The University of Burdwan

Department of Molecular Biology and Human Genetics

Department of
Molecular Biology and Human Genetics

The University of Burdwan
Burdwan – 713 104, West Bengal, India

CONTENTS

History Behind Department: Vision and Mission

The Department of Molecular Biology & Human Genetics is the first of its kind in the eastern region of India. Its inception traces back to an initiative by the Department of Zoology, which proposed the establishment of a Centre for Molecular Diagnostics in 2017. This initiative aimed to bridge the technological and manpower gap in the field of human genetics and molecular diagnostics to meet the growing demand for expertise in these areas.

Recognizing this necessity, the university formally approved the establishment of the department to offer a postgraduate program in Molecular Biology and Human Genetics during a Court meeting held on December 24, 2020. Subsequently, Prof. Anupam Basu from the Department of Zoology was entrusted with the responsibility of leading the department as in- charge (Vide No. R/…./MBHG/185 dated January 29, 2021).

The department is envisioned as a center of excellence dedicated to advancing research in human genetics, molecular diagnostics, and therapeutic strategies for various human diseases.

Vision

To impart in-depth knowledge in Human Genetics and Molecular Biology, with a strong emphasis on advanced research areas such as Gene Therapy, Stem Cell Biology, Cancer Genomics, Computational Biology and Molecular Diagnostics.

Mission

» To advance healthcare genomics and develop a skilled workforce for the biotechnology and healthcare industries.

» To promote cutting-edge research in Artificial Intelligence and Genomics.

» To foster innovations in Gene Therapy, Stem Cell, and Regenerative Medicine.

» To strengthen industrial collaborations in genomics and healthcare, bridging academia and industry for translational research.

Industry -Ready Manpower in Health Care and Genomics

In the post-Human Genome Project era, the biotechnology industry has increasingly integrated into healthcare through genomic-based solutions, including diagnostic next-generation sequencing, gene therapy, and pharmacogenomics. According to a 2021 report by the Confederation of Indian Industry (CII), the global genomics market is projected to grow from USD 22.7 billion in 2020 to USD 54.4 billion by 2025. In response, CII has recommended.

increased funding to enhance genome-based healthcare solutions. This investment will create significant job opportunities and drive advancements in the biotech industry, particularly in health genomics, stem cell research, Vaccine development, and other emerging fields.

To capitalize on these opportunities, this course is designed to build capacity in these domains, integrating industrial internships and site visits to strengthen industry linkages. The postgraduate program in Molecular Biology and Human Genetics aims to equip students with industry-relevant skills, bridging the gap between training through University Degree and job opportunities in the biotechnology sector.

Prof. Anupam Basu
(In Charge)

Department at Glance

Name of the Course (interdisciplinary)	Molecular Biology and Human Genetics
Year of Establishment	2020/2021
Course offered	M.Sc.
Curricular Aspect	Semester & CBCS
Current Students in PG	SEM-III : 11 SEM-I: 12

Highlights of Post Graduate Program

The Department is offering M.Sc. in Molecular Biology & Human Genetics with the choice-based credit system (CBCS) since 2021.

Program Highlights

A] Highlights of Theoretical Courses

» Basic Inheritance Biology

» Genetic Engineering

» Computational System

» Biostatistics

» Bioinformatics

» Omics or System Biology

» Human Genetics and Genomics

» Clinical Genetics and Genetic Counselling

» Pharmacogenomics

» Neurogenetics

» Developmental Genetics

» Biochemistry and Cell Biology

» Infection Biology

» Molecular Diagnostic

» Cancer Biology and Cancer genetics

» Advance Techniques in Molecular Biology and Genomics

B] Highlights of Practical

» Molecular Biology : DNA and RNA Extraction, Gel electrophoresis and PCR and RT PCR. Sanger Sequencing and others

» Cell Biology : Cell Culture, Flow cytometry and others

» Computational System: Linux based OS and genomics solution, Python code based genomic data analysis , R –programming and Statistical analysis

» NGS: NGS data analysis, FASTQ file, BAM file , SAM file, VCF file annotation, Exome sequence and Clinical Exome data analysis, Target panel preparation, Library preparation, QC check

» Omics and System Biology : Transcriptome data analysis, Differential gene expression, Gene set enrichment analysis, GO Molecular pathway analysis Network analysis, Heatmap preparation and others

» Microbiology: Bacterial culture, gram staining, Antibiotic sensitivity test and others.

» Bioinformatics : Databases, ClinVar, OMIM, Protein Modelling, Docking and drug designing, Pathway and network analysis and others

C] Clinical Assignment/ Community Engagement :

» The motto of this component to understand clinical service, diagnostic importance and link up with the society with the knowledge

D] Internship and Biotech Industry and lab Visit:

» This will help students understand and exposer to the functions, operations, and R&D processes in various biotech industries and research laboratories. It also provides a direct pathway to industry connections for future job opportunities, which may be substitute of campus-based placements.

E] Journal Club and Term paper and Project work:

» This will help students to understand the advance research problem formulation, workplan and science communication and publication.

» The present course of MSc syllabus will also cover the curriculum of NET, BET, or ICMR and other entrance test for research programme.

Salient Features

» The degree programme thus addresses an interdisciplinary area at the interface of modern biology and medicine and is expected to especially help students interested in pursuing a career in research in bio-medical and clinically relevant industry sectors.

Program Specific Outcomes (PSOs) of MSc

Upon successful completion of the M.Sc. Students can be Competitive for Genomic Industry, Stem cell Industry or others along with fit for advance research in Molecular Biology and Human Genomics   with following areas

Advanced Genomic and Genetic Analysis
  * Demonstrate expert knowledge in genomic technologies, in both clinical and research settings for disease diagnosis and risk prediction and Genomic Industry .

Computational Genomics and Systems Biology
  * Utilize computational tools and systems biology approaches to analyze complex genomic data and Omics big Data

Bioinformatics and Artificial Intelligence in Biology
  * Knowledge about bioinformatics tools and AI-based algorithms for predictive modeling in genomics and others

Gene Editing and Gene Therapy
  * Proficiency in gene editing technologies and their application in correcting genetic disorders

Cell Culture and Stem Cell Biology
  * Learn techniques in mammalian cell culture, including stem cell culture in Research and Stem Cell Industry

Cancer Biology and Therapeutics
  * Understand current strategies in cancer diagnosis, targeted therapy, and Oncology research

Endocrinology and Hormonal Disorders
  * Acquire advanced understanding of hormonal regulation and associated disorders.

Immunology and Infection Biology
  * Apply immunological principles to diagnose and manage infectious diseases.

Microbiology and Microbial Applications
  * Cultivate and study microbes for research and Vaccine Industry .

Monoclonal Antibody Techniques

  * Gain expertise in monoclonal technology and the Therapeutic Application
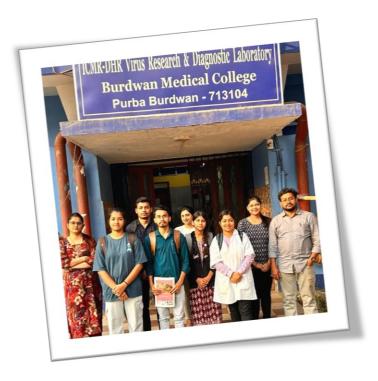
Student's Participation: Enjoying Practical Class

Student's Participation: Enjoying Learning

Student's Participation: Clinical Outreach

Industry Based Internship Opportunity -2025

» Cordlife Sciences India Pvt. Ltd., Subsidiary of Cordlife Group Limited, a Singapore

» Tata Translational Cancer Research Centre (TTCRC)., Tata Medica; Centre. Kolkata

Brief Profile of Faculty Members Engaged

PROF. ANUPAM BASU
In-charge
M.Sc (Zoology), M.Phil, PhD

Course Taught: Medical Genetics, System Biology, Computational Genomics, Bioinformatics, Molecular Diagnostics, Evolutionary Genetics, Immunology, Cancer Genomics, Instrumentation.

Area of Research Interest: System Biology and Medical Genomics, Stem Cell Biology and HSC maturation , Thalassemia, Cancer Immunology and Rare disorder

Teaching Experience: 17 years

Research experience : 28 years

Present Designation: Professor, Department of Zoology

Significant Accomplishments:
» Post-Doctoral Fellow, Health Science Centre University of New Mexico, USA (2006- 2007).
» Former Associate Director at National Institute of Biomedical Genomics, Kalyani, India (2021 - 2023, Lien Bound)
» Founder and Director, Genoclimics Pvt Ltd.

No. of Paper and Patent: paper: 45, Patent (Submitted):02

No. of PhD student guided: 17

PhD Area and Institute: Immunodiagnostics, [National Institute of Health and Family Welfare, New Delhi (Degree: The University of Burdwan)]

PROF. SUNIL KARFORMA
MCSE, Ph.D.

Course Taught : Python for Biological Computation

Areas of Research Interest : Machine Learning, Artificial Intelligence, Network Security, Electronic Commerce, Cryptography, Block Chains, the Internet of Things and Elliptic Curve Cryptography.

Teaching Experience : 18 yrs

Research experience (year) : 18 yrs

Designation and parent Dept. : Professor, Dept. of Computer Science

Significant Accomplishment (if Any): i) Serve as PI of One Project funded by State Bank of Indiaii) Acted As External Member of Board of Studies and the Board of Research Studies (BRS) in Different State Universities Such As Binod Bihari Mahto Koyalanchal University (Dhanbad), Visva Bharati University, Kazi Nazrul University, Bankura University, Rani Rashmoni Green University, University of Gour Banga, Barasat State University. iii) He is associated with the West Bengal College Service Commission (WBCSC) as a member of the selection committee (2019 & 2022).

No. of Paper and Patent : Paper: 172, Patent: 5

Book / Book chapter : Book: 1

No. of PhD student guided : 12

PhD Area and Institute : A Study on the Application of Cryptography in E- Commerce, The University of Burdwan

PhD Area and Institute : A Study on the Application of Cryptography in E- Commerce, The University of Burdwan

PROF. RAJIB BANDOPADHYAY
MSc (BOTANY), PhD

Course Taught : Bioinformatics; System Biology; Instrumentations, Omics

Area of Research Interest: Genomics, Proteomics, Microbiology Teaching
Experience: 19 (years)

Research experience (year): Starting from PhD 25 years Present Designation:
Professor, Department of Botany

Significant Accomplishment (if Any): BOYSCAST Fellow; Participated Southern
Ocean Expedition in 2011; MNASc

No. of Paper and Patent: More than 150; Filed one

Book / Book chapter with name: Edited book-1; More than 20

No. of PhD students guided   17

PhD Area and Institute: Botany (Plant Molecular Biology), University of Calcutta

DR. ANINDYA JYOTI PAL
M.Tech. Ph.D.

Course taught: Basic computer, Programing concept, Design & Analysis of
Algorithm, Linux, DBMS, Machine Learning, etc.

Area of Research Interest: Machine Learning, Artificial Intelligence, Different soft
computing approaches to solve different hard problems and apply the same to solve
different multidisciplinary problems.

Teaching Experience: 25 yrs + Research experience (year): >15 yrs

Present Designation: Controller of Examinations, BU No. of Paper and Patent: 50

Book / Book chapter with name: 11

No. of PhD students guided: 03

PhD Area and Institute: Different Soft Computing approaches to solve Graph
Coloring Problem and Its applications, University of Kalyani

PROF. SANJIB RAY
MSc (Zoology), Ph.D

Course Taught : Cell Biology, Molecular Biology & Genetics, Molecular Diagnostics

Area of Research Interest : Bioassay guided extraction and purification of the active
principles from traditionally used medicinal plant. Evaluation of hypoglycaemic,
antimicrobial, antioxidant, antiproliferative, anticancer, metaphase arresting and
apoptosis inducing potentials of the selected phytochemicals / extract fractions.

Teaching Experience: 22 Years

Research experience (year): 25 Years Starting from PhD Present Designation:
Professor, Dept of Zoology

No. of Paper and Patent : 42 and 3 granted, 1 applied

Significant Accomplishment (if Any): Fellow of Zoological Association of Burdwan;
Bharat Vikas Award and Founder Director of Sanjibani Botanicals (OPC) Private
Limited.

No. of Ph.D. student guided :10

Ph.D. Area and Institute: Radiation Biology, NEHU

DR. SOMASRI DAM

M.Sc.(Biochemistry), Ph.D.

Course Taught: Molecular Biology, Biochemistry, Genetic Engineering & model systems, Infection Biology

Area of Research Interest : Molecular Parasitology (Entamoeba histolytica), Identification of leads from plants, Impact of probiotics on health

Teaching Experience : 13 years Research experience (year) : 22 years

Present Designation : Assistant Professor, Dept. of Microbiology Significant Accomplishment :

➢ Post-Doctoral research, Max Planck Institute for Terrestrial Microbiology, Marburg, Germany 2010-12

➢ Young Scientist Award Grant 2014, BRNS, DAE, GoI

No. of Paper and Patent : Papers- 41

Book / Book chapter with name : Book Chapter-5, Edited book-1

No. of PhD student guided : 5

PhD Area and Institute : Molecular analysis of proteins regulating epigenetic mechanism in Entamoeba histolytica, Bose Institute, Kolkata (Degree awarded-Jadavpur University)

DR. SUBHAJIT KARMAKAR

M.Sc. (Physics), Ph.D.

Course Taught : Bio-Statistics

Area of Research Interest : Biomedical Instrumentation, Ultrasound, HCI, Vision Sc. Photoacoustics,

Teaching Experience : 7 yrs + Research experience (year) : >18 yrs

Present Designation : Senior Scientific Officer, University Science Instrumentation Centre Significant Accomplishment (if Any): Completed one R&D project funded by WBDSTBT No. of Paper and Patent : 15

PhD Area and Institute : Signal Processing in Human Visual System, Ultrasound Instrumentation, Saha Institute of Nuclear Physics

---

DR. SUNIL KANTI MONDAL

MSc (Biophysics) M. Phil, PhD

Course Taught : Bioinformatics, Biotechniques, Biosafety and Bioethics

Area of Research Interest : 1. System Biology, 2. AI-ML, 3. NGS data analysis, 4. Drug Designing

Teaching Experience: 17 years

Research experience (year): Starting from PhD 18 years Parent Dept.: Faculty Member, Department of Biotechnology. No. of Paper and Patent : 23 articles

Book / Book chapter with name : 2 book chapters

PhD Area and Institute: Bioinformatics, Department of Biophysics, Molecular Biology and Bioinformatics, University of Calcutta

Course Taught : Immunology, Molecular Biology, Evolutionary Biology & Instrumentation Area of Research Interest : Cellular Immunology, Cancer Biology, Infection Biology Teaching Experience : 10 (years)

Research experience (year) : Starting from PhD 16 Years Present Designation : Assistant Professor, Department of Zoology

Significant Accomplishment (if Any): DST-SERB Early Career Research Award, American Association of Immunologist Early Career Award, IUIS Travel Award

No. of Paper and Patent : 72

Book / Book chapter: Two

No. of PhD student guided : Two (02)

PhD Area and Institute : Immunology (Banaras Hindu University)

DR. SUMIT KUMAR HIRA
M.Sc. (Zoology), Ph.D.

Course taught : Inheritance Biology , Basic Human Genetics, Molecular Human Genetics, Clinical Genetics, Molecular Diagnostics

Area of Research Interest : HPV and cervical cancer , Metagenomics, aplastic anaemia Teaching Experience : 8 years

Research experience (year) : 15 years

Present Designation : Assistant Professor, Department of Zoology. Significant Accomplishment:

» DST-SERB Early Career Research Award on20 18 for start-up research grant

» DBT-BIOCARE major research project from 2017-2021.

» Best paper award in 2019 by Emerging Contaminants journal in recognition of most citation to a paper published between 2015 and 2018

No. of Paper and Patent : Publication-23, Book / Book chapter with name : 06

No. of PhD student guided 06

PhD Area and Institute : Cancer Genomics, National Institute of Biomedical Genomics, Kalyani

DR. PARAMITA MANDAL
M.Sc. (Zoology), Ph.D

Course taught : Cell Biology, Developmental Genetics, Molecular Diagnostics Area of **Research Interest :** Drosophotoxicology, Cytogenetics, Stress Biology No. of Paper and Patent : Research articles: 23,

Book / Book chapter with name : Book Chapters: 11 Teaching Experience : UG: 1 Year 10 Months, PG: 07 Research experience (year) : 10 Years

Present Designation : Assistant Professor, Department of Zoology.

Significant Accomplishment (if Any): Received "Global Young Women Scientist Award" in 2024 by Agricultural Technology Development society (ATDS)

PhD Area and Institute : Toxicology, The University of Burdwan, Burdwan, W.B.

DR. MOUTUSHI MANDI
M.Sc. (Zoology), Ph.D

Course Taught : Computational Biology, Biostatistics

Area of Research Interest : Step-stress model, Cure rate model, Competing risks

Teaching Experience : 5 (years) Research experience (year) : 10 years

Present Designation : Assistant Professor, Dept. of Statistics

Significant Accomplishment (if Any): Outstanding PhD Thesis Award from the Department of Mathematics & Statistics, IIT Kanpur, 2021.

No. of Paper and Patent : 11

Book / Book chapter : Book Chapter (1)

PhD Area and Institute : Reliability theory and survival analysis, IIT Kanpur

DR. AYAN PAL
M.Sc. (Statistics), Ph.D.

Student's Participation with Teachers: Cultural Excitement

The University of Burdwan