Department of Chemistry
IIT Kanpur

Placement Brochure
2025-2026

Visit : https://www.iitk.ac.in/chm/

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VISION

To create, disseminate and translate knowledge in science, engineering and allied disciplines that will best serve the society.

About IIT Kanpur

- Motto : तमसो मा ज्योतिर्गमय
- Public engineering institution in Kanpur, Uttar Pradesh, Established in 1959
- Institute of National Importance by GOI
- During the first ten years of its existence, a consortium of nine US universities helped set up IIT Kanpur's research laboratories and academic programmes under the **Kanpur Indo-American Programme (KIAP)**
- The campus is designed by Achyut Kavinde in a modernist style

About the Department

- One of the **premier** departments at ITK
- Contributes to **research** and **industry**
- Address problems of **societal importance**

- The Department started its journey in early 1960's under the headship of **Prof. C.N.R. Rao**
- The faculty prope led the department forward with exce lence in modern chemistry teaching and research.

- To name a few present faculty members with distinguished awards;

Prof. Vinod K Singh –Synthetic Organic Chemistry –Padma Shri

Prof. Amalendu Chandra –Statistical mechanics and molecular simulations – Shanti Swaroop Bhatnagar

Prof. J.N. Moorthy– Physical Organic Chemistry–Shanti Swaroop Bhatnagar

Prof. V. Chandrasekhar– Bioinorganic and Supramolecular Chemistry–Shanti Swaroop Bhatnagar

Prof. Sandeep Verma –Chemical Biology–Shanti Swaroop Bhatnagar

From the HODs Desk

The Department of Chemistry at IIT Kanpur reiterates its commitment to excellence in contemporary research and teaching. Some courses initiated by my former and present colleagues in this department have become beacons for chemical education in India. We also have one of the strongest Industry–Academia connections. As its newly appointed head, I invite you to explore our department and witness the impactful research and educational initiatives that define us; together, let us embark on a journey of discovery, innovation, and excellence in the fascinating world of Chemistry – a fundamental science of all things in and around us.

Professor Gurunath Ramanathan

Labs in the department

Main group, Coordination, Organometallic Lab	Theoretical Chemistry Group
Inorganic Synthesis And Bioinspired Catalysis	Molecular Functional Materials Research
Organometallic Synthesis and Catalysis	Quantum Thermodynamics Group
Multifunctional Molecular Nanofilms	Femto Lab
Bioinorganic Laboratory	Computational Chemistry lab
Total synthesis of biologically active natural products.	Plasmonic Chemistry Research Group
Energetic Materials Lab	Bio-Nanoparticle Lab
Organic Photochemistry	Theoretical Chemistry Research Group
Organic Synthesis and Bioorganic lab	Ultrafast Spectroscopy Laboratory
Synthetic organic chemistry	Supramolecular Lab

Major Degree Programs

Master of Science (M.Sc)

Post bachelors degree in chemistry
Admission via Joint Admission Test to M.Sc. (JAM)
Combination of compulsory and elective courses
Are required to carry out research

Dual- majors (BS-MS)

Bachelors–Masters Integrated program
5 years

Bachelor of Science (BS.)

4–year
Admission via Joint Entrance Examination (JEE)
Basic courses Electives in chemistry and open electives Research projects (UGP)

Minors

Done along with Bachelor's degree
Offered in Organic, Inorganic and Physical Chemistry

PhD

Doctorate in Philosophy
5 years
Admission by either of the two nation–wide examinations post M.Sc
Rigorous Interview

INORGANIC CHEMISTRY

The research interests of inorganic section span diverse areas that include

- Coordination chemistry
- Bioinorganic chemistry
- Organometallic chemistry
- Catalysis
- Supramolecular chemistry

Some of them are

- The study of inorganic entities in biological systems is major topic of interest
- Studies on heme centers in heme protein
- Topics related to medicinal inorganic chemistry
- The creation of new chemical entities with interesting structures
- Magnetic and electrochemical properties for applications in catalysis and material chemistry

ORGANIC CHEMISTRY

Research areas in organic chemistry– Includes an eclectic mix of Traditional and Contemporary fields such as

- Bioorganic chemistry,
- New reaction development,
- Natural product synthesis,
- Photochemistry,
- Chemical biology,
- Organic materials
- Catalysis.

In addition to studying the chemistry of small molecules,

- The synthesis and application of carbohydrate and peptide based architectures
- Metal–organic frameworks for applications in medicine and material science

are also being performed in a number of laboratories.

PHYSICAL CHEMISTRY

Research areas in the domain of physical chemistry encompass

- Computational and Theoretical chemistry
- Reaction dynamics
- Spectroscopy
- Materials chemistry

Specific areas include

- Fundamental gas phase molecular dynamics
- Statistical mechanics

Application of modern techniques like

- Ultrafast pulse–shaping
- Molecular beams
- Single molecule spectroscopy and imaging
- Fluorescence correlation and up–conversion

Both experimental and theoretical research components are strongly represented.

Basic Chemistry Lab

Permanganometric Titrations	Viscosities of Solutions
Acid – Base Titration	Chemical Kinetics
Iodometric Titrations	Heterogeneous Equilibrium
Complexometric Titrations	Photochemical Oxidation – Reduction
Preparation and Analysis of a Metal Complex	Conductometric titration of HCl Vs NaOH
Polynuclear Metal Complexes with Multidentate Bridging Ligands	Synthesis of antioxidants used as food preservative
Chromatography of Natural Pigments	The Detection of Changes in the Conformation
Preparation of Polymer Films	Determination of pI of Glycine
Isolation of Caffeine from tea	Preparation of Fluorescein Dye

Organic qualitative and quantitative analysis

1. Experimental Techniques

(A) Purification of Organic Compounds

- Recrystallisation
- Sublimation
- Steam distillation
- Distillation
- Bulb–to–bulb distillation

(B) Chromatography

- Thin layer chromatography (TLC)
- Column Chromatography
- Preparative TLC

(C) Physical Constants

- Melting Points and Boiling Points
- Optical rotation and molecular rotation

(D) Spectroscopic Methods

- Preparation of ester (Confirmation by IR , NMR)
- Structure elucidation (by spectral data)

2. Investigation and Characterization of Organic Compounds

- Detection of elements present in a given organic compound.
- Identification of functional groups in a given organic compound.
- Identification of unknown organic compounds.
- Separation of organic mixture by chemical methods, preparation of derivatives, and identification of the material

Inorganic Chemistry Laboratory

Estimation of iron in minute quantities by **UV-vis spectrophotometry**
Principles of **colorimetric analysis**: determination of iron content of an unknown sample.
Preparation of hexamminenickel(II)chloride: estimation of ammonia and nickel by **titrimetric** and **gravimetric** methods
Preparation of diamagnetic and paramagnetic main–group and transition–metal acetylacetonates
Synthesis, isolation and **spectroscopic characterization** of the complexes
Synthesis and characterization of **ferrocene** and **acetylferrocene**
Synthesis of the complex and their purification using **chromatography**
Acid–base and **redox titration** of tablets containing Vitamin–C
Estimation of ascorbic acid in Vitamin–C tablets
Paper chromatographic separation of Cu^{2+}, Fe^{3+} and Ni^{2+}
Utilization of paper chromatographic techniques to separate the metal salts
Spectrophotometric determination of phosphate: estimation of phosphate in cola drinks
Determination of concentration of phosphates applying Beer–Lambert law
Potassium tris–oxalatoferrate(III): synthesis, analysis and photochemistry
Synthesis of the complex and its utilization in **blue-printing experiment**

Physical Chemistry Laboratory

Calibration of **volumetric apparatus**
Analysis of the **rotational-vibrational spectra**
Determination of **partial molal volume**
Isotherm for a three component system
Kinetics of fast reactions by **stopped-flow technique**
Spectrophotometric determination of acid dissociation constant
The measurement of **electrical conductance** for the determination of the equivalent conductance at infinite dilution
Rate of the hydrolysis of sucrose using **polarimeter**
Determination of pKa of poly–basic acid with the **pH meter**
Determination of **critical micelle concentration**
Determination of transport number by **moving boundary method**
Polarizability from refractive index measurements
Formula and **stability constant** of a complex by spectrophotometry
Fluorescence quantum yield determination of an unknown molecule.
Fluorescence spectrum and **stern-volmer quenching** constant
IR and Raman spectroscopy of solvent mixtures
Computing **Potential Energy Surface** of molecules using Quantum Mechanics
Introduction to **Scanning Probe Microscopy**

Inorganic Chemistry Laboratory-II

Invisible ink Utilization of coordination chemistry
Ligand-exchange concept
Crystal-field splitting parameters of 3dmetal ions.
Acidic and basic salts **Hydrolysis** of salts and its consequences.
Various **spectroscopic techniques**
Synthesis, isolation and characterization of complex
Geometrical isomers: synthesis, identification using spectroscopic techniques.
Investigation of **acid hydrolysis** of the complex
Resolution into **optical antipodes** Optical isomers
Titrimetric and **gravimetric** methods
Synthesis of an **air-sensitive organometallic** complex
Ferrocene ,acetylferrocene **Synthesis**, **chromatography**, **characterization**

Organic Preparations Lab

Benzil – Benzilic Acid Rearrangement

Fisher: Indole Synthesis:
Diazotization
Reductive Coupling Prep

Molecular Rearrangement
Pinacol – Pinacolone – rearrangement

Reimer–Tiemann Reaction

Perkin Reaction

Aldol condensation and epoxidation

Department Facilities

The Department of Chemistry has excellent facilities including a wide range of sophisticated instruments offering technical support to the research activities.

High Field Nuclear Magnetic Resonance	Cyclic Voltammetry
Resonance Raman Spectrometer	Elemental Analyzer PE
Spectrophotometer	UV-VIS Spectrophotometer
Surface Plasmon Resonance	Micro-Analytical Facility
Mossbauer spectrometer	REACT IR (Metler Toledo)

Department Facilities

NMR Spectroscopy

The department operates three high field NMR (both 400 and 500 MHz) spectrometers for recording high resolution spectra from solution phase samples. NMR spectrometers are run and maintained by dedicated operators who also routinely train and assist students in recordingsimple 1-Dspectra as well as multidimensional hetero-nuclear experiments.

Mass Spectrometry

This facility allows for collection of routine and high resolution mass spectra under a variety of ionization conditions om the state-of-the art. Waters Q-TOF Premier HAB213 and Waters GC Premier mass spectrometers.

X-Ray Crystallography

Determination of molecular structures of organic, organometallic and coordination compounds are performed by single crystal Xray diffraction measurement using two state of-the-art single crystal X-ray diffractometers. (Bruker Apex-II and D8 Quest Single Crystal Microfocus X Ray Diffractometer) equipped with a low temperature device.

Femtosecond Transient Absorption Spectrometer

Early time structural and excited-state dynamics of molecules and materials in the condensed phase can be studied using this facility. The time resolution of setup is 120fs.

Department Facilities

Resonance Raman Spectrometer

A tunable laser source (Argon ion) coupled to a high resolution Raman spectrometer enables us to record resonant Raman spectra of molecules and materials. This technique can be used to probe subtle changes in the structure of a complex molecular system.

EPR Spectroscopy

Electron Paramagnetic Resonance spectroscopic measurements are done using Bruker EMX300 EPR spectrometer installed in the department. Our facility routinely records EPR spectra of solid, liquid and frozen samples under variable temperature condition.

Other Department facilities

Include FT–IR spectrometer,UV–vis–NIR spectrophotometer,elemental(CHN)) analyzer,Mossbauer spectrometer, circular dichroism spectrometer, Pico second Time–Resolved Fluorimeter, Atomic Force Microscope, powder X-ray Diffractometer, Thermo Gravimetric/Differential Thermal Analyzer,polarimeter,etc

Nano Science Center

Nano science center at the institute caters the state of the art facility and resources for carrying out research, development activities in the areas of soft nano fabrication. Some of the major equipments at the center are NSOM/RAMAN/Confocal/AFM, Scanning Electron Microscope with electron beam lithography, small angle and wide angle XRD.

Distinguished Alumni

Prof. Padmanabhan Balaram is an Indian biochemist and a former director of the Indian Institute of Science in Bangalore, India. He is a recipient of the third highest Indian civilian honor of **Padma Bhushan** (2014) as well as the **TWAS Prize (**1994)

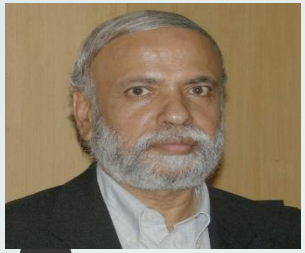
Dr. Swaminathan Sivaram is a former director of the National Chemical Laboratory, Pune. The Government of India awarded him the fourth highest civilian honor of the Padma Shri, in 2006, for his contributions to Indian science.

Prof. Sourav Pal is an Indian theoretical chemist ,former director of the Indian Institute of Science Education and Research, Kolkata. He was a director of the CSIR-National Chemical Laboratory in Pune.

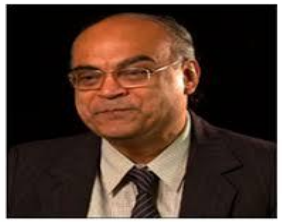
SASTRA-CNR Rao Award for excellence in chemistry and material science in 2014.

Shanti Swarup Bhatnagar Prize in Chemical Sciences, 2000.

Distinguished Alumni



Prof. Tushar Kanti Chakraborty is an Indian organic chemist
He has served as a director of Central Drug Research Institute and as a chief scientist at the Indian Institute of Chemical Technology
Shanti Swarup Bhatnagar Prize for Science and Technology



Dr. Pushpito Ghosh is a chemist by training he served from 1999-2014 as the Director of CSIR-Central Salt & Marine Chemicals Research Institute (CSMCRI, Bhavnagar, and from 1985-1998 he held senior R&D positions in ICI India and ICI UK.

Dr. Uday Maitra Currently Honorary Professor and INSA Senior Scientist at the Indian Institute of Science, Bangalore

- CDRI Drug Research Award, 2006
- S.S. Bhatnagar Prize in Chemical Sciences

Distinguished Alumni

Prof. Amitabha Chattopadhyay is an Indian scientist and he served as the founding dean of biological sciences at the Academy of Scientific and Innovative Research(AcSIR)
•Shanti Swarup Bhatnagar Prize
•Ranbaxy Research Award

Prof. P. Veeraraghavan Ramachandran is currently a Professor of Chemistry at Purdue University. He is also the Director of the Hebert C. Brown Center for Borane Research.

Prof. Arun K Ghosh is an Ian P. Rothwell Distinguished Professor at Purdue University since 2009. He was earlier a Professor in the Department of Chemistry at University of Illinois at Chicago, Chicago, IL from 1998 to 2005.

- Elected Fellow, National Academy of Inventors, 2024
- Fellow of the Royal Society of Chemistry, 2015

Prof. Ayusman Sen is the Verne M. Willaman Professor of Chemistry

- Elected Fellow, Royal Society of Chemistry
- Medal, Chemical Research Society of India (CRSI)

Past Recruiters

Pal ReMaterials (ModRoof)

Syngene International Ltd

PharmaAce analytics Reckitt

Benckiser Mastercard

Proctor and Gamble

Zomato

Reading right

FN Mathlogic Consulting Services Pvt Ltd

Thank You

Sourabh Patidar

Department Placement Coordinator

Email : sourabhp24@iitk.ac.

Phone: +91-7049972204

Prof. Anantharaj Sengeni

Faculty-in-Charge for Student Placement(2025-26)

Email : ananths@iitk.ac.in