Summary Report

About Department/Center/School: The Department of Mechanical Engineering is the largest department in the IIT Kharagpur and has been a key part of the institute since its formation in 1951. Currently, the department offers undergraduate, postgraduate and doctoral programmes with total student strength of around 950. The department is well posed to maintain and enhance its excellence in teaching and research. All in all, the Department of Mechanical Engineering has played and will play a pivotal role in fulfilling the Institute's goal of dedicating ourselves to the service of the nation.

1. **Academic Programs (Range of Degrees and Disciplines):**
   a. 4 Year B.Tech Programmes: (i) Mechanical and (ii) Manufacturing Science and Engineering
   b. 5 Year Dual Degree B. Tech and M.Tech Programmes: (i) Mechanical Systems Design, (ii) Thermal Science and Engineering, and (iii) Manufacturing Engineering
   c. MS (by Research) Programme
   d. Ph.D. Programme
2. **Major 4-5 Thrust Areas of Research**: Microfluidics, surface engineering, laser based material processing, bio-mechanics, friction stir welding, micro- and nano-mechanical engineering
3. **Curriculum and Courses & Teaching Environment**

Items	**Ratio/ Number**	**Items**	**Number/%**
Teacher-student Ratio	1:23	Average No. of students motivated (%) to opt of careers Eng/ Tech. Sectors UG/PG/PhD	67
No. of Faculty members as on today	44	Average No. of students motivated (%) to opt of careers in Science sectors UG/PG/PhD	1
Average No. of Tutorial Assistants	100	No. of teaching labs	15
No. of UG/DD students in 2008-13 batches	530/369	Average No. of students per experiments in core courses	4-6
No. of PG students/PhD students in 2008-13 batches	517/111	No. of Students' workshops/``Tinkering'' Labs	0
Average no. of tutors with more than 100 students	6	No. of new courses introduced	10
Average Students placements (%) (UG/DD/PG)	95/95/92	No. of New program introduced	1
No of major curriculum review in both UG & PG level	1	Undergraduate Vs PhD strength expressed as Percentage	89:11
No of UG lab (teaching labs) developed/set-ups	3	No of PG/research labs developed/new set up	10
No of E class rooms (in department)	6	No. of lab classes per week per lab course	1
Average No. of (theory) courses done	35/40/9/4	No. of core/elective/seminar/projects	48/6/0/3,

per student for B. Tech/DD/M. Tech/Ph.D		subjects taken for B. Tech, DD, and M. Tech respectively	55/15/0/5, 6/8/2/2

4. Research and Development & its Environment

Items	Number	Items	Number	Items	No.
Total No. of Publications in Journals (2008-13)	746	Average no. of citation per paper	5	No of large interdisciplinary research projects	17
Total No. of Publications in Conference & Symposium	179	Average Journal publication per year	124	Number of Int. conf./workshops attended by students	160
Total No of Books & e-books published	7	h-Index of the department since 2008/overall h-index in Scopus	41	No. of PDF hired in the Institute	-
Total No of Edited Conference Proceedings/book chapters	9	Number of papers with citation more that the average no. of citation of the Journals	440	No. of international Students as PhDs/PDFs	-
Total No. of Technology Developed/transferred	2	No. of recognitions & Awards, fellows etc to faculty/students (provide break up if necessary)	16	No. of International visiting researchers/adjunct faculty stayed here for at least a week	6
Total No. of Patents Filed/Obtained	19/2	Average Retention(%) of Young faculty for at least 10 years	55%	No. of short courses/workshops /conf. organized with international participations	13
Total No. of Copyright Filed/Obtained	-	No. of Sponsored research Project /fund(lakh) generated from non-internal source	130/7300 Lakhs	Average No. of PhD granted per year	12
No. of Publications per Faculty/Masters/PhD students	17/0.2/10	No. of Consultancy /fund (lakh) generated from non-internal source	54/1670 Lakhs	Average No. of PhD Granted per year per faculty	0.3
No. of Publications per Faculty/Masters/PhD students in Top Ten Journals as Identified by the department	2/0/1	No of Internal and external Collaborations research papers/research projects/PhD students	139	Patent granted per faculty	0.05
Average No. of Citation per faculty per year (for papers published from 2008-12)	12	No of M. Tech students motivated into pursuing PhD/PhD graduates motivated to pursue career in Academics(abroad or IIT etc)	36/72	Number of articles in collaborations with Ten countries* (for papers published from 2008-12)	56
Ranking of the	9	Ranking of the	5/5	No of articles of	1

department in terms of average citations per paper within the Institute		department in terms of total number of Journal publications within the Institute/publications per faculty		the dept. contributing towards h-index of the Institute since 2008	

5. External Stakeholder Engagement and others

Items	**Number**	**Amount Lakh**
No. of PhD/Master students' thesis funded by Industries	10	-
Total number of Industry sponsored projects and its income (Lakh)	45	2600
No. of Curriculum Development Initiative for Industries	1	-
No of Technology transfer/adopted by Industry/Labs	30	320
No. of Nationally relevant research projects	12	4500
No of Policy inputs/consultancies provided	54	1670
No. of Research grant and seed money from internal savings of the Institute per young faculty of the department and its total fund	3	15
No. of Community Relevant projects	2	92

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.

The department aims to do high quality research in several thrust areas including microfluidics, surface engineering, laser based material processing, bio-mechanics, friction stir welding, micro and nano-mechanical engineering. Several interdisciplinary teams have been formed to work in the said areas. Funds needed to set up lab and do research is being sourced from several governmental agencies.

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

(a) Date of the peer review: Mar 28, 2013

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

Prof. V Radhakrishnan, IIST Thiruvananthapuram
Prof. K Gupta, IIT Delhi
Prof. P K Dutta, IISc Bangalore
Mr. A Sanyal, Saudi European Petrochemical Company, KSA

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

The committee was impressed by the wide spectrum of research activities undertaken by the department. It was also observed that many of research projects have practical relevance and are of national interest. Classical as well as new interdisciplinary areas (such as bio-mechanlcs, microfluidics etc.) are equally flourishing. Also notable are some of the new collaborative projects undertaken under some major national level programmes such as the Centre for Railway Research. The committee recommended the following

- The department may try to participate in major national programmes or missions
- Attempts should be made towards enhancing research funding from Industries.
- Attempts should be made in participating in major internationally funded projects
- The department may consider providing funding for PhD scholars for the 5th year for deserving cases,

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

Participation in major internationally funded projects, funding for PhD scholars for the 5th year, participation in national mission programmes, enhancement of lab spaces

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

STRENGTHS	**OPPORTUNITIES**
- Very good research infrastructure - Excellent faculty from diverse backgrounds - Bright undergraduate and hardworking post graduate students - Supportive administration - Multiple funding agencies **WEAKNESSES** - Large student strength - Inability to persuade our undergraduate students for doing MTech or PhD	- Participation in projects of national relevance - Breakthroughs in fundamental in applied research - Human resource development for teaching and research - Technology transfer to industries - High tech entrepreneurship **THREATS** - Lack of high quality industry jobs in core sector

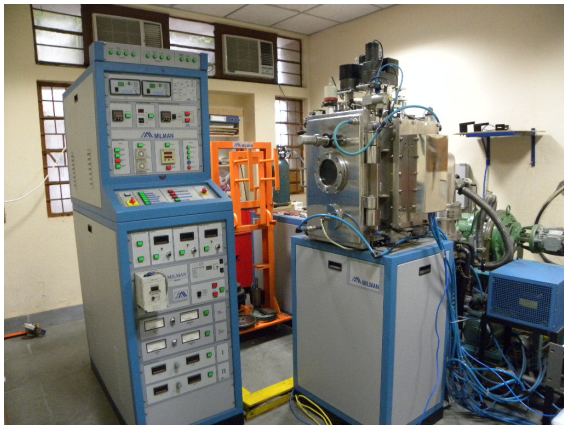
9. Additional Information, if any

***Note: Ten countries: US, UK, Germany, Japan, Canada, France, Italy, Australia, Singapore, South Korea (optional: China may be replaced with anyone if department wants)**

Important Highlights

A Glimpse of the Department of Mechanical Engineering, IIT Khargpur

The department of Mechanical Engineering is the largest department in the Indian Institute of Technology Kharagpur, which has been a key part of the institute since its formation in 1951. Currently, the department offers undergraduate, postgraduate and doctoral programmes with total student strength of around 1020. The department consistently attracts some of the best students of the country as its undergraduates who may choose from the B.Tech. programmes, namely Mechanical Engineering, and Manufacturing Science and Engineering. The students can also pursue a 5-year dual degree programme in the broad areas of Thermal Science and Engineering, Mechanical System Design and Manufacturing Science and Engineering. The department has a vibrant research culture. Presently about 180 M.Tech students are registered in the above-mentioned three specialisations. A student can also earn an MS by research that is primarily oriented towards industrially sponsored projects. Being a favourite destination for doctoral candidates, the department can afford to implement stringent selection and qualifying criteria that ensure a large, steady output of Ph.D. work of high standard. Currently about 110 Ph.D. students are working on cutting-edge research problems in diverse fields.



The department has an impressive placement record, as most of its students are placed in highprofile jobs cutting across all sectors. A large number of students also chooses to pursue higher studies at prestigious institutes across the globe. In recent years, a team of our students, under the guidance of three professors, has designed and manufactured the student version of Formula SAE Car which has become a prized possession of our department. They are still dwelling with it to come up with the second version, which is aimed at providing better safety and higher performance.

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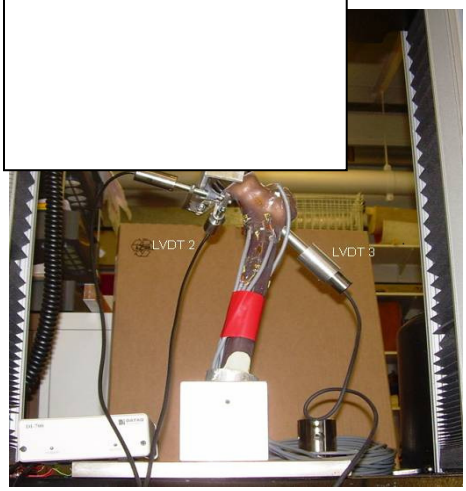
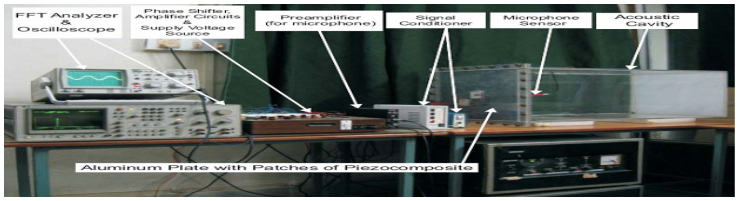


Presently the department has 44 dynamic and highly distinguished faculty members, ably supported by technical and administrative staff members. The department has 23 teaching and research laboratories with a modern workshop and world-class research facilities in the areas of laser processing, 3-D printing, experimental fluid mechanics, tribology, robotics, noise and vibration engineering, machining and surface engineering. In addition to the traditional research facilities in the areas of Thermal Sciences and Engineering, Applied Mechanics and Design, and Manufacturing Science and Engineering, the department houses several interdisciplinary research facilities in tune with modern-day technological demands. These facilities include dedicated research laboratories in the areas of Microfluidics, Bio-Mechanics, Laser Materials Processing, and Robotics and Computer Automated Control, to name a few. The department, in particular, been a pioneer in developing indigenous lab-on-a-chip based devices, developing the first autonomous underwater vehicle of the Nation, initiating research in high speed railway trains, and establishing the Nation's only multi metal laser based additive manufacturing research and development facility.

notes in its contribution in technology research through technique. These include dynamic design of CRYO ARMS in the second LP at SHAR Centre, suspension design of missile launch pad, KAVERI Rotor dynamics, aircraft arrestor system to name a few.

The department has expertise at the frontiers of computational and analytical work in traditional as well as emerging fields.The pioneering research on smart composite materials and structures and the micromechanics of novel radially aligned carbon nanotube reinforced composites is credited to



this Department. Members of the department have published more than 700 articles in high-impact journals in the last 5 years and have implemented more than 200 million INR worth of sponsored research and industrial consultancy, catering to the past, current and future needs of the country in areas of strategic national importance such as defence, space and railways, nuclear engineering, power, coal and steel industries on one side, and the healthcare sector on the other. There is vigorous collaboration with various universities and research laboratories both in India and abroad leading to joint research projects, and faculty and student exchange. In addition, the department has strong inter-disciplinary interactions with other departments and schools of IIT Kharagpur, with objectives of furthering the frontiers of engineering through research and faculty participation. The department has also contributed immensely in the development of educational material, such as leading text books, web courses, video lectures, virtual laboratories and pedagogic contents through NPTEL and NMEICT.

Faculty members of the department have been recognized with prestigious National and International Fellowships. Currently, 6 faculty members are Fellows of the Indian National Academy of Engineering, and 3 faculty members are Fellows of the Indian National Academy of Sciences. One faculty member has also received the Shanti SwarupBhatnagar Prize. The first recipient of the Outstanding Teacher award of INAE is also from this department. There are several faculty members who have been the recipients of Young Scientist and Young Engineering Awards from the various national Academies of Science and Engineering, as well as International bodies.

The department is well poised to maintain and enhance its excellence in teaching and research. All in all, the department of Mechanical Engineering has played and will play a pivotal role in fulfilling the Institute's goal of dedicating ourselves to the service of the nation.