

## Summary Report

**About Department/Center/School:** Department of Chemistry was one of first few departments started in IIT Kharagpur in 1952. Professor J.C. Ghosh, the first director of the institute played crucial role in the installation and development of the department. Ever since its inception, the department has established a tradition of excellence in education and research in the arena of chemistry in the country. With its multifaceted research activities and excellent facilities, the department provides one of the best academic environments in the nation.

### 1. Academic Programs ( Range of Degrees and Disciplines):

- 5-Year Integrated M.Sc. in Chemistry
- Joint M.Sc.-Ph.D. Degree in Chemistry (2009 onward)
- 2-Yr M.Sc. in Chemistry (till 2008)
- Ph.D. in Chemistry

### 2. Thrust Areas of Research:

- Synthetic chemistry and Advanced materials
- Biomolecules and biomimetics
- Colloids and macromolecules
- Theoretical chemistry

### 3. Curriculum and Courses & Teaching Environment

Items	Ratio/ Number	Items	Number/ %
Teacher-student Ratio	10.5	Average No. of students motivated (%) to opt of careers Eng/ Tech. Sectors UG/PG/PhD	UG 20% PhD 20%
No. of Faculty members as on today	33	Average No. of students motivated (%) to opt of careers in Science sectors UG/PG/PhD	UG 50% PhD 70%
Average No. of Tutorial Assistants	100	No. of teaching labs	5
No. of UG/DD students	185	Average No. of students per experiments in core courses	3
No. of PG students/PhD students	170	No. of Students' workshops/`Tinkering` Labs	-
Average no. of tutors with more than 100 students	63	No. of new courses introduced	43
Average students placements (%) (UG/DD/PG)		No. of new program introduced	01
No of major curriculum review in both UG & PG level	01	Undergraduate Vs PhD strength expressed as Percentage	109% (UG/ PhD)
No of UG lab (teaching labs) developed/set-ups		No of PG/research labs developed/new set up	06
No of E class rooms	03	No. of lab classes per week	15
Average No. of Courses taken per student		No. of core/elective/seminar/projects subjects	
Int MSc	67	Int MSc	54/7/4/2
Joint MSc-PhD	35	Joint MSc-PhD	25/5/3/2
Ph.D	7-10	Ph.D	7-10

#### 4. Research and Development & its Environment

Items	Number	Items	Number	Items	No.
Total No. of Publications in Journals (2008-13)	852	Average no. of citation per paper	9.0	No. of large interdisciplinary research projects	10
Total No. of Publications in Conference & Symposium	14	Average Journal publication per year	170	No. of Int. conf./workshops attended by students	20
Total No. of Books & e-books published	10	h-Index of the department since 2008/overall h-index in Scopus	34	No. of PDF hired in the Institute	5
Total No. of Edited Conference Proceedings/book chapters	6	No. of recognitions & Awards, fellows etc to faculty/students	45	No. of International visiting researchers/adjunct faculty stayed here for at least a week	2
Total No. of Technology Developed/transferred	2	Average Retention(%) of Young faculty for at least 10 years	99.9%	No. of short courses/workshops /conf. organized with international participations	14
Total No. of Patents Filed/Obtained	15	No. of Sponsored research Project /fund (lakh) generated from non-internal source	22 crore	Average No. of PhD granted per year	25-30
No. of Publications per Faculty/Masters/PhD students	5 per faculty per year	No. of Consultancy /fund (lakh) generated from non-internal source	08	Average No. of PhD Granted per year per faculty	1
No. of Publications per Faculty/Masters/PhD students in Top Ten Journals as Identified by the department	9 in 5 years	No. of M. Sc. students motivated into pursuing PhD/PhD graduates motivated to pursue career in Academics(abroad or IIT etc)	100%	Ranking of the department in terms of total number of Journal publications within the Institute/publications per faculty	4
Average No. of Citation per faculty per year	51	No. of publications resulting from outside collaboration	102 (within IIT KGP)		
			69 (National)		
			50 (International)		

## **5. Vision for the Future (in brief):**

**(a) Departments/centers/schools should spell out its Mission and Vision Statements, (b) Plans for future to achieve the projected goals and (c) measures adopted towards above.**

The Department of Chemistry intends to assume a leadership role in teaching as well as research. Our curriculum is rigorous and we continue to update the concepts on a regular basis to meet the demands of the ever-extending, interdisciplinary and diverse nature of chemical sciences. We are committed in providing thorough training to our students so that they become successful entrepreneurs, scholars, scientifically literate citizens and leaders of future. We make and will continue to make significant contributions and impact on chemical education, teacher preparation, and professional development in the region and also for the country. Our commitment to excellence in research has transformed the department during last decade and the new generation of highly professional teachers and researchers will continue to strive for the highest possible standards. Even with limited resources, we promote excellence in service to the department, university and community and academic institutions. Cultivating ties with industries will be one of the priorities in the future course of actions. In short, the Department will strive to create a collegial, collaborative, and supportive environment that enrich teaching and learning, strengthen scholarship, and encourage professionalism.

## **6. External peer review of the Dept./centre/schools (in brief):**

**(a) Date of the peer review:** 06.02.13 and 25.02.13

**(b) Name of the Experts involved and their affiliations in short:**

1. Professor Parimal K. Bharadwaj, FNA, Head, Chemistry Dept., IIT Kanpur
2. Professor Amalendu Chandra, FNA, Bhatnagar awardee, Professor, Chemistry Dept., IIT Kanpur
3. Professor Viswakarma Singh, FNA, Chemistry Dept., IIT Bombay

**(c) Overall recommendations of the peer review committee: strengths, weaknesses, suggestions and comments**

All the reviewers observed that the department of chemistry, IIT Kharagpur has been doing exceedingly well both in teaching and research. However, they also pointed out that both the research and teaching laboratories in the department need urgent attention in view of severely limited laboratory space, non-availability of adequate safety measures such as fume hoods and proper storage of chemicals and other infrastructures. The reviewers felt that productivity of the department in research (both in terms of quality and quantity) would substantially increase if adequate facilities are provided especially if all the lab spaces are doubled, safety measures updated and laboratory waste management rigorously implemented. In case of teaching laboratories, enough trained personnel should be present in the laboratories including computer technicians. Augmentation of instrumental facilities like NMR was also suggested.

Teaching and research activities were noted as the prime activities of faculty members and departmental/institute administrative assignments were suggested to be kept a minimum so that a faculty member can devote more time for academic activities. It would be highly desirable to have teaching assistants for large lecture-based classes.

**(d) Measures adopted/action taken at the department level to address the recommendations of the peer review report:**

Extensive review exercise is being undertaken by the Department to address the recommendations of the peer review report and the suggestions are expected to be incorporated in the academic review process under discussion. Modernization of the laboratory facilities and safety measures are being actively pursued.

**7. Strengths, Weaknesses, Opportunities & Threats (SWOT) Analysis of the Department**

<p><b>STRENGTHS</b></p> <ul style="list-style-type: none"><li>• Research opportunities for undergraduate students in their final year of MSc</li><li>• Versatile expertise of faculty members in a wide range of areas of chemical, material and biochemical science</li><li>• State-of-the-art research infrastructure and equipments</li></ul> <p><b>WEAKNESSES</b></p> <ul style="list-style-type: none"><li>• Lack of space and trained manpower to maintain high end research facilities available at the department</li><li>• Lack of communication with Career Development Centre for summer internship and industrial training/planning of ALL undergraduate and PhD students<ul style="list-style-type: none"><li>• Lack of incentive to undergraduate students interested in teaching assistantship for departmental courses</li></ul></li></ul>	<p><b>OPPORTUNITIES</b></p> <ul style="list-style-type: none"><li>• Cutting edge inter-disciplinary research spanning nearly all major areas of chemistry</li><li>• Unique training in research using both theoretical and experimental methods</li></ul> <p><b>THREATS</b></p> <ul style="list-style-type: none"><li>• Inadequate lab space</li><li>• Absence of safety regulations especially regarding handling and disposal of chemical and biochemical wastes</li></ul>
--	--

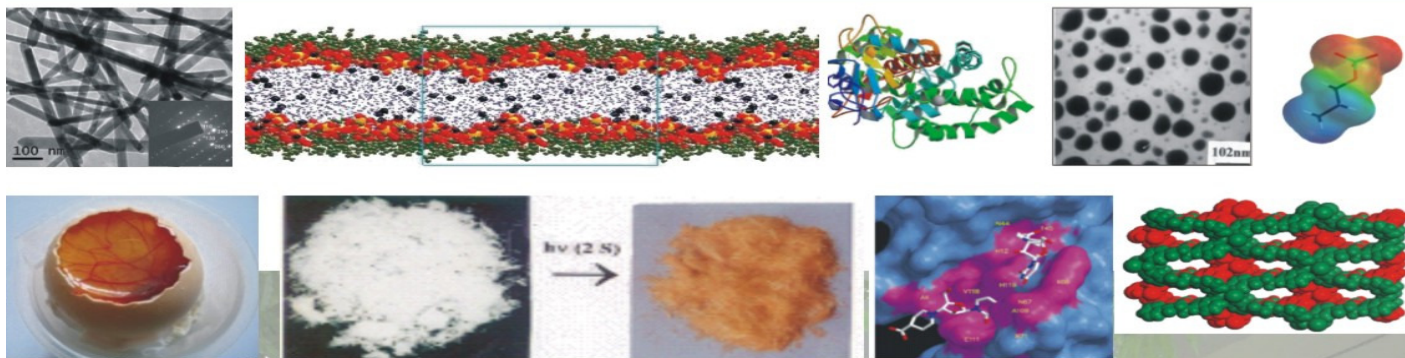
**8. Additional Information, if any**

- The Department has been ranked as one of the top six chemistry departments in India by the Department of Science & Technology, India.
- The Department has been awarded DST-FIST financial grant (Level II).



## Important Highlights

# DEPARTMENT OF CHEMISTRY



Department of Chemistry was started in IIT Kharagpur in 1952 by Professor J.C. Ghosh, the first director of the institute. With its multifaceted research activities and excellent facilities, the department provides one of the best academic environments in the nation. In 2011, the department was ranked by DST as one of the top six chemistry departments in the country. Today, it has 33 faculty members, 17 non-teaching staff, 150 masters' students and 170 doctoral students.

<http://www.iitkgp.ac.in/academics/?page=acadunits&&dept=CM>

रसायन विज्ञान विभाग  
DEPARTMENT OF CHEMISTRY



INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR 721 302, INDIA

## *Faculty profiles...*

<b>Faculty Members</b>	<b>Specialization</b>
Anoop Ayyappan, PhD (Hyderabad)	Computational chemistry, reaction mechanism
S. Bandyopadhyay, PhD (IISc)	Molecular simulation and computational biology
A. Basak, PhD (Oxford)	Bioorganic chemistry
M. Bhattacharjee, PhD (NEHU)	Synthetic inorganic chemistry
K. Biradha, PhD (Hyderabad)	Supramolecular chemistry and crystal engineering
P. K. Chattaraj, PhD (IIT Bombay)	Density functional theory, quantum chaos
M. C. Das, PhD (IIT Kanpur)	Functional porous materials
S. Dasgupta, PhD (Rensselaer)	Protein chemistry, structure analysis
D. Dhara, PhD (IICT)	Polymer chemistry
J. K. Dey, PhD (IIT Kanpur)	Biophysical and analytical chemistry
S. Hajra, PhD (NCL)	Synthetic organic chemistry
M. Halder, PhD (IACS)	Ultrafast spectroscopy and spin chemistry
M. Maji, PhD (Muenster)	Catalysis and asymmetric organic synthesis
D. Mal, PhD (Missouri)	Organic synthesis
G. Mani, PhD (IISc)	Inorganic chemistry
S. Mishra, PhD (Munich)	Theoretical and computational chemistry
A. Nag, PhD (Jadavpur)	Application of enzymes in organic synthesis
S. Nanda, PhD (IICT)	Synthetic organic chemistry
T. Pal, PhD (Burdwan)	Environmental chemistry, catalysis by nanoparticles
A. P. Mahanty, PhD (IIT Kharagpur)	Synthesis and biological application of nanomaterials
T. Pathak, PhD (Uppsala)	Carbohydrate and nucleoside chemistry
S. K. Patra, PhD (IIT Kanpur)	Inorganic, organometallic and polymer chemistry
P. Pramanik, PhD (IIT Kharagpur)	Nanoscience and technology, solid state chemistry
C. R. Raj, PhD (Madurai Kamaraj)	Electroanalytical chemistry, biosensors and nanomaterials
A. Rajakumar, PhD (Madurai Kamaraj)	Environmental and analytical chemistry
D. Ray, PhD (IACS)	Bioinorganic chemistry
J. K. Ray, PhD (IACS)	Supramolecular chemistry
R. Samanta, PhD (IICT)	Synthetic organic chemistry
N. Sarkar, PhD (IACS)	Photochemistry and photophysics in organized assemblies
T. K. Sarkar, PhD (IACS)	Synthetic organic chemistry
N. D. Pradeep Singh, PhD (Madras)	Organic chemistry
S. K. Srivastava, PhD (Kharagpur)	Solid state chemistry and catalysis
S. Taraphder, PhD (IISc)	Chemical reaction dynamics

**Awards & Honors:** FTWAS, FNA, FASc, FNASc, FAcST, CRSI, MRSI, INSA young Scientist, J. C. Bose Fellowship, etc.



### Instrumental Facilities

- ▲ Single Crystal X-ray diffractometer
- ▲ Powder XRD
- ▲ 200 MHz, 400MHz & 600 MHz NMR
- ▲ Perkin Elmer C,H,N Analyzer
- ▲ Magnetic Susceptibility Balance
- ▲ HPLCs, Digital Polarimeter
- ▲ F7000 Fluorimeter
- ▲ Gas Chromatograph and GC-MS
- ▲ Thermal Analyzer (TG-DTA/DSC)
- ▲ FT-IR, UV-visible with NIR)
- ▲ Electrochemical Analyser
- ▲ FLIM
- ▲ Circular Dichroism
- ▲ FESEM
- ▲ High Performance Computing Platform

### Research Activities:

The department has focused its research activities on basic and contemporary areas of chemistry, relevant to the society. The major research fields encompass interdisciplinary areas such as bioinorganic, bioorganic, biophysical, computational, material, nanomaterial, organometallic, polymer, solid-state, and theoretical chemistry in addition to the traditional divisions i.e. inorganic, organic and physical chemistry.

#### Advanced Materials

Ceramic Nanostructures; Nanomaterials for Energy and Environment; Nanoscience and Nanotechnology; Organic architecture for Lithography; Polymer Nanocomposites

#### Synthetic Chemistry

Organic Synthesis, Asymmetric Catalysis and Stereoselective Synthesis of Biomolecules; Drug Design and Development; Enzyme Catalyzed Manufacture of Industrial Chemicals; Modified Carbohydrates; Natural Products; Organometallic Chemistry; Photochemistry and Photophysics of Assemblies and Protecting Groups; Supramolecular Chemistry

#### Colloids and Macromolecules

Block Copolymers; Colloids and Drug Delivery; Polymer-Surfactant interactions; Solvation Dynamics of Assemblies; Synthesis and Characterization of Polymeric Materials

#### Biomolecules & Biomimetics

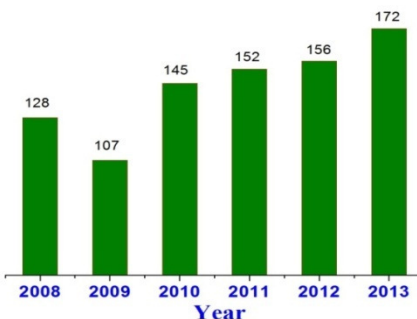
Biomimetic Chemistry of Metals; Characterization of Enzymes, Receptors and Nucleic Acids; DNA-interacting Molecules; Enzyme Inhibitors; Nucleosides as Antivirals; Structure and Function of Proteins

#### Theoretical Chemistry

Density Functional Theory; Quantum Chaos; Chemical Reaction Dynamics; Soft Condensed Matter; Studies at Interfaces; Computational Organic/Inorganic Chemistry; Computer Simulation of Biomolecules and Materials

### Publication (2008-2013)

Total number of publications	860
Citation per paper	9
h-index of Department (Source: SCOPUS)	34



### Funding (2008-2013)

