

Summary Report

About Department/Center/School: *The Civil Engineering Department was established along with the Institute in 1951 to train young engineers in this profession of socio-economic relevance. The mission of the department is to impart undergraduate and postgraduate education and carry out research. The focus of the department's educational and research activities is on the latest relevant developments in technology, science, and management in order to address society's infrastructural and environmental problems.*

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

- B.Tech.- Civil Engg. (4 years)
- Dual Degree - Civil Engg. / Hydraulic & Water Resources Engg.
- Dual Degree - Civil Engg. / Transportation Engg.
- Dual Degree - Civil Engg. / Geotechnical Engg.
- Dual Degree - Civil Engg. / Structural Engg.
- Dual Degree - Civil Engg. / Environmental Engg. & Management
- Dual Degree - Civil Engg. / MBA
- M. Tech. - Hydraulic & Water Resources Engg.
- M. Tech. - Transportation Engg.
- M. Tech. - Environmental Engg. & Management
- M. Tech. - Geotechnical Engg.
- M. Tech. - Structural Engg.

2. **Major 4-5 Thrust Areas of Research:** *Pavement design, wastewater treatment, geomaterial characterization, computational fluid dynamics, disaster mitigation and management.*

3. Curriculum and Courses & Teaching Environment

Items	Ratio/ Number	Items	Number/%
Teacher-student Ratio (UG/all)	1:13.2/ 1:24.5	Average No. of students motivated (%) to opt of careers Eng/ Tech. Sectors UG/PG/PhD	?/100/100
No. of Faculty members as on today	33	Average No. of students motivated (%) to opt of careers in Science sectors UG/PG/PhD	0
Average No. of Tutorial Assistants (per year)	=457/6 = 76/year	No. of teaching labs	7
No. of UG/DD students (per year)	50.7/ 21.7	Average No. of students per experiments in core courses	4-12
No. of PG students (per year)/PhD students (on roll today)	66/ 76	No. of Students' workshops/`Tinkering'' Labs	0
Average no. of tutors with more than 100 students	?	No. of new courses introduced	2
Average Students placements (%) (UG/DD/PG)	83/ 71/ 70	No. of New program introduced	7
No of major curriculum review in both UG & PG level	1	Undergraduate Vs PhD strength expressed as Percentage	85%/ 15%

No of UG lab (teaching labs) developed/set-ups	0	No of PG/research labs developed/new set up	1 (shake table)	
No of E class rooms	1	No. of lab classes per week	15	
Average No. of Course done per student for B. Tech/DD/M. Tech/Ph.D	61/72/19/≥5	No. of core/elective/seminar/projects subjects taken for B. Tech, DD, and M. Tech respectively	B.Tech	52/7/0/2
			DD	60/8/1/3
			M.Tech	10/7/2/0

4. Research and Development & its Environment (based mainly on Scopus)

Items	Number	Items	Number	Items	No.
Total No. of Publications in Journals (2008-13)	438	Average no. of citation per paper (2739/406)-Scopus	6.75	No of large interdisciplinary research projects	10
Total No. of Publications in Conference & Symposium	204	Average Journal publication per year (based on Department data)	73	Number of Int. conf./workshops attended by students	56
Total No of Books & e-books published	20	h-Index of the department since 2008/overall h-index in Scopus	23/ 48	No. of PDF hired in the Institute	0
Total No of Edited Conference Proceedings/book chapters	12	Number of papers with citation more that the average no. of citation of the Journals	NA	No. of international Students as PhDs/PDFs	0
Total No. of Technology Developed/transferred	7	No. of recognitions & Awards, fellows etc to faculty/students (provide break up if necessary)	21	No. of International visiting researchers/adjunct faculty stayed here for at least a week	7
Total No. of Patents Filed/Obtained	9/0	Average Retention(%) of Young faculty for at least 10 years	97.5%	No. of short courses/workshops /conf. organized with international participations	18
Total No. of Copyright Filed/Obtained	0	No. of Sponsored research Project /fund(lakh) generated from non-internal source	15/ 1085.84 Lakhs	Average No. of PhD granted per year	6.5
No. of Publications per Faculty/Masters/PhD students	No breakup available	No. of Consultancy /fund (lakh) generated from non-internal source	37/ 1280.2 Lakhs	Average No. of PhD Granted per year per faculty	0.2
No. of Publications per Faculty/Masters/PhD students in Top Ten Journals as Identified by the department	28*	No of Internal and external Collaborations research papers/research projects/PhD students	31/ ? /1	Patent granted per faculty (total)	1
Average No. of	10684/(36*16)	No of M. Tech students	28/	Number of articles	19

Citation per faculty per year	= 18.56	motivated into pursuing PhD/PhD graduates motivated to pursue career in Academics (abroad or IIT etc)	100%	in collaborations with Ten countries*	
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5. External Stakeholder Engagement and others (all information was included in above)

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

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.

- a. **Mission:** *The mission of the department is to impart undergraduate and post-graduate education to Civil Engineering students, and inculcate research skills along with technical skills in its students.*
Vision: *At present, the department is highly reputed in the country and it is envisioned that it will improve its global standing in the near future.*
- b. **Plans for the future and measures to be adopted toward achieving the Vision:**
- i. *Increase in activities at the international level, i.e., exchange of faculty and students, international projects, conferences, etc.*
 - ii. *Increased course offerings at the advanced level with a focus on quality rather than quantity; streamlining of curricula so that it is 'in sync' with global standards, and redundancy is avoided.*
 - iii. *Improvement in research and infrastructural facilities*
 - iv. *Incorporating principles of sustainability into all aspects of Department activities*
 - v. *Increasing interaction between industry and academia*

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

(a) Date of the peer review: 20 to 22 May 2013

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

Prof. S. K. Rao, Prof. T. Gangadharaiah, Prof. A. Ramaswamy

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

<p>STRENGTHS</p> <ol style="list-style-type: none">1. Diverse, inter-disciplinary capabilities2. Disaster mitigation and management3. Materials characterization4. Hydrodynamic analysis5. Representation on editorial boards of international journals <p>WEAKNESSES</p> <ol style="list-style-type: none">1. Student-teacher ratio is too high2. Most activities are at the national rather than international level3. Research facilities are limited4. Workshop facilities are no longer a priority, but are the backbone of research.5. Space for laboratories and installation of equipment is limited	<p>OPPORTUNITIES</p> <ol style="list-style-type: none">1. Incorporating sustainability issues into all aspects of teaching and research2. Creating industry-academia relationships in India3. Developing mobile phone applications for different aspects of civil engineering <p>THREATS</p> <ol style="list-style-type: none">1. Loss of competitive edge in jobs and R&D.2. In a real sense, innovative research is in declining mode.
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***Note: Ten countries: US, UK, Germany, Japan, Canada, France, Italy, Australia, Singapore, South Korea**

Important Highlights

CIVIL ENGINEERING DEPARTMENT (For External Peer Review – 2014)

The Civil Engineering Department was established along with the Institute in 1951 to train young engineers in this profession of socio-economic relevance. The department offers degrees at all three levels: Bachelor's, Master's and Doctorate degrees. There are five different specializations at the post-graduate level: Environmental Engineering and Management, Geotechnical Engineering, Hydraulics and Water Resources Engineering, Structural Engineering and Transportation Engineering. The first batch of students graduated in 1954 and since then, 51,731 students have been awarded degrees.

Activities of each of the five sections of Civil Engineering Department are described here briefly:

Environmental Engineering and Management

The objective of the environmental engineering and management programme is to bring technological development in harmony with the natural environment and mitigate potentially deleterious effects of human activities. The faculty of the Environmental Engineering Division are actively involved in the development of economical methods for water and wastewater treatment, energy recovery from wastewater, on-site treatment of domestic sewage for small communities, water quality and health assessment, solid and hazardous waste management, biological treatment of solid waste, removal of fluoride and arsenic from ground water using low cost adsorbents, air pollution and control.

Geotechnical Engineering

The geotechnical engineering section of the department has been actively involved, nationally and internationally, with the latest developments in the areas of disaster management, materials research for geotechnical engineering applications, characterization of geomaterials *in situ* and in laboratory and numerical modeling, and development of codes of practice.

The section has one of the most versatile facilities for geomaterial characterization comprising of an *in-situ* testing vehicle and an excellent laboratory. The *in situ* testing vehicle is equipped with a seismic piezocone, a crosshole shear wave velocity testing instrument, a nuclear densometer for characterizing shallow soil layers for bulk density and moisture content. It can also be used for shear wave velocity profiling with the continuous surface wave (CSW) procedure, and conducting standard penetration and field vane shear testing. The geotechnical laboratory is equipped with cyclic simple shear, cyclic triaxial, stress-path controlled cyclic triaxial and resonant column instruments, and a multichannel high-frequency vibration meter for recording and processing of 3-axis data. There are over and above, routine facilities available for geomaterial characterization for permeability, shear strength (triaxial, direct shear, unconfined compression), consolidation behavior (incrementally loaded one dimensional consolidation testing), grain size distribution, Atterberg limits, and chemistry (salinity, pH, sulfate and conductivity).

Hydraulics and Water Resources Engineering

Faculty of the hydraulic and water resources engineering group are working on various aspects of hydraulics, especially fluvial hydraulics and uncertainties in the hydrologic cycle. The fluvial

hydraulic group looks at fundamental theories of sediment threshold, turbulent shear stresses in open channel flow, experimental and numerical modeling of unsteady flows in closed conduits and aquifers, groundwater flow, ground water contamination and remediation. In the past, the group has extensively explored problems of local scour, such as scour at bridge piers and abutments, scour downstream of structures, scour within channel contractions, scour at vertical drops and scour below pipelines. Development and testing of computational fluid dynamics and computational hydraulics codes for flow simulation is also an active area of research. Other areas where the group works include the stochastic hydrology, the climatology, the geographic information system(GIS) and remote sensing (RS) tools for regional planning in relation to floods, cyclones, droughts and environmental balance and economic design of hydraulic structures like river diversion barrages. Hydraulic and water resources engineering laboratory is equipped with vectrino down-looking ADV, vectrino profile and aquadopp profile for teaching and research.

Structural Engineering

The structural engineering discipline offers a programme that is balanced with respect to basic and applied research encompassing solid mechanics, structural analysis and design, construction materials and high performance computing. The programme is designed such that it trains students entering the profession and also prepares students for research leading to Ph.D. The current research activities of structural engineering section are structural health monitoring, fluid-structure interaction, earthquake analysis of dam, stability of structures, bio-mechanics, vibration control of structures, use of composites in repair and retro fitting of structures, sustainable concrete construction technologies, artificial intelligence and soft computing applications, earthquake resistant analysis and design, nondestructive testing and evaluation of structures and materials. The structural engineering section has a well-equipped laboratory catering to the need of teaching and research. The equipment includes universal testing machines of various capacities and features, compression testing facility, dynamic compression testing facilities, high speed digital camera, nondestructive testing facilities, analyzer and shaker.

Transportation Engineering

Transportation Engineering Section has five faculty members: three in Pavement & Materials Engineering areas, and two in the areas of Traffic and Transportation Engineering. Transportation Engineering Section has been working on characterizing asphalt binders, mixes and evaluation of specifications for asphalt mixes in the last fifty years. More than twenty PhD and numerous MTech theses have been produced in the area of asphalt binders and mixtures. Five research schemes have been carried out enabling the team to understand the challenges related to pavement mix performance. As participants in the Government of India Ministry of Road Transport and Highways projects (R-6, R-24, R-56 and R-81), the section has been able to make significant contributions to the revision/drafting of Indian Roads Congress (IRC) guidelines such as IRC:37, IRC:81 and others. The draft guideline prepared by IITKGP for Falling Weight Deflectometer evaluation of asphalt pavements, which is based on R-81 research scheme is under final stages of approval by the IRC. The research carried out at IIT Kharagpur on concrete pavement analysis and design has also enabled the section to make significant contribution to the IRC:58.