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भारतीय प्रौद्योगिकी संस्थान कानपुर  
Indian Institute of Technology Kanpur

# BIOLOGICAL SCIENCES AND BIO ENGINEERING

POST GRADUATE PROGRAM

Website: [www.iitk.ac.in/bsbe](http://www.iitk.ac.in/bsbe)



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# BIOLOGICAL SCIENCES AND BIO ENGINEERING

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The Department of Biological Sciences and Bioengineering (BSBE) was established in September, 2001. The department offers both undergraduate (B.Tech) and postgraduate programs (M.Tech. and Ph.D.) and the faculty conduct research in diverse areas of basic and applied biology and engineering. Ongoing research projects are spread in major domains that include: (a) Molecular, Cellular and Developmental Biology, (b) Structural and Computational Biology (c) Bioengineering and (d) Biomedical Engineering. A major emphasis is on understanding the fundamental aspects of cell differentiation and growth, regenerative medicine, neuroscience, elucidating protein structure-function relationship, and engineering approaches to understand complex biological systems, generation of economical detection methods, devices and generation of novel molecular therapies. The department has attracted funding from major national and international agencies including the Wellcome-DBT India Alliance, Indo-UK Science bridge program, UKERI, Brain and Behavior Research Foundation, DBT, DST, CSIR, DAE, ICMR and DRDO to name a few. BSBE faculty and student members have received many awards and honors in recognition of their excellence in research.

The department currently has twenty-nine members in its faculty with expertise in diverse areas of research.

Please visit the webpages of individual faculties to know more about their research [<https://iitk.ac.in/webtheme/bsbe/current-faculty>]





# FACULTY LIST

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- ❖ **Amitabha Bandyopadhyay**, Ph.D. (Albert Einstein College of Medicine, New York, USA): skeletal development and differentiation; metabolomics.
- ❖ **Anusmita Sahoo**, Ph.D. (IISc, Bangalore, India): Protein engineering, Vaccine design Immunology, Antibody glycosylation
- ❖ **Appu Kumar Singh**, Ph.D. (Inst. of Microbial Tech., Chandigarh, India): Calcium signaling, ion channels, patch-clamp, electrophysiology, structural biology, X-ray crystallography, cryogenic electron microscopy.
- ❖ **Arun K. Shukla**, PhD (Max Planck Institute of Biophysics, Frankfurt, Germany): Structural biology of membrane proteins, X-ray crystallography, cryoEM, cellular signaling and combinatorial biology.
- ❖ **Arjun Ramakrishnan**, PhD (National Brain Research Centre, Manesar, India): Reward-based learning, decision making, human and nonhuman primate electrophysiology, eye tracking and pupillometry, computational modelling, wearable sensors.
- ❖ **Ashok Kumar**, Ph.D. (IIT Roorkee, India): Biomaterials, tissue engineering, regenerative medicine, nanobiotechnology, stem cell research, drug screening and delivery, cryogel technology bioprocess engineering and environmental sciences.
- ❖ **Ashwani Kumar Thakur**, Ph.D. (Inst. of Microbial Tech., Chandigarh, India): Protein aggregation in diseases and therapeutic design, self-assembly of proteins, and biopharmaceuticals.
- ❖ **Bushra Ateeq**, Ph.D. (AMU, Aligarh, India): Molecular Oncology, Cancer Genomics, Drug targets, Mechanism of drug resistance in cancer, Cancer diagnostics, Cancer therapeutics.
- ❖ **Debanjan Dasgupta**, Ph.D. (IISc Bangalore): Neurophysiology, Circuits and Systems Neuroscience, Behavioural assay, Electrophysiology
- ❖ **Debdeep Dutta**, PhD (BHU Varanasi): Genetics, Cell signaling, Mitochondria, Rare diseases, Neurological disorders
- ❖ **Dhirendra S. Katti**, Ph.D. (Bombay University, India): Tissue engineering, biomaterials, drug delivery systems and nanobiotechnology.
- ❖ **Dibyendu K. Das**, Ph.D. (IACS, Kolkata, India): Molecular Basis of Enveloped Virus Entry, Viral Genome organization and replication, Neutralizing antibody and Vaccine design, Single molecule fluorescence Imaging and High-resolution optical tweezers development.
- ❖ **Ganesh S**, Ph.D. (BHU, Varanasi, India): Neurobiology of disorders, stress biology, and human genetics.
- ❖ **Hamim Zafar**, Ph.D. (Rice University, Houston, USA): Computational biology, tumor heterogeneity and evolution, cell lineage tracing, genomics, single cell multiomics.
- ❖ **Jayandharan G Rao**, Ph.D. (Christian Medical College, Vellore, India): Gene therapy: Neuro-ophthalmic disorders; Blood disorders; Cancer gene therapy; Human molecular genetics
- ❖ **Jonaki Sen**, Ph.D. (Albert Einstein College of Medicine, New York, USA): Morphogenesis, differentiation, migration and axonal guidance in the avian and mammalian brain, vertebrate developmental neurobiology.
- ❖ **Nikunj Arunkumar Bhagat**, PhD (University of Houston, Houston) (Joint faculty at BSBE & EE): Neural & Bio-signal processing, Medical Instrumentation, Brain-machine interfaces, Functional Electrical Stimulation, and Rehabilitation Engineering



# FACULTY LIST

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- ❖ **Nitin Gupta**, Ph.D. (University of California, San Diego, USA): Neuroscience, insect olfaction, computational biology, digital interventions for mental health.
- ❖ **Nitin Mohan**, Ph.D. (Academia Sinica, Taiwan): Optical engineering, superresolution microscopy, Microtubule based dysregulations in neurodegeneration, lysosome mediated nutrient sensing and dysregulations in diabetes, obesity.
- ❖ **Rakesh Majhi**, Ph.D. (NISER, Bhubaneswar, India): Ion channels, immune cell engineering, Tissue restoration.
- ❖ **Robert Sonowal**, Ph.D. (IISc, Bangalore, India): Microbiota, aging, metabolites, antimicrobial resistance.
- ❖ **Sai Chaitanya Chiliveri**, PhD (CCMB, Hyderabad): Host-pathogen interactions, NMR spectroscopy
- ❖ **Sai Prasad Pydi**, Ph.D. (University of Manitoba, Canada): Diabetes, Obesity, NAFLD, Immunometabolism, GPCRs, Cell Signaling and Single-Cell Transcriptomics.
- ❖ **Sankararamakrishnan R**, Ph.D. (IISc, Bangalore, India): Bioinformatics, molecular modelling of membrane proteins and biomolecular simulation.
- ❖ **Saravanan Matheshwaran**, Ph.D. (IISc , Bangalore , India) : Microbiology, Epigenetic regulation of Host-Pathogen Interaction, Chromatin Remodeling and DNArepair.
- ❖ **Santosh Kumar Misra**, Ph.D. (IISc, Bangalore, India): Biosensors, 3D-printed biomedical devices, Nanocomposites and Personalized medicine.
- ❖ **Shanu Jain**, PhD (ICGEB, New Delhi): Liver Metabolic Disorders, G ProteinCoupled Receptors, Cellular Signalling, Genetic Mutations, Small Molecule Drug Discovery
- ❖ **Sivaprakash K. Ramalingam**: PhD (University of Madras): Therapeutic genome editing, Hemoglobin regulation, cell therapy, disease modeling and small molecule drug discovery
- ❖ **Suresh Kumar**, Ph.D. (Indian Institute of Integrative Medicine, Jammu, India):Autophagy, colorectal and breast cancer.





# FACILITIES

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BSBE offers its members with a wide variety of high-end equipment. Some of these include bioinformatics facility (servers, workstations, and software modules for high performance computing), material characterization facility (SEM, micro-CT, rheometer, mechanical testing and fabrication facilities), cell sorting and imaging facility (cell sorter, confocal microscope), genomic facility (microarray and real-time PCR machines), centrifuge facility (ultra-speed, large volume and multipurpose centrifuges), sonication facility (bath sonicator, probe sonicator with micro and mini probes), gel imaging station, protein purification and characterization facility (Chromatography, HPLC and FPLC systems), protein crystallization facility (X-ray data collection facility with cryo cooling features), tissue culture facility (culture rooms for cell, organ and virus cultures), histopathology facility (tissue processing unit, automated microtome, and cryostat), electrophysiology facility, calcium imaging set-up, and a transgenic facility (transgenic facility for mouse, chicken, Drosophila, C.elegans, mosquitoes and zebra fish), and electrophysiology labs.

# POST-GRADUATE PROGRAMMES OFFERED

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## **M.Tech. in BSBE (4 Semesters)**

Master of Technology (M.Tech.) program in BSBE meets a variety of career objectives in research and industry. The program is also supported by the Department of Biotechnology (DBT), Govt. of India. The Program is for four semesters of which the last two semesters involve hands-on training and research. Midway through the program, students may apply for switchover to the Ph.D. program of BSBE. The program is designed for students from both biology and non-biology background.

### **WHO CAN APPLY?**

Candidates who have a Master's degree in any area of science (mathematics, physics, chemistry or life sciences)

OR

Bachelor's degree (4-year program) - Bachelor's degree in Technology/Engineering, Medicine (MBBS), Pharmaceutical (B.Pharm.), Agricultural or Veterinary Sciences are eligible to apply.

Applicants should have secured a minimum CPI of 6.0 (or 60 percent marks) in their qualifying degree (and should be at least seven percent higher than the minimum pass marks/CPI) and should either have a valid GATE score or qualified in the national level tests conducted by the UGC, CSIR, DBT, ICAR or ICMR. The requirement of a GATE score is waived for M.B.B.S. degree holders and for engineering graduates from IITs with an overall CGPA of 6.5 and a CGPA of 8.0 during the last two semesters. Candidates appearing in the final examinations of the qualifying degree are also eligible to apply.

## **M.Tech in Biomedical Engineering (4 Semesters)**

Master of Technology (M.Tech.) program in Biomedical Engineering is the newly introduced program, which started in year 2024. The program has been designed to mentor students in product development for the rapidly growing healthcare industry. Students from various science and engineering backgrounds are welcome in this program. The first two semesters involve taking courses from a mixed basket of engineering and biology courses. The last two semesters involve a product development, which can even lead to a startup. The major focus area under this program are:

- Biomaterials, Bio-instrumentation
- Biomedical Devices, Medical Robotics
- Digital Healthcare
- Healthcare Ventures & Entrepreneurship
- Students will also get the opportunity to undergo clinical immersion at one of our partner hospitals SCTIMST, Thiruvananthapuram, KGMU, Lucknow or GSVM, Kanpur.



# POST-GRADUATE PROGRAMMES OFFERED

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## WHO CAN APPLY?

Applications are invited with a bachelors' degree in any branch of engineering or medicine or 4th year BS/B.Sc. or 5-year integrated BS-MS/B.Sc.-M.Sc.

Eligibility criteria: G-PAT, GAT-B, GATE or MBBS

## Ph.D. in BSBE

Ph.D. Program in BSBE is intended for students interested in carrying out distinguished scholarly activities. Excellence in research apart, the program envisages comprehensive development of students for leadership in science and engineering in both industry and academia. Therefore, the Ph.D. Program involves course work covering diverse areas of biology and bioengineering for competence in both analytical and quantitative skills. We encourage students from any discipline (including nonbiology background) to apply as they will be given a formal training in biology through a well formulated course work in basic biology.

## WHO CAN APPLY?

Candidates should meet one of the following 4 conditions. Candidates appearing in the final examinations of the qualifying degree are also eligible to apply.

1. Should have a master's degree in engineering (ME/M.Tech.), or medicine (M.D.) or M.Sc. (Agri) or equivalent with minimum of 55 percent marks/ 5.5 CPI (on a 10-point scale) as long as it is not less than the minimum pass marks/CPI.

OR

2. Should have a bachelor's degree in engineering (B.E/B.Tech) or pharmacy (B.Pharm) or Bachelor's degree (4 year program) with a minimum of 75,percent marks/7.5 CPI, and a valid GATE score or qualified in the JRF of UGC, CSIR, DBT, ICAR or ICMR. The requirement of GATE score is waived for candidates with bachelor's degree in engineering from the centrally funded technical institutes (CFTIs).

OR

3. Master's degree in sciences or an allied area (M.Sc.), satisfying each of the following criteria may also be considered.
  - a) a minimum of 65 percent marks/6.5 CPI in the master's degree.
  - b) first division in bachelor's degree, and
  - c) UGC, CSIR, DBT, ICAR or ICMR junior research fellowship (JRF) OR 95% or higher GATE score.

OR

4. MBBS degree holders with a minimum of 60% marks in the qualifying degree.



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## CONTACT

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