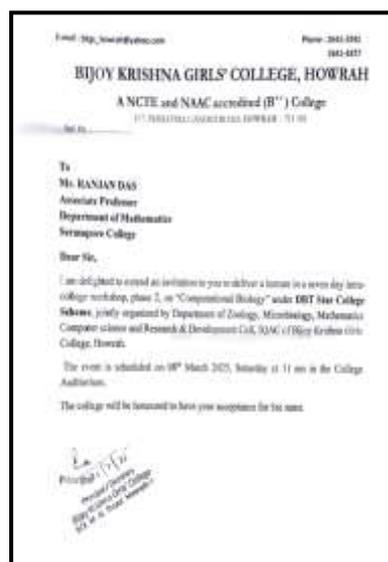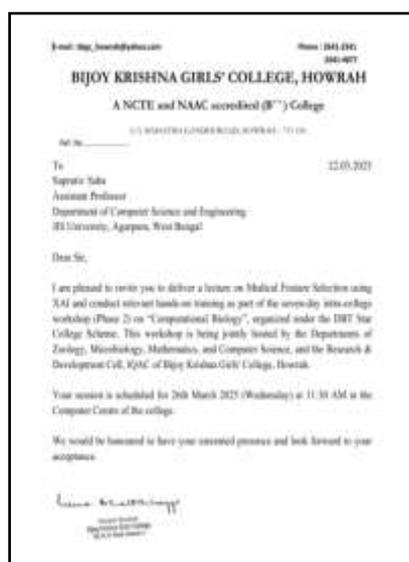
- **Number of Participants with proof: 28**

Name	C U Roll No.	C U Regn No.	Department
Asha Basu Mallick	223411-11-0046	411-1211-0445-22	Microbiology
Sreedeepa Mondal	223411-11-0068	411-1211-0471-22	Microbiology
Saheli Bhattacharya	223411-11-0077	411-1211-0485-22	Microbiology
Shreyashree Pramanik	223411-11-0138	411-1212-0492-22	Microbiology
Sathi Pandit	223411-11-0095	411-1211-0510-22	Microbiology
Sada Siddiqa Nabiha	223411-11-0159	411-1215-0488-22	Microbiology
Anushka Naskar	223411-11-0126	411-1212-0419-22	Microbiology
Mehar Afroz	223411-11-0050	411-1211-0449-22	Microbiology
Shafaque Naz	223411-11-0048	411-1211-0447-22	Microbiology
Dipannita Bhattacharya	233146-11-0020	146-1211-0496-23	Microbiology
Atikur Rahaman	233146-21-0056	146-1115-0507-23	Microbiology
Rupsa Bhowmick	223411-11-0090	411-1211-0504-22	Mathematics
Dipannita Bhattacharya	233146-11-0020	146-1211-0496-23	Microbiology
Atikur Rahaman	233146-21-0056	146-1115-0507-23	Microbiology
Antika Jana	223411-11-0087	411-1211-0501-22	Zoology
Esika Das	223411-11-0107	411-1211-0531-22	Zoology
Koushani Poddar	223411-11-0094	411-1211-0508-22	Zoology
Sohini Mandal	223411-11-0089	411-1211-0503-22	Zoology Honours
Saswati Panja	223411-11-0053	411-1211-0452-22	Zoology
SUSMITA BOSE	223411-11-0061	411-1211-0462-22	ZOOLOGY (HONOURS)
Ahana Ghosh	223411-11-0093	41112-11-0722	Zoology
MOUMITA BOGI	223411-11-0137	411-1212-0490-22	Zoology

Sayoni Das	223411-11-0100	411-1211-0520-22	Zoology
Tiyasha Naskar	223411-11-0143	411-1212-0516-22	Zoology
Debanjana Chaudhury	223411-11-0106	411-1211-0529-22	Zoology
Tiyasha Naskar	223411-11-0143	411-1212-0516-22	Zoology
Varsha Tiwari	213411-11-0062	411-1211-0430-21	Zoology
Sheetal singh	223411-11-0164	411-1211-0971-22	Computer science
Tapati Paul	223411-11-0042	411-1211-0441-22	Computer Science
Nandini khara	223411-11-0022	411-1211-0412-22	Computer science
Sampita Mondal	223411-11-0010	411-1211-0398-22	Computer Science
Shrijita Banerjee	223411-11-0003	411-1211-0389-22	Computer Science
Rumpa Naskar	223411-11-0129	411-1212-0436-22	Mathematics
Chandreyee Samaddar	223411-11-0139	411-1212-0497-22	Mathematics

Report on the programme:

A 30 contact hours certificate course on **Computational Biology** was successfully conducted to provide undergraduate students with hands-on exposure to modern bioinformatics tools and techniques. The program aimed to bridge the gap between theoretical biology and practical computational applications in genomics, proteomics, and drug discovery.

Objectives:

- To familiarize participants with genome navigation and variant analysis
- To introduce protein structure analysis and ligand interaction studies
- To demonstrate molecular docking using AutoDock Vina
- To enhance understanding of bio-mathematics and its relevance to biological data interpretation

Topics Covered:

1. **Navigating the Genome:**

- o Data browsing, variant identification, and primer designing using bioinformatics tools.
2. **Protein and Ligand Analysis:**
   - o Structural analysis, database curation, and molecular visualization techniques.
3. **Molecular Docking Techniques:**
   - o Precision binding and interaction modeling using **AutoDock Vina**.
4. **Basics of Bio-Mathematics:**
   - o Quantitative approaches in biology, data interpretation, and model building.

Methodology:

Each session included theoretical lectures followed by practical, hands-on sessions. Tools like **NCBI**, **PDB**, **AutoDock Vina**, **PyMOL**, and **primer design software** were actively used.

Feedback:

The course received highly positive feedback. Students appreciated the balance between theory and practice, especially the sessions on protein-ligand interaction and molecular docking.

Conclusion:

The course successfully achieved its objectives and equipped participants with essential skills in computational biology. It provided a strong foundation for further research and academic pursuits in bioinformatics and molecular modeling.
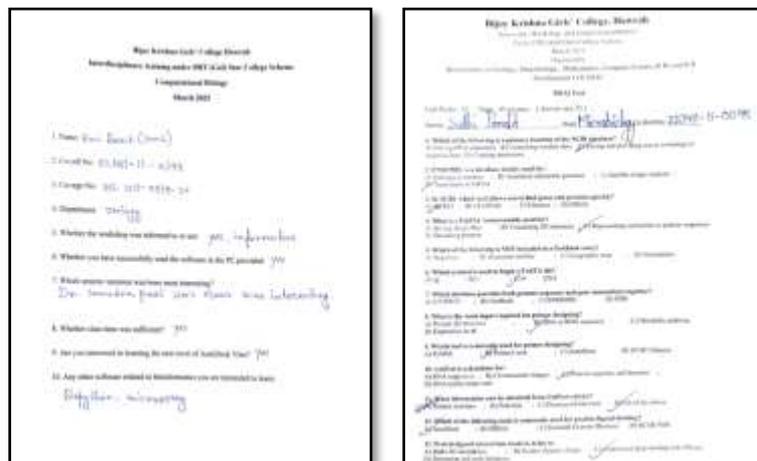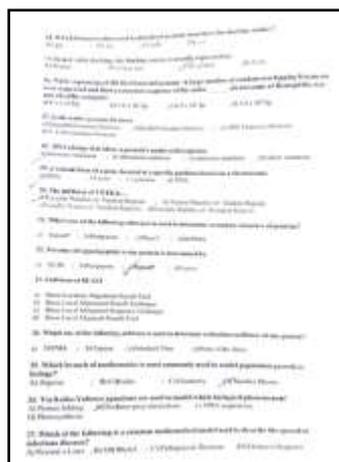
Programme Outcome:

Upon successful completion of this course, students were able to:

1. **Interpret and Analyze Genomic Data:**
   - Navigate genomic databases to browse and extract relevant data.
   - Identify genetic variants and understand their biological significance.
   - Apply bioinformatic tools for sequence analysis and design primers for experimental validation.
2. **Explore and Characterize Protein-Ligand Interactions:**
   - Analyze protein structures and ligand properties using advanced visualization tools.
   - Perform database curation to compile and evaluate structural and functional information of biomolecules.
3. **Perform Molecular Docking Simulations:**
   - Understand the principles and applications of molecular docking.
   - Use **AutoDock Vina** to predict and evaluate binding interactions between proteins and ligands with precision.
4. **Apply Quantitative Reasoning in Biology:**
   - Utilize basic mathematical concepts and statistical tools to model biological systems and interpret computational results.
5. **Integrate Computational Tools in Biological Research:**
   - Demonstrate proficiency in integrating bioinformatics workflows across genomics and structural biology to address real-world biological problems.

Poster/Brochure/Banner

Bijoy Krishna Girls' College Howrah

Interdisciplinary Training Under DBT (GoI) Star College Scheme

COMPUTATIONAL BIOLOGY

Certificate Course , Hybrid Mode

Department of Biotechnology, Government of India

1st - 8th March 2025
11:30 am - 4 pm
Zoology Dept. (lecture)
Computer Centre (hands on)

Organised by

Department of Zoology , Microbiology , Mathematics, Computer Science & Research & Development Cell, IQAC

Resource Person: External

- Dr. Samudra Pal, Assistant Professor
  Department of Biotechnology, School of Life Sciences
  Swami Vivekananda University

- Dr. R. Das, Associate Professor, Mathematics
  Serampore college

Resource Persons: Internal

- Biswajit Saha
- Dr. Susanto Sadhukhan
- Dr. Sayak Bhattacharrya
- Dr. Saurav Dutta
- Joy Adhikary

SCAN ME

Bijoy Krishna Girls' College Howrah

COMPUTATIONAL BIOLOGY

Interdisciplinary Training Under DBT (GoI) Star College Scheme

Department of Biotechnology, Government of India

1st - 8th March 2025
12 noon-4 pm
College Auditorium (lecture)
Computer Centre (hands on)

- ✓ Navigating the Genome: Data Browsing, variant identification, Bioinformatic Tools, and Primer Designing
- ✓ Exploring Proteins and ligands: Structure Analysis, Database Curation, and Visualization Tools
- ✓ Precision Binding: Understanding Molecular Docking Techniques with AutoDock Vina
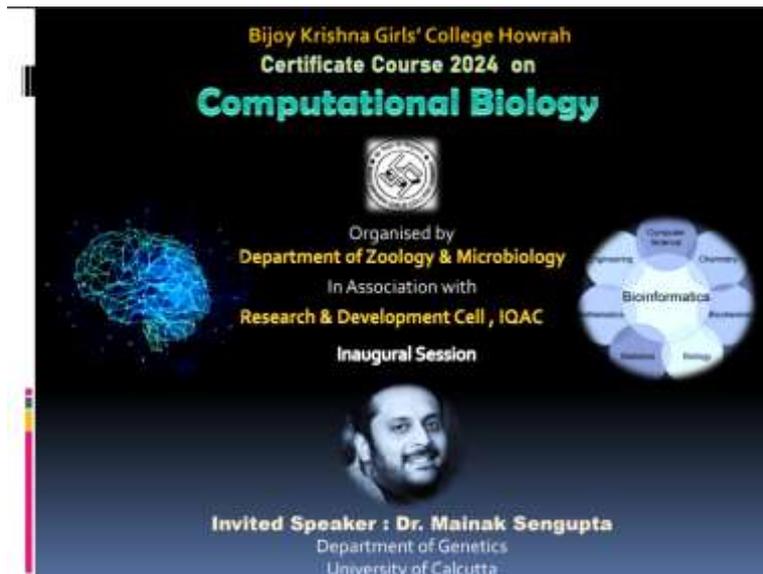- ✓ Basics of Bio Mathematics

https://forms.gle/qjrMCfpHBNjNmkNS8

SCAN ME

Sample Certificate

Geo-tagged pictures