

PhD Admission Brochure



भारतीय प्रौद्योगिकी संस्थान हैदराबाद
Indian Institute of Technology Hyderabad

Department of Chemical Engineering
Indian Institute of Technology Hyderabad
Kandi, Sangareddy-502285, Telangana, India

Academic year 2018-2019

About us

We offer BTech, MTech and PhD programs in Chemical Engineering. Our outstanding student-to-faculty ratio of 10.5:1 facilitates personalized teaching and research activities. We strive to maintain an

environment that enables students to identify and pursue their personal, professional goals within an innovative educational and research program that is rigorous as well as flexible. We affirm

our commitment to creation, development, and organization of fundamental knowledge along with technical service to the



community. Currently, the department has sixteen young and dynamic faculties from versatile areas. Despite being a young department, 75% of the class students are actively participating in internship programs. In addition, 50% of our

students seek jobs, 30% seek a graduate program and rest of them pursue other opportunities including start-ups.

Academics

The BTech program encompasses a wide variety of courses which prepares a student for both industry as well as research. A BTech degree is awarded on completion of 125 credits of which 33 credits are allocated for core/free electives. Core electives are divided into four areas:



Biological Processes, Energy and Environment, Materials and Chemical Processes. In addition, students are given opportunities for a minor degree, dual degree and an integrated M. Tech program.



MTech program features a curriculum that is both comprehensive and flexible. Students are encouraged to actively formulate and solve innovative research problems. The program culminates in an MTech thesis describing the student's original research. All

course MTech degree is awarded on completion 36 credits.

PhD students are allocated an advisor after the completion of first semester based on their preferences which gives them the flexibility to work with the faculty and research area of their choice.

Research

Research spans a wide variety of exciting areas including fluids, mineral processing, catalysis, materials for energy and biological applications, nanotechnology, bioengineering, process control and optimization. The department now



hosts 55 PhD students. Our strong commitment to research is evidenced by INR30 crores extramural funding that our faculties have obtained. Faculties are actively involved in hosting conferences and outreach workshops benefitting the students and faculty across several institutes in India. The Department also houses state of the art research and teaching equipment. Faculty productivity is indicated by their publication record in leading journals.

Energy

The energy research in the Department of Chemical Engineering spans across bio-fuels to fuel processing to fuel cells and batteries. The faculty members are actively involved in Solid Oxide Fuel Cell (SOFC) research and onboard fuel processing for SOFC-auxiliary power unit applications along with design and materials aspect of rechargeable batteries.

Catalysis

Our research is also focused on the design and development of catalyst materials – ranging from zeolite, and supported metal/metal oxide – with improved reactivity, stability, and selectivity. The catalysts are tested for various industrial processes (e.g. steam reforming, water-gas shift reaction, and fine chemicals) and biomass based fuels and chemicals. These study aims to produce hydrogen, bio-fuels, and value-added chemicals and utilizes renewable feed stocks, low-value by-products, and waste materials. The design and optimization of chemical processes using Aspen Plus are also integral part of this research.

Fluid Mechanics

We pursue research on a variety of problems of fundamental and applied interest in fluid mechanics, and heat and mass transfer using a combination of tools ranging from basic modeling, computational fluid dynamics (CFD), and linear stability analysis. Fluid mechanics research conducted in the department spans a wide range of topics such as multiphase flows, spatially developing flows in complex geometries, micro-fluidics, and biological flows. A major focus of our research is on understanding the transition to turbulence, with high emphasis on the laminar-turbulent transition.

Mineral Processing

In mineral processing research, we are involved in flow sheet development and optimization for various mineral beneficiation plants. We study dense medium cyclones (DMC), hydro-cyclones (HC), feed slurry distributors, grinding mills and flotation devices for understanding the process by using computational modeling techniques (multi-phase CFD/discrete element methods/coupling CFD-DEM models). New innovative/novel improved mineral processing equipment designs through integrated CFD/DEM studies and physical modeling is our major focus. Mathematical models based on industrial data and inputs from CFD/DEM are also being developed using non-linear model building techniques for various mineral processing units.

Molecular and Cellular Bioengineering

The key to understanding the role of chemical engineers in biological engineering research is to recognize that biological systems are inherently chemical in nature. Chemical Engineering provides a unique integrated systems perspective across a wide range of length scales (molecular to macroscopic) that makes it well suited to attack problems of great interest in modern biology. Specifically, the thrust of our research is on developing a mechanistic understanding of intercellular interactions involved in pathophysiological processes such as infection, inflammation, thrombosis, and cancer metastasis. In addition, our efforts are focused on developing multi-scale computational models for vascular processes such as leukocyte rolling over the endothelium, and bulk phase intercellular interactions in blood flow.

Haemodynamics and Haemostasis

Pathologies of the cardiovascular system due to coagulation abnormalities are greatly influenced in their progression by the mechanics of vascular tissue, by the flow behavior of blood in blood vessels, and by the biochemistry of the reactions in the coagulation cascade and fibrinolysis. The thrust of our research is to better understand these pathologies by characterizing the rheological and biochemical variables in flow situations that present in the human vasculature,

and by identifying conditions that precipitate potentially life-threatening events (like thrombo-embolisms and strokes). Towards this end, we use various tools like computational modeling of blood flow in the presence of clot formation and lysis, experimental characterization of blood and clot rheology, and constitutive modeling of blood, clot, and vessel walls.

Drug Delivery

Many newly developed specialized polymers are increasingly being applied for delivering drugs in more controlled and sustainable way. In this important area of application, an effort is going on at IITH to develop new methods and mechanisms to achieve 'controlled, targeted and sustainable release of drugs' with the help of specialized polymers. We're also interested in investigating the fundamental forces between the polymer and drug molecules at various conditions.

Nanoscience and nanotechnology

Nanoscience and nanotechnology is a rapidly emerging interdisciplinary field at the interface between physics, chemistry, materials science, electronics, and biology. Broad activities in this fast changing arena of research include synthesis of a wide range of nanomaterials, their characterization and applications in energy and environment. Presently, we focus on synthesis, fabrication of carbon based

nanostructures and their applications in energy storage devices such as Li ion rechargeable batteries etc. We also deal with nanopatterning of soft matters for various applications such as superhydrophobic surfaces.

Process Control and Stochastic Control

Process Control deals with the use of automatic control strategies to improve efficiency of a chemical process. Apart from the applications of standard control techniques, we develop novel sensor technologies (known as "soft sensors") based solely on data obtained from a running plant. For example, the data could be in the form of images, sound or just input output data of a process stored in a chemical plant. We also study the application of non-linear and stochastic control techniques.

Polymers

Conventional polymers are currently facing a lot of issues related to the environment as well as their petroleum origin. Our research program aims to address these aspects by coming up with new grades of environment friendly polymers and/or building knowhow of making biodegradable polymers with customized features for specific applications. The main focus is on building polymerization technology through modeling, optimization, and lab. Scale implementation and then optimally linking with rheology and processing with desired end use properties.

Who can apply?

Eligibility

- Candidates with MTech/ME degree in Chemical Engineering are eligible to apply. A valid GATE score is not a pre-requisite.
- Candidates with BE/BTech degree in Chemical Engineering and allied field with valid GATE score (CH) are also eligible to apply.
- Candidates with MTech/ME degree in allied engineering disciplines such as Chemical Technology (Polymer, Petroleum, Petrochemical etc.) and Biotechnology are also eligible to apply.
- Candidates with MSc degree with valid CSIR/UGC NET qualification are encouraged to apply.

Category of admission

- I. **Full time Institute Fellowship (MHRD):**
- II. **Fellowship from external funding agency:** Candidates with valid DST Inspire, CSIR/UGC NET etc. fellowship are encouraged to apply.
- III. **Sponsored project:** Candidates working in a sponsored project at IITH can apply under this category.
- IV. **Industry, Research Laboratory and Academic Institution sponsored:** A minimum two years of research /teaching work experience.

Financial assistance

Candidates admitted to the PhD program under regular scheme (full-time) are eligible for following financial assistance for which:

- They should work 8 hours a week in the department.
- Renewal of assistance every semester will be contingent on enrolment, satisfactory progress and performance in the preceding semester.
- Candidates admitted under various sponsored categories are not eligible for financial assistance from Institute. However, they are eligible to receive financial assistance from project (IITH) or sponsoring academic and research institute, industry etc.

Reservations

Reservation is applicable to SC/ST/OBC/Persons with disability as per the rules of Government of India.

Selection process

- Students are admitted based on a written test and interview. Depending on the number of applicants, the department reserves the right to conduct written exam for initial screening.
- The interview is to gauge fundamental knowledge in Chemical/relevant engineering and research aptitude of the candidate. In general, candidates will be tested for clarity of thought, analyzing skills, confidence level, and passion for research.
- The written test and interview are performed in the same day.

Results

- Results will be declared on the departmental website in a week time after the interview. Candidates are requested to check the website regularly for all updates.
- Candidates should check emails sent to the email address provided in your application form for all important communication and announcement.

After PhD Admission

Courses

The PhD candidate is required to undergo course work during the first two semesters. The typical course requirement in the department is 12 credits, with a minimum cumulative grade point average of 7.0. The candidates, in consultation with their supervisor, may also choose to take relevant courses from other departments. Candidates with BTech degree and MSc in science will have to do extra credits as per institute policy.

Guide selection

The student is allocated a supervisor at the end of the first semester. During the first semester, PhD candidates are encouraged to discuss with faculty members working in research areas of interest. Towards the end of the first semester, PhD candidates are required to provide names of three faculty members whom they wish to work with, listed in order of reference. Allocation of supervisors is done based on preferences received from all PhD candidates.

Contact

Department of Chemical Engineering
Indian Institute of Technology Hyderabad
Kandi, Sangareddy-502285, Telangana
Tel: (040)-2301-6026/6147. Fax: (040)-2301-6032
Email: DPGC convener (dpgcche@iith.ac.in)

www.iith.ac.in

Thesis proposal

All PhD candidates are required to defend a thesis proposal within 13 months of the date of joining the department. The thesis proposal consists of a written document outlining the research plan, and a presentation before the doctoral committee. The doctoral committee consists of a minimum of three faculty members: PhD supervisor, and two subject experts.

Research progress

Subsequently, PhD scholars are required to regularly apprise the doctoral committee of progress made in solving the research problem. Continued involvement in the PhD program is subject to satisfactory progress, as deemed by the doctoral committee.