भारतीय प्रौद्योगिकी संस्थान कानपुर
Indian Institute of Technology Kanpur

CHEMICAL ENGINEERING

POST GRADUATE PROGRAM

Website: www.iitk.ac.in/che

CHEMICAL ENGINEERING

The Department of Chemical Engineering is among the five departments established at the inception of IIT Kanpur in 1960. Along with the other pioneer departments, it ushered in a new paradigm in undergraduate engineering education that fosters the creative thinking process in a very open and vibrant academic environment. From an early emphasis on developing and perfecting the undergraduate curriculum to nurturing a fledgling post-graduate research program to significantly contributing to applied and fundamental ChE research, we have grown from strength-to-strength over the past five decades.

A hallmark of our Department is the emphasis on quality education as reflected in the over 36 “labor of love” textbooks written by our faculty, many receiving international acceptance. This is complemented by a strong research ethos, carefully nurtured by the pioneers and effectively passed on from one generation to the next. The significant postliberalization research funding has brought in a critical mass of young, talented and motivated faculty immersed in research in the frontier areas of complex fluids, microreactors, nano-technology, adhesion, molecular simulations and biocomputation, carbon capture, storage and conversion, and energy systems. This is in addition to research in traditional areas of fluid dynamics, conventional/new separation processes, catalysis, polymer engineering and process design, control and intensification. The very diverse research portfolio is our core strength that effectively complements quality education.

POST-GRADUATE PROGRAMMES OFFERED

The Department offers a Master of Technology (M Tech), a MS (Research) and a Doctorate (PhD) degree in Chemical Engineering. These programs are research centric and prepare the student for a productive research career. The rigorous coursework and research provide a healthy balance of breadth in ChE fundamentals and depth in their chosen research field.

Master of Technology (M Tech)
Duration: 2 years

Admission: Through Graduate Aptitude Test in Engineering (GATE). The examination is usually announced in the month of August and held in February across the country. Sponsored candidates from the industries as well as research organizations with appropriate experience need not have qualified GATE.

Course requirements: The students take six courses (of which at least four are in compulsory areas of Chemical Reaction Engineering, Thermodynamics, Transport Phenomena and Mathematical Methods in Chemical Engineering or Numerical Methods, the remaining from several state-of-art electives).

Research: Students have to usually do 10-12 course units (including summer term) of research. In their research thesis, students often work on research problems with individual faculty members, or are involved in sponsored projects from industry or government funding agencies. MHRD offers scholarships to students getting admission through GATE currently at Rs 12,400 per month. Scholarships from research projects are also available.

Master of Science by Research (MS Research)
Duration: 2 years

Admission: Through Graduate Aptitude Test in Engineering (GATE). The examination is usually announced in the month of August and held in February across the country. Sponsored candidates from the industries as well as research organizations with appropriate experience need not have qualified GATE.

Course requirements: The students take four courses (of which at least three are in compulsory areas of Chemical Reaction Engineering, Thermodynamics, Transport Phenomena and Mathematical Methods in Chemical Engineering or Numerical Methods, the remaining from several state-of-art electives).

Research: Students usually do 12-14 course units (including summer) of research. In their research project, students often work on research problems with individual faculty members, or are involved in sponsored projects from industry or government funding agencies. They must be sponsored through project funding from their thesis supervisors (or) financial sponsorship must come from their parent industrial organization.

POST-GRADUATE PROGRAMMES OFFERED

Doctor of Philosophy (PhD)
Duration: 4-5 years

Admission: PhD admissions are typically conducted twice a year, in the month of July and December. The selection process includes a written test followed by an interview. Additionally, candidates may be sponsored for the PhD program by industries and research organizations.

Course requirements:

Students are required to complete a minimum of 36 course credits equivalent to four full courses in areas such as Chemical Reaction Engineering, Thermodynamics, Transport Phenomena, and Mathematical Methods or Numerical Methods in Chemical Engineering. This ensures they gain a strong foundation in chemical engineering principles while also supporting their research endeavors.

Research: After completing their coursework, students focus on a research problem of their choice under the supervision of a faculty mentor(s). Engaging with a specific problem for 3-4 years provides a valuable opportunity to cultivate scientific thinking and enhance technical communication skills. The typical norm for graduation is 3-5 publications (submitted or accepted) in reputed peer-reviewed journals. Full-time PhD students are eligible for scholarships from MHRD, currently ranging from ₹37,000 to ₹42,000 per month, with additional funding opportunities available through research projects.

Lab Facilities

- Multichannel Voltammetry Analyzer (MVA)
- Autosorb iQ (BET, Chemisorption, TCD)
- High Resolution Scanning electron Microscope
- PARTEC CyFlow space Flow Cytometer
- ICPMS (Agilent 7900)
- Particle Image Velocimetry (PIV) Systems
- Nanoscale Infrared Spectroscopy
- Thermogravimetric Analysis
- UTM (Zwick Roell- Z005)
- X'Pert3 Powder (XRD)
- Electrospinning Unit (E-Spin)
- Scanning Transmission Electron Microscopy (STEM)
- Advance Research Grade Polarization Microscope with fluorescence and Peltier Heating stage.
- QuantStudioTM 5 Real-Time PCR(RTPCR)
- Sputter Coater
- 3D Bio Printer (CellinkAB)
- Ultra - Microtome System (Leica EM UC 7)
- Differential Scanning Calorimeter (DSC-25)
- Super Computing Facility (Param Sanganak- 1.5 PF)

FACULTY LIST

- **Akash Choudhary**: Complex fluids and flows, Active Colloids & Biological Microswimmers: Dynamics & Rheology, Microfluidics, Electrokinetics
- **Animangsu Ghatak**: Adhesion and friction on soft interfaces, fracture of soft materials, bio-inspired design of reusable surfaces.
- **Anurag Tripathi**: Mechanics and rheology of granular flows and complex fluids.
- **Ashutosh Sharma**: Colloid and interface engineering, nanotechnology, thin films.
- **Dipin S. Pillai**: Stability theory, Reduced-Order Modelling, Non-Linear Dynamics, Hydrodynamic stability, Thin Films, Electrohydrodynamics, Multiphase Flows
- **Goutam Deo**: Heterogeneous catalysis, kinetics, transport phenomena
- **Harshwardhan H. Katkar**: Soft matter, Biophysics, Nanopores, Bacterial Assemblies, Fluid Mechanics, Multiscale modeling, Bottom-up coarse-graining, Enhanced sampling.
- **Himanshu Sharma**: Flow through porous media, Enhanced oil recovery, Colloids & interfaces, Nanotechnology
- **Indranil Saha Dalal**: Modelling and simulation of the dynamics of polymer chains in flow, complex fluids, flow induced effects in biomolecules.
- **Ishan Bajaj**: Process systems engineering, Optimization theory and algorithms, Energy systems modeling, Multi-scale optimization, Operations research
- **Jayant K. Singh**: Molecular simulation & thermodynamics, CO2 capture and conversion, nucleation, interfacial science, machine learning
- **K. P. Krishnaraj** : Flow, structure and stress transmission in granular media, structure and transport in spatial networks
- **Naveen Tiwari**: Transport phenomena, instabilities in micro-scale free surface flows, flow through porous media.
- **Nishith Verma**: Adsorption, environmental pollution control, mathematical modelling and simulation.
- **Nitin Kaistha**: Integrated process design, plantwide control and intensification
- **Pankaj Apte**: Statistical mechanics, interfacial thermodynamics, nucleation.
- **Raghavendra Ragipani**: Carbon dioxide capture and mineralisation, Solid waste utilisation, Process Intensification, Modular and autonomous chemical reactors
- **Raghavendra Singh**: Computational biology, gene therapy, embryonic and adult stem cells, tissue engineering, biomaterials.
- **Rahul Mangal**: Polymer physics, colloids, complex fluids, nanocomposites, active matter, liquid crystals

FACULTY LIST

- **Raj Ganesh S. Pala**: Sustainable energy, heterogeneous catalysis, Photochemical analysis, quantum and classical simulation of condensed matter systems.
- **Raju K. Gupta**: Nanomaterials, self-assembly, nanostructures for energy applications.
- **Salman A. Khan**: Quenched disordered catalysts (amorphous catalysts and high-entropy alloys), Dynamically disordered catalysts (sub-nanometer metal clusters), Reaction rate theory, Rare events simulation methods, Scientific machine learning
- **Sanjeev Garg**: Bio-informatics, computer aided molecular design, flexibility analysis
- **Siddharth Panda**: Chemical sensors, micro/nano fabrication, processing of electronic materials, microfluidics, lab-on-a-chip.
- **Soumik Das**: Wettability alteration, Surfactants, Composites Molecular assembly and synthesis in structured solvents Liquid crystals, Solitons in liquid crystals, Soliton-based chemical soft matter
- **Sri Sivakumar**: Synthesis and characterization of nanomaterials, layer-by-layer assembly of polymer capsules, thin films, drug delivery and photonic crystals
- **Vishal Agarwal**: Catalysis, reaction rate theory, biofuels, molecular simulations
- **V Shankar**: Stability of fluid flows, dynamics and rheology of complex fluids.
- **Yogesh M. Joshi**: Rheology, polymer science and engineering, fluid mechanics

BROAD RESEARCH AREAS

- Materials and Nanotechnology
- Biotechnology and Biosystems
- Catalysis and Reaction Engineering
- Complex Fluids and Soft Matter
- Theory, Computation and Machine Learning
- Energy and Sustainability

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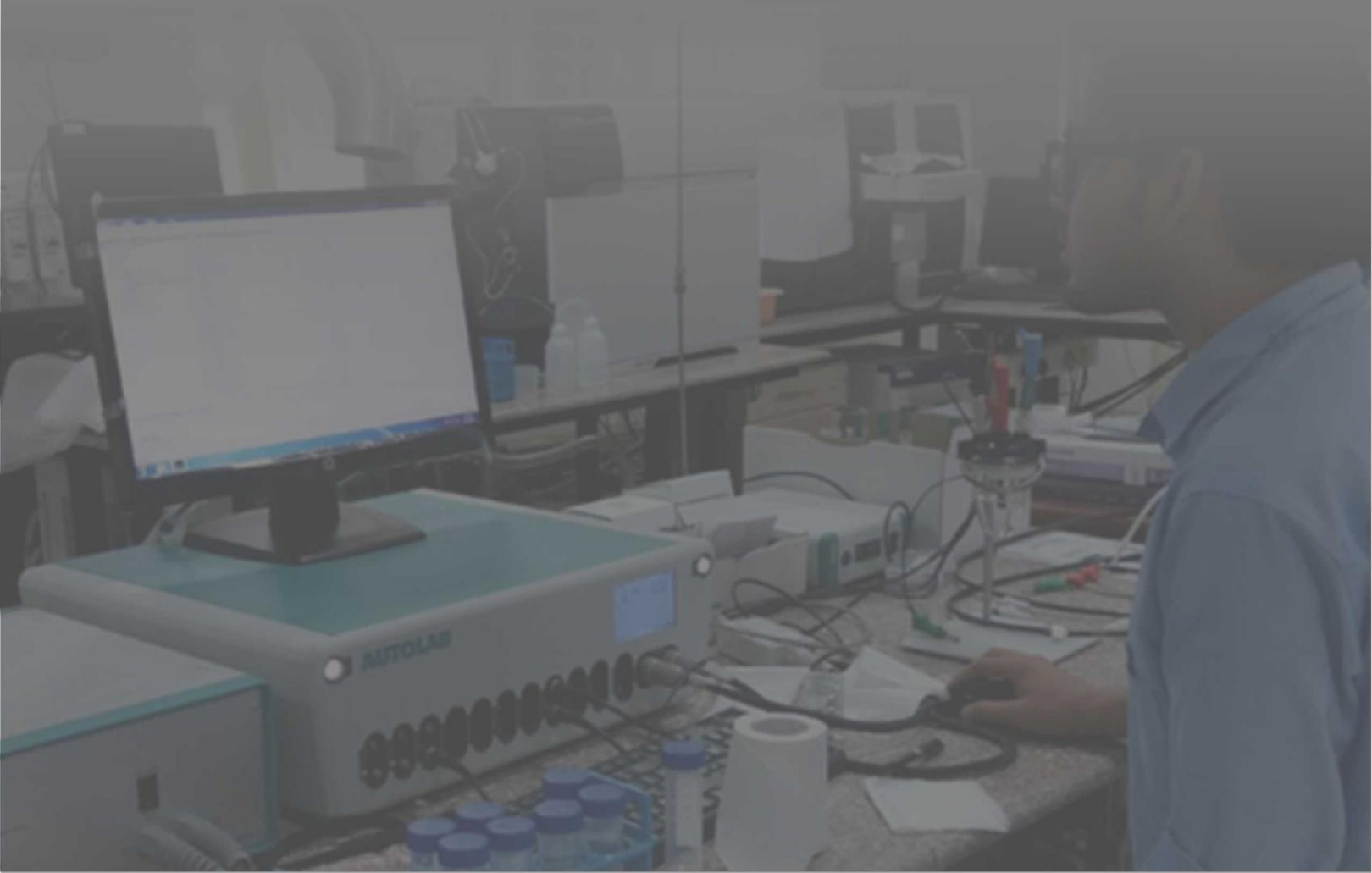

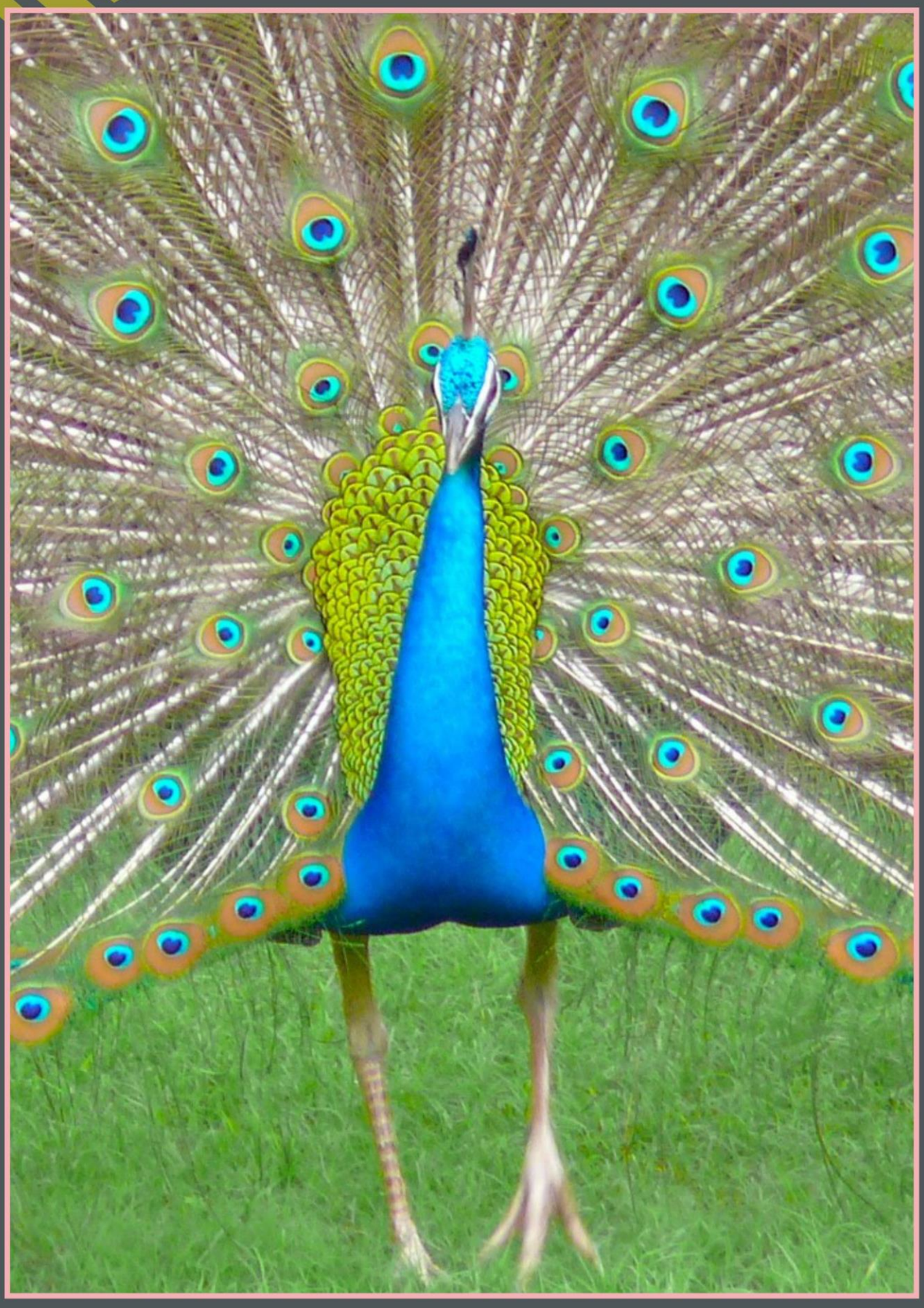

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