Indian Institute of IITK Technology Kanpur

Chemical Engineering

Ranked among the nation's top schools in Chemical Engineering, the department at IITK is endowed with a highly competitive undergraduate program, a vibrant graduate program supported by the state-of-the-art facilities, and a distinguished faculty that has obtained national and international recognitions. The Department currently has 18 faculty members who bring to the Department a wealth of expertise to maintain a vibrant teaching and research environment. Several of our faculty members are Fellows of the Indian Academies of Sciences and Engineering, and many serve on the editorial boards of national and international journals. They have also been recognised by the prestigious awards such as the Bhatnagar Prize and the Herdillia, Amar Dye Chem and the NOCIL awards of the Indian Institute of Chemical Engineers. Our faculty has authored over 25 textbooks and research monographs. Our alumni, many of who have gone on to be the CEOs, business leaders, department chairs and distinguished scientists (even social workers and artists!), both in India and abroad, are a very visible lot and continue to inspire new generation of students here.

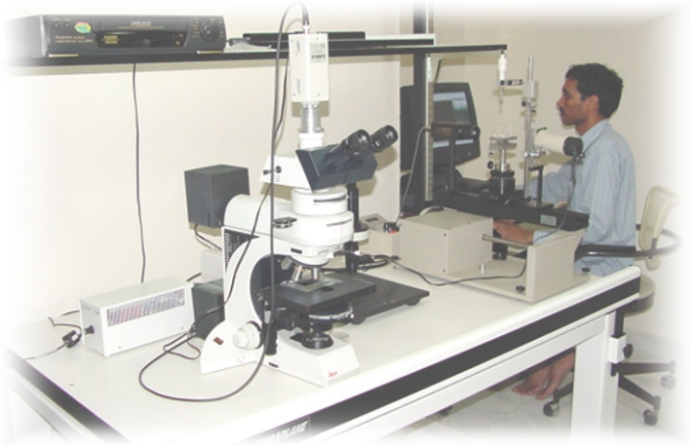
The research in the department ranges from the core areas of chemical engineering such as transport phenomena, thermodynamics, kinetics, process engineering, catalysis, hazard management, optimization and control and separation processes, to the newer frontiers that include bioinformatics, colloids and interfaces, nanotechnology and novel polymeric and semiconductor materials. Our research programs receive support from almost all of the Government funding agencies, as well as from a host of chemical and processing industries like Hindustan Lever, IPCL, GSFC, BPCL, GAIL, ICI, etc. Our faculty also contributes to the training and teaching needs of the industry and the faculty of other colleges by conducting short-term courses in almost all areas of chemical engineering.

Areas of Research

- Bioinformatics
- Catalysis
- Computational Fluid Dynamics
- Chemical Sensors
- Colloid and Interfacial Engineering
- Hazard Analysis and Safety
- Molecular Simulations
- Nanotechnology and Thin Films
- New Materials
- Non-Newtonian Fluid Mechanics and Multiphase Systems
- Process Simulation, Optimization and Control
- Polymer Engineering
- Pyrolysis
- Reaction Engineering and Reactor Design
- Rheology & Complex Fluids
- Soft materials
- Semi-conductor Processing
- Thermo-physical Properties of Fluids and Fluid Mixtures
- Transport Phenomena, Including new Membrane Separation processes and Flow Through Porous Media
- Treatment of Effluents

Facilities Available

- AFM (Atomic Force Microscope)
- Haake RS-1 Rheometer
- Reverse Osmosis/Ultra Filtration Spiral Wound Modules, Pilot Plant with Automatic Temperature and Flow Controls.
- Electrodialysis Set-up
- Surface characterization apparatus including TPD/TPR
- HPLC
- Thermogravimetric Analyser
- CVD Reactor
- Haake Viscometer
- Parr Precision Densitometer
- Contact Angle Goniometer
- Berty Reactor
- PC-controlled S.S. Parr Reactors
- Fully Instrumented Pilot Plant Distillation Column unde Multi-level Optimal Computer Control
- Bench Scale CSTR with pH Control Using a Solid State pH Probe
- Online Mass Flowmeter/Density Meters
- Computer Simulation Packages such as ASPENPLUS, SPEEDUP, MATLAB, LABVIEW, PRO II, etc.
- Modern undergraduate laboratories
- L-B Deposition
- Imaging Ellipsometer



Representative Research Projects

- Online Optimizing Control of PMMA Reactors (DST)
- Removal of VOC by Surface Adsorption and Desorption (CSIR)
- Molecular Level Engineering of Supported Metal Oxide Catalysts (AICTE)
- Modelling of Rotary Kilns (CSIR)
- Process Intensification in Trickle-Bed Reactors (DST)
- Hydrodynamics and Mass Transfer in a High Gravity Gas-liquid Contactor (DST)
- Development of PC Software for Hazard Analysis (MEF)
- Mathematical Modelling of Multistage Multicomponent Distillation (DST)
- Model Predictive Control of Distillation Columns (CSIR)
- Development of Vapor Grown Carbon Fibers (ARDB)
- Catalytic Pyrolysis of Hydrocarbons (DST)
- Real Time Computer Control of Chemical Processes (MHRD)
- Simulation and Experimental Verification of Polymerization (DST)
- Experimental & Computer Simulation of Role of Polymer Supports in Heterogeneous Catalysis of Lewis Acids (DST)
- Equilibrium, Dynamics and Morphology of Thin Films (IFCPAR; MHRD)
- Polymer Thin Films (MHRD)
- Membrane Separations (IFCPAR)

Industrial Projects/ Consultancy

- Modelling, Simulation & Optimization of PVC Batch Reactors (IPCL)
- Process Design of a Pilot Plant for Gas Cracking (IICT)
- Thermal Cracking of Pinane (Hindustan Lever Ltd.)
- In-Flight Oxygen Separator for an Air-Breathing Hypersonic Vehicle (Defense Research & Development Laboratory)
- Modelling of Interlinked Distillation Columns as Encountered in Distilleries (Vittal Mallya Scientific Research Foundation, Bangalore)
- Optimization of Semibatch Nylon-6 Reactor (GSFC)
- Analysis of Ammonia Column Performance (IEL)
- Development of Coke Inhibitors for Pyrolysis Furnaces (Gas Authority of India Ltd., New Delhi)
- District wise Hazard Analysis of MAH Industries in Bhopal (MEF)
- Polymerization and Catalyst Development for HDPE (GAIL)
- Trial Runs for Prehydrolysis Liquor (Grasim Industries, Kerala)
- Particulate Removal (HLL, Bangalore)
- Purification of Lignosulfonates by Membrane Processes (SPM)
- Extraction of Aromatics from Petroleum Naphthas (BPCL)
- Development of Virtual Analysers for Crude Distillation (Bharat Petroleum)
- Online Inferencing and Optimization of Blending Operations (Center for High Technology)

Books

- **A. Kumar and S.K. Gupta,** *Fundamentals of Polymer Science and Engineering,* Tata McGraw Hill, New Delhi, 1978.
- **S.K. Gupta,** *Momentum Transfer Operations,* Tata McGraw Hill, New Delhi, 1979.
- **A. Kumar,** *Chemical Process Synthesis and Engineering Design,* Tata McGraw Hill, New Delhi, 1981.
- **V. Gupta and S.K. Gupta,** *Fluid Mechanics and Its Applications,* Wiley Eastern, New Delhi, 1984.
- **J.P. Gupta,** *Engineering Fundamentals of Heat Exchanger and Pressure Vessel Technology,* Hemisphere, New York, 1986 Paperback edition, 1990.
- **S.K. Gupta and A Kumar,** *Reaction Engineering of Step Growth Polymerization,* Plenum, New York 1987.
- **D.N. Saraf and D. Kunzru (Eds.),** *Recent Advances in Chemical Engineering,* Tata McGraw-Hill, New Delhi, 1989.
- **R.P. Chhabra and D. DeKee (Eds.),** Transport Processes in Bubbles, Drops and Particles, Hemisphere, New York, 1992.
- **Y.V.C. Rao,** *An Introduction to Thermodynamics*, Wiley Eastern, New Delhi, 1993.
- **R.P. Chhabra,** *Bubbles, Drops and Particles in Non-Newtonian Fluids*, CRC Press, Boca Raton, FL, USA, 1993.
- **Y.V.C. Rao,** *Postulational and Statistical Thermodynamics*, Allied Publishers, New Delhi, 1994.
- **Santosh K. Gupta,** *Numerical Methods for Engineers*, Wiley Eastern New Age International, New Delhi, 1994.
- **Y.V.C. Rao,** *Chemical Engineering Thermodynamics*, Universities Press, Hyderabad 1971.
- **P.J. Carreau, D. DeKee and R.P. Chhabra,** *Rheology of Polymeric Systems*, Hanser, Munich 1997.
- **A. Kumar and R.K. Gupta,** *Fundamentals of Polymer Behaviour*, McGraw Hill, New York 1998.
- **R.P. Chhabra and J.F. Richardson,** *Non-Newtonian Flow in the Process Industries*, Butterworth-Heinemann, Oxford 1999.
- **Y.V.C. Rao,** *Heat Transfer*, Universities Press, Hyderabad 2001.
- **D. De Kee and R.P. Chhabra,** Transport processes in Bubbles, Drops of Particles, Vo 11, Taylor & franeis New York, 2002
- **A.Kumar and R.K. Gupta,** Fundamantals of Polymer Engineering, Marcel Dekken, New York 2003
- **A.K. Ray and S.K. Gupta,** Mathematical Methods in chemical and Environmental Engineering, chomoon Learning, Singapore, 2003.

Awards and Honours

BHATNAGAR AWARD FOR ENGINEERING SCIENCES

Dr. A. Sharma (2002)

AMAR DYE CHEM Award of the Indian Institute of Chemical Engineers for "*Excellence in R&D for Chemical Engineers below the age of 35 years*"

Dr. R. P. Chhabra (1988)
Dr. A. Sharma (1995)

HERDILLIA Award of the Indian Institute of Chemical Engineers for "*Excellence in Basic Research in Chemical Engineering*"

Dr. A Sharma (2003)
Dr. R. D. Srivastava (1980)
Dr. Anil Kumar (1986)
Dr. S. K. Gupta (1987)
Dr. D. Kunzru (1992)
Dr. R. P. Chhabra (1996)
Dr. P. K. Bhattacharya (1998)

NOCIL Award of Indian Institute of Chemical Engineers for "*Excellence in Design and Development of Process Plants and Equipment*"

Dr. J. K. Gehlawat (1983)
Dr. D. N. Saraf (1989)

INSA Young Scientist medal

Dr. V. Shankar, Yogesh Joshi

INAE Young Enggr award

Dr. V. Sankar, Dr. A Ghatak

ISTE-SGSITS National Award for Research by Young Teachers

Dr. A. Sharma (1993)

DISTINGUISHED ALUMNUS Award of IIT Kanpur

Dr. Ashutosh Sharma

FELLOW, Indian National Academy of Engineering

Dr. D. N. Saraf (1998)
Dr. R. P. Chhabra (2000)
Dr. D. Kunzru (2001)
Dr. A. Sharma

FELLOW, SCIENCE ACADEMIES

Dr. R. D. Srivastava (1983), FNASc
Dr. S.K. Gupta (1987), FASc, FNASC
Dr. Anil Kumar (1987), FNASc
Dr. Ashutosh Sharma (1999), FASc, FNA,FNASC

FELLOW, Institution of Engineers (India)

Dr. J. P. Gupta
Dr. D. N. Saraf
Dr. Y. V. C. Rao

MEMBERSHIP OF EDITORIAL ADVISORY BOARDS

Dr. R.P. Chhabra, Int. J. Eng. Fluid Mech., Gulf, Houston (1987-1992)
Dr. S. K. Gupta, J. Polymer Eng., Freund, London (1995 onwards)
Dr. P.K. Bhattacharya, J. Environment & Pollution, Techno. Sci. (1998 onwards)
Dr. A. Sharma, J. Colloid and Interfaced Science, Academic Press (2000 -2003), Canadion J. Of Chemical Eng; Chem.Engg. SG (2007-10) (2006-2007)

Faculty

- **Anil Kumar :** Polymer Science, Catalysis, Membrane separations
- ***Animangsu Ghatak :*** Adhesion, Mechanics of Soft Materials
- **Ashok Khanna :** Two Phase Flow, separations, Moleurla Thermodynamics
- **Ashutosh Sharma :** Nanotechnology, Meso-patterning, functional interfaces
- **D Kunzru :** Microstrachred reactor, catalysis, pyrolysis
- **G Deo :** Heterogeneous Catalysis, Reaction Linetics
- **Jayant Singh :** Moleculon Simulations, Phase behavior of complex fluids
- **J P Gupta :** Transport Phenomena, Safety
- **Nishith Verma :** Adsorption, Pollution control, Transport phenomena
- **Nitin Kaistha :** Process Monitoring, Fault Detection & Isolation, Process Simulation & Control
- **Pankaj Apte:** Interfacial thermodynamics, Phase equetibria, Nucleation
- **P K Bhattacharya :** Membrane Separations
- **R P Chhabra :** Non-Newtonian Fluid Particle Systems, Rheology
- **Siddhartha Panda:** Chemical sensors, Microfabrication
- **S K Gupta :** Polymerization, Optimization & Control
- **Sanjeev Garg :** Bioformatics, Computer Aided Molecular Design & Flexibility Analysis
- **V Shankar :** Stability of Flows; Rheology of Complex Fluids; Transport Phenomena
- **Yogesh M Joshi :** Colloidal glasses, soft matter, Rheology

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