Summary Report

About Department/Center/School: The Department of Computer Science and Engineering at the Indian Institute of Technology, Kharagpur, was formed in 1980. The first undergraduate batch rolled out in the year 1982 and the first PhD was awarded in 1986. Since its inception, the department has always been recognized all over the world for excellence in research and teaching. The Department provides an outstanding research environment complemented by superior teaching for its students to flourish in. Graduates from the department are heavily recruited by both academia and industry. All over the world, ex-students of the Department occupy top positions in both academia and industry.

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

B.Tech, M.Tech (Dual 5 years), M.Tech (Computer Science and Engineering), MS, Ph.D.

2. **Major 4-5 Thrust Areas of Research:**

Algorithms and Computational Geometry, Artificial Intelligence, Complex Networks and Data Mining, Computer Security and Cryptography, Formal Verification and Design

3. Curriculum and Courses & Teaching Environment

Items	**Ratio/ Number**	**Items**	**Number/%**
Teacher-student Ratio	1:21	Average No. of students motivated (%) to opt of careers Eng/ Tech. Sectors UG/PG/PhD	**80/100/100**
No. of Faculty members as on today	32	Average No. of students motivated (%) to opt of careers in Science sectors UG/PG/PhD	**-**
Average No. of Tutorial Assistants	115	No. of teaching labs	**4**
No. of UG/DD students	425	Average No. of students per experiments in core courses	**1**
No. of PG students/PhD students	195	No. of Students' workshops/``Tinkering'' Labs	**1**
Average no. of tutors with more than 100 students	20	No. of new courses introduced	**10**
Average Students placements (%) (UG/DD/PG)	100%	No. of New program introduced	**0**
No of major curriculum review in both UG & PG level	1	Undergraduate Vs PhD strength expressed as Percentage	**15% (PhD)**
No of UG lab (teaching labs) developed/set-ups	4	No of PG/research labs developed/new set up	**10**
No of E class rooms	0	No. of lab classes per week	**3**
Average No. of Course done per student for B. Tech/DD/M. Tech/Ph.D	60/83/18/5	No. of core/elective/seminar/projects subjects taken for B. Tech, DD, and M. Tech respectively	**42/14/0/2 44/17/0/4 5/7/2/3**

4. Research and Development & its Environment

Items	Number	Items	Number	Items	No.
Total No. of Publications in Journals (2008-13)	259	Average no. of citation per paper	**8.71**	No of large interdisciplinary research projects	**5**
Total No. of Publications in Conference & Symposium	441	Average Journal publication per year	**55**	Number of Int. conf./workshops attended by students	**103**
Total No of Books & e-books published	20	h-Index of the department since 2008/overall h-index in Scopus	**14**	No. of PDF hired in the Institute	**1**
Total No of Edited Conference Proceedings/book chapters	5	Number of papers with citation more that the average no. of citation of the Journals	**NA**	No. of international Students as PhDs/PDFs	**1**
Total No. of Technology Developed/transferred	*4*	No. of recognitions & Awards, fellows etc to faculty/students (provide break up if necessary)	55	No. of International visiting researchers/adjunct faculty stayed here for at least a week	*20*
Total No. of Patents Filed/Obtained	*17*	Average Retention(%) of Young faculty for at least 10 years	90%	No. of short courses/workshops /conf. organized with international participations	*8*
Total No. of Copyright Filed/Obtained	-	No. of Sponsored research Project /fund(lakh) generated from non-internal source	22/589	Average No. of PhD granted per year	*20*
No. of Publications per Faculty/Masters/PhD students	**23/0.4/2.8**	No. of Consultancy /fund (lakh) generated from non-internal source	56/1621	Average No. of PhD Granted per year per faculty	*1.5*
No. of Publications per Faculty/Masters/PhD students in Top Ten Journals as Identified by the department	**6.3/0.2/0.8**	No of Internal and external Collaborations research papers/research projects/PhD students	442/38/59 225/5/7	Patent granted per faculty	*0.6*
Average No. of Citation per faculty per year	**1.9**	No of M. Tech students motivated into pursuing PhD/PhD graduates motivated to pursue career in Academics (abroad or IIT etc)	10	Number of articles in collaborations with Ten countries*	*20*
Ranking of the department in terms of average citations per paper within the Institute	**NA**	Ranking of the department in terms of total number of Journal publications within the Institute/publications per faculty	NA	No of articles of the dept. contributing towards h-index of the Institute since 2008	*NA*

5. External Stakeholder Engagement and others

Items	Number	Amount Lakh
No. of PhD/Master students' thesis funded by Industries	30/10	450/5
Total number of Industry sponsored projects and its income (Lakh)	62	1910
No. of Curriculum Development Initiative for Industries	2	
No of Technology transfer/adopted by Industry/Labs	4	
No. of Nationally relevant research projects	8	
No of Policy inputs/consultancies provided	2	
No. of Research grant and seed money from internal savings of the Institute per young faculty of the department and its total fund	1.2	303
No. of Community Relevant projects	5	

6. 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.

In the coming years, the department will continue to aim to excel in teaching and research, and establish itself as a leader in the field of Computer Science & Engineering education and research both nationally and internationally.

To achieve leadership and excellence in research, the department plans to focus on the following:

1. *Further strengthen existing core research groups in the department. The department plans to further strengthen these groups by targeted hiring of highly qualified faculty in these areas and building up necessary computing and other infrastructure to support them. To this end, the department is already building a high performance computing infrastructure.*
2. *Initiate developing research groups in some core CS areas where the department currently does not have a strong presence.*
3. *Set up centers of excellence in niche domains. Forthcoming centers include a center on artificial intelligence for societal needs, a center on security of internet and embedded systems, and a center on formal verification.*
4. *Build up a strong and robust research ecosystem by attracting talented research scholars and post-docs to the department. The department already has several industry-sponsored fellowships and plans to work with industry to increase such fellowships which will be helpful in attracting high quality students.*
5. *Promote interdisciplinary research by promoting top students of other disciplines to take up research positions in the department.*
6. *Finally, work on high-impact research and technology development problems identified in consultation with industry and national agencies.*

Leadership in research is expected to also strengthen teaching in the department. As the faculty strength increases, the department also plans to hold smaller classes to give more focused attention to students, understanding their individual needs, and possibly customizing the learning imparted. Increase in faculty strength and strengthening of different core research groups will allow more specialized electives to be given to enable the students to have a wider perspective. In particular, as the department grows, the department would like to develop more specialized post-graduate programs to build highly skilled and specialized manpower in nationally-relevant areas. Finally, the department envisions an education system where teaching and research is intertwined to enable students to engage in research and gain research experience from early on, which will help build a healthy and robust research ecosystem in the department, and also help in creating a better scientific manpower for the nation in future.

7. External peer review of the Dept./centre/schools (in brief):

(a) Date of the peer review: November 2010

(b) Name of the Experts involved and their affiliations in short:
Prof. Y.N. Srikant, IISc, Prof. G. Sivakumar, IITB, Dr. S. Ramesh, GM, Prof. S. Bandhyopadhay, ISI Calcutta

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

Many new courses has been introduced. Many of them are in tune with industry needs.
Many new research labs., and computing and other research facilities has been created.
New faculty members have been recruited.

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

STRENGTHS The department is able to offer courses in a wide variety of areas, Students graduating from this department typically have more breadth than students graduating in the same discipline from other institutions. The department has established strengths in several domains of research as is established by a large number of publications in reputed venues as well as a number of awards. It also has a sizeable and vibrant research student community. The department is one of the leaders in the country in terms of industrial collaboration. Major research initiatives by the faculty members have translated into development of collaborative facilities. **WEAKNESSES** Locational disadvantage, owing to Kharagpur being a small town. A number of vacant faculty positions.	**OPPORTUNITIES** The department plans to offer newer and updated curriculum which will keep its students competitive in industry and research. It will enrich its research program to attract brighter research students from all over the country. New research labs will be built in partnership with industry for technology development and transfer. It will continue to contribute to projects of national importance. It will take a lead role in research and teaching in new interdisciplinary areas and frontiers of computer science and engineering. **THREATS** Increasing pressure of undergraduate teaching due to poor teacher student ratio. High non-academic load of faculty members. Lesser students being motivated to pursue PhD education.

9. Additional Information, if any

In the last three decades, the Department has established its reputation in teaching, state-of-the-art research and consultancy works. The hallmarks of the Department are in its world-class academic and research facilities, breadth and relevance of its academic curricula and diversity in fundamental research and industrial collaborations. The faculty members are well known in their respective fields of research, and have won accolades and highest awards such as the *Shanti Swarup Bhatnagar* Award, Fellows of National Academies.

Important Highlights

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HoD, CSE facilitating Prof. NavinGarg(IIT Delhi) during Research Scholars' day, 2014.

The CSE Annex Building came up in 2013.

The major areas of research include (but not limited to): Computer aided Design of VLSI chips, Computer Networking, Complex Networks, Computational Linguistic, Computational Biology, Machine Learning and Data Analytics, Internet of Things, Image Processing and Computer Vision, Artificial Intelligence, Formal Methods, Distributed Systems, Computer Aids for the Visually Handicapped, Telemedicine, Real-time Embedded Systems, Data-base, Software Engineering,Cryptography, Network Security, Hardware Security, and Computational Geometry.

Faculty members of the Department also maintain strong ties with many reputed national and international companies and are involved in a large number of projects in the forefronts of cutting edge technology. The department has executed many research projects sponsored by organizations like MHRD, DST, DIT, DRDO, C-DAC etc. It has also engaged in consultancy projects with reputed MNCs like NTT Labs, Semiconductor Research Corporation, Intel, General Motors, Reconnoiter Technology,Xerox corp., Interra Systems and many more.

New Laboratories set up

The following new laboratories have been set up by the department in last five years

- Complex Networks Research Group Laboratory–The laboratory has been functioning with considerable international recognition for the last few years
- Laboratory facilities which are being progressively set up in the newly constructed CSE Annex building
    - Secure Embedded Architecture Laboratory
    - Visual Image Processing Laboratory

- Big data cluster for high performance computing
- Bioinformatics laboratory

New Courses

The following new courses have been offered by the department in the last five years

- Computational Biophysics: Algorithms to Applications
- Hardware Security
- Smartphone Computing and Applications

Publications

A total of 259 journal papers, 441 conference papers,20 books and 5 edited volumes have been published by the faculty members of the department in the last five years.

Awards and Honors

The faculty members of the department have been conferred the following awards and accolades in the last five years.

- **Animesh Mukherjee:** Young Scientist (INSA), Young Engineer (INAE), Young Scientist (ISCA), Associate (Simons Associate, Italy)
- **RajatSubhraChakrabory:** IBM faculty award, Research Exchange Fellowship (Royal Academy of Engg, UK)
- **DebdeepMukhopadhyay:**Young Scientist (INSA), Young Engineer (INAE), Associate (IAS), Fellow (Indo US_STF)
- **PallabDasGupta:** Fellow (INAE), Fellow (IETE), IESA Technomentor Award
- **DipanwitaRoyChowdhury:** Fellow (INAE)
- **ParthaPratimChakraborty:** J C Bose Fellowship, Rotary Award for Science & Technology, S Ramanujam Memorial Lecture of Institute of Engineers
- **NiloyGanguly:** Yahoo Award

Students' Placements

A number of Ph.D. students have joined other IITs and NITs in faculty positions after completing their degree from the department. Most of the BTech, MTech and MS students have got placed through campus interviews.

Funded Research

A total funding of more than Rs. **589**Lakhs have been awarded to the faculty members as sponsored research grant from various external funding agencies in the last five years. Another Rs. **1621** Lakhs have been receivedin the form of consultancyprojects from various external funding agencies in the last five years.