Biological Sciences & Bioengineering

Indian Institute of Technology, Kanpur

Placement Brochure 2021-22

Introduction to the department

The department was established in the year 2001 with the vision of conducting cutting-edge research and providing quality teaching and research training in basic biology, biomedical and bioengineering fields. Our faculty and students come from a range of science and engineering disciplines and work in challenging problems that transcend the boundaries of science, engineering and medicine.

The department currently offers four academic programs; B. Tech, B.Tech-M.Tech Dual, M. Tech and PhD in biological sciences & bioengineering. There are 24 faculty members and about 50 postgraduate (25 PhD. and 25 M. Tech.) and 35 undergraduate students.

Recent Notable Contributions

- A team of researchers at the Indian Institute of Technology--Kanpur (IITK), led by biophysicist Dibyendu Kumar Das, is joining the race to develop a vaccine against SARS-CoV2 — the virus that causes Covid-19. Das' team at IITK's Biological Science and Bioengineering department is developing two vaccines — a subunit and a live attenuated — against the deadly virus.
- Lafora disease is caused by defects in laforin and/or malin genes. These genes are essential for heat shock response (HSR). Dr. Subramaniam Ganesh and his group has shown that mice deficient for laforin or malin show reduced levels of heat shock factor 1 and their targets in brain tissues.
- Dr. Ashwani Kumar Thakur contributed in understanding the molecular mechanism of protein and peptide aggregation. He specifically studied about the polyglutamine and polyphenylalanine aggregation which are implicated in Huntington's disease and Phenylketonuria respectively.
- BSBE Department is very happy to share the news that Prof. Amitabha Bandyopadhyay has been nominated as a member of the National Startup Advisory Council by Government of India. This is also a recognition to Prof. Bandyopadhyay's strong involvement in promoting IIT-Kanpur's eco-system in innovation as a Professor-in-charge of Innovation and Incubation.

Courses

Courses

MICROBIOLOGY AND IMMUNOLOGY

- Innate Immunity and Inflammation
- Microbial Recognition and Responses in Innate Immunity
- Antibodies – Structure and Function
- T cells: Activation, response
- Immunology-Based Therapy of Diseases

NEUROBIOLOGY

- Neuroanatomy, Cell and Molecular Neurobiology
- Electrophysiology of Synaptic Transmission and Plasticity
- Methods/Techniques in Neuroscience and Computational Neuroscience
- Neural Basis of Visual and Auditory Object perception

HUMAN MOLECULAR GENETICS

- mutation/polymorphisms, heredity, Mendelian genetics, complex genetics.
- Genome Map, Hap-map projects
- Interpreting articles in genetics of Mendelian diseases and complex diseases

DEVELOPMENTAL BIOLOGY

- Lineage tracing, candidate gene approach, model organisms
- Application of methods through experiment design for (dis)proving hypotheses - Morphogenesis -
- Axis formation and patterning, especially limb patterning - Stem cells, regeneration, developmental disorders, evolutionary developmental biology

Courses

BIOLOGICAL MEMBRANES

- Membrane Lipids And Lipid Bilayer
- Membrane Proteins
- Membrane Trafficking
- Cell Signaling

PHYSIOLOGY

- Homeostasis
- Aerobic vs. anaerobic metabolism
- Dynamic and Steady State Conditions

MODERN INSTRUMENTAL METHODS IN BIOLOGICAL SCIENCES

- Fluorescence Physics
- Application of fluorescence in microscopy, FRET
- Modern techniques in microscopy and optics
- Modern Purification methods

TISSUE ENGINEERING

- Biomaterials: hydrogels, ceramics, scaffold fabrication
- Immune response to biomaterials
- Cells: source, culture, and tissue dynamics
- Cells: differentiation, adhesion, and migration
- Cell Signalling via integrins

Courses

COMPUTATIONAL GENOMICS

- Burrows-Wheeler Transform
- Hidden Markov Models
- Human Population Genomics
- Molecular Evolution and Phylogenetic Tree Reconstruction
- Cancer Sequencing

MOLECULAR CELL BIOLOGY

- Transcription and Transposition
- RNA Processing and Translation
- Introduction to Statistical Methods for Gene Mapping
- Developmental and Stem Cell Biology

BIOPHARMACEUTICALS

- Discovery and development of large molecule drugs: monoclonal antibodies
- biosimilars, antibody-drug conjugate
- Pharmacogenetics
- cell-based assays

DECISION MAKING AND THE BRAIN

- Risky decisions and pharmacology
- Neural basis of perceptual decisions
- Adaptive decision making and the brain
- Suboptimal decision making in health and disease

Courses

BIOCHEMISTRY

- Glycolysis and Gluconeogenesis: Energy conversion pathways in organisms
- The citric acid Cycle: Pathway, control, source of biosynthetic precursors, glyoxylate cycle.
- Stability, pathways of folding, chaperones, proteasomes, amino acid degradation, urea formation.

BIOINFORMATICS AND COMPUTATIONAL BIOLOGY

- The Human Genome Project, Biological databases
- Analysis of genomic sequences, Pairwise and multiple sequence alignments
- Homology modeling, Simulation studies of proteins and nucleic acids.

STRUCTURAL BIOLOGY

- Principles of Protein Structure from primary sequence to three dimensional structures.
- Determination of 3D Structures using X-ray crystallography an overview of the method
- Evaluating the quality of crystals, Cryoprotectant crystals at low temperature for data collection

BIOELECTRICITY

- Electrophysiology of Synaptic Transmission and Plasticity
- Neuroanatomy, Cell and Molecular Neurobiology
- Modeling Action potentials,

Past Recruiters

Academic

- Massachusetts Institute of Technology
- Caltech
- University of Wisconsin-Madison
- John Hopkins University
- National University of Singapore
- Oxford University
- Cambridge University
- Harvard University Med school
- Georgia Tech
- Heidelberg University
- Ludwig Maximilian University
- Karolinska Institutet
- Aalto University

Industrial

- Intas Pharmaceuticals
- Pfizer
- Sun Pharma
- GSK
- Abbott
- Dr. Reddy's Laboratories Strand Life Sciences
- Daiichi-Sankyo
- Reliance Jio
- Bain & Company
- BlackRock
- PWC
- Citi bank Services

Infrastructure & Research facilities

UG/PG Teaching Labs:

Microscopes, centrifuges, laminar hood, incubators, gel doc system, fermenter, electrophoresis apparatus etc.) for conducting lab courses (microbiology, molecular biology, biochemistry, biochemical engineering and biomaterials) for the undergraduate students (about 100/year).

Core facilities:

Basic facility include Ultra centrifuges, large volume centrifuges, shaker incubators, confocal and fluorescence microscopes, gel doc systems, water purifier, autoclaves, cold rooms, deep freezers.

Protein purification and characterization facility:

X-ray crystallography facility, scintillation counter, phosphorimager, Circular Dichroism, Fourier Transform Infrared Spectroscopy, High Performance Liquid chromatography, Fast protein liquid chromatography

Tissue culture and histopathology facility

culture rooms for cell, organ and virus cultures, tissue processing unit, microtome and cryostat

Thank You

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