



INDIAN INSTITUTE OF TECHNOLOGY  
(BANARAS HINDU UNIVERSITY),  
VARANASI

# SCHOOL OF BIOMEDICAL ENGINEERING



## ABOUT IIT(BHU), VARANASI

Indian Institute of Technology (BHU), Varanasi is one of the leading Engineering institute in India. Founded in 1919, It was known as Benaras Engineering college (BENCO). It was designated status of IIT in the Institute of Technology (Amendment) Act in 2012 passed in parliament of India. IIT(BHU) have 13 Departments and 3 Interdisciplinary schools.

## WHO WE ARE ?

Biomedical engineering is an interdisciplinary field, integrating two dynamic professions, Medicine and Engineering. School of Biomedical Engineering, with its consistent research accomplishments and long tradition of cross- discipline collaborations, represents an ideal environment for Biomedical Engineers. Being an integral part of Banaras Hindu University, school benefits from having collaborative research with Institute of Medical Sciences situated in the campus.

Faculty members of school have expertise in the fields of Electrophysiology, Biomaterials, Medical image processing, Neurophysiology, Tissue Engineering, Biomechanics and Bioinstrumentation.

## PROGRAMS OFFERED

### **INTEGRATED DUAL DEGREE (BTECH + MTECH)**

This is a 5-year course comprising of 10 semesters. The students are admitted through the Joint Entrance Exams (JEE). The students study an additional post-graduation course in the chosen specialization.

### **MASTERS OF TECHNOLOGY**

This is a 2-year course comprising of one year of research work. The students are admitted through the Graduate Aptitude Test in Engineering (GATE). The students are required to present and successfully defend a dissertation at the end.

### **PHD**

It is the highest degree awarded by the department and is for the students interested in the field of research careers. Its focus is to enhance the cutting-edge research in the field of the Biomedical Engineering.

# INTEGRATED DUAL DEGREE

## **FRESHER (1ST YEAR)**

- Biomedical Introduction
- Electromagnetics
- Computer Programing
- Chemistry
- Mathematics
- Quantum And Relativistic Mechanics
- Biochemistry

## **SOPHOMORE (2ND YEAR)**

- Electronics Engineering
- Mathematical Methods
- Fluid Mechanics
- Transport Phenomenon
- Genetics
- Physiology
- Cell Mechanobiology
- Biomaterials

## **JUNIOR UNDERGRADUATE (3RD YEAR)**

- Medical Imaging Modalities
- Bioinstrumentation
- Linear Control Theory
- Electronics Circuits For Medical Instrumentation
- Biomechanics
- Microprocessors
- Composite
- Open Elective

## **SENIOR UNDERGRADUATE (4TH YEAR)**

- Artificial Intelligence And Its Applications To Biomedical Technology
- BioMEMS And Biosensors
- Bioinformatics
- Signal And Image Processing
- Biotransport Processes
- Rehabilitation Engineering
- Tissue Engineering
- Radiation Biology
- Thesis
- Departmental Elective

## **MASTERS (5TH YEAR)**

- Mathematical Modelling And Simulation
- Bioinstrumentation System Designing
- Hospital Management
- Nanomedicine And Therapeutics
- Orthopedic Biomechanics
- Dissertation
- Departmental Electives



# COLLABORATIONS

*"I think the biggest innovation of the 21st century will be based on the intersection of biology and technology. A new era is beginning."*

**-Steve Jobs**

## OUR COLLABORATIONS:

- Mandatory 8 weeks internship in Industry, Research labs and Universities which includes Philips, GE Healthcare, Siemens, Nference Labs, MIT (Cambridge), NUS (Singapore), Tokyo University (Japan), INRIA (France), Swiss Institute of Bioinformatics, McMaster University (Canada), DRDO, IISc, AIIMS, DAE (India).
- Research scholars and students have attended and presented in various international & national level conferences and workshops proving their mettle in places like University of Oxford (UK), University of Michigan (USA), IBRO (South Africa), NIMHANS (India).
- Faculty members have collaborations with other departments of IIT (BHU) and have associations with Uppsala University (Sweden) and IMS (BHU). Many seminars and guest lectures have been conducted by eminent academicians from places like Uppsala University (Sweden) and DST (India).

# HIGHLIGHTS OF RESEARCH





# PAST RECRUITERS



TATA CONSULTANCY SERVICES



JPMORGAN CHASE & Co.



# LABS AND FACILITIES

## COMPUTATIONAL NEUROSCIENCE AND NEUROIMAGING LAB

— **Major Facilities:** Non-invasive Blood Pressure Monitor (AD instrument); Laser Doppler Blood Flow Meter(AD instrument); Tissue oxygen Monitor (Oxford Optronix); HPLC-ECD; RotaRod; Ultrasound Probe Sonicator; -200C Refrigerator; Stereotactic Device with surgical table; Polyrite-D for EEG, ECG and EMG; EMF generator.

— **Major Thrust Area:** Rodent Model Development: Middle Cerebral Artery Occlusion; Bilateral Common Carotid Artery Occlusion; Stress; Wound Healing etc. Neuroprotection, In silico Drug Designing.

## BIOINSTRUMENTATION AND SIGNAL PROCESSING LAB

— The recording and analysis of bio-signals and Images have gained much more importance in these recent years, which allows the medical practitioners to extract needed information for analyzing the physiological events real-time. In this lab we are mainly working on: **Digital Signal processing techniques, Image Processing techniques, and Application of Artificial Intelligence to Biomedical Engineering areas.** At research level we are working to improve the disease diagnosis, and particularly interested to develop the new algorithms to improve the quality of radiological images in terms of artifact corrections and enhancement. A strong interest is arising in the field of deep learning-based segmentation and medical image quality assessment.

## MICROPROCESSOR LAB

— Mainly designed to give students hand on experience in the area of assembly level programming of **microprocessor/microcontroller**, interfacing peripheral devices. Lab is also equipped with **PIC and ARM processor trainer system.** This lab provides support to the UG/PG students introduced in carrying out project work on the design and fabrication of **embedded system** of biomedical design. Further the facilities available in the lab are also used by student for carrying out exploratory projects.

## ELECTROPHYSIOLOGY LAB

— The lab focuses on cerebral circulation, neurophysiology, neurological disorders and neuroprotection. Ongoing Research(es): Neurodegenerative diseases and neuroprotection; Molecular biology of Neurological disorders Outcome (Till Date): Low cost **hearing aid; Android operated caregiver bed;** Electromagnetic healing apparatus; Dynamic cerebral pressure modelling; phytochemicals as potent drugs in Stroke.

## BIOMECHANICS LAB

— Biomechanics Laboratory is associated with the research in the field of Orthopedic Implants, Dental Biomechanics and Energy Harvesting using Piezo electric devices. Present work focuses primarily on Computational Biomechanics of lower extremity as well as dental biomechanics. It deals with **3D modeling using CT and MRI data**, implant design (CAD/CAM) and Optimization as well as **Simulations** (Finite Element Analysis). Lab has its collaboration with Institute of Medical Sciences, BHU and faculty of Dental Sciences, Trauma Centre, BHU.

## TISSUE ENGINEERING AND MICROFLUIDICS LAB

— Research interests in Tissue Engineering and Biomicrofluidics (TEBM) Laboratory forge multidisciplinary teams covering expertise ranging from core engineering and biomaterials discovery to the in-depth understanding of human physiological systems. The primary research areas include the recreation of three-dimensional (3D) tissue constructs and functional entities of complex organs, biomaterial scaffolds, 3D bioprinting, Stem cells, biocompatibility assessment and characterization of micro engineered tissue reconstructs, and testing of their physiological compatibility upon implantation in the animal models.

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## **POLYMER LAB**

— Laboratory undertakes evaluation of composites for thermal, thermo mechanical and calorimetric profile evaluation with temperature which helps in identifying polymers and their performance under various operating conditions. Division is having R&D projects in high performance polymeric composites, nano-medicines and other sponsored projects.

## **CELLULAR THERAPEUTICS AND BIO-DEVICES LAB**

— Major works include developing cellularised platforms which enables selective differentiation of human stem cell into tissue specific cells, developing cost effective Biosensors and Bio-MEMS/Bio-Devices, process development towards large scale production of nanomaterials of clinical significance for nano-therapeutics uses and biocompatible metal ion impregnated polymeric nanocomposite films as efficient antibacterial materials.

# CONTACT US

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## **WEBSITES —**

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[www.iitbhu.ac.in/dept/bme](http://www.iitbhu.ac.in/dept/bme)