

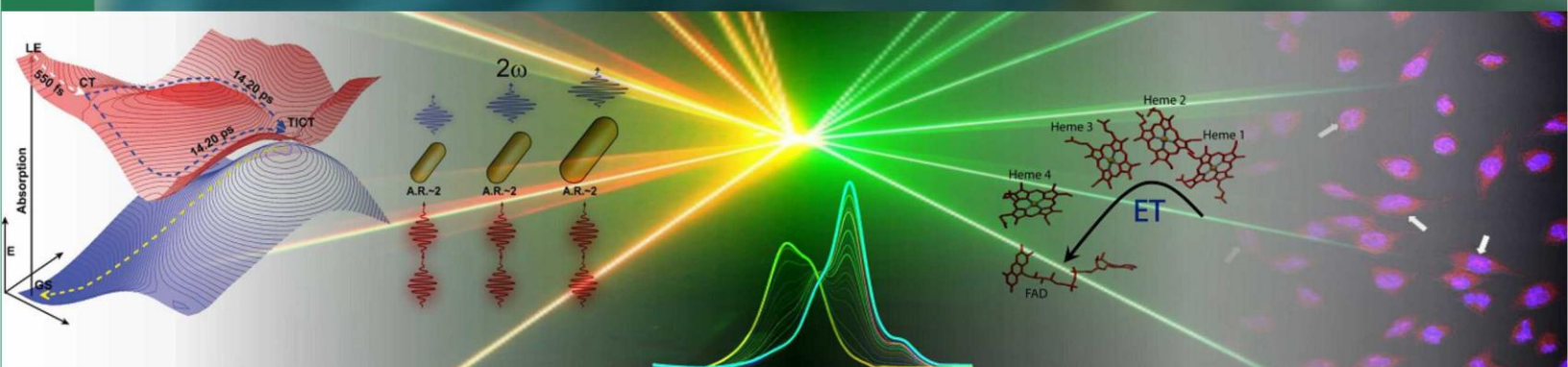


भारतीय प्रौद्योगिकी संस्थान कानपुर  
Indian Institute of Technology Kanpur

# CHEMISTRY

POST GRADUATE PROGRAM

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



# CHEMISTRY

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The Department of Chemistry at the Indian Institute of Technology Kanpur is one of the premier teaching and research departments in the country. The Department started its journey in early nineteen sixties under the leadership of Professor C.N.R. Rao and maintained vigorous momentum under a galaxy of exceptionally gifted faculty members over these years. Altogether, they propelled the department forward and put it firmly on the path of excellence in modern chemistry teaching and research.

Over the years, the department has been able to maintain a steady growth by not only increasing visibility in academics, but also by leading in the chemical sciences research landscape in India. This has been made possible by the collective efforts of dedicated faculty members, motivated students and committed supporting staff. Since its inception, the department has attracted world class faculty, who are involved in research in all major areas of chemistry. Several of our faculty members are also engaged in interdisciplinary research spanning fields such as biology, physics and materials science. We offer a challenging environment for teaching and research in order to inculcate excellent working relationships with undergraduate and graduate students. The department has several state-of-the-art instruments to support cutting-edge research activities.

The Department of Chemistry has a Ph.D. programme designed to train candidates to pursue research in both fundamental and applied chemistry. The program allows collaboration with other departments of this institute. The Department believes that the training of the students to a high level of professional competence for academic and industrial careers can be achieved only in an environment where active research of high quality is produced.

The Department offers a Bachelor of Science (BS) program spanning four years, providing students with the flexibility to select courses tailored to their academic interests and needs. The curriculum encompasses fundamental disciplines such as chemistry, mathematics, physics, life sciences, as well as human and social sciences. Additionally, the department offers an Integrated BS-MS (Dual Degree) program. Furthermore, the department facilitates a Master of Science (M.Sc.) program through the Joint Admission Test for Masters (JAM). The Department consists of around 40 Faculty members, about 300 Doctoral students, 35 post-doctoral and several project research associates. In addition, the department has about 95 Masters and 140 Undergraduate students.



# POST-GRADUATE PROGRAMMES OFFERED

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- ❖ Ph.D.
- ❖ M.Sc. (through JAM)

## Lab Facilities

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- ❖ The Department is equipped with large numbers of instrumental facilities. These include infrared, ultra-violet/visible and near infrared spectrophotometer; single crystal X-ray diffractometers with liquid nitrogen facility, various types of chromatographs, polarographs, cyclic voltammetry equipment, steady-state fluorimeter, circular dichroism, time-correlated single photon counting system, stopped flow apparatus, high speed centrifuge, ultracentrifuge, electrophoretic equipment, photochemical reactors and molecular modelling laboratory. The department has acquired two 400 MHz and one 500 MHz multinuclear NMR spectrometers, EI and ESI Mass spectrometers, Resonance Raman spectrophotometer, Mössbauer spectrometer, EPR spectrometer, Gas adsorption, CHNSO analyser, atomic force microscopy to augment research activities.
- ❖ The department also has access to the Institute's low-temperature laboratory, glass blowing and machine shops and various other analytical facilities in the institute. The department has a very good high performance computational facility and the department also has access to institute's computing facility.

# FACULTY LIST

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## Inorganic Chemistry

- ❖ **Anantharaj Sengeni, Ph.D. (AcSIR, Karaikudi):** Electrochemistry, Catalysis at Electrified Interfaces, Energy Conversion and Storage, Inorganic Materials, Energy and Materials Chemistry
- ❖ **Apparao Draksharapu, Ph.D. (University of Groningen):** (Bio)Inorganic Chemistry, Elucidation of reaction mechanisms, Water Oxidation Catalysis, Raman Spectroscopy, Electrochemistry, Photochemistry
- ❖ **Ashis K. Patra, Ph. D. (IISc Bangalore):** Medicinal inorganic chemistry, lanthanide chemistry, chemical biology, drug delivery
- ❖ **Basker Sundararaju, Ph.D. (Université de Rennes1, France):** Organometallic chemistry and Catalysis driven Organic Synthesis, Predictive catalysis using 3d Transition metals, Metallophotoredox catalysis, Artificial Metalloenzymes, Carbon Capture and Utilization, Asymmetric Catalysis and Molecular editing
- ❖ **Ganapathi Anantharaman, Ph.D. (Goettingen University):** Organometallic chemistry, coordination chemistry, main group chemistry
- ❖ **Jitendra K. Bera, Ph.D. (IISc Bangalore):** Organometallics, 3d-metal catalysis, sustainable processes and products, metal-complexes as antibiotics
- ❖ **Namrata Singh, Ph.D. (IISc Bangalore):** Chemical Biology and Bioinorganic Chemistry, Bioinspired and Stimuli-Responsive Nanomaterials for Antimicrobial Applications, Nanomedicine, Cancer Proliferation and Metastasis
- ❖ **Prakash C. Mondal, Ph.D. (University of Delhi):** Coordination Chemistry, Surface Chemistry, Interfacial Electrochemistry, Molecular Electronics and memory, Electrochromic and Supercapacitor SolidState Devices
- ❖ **Raja Angamuthu, Ph. D. (Leiden University):** Evolution of molecules; bioinspired sequestration and activation of molecules; hydrides
- ❖ **Ritika Gautam, Ph.D. (The University of Arizona):** Bioinorganic and Bioorganic Chemistry, Metal based site-selective drug design
- ❖ **Sabuj K. Kundu, Ph. D. (Rutgers University):** Organometallic chemistry and catalysis, renewable energy and green chemistry
- ❖ **Sankar P. Rath, (IACS, Kolkata):** Bioinorganic chemistry, Artificial metalloenzymes and biocatalysis, Medicinal inorganic chemistry, Metalloporphyrins in biology, Supramolecular chirogenesis

# FACULTY LIST

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## Organic Chemistry

- ❖ **Anand Singh, Ph.D. (Vanderbilt University):** Synthetic Organic Chemistry, Visible light photocatalysis, Solar Photovoltaics, Fluorinated Organics
- ❖ **Dattatraya H. Dethe, Ph. D. (IISc Bangalore):** Total synthesis of bioactive natural products, new synthetic methods, Organic Synthesis, Asymmetric Catalysis, C-H activation, Medicinal Chemistry
- ❖ **Dharmaraja Allimuthu, Ph.D. (IISER Pune):** Organic chemistry, Chemical biology and Small molecule therapeutics
- ❖ **Gurunath Ramanathan Ph.D. (IISc Bangalore):** Biochemistry, environmental biochemistry, fluorescence probes in biology
- ❖ **Jarugu N. Moorthy, Ph.D. (IISc Bangalore):** Organic photochemistry, mechanistic organic chemistry, organic synthesis and supramolecular chemistry
- ❖ **Maddali L. N. Rao, Ph.D. (University of Hyderabad):** Organic Synthesis, Cross-coupling Reactions, Organobismuth Chemistry, Organometallics, Natural products, Green chemistry.
- ❖ **Manas K. Ghorai, Ph.D. (NCL, Pune):** Asymmetric organic synthesis, biologically significant carba- and heterocycles, synthetic methodology, bio-organic chemistry
- ❖ **Parthasarathi Subramanian, Ph.D. (IIT Bombay):** Synthetic Organic chemistry, Total Synthesis of Natural Products, Asymmetric synthesis, and Catalytic Methodologies for biologically relevant molecules.
- ❖ **Ramesh Ramapanicker, Ph.D. (IISc Bangalore):** Synthetic organic chemistry, bioorganic chemistry
- ❖ **Ramkrishna Sarkar, Ph. D. (IISc Bangalore):** Polymer synthesis, Dynamic covalent polymeric network, Reusable polymeric (coating) materials, Recycling and upcycling of polymers, Bio-sourced reusable polymers, Light-driven (green) catalysis in water
- ❖ **Sandeep Verma, Ph.D. (University of Illinois, Chicago):** New antibiotics & AMR, Programmable neuronal regeneration, Stem cell engineering, Microfluidic devices
- ❖ **Srinivas Dharavath, Ph.D. (University of Hyderabad):** Organic Chemistry, Medicinal Chemistry, Heterocyclic Chemistry, High Energy Density Materials, Energetic Oxidizers, Iodine rich Compounds, Energetic Cocrystals, Energetic Ionic Liquids
- ❖ **V. S. Mothika, Ph.D. (JNCASR, Banaglore):** Organic synthesis, Organic materials, Supramolecular chemistry, Porous organic materials, Light-emitting materials, Electrochemistry, Catalysis
- ❖ **Vinod K. Singh, Ph.D. (M.S. University, Baroda):** Synthetic organic chemistry with particular emphasis on enantioselective reactions, synthesis of biologically active molecules



# FACULTY LIST

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## Physical Chemistry

- ❖ **Amalendu Chandra, Ph.D. (IISc Bangalore):** Statistical mechanics and molecular simulations (classical, ab initio and quantum-classical) of liquids, surfaces, interfaces and biological systems; Theoretical spectroscopy and machine learning methods
- ❖ **Arnab Ghosh, Ph.D. (IACS, Kolkata):** Non-equilibrium quantum statistical mechanics and Quantum thermodynamics
- ❖ **Dasari L.V.K. Prasad, Ph.D. (University of Hyderabad):** Computational materials, solid state chemistry (theory)
- ❖ **Debabrata Goswami, Ph.D. (Princeton University):** Thermal spectroscopy, nonlinear spectroscopy, multiphoton imaging, femtosecond pulse shaping, coherent control, quantum computing
- ❖ **Devendra Mani, Ph. D. (IISc Bangalore):** High-resolution gas phase spectroscopy, Helium nanodroplets, Chemical reactions at ultracold temperatures, Non-covalent interactions
- ❖ **Keshavamurthy Srihari, Ph.D. (University of California, Berkeley):** Semi classical methods in chemistry (Theory)
- ❖ **Madhav Ranganathan, Ph.D. (Stanford University):** Modelling and simulation of crystal growth, membrane mechanics
- ❖ **Mainak Sadhukhan, Ph.D. (IISER Kolkata):** Time-dependent quantum mechanics, Development and applications of accurate electron structure methodologies, Quantum chemistry of noncovalent interaction
- ❖ **Manabendra Chandra, Ph. D. (IISc Bangalore):** Single-particle spectroscopy and imaging, Nanoscale plasmonics, Electronic and vibrational strong coupling, plasmon photocatalysis, perovskite, Nonlinear spectroscopy, nano-bio interfaces, probing antibiotic transport in live bacterial cells
- ❖ **Nagma Parveen, PhD (University of Muenster):** Biological nanoparticles, Virus-membrane interactions, Surface functionalization, Binding kinetics, Fluorescence imaging
- ❖ **Nishanth N. Nair (University of Hannover, Germany):** Computational chemistry, computational catalysis, ab initio molecular dynamics simulations of condensed matter systems
- ❖ **Pratik Sen, Ph.D. (IACS Kolkata):** Ultrafast laser spectroscopy, fluorescence spectroscopy, single molecular level fluorescence correlation spectroscopy
- ❖ **Thiruvancheril G. Gopakumar, Ph. D (Technical University of Chemnitz, Germany):** Molecular thin films, molecular switches and gates, 2D materials based on molecules, chemistry at surfaces and interfaces, scanning tunnelling microscopy, atomic force microscopy, solid state.
- ❖ **Vishal G. Rao, Ph.D. (IIT Kharagpur):** Perovskite stability, photocatalysis, and photovoltaics; Plasmonic photocatalysis; interfacial charge transfer dynamics; strategies for efficient solar energy utilization; and carbon dioxide reduction into hydrocarbon fuels.

# BROAD RESEARCH AREAS

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## Inorganic Chemistry

The research interests of inorganic division span diverse areas like coordination chemistry, bioinorganic chemistry, organometallic chemistry, catalysis, and supramolecular chemistry. The study of inorganic entities in biological systems is also a major topic of interest, which includes studies on heme centers in heme protein and topics related to medicinal inorganic chemistry. The creation of new chemical entities with interesting structures, optical, magnetic and electrochemical properties for applications in catalysis and functional material chemistry is also being pursued in many groups.

## Organic Chemistry

Research areas in organic chemistry include an eclectic mix of traditional and contemporary fields such as bioorganic chemistry, new reaction development, natural product synthesis, photochemistry, chemical biology, environmental biochemistry, organic materials and catalysis. In addition to studying the chemistry of small molecules, the synthesis and application of carbohydrate and peptide based architectures and metal-organic frameworks for applications in medicine and material science are also being performed in a number of laboratories. Many laboratories are engaged in interdisciplinary research wherein chemical synthesis of new molecules is guided by their applications as modulators of biological function or as potential new catalysts and materials. Investigations of mechanistic basis of organic photo and thermal reactions and development of organic functional materials based on de novo approaches are actively pursued.

## Physical Chemistry

Research areas in the domain of physical chemistry encompass computational and theoretical chemistry, reaction dynamics, spectroscopy, and materials chemistry. Specific areas include fundamental gas phase molecular dynamics, statistical mechanics, and the application of modern techniques like ultrafast pulse-shaping, molecular beams, single molecule spectroscopy and imaging, and fluorescence. Modern research problems are increasingly becoming multifaceted, and require research efforts that encompass more than one field of science. Our department has a number of laboratories involved in investigating such problems that lie on the interface of two disciplines, and incorporate research from synthetic chemistry, biological sciences, material sciences, medicinal chemistry, and drug discovery correlation and up-conversion to study challenging problems involving electronic structure and dynamics. Both experimental and theoretical research components are strongly represented, and many research programs amalgamate a variety of techniques to answer fundamental questions.



# BROAD RESEARCH AREAS

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## Inter-disciplinary Research

Modern research problems are increasingly becoming multifaceted, and require research efforts that encompass more than one field of science. Our department has a number of laboratories involved in investigating such problems that lie on the interface of two disciplines, and incorporate research from synthetic chemistry, biological sciences, material sciences, medicinal chemistry, and drug discovery.







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## CONTACT

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