



ANNUAL REPORT 2016-17

INDIAN INSTITUTE OF TECHNOLOGY BOMBAY



IIT BOMBAY

ANNUAL REPORT 2016-17

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Director's Report

Indian Institute of Technology Bombay has a rich tradition of pursuing excellence and has continually re-invented itself in terms of academic programmes and research infrastructure. Students are exposed to challenging research-based academics and a host of sport, cultural and organizational activities on its vibrant campus. The presence of world class research facilities, vigorous institute-industry collaborations, international exchange programmes, interdisciplinary research collaborations and industrial training opportunities help the students of IIT Bombay to excel and race ahead in the competitive professional environment.

I am pleased to state that the Institute continues to be ranked as one of the top universities of the country and among the best in the world. IIT Bombay attracts the brightest students from the country for its Bachelors, Masters and Doctoral programmes. The Institute provides the best and it ensures that its students are also of exceptionally high quality. IIT Bombay continues to be the most sought-after destination for UG and PG studies and attracts the top performers in national examinations such as GATE, CEED, NET, JAM and JEE. Among 23 IITs in the country, 41 out of top 50 rankers and 61 of top 100 rankers in JEE 2017 have joined IIT Bombay. A similar trend is observed for the candidates qualifying in other entrance examinations as well.

IIT Bombay continuously strives to introduce new areas in its academic programmes and innovate in its academic activities, in a bid to generate the kind of intellectual capital that will keep the Institute and the nation up-to-date on the technological front. During the year 2016-17, a four-year Bachelor of Science program in Economics has been started with admission through the JEE (Advanced) for its 26 seats. Another new initiative is the offering of an interdisciplinary dual-degree program (BTech in one department and MTech in another) to the undergraduate students of this Institute. With the possibility of minors already existing, actions such as the above allow for increased flexibility to the students to essentially custom-design their



Prof. Devang V. Khakhar
Director, IIT Bombay

own curriculum and leap over any barriers that might exist between various disciplines. At the postgraduate level, a new doctoral program in Policy Studies (with 10 fellowship) has been initiated during the year.

With our theme - 'Research that makes a difference', IIT Bombay has made concerted efforts to align its R&D focus with the national goal of achieving technological self-reliance. During last ten years, R&D receipts grew at a compound annual growth rate (CAGR) of over 42 per cent. The R&D revenues for the financial year 2016-17 is Rs. 390 crores. There were 109 patent applications filed during the year. The Institute has signed 32 MoUs with various universities and received governmental and ministerial delegations, from countries across the globe, for exploring areas of collaboration and cooperation.

The Institute has been able to attract outstanding faculty members from not just India but other parts of the globe. The Institute has 629 faculty members on rolls with many of them globally acknowledged for their research contributions. The Institute also has furthered links with international and national peer universities, enabling enhancement of research and educational programmes at the Institute.

In the 59 years of its existence, more than 52,600 students have graduated from IIT Bombay. The alumni of the Institute have made their alma mater proud through their achievements and contributions in diverse fields and our engagements with them are steadily growing.

I would like to place on record the outstanding work done by the faculty and the staff members of the Institute in strengthening teaching, research and outreach programmes.

Aspiration

- *To see IIT Bombay among the top ranks of technical universities, known for its outstanding undergraduate programme and for its contributions to research.*
- *Participate in solutions of problems facing the nation and the world by providing new ideas and talent.*

Academic Programmes



Prof. D.V. Khakhar, Director, IIT Bombay presenting Institute report at the 54th Convocation

IIT Bombay continues to make forays into newer territories pertinent to undergraduate and postgraduate education. A four-year Bachelor of Science program in Economics has been started this year with admission through the JEE(Advanced) for its 26 seats. Another new initiative is the offering of an interdisciplinary dual-degree program (BTech in one department and MTech in another) to the undergraduate students of this Institute. With the possibility of minors already existing, actions such as the above allow for increased flexibility to the students to essentially custom-design their own curriculum and leap over any barriers that might exist between various disciplines. A new doctoral program in Policy Studies (with 10 fellowship) at the postgraduate level has also been initiated this year.

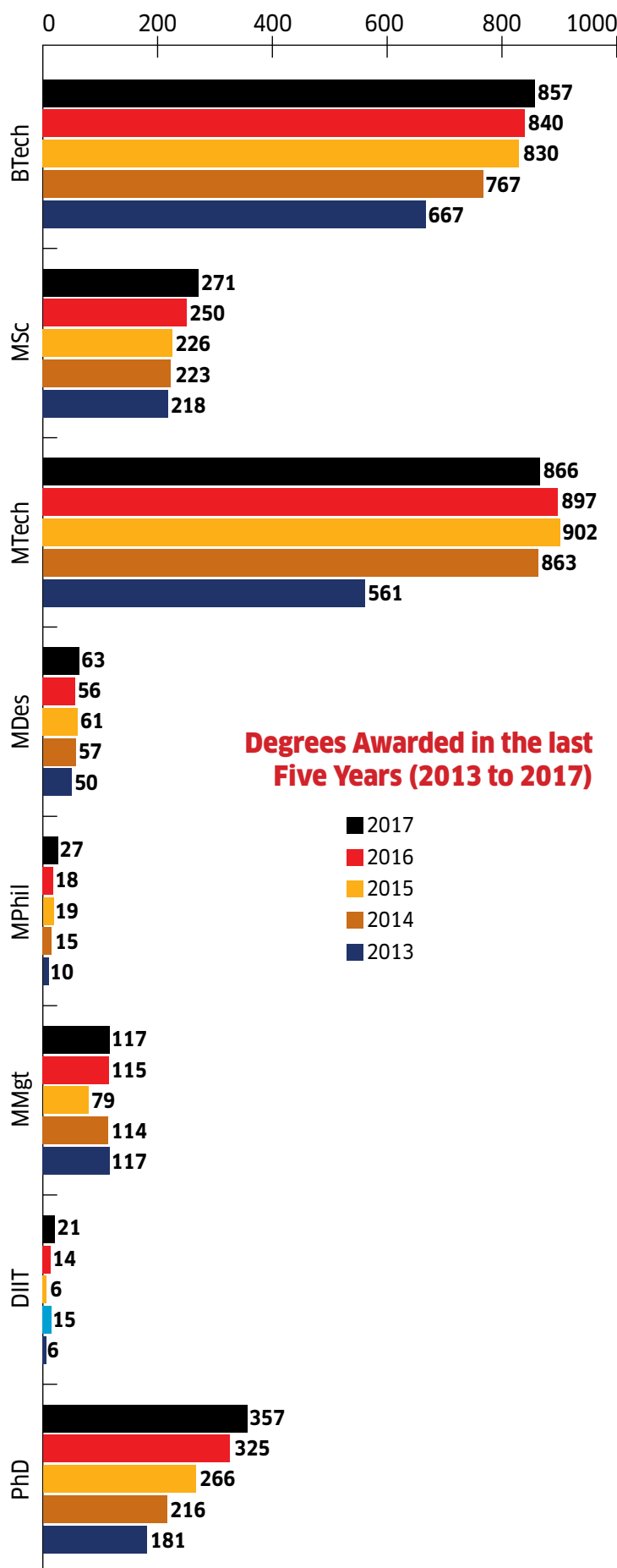
At the 54th Convocation, a total of 2515 degrees were awarded: BTech - 586, Dual Degree (BTech & MTech) - 254, MSc (5 Yr. Int.) - 22, MSc (2 Year) - 207, Dual Degree (MSc-PhD) - 7, MSc - PhD(Int.) - 4, MSc -

MPhil - 3, MSc - MTech - 7, MTech - 886*, MTech (Exit) - 1, MDes - 56, MPhil.-17*, MPhil + PhD. - 1, MMgt - 115, PGDIIT (Exit) - 14, PhD-325* and MTech+PhD - 10. (* = including dual degree).

With an increase in undergraduate (UG) and postgraduate (PG) intake, the student population has undergone significant changes in the last 10 years. In 2006-07, the number of on-roll UG students was 2460 (46.67 %) while the number of PG students was 2810 (53.32%) [Masters - 1598, PhD - 1212]. This changed to 3400 (43.79 %) and 4363 (56.17 %) for UG and PG students, respectively in 2011-12. Presently, the Institute has about 10,169 students of which 4141 (41%) are UG and 6028 (59%) are PG.

In order to continue imparting high-quality, holistic education to the much larger student populace, the Institute continues to modify and evolve processes which can effectively address the changing situation.

The PhD student strength has increased in



Degrees Awarded in the last Five Years (2013 to 2017)

■ 2017
 ■ 2016
 ■ 2015
 ■ 2014
 ■ 2013

leaps and bounds in the last 15 years. From 771 PhD students in 2001-02, the number increased to 1879 in 2011-12 and currently stands at about 3000.

The number of students graduating with a PhD has also been steadily increasing. In the last 10 years, the number of PhD degrees awarded has gone up from about 180 to 350. A significant fraction of these are in the engineering disciplines. All students involved in research at the Institute are given an opportunity to interact with the research community at the national and the international level by providing funds to attend international conferences. During the academic year 2016-17, 327 students were granted financial assistance for attending international conferences and an amount of Rs. 3,23,02,122 was utilised for this purpose.

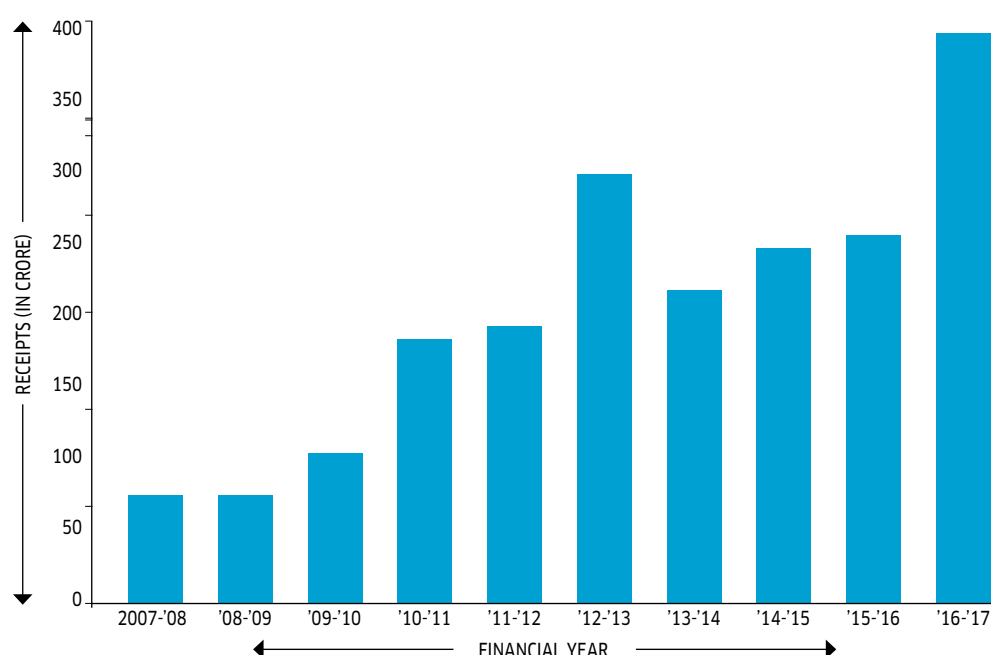
This year, four MTech students, one MDes student were selected for the DAAD Scholarships 2016-17 under the Sandwich System for Master's students.

UG Teaching Assistantship: In an effort to make the senior UG students more self-sufficient and responsible towards academics, UG Teaching Assistantship was introduced during the academic year 2009-10. This year, 211 UG Teaching Assistants (115 in Spring semester and 96 in Autumn semester) were appointed to assist the faculty members in conducting the various UG courses.

Research And Development Activities

Research and development activities at IIT Bombay are growing rapidly. During the last ten years, R&D receipts grew over 42 per cent at a compound annual growth rate (CAGR) and with a remarkable increase of 55% over last year. The R&D receipts for projects during the financial year 2016-17 is Rs. 390 crores. Figure 1 shows the growth of research funds in the last few years.

Figure 1: Growth of R&D receipts in the last decade



1. Overview

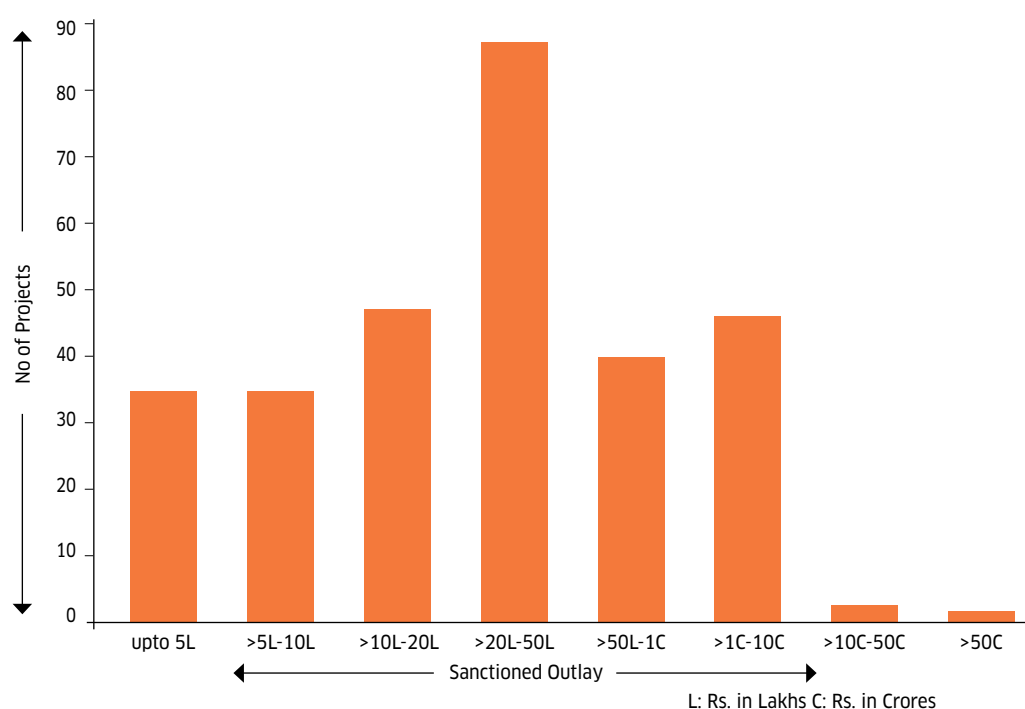
During the year 2016-17, new R&D projects were initiated in all the areas of science, engineering, management and social sciences, typically ranging from two to five years duration. These included short-term consulting projects and long-term sponsored research projects (Table 1).

Table 1: Information on new projects sanctioned during last 3 years

Year	Sponsored Projects		Consultancy Projects	
	Number	Sanctioned outlay (Rs. in crores)	Number	Project outlay (Rs. in Crores)
2014-15	294	165.25	513	32.2
2015-16	261	255.5	529	39.3
2016-17	297	499.3	627	60.5

Sponsored projects sanctioned outlay ranges during the financial year 2016-17 from few lakhs (in Rs.) to Rs.160 crores and the distribution of outlay ranges is shown in the Figure 2.

Figure 2: Distribution of Sponsored projects-sanctioned outlay ranges



External Grants for R&D

The total money received for R&D activity in 2016-17 was Rs. 393.46 crores (Table 2). This includes grants received in the year for the new projects sanctioned and the ongoing projects.

Table 2: Money received for R&D in 2016-17

Project Type	Number	Funds received (Rs. In crores)
Sponsored Projects	631	342.96
Consultancy Projects	706	47.15
Royalty	-	1.24
Equipment usage	-	2.11
Total	1337	393.46

The R&D work continues to be mainly supported by the government entities (Figure 3 and Table 3). Table 4 indicates some of the major sponsors from industry and other sponsors.

Figure 3: Distribution of receipts from different agencies

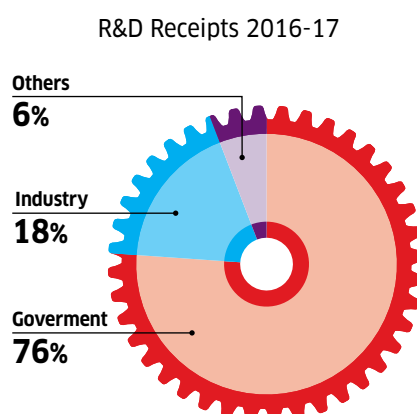


Table 3: Main sponsors of sponsored projects

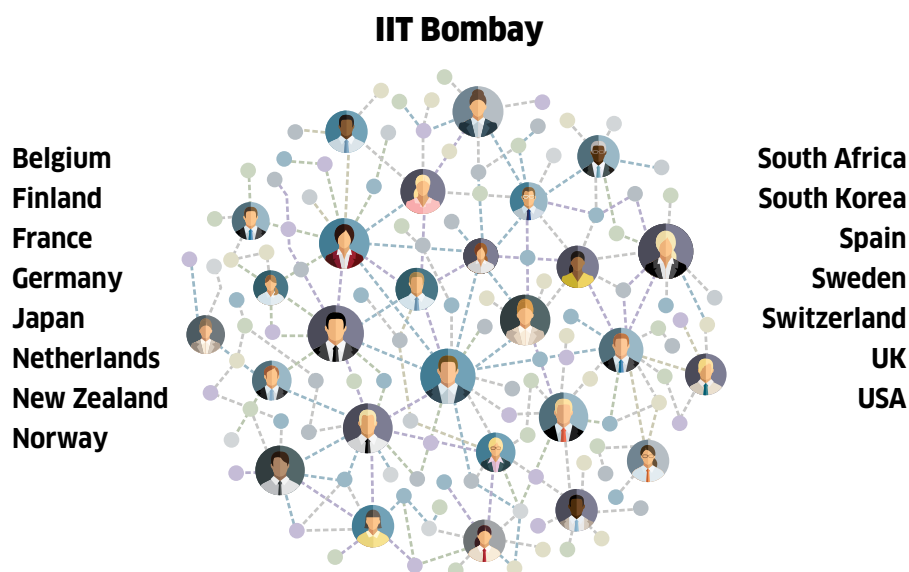
Agencies	Grant received (Rs. In crores)	Number of new/ ongoing projects funded
Ministry of Human Resource Development	62.39	15
Department of Science & Technology	49.81	201
Ministry of New And Renewable Energy	38.21	10
Ministry of Culture	31.00	1
Department of Electronics & Information Technology	24.77	18
Defence Research & Development Organisation	16.72	26
Department of Biotechnology	15.61	46
NTPC Energy Technology Research Alliance	11.72	5
Board of Research in Nuclear Sciences	9.74	38
Rajiv Gandhi Science and Technology Commission	7.40	2
Ministry of Textiles	7.39	2
Indo-US Science & Technology Forum, New Delhi	3.95	8
Oil & Natural Gas Commission	3.47	7
Ministry of Environment, Forest & Climate Change	3.25	3
Indian Space Research Organisation	2.64	5
Aditya Birla Science and Technology Co Ltd.	2.37	1
Power Grid Corporation of India Limited	2.10	1

Table 4: Sponsors from Industry and other organisations

■ Applied Materials Inc., USA	■ Aditya Birla Science and Technology Co. Ltd., Mumbai
■ Facebook, USA	■ Bihar Rajya Pul Nirman Nigam Limited, Patna
■ Google, USA	■ CEAT Tyres Ltd., Mumbai
■ Indo-German Science and Technology Centre, Germany	■ CIDCO Limited, Navi Mumbai
■ International Business Machines Corporation, USA	■ Grind Master Machines Pvt. Ltd., Aurangabad
■ Johns Hopkins Bloomberg Scholl of Public Health, USA	■ IDEA Cellular Limited
■ Murata Manufacturing Co., Ltd., Japan	■ IL&FS Transportation Networks Limited, Mumbai
■ Oracle, USA	■ Intel Technology India Pvt. Ltd., Bengaluru
■ Qualcomm, USA	■ Jalpa Devi Tollways Limited, Bhopal
■ Research Council of Norway, Norway	■ Jamsetji Tata Trust, Mumbai
■ Sandvik Materials Technology, UK	■ Jayshree Machines & Tools, Mumbai
■ Seagate Technology LLC, USA	■ Larsen & Toubro Limited, Mumbai
■ Secretariat of the Basel, Rotterdam and Stockholm conventions, Sweden	■ Oil & Natural Gas Commission, Dehradun, Uttarakhand
■ Synopsys Inc., USA	■ SAP India Pvt Ltd., Mumbai
■ Terra Biologics, USA	■ Shapoorji Pallonji and Company Pvt. Ltd., Mumbai
■ The Boeing Company, USA	■ State Bank of India, Mumbai
■ U S India Educational Foundation, USA	■ Tata Education and Development Trust, Mumbai
■ Volkswagen Ag, Germany	■ Wadhvani Foundation, Bengaluru
■ Wellcome Trust, UK	

Institute continues to get international funding for research and our international interactions (with countries) are shown in Figure 4.

Figure 4: International Interactions



Some major sponsored projects initiated:

- **Centre of Propulsion Technology**
Sanctioned outlay: Rs. 160 crores over five years
Funding agency: Defence Research and Development Organization
- **National Centre for Photovoltaic Research and Education (NCPRE) Phase-II**
Sanctioned outlay: Rs. 62.35 crores over five years
Funding agency: Ministry of New and Renewable Energy
- **Solar Urja Lamps (SoUL Program) - Distribution of 5 lakh lamps & 70 lakh lamps**
Sanctioned outlay: Rs. 64.73 crores over two years
Funding agency: Ministry of New and Renewable Energy
- **Design Development and Prototype of 720 Gbps capable Transport Cross Connect Prototype**
Sanctioned outlay: Rs. 11.15 crores over two years
Funding agency: Defence Research & Development Organisation
- **Teaching Learning Centre for Information and Communication Technologies**
Sanctioned outlay: Rs. 9.75 crores over four years
Funding agency: Ministry of Human Resource Development
- **High Resolution Mass Spectrometry based Proteomics Research and Training Facility**
Sanctioned outlay: Rs. 9.67 crores over five years
Funding agency: Department of Biotechnology

- **Development of Lab-on-chip platforms for efficient and automated farming Agricultural Sensors**
Sanctioned outlay: Rs. 9.55 crores over three years
Funding agency: Department of Science & Technology
- **Centre for Computational Engineering and Science**
Sanctioned outlay: Rs. 4.99 crores over three years
Funding agency: Board of Research in Nuclear Sciences
- **Design & Development of a single cylinder free piston Stirling engine for net 3 kW electrical output using solar energy as input**
Sanctioned outlay: Rs. 1.68 crores over three years
Funding agency: ONGC Energy Centre Trust, Delhi

Ministry of Human Resource Development (MHRD) funded seven projects with an outlay of Rs. 17 crores over two to three years under Uchhatar Avishkar Yojana (UAY) scheme with a view to promote innovation in areas that are directly of relevance to the manufacturing industry. Under this scheme, each project is funded by MHRD (50%), participating industry (25%) and the rest (25%) by participating Department/ Ministry such as Department of Science and Technology, Ministry of Environment, Forest and Climate Change, Ministry of Health & Family Welfare, Ministry of Heavy Industries and Public Enterprises. MoUs between Institute and the partnering industries were signed in the presence of Hon'ble President at the function held during Visitors Conference at Rashtrapati Bhavan, New Delhi on November 16, 2016.



In addition, MHRD has initiated new scheme called IMPacting Research INnovation and Technology (IMPRINT) focussing research to solve major engineering and technology challenges in ten domains needed by the country. Thus, it aims to enable, empower and embolden the nation for inclusive growth and self-reliance. IMPRINT scheme was launched by the Honourable President of India, in the presence of the Honourable Prime Minister of India and the Honourable Union Minister of Human Resource Development on November 5, 2015.



Under this scheme, each project is funded by MHRD (50%) and the rest (50%) by participating Department/ Ministry such as Department of Science and Technology and Indian Council of Medical Research, Ministry of Power, etc. At the first stage, MHRD funded eleven projects for IIT Bombay with an outlay of Rs. 28.8 crores over two to three years.

Efforts were made to disseminate information and provide support to faculty regarding project funding from sponsors (both national and international).

Consultancy activities: Consultancy activities were taken up for government, public sector and industry, both Indian and international. The types of consultancy provided included expert advice, retainership, product/ process/ software development, analysis, evaluation, product design and limited testing.

Some consultancy projects initiated:

- Advanced combustion models
- Air quality monitoring and emission source apportionment studies for 10 cities
- Analysis of Algorithmic Trading, HFT & Colocation in Indian securities market
- Battery electrode materials characterization
- Capacity evaluation of underground metro structures
- Classification of chemical compounds
- Demonstration of biogas scrubber using water
- Design and development of an online platform for HR services
- Design improvement in aesthetics and ergonomics of guard for Victory and Galaxy machines
- Developing processes for manufacture of various fragrance compounds
- Development of Continuous Flow Process
- Development of environmentally sound management of hazardous waste in Chittagong, Bangladesh and Gadani/ Hub, Pakistan
- Development of process strategies for BOF steel making
- Effluent treatment plants study at Mumbai trans harbour link
- Energy audit of Haryana distribution utilities
- Evaluation of enterprise wide data warehouse software
- E-water project for Godavari basin
- Extreme wind and wave data analysis for Bavanapadu port
- Hazardous waste audit
- Interoperability of set top box
- Mechanism of film formation
- Mould cleaning by laser technology
- Municipal solid waste-classification & characterisation
- Noise reduction of cooling towers in hotel

- Quantifying the ecosystem services of Park
- R&D of current and future education projects
- Ridership estimation study
- Set up a pilot plant of pigment grade Titanium Di-Oxide
- Setting up of wind augmentation and air purifying unit for traffic junctions and congested roads
- Solar steam generator with absorber integrated storage and cooker
- Stabilizing Lipase and Protease via conjugation with Polymer Surfactants
- Statistical analysis of Interregional Flows
- Studies on ANG system for NG storage in transport networks
- Surge analysis
- Technology roadmap for Tata Communications' transmission core, wireline & wireless access network
- Validation of wireless links – BharatNet Planning tool

Internal Grants for R&D

The Institute provided internal funding for supporting faculty research and student activities. Around Rs. 47.6 crores were sanctioned for these activities, which included the following:

- Seed grant for initiation of research for new faculty and healthcare consortium
- Augmenting research resources of faculty recipients of research/ review paper/ Young Investigator awards
- Research internships and fellowships for PhD students
- Student research/ competition: projects such as Automotive Racing, Intelligent Ground Vehicle Competition and Underwater Vehicle
- Augmenting research facilities and maintenance of central and national research facilities
- Leverage grants and bridge grants
- Grants for development of prototypes

R&D Award Grants from external agencies

The Institute's research was recognised by peers and society in the form of award grants conferred on faculty, students. Some of the awards/ fellowships received during this year are:

Department of Science & Technology awarded:

- Swarnajayanti fellowship in Mechanical Engineering
- Ramanujan fellowship awards in Physics
- Faculty Innovation in Science Pursuit for Inspired Research (INSPIRE) grant in Earth Sciences, Industrial Engineering and Mathematics
- Post-Doctoral Fellowship in Civil Engineering
- Women Scientist Fellowship in Biosciences and Bioengineering
- C.V. Raman international Fellowship for African Researchers (from Tunisia) in Electrical Engineering

Department of Atomic Energy awarded

- Dr. Raja Ramanna Fellowship in Mathematics

Ministry of Human Resource Development awarded

- Fellowships to visiting 9 Canadian students under student research mobility programme of the World Bank-assisted technical education quality improvement programme

Industry awarded

- Google India PhD Fellowship in networking
- Qualcomm Innovation Fellowship in Computer Science & Engineering

2. Licensing Activities

a) Entrepreneurship:

Rights to technology/ Intellectual Property created in the Institute were given to researchers for incubation/ entrepreneurship activity. The incubated companies started during this year in SINE are as follows:

- Swasthya Guru
- WKA Technologies Pvt. Ltd

b) Technology Transfers:

We continue to receive royalties for different IPs licensed in the past. Some of the technologies licensed in this year are:

- A surgical instrument with multiple degrees of freedom
- Board games design
- Design for high performance compliant mechanisms
- Designing of thermal atomic layer deposition system
- Fuel additives for improving efficiency
- Method for frictionless precision guidance using flexible links in vertical plane
- Multi utility heat pump
- Omnipresent ethernet router
- Software for bid matching in power exchange
- Super heat recovery water heaters based on tube heat exchangers
- Technology on wind augmentation and purifying unit
- Web based software for transmission usage cost and loss allocation

3) Dissemination / Outreach:

Asia Pacific HRM Congress & National CSR Leadership Congress Meet – 2016

IIT Bombay organized R&D Exhibition in the Asia Pacific HRM Congress & National CSR Leadership Congress and Awards (15th Edition) event held during September 1-2, 2016 at Vivanta by Taj, Bengaluru. It was organized by Times Ascent and theme for the Congress was “Next Now..? The Future is Now”. About 250 HR Heads & CSR Leaders from industry participated in the event. IIT Bombay showcased CSR opportunities at the Institute and exhibits included posters on technologies developed in the Institute (both in print and video version).

International Engineering and Technology Fair – 2017



IIT Bombay's participation in the International Engineering and Technology Fair – 2017 held in New Delhi



R&D Exhibits during the fair

IIT Bombay participated in the International Engineering and Technology Fair - 2017, organised by the Confederation of Indian Industries, held at Pragati Maidan, New Delhi during February 2-4, 2017. More than 300 international and domestic industries participated in the event and the themes were industrial automation, green mobility, real estate, water and welding. IIT Bombay showcased the technologies and IP assets of the Institute in the KnowledgeExpo domain of the event. IIT Bombay's posters, flyers and brochures were very well received.

International Engineering Sourcing Show-VI

IIT Bombay participated in the International Engineering Sourcing Show-VI organised by the Engineering Export Promotion Council, Ministry of Commerce & Industry along with Russia at Chennai Trade Centre, Chennai during March 16-18, 2017. The theme of the show was Manufacturing (Smart Tech for Smart Engineering). The event was inaugurated by Hon. Ms. Nirmala Sitharaman, Minister of State for Commerce & Industry (Independent), Govt. of India and Mr. Denis Manturov, Hon. Minister of Industry and Trade, Russia. The event had an exclusive technology and innovation pavilion where IIT Bombay, IIT Madras and few other research institutions participated and show-cased their innovations especially in the areas of manufacturing. In addition, ~400 exhibitors mostly from micro, small and medium enterprises participated at the show.

IIT Bombay exhibits included few prototypes, posters on technologies developed in the Institute (both in print and video version), and IIT Bombay videos. We distributed R&D Resources booklet, Technology brochure and R&D Highlights fliers. IIT Bombay stall attracted an overwhelming response mostly from R&D personnel from the government institutions, industry, students apart from general public.



◀ R&D Exhibits during the International Engineering Sourcing Show-VI

TechConnect 2016

‘TechConnect 2016’ was organised during Techfest event held at IIT Bombay between December 16-18, 2016 to showcase R&D exhibits from different academic units. Brochure on ‘Academic Programs’ prepared by IRCC was released by the Director on December 16, 2016. Stalls from Office of the Dean (R&D) and Academic Office exhibited posters on technology development and distributed respective brochures to visitors. A large number of students and general public visited the exhibition.



Prof. D. V. Khakhar, Director, Prof. Soumyo Mukherji, Dean (Student affairs), Prof. P. V. Balaji, Dean (Research & Development) at the IIT Bombay stalls during TechConnect



Publications of Booklets:

Brochures titled 'R&D Highlights', 'Intellectual Property available for licensing', 'Innovations licensed to industry', 'Partner with us' highlighting the possible modes of interactions between IIT Bombay and Industry were updated.



These brochures were distributed in various industrial forums like International Engineering & Technology Fair - 2017, International Engineering Sourcing Show - VI, Asia Pacific HRM Congress & National CSR Leadership Congress meet - 2016 as well as to visitors of the Institute to disseminate information on R&D activities and industry interactions of the Institute.

A brochure titled "Glimpses of Research" describing the research work of some of the faculty members was published in the Institute. It was released by Mr. Sanjay Kohli of Facebook during the National Education Day function held on November 11, 2016 in the Institute.



(In - centre from L-R) Mr. Sanjay Kohli of Facebook & Prof. D. V. Khakhar, Director, IIT Bombay at the release of research booklet 'Glimpses of Research'

4. Augmentation of Research Infrastructure

As part of creating and upgrading infrastructure for enabling R&D activities, the Institute has been establishing state-of-the-art equipment, based on the recommendations of the Research Infrastructure Funding Committee (RIFC). Under this initiative, this year, Bio Safety Level-2 Laboratory at the Department of Biosciences & Bioengineering was established. In addition, several equipments and facilities were procured from external grants. Some of these are as listed below:

- Field emission electron microscope and accessories
- Flow cytometer system with 5 lasers
- High temperature conical nozzle levitator instruments
- Omni-directional laser cladding system
- Scala platform facility -Integrated electronics and optical measurement unit
- SDR- based 5G platform
- Universal testing machine - 250kN capacity

5. Intellectual Property (IP) Protection Activities

During the year, 109 patent applications were filed. List of all Indian and international IPR filed & granted are given in Table 5.

Figure 5: Patents Applications file during 2016-17

IP type	Applications filed (No.)	Granted (No.)
Indian Patent	86	20
PCT	14	-
US Patent	9	4
Trademark	11	6
Design	2	1

Some of the trademarks are given below:

Entangle - Geometry Board



IIT Bombay continued its efforts for licensing of these technologies, products and designs

Areas of IP filings included:

- Biomedical devices & biosensors
- Chemical processes
- Communication systems & ICs

- Drug delivery systems
- Electronic & Energy storage devices
- Light weighting of vehicle bodies
- Memory Devices
- MEMS sensors
- Microfluidics
- Multilevel converters
- Optics, Photovoltaics
- Precision motion
- Robotics
- Synthesis of nano fibres
- Vortex flow metering
- Water pollutant filters
- Wireless communication systems and others

As in the previous year, proactive efforts were made to assess the possibility of intellectual property in the work of MTech/Dual degree students to file for possible protection. For this, almost 587 abstracts were reviewed, out of which about 14 were shortlisted for a possible filing of patent applications and five patent applications were filed.

Nearly 50 agreements were finalized and signed during the year including those for research collaboration, licensing, non-disclosure agreements, IP transfer, student sponsorships, endowment, material transfers, etc. with industries, organisations, universities and government, both national and international.

6. Awards for Intellectual Property Activities

i) Clarivate Analytics India Innovation Awards 2016

The Institute was awarded as one of the 'Top 50 Indian Innovators' for the year 2016 by Clarivate Analytics (formerly the Intellectual Property & Science division of Thomson Reuters) for its spirit of innovation in R&D.



Clarivate Award-2016



Prof. P. V. Balaji, Dean (R&D) receiving the 'Top 50 Indian Innovators' awards for the year 2016

The award honours the most innovative commercial enterprises, research organizations and academic institutions headquartered in India for their innovation in R&D as represented by both the level and quality of patents.

It has identified the top 50 Indian Innovators as the award winners based on various patent metrics – volume, grant success rate, extent of globalization and Influence of innovation (citations).

ii) National Award for the Animation Film – Hum Chitra Banate Hai

Animation film, ‘Hum Chitra Banate Hai’, directed by Prof. Nina Sabnani, Industrial Design Centre (IDC), produced by IDC and animated by Mr. Piyush Verma and Mr. Shyam Sunder Chaterjee was awarded Rajat Kamal Award for the Best Animation Film by the Government of India under Non-Feature Films category at the 64th National Film Awards for the year 2016. The initial research activity of this work was funded by the Institute as ‘Seed Grant project’ to Prof. Sabnani in 2008.



Prof. Nina Sabnani, Industrial Design Centre, IIT Bombay receiving the Rajat Kamal Award, presented by the hon'ble President of India Mr. Pranab Mukherjee

7. Focused Initiatives

Several initiatives have been taken to promote and facilitate R&D activities, especially to encourage students to focus on R&D. Some of them are:

a. Enhancing industry partnership

Institute continued its efforts to enhance its interaction with industry. Visits by industry were managed in a seamless manner by facilitating meetings with faculty having specific areas of expertise of interest and continued follow-up for initiating projects/ collaboration. Agreements were entered into to establish a formal association. New initiatives to promote linkages with industry were rolled out:

- Undergraduate student research internships in core industry leading to academic credits and
- Simplified terms for short duration visits by faculty to industry for R&D collaboration

In addition, brochures and booklets were published and updated, highlighting the interactions with industry and disseminating the possible modes of collaboration.

Seven projects were initiated with industry partners under the Uchchatar Avishkar Yojana scheme launched by the Government of India. Nearly 200 Indian and international industries approached the Institute for partnering with the Institute through collaborative R&D projects.

Some of the Industries and PSUs which visited IIT Bombay to explore research collaborations:

- | | |
|--------------------------------------|---|
| ■ Bosch | ■ MasterCard |
| ■ IBM | ■ L&T |
| ■ JCB | ■ Torrent Pharmaceuticals |
| ■ BSNL | ■ Unilever |
| ■ Gas Authority of India Ltd. (GAIL) | ■ Tofler |
| ■ Bharat Forge | ■ Samsung Electronics |
| ■ Hilti Corporation | ■ TE Connectivity Solutions |
| ■ Amazon | ■ SBI |
| ■ TATA Steel | ■ Semiconductor Research Corporation (SRC) |
| ■ BASF | ■ Mahindra Comviva |
| ■ Shell | ■ Marvel Electronics |
| ■ Total | ■ Huawei Technologies |
| ■ Toray Industries | ■ Hindustan Petroleum Corporation Ltd. (HPCL) |
| ■ ICL Innovation | ■ Mercedes Benz |
| ■ Panasonic | ■ BookMyShow |
| ■ Siemens | ■ Chemlayer |
| ■ Murata Manufacturing | ■ Science and Engineering Research Board (SERB) |
| ■ Ericsson | ■ SG Pharma, Kirloskar Oil Engines |
| ■ Suzlon | ■ Essar Steel |
| ■ Indofil Industries | ■ Jost Engg. |
| ■ Lear Corporation | ■ CME Group |
| ■ Wadia Group | ■ Mumbai Fisheries & Seafood Ltd. |
| ■ Faurecia Interior Systems | ■ Eco Earth Solutions |
| ■ Deniar | ■ HD Fire Protect |
| ■ CEAT Tyres | ■ Georgia Gullini Fashions, etc. |
| ■ RPG Enterprises | |
| ■ KEC International | |
| ■ Dhall Industries | |
| ■ Reliance Industries | |

b. Healthcare Research Consortium:

Healthcare Research Consortium Management Committee Meeting and Advisory Committee meetings were held in March 2017. Term of the consortium has been extended by five years. Two new seed grant proposals were approved this year. The members appreciated seed funding scheme that has helped researchers to write bigger collaborative projects. The consortium members agreed that focussed group discussions around thematic areas and increased academic collaborations and periodic networking sessions between the members is vital. Healthcare start-ups (BioNEST medtech incubator in SINE) will play an important role in taking the collaborative research to market.

c. Institute Ethics Committee (IEC)

The ethics committee reviewed 25 proposals of which 16 were approved and the rest are under review. Guidelines have been revised to incorporate provisions for expedited review which will allow quicker turn-around-time for proposals involving less than minimum risk to the participants. In order to ease the pressure on primary reviewers due to increasing number

of proposals, IEC was expanded to include more scientists/ clinicians/ experts. Training sessions have been conducted for the new committee members to keep them updated on their roles and responsibilities. Training on latest Health Ministry Screening Committee guidelines for “International collaboration involving clinical data” was imparted to all committee members to keep them up-to-date with the latest regulatory guidelines in clinical research.

d. Incentives for R&D

IRCC-IIT Bombay Research awards were instituted in 2004. The decade-old guidelines governing nominations, reviewing and selection, etc was reviewed by the Director-appointed committee as substantial changes in the research and development landscape of the Institute was observed during the last 12 years. The Committee recommended the following awards and guidelines for its review and selection among others:

- Research Publication Award
- Impactful Research Award
- Research Dissemination Award
- Early Research Achiever Award

The winners of these awards during the year are as follows:

Awards Name	Names of Recipients
Research Publication Award	Prof. Mahesh S. Tirumkudulu, Department of Chemical Engineering Prof. Chebrolu Pulla Rao, Department of Chemistry Prof. Sagar Mitra, Department of Energy Science & Engineering Prof. (Ms.) P. Ramadevi, Department of Physics
Impactful Research Award	Prof. Maryam Shojaei, Department of Electrical Engineering Prof. V.S. Raja, Department of Metallurgical Engineering and Materials Science
Research Dissemination Award	Prof. Harkesh B. Singh, Department of Chemistry Prof. Vishnu D. Sharma, Department of Mathematics
Early Research Achiever Award	Prof. Supreet Saini, Department of Chemical Engineering Prof. Srikanth Srinivasan, Department of Mathematics Prof. Dinesh Kabra, Department of Physics

Winners of Research Publications and Other Awards with Guests

Rewards for research excellence, technology development and transfer efforts, awarded during the year are as follows:

Awards Name	Names of Recipients
S.C. Bhattacharya Award for Excellence in Pure Science	Prof. Amiya K. Pani, Department of Mathematics
H.H. Mathur Award for Excellence in Applied Science	Prof. Rinti Banerjee, Department of Biosciences and Bioengineering
Dr. P.K. Patwardhan Technology Development Award	Prof. Anirban Guha, Prof. C. Amarnath, Prof. B. Seth, Prof. K. Kurien Issac and Mr. Abhay Kharade, Department of Mechanical Engineering



Prof. A. K. Pani,
Department of
Mathematics, receiving
S. C. Bhattacharya
Award for Excellence in
Pure Sciences

Prof. Rinti Banerjee,
Department of Biosciences
and Bioengineering, receiving
H.H. Mathur Award for
Excellence in Applied Sciences





Prof. Anirban Guha, Prof. C. Amarnath, Prof. B. Seth, Prof. K. Kurien Issac and Mr. Abhay Kharade, Department of Mechanical Engineering receiving Dr. P.K. Patwardhan Technology Development Award

Awards Name	Names of Recipients
Research Internship awards	<p>Given to bright students across the country to undertake research at IIT Bombay for six months, based on national advertisement and selection process. Each selected intern gets monthly stipend of Rs. 10,000/- for six months.</p> <ul style="list-style-type: none"> ■ No. of applications received: 418 ■ No. of Intern selected: 86 ■ No. of Intern joined : 64

e. Dissemination / Outreach

Workshop on Central facilities was held on 23rd and 24th November 2016 to disseminate information about the central facility (CF) - capability, usage and research output to the academic community. Conveners of thirty five central facilities made presentations on technical specification and capability, types of experiments carried out and the usage. About 100 faculty members and students attended the workshop. Parallel poster presentations were held showing the detailed research output (technical) obtained from the facility by the students.

Lectures by domain experts (faculty members from Institute and Tata Institute of Fundamental Research) on the work of Winners of the Nobel Prize 2016 were organised at the Institute on November 3, 2016.

IP workshop for students and faculty members was organised at the Institute on January 25, 2017. Workshop had detailed presentations on Institute's Intellectual Policy, IP Protection and Management process and IP Commercialisation activity.

f. Safety activities at the Institute

Keeping in mind the importance of safety, a workshop on Laboratory Safety was conducted on February 2, 2017. Around 125 people, students, faculty and staff members attended the workshop. Safety seminars were conducted in the Departments of Biosciences and Bioengineering, Chemistry, Physics and Centre of Excellence in Nanoelectronics. The Institute started online safety test consisting of multiple choice questions (~100 Nos.) with the aim to bring awareness on fire, chemical and gas cylinder safety. The students are required to go through the safety videos and

other information available on the institute safety portal and then attend the test. Department of Biosciences and Bioengineering conducted this test for all its students. It is planned to conduct this test for all new students.

g. Online processes

Online interface of R&D activities continued to make it more user-friendly. Few of the activities automated in this year are as follows:

- Module for research/patent write ups and its review
- Faculty members can send online request for advance and honorarium from respective DDF
- Automated scanning, attachment and dispatch of appointment/ joining letters of Project staff
- Bulletin board for outside campus accommodation
- Biometric attendance, CL approval and its administration of IRCC staff
- Modification of consultancy request and its follow-up process
- Modification of sponsored projects administration proposal, sanctions, funds management & service tax
- Online web portal for 'Online Safety test', planned for new students who will be joining in the Institute in July/ later on
- NET & GATE score captured in online job opportunities portal.

For ERP system: Preparation of document, process & data; training to implementing ASC staff and related activity.

For ERP system: Preparation of document and process of all IRCC activities, training to implementing staff and related activity.

h. Project Manpower

The number of project staff working in various projects as on March 31, 2017 is 1310. Of them, 368 joined during the financial year 2016-17. Rules for accommodation of project staff were reviewed during this year and online processes were implemented for circular, applying and allotment of quarters.

Outreach Programmes

The Continuing Education Programme & Quality Improvement Programme (CE & QIP) office at IIT Bombay have been actively reaching out to working professionals from both academia and industry to serve the competency development and training requirements. A large number of working professionals from industry as well as faculty and students from academia have participated and acquired knowledge from short and long term courses during 2016-17.

The CE & QIP office took up the role of national co-ordinatorship for the QIP under AICTE, for the last 2 years. All the QIP admissions across the country were successfully co-ordinated by the office. Also, a number of short term training programs (STTP) courses, which are fully funded by the All India Council for Technical Education (AICTE) for faculty members of engineering colleges, were conducted. In order to provide college teachers an opportunity to interact with the industry professionals, special efforts have been made to permit a few industry participants as part of the QIP courses, in the normal CEP mode. This model has been appreciated by the teachers as well as the industry personnel, and has also helped to improve the overall effectiveness of the various QIP courses.

Many of our CEP courses for the industry are now well established worldwide and continue to attract large participation, both from within as well as from abroad. The courses on “3D Printing”, “Urban Drainage Management”, “Human Computer Interaction”, “Energy Management”, “Elements of Chemical Engineering”, “Executive Programme in Management”, “Leadership Development Program”, “Dynamics and Control in State-Space (DCSS)”, “Expo CD and Expo PDI”, “Strategies for Organization’s Growth”, “Finite Element Method and Application”, “System Engineering and Principles”, “Data Analytics”, have all been appreciated by the

industry.

During 2016-17, a large number of courses under TEQIP II for Engineering college teachers and students on new emerging areas were conducted. Amongst other programs, the courses on “Biology for engineers”, “Technology driven innovation”, “End to end innovation”, “Advances in Control systems and optimization”, “Innovations in teaching methodologies”, “Introduction to Research methodologies”, were conducted as per the requirement of the colleges/ universities and industries.

The CEP course on “Piping Engineering” (contact version) has reached another milestone and has crossed its 70th edition in 2016. About 10000 engineers have registered in the last 25 years. The on-line version of the course on “Piping Engineering” commenced in July 2009 and has continued during the current year. During 2016-2017, over 500 participants have registered from all over the world and the list is expected to grow many folds in future.

In terms of the overall performance of CE&QIP during 2016-2017, a total of 152 CEP courses were conducted with about 2935 participants from across different disciplines as well as industries, organizations and institutions, with a revenue of around 7.58 crore (an increase of above 13%). Under the QIP category, 4 MTech and 11 PhD students from AICTE approved engineering colleges were admitted. In addition, 13 teachers were inducted into PhD programme under the advance admission scheme who would be joining the institute for the regular programme from July 2017. Further, 8 short term courses (STC) were conducted for college teachers under the sponsorship from AICTE and a total of 248 participants from various engineering institutions/colleges attended these courses.

Faculty Achievements and Recognitions

During the year, 38 faculty members were appointed. The number of full-time faculty members on the roll of the Institute has risen to 629 comprising 306 Professors, 150 Associate Professors, and 173 Assistant Professors. In addition, there are 41 adjunct faculty members and 122 post doctoral fellows on the roll. During the year, 9 faculty members retired – seven of whom were re-employed and three resigned.

The Institute provided financial assistance to 359 faculty members for participating in international conferences. In addition, 87 faculty members travelled abroad for attending international conferences using external funding and one faculty member went abroad on fellowship for research work.

Apart from educational and research pursuits, the faculty of the Institute meet national and global obligations in diverse ways. Many of them have accepted membership of various national committees and editorship of journals. They also review manuscripts for publications. We are proud that their efforts have received recognition in the form of many awards and distinctions, some of which are listed below:

Prof. Satish Agnihotri, Centre for Technology Alternative in Rural Areas (CTARA), has been appointed as a Member on the Central Advisory Committee of the Central Electricity Regulatory Commission.

Prof. Suvarn Kulkarni, Department of Chemistry, has been admitted as a Fellow of Royal Society of Chemistry (FRSc).

Prof. Suvarn Kulkarni, Department of Chemistry, has been selected to receive the prestigious CRSI Bronze medal for the year 2017.

Prof. Suvarn Kulkarni, Department of Chemistry, has been successfully nominated for Dr. H. C. Srivastava Memorial Lecture Award-2016.

Prof. Sourav Pal, Department of Chemistry, has been nominated as Visiting Professor in Chemistry at Gauhati University. He has also been nominated as a member to the School Board of School of Chemistry of University of Hyderabad.

Prof. Subhananda Chakrabarti, Department of Electrical Engineering, has been appointed to the editorial board of IEEE Journal of Electron Devices Society.

Prof. Ruchi Anand, Department of Chemistry, has been invited to join the Editorial Board of ACS Sensors.

Prof. Ronita Bardhan, Centre for Urban Science & Engineering, been awarded the fellowship “Building Energy Efficiency Higher & Advanced Network (BHAVAN)” by the Department of Science and Technology, Government of India and the Indo-U.S. Science and Technology Forum (IUSSTF).

Prof. Nand Kishore, Department of Chemistry, has been appointed as a Member of the Editorial Board of the journal Protein and Peptide Letters.

Prof. Deepankar Choudhury, Department of Civil Engineering, has been selected by the International Journal of Geomechanics as an ASCE 2015 Outstanding Reviewer.

The collaborative efforts of **Prof. I. N. N. Namboothiri**, Department of Chemistry and researchers at the Ariel University and Weizmann Institute, Israel has resulted in the development of a novel technique for membrane protein purification. This technology development was presented recently at the Techconnect event in Washington DC, USA. It was identified as one of the top 15% technologies submitted and selected for the Techconnect Innovation Award, 2016.

Prof. Ashutosh Gandhi, Department of Metallurgical Engineering and Materials Science, has been recognised by SCRIPTA MATERIALIA 2015 for his significant contributions made to the quality of the journal.

Prof. Srikanth Srinivasan, Department of Mathematics, has been selected to receive the Young Scientist Award of the Indian National Science Academy, New Delhi.

Prof. R. Murugavel, Department of Chemistry, has been selected to receive the CRSI Silver Medal – 2017.

Prof. R. Murugavel, Department of Chemistry, has been appointed as honorary Professor of JNCAR Bangalore for a period of two years.

Prof. Bhaskaran Muralidharan, Department of Electrical Engineering, has been invited to serve as an Editorial Board Member for Scientific Reports.

Prof. Ramesh Singh, Department of Mechanical Engineering, Mr. Santanu Paul and Mr. Wenyi Yan have received the outstanding paper award for “Thermal Model for Additive Restoration of Mold Steels Using Crucible Steel” at 44th North American Manufacturing Research Conference and ASME Manufacturing Science and Engineering conference held at Virginia from June 27 to July 1, 2016.

Prof. Ashwin Gumaste, Department of Computer Science & Engineering, and Prof. Subhananda Chakrabarti, Department of Electrical Engineering, have been selected for NASI-Reliance Industries Platinum Jubilee Award for Application Oriented Innovations in Physical Sciences for the year 2016.

Prof. Aftab Alam, Department of Physics, was honored during a conference in Sweden by the International Association of Advanced Materials Congress with the prestigious “International Association of Advanced Materials Scientist Medal (IAAM Scientist medal) for the year 2016”.

Prof. Aftab Alam, Department of Physics, has been invited to join the editorial board of the journal Advanced Materials Letters (AML, www.vbripress.com/amp).

Prof. Anand Khanna, Department of Metallurgical and Materials Science, has been selected to receive the prestigious International Association of Advanced Materials Medal (IAAM) for the year 2016 in recognition of his outstanding contributions in the field of “Advanced Materials Science and Technology”.

Prof. A.S Khanna, Department of Metallurgical Engineering & Materials Science has been selected for the award “Skoch Order-of-Merit”. Prof. Khanna has also been chosen by CIA World Magazine for the award “Innovation in New Building Products”.

Prof. Saravanan Vijayakumaran, Department of Electrical Engineering: As per the copy of the Minutes of the meeting of the Closure Report Review of ISRO sponsored project “Signal Processing for Performance Improvement of MOTR”, the Review Committee has appreciated the research work carried by Prof. Saravanan Vijayakumaran and his team for the successful launch of the satellites on June 22, 2016.

Prof. Nina Sabnani, Industrial Design Centre, won the grandprize “Light of Asia” at the International Animation Festival Indie-Anifest at Seoul for the film “Hum Chitra Banate Hain” (We make Images) made under the TCTD project.

The film “We Make Images” produced and directed by Prof. Nina Sabnani, Industrial Design Centre, has won the following awards:

(1) SIGNS 2016, Kerala: Jury’s Special Mention Award October 2, 2016

(2) MAMI 2016, Mumbai: Silver Gateway Award for short film (Half Ticket category) October 27, 2016

(3) Aadhar, Heritage Film Festival, Ahmedabad 2016: Best Animation Film in Professional category, November 4, 2016.

Prof. Nina Sabnani, Industrial Design Centre, has been invited to be a jury member for Indie-AniFest 2017 to be held in September 2017 in Seoul Animation Center. The film “We Make Images” has been invited to be screened in the Indie Ani Tour to be held in Japan.

Prof. Debabrata Maiti, Department of Chemistry, has been invited to be a Member of the Editorial Advisory Board of Organometallics.

Prof. Debabrata Maiti, Department of Chemistry, has been invited to become ‘Associate Editor’ of ‘The Journal of Organic Chemistry’.

Prof. Prasenjit Ghosh, Department of Chemistry, has been invited to be a Member of the Editorial Advisory Board of Organometallics.

Prof. Abhay Karandikar, Department of Electrical Engineering, has been selected to receive the IEEE-SA Standards Medallion award for his significant contributions to the development of Standards.

Prof. Amartya Mukhopadhyay, Department of Metallurgical Engineering & Materials Science, has been selected to receive the INAE Young Engineer Award 2016. Prof. Mukhopadhyay has also been awarded the ASM-IIM North America Visiting Lectureship Award 2016.

Prof. Santanu Bandyopadhyay, Department of Energy Science and Engineering, has been appointed as : (1) Associate Editor, International Journal of Energy Technology and Policy, Interscience, (2) Section Editor (Energy Engineering), INAE Letters, Springer Nature, (3) Editor-in-Chief (with Prof. Dominic Foo and Prof. Raymond Tan), Process Integration and Optimization for Sustainability, Springer Nature and (4) Section Editor (Energy Systems), Encyclopaedia of Sustainable Technologies, Elsevier.

Prof. D. Bahadur, Department of Metallurgical Engineering & Materials Science, has been invited to serve on the editorial board of journal "Scientific Reports" published by the Nature Publishing Group.

Prof. Anil Kumar, Department of Chemistry, has been invited to join the editorial advisory board of ACS Sustainable Chemistry and Engineering journal.

Prof. G. K. Lahiri, Department of Chemistry, has been selected by the Council of the Indian Chemical Society to receive Rev. Fr. L. M. Yeddanapally Memorial Award for the year 2015. He has also been elected as a Fellow of The National Academy of Sciences, India (2016).

Prof. Sanjeeva Srivastava, Department of Bioscience and Bioengineering, has been selected as a member of the Human Proteome Organization at the HUPO World Congress in Taipei in 2016.

Prof. Sanjeeva Srivastava, Department of Bioscience and Bioengineering, has been invited to be the Editor of a special issue of the journal PROTEOMICS – Clinical Applications (Wiley) devoted to neglected and tropical diseases.

Prof. K.P Madhavan, Emeritus Professor, Department of Chemical Engineering, has been selected by the International Society of Automaton for its life time achievement award.

Prof. S. R. Kotha, Department of Chemistry, has been elected as a Fellow of Indian National Science Academy, New Delhi.

Dr. Parthasarathi Subramaniam, former PhD student, has been selected to receive the Eli Lilly and Company Asia Outstanding Thesis Award for the year 2016.

Prof. Avik Bhattacharya, Centre of Studies in Resources Engineering (CSRE), has been appointed as the Associate Editor of IEEE Geoscience and Remote Sensing Letters (GRSL). Prof. Bhattacharya has also been appointed as the Guest Editor of a Special Issue on "Applied Earth Observations and Remote Sensing in India" in IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing (JSTARS).

Prof. Avik Bhattacharya, Center of Studies in Resources Engineering (CSRE), students Arnab Muhuri, Shaunak De, Surendar M, from the University of Erlangen-Nuremberg; Swinky Dhingra, Debanshu Ratha, Abhishek Maity presented a paper entitled "Novel Scattering Power Decomposition from Full and Compact Polarimetric SAR Data" at the National Symposium on "Recent Advances in Remote Sensing and GIS with Special Emphasis on Mountain Ecosystems" & Annual Conventions of Indian Society of Remote Sensing and Indian Society of Geomatics held during December 7 – 9, 2016 at Dehradun. It has been adjudged for Best Poster Presentation Award (Student Category).

Prof. Gopal Dixit, Department of Physics, has been selected for the Max-Planck Society's India Mobility grant for the years 2017-2020.

Prof. R.B. Sunoj, Department of Chemistry,

has been invited to become a Member of the Editorial Advisory Board of an ACS journal “Organic Letters” for a period of three years from January 2017.

Prof. R.B Sunoj, Department of Chemistry, has been elected as a Fellow of the Indian Academy of Sciences.

Prof. Sudesh Balan, Industrial Design Centre: The film “Boundaries of Memory” written, shot and directed by Prof. Balan is among the 21 non-feature films to be selected in the Indian Panorama section in this year’s The International Film Festival of India. This film is a part of his academic research (SEED grant project) on making cost-effective films for delivering social messages without losing cinematic value.

Prof. Amit Agrawal, Department of Mechanical Engineering, has been appointed as Editor of the journal “Experimental Thermal and Fluid Science”. Prof. Agrawal has joined the Editorial board of the Journal “Nature Scientific Reports”.

Prof. Manoj Prabhakaran, Department of Computer Science and Engineering (CSE), has joined the editorial board of the “Journal of Cryptology”, an official journal of the International Association for Cryptologic Research (IACR).

Prof. Alok Porwal, Centre of Studies in Resources Engineering (CSRE), has been invited to co-edit a special issue of the journal “Ore Geology Reviews” devoted to “Applied Geologic Remote Sensing and Spectroscopy: A Mineral Exploration Perspective”.

Prof Alok Porwal, Centre of Studies in Resource Engineering (CSRE) has been appointed as Associate Editor of the international journal “Arabian Journal of Geosciences”.

Prof. Ramgopal Rao, Department of Electrical Engineering, currently Director of IIT Delhi, has been elevated to the Fellowship of the IEEE Society for his contributions to CMOS System-on-Chip technologies.

Prof. Surya Durbha, Centre of Studies in Resources Engineering, has been awarded the NVIDIA Innovation Award 2016 in recogni-

tion of his work in the area of Image Information Mining and High Performance Computing (HPC) carried out along with his PhD students Mr. Kuldeep Kurte and Ms. Ujwala Bhangle.

Prof. S. Sudarshan, Department of Computer Science and Engineering, has been chosen to receive the Distinguished Alumnus Award for the year 2017 by IIT Madras.

Prof. Rajesh Gupta, Department of Energy Science and Engineering, along with his UK academic partner won the Research Excellence Award 2016 by the Confederation of Indian Industry (CII) and the British Council under India-UK collaboration in higher education. The award has been given in a ceremony under UK-India Tech Summit, which was held in New Delhi during the recent visit of UK Prime Minister Theresa May with her high-level delegation team.

Prof. Kaivan Munshi, alumnus, Department of Civil Engineering, has been awarded the Infosys Prize 2016 for Social Sciences (Economics) in recognition of his research.

Prof. Preeti Rao, Department of Electrical Engineering, has been appointed as a member of the editorial board of the Journal of “New Music Research”.

Prof. D. N. Singh, Department of Civil Engineering, has been invited to become Fellow of the Institution of Civil Engineers (ICE), London by a Presidential Invitation.

Prof. Prasenjit Ghosh, Department of Chemistry, has been invited to be a member of the Editorial Advisory Board of Organometallics.

Prof. B. Ravi, Department of Mechanical Engineering, **Prof. B.G. Fernandes**, Department of Electrical Engineering, & **Prof. Chandra Venkataraman**, Department of Chemical Engineering, have been inducted in the Indian National Academy of Engineering.

Prof. Vivek Borkar, Department of Electrical Engineering, received the INAE Lifetime Contribution Award in Engineering.

Prof. Santanu Banerjee, Department of Earth Sciences, has been selected to receive the

National Geoscience Award - 2016 in Basic Geosciences.

Prof. Pushpak Bhattacharyya, Department of Computer Science and currently Director of IIT Patna, has been awarded “the Eminent Engineer Award” by the Institute of Engineers (India).

Prof. S.A. Khaparde, Department of Electrical Engineering, has been awarded “The Eminent Engineer Award” by the Institution of Engineers (India) for his valuable contributions in the field of Electrical Engineering.

Prof. D. Parthasarathy, Department of Humanities and Social Sciences, has been elected as a Board Member of the Commission on Legal Pluralism, a part of International Union of Anthropological and Ethnological Sciences (IUAES).

Prof. Rinti Banerjee, Department of Bio-Sciences and Bioengineering, has been appointed as Associate Editor of ACS Biomaterials Science & Engineering published by the American Chemical Society.

Research work of **Prof. Souvik Mahapatra**, Department of Electrical Engineering, on reliability methodology in simulation CAD tools for advanced CMOS process

development has been mentioned in First Quarter 2017’s earning call of Synopsys, a leading CAD tool company. This methodology would impact design of VLSI chips that would go into future electronics products such as smartphones.

Research collaboration of **Prof. Souvik Mahapatra**, Department of Electrical Engineering, with the Synopsys has resulted in the release of a Sentaurus TCAD Model for NBTI Reliability Simulation of Advanced Transistors.

Prof. Milind Atrey, Department of Mechanical Engineering, has been awarded Fellowship by the Indian Cryogenics Council in recognition of his notable contributions to the field of Cryogenics.

Prof. D.K. Sharma, Department of Electrical Engineering, along with Prof. D.T. Shahani and Prof. Agarwala of IIT Delhi and Prof. Rajat Moona, Dir. Gen. CDAC received special felicitation from the Election Commission of India as members of its technical experts committee on Voters’ Day, January 25, 2017. The award was given by the Honorable President of India Mr. Pranab Mukherjee in a function organized at the Maneckshaw centre in New Delhi.

Student Activities

Students at IIT Bombay explore their interests in a plethora of activities. There are excellent recreational facilities for sports, including gymnasiums, swimming pools, courts for tennis, basket ball, volleyball, hockey, football and cricket, athletics tracks and many more. Along with studies, sports activities too are carried throughout the year. All the events are organized by a capable Institute Sports Council headed by General Secretary, with the able guidance of Sports Officers, Chairman Sports and Dean Students Affairs.

Techfest

IIT Bombay's annual international science and technology festival called TechFest, is well established as Asia's largest science and technology festival patronized by UNESCO, UNICEF, SAYEN, CEE and Make In India. The event was held during December 16-18, 2016 and witnessed a footfall of more than 1.6 lakhs people comprising mainly of youth from across the nation and an outreach of over 2500 colleges across India and over 500 overseas. The theme for this year's edition of Techfest was 'A Space Expedition'. Some of the activities organised as a part of Techfest 2016 are as follows:

Lecture series: A total of 20 lecture sessions were conducted during Techfest in a span of 3 days. These included 17 keynote speaker sessions, two panel discussions and one interview session. Prof. Urjit Yajnik & Prof. D B Phatak of IIT Bombay were part of panel discussions on "The Discovery of Gravitational waves" & "Make In India" respectively. The interview session with Mr. Rakesh Sharma was moderated by Prof. Hemendra Arya of IIT Bombay. Interaction sessions with Mr. Rakesh Sharma, Prof. Peter Atkins, Mr. A S Kiran Kumar, Prof. Kaushik Basu (N.R. Kamath Chair Professor, IIT Bombay) were also organised.

Exhibitions: is one of the distinguished sector of Techfest which provides an opportunity to see what the world has achieved and is trying to achieve through technology. The event,

this year, witnessed more than 20 exhibits from countries across the world and from elite universities like EPFL, ETH Zurich, St. Petersburg, Michigan University etc. It also showcased some of the most impressive exhibits from India consisting of Indian Army, student innovations and Indian tech companies. ISRO also participated in the exhibitions showing the breakthroughs and latest technological advancements in the field of Indian space technology. Over the 3 days of the festival, the exhibition hangar witnessed around 40,000 people.

Techconnect: After being discontinued for 2-years, Techconnect was re-started this year, with 43 exhibits showcased by more than 250 BTech/ MTech students. Two companies from SINE along with 6 student bodies and 35 other exhibits from various laboratories and departments of the Institute participated. Lecture by B. Ravi on "Scope and Importance of Medical Device Innovation in present day world" was also organised as part of TechConnect, which was attended by around 200 visitors.

CURED: CURED (Can U Really Escape Diabetes?) was A PAN-India level initiative and biggest outreach campaign by Techfest IIT Bombay to evade diabetes. Diabetes health check camp was organised on September 25, 2016 in 20 cities across eight states of India. Guinness World Record for maximum number of health pledges card signed by people was attempted. A total of 65,000 patients were screened for diabetes on that particular day.

IAMPOWER: With an aim to empower girls to become leaders in technology, innovators in Science, Technology, Engineering and Mathematics (STEM) and build their own future through exposure to computer science and technology, Techfest conducted the initiative IAmPower to support the young girls and women of India by involving them in STEM. As a part of the online awareness drive, video testimonials were taken from 11 female students of IIT Bombay.

International Coding Challenge: The coding hunt, which witnessed participation of over 15 countries organised by Techfest 2016-17, was attended by over 300 students from the Institute. Overall third and fourth position and cash prize worth Rs.30000 was bagged by two IIT Bombay 3rd Year Computer Science students Govind Lahoti and Rishabh Agarwal.

Mood Indigo

The annual cultural festival Mood Indigo, held during December 23-26, 2016, saw an overwhelming response from the youth of the country who came to IIT Bombay to witness the four-day extravaganza. The festival witnessed more than 220 events and saw a footfall of 1,39,000.



Hon'ble Chief Minister of Maharashtra Mr. Devendra Fadnavis addressing students at the proshow during Mood Indigo 2016

Proshows: The Litfest featured eminent personalities like Hon'ble Chief Minister of Maharashtra Mr. Devendra Fadnavis. The show also had noted journalist Mr. Arnab Goswami and hundreds of college students as part of his 'Transform Maharashtra' initiative.

The other speakers included Hon'ble Minister of State with Independent Charge for Power, Coal, New and Renewable Energy and Mines Mr. Piyush Goyal, entrepreneur, filmmaker and author Mr. Varun Agarwal, Padma Bhushan awardee Prabhu Chawla, and many more. Stand-up comedy shows saw crowds roar in laughter featuring big artists like Mr. Sorabh Pant and Mr. Navin Prabhakar. The theatre shows touched new heights with Mr. Saurabh Shukla bringing his famous play 'Barfi' to the convocation hall apart from

other famous shows like Daddy Cool etc. The International Music Festival had crowds pouring in for shows of Mame Khan, Arjun Kanungo etc. In addition, Mood Indigo 2016 featured lots of international artist groups from Turkey, Netherland, USA and France enthralling the audiences with their amazing performance. Inaugural events like MI Tour and Live Art Showcase were a huge success with the former offering a unique and assisted experience for visitors.

Pronites: Mood Indigo 2016 featured for the first time the International Nite in the gymkhana grounds. Crown The Empire - an American post hard-core rock band who was the headliner for the night, created an electric and entertaining atmosphere for one and all in the crowd. Day 2 had the famous Karsh Kale



Students performing at the Pronites during Mood Indigo at IIT Bombay

collective provide a serene musical experience. Day 3 had world famous Italian duo of VINAI coming down to India to make the enthusiastic youthful crowd buzz in the EDM night. The festival ended with the best possible act of Shankar Ehsaan Loy, making perhaps the highest-ever gymkhana turnout ring to their old and new Bollywood tracks.

Competitions: While the flagship competitions in dance, music and dramatics stayed the point of attraction, what captivated people's minds were the novel competitions in various genres like journalism, digital arts and lifestyle. To add a cultural flavour to the festival, various competitions in the classical and folk arts genre were also introduced, which were highly appreciated by the judges as well as the participants.

Entry of competitions in niche fields like improvisational theatre, rap, photography and folk dance increased participation by 20%. Under the “Live Your Passion” campaign, the participants received various incentives, which included airing of the finals of the competition on NDTV Prime, performances and exhibitions at prestigious stages like Kala Ghoda, Indian Arts Festival and summer internships in institutions like Anupam Kher’s Actor Prepares, Spic Macay, Ritam Banerjee, True School of Music etc. The competitions saw participation from over a thousand colleges panning across various cities like Mumbai, Delhi, Jaipur, Hyderabad and Bengaluru.

Media: The festival was extensively covered by various mainstream and regional media houses. Various news channels also featured the festival on television, including Romedy Now showing snippets of the humour show. In an attempt to explore the new mode of mass communication, social media, the organizers indulged in posting live updates via various social networking sites like Facebook, Twitter, Inshorts and Instagram. In addition, a 12 page newsletter was published in association with Bombay Times which was distributed in over 60, 000 households in Mumbai. The Media Team also explored other avenues of publicity like outdoor hoardings and publicity in cinema houses. A barter deal across 10 cities helped increase the reach for Mood Indigo and IIT Bombay brand name.

Entrepreneurship Cell (E-Cell)

The E-Cell at IIT Bombay was founded with a vision to create an entrepreneurial ecosystem by enabling an easy and efficient interaction between students, faculty, aspiring and existing entrepreneurs, mentors and investors. E-Cell has worked to spread awareness and promote latent entrepreneurship spirit amongst people by conducting four major initiatives:

a) The Entrepreneurship and Business Club (EnB Club)

The EnB Club tried to foster the latent entrepreneur skills within all the IIT Bombay students by catering to the requirements of all the students having different levels of entrepreneurship skills. Several activities were conducted, some of which are:

Speaker Sessions and Panel Discussions:

Various sessions such as ‘Business Vs Entrepreneurship’ panel discussion were held in which attendees were informed of the pros and cons of each of them. The Crowdfunding speaker session briefed about the various aspects of raising funds. A detailed discussion about crowd funding and their real grounds minutes were discussed.



Panel Discussion on ‘Business Vs Entrepreneurship’ organised by the Entrepreneurship Cell during 2016-17

Bootcamps and courses on

Entrepreneurship: Several boot camps and courses were conducted to cater to all the IIT Bombay students. Some of them were:

- A 5-hour long course by Ajeet Khurana was conducted with the motive of discussing grass rooted information on entrepreneurship
- A one-day course that covers all aspects of starting and running a company such as idea generation, business modelling, finance, legal aspects, marketing, funding and pitching was also conducted
- A 22-day long program, during which ideas are made startup worthy, with the help of extensive mentoring was held. Product Showcase, Idea Submission, Team Building Session, Offline Mentoring, Final Pitching round in front of investors were the different rounds that were conducted.

Coffee Meetups: This was a networking event for all Powai startups, VC's, corporates, mentors. This helped building contacts and flow of ideas in an informal yet professional way.

b) National Entrepreneurship Challenge:

This was launched with a vision to promote entrepreneurship amidst all the college campuses in India. Overall 150 entries have registered and had established E-Cells in their colleges.

Eureka ! : Eureka! has been independently recognized as Asia's largest Business Plan Competition by CNN and Thomson Reuters. Eureka provides a platform for potential ideas and early stage start-ups to evaluate their plan in the risk-free environment of a competition. During the event, thirty five one-day long workshops aimed at imparting knowledge about entrepreneurship across major cities of India, catering to over 2800 students, via Business Model Canvas and hands-on experience with an average feedback of 4/ 5 were organised. Mentors were allotted to the selected participants for a span of 2 months with whom they could talk over phone. Offline mentors meet was conducted for them to consult mentors of all fields face-to-face and a lean startup workshop aimed at helping

them to make a MVP was also conducted. A team of experts and judges selected the finalists through a transparent judging process. Business and social startups were awarded separately. Various other awards such as youth award etc. were given.

Enspace: Two issues of Enspace were launched this year. Inside and outside readership of Enspace as well as blogs increased by 100%.

Enlighten: An online learning platform to learn about entrepreneurship free of cost was launched. The portal also includes speaker sessions conducted by E-Cell since last 3 years along with various resources such as reading material to learn about entrepreneurship.

The Entrepreneurship Summit: The Entrepreneurship Summit is a confluence of visionary students, professionals or anyone who wishes to be one of those crazy rebels who will change the world, start his own business or fund a business and become a trend-setter. It is the annual flagship event of E-Cell, IIT Bombay. Various activities were conducted during this 2-day Summit. Some of them are:

Networking Arena: We hosted a series of networking events where young entrepreneurs, investors and people from entrepreneurial background connect with each other. This year, the Networking Arena was divided into three sessions namely Investors Speed Dating, Idea Validation Arena and Quora Meetup. Networking Arena in E-Summit 2017 was a huge success with pre-registrations of over 170 participants in each session.

The Ten Minute Million: One of the highlight events of The Entrepreneurship Summit, 2017 hosted a total of 8 startups (out of 130 entries) for a 5-minute pitching and 5 minutes Q & A session in front of a panel of 12 investors. Out of those 8 startups, 6 startups received an on-the-spot funding of 10 lakh INR.

StartupExpo: It is a platform for innovative startups from all over the country to get in touch with thousands of its potential customers and investors. It also provides an opportunity for the

attendees to learn about the new entrepreneurial techniques that these startups have used to become successful in their journey.

Internship Fair: Job and Internship Fair was conducted for the students of IIT Bombay to help them get jobs and internships by directly communicating with the startups coming in, as per their interests. Eight startups participated and were given a kiosk for the entire day for scheduling and conducting interviews.

Hackathon: In this competition, participants had 24 hours to build a business plan, design and code it with help from a roster of mentors from various fields and expertise roster of top sponsors and access to top notch technical experts while they compete for a prize worth of INR 100000 to be given to the top 3 teams. The teams got the chance to pitch in front of Accel Partners, one of the leading Venture Capital (VC) firms in the world.

Lean Startup Workshop: It was an intensive three-day workshop which teaches entrepreneurs and innovators how to build disruptive products using Lean Startup methodologies.

The Unconference: In this event, attendees create the agenda so that all the discussions become relevant and engaging. The session topics are dynamic and decided at the event when participants propose topics they want to discuss and sign up for topics proposed by others. This event was envisioned to build communities, unleash initiatives and help solve problems.

Speaker Sessions and Panel Discussions:

A large number of speaker sessions were conducted with speakers from all the fields related to entrepreneurship. Attendees could learn from the experiences of the speakers and could look at the tangible aspect of their start-ups and ventures (some of the speakers were: Amit agarwal, Jeff Bulas, Paul Sloane, Jim Beach, Shraddha Sharma, Alan Mamedi, Gabor Veszi, Raj Jaiswa).

Workshops: A wide multitude of workshops were conducted giving the attendees insights into all the aspects of running a startup and how to solve various issues and scale their

startups as fast as possible. Some of the topics were: Bootstrapping, Legal Issues, Entrepreneurial Finance, Business Model Canvas & Personal Branding.

Competitions: Many competitions were conducted, each of them targeted to instill qualities in the participants that are fundamental for becoming a good entrepreneur and investor. Some of the competitions were: Crowd pitch, Apocalypse Management, Finance Case Study, Marketing Case Stud, National Bizquiz, Investor's Hat Merger and acquisition.

Investor's Conclave: The aim of this initiative was to foster networking among investors and startups. The startups were mentored on how to pitch and how their ideas will be judged when they give their first pitch to an angel investor. The participation in this edition was around 35 investors and 20 startups.

c) Student's Technical Activity Body (STAB):

The student technical activities in the Institute saw a huge growth in 2016-17 spearheaded by the move towards technical resource group formation under various clubs, expansion of Tinkerers' Lab, a successful summer programme (Institute Technical Summer Projects), the Tech and RnD exposition and the introduction of the position of General Secretary for Technical Affairs position in this year's gymkhana elections. Some of the new initiatives of this year were as follows:

- Expansion of Tinkerers' Lab from the earlier 800 sq ft to 2500 sq ft. A lot of new, state-of-the-art equipment was bought with generous contributions from the 1966 and 1975 alumni batches.
- Involvement of hostel councils in technical activities saw a two-fold increase in the number of events and participation. The technical hobby clubs and the hostel technical councils worked together to make sure a plethora of events were conducted in hostels. Technical rooms of 4 hostels were revamped with help from STAB.
- Institute Technical Summer Projects



(ITSP) was completed successfully by 40 teams wherein freshers worked on their own ingenious ideas over 2 months in the summer of 2016.

- Summer of Science (SoS), a new initiative by the Maths and Physics Club, saw senior students volunteer to mentor juniors to help them learn something new in the summers of 2016 through reading papers, journals and online courses. The topics ranged from astrophysics to cosmology to the general theory of relativity and witnessed 7 reports being submitted. Summer of Science '17 saw 40 reading projects and a 5-fold increase in the number of mentors.
- Seasons of Code (SoC), a new initiative by the Web and Coding Club, saw juniors take up projects floated by senior students. The senior students personally mentored the students. This programme boasts of 8 completed projects and a collaboration with FOSSEE, IIT Bombay.
- Enthuse, a platform for students to interact with professors in hostel lounges and mess to know about ongoing research in various departments, was revived. Three Enthuse sessions were conducted this year parallelly across 5 hostels. This was done in collaboration with the Dean (RnD) and the UG Academic Council.

- BioEngineering Club was a new club formalised and run actively this year.
- Group discussions, Reflections, BioBytes: This year saw the move towards an unprecedented number of group discussion with each hobby club conducting one group discussion a fortnight. Reflections was an initiative by the Web and Coding Club bringing senior students together to discuss about projects they have worked on in layman terms. BioBytes was a discussion group formed with the help of the BioEngineering Club and Maths and Physics Club.
- The Tech and RnD Exposition, which used to be conducted previously along with the Student Alumni Meet was conducted as a standalone event along with the UG Academic Council. This event saw 30 undergraduate projects along with 6 projects from technical teams being displayed over a period of 2 days.

Continuing the trend from last year, there was an exponential increase in the number of activities. There was a two-fold increase in the number of events. Hostel technical councils were revived. Many innovative projects were developed and showcased.

Placement

The Placements season for the academic year 2016-17 began with campus interviews conducted in two phases. Preparations for these phases and associated activities started in July 2016. The first phase of IIT Bombay's campus placement in December 2016 witnessed participation of more than 225 companies and the second phase saw more than 50 companies resulting in 1114 job offers in total, including the pre-placement offers. Students from Bachelor of Technology (BTech), Master of Science (MSc), Dual Degree (DD), Master of Technology (MTech), Master of Design (MDes), Master of Philosophy (MPhil) and Doctor of Philosophy (PhD) programs in various fields of engineering, science and technology, design and humanities participated in the placement process. There were a total of 1718 students registered for campus placements in 2016-17 which includes PhD and MDes students.

Student registration for campus placements opened in August 2016 with the customary introduction to the placement process by the Professor-in-charge and student placement team. Companies were invited from July 2016 onwards to fill up online "Job Announcement Forms" which opened to students registered for placements from early October. Pre-placement talks by some companies, provided an avenue for interaction and familiarisation of students with recruiting organisations and their work profile as a run up to formal placements. Companies were increasingly being asked to make only electronic presentations rather than on-campus talks, especially if they have visited IIT Bombay over the past few years. The company interview process for the first phase began on December 1, 2016 with a break on December 4 for scheduled CAT exam. A small number of eligible students did not actively participate in the placement process due to other career choices.

December 1, 2016, the first day of formal placements, saw 33 companies, representing some of the most coveted jobs in global industry vie for students. An unprecedented 158 jobs were offered on that day reconfirming

the commitment of top recruiters to IIT Bombay graduates. Placement season 2016-17 also had the formal placement process for Industrial Design Centre (IDC) conducted separately in May 2017 to better synchronize with the academic calendar for final year students.

While the placement season eventually saw recruiters from the entire spectrum of the industry, the initial part of the season was dominated by firms from sectors like engineering and manufacturing, computer software and hardware, data analytics, management consulting, finance/banking, and FMCG. Most of these firms are world leaders in their respective domains. Some of the major start-ups as recruiters turned up but the budding start-ups were avoided this year since offers from the previous year start-ups were delayed/ revoked.

Student Preparations

As in previous years, a key focus of the Placement Office was to prepare the students for placement and internships. A large number of preparatory activities were conducted this year for the graduating students, including refresher lectures on various technical subjects. In addition, preparatory programmes to enhance communication skills, interview skills and group dynamics were also organised. Talks with the alumni working in diverse sectors were also organized to orient the students to different job requirements. Around 1330 preparatory sessions were organised by the Placement Office. Senior and experienced alumni from the corporate sector were available at the Placement Office during December 2016 to counsel and advise students.

Engineering and Technology

IIT Bombay students continue to demonstrate strong commitment to their core educational background in their choice of employment. Majority of students opted for science, engineering and technology-oriented jobs with

the recruiting companies operating in various sectors of the economy. Placement session 2016-17 witnessed the presence of 88 core engineering organisations especially the Public Sector Units (PSUs), offering 345 jobs.

IT/ Software

IIT Bombay students known for programming skills have continued to attract recruiters through campus placement over the past several years. Challenging global scenario and the increasing competition amongst the IT companies did not impact the job opportunities in this sector which resulted in 184 job offers by 64 companies.

Financial Services

The financial service sector was a major recruiter this year too. Many of the top global companies in financial sector visited the campus. The Fin-Tech sector noticed a rush among top-level as well as mid-level companies to recruit the brightest and the best from the campus. 25 companies from these sectors offered 130 jobs to students. The rapid ongoing digitization of financial services sector in India also resulted in strong presence of Indian financial firms in a sector traditionally dominated by multinationals at IIT Bombay.

Data Analytics

The reputation of superior analytical and reasoning skill of IIT Bombay graduates continued to draw recruiters from the rapidly growing field of data analytics. There were 113 job offers from 44 organisations making this one of the biggest recruiters after engineering and information technology. This trend seems to have taken strong roots at IIT Bombay.

Consulting Sphere

Over 24 leading consulting firms, including several global leaders, visited IIT Bombay for campus placement this year. These organisations work with large corporations across the world and help them resolve complex business problems. Management

consulting companies carry a reputation of being very selective in their choice of campuses and follow extremely high standards in their recruitment process. Over 89 offers were made in the consulting sector including management consulting.

Research & Development

With the economy increasingly striving for high-end products and services, a larger number of companies now develop products on the forefront of technology. IIT Bombay saw an increase in the number of organisations hiring fresh graduates in the research and development sector. A total of 32 R&D organisations offered 118 positions this year.

Education

IIT Bombay continues to provide faculty to several educational institutions through campus placement over the past several years. 11 organisations selected 47 students, including some with doctoral degree, who have been offered jobs in public and private educational institutions through campus placement.

Conclusion

The successful campus placement session in 2016-17 clearly demonstrates the demand of IIT Bombay graduates among the top recruiters in various segments of the economy. A majority of our past recruiters held their faith in the abilities of our students and came to recruit in large numbers. This year, several new organisations visited the Institute for the first time, and the Institute looks forward to fostering long-term relationship with all these organisations in near future. The year saw several important headwinds in the business climate of Indian and International companies due to global events which impacted the placement process in the interim period. Internal factors such as selection trends and strict criteria for participating companies, and restricted participation of start-up companies were some reasons for fall in demand.

Program-wise statistics:

Over the years there has been a gradual increase in the registered students count. The numbers below narrate the participation according to the programs with their respective selections.

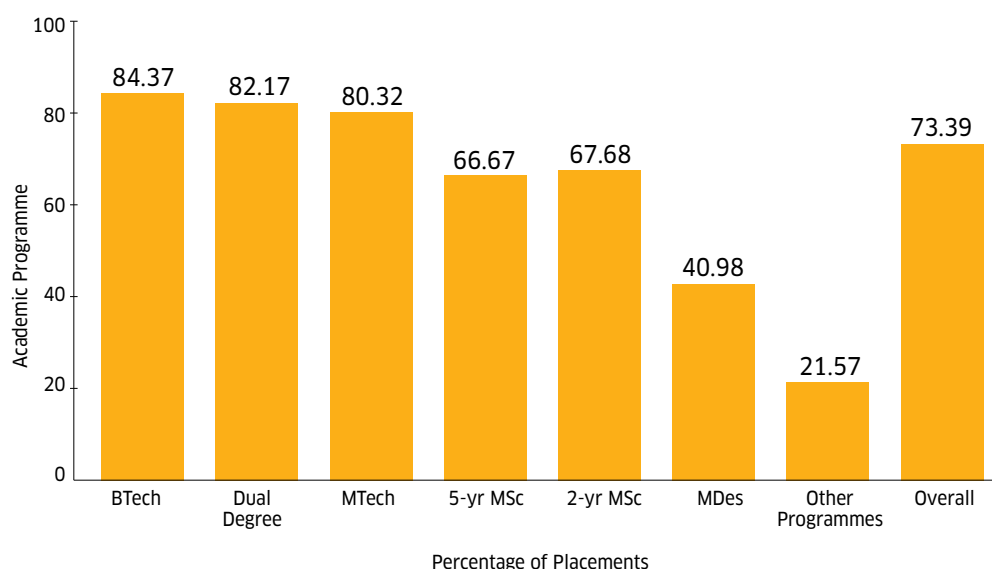
Program-wise placement data 2016-17:

Academic Programme	Registered	Participated	Placed	Percent placed
BTech	544	467	394	84.37
Dual Degree (BTech+MTech)	247	230	189	82.17
MTech(2 Yr.)	542	493	396	80.32
5-yr MSc	16	15	10	66.67
2-yr MSc	147	99	67	67.68
MDes	62	61	25	40.98
Other Programmes	160	153	33	21.57
Total	1718	1518	1114	73.39

* Includes MPhil, MTech + PhD, MSc+ PhD, MSc + MTech, PhD, MS by Research-general

NOTE: Participated count excludes de-registered students who opt for higher studies & have other career options and hence de-register themselves from the placement process.

Figure 1: Programme-wise Placement (%)



Note: All registered students do not necessarily participate actively in campus placements. Some plan to study further. It is also important to note that students are also get placed through channels other than campus placements.

- In addition to the above mentioned numbers, 1 MPhil and 26 PhD students were also placed in the campus placement process.
- For MSc, MSc+MTech and PhD students, higher studies and post-doctoral work can be a priority.

Sector-wise Selection:

Sectors like Core Engineering & Technology, Research & Development, Analytics and IT/Software saw good selections this year, which were inclined to the industry trends.

Table 2: Placement detail by type of organisation:

Sr. No.	Sector	Number of Organizations	Number of Offers
1	Engineering & Technology	88	345
2	IT/Software	64	184
3	Finance	25	130
4	Analytics	44	113
5	Consulting	24	89
6	Research and Development	32	118
7	Education	11	47
8	FMCG	6	18
9	Public Sector Undertaking	6	27
10	Others	16	43
Total		316	1114

Category-wise Offers:

The job profiles offered by recruiting organisations are divided into various categories based on the gross compensation packages as listed below. Factors other than compensation package like job profile, past association of recruiting organisation etc. may sometimes be considered to alter the category.

Table 3: Placement detail as per salary offered:

Range of Gross Salary (in Lakh Rupees per annum)	Number of Organizations	Number of Offers Received
Above 13	69	250
Between 11 to 13	42	153
Between 9.25 to 11	45	166
Between 7.5 to 9.25	66	202
Between 6 to 7.5	63	206
Between 5 to 6	27	94
Less than 5	16	43
Total	328	1114

Average Compensation, International Offers & PPROs

Average Gross Salary (in LPA*)	11.41
Average CTC (in LPA*)	13.38
Total Number of International Offers	67
Total Number of Pre-Placement Offers	59

*LPA = Lakhs Per Annum

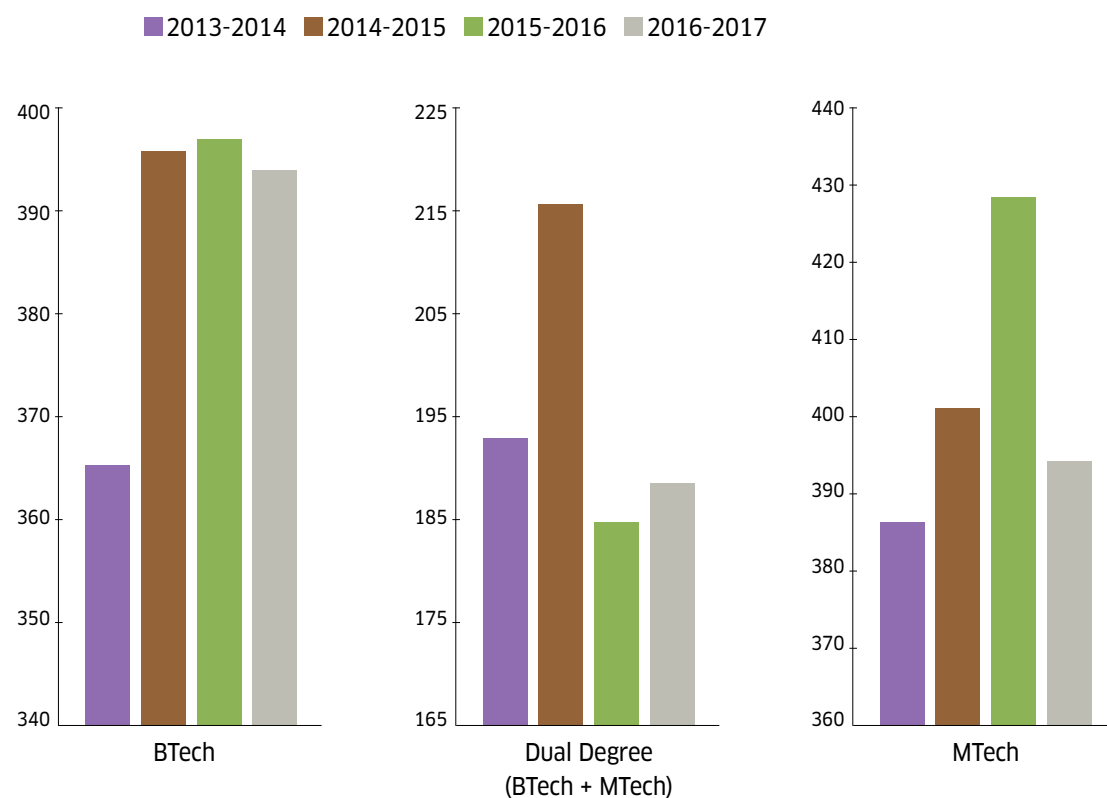
Year-wise Placement Comparison:

Inspite of the challenging market situations over the years, IIT Bombay managed to maintain good interest amongst the recruiting firms in the job market.

Table 4: Comparison of students placed in 2013-14 vs 204-15 vs 2015-16 vs 2016-17

Program	2013-14	2014-15	2015-16	2016-17
BTech	365	396	397	394
Dual Degree (BTech + MTech)	193	216	185	189
MTech	387	402	429	396
Total	945	1014	1011	979

Figure 2: Year-wise selections for BTech (2-a), Dual Degree (BTech + MTech) (2-b) and MTech (2-c)



Sector vs. Department Offers:

BTech and MTech maintained almost the same demand amongst various companies.

Table 5: Sector-wise statistics for different degree courses:

Sr. No.	Sector	B.Tech	Dual Degree	M.Tech	Others
1	Analytics	32	23	34	24
2	Consulting	48	28	11	2
3	Education	-	2	7	38
4	Engineering & Technology	90	48	183	24
5	Finance	81	44	4	1
6	FMCG	5	8	4	1
7	Public Sector Undertaking	13	-	8	6
8	Research & Development	37	11	49	21
9	IT/Software	73	19	79	13
10	Others	15	6	17	5
Total		394	189	396	135

Engineering & Technology, Finance and IT/ Software were amongst the top hiring sectors for the BTech.

Figure 3: Sector-wise selection for BTech:

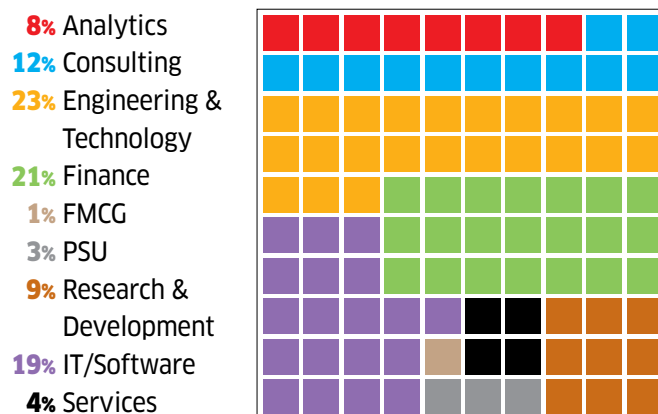
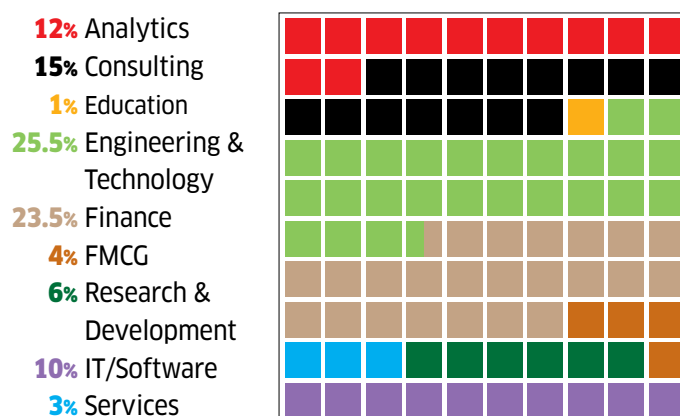
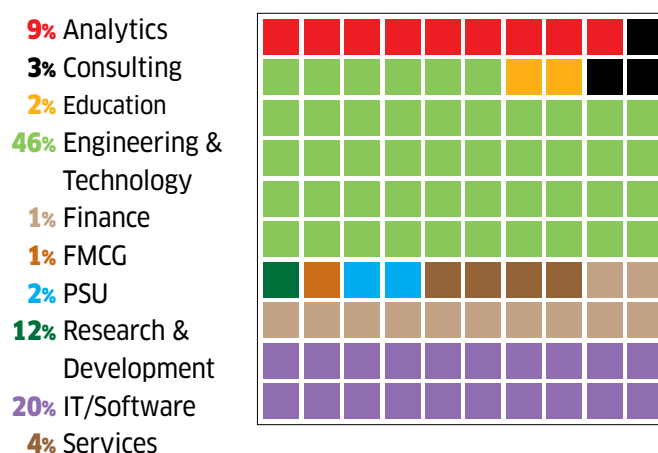


Figure 4: Sector-wise selection for Dual Degree (BTech + MTech):



Core Engineering and R&D came up with the highest selections from these sectors.

Figure 5: Sector-wise selection for MTech:



Internship Report 2016-17:

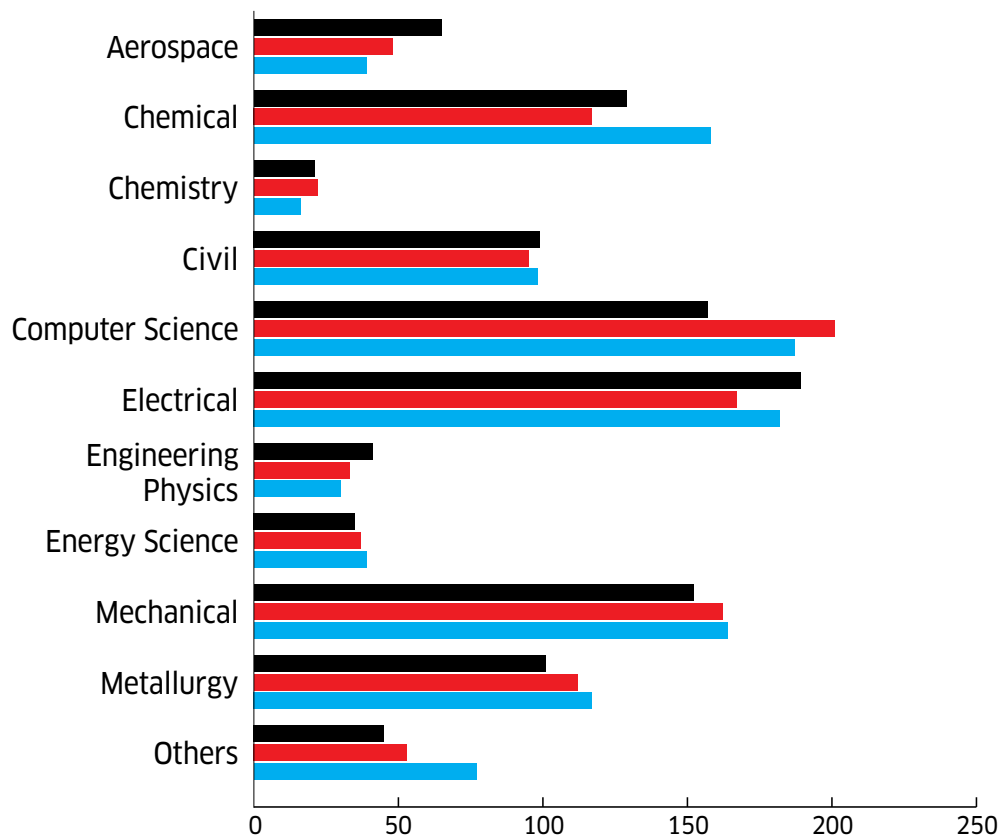
The Internship Session 2016-2017 witnessed 1107 offers from over 650 organisations. There were 120 Pre-Placement Offers (PPO) made to students for final placement based on their performance during internships in 2015-16, of which 59 were accepted by students.

The internship season started in July 2016 and continued till May 30, 2017. The students in the 2nd and 3rd years of Bachelor of Technology (BTech), 5-year and 2-year Master of Science (MSc) and 5-year Dual Degree (DD) programmes in various departments participated in the internship process.

Table 6: Department-wise Internship Data for 2014-15, 2015-16 & 2016-17:

Department	Number of Internships		
	2014-15	2015-16	2016-17
Aerospace	65	48	39
Chemical	129	117	158
Chemistry	21	22	16
Civil	99	95	98
Computer Science	157	201	187
Electrical	189	167	182
Engineering Physics	41	33	30
Energy Science	35	37	39
Mechanical	152	162	164
Metallurgy (MEMS)	101	112	117
Others	45	53	77
Total	1034	1047	1107

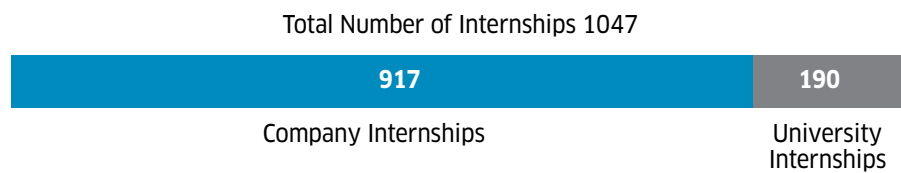
Figure 5: Department-wise selections year-wise:



Summer vs. Winter Internships:



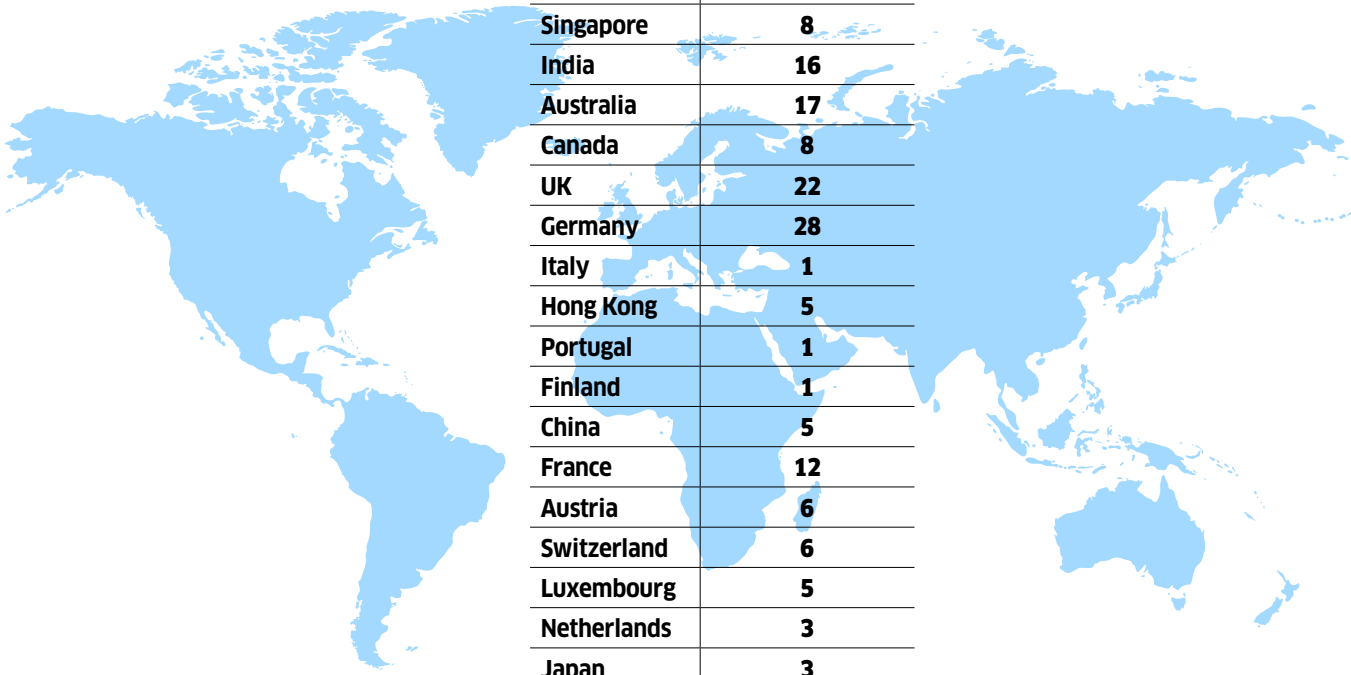
Companies vs. Universities:



Country-wise Offers:

The best foreign universities across the globe have a huge demand for IIT Bombay students.

Table 7: Country-wise offers from universities:



Country	Number of Internship Offers
USA	39
UAE	1
Singapore	8
India	16
Australia	17
Canada	8
UK	22
Germany	28
Italy	1
Hong Kong	5
Portugal	1
Finland	1
China	5
France	12
Austria	6
Switzerland	6
Luxembourg	5
Netherlands	3
Japan	3
Taiwan	3
Total	190

Table 8: Country-wise offers from companies:

There has been a positive trend in international companies hiring IIT Bombay students as interns. Japan has been at the top in the list.

Country	Number of Internship Offers
India	899
Japan	12
USA	2
China	3
Dubai	1
Total	917

Society For Innovation And Entrepreneurship

The Society for Innovation and Entrepreneurship (SINE) is an umbrella for fostering entrepreneurship and nurturing tech start ups at IIT Bombay. It administers a business incubator, which provides support for technology-based entrepreneurship and facilitates the conversion of research activity into entrepreneurial ventures.

Since inception, 104 companies have been incubated. In the year 2016-17, SINE hosted 54 companies, of which, 26 new companies got incubated and 15 have graduated. During the period, four companies received VC/ Angel investments and 12 companies are based on technology/ knowhow from the Institute. The existing companies are from various technologies such as education, cleantech, mechatronics, nano technology, engineering software, fintech, environment, medtech and healthcare. SINE has also supported around 30-40 innovators/ entrepreneurs under various other programmes.

SINE has been selected as “Centre of Excellence” by Department of Science and Technology (DST), Government of India. SINE has also been approved for setting up a BIO-Incubator, i.e. BIO-NEST to support the medtech start ups, and has also partnered with ONGC to run a joint incubation program to support the start ups in oil & gas, energy and cleantech sectors.

SINE has been self sustaining its operations since inception. It has received grants from GoI organisations like DST, TDB, DeiTy and also some CSR funding from a few corporates to seed support its start-ups.

SINE also actively associates with the entrepreneurial ecosystem of the IIT Bombay like eCell, Desai Sethi Centre for Entrepreneurship, Healthcare Consortium, Tata Centre, BETiC, IITBAA etc.

SINE conducts various end-to-end support programmes for technology start-ups. This will also enhance its incubation support and also serve as a pipeline for incubation. Support programmes undertaken during the year are as follows:

- SINE partnered with CAMTECH and Lattice innovation to organize a two day hack-a-thon with a focus on healthcare for urban poor.
- Prototyping support program to fund innovators to build their ideas into prototype. Entrepreneurial fellowship program supports an aspiring or budding entrepreneur of considerable potential to pursue a promising technology business idea. These programs serve as a pre-incubation initiative.
- Short term incubation/ accelerator programme in joint collaboration with SAP, to assist technology-based start-ups that are developing for-profit business solutions with a clear social and/ or environmental impact and with Intel India to help hardware and electronic based start ups to develop their products and assist in go-to-market strategies and scaling up.
- Seed Support program which would provide assistance to start ups and act as a bridge between development and commercialization of innovative products/ services.
- Cross border programmes like Academia Industry Training (AIT) - A bilateral entrepreneur exchange program in partnership with Swissnex India, to help them translate their applied research into market applications and India Russia Bridge for Innovations (IRBI), for entrepreneurs to explore market to provide startup ecosystem and mutual synergies in Russia.



Plug in Launch - Accelerator program in collaboration with Intel



S-Cube session - Accelerator program in collaboration with SAP

Products – SINE Companies



Drone - Drona Aviation



Digital Braille Device - Innovision

International Relations

IIT Bombay assigns significant value to its relationships with various international partners. Over the years, IIT Bombay has steadily built up a reputation for research and education both in India and abroad. This has helped in attracting bright and young researchers from all over the world, as faculty of the Institute.

A good number of international students have also come to the Institute either as full-time or as exchange students.

During the year 2016-17, IIT Bombay has signed 32 MoUs with various foreign universities and received functionaries from many universities, governmental and ministerial delegations, from countries across the globe, for exploring areas of collaboration and cooperation.

MoUs with Foreign Universities:

- Charles Darwin University, Australia
- University of Calgary, Canada
- Institut Mines-Telecom, France
- Texas Tech University, USA
- Malardalen University, Sweden
- University of Mons, Belgium
- Siberian Federal University, Russia
- The Ohio State University Institute for Materials Research, USA
- Yonsei University, Korea
- Nara Institute of Science and Technology, Japan
- National Tsing Hua University, Taiwan
- Freie University of Berlin, Germany
- Technische Universitaet Darmstadt, Germany
- Federal University of Minas Gerais (UFMG), Brazil
- Institut Supérieur De L'Aeronautique et de L'Espace (ISAE-SUPAERO), France
- Ecole de Technologie Supérieure, Canada
- Augsburg University of Applied Sciences, Germany
- Ontario Universities International, Canada

- University of Alberta, Canada
- Simon Fraser University, Canada
- St. Ignatius of Loyola University, Peru
- Washington University in St. Louis, USA
- Koc University, Turkey (Erasmus+ Programme)
- Holon Institute of Technology, Israel
- University of Cologne, Germany
- Kochi University of Technology, Japan
- Sharif University of Technology, Iran
- University of Newcastle upon Tyne, UK
- ETH Zurich, Switzerland
- Ecole Centrale de Nantes (Erasmus+ Programme)
- Rensselaer Polytechnic Institute, USA

Visits of International Delegations

IIT Bombay also received a large number of international delegations for exploring areas of collaboration and cooperation. The major ones are as follows:

- Prof. Andrew S. Whittaker (Professor and Chair), Prof. Kellie Stanchak (Graduate Academic Coordinator) from Dept. of Civil, Structural & Environmental Engineering, University of Buffalo, USA.
- President of Universidad San Ignacio de Loyola in Peru, Dr. Ramiro Salas Bravo, Mr. Raul Diez Canseco Terry, Founding President of the University, Mrs. Luciana de la Fuente; Executive President, Mr. Diego Castrillon Dioses, Head of Projects of the General Management visited IIT Bombay to discuss the possibilities of cooperation between the two institutions.
- Prof. Adam Habib (Vice Chancellor), Prof. Ian Jandrell (Dean of Engineering and the Built Environment), Ms. Kanina Foss (Chief of staff to the Vice Chancellor) from Witwatersrand University, Johannesburg, South Africa.
- Dr. Bertrand de Hartingh, (Counsellor

- for Cooperation and Cultural Affairs), Dr. Nicolas Idier (Books, Ideas and Knowledge Attache), Ms. Estelle Berruyer (Cultural Attache) from New Delhi and Mr. Alain Zayan, Director, Alliance Francaise, Mumbai.
- A delegation lead by Prof. Wei-Chung Wang, Senior Advisor for Global Affairs, National Tsing Hua University, Taiwan.
 - A delegation led by Dr. Kim, Yong-Hak, President, Prof. Jooni Kim, Vice President and Professor of Law and team from Yonsei University, Korea.
 - Cen Huang (Ms), Associate Vice President and team from University of Alberta.
 - Dean Anil Makhija and Senior Associate Dean Peter Ward from Fisher College of Business, The Ohio State University.
 - Prof. Maria do Rosario Trindade (Head of Cooperation Division) and Prof. Luis Filipe Malheiros (Full Professor and Subdirector of the Department of Metallurgical and Materials Engineering) from the Faculty of Engineering University of Porto (FEUP), Portugal.
 - Japanese Ambassador Mr. Hiramatsu Kenji visited IIT Bombay on August 17, 2016 and gave a lecture regarding Indo-Japan relationship and interacted with the students.
 - Ambassador of Finland to India Ms. Nina Vaskunlahti.
 - Mr. Mauro Moruzzi, Ambassador, Head International Relations and State Secretariat of Education, Research and Innovation in Switzerland.
 - Dr. Zerihun Kebede Wudie (Academic Research-General Director- From Ministry of Education), Mr. Mitiku Berecha Hunde (Head of Scholarship Office-From Ministry of Education), Mr. Asalf Habtegeorgis Wondemgezahu- Minister Counsellor-I (Education) from the Ministry of Education, Ethiopia.
 - Prof. Yaron Oz, Rector and team from Tel Aviv University, Israel.
 - Professor Phil Wright, Pro Vice Chancellor for Science Agriculture and Engineering, Newcastle University, UK.
 - Prof. Bruce E. Seely (Dean, College of Sciences and Arts) and Prof. Ravindra Pandey, (Chairman, Department of Physics) from Michigan Technological University, USA.
 - President and Vice-Chancellor Dr. Andrew Petter, Prof. Faisal Beg (School of Engineering Science), Carol Zachs (Director, International Partnerships and Protocol), Prof. Mirza Faisal Beg (School of Engineering Science and Associate Dean, Faculty of Applied Science) from Simon Fraser University, Canada.
 - Mr. Kretschmann (Minister President of the State of Baden-Württemberg), Minister Hoffmeister-Kraut (Minister of Economic Affairs, Labour and Housing), Minister Hermann (Minister of Transport), Murawski (State Minister and Head of the State Chancellery) Mrs. Olschowski (State Secretary, Ministry of Science, Research and the Arts), Mr. Schwarz (Member of State Parliament), Mr. Stoch (Member of State Parliament), Mr. Kuhn (Mayor of City of Stuttgart), Dr. Mentrup (Mayer of the City of Karlsruhe) and team of approx 120 member delegation from Germany.
 - Prof. Iwan Davies Pro Vice Chancellor of Swansea University.
 - Dr. Juan Manuel Restrepo Abondon, Vice-Chancellor and Rector of Universidad del Rosario.
 - Prof. Tuula Teeri (President) and faculty members and administrative staffs from International Office, Aalto University, Finland.

In addition, several individuals visited IIT Bombay as representatives of their respective universities.

International Students

A total of 98 International students (from countries like Afghanistan, Australia, Bangladesh, Bhutan, Canada, Dubai, Egypt,

Ethiopia, Finland, France, Germany, Italy, Mongolia, Myanmar, Nepal, Norway, Palestine, Singapore, Sudan, Sweden, Switzerland, Syria, Taiwan, Turkey and USA) have registered at IIT Bombay during the financial year 2016-17. They have joined IIT Bombay for course work/ project work/ post graduate studies.

Student Exchange Programs

	Name of the University	No. of students/ Programmes
1.	Aalto University, Finland	Two Dual Degree students from Electrical Engineering Dept., and Mechanical Engineering Dept. respectively.
2.	Bogazici University, Turkey	Four Dual Degree students from Electrical Engineering Dept.
3.	Ecole CentraleSupélec, France	Two Dual Degree students from Electrical Engineering and Energy Science and Engineering Dept. respectively.
4.	ETH Zurich, Switzerland	Two BTech, and one Dual Degree students from Physics Dept. and one MMgt, student from SJM School of Management
5.	KTH Royal Institute of Technology, Sweden	One Dual Degree student from Electrical Engineering Dept. and two Dual Degree students from Mechanical Engineering Dept.
6.	Nanyang Technological Univ, Singapore	Three Dual degree students from Electrical Engineering Dept.
7.	National University of Singapore	Two Dual degree students from Electrical Engineering Dept., one Dual degree student from Mechanical Engineering Dept., two BTech students from Chemical Engineering Dept. and Computer Science & Engineering Dept., respectively
8.	Peter the Great St. Petersburg Polytechnic University, Russia	One Dual Degree student from Energy Science and Engineering Dept.
9.	Ryerson University, Toronto (OMG Program)	One Dual degree student from Chemical Engineering Dept.,
10.	Tallinn University of Technology, Estonia (Erasmus Mundus Heritage Program)	One Dual Degree student from Electrical Engineering Dept.
11.	Technical University of Denmark	Three Dual degree students from Chemical Engineering Dept., one Dual degree student from Aerospace Engineering Dept., one Dual degree student from Mechanical Engineering Dept., and one BTech student from Civil Engineering Dept.
12.	Technical University of Munich, Germany	Two Dual degree students from Mechanical Engineering Dept. and Electrical Engineering Dept. Respectively.

13.	Technion-Israel Institute of Technology, Israel	One BTech student from Mechanical Engineering Dept.
14.	Telecom Ecole de Management, France	Two MMgt students from SJM School of Management
15.	Telecom ParisTech, France	Three BTech students from Electrical Engineering Dept.
16.	The Cooper Union for the Advancement of Science and Art, USA	One Dual degree student from Chemical Engineering Dept., and two BTech, students from Chemical Engineering Dept., and Electrical Engineering Dept., respectively
17.	University of Quebec at Trois Rivieres, Canada	Two Ph. students from Energy Science and Engineering Dept.
18.	University of Toronto, Canada	One BTech student from Electrical Engineering Dept.

Foreign Language courses: Following language courses for the students and staff of IIT Bombay in the Autumn and Spring semester were organised :

- French (in association with the Embassy of France, New Delhi)
- Japanese (in association with Koo International Co. Ltd., Japan)
- Italian (in association with University of Pavia, Italy)
- Mandarin (in association with Embassy of Taiwan, New Delhi)
- Persian (in association with Culture House of the Islamic Republic of Iran in Mumbai)

The courses were conducted by the native speakers of these languages.

Curtin University of Technology, Australia: Workshop on Sustainable Smart Cities and Energy:



Participants in the joint workshop with Curtin University, Australia on May 9, 2016 at IIT Bombay



Participants in the joint workshop between IIT Bombay and NCTU, NTU and KSU from Taiwan held during May 16-17, 2016 at IIT Bombay

A one-day workshop was conducted at IIT Bombay on the topics of Sustainable Smart Cities and Energy in May 2016 where faculty members from both sides gave technical talks on their ongoing research areas to identify areas of common interests for future collaboration. On the topic of Sustainable Smart Cities, faculty members from Centre of Urban Science Engineering from IIT Bombay and Architecture, School of Built Environment faculty members from Curtin University participated.

Faculty members from the department of Electrical Engineering, Energy Science and Engineering and Aerospace Engineering at IIT Bombay, and those from the Chemical and Electrical Engineering departments at Curtin University participated in the session on energy.

The technical talks were followed by open discussion where few PhD and post-doctoral students also participated. Lastly, both universities showed interest to collaborate by offering courses, supervising PhD students and research work and publication through combined research projects. It was also decided to have another joint workshop between IIT Bombay and Curtin University at Curtin University, Australia during 2017 in mutually-agreed timeframe.

IIT Bombay - National Chaio Tung University, Taiwan Workshop on “Nanodevice Technology”:

The MoU between IIT Bombay and National

Chaio Tung University was signed on April 2016 by Director, IIT Bombay and President, NCTU. A joint workshop between IIT Bombay-NCTU on “Nanodevice Technology” was held during May 16-17, 2016 at IIT Bombay.

The NCTU delegation comprising of nine faculty members was led by Prof. Edward Chang, Vice-President of NCTU, and included Education and Science & Technology (S&T) officials from the Taiwanese embassy Mr. Yi Ta Chen and Dr. Henry Chen respectively, the President of Kun Shan University Prof. Yan-Kuin Su, and Prof. Chee-Wee Liu of the National Taiwan University.

On the first day, NCTU professors gave lectures on their research and later, a short informal interaction session for the NCTU faculty with IIT Bombay post-graduate students was held. The second day witnessed technical presentations by IIT Bombay professors and faculty members from NCTU, NTU and KSU, on a broad variety of topics. Later, the delegation was given an extensive tour of semiconductor research facilities in the departments of Electrical Engineering and Metallurgical Engineering & Materials Science followed by IIT Bombay campus tour.

The workshop witnessed high volume of student participation and interaction with delegations from NCTU, NTU and KSU. The major motive for the joint workshop is to strengthen the academic and research collaboration activities between the faculty members of the institutions and build strong



Joint workshop between IIT Bombay and SSAU, Russia at IIT Bombay

relationship to facilitate the joint supervised PhD program, student exchange and faculty exchange.

IIT Bombay - Samara State Aerospace University (SSAU), Russia Joint Workshop:

IIT Bombay is keen to build the network of Russia-India Network (RIN) of Institutions of Higher Education. To further strengthen the tie-ups, a two-day workshop with Samara State Aerospace University was held in IIT Bombay. From SSAU, six Russia researchers

and seven faculty members from IIT Bombay, participated in the joint workshop. The researchers from Russia and faculty members from IIT Bombay gave technical presentations on the topics covering “Biomedical and Biotechnical research areas”, “Aerospace Engines and Fuel Efficient Engines research progress”, “Automation and Cybernetics”, “Modern Space Technologies” and “Research in Physics”. On the second day, they visited labs in the Department of Aerospace Engineering, Department of Mechanical Engineering, Department of Physics and few centres.



Participants in the joint workshop between IIT Bombay and NTU at IIT Bombay

After the open discussion in the concluding session, the researchers from SSAU and IIT Bombay mutually identified the areas of research interest to collaborate through joint research projects, faculty exchange and PhD

co-guidance. It was also agreed upon to have a bilateral MOU in place to further strengthen the partnership between SSAU and IIT Bombay.



Participants in the joint workshop between NTU & IIT Bombay at NTU in Singapore

Joint workshop between IIT Bombay and Nanyang Technological University, Singapore in Health and Medicine:

The MoU between IIT Bombay and Nanyang Technological University was signed on April 2016 by Director, IIT Bombay and Vice President, International Affairs, NTU. Thereafter, a joint workshop between IIT Bombay-NTU on “Healthcare Technologies” was held on September 26-28, 2016 at IIT Bombay.

The NTU delegation comprised of 14 faculty members. Two students gave technical talks and poster presentation. The main objective of this workshop was to connect faculty members from both the institutions to identify topics of mutual interest for research

collaboration, students research internship, short-term faculty exchanges, seed funding for selected joint research programs and joint PhD programs.

The follow-up workshop was held in NTU, Singapore on March 6-7, 2017 titled NTU NITHM – IIT Bombay symposium on “Healthcare and Medical Technologies II”. The workshop focused on small group discussions on focused areas of research and also student centric activities including poster presentations. The objective of the workshop was not only to bring academics and students of both IIT Bombay and NTU together but also to continue to build academic bridges between the two great institutions.

International Governing Board (IGB) Meeting of BRICS - Network University at IIT Bombay

The Institute hosted the meeting of the International Governing Board (IGB) of Brazil, Russia, India, China and South Africa (BRICS) Network University on September 27, 2016. The meeting was attended by Mr. Vinay Sheel Oberoi, Secretary (Higher Education), Ministry of Human Resource Development (MHRD) and Mr. Siljo V.K., Deputy Secretary, Department of Higher Education, Ministry of Human Resource Development, Government of India along with Prof. Ved Prakash, Chairman of University Grants Commission (UGC) and Dr. Manju Singh, Joint Secretary for International Cooperation of UGC. Senior government officials and the following academic leaders from the BRICS countries were present for the IGB meeting.

From Brazil:

- Leandro Gomes Cardoso, Head of International Affairs, Ministry of Education of Brazil
- Elisa Maria Costa Pereira de S.Thiago, General Coordinator, Evaluation Department of CAPES, Brazil

From Russia:

- Vladimir Timonin, Deputy Director, Department of State Policy in Higher Education of Russian Ministry of Education, Russia
- Maxim Khomyakov, Vice-President for International Affairs, Director of the BRICS Studies Centre, Ural Federal University, Russia

From South Africa:

- Sandile Williams, Director, University Policy and Development Support at DHET, South Africa
- Diane Parker, Deputy Director General, Department of Higher Education and Training, South Africa
- Stephanie Burton, Vice Principal, Research and Postgraduate Education, University of Pretoria, South Africa.

During the meeting, mechanisms to enhance research collaboration and student exchanges at a pan-BRICS level were discussed. The activities of BRICS Network University are focused on the following thematic areas: Energy, Computer Science and Information Security, BRICS studies, Ecology and Climate change and water resources and pollution treatment. India is currently the Chair of BRICS for the year 2016-17.



BRICS-NU International Governing Body members and Thematic Group coordinators from Indian Institutions

IIT Bombay-University of Sydney, Australia Joint Workshop on “Photonics and Nano Materials” :

The IIT Bombay - University of Sydney joint workshop on Photonics was held at IIT Bombay on November 21-22, 2016. This was the first of the series of workshop planned between the two institutes.

Talks on the photonics-related research being carried out at the two institutes and few invited lectures on specific topics from faculties of both institutes were organised on the first day. The second day was devoted to lab visits in Physics and MEMS departments.



Signing of the renewal of MOU between IIT Bombay and University of Alberta

Participants from IIT Bombay included Prof. R. Dusane (MEMS, Dean (IR)), Prof. B.P Singh, Prof. T. Kundu, Prof. P. Vasa (from department of Physics) and Prof. S. Shukla (MEMS), and Mr. A. Das (Dean IR office).

Participants from University of Sydney included Prof. S. Fleming, Prof. G. Lakhwani, Dr. A. Choudhary and Ms. Amanda Sayan (Office of Global Engagement).

The attendees also actively discussed various aspects of the IIT Bombay - University of Sydney PhD program. The concluding session included discussions on the admission procedure, criteria for student evaluation and awarding joint degree as well as on the possible dates of follow-up workshop to be held in University of Sydney.

The major goal of the joint workshop was to strengthen the interactions between the faculty members of the two Institutes for eventually facilitating the joint PhD program, a goal which participants believe was successfully achieved.

IIT Bombay - University of Alberta, Canada and IC-IMPACTS Joint Workshop on “Clean Water Technologies” :

A one-day workshop was organized at IIT Bombay on “Clean Water Technologies”. The workshop was jointly funded by IIT Bombay and IC-IMPACTS. Researchers from Canadian and Indian institutions partnered with IC-IMPACTS for the workshop and gave technical talks on their ongoing research areas to identify common interests for future collaboration and to identify seed funding for selected joint research programs.

The MOU between IIT Bombay and University of Alberta was renewed on the same day in the presence of Director of IIT Bombay Prof. Devang Khakhar and President, University of Alberta, Dr. David. H Turpin. Both the institution agreed through the agreement to foster collaboration on graduate programs, including the co-supervision of PhD students. One of the major goal of the joint workshop was to identify joint PhD students. The workshop witnessed high volume of student participation including poster presentations from 20 students and interaction with Canadian researchers. It was agreed upon to hold the next edition of this workshop in University of Alberta, Canada.

Visit of Minister President of Baden - Wuerttemberg, Germany:

The Minister President Winfried Kretschmann from the State of Baden-Wuerttemberg, Germany with a delegation of 120 participants visited IIT Bombay on January 27, 2017.

The delegation wished to understand India’s economic, research and university landscape, country’s Smart City Mission and to strengthen ties between the state of



Minister President Winfried Kretschmann and Director of IIT Bombay Prof. Devang Khakhar

Maharashtra and Baden-Wuerttemberg. During the visit, IIT Bombay hosted thematic discussions on Entrepreneurship, Smart Cities & Urban Challenges and Energy. The session ended with Minister-President of the State of Baden-Wuerttemberg Winfried Kretschmann's keynote address on "The Future Of Mobility And Energy".

IIT Bombay - Aalto University, Finland Mini-Symposium :

IIT Bombay and Aalto University are founding members of the consortium of Finnish-India Higher Educational Institutions and share a very strong networking relationship. Both the institutions are keen to enhance their research collaboration, so a mini-symposium was held in February 2017 at IIT Bombay during the visit of President of Aalto University Dr. Tuula Teeri and faculty team of ten members from Aalto University.

The one-day mini-symposium focused on departmental research strength by faculty members from both the institutions. Department visit, lab tour and student interaction were also organised. The session ended with President Dr. Tuula Teeri's talk on "Universities and Innovation-Driven Growth: The Case of Aalto University".

International visits by Dean (International Relations), IIT Bombay:

Apart from hosting foreign delegations and joint workshops, IIT Bombay also made efforts to reach out to partner institutes. In this regard, the Dean (IR), Prof. R.O. Dusane visited Ohio State University & University of Binghamton, USA and discussed ways of future collaboration. He also visited Yonsei University, Korea and had discussions with the



Dean (International Relations) Prof. R.O. Dusane with the Head, Department of Physics of Ohio State University, South Korea

VP of International Affairs & several Heads of Departments. Further steps to enhance collaborations with Yonsei University are underway.



Deputy Director (FEA) Prof. P. Mujumdar and Dean (IR) Prof. R. O. Dusane with President

In addition, Prof. Dusane along with Deputy Director, Prof. P. Mujumdar paid visits to the University of Notre Dame and New York University and met their Presidents. Both the universities are quite keen on scientific collaborations with IIT Bombay. As a result, a small team from University of Notre Dame visited IIT Bombay and interacted with faculty member from Chemistry & MEMS department.



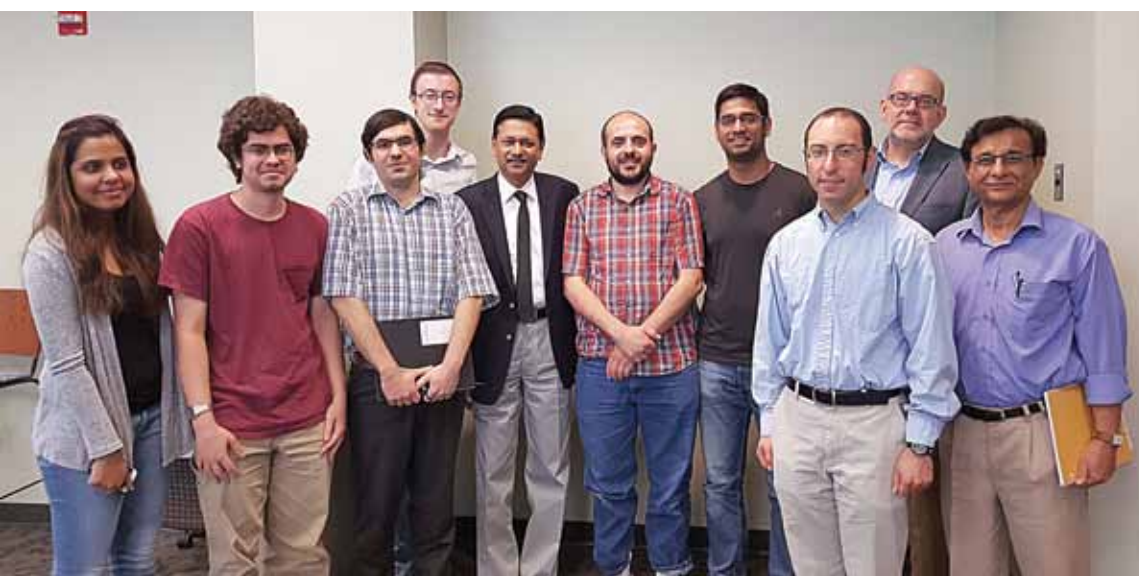
Visit of IIT Bombay delegation to University of Toronto, Canada

In addition to these visits, Prof. Dusane along with the Dean (ACR), Prof. Ravi Sinha visited University of Pittsburg and had several meetings with their leadership. They also interacted with faculty members and explored the possibilities of joint research programs.

They also paid visits to University of Toronto and McMaster University in Canada. IIT Bombay and University of Toronto are already engaged in joint research programs and as a result, various joint activities are undertaken.



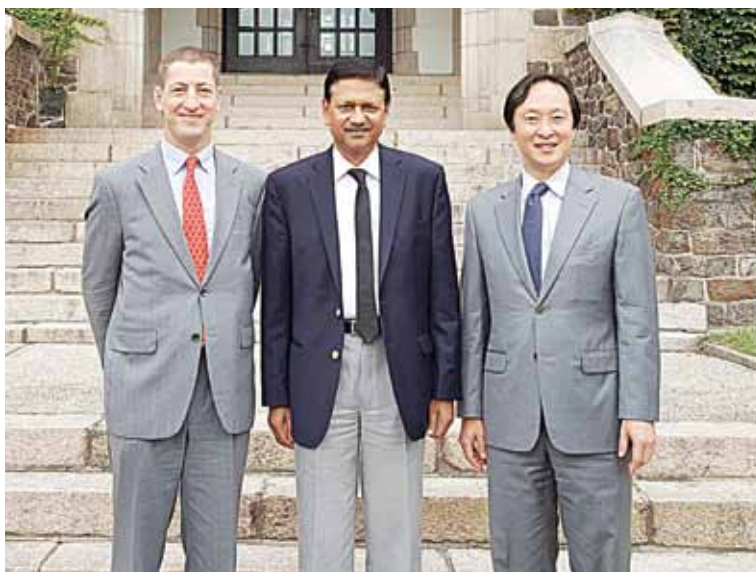
Participants of the mini-symposium between IIT Bombay & Aalto University, Finland with the President, Aalto University & Director, IIT Bombay



Dean (International Relations) Prof. R.O. Dusane at the University of Binghamton, Notre Dame University, USA



Deputy Director (FEA) Prof. P. Mujumdar and Dean (IR), Prof. R.O. Dusane visited Notre Dame University, USA



Dean (International Relations) Prof. R.O Dusane with functionaries at Yonsei University, South Korea



Meeting with the President of University of Wollongong and others in Mumbai



Visit of delegation from Taiwan university to IIT Bombay on the occasion of agreement signing for Taiwan Education Centre in IIT Bombay

Alumni & Corporate Relations

The Dean Alumni and Corporate Relations (ACR) Office integrates two strategic thrusts for IIT Bombay. One is nurturing and enhancing alumni relations and other is the same with corporations. The government of India, through MHRD, continues to be the primary source of funds for the Institute. The alumni and corporate donations that have picked up significantly in the last few years also provide a great support to the Institute. The Office of Dean (ACR) performs the important task of nurturing relationship for the benefit of the Institute and raising additional resources from the alumni and other well-wishers of IIT Bombay.

During 2016-17, the Institute received a total donation of Rs. 33.46 crores. The Institute expresses our deep gratitude and appreciation for the constant support shown by our alumni and other well-wishers to IIT Bombay. The major donors, among others, were Sir Dorabji Tata Trust, Portescap India Private Limited, SAP, CISCO, GE, Applied Materials and Class of 1990. The development and alumni activities of the Institute are not just a role model in India, but have also been appreciated by major international universities.

The major activities for which these donations were received are as under:

Institute Development Fund: This fund primarily caters to the critical needs of the Institute such as those related to modernisation and the establishment of new academic, research and campus infrastructure.

Young Faculty Awards (YFA): In an endeavour to enable IIT Bombay attract quality faculty, the alumni have instituted the Young Faculty Awards programme, which provides a grant of Rs. 1 lakh per year for the first four years to newly-recruited young faculty members. This grant acts as an incentive to the prospective faculty at IIT Bombay. The “Young Faculty Joining Bonus”, initially a Class of ’82 Legacy Project, has been awarded from 2010 onwards. Class of ’78, ’83, ’84, ’85 and ’88 have also joined this project. Nomura has also contributed to the YFA. The project focuses on supporting young

faculty in their academic pursuits in order to attract outstanding young faculty to replace retiring faculty and to augment current faculty as a key element for IIT Bombay to maintain its long-term competitiveness.

Chair Professorship: The Chair Professorship is a distinguished academic position of the Institute. Besides acting as a recognition for the permanent faculty of the Institute, it is also used to attract outstanding academicians to join the Institute as visiting faculty or permanent faculty. Each Named Chair is supported by an endowment created from a donation to the Institute. The endowment for a Chair is currently Rs. 90 lakh.

Hostel Development: The Hostel Alumni Team Stewardship (HATS) is an important alumni-driven initiative that aims to channel the affinity and affection that many alumni have for their former hostels. This activity is run exclusively through the alumni support and contributions. The key goals of HATS are as follows:

- (a) Improve hostel infrastructure and facilities
- (b) Assist the current and retired mess workers
- (c) Increase interaction between the alumni and students
- (d) Empower students to improve their living conditions under the aegis of Make Hostel My Home (MHMH) and
- (e) Organize hostel-level reunions in each hostel on the Alumni Day

Student Development:

(a) Scholarships: One way to nurture excellence amongst students is by awarding scholarships to deserving candidates. The scholarships funded by the alumni, trusts and corporations supplement the scholarship available from government funds and enable the Institute to provide support to a larger number of deserving students. During the year 2016-17, about 350 scholarships of varying amounts were granted.

(b) Awards and Prizes: As every year, about 50 awards and prizes of varying amounts and

forms (certificates, medals, etc.) were given away during 2016-17.

Major Events:

(a) Institute Valedictory Function: The Valedictory Function for the graduating students was organised on April 28, 2016. The event was graced by the presence of Institute dignitaries: Director Prof. Devang Khakkar, Padmashri Prof. D. B. Phatak, Valedictory Speaker, Dean of Student Affairs Prof. Soumyo Mukherjee, Dean of Alumni & Corporate Relations Prof. Ravi Sinha and CEO of IIT Bombay Alumni Association Ms. Damayanti Bhattacharya. During the function, the Director also presented Certificate of Appreciation for outstanding contributions to the select members of the Student Alumni Relationship Cell. Prof. Phatak delivered the Valedictory Address on “Building India where dreams come true”. The graduating students also took the ‘Give One for IIT’ pledged, wherein they pledged to donate 1 % of their income to the Institute to support its various activities.

b) Visit of Mr. Takeshi Furuichi, Executive Vice President and Representative Director of Nippon Life Insurance Company to IIT Bombay:

IITs are often mentioned in Japanese media as the center of innovation. This led Mr. Takeshi Furuichi to visit IIT Bombay’s campus. Mr. Takeshi Furuichi is the Executive Vice President and Representative Director of Nippon Life Insurance Company. He is also a Non-Executive Director of Reliance Life Insurance Corporation. Mr. Furuichi had a brief meet with Prof. Devang Khakhar, Director and Prof. Ravi Sinha, Dean (ACR). The meeting was followed by his visit to the Centre of Excellence in Nanoelectronics in the Department of Electrical Engineering and Tata Centre for Technology and Design (TCTD) at IIT Bombay. During the visit, he also interacted with faculty members and students at TCTD and got a close view of innovation cycle in the Institute.

c) Alumination: The Students Alumni Relationship Cell (SARC) hosted its annual Student Alumni Meet ‘Alumination’ during October 1-2, 2016. The meet was a highly career-centric event designed especially

for the students appearing for placements this year and was organized in association with Placement Office. An overwhelming participation was seen from both students and alumni. Our alumni were delighted with the opportunity to share their expertise and experience with the students. Mock interviews, speed mentoring, group discussions, core engineering talks, etc. were scheduled during the event. Under the Alumni Student Mentorship Program (ASMP), an event called “Break the Ice” was organized where the students got an opportunity to meet their alumni mentor for the very first time.

d) US Roadshow by IIT Bombay:

Faculty Alumni Network (FAN)

Symposium: US Faculty Alumni Network (FAN) Symposium on ‘Innovation and Entrepreneurship’ was held on October 14-15, 2016 at St. Louis, Missouri. The symposium was organized jointly with IIT Bombay Heritage Foundation and Washington University in St. Louis. A number of highly-distinguished speakers participated as keynote speakers, panelists and participants. Special highlight was the startup pitch competition where 10 startup companies, selected through rigorous screening, pitched to a panel of venture capitalists and angel investors. About half of participating companies are by IIT Bombay alumni based in India.

Distinguished Alumni Meeting: A meeting of the Institute’s distinguished alumni was held during October 15-16, 2016. The meeting was held following the FAN event. Eleven distinguished alumni participated in the brainstorming sessions with the Deputy Director (Finance & External Affairs), Dean (Alumni and Corporate Relations) and other IIT Bombay officials to sketch a strategic plan for IIT Bombay’s future development. The updates from previous DA meetings in January 2015 and 2016, salient points of Institute Strategy Plan and priorities of IIT Bombay Research & Development Foundation were also discussed during the meeting.

Meetings with University Leaderships:

During the roadshow, the IIT Bombay team held meetings with leaderships of several universities in the US. These included

Carnegie Mellon University, Georgia Institute of Technology, New York University, Northwestern University, Notre Dame University, University of California at Los Angeles, University of Pittsburgh, University of Southern California, University of Toronto, and Washington University in St. Louis.

Alumni Meetings: A number of meetings with alumni in the US were held during the roadshow. Alumni chapter meetings were held in Chicago, Los Angeles, New York City, Pittsburgh and Toronto.

e) Workshop by Global Leader Experiences for IIT Bombay Students: Global Leader Experiences (GLE) are leadership programs for students of all backgrounds and academic disciplines who are studying in the magnet cities. It was held during November 22-23, 2016 at IIT Bombay. Through addressing a global challenge, the students work towards finding solutions to the challenge and in the process, put their leadership skills to action. GLE aims to develop leadership skills to help influence the future of the world as leaders by giving them real and practical experiences, broadens their horizons, equips them with skills and challenges them to adapt and thrive in diverse situations. The programme addressed a global issue: “How can you increase civic engagement in your city?”

The program took the students off campus and out into the city to: learn from leaders from business, government and NGOs; develop cultural intelligence; discover how a city works and doesn't work; and generate innovative solutions to the challenge, which are presented to city leaders.

f) Institute Alumni Day & presentation of Distinguished Service Awards (DSA): The annual Alumni Day, celebrated on December 25, 2016 (the last Sunday of the year), saw six of the alumni, who have contributed in a notable and sustained manner to the progress of the Institute, being honoured with the ‘Distinguished Service Awards’. The DSA were conferred on Mr. Pradip Nadkarni (BTech, 1970, Mechanical Engineering), Mr. Raj Nair (BTech, 1971, Metallurgical Engineering), Mr. Avinash Sankholkar (BTech 1974, Chemical Engineering), Mr. Dinkar

Natraj (BTech, 1982, Chemical Engineering), Mr. Suneet Chitale (BTech, 1984, Mechanical Engineering) and Ms. Anuradha Narasimhan (BTech, 1990, Civil Engineering).

During this event, the Class of 1991 presented their ‘Silver Jubilee Class Legacy Project’ and pledged to contribute a record-breaking amount of Rs. 8 crore to the Institute. The Legacy Project will support important initiatives at the Institute. Distinguished alumnus Mr. Pramod Chaudhari (BTech 1971, Mechanical Engineering), Executive President of Praj Industries, made a huge contribution of Rs. 2.51 crores to the Institute towards establishing a Centre for Learning and Teaching, which will focus on promoting teaching and learning at IIT Bombay. The Jade Jubilee reunion batch (1980) and the Decennial batch (2005) also addressed the meet on December 27, 2016.

g) Golden Jubilee Reunion: The class of 1967 celebrated its Golden Jubilee Reunion on January 6, 2017.

h) Ruby Reunion: IIT Bombay celebrated the Ruby Reunion (40 years) for the batch of 1977 on January 20-21, 2017. The class of 1977 pledged to contribute an amount of Rs. 50 lakhs for student welfare activities.

i) Faculty Alumni Network India & Annual Distinguished Alumni Meetings: Distinguished Alumni Meet was held during January 21-22, 2017 in Goa. It is an initiative that brings together IIT Bombay's distinguished alumni who have contributed and have been acknowledged by the Institute for their distinguished services to the society at large. The meet is held annually to plan the strategic growth of the institution in the future years. The annual Faculty Alumni Network (FAN) India meeting was also held on January 21, 2017 in Goa in conjunction with the Distinguished Alumni meeting. The theme of FAN meeting was “Large Scale Computing & its Applications”. The current status and future of large-scale computing applications in various domains of science and engineering were discussed during the meeting.

j) Director's visit to the US: IIT Bombay has a very active San Francisco alumni chapter and several hundred alumni in the San Francisco

Bay area. To leverage the goodwill amongst our alumni in the area and to further conversations between IIT Bombay and donors, Prof. Devang Khakhar visited California on February 15-20, 2017. An alumni chapter meeting of the Bay Area Chapter was held on February 15, during the visit.

k) Tinkerers' Laboratory Expansion

Inauguration Ceremony: With generous donations from the class of 1975 and class of 1966, a much bigger area of the Tinkerers' Lab has been set up. The class of 1966 inaugurated the facility on March 11, 2017 in presence of Prof. Devang Khakhar, Director of IIT Bombay.

l) Foundation Day: The 58th Foundation Day of the Institute was celebrated on March 10, 2017. During the function, 11 alumni were honoured with the Distinguished Alumnus Awards and three Young Alumnus Achiever Awards. The Distinguished Alumnus Award is conferred on those alumni who have reached positions of eminence in the areas of business, academics, research, government, public service and entrepreneurship. The Young Alumnus Achiever Award is presented to those who have shown outstanding achievements in their chosen field of work and are below 40 years of age.

The recipients of the Distinguished Alumnus Award are as follows:

- Prof. Ajit Tamhane, BTech, 1968, Mechanical
- Mr. Paritosh Choksi, BTech, 1975, Mechanical
- Mr. Parag Saxena, BTech, 1977, Chemical
- Mr. Narendra Joshi, BTech, 1979, Mechanical
- Dr. Mukta Ghate Farooq, BTech, 1983, Metallurgy
- Mr. Ardeshir Contractor, BTech, 1984, Mechanical
- Prof. Nitin Padture, BTech, 1985, Metallurgy
- Mr. Rajesh Subramanian, BTech, 1987, Chemical
- Prof. Umesh Waghmare, BTech, 1990, Engineering Physics
- Dr. Ganesh Natrajan, PhD, 2005, School of Management

- Dr. K. Sivan, PhD, 2006, Aerospace

The recipients of the Young Alumnus Achiever Awards are as follows:

- Prof. Pramod Reddy, Dual Degree, 2002, Mechanical
- Mr. Prashant Mali, Dual Degree, 2003, Electrical
- Mr. Harpreet Singh Grover, Dual Degree, 2005, Civil

m) Deans' Meet for Alumni and

International Relations: A meeting of Deans of all IITs who are responsible for external and alumni relations was held on March 17-18, 2017 at IIT Kharagpur. The meetings are held once or twice a year, and is intended to share best practices, explore collaboration opportunities and brainstorm on common problems. This two-day event was inaugurated by Prof. Sriman Kumar Bhattacharyya, Deputy Director, IIT Kharagpur.

n) Lecture Series: The following lectures were organised with the involvement of Dean ACR Office:

NR Kamath Chair Colloquium Lecture Series – Three lectures were organised in the NR Kamath Chair Colloquium Lecture Series on July 4, 2016; August 10, 2016 and December 9, 2016. Dr. Samir Mitragotri, Director, Center for Bioengineering, Professor, Department of Chemical Engineering, University of California, Santa Barbara, CA, USA & NR Kamath Chair Professor, IIT Bombay delivered a lecture on 'Making of Smart Medicines' on July 4, 2016. Prof. Bruce Hajek, Coordinated Science Laboratory Hoeft Chair in Engineering, University of Illinois, Urbana-Champaign, delivered a lecture on 'Community Detection in Networks: Algorithms, Complexity, and Information Limits' on August 10, 2016, and Prof. Kaushik Basu, C. Marks Professor at Cornell University, New York, (former Chief Economist, The World Bank) & NR Kamath Chair Professor at IIT Bombay delivered a lecture on 'The Economics of Corruption, Black Money and Demonetisation' on December 9, 2016.

Prof. K.C. Khilar Lecture in Chemical Engineering – This annual Institute Distinguished Lecture in Chemical

Institute Distinguished Lecture in memory of Professor C.V. Seshadri – The Institute Distinguished Lecture in Chemical Engineering in memory of Prof. C.V Seshadri was delivered by Prof. Shankar Narsimhan, Department of Chemical Engineering, IIT

Tinkerer's Lab Lecture Series – The first lecture in the Tinkerer's Lab lecture series was delivered by Mr. Sameer Katdare, Vice President, Technical, Alkyl Amines Chemical Ltd. On “Engineering Lessons from a Disaster Bhopal Gas Tragedy” on April 7, 2016.

The second lecture in the series was delivered by Mr. Ranjit Deshpande, Chief Technology Officer, K2 Inc. On “Internet of Things” on September 29, 2016.



Institute Events



Distinguished alumnus awardees with the Chief Guest Mr. Sanjay Mashruwala, Managing Director of Reliance Jio Infocom Limited, and Director Prof. D.V. Khakhar at the 58th Foundation Day celebrations

54th Convocation

The 54th Convocation of IIT Bombay was held on August 13, 2016. Dr. Rajendra Singh, Chairman, Tarun Bharat Sangh and winner of Stockholm Water Prize 2015, was the Chief Guest and delivered the Convocation Address.

58th Foundation Day

IIT Bombay celebrated its 58th Foundation Day on March 10, 2017. Mr. Sanjay Mashruwala, Managing Director of Reliance Jio Infocom Limited, was the Chief Guest. The Institute honored 14 outstanding alumni this year with the Distinguished Alumnus Awards and two

with Young Alumnus Achievers Awards.

The 'Prof. S.C. Bhattacharya Award for Excellence in Research in Pure Sciences' was conferred on Prof. Amiya Pani, Department of Mathematics. The 'Prof. H.H. Mathur Award for Excellence in Research in Applied Sciences' was conferred on Prof. Rinti Banerjee, Department of Biosciences and Bioengineering.

Teacher's Day

The 58th Teacher's Day was celebrated on September 2, 2016. Prof. Sabyasachi Bhattacharya, Distinguished Professor, Tata Institute of Fundamental Research, was the



Director Prof. D.V. Khakhar presenting memento to the Chief Guest Prof. Sabyasachi Bhattacharya, Tata Institute of Fundamental Research at the Teachers' Day function

Chief Guest. The “Excellence in Teaching Award – 2016”, “IRCC Research & Industrial Consultancy Award – 2015” and the “Dr. P. K. Patwardhan Technology Development Award - 2015” were presented on the occasion.

Vana mahotsav 2016 was celebrated on July 1, 2016. Saplings were planted on the hill behind SAMEER and Ananata building located within IIT Bombay campus.

Materials Management Activities, Vikram Sarabhai Space Centre, Trivandrum, spoke on ‘Steel for Space Applications’ at the inaugural lecture of the Steel Colloquium Series on May 24, 2016.

Prof. Seshadri Seetharaman, Professor Emeritus, The Royal Institute of Technology, Stockholm, and Distinguished Visiting Professor, IIT Bombay, spoke on “Cleaning



Prof. D.V. Khakhar, Director, IIT Bombay addressing participants during Vana mahotsav – a tree plantation drive, at IIT Bombay

Centre of Propulsion Technology's Foundation Stone Laying Ceremony

Honourable Union Minister of State (Defence) Subhash Bhamre laid the foundation stone of the Centre of Propulsion Technology at IIT Bombay premises set up by Defence Research and Development Organisation (DRDO) along with IIT Bombay and IIT Madras, on November 11, 2016.

the ‘Backyard’-A Technological Challenge” at the Steel Colloquium lecture Series on June 24, 2016.

Prof. Sujit K. Biswas, Jadavpur University, Kolkata, spoke on ‘Design and Assembly Issues of Power Electronic Converters and its Magnetic Components’, at a lecture series on during May 16–18, 2016.

Conferences/Colloquia/Lectures/Seminars

Many conferences and lectures were organised during the past year. Some of them have mentioned earlier and few are listed below:

Prof. Rana Adhikari, California Institute of Technology, United States spoke on ‘Discovery of gravity waves by the LIGO experiment: Dawn of a new era in experimental physics’, at an Institute Colloquium on April 13, 2016.

Prof. Nitin P. Padture, Professor and Director, Institute for Molecular and Nanoscale Innovation Brown University, School of Engineering, United States, spoke on “Harnessing the Power of the Sun Efficiently and Cheaply: The Unprecedented Promise of the New Perovskite Solar Cells”, at an Institute Colloquium on July 22, 2016.

Prof. Vijay Prashad, George and Martha Kellner Chair in South Asian History, Professor, International Studies, Trinity College, Hartford, Connecticut, USA, spoke on ‘Syria and the Destruction of Nations’, at an Institute lecture on July 19, 2016.

Mr. P. Ramkumar, General Manager,

Mr. T. V. Narendran, MD, Tata Steel India and South East Asia, spoke on “Why steel is a big deal ... in the life of people and nations and .. how can you help”, at the Steel Colloquium Lecture Series on July 27, 2016.

Prof. Sudarshan Iyengar, Distinguished Chair Professor in Gandhian Philosophy, IIT Bombay, spoke on “Individual Freedom in Gandhian Perspective: Implications for Nonviolence Society”, at the Institute Lecture on August 24, 2016

Prof. Dipak Mazumdar, Ministry of Steel Chair Professor, IIT Kanpur, spoke on “Engineering in Steel Making”, at the Steel Colloquium Series on September 2, 2016.

Dr. Srinath Raghavan, Senior Fellow, Centre for Policy Research, New Delhi, spoke on “The Economic Consequences of the War: India, 1939-45” on September 21, 2016.

Mr. Alok Chandra, Executive Vice President, JSW Steel Ltd, spoke on “Rebuilding of Blast Furnace by ‘Single Block’ Method An Engineering Marvel” at the Steel Colloquium on September 28, 2016.

Prof. Sugata Mitra, Professor of Education Technology, School of Education, Communication and Language Sciences, Newcastle University, United Kingdom, spoke on “The Future of Learning” on October 13, 2016.

Dr. Manish Gupta, Vice President and Director, Xerox Research Center, India, spoke on “Towards Personalized Education and Healthcare using Data and Behavioural Sciences” on October 19, 2016.

Dr. R. Balamuralikrishnan, Scientist ‘G’, DMRL, Hyderabad, spoke on “Low Alloy Steels for Naval Applications: From Lab to Product, From Science to Technology” on October 20, 2016.

Mr. Navroz H. Seervai, Senior Counsel, Bombay High Court & Supreme Court of India, spoke on “Article 368: Amending the Indian Constitution” on October 22, 2016.

Prof. Ikuo Towhata, Vice President for Asia, International Society for Soil Mechanics and Geotechnical Engineering, spoke on “Long term disaster management of the Nuclear accident at Fukushima (2011)” on December 5, 2015.

Prof. Timothy J. Pedley, F.R.S., Department of Applied Mathematics and Theoretical Physics, University of Cambridge, England, spoke on ‘Micro-organism swimming: Individual and collective behaviour’ on November 29, 2016.

Dr. Bruce Allen, Managing Director, Albert Einstein Institute Hannover, Germany, Max Planck Institute for gravitational physics and Leibniz University, spoke on “Direct observation of gravitational waves from the merger and inspiral of two black holes” on December 15, 2016.

Prof. Tuula Teeri, President, Aalto University, Finland, spoke on “Universities And Innovation-Driven Growth: The Case Of Aalto University” on February 23, 2017.

Dr. Gururaj “Desh” Deshpande, Trustee of Deshpande Foundation, President and Chairman of Sparta Group LLC and Chairman of Tejas Networks delivered a distinguished lecture on “The Global Opportunity For Indian Institutions And Entrepreneurs” on January 12, 2017.

Dr. Tiziano Camporesi, Senior Physicist, CERN, Geneva, Switzerland, spoke on “The Future Of Elementary Particle Physics” on February 10, 2017.

Prof. D.D. Sarma, Solid State Structural Chemistry Unit, Indian Institute of Science, Bangalore, delivered the Professor C.N.R. Rao Lecture Series on Nanoscience and Nanotechnology titled “Brighter side of semiconductor nanocrystals: How to make defects useful” on April 22, 2016.

Mr. Aspi Chinoy, Advocate and Senior Counsel of Bombay High Court and the Supreme Court of India, delivered the second lecture of the “Institute Lecture Series on the Indian Constitution” titled “The Nature, Import and Effect of a Constitution” on April 2, 2016.

Conferences:

Sixth International Congress on Computational Mechanics and Simulation:

The sixth International Congress on Computational Mechanics and Simulation (ICCMS2016) was held during June 27 - July 1, 2016 at IIT Bombay. It was organized and hosted jointly by Department of Civil Engineering, IIT Bombay and Department of Structural Engineering, Veermata Jijabai Technological Institute (VJTI) Mumbai, under the auspices of Indian Association for Computational Mechanics (IndACM).

International Conference on Sustainability in Geotechnical Engineering Practices and Related Urban Issues:

International Conference on “Sustainability in Geotechnical Engineering Practices and Related Urban Issues” was jointly organised during September 23-24, 2016 by the Indian Geotechnical Society (IGS), Indian Geotechnical Society Mumbai Chapter (IGS Mumbai Chapter) in association with International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE). Prof. Deepankar Choudhury (Organising Secretary), Prof. Santiram Chatterjee, (Convener, Technical Committee) and Prof. Prasenjit Basu (Convener, Technical Committee), Department of Civil Engineering, IIT Bombay co-ordinated the event.

SciPy India 2016 :

Free and Open Source Software for Education (FOSSEE) organized SciPy India 2016 at IIT Bombay from December 10-11, 2016. SciPy India conference aimed at providing opportunities to spread the use of the Python programming language in the Scientific Computing community in India. The objective of the conference was to combine education, engineering, and science with computing through the medium of Python. The conference featured a variety of workshops and invited talks. Prof. Prabhu Ramchandran, Department of Aerospace Engineering, IIT Bombay, Conference Chair of SciPy India 2016 co-ordinated the event.

WRCB Clinical Day on Cancer Precision Medicine:

The Department of Biosciences and Bioengineering, IIT Bombay organized a one-day in-house symposium, WRCB Clinical Day on “Cancer Precision Medicine” on December 5, 2016. Dr. Sanjeeva Srivastava, Convener (Department of Biosciences and Bioengineering) delivered an inaugural talk followed by an WRCB introduction by Dr. Pramod Wangikar, Professor-In-Charge, WRCB.

Sixth International Conference on Asian Current Research on Fluid Inclusions VI:

The Department of Earth Sciences, IIT Bombay organized an International Conference on “Asian Current Research on Fluid Inclusions VI” (ACROFI VI) from November 22-27, 2016 to provide an international forum for exchange of latest research results and ideas between geoscientists from universities, government and industry from Asian countries and other nations focusing on studies of fluid and melt inclusions. Scientists from 11 countries participated in the event. The conference featured several oral and poster thematic sections.

International Conference on Organic Synthesis (ICOS):

21st International Conference on Organic Synthesis was held during December 11-16, 2016 at IIT Bombay. The International Conference on Organic Synthesis (ICOS), a biennial event, initiated in 1976 by IUPAC as a platform for the exhibition of new and upcoming topics in the field of organic chemistry, brings together a plethora of new ideas and more importantly catenates new scientific minds. Prof. Krishna P. Kaliappan, Department of Chemistry, IIT Bombay, Organizing Chair of ICOS 21 along with Dr. S. Chandrasekhar, Director, CSIR-IICT Hyderabad, Organizing Secretary ICOS 21 CSIR-IICT Hyderabad coordinated the event.

International Conference on 12th Transportation Planning and Implementation Methodologies for Developing Countries:

The 12th International Conference on “Transportation Planning and Implementation Methodologies for Developing Countries (TPMDC)” by Transportation Systems

Engineering (TSE) Group of Civil Engineering Department, IIT Bombay was organized from December 19 – 21, 2016. This conference served as an ideal platform to share the findings on transportation related issues of the developing countries.

3rd Indo-Austrian Symposium on Materials Engineering:

3rd Indo-Austrian Symposium on ‘Advances in Materials Engineering’ (AME 2016) was jointly organized by IIT Bombay, Indian Institute of Metals (IIM) Mumbai Chapter and Nonferrous Technology Development Centre (NFTDC) during December 19-20, 2016. The aim of this symposium was to address the challenges, where knowledge in materials engineering becomes an important tool to solve problems in the fields related to structural applications, protection of materials, energy storage and health care, primarily in India and Austria.

3rd International Conference on Emerging Electronics:

The 3rd International Conference on Emerging Electronics (ICEE 2016) was held at the IIT Bombay during December 27 – 30, 2016. ICEE 2016 was jointly organized by IIT Bombay and IISc Bangalore and co-sponsored by IEEE Electron Devices Society. The conference featured plenary and keynote talks from world renowned experts in diverse areas of electronic materials, devices and systems along with panel discussions, contributed presentations, and poster sessions involving experts from the government, industry and academia.

Computational and Experimental Studies of Microtubules and Microtubule based Motor Proteins:

A one-day international symposium supported by a mini-grant from Biophysical Society (USA), Department of Biotechnology (Government of India) and Department of Biosciences and Bioengineering, IIT Bombay was organized on December 14, 2016.

Conference on “Environmental Governance in the Post-Liberalization Phase in India: The Department of Humanities and Social sciences of IIT Bombay organized a two-day national conference on “Environmental

Governance in the Post-Liberalization Phase in India: Challenges for Sustainability and Social Justice” during January 23-24, 2017. This conference was funded by the Indian Council of Social Science Research (ICSSR), Delhi. The focus of the conference was to examine the constraints posed by the principles of liberalisation to environmental governance process and to discuss the ways in which the liberal economy which has become a part and parcel of Indian deny citizens, and particularly some of the most vulnerable communities, their equitable rights to ownership, access, use and distribution of resources.

Workshops:

A joint workshop by IIT Bombay and Curtin University, Australia was held at the Institute on May 9, 2016. The theme of the workshop was ‘Smart Cities’ and ‘Energy Technologies’. The workshop was coordinated by Prof. Ronita Bardhan (for Smart Cities), Centre for Urban Science and Engineering and Prof. Sreenivas Seethamraju (for Energy Technologies), Department of Energy Science and Engineering.

IIT Bombay, National Chiao Tung University and National Taiwan University held a joint workshop on May 16 and 17, 2016. The theme of the workshop was ‘Nanodevices’. The 2-day workshop was coordinated by Prof. Swaroop Ganguly, Department of Electrical Engineering and Prof. Aswani Yella, Department of Metallurgical Engineering and Materials Science.

A joint workshop by IIT Bombay and Samara State Aerospace University, Russia was held on May 25-26, 2016. The motive of the workshop was to find areas of joint research collaboration and build a good relationship between the two institutions for further enhancement in education and research. Prof. P.P Date, Department of Mechanical Engineering co-ordinated the workshop.

Workshop on Unmet Needs In Drug Delivery Technology:

IIT Bombay jointly with Indian Drug Manufacturers’ Association & Organisation of Pharmaceutical Producers of India had

organised a one-day workshop on 'Unmet needs in drug delivery technology' on February 25, 2017 at IIT Bombay campus. Dr. R. A. Mashelkar, National Research Professor (NCL) & Former Director General Council of Scientific & Industrial Research was the Guest of Honour on the occasion. Prof. Samir Mitragotri, N. R. Kamath Chair Professor at IIT Bombay, delivered the keynote address. The main objective of the workshop was to identify the gaps and challenges in drug delivery technologies, industry academia interaction and collaboration on potential commercializable technologies.

HINDI CELL

Hindi Cell is actively engaged in providing support for implementation of Hindi in the Institute. The Institute's circulars, office orders, registers, forms, visiting cards, signboards and degree certificates are prepared in bilingual form. Hindi workshops titled "Correspondence in Hindi", "Noting and Drafting in Hindi", "Basic Hindi Translation" and "Hindi Typing Skill" etc. were conducted during the year for staff members of the Institute. The cell continues to send Hindi synonyms of the administrative terms through the Institute's

email (GPO). The Staff Handbook of the Institute was also translated into Hindi during the year.

This year 12 staff members of the Institute appeared for Hindi Typing Exam, conducted by the Hindi Teaching Scheme, Department of Official Language, Ministry of Home Affairs.

"Hindi Pakhawada" was celebrated during September 1-14, 2016, where competitions in essay writing, dictation, general knowledge and Hindi translation were organised for the students and the staff of the Institute. Hindi seminar-cum-Hindi Book exhibition was jointly organised by the Central Library and Hindi Cell on the occasion. Mrs. Sudha Arora, eminent writer, was the Chief Guest of the Hindi Diwas. The certificates and cash awards were distributed to the winners of the competition. Awards to Institute employees for significant contributions in Hindi implementation were conferred during the event.

Regular meetings of the Official language implementation Committee of the Institute were conducted during the year for improving the use of Hindi in official work.

Departments/ Centres/ School and Interdisciplinary Groups

Science & Engineering Departments:

The engineering departments at IIT Bombay offer undergraduate and postgraduate programmes leading to BTech, MTech or PhD degrees. The five-year Dual Degree programme pioneered by the Institute in 1996, offers a BTech degree in a basic discipline and an MTech degree with specialization in a field on its completion. This programme is now offered by all engineering departments. The Science departments at IIT Bombay were set up to provide basic grounding in Science and Mathematics to engineering students. However, apart from providing core courses in undergraduate programmes, these departments also offer postgraduate courses which lead to MSc or PhD.

- Aerospace Engineering
- Biosciences & Bioengineering
- Chemical Engineering
- Chemistry
- Civil Engineering
- Computer Science and Engineering
- Earth Sciences
- Electrical Engineering
- Energy Science and Engineering
- Mathematics
- Mechanical Engineering
- Metallurgical Engineering and Material Sciences
- Physics

Arts and Humanities Department:

The Arts and Humanities Department at IIT Bombay were set up to familiarize the students of science and technology studies with the broader social, cultural, economic, ethical and humane concerns underlying social change. The advanced courses offered at the PG level aim at cultivating critical thinking and enhancing the analytical capabilities of students engaged exclusively with the study of these concerns. However, these departments offer postgraduate courses which lead to MSc ,

MPhil, MDes, and PhD

- Humanities and Social Sciences
- Industrial Design Centre

School:

The Shailesh J. Mehta School of Management offers postgraduate programmes in new, emerging areas and aim to expand the scope of the academic programmes in the Institute. They have been set up with substantial support from IIT Bombay alumni and industry.

Centre/ Interdisciplinary Groups:

Some of the Centres and Interdisciplinary groups offer postgraduate programmes and reflect the Institute's multi-disciplinary approach and emphasis on staying with leading-edge technologies in its academic approaches.

- Centre for Environmental Science & Engineering
- Centre of Studies in Resources Engineering
- Centre for Technology Alternatives for Rural Areas
- Centre for Formal Design and Verification of Software
- Center for Aerospace Systems Design & Engineering
- Centre for Urban Sciences and Engineering
- Centre for Research in Nanotechnology and Science
- Education Technology
- Industrial Engineering and Operations Researchers
- Systems and Control Engineering
- Corrosion Science and Engineering
- Climate Change Studies

Other Centres/ Research Facilities:

Other Centres host a large number of sophisticated equipments and advanced facilities to carrying out R&D activities at IIT Bombay.

- Centre for Policy Studies
- Application Software Centre
- Computer Centre
- Centre for Distance Engineering Education Programme
- Desai Sethi Centre for Entrepreneurship
- IITB-Monash Research Academy
- National Centre for Aerospace Innovation and Research
- National Centre for Mathematics
- Tata Centre for Technology and Design
- Wadhvani Research Centre for Bioengineering
- Centre of Excellence in Steel Technology
- Centre of Propulsion Technology
- Biomedical Engineering and Technology Incubation Centre
- Centre for Computational Engineering and Science
- Centre of Excellence in Nanotechnology
- Forbes Marshall Energy Efficiency Laboratory
- Geospatial Information Science and Engineering
- National Centre for Photovoltaic Research and Education
- National Centre of Excellence in Technology for Internal Security
- National Mission on Education through ICT
- National Solar Thermal Research, Testing & Simulation Facility
- Power Anser Laboratory
- Tata Teleservices- IIT B Centre of Excellence in Telecommunication

Department of Aerospace Engineering

Established in 1966-67 as the Department of Aeronautical Engineering, this department was renamed the Department of Aerospace Engineering in 1992. The department has a total of 21 faculty members. The academic programs of the department focus mainly on science and engineering/ technology behind flight vehicles and their sub-systems. The curriculum focuses on fundamentals of fluid dynamics, propulsion, structural mechanics, vehicle dynamics, control and guidance etc., as well as applications of these fundamentals to the analysis and design of aerospace vehicles. The Department has extensive experimental and computational facilities that support its research and teaching activities. Among these are: the Aerodynamics Lab, which houses wind and shock tunnels, Laser Doppler Velocity-meter (LDV), Anechoic Chamber for noise measurement; the Instrumentation Lab. the Structures Lab; the Propulsion Lab; the MAV Lab; and the ARDB Associate Center for CFD, which provides computational resources for sophisticated flow simulation tasks.

Academic Programmes: The department runs strong undergraduate and graduate programs in Aerospace Engineering and carries out basic and applied research as well as continuing education activities in various sub-disciplines of Aerospace Engineering such as Aerodynamics, Propulsion, Structures, Dynamics and Control, Design and Systems Engineering. The academic programs include the four year BTech degree program, the five year Dual Degree program, the two year MTech program and the PhD program. The department has around 350 students, out of which about 120 are graduate student and 230 are undergraduate students.

	Student Intake	Degrees Awarded
BTech	56	42
MTech	40	53
DD(BTech-MTech)	-	21
PhD	15	2

R&D Activities: During the year 2016-2017, the department has been actively engaged in teaching, research and other professional activities e.g. workshops, seminars, industry interactions, projects, professional development course modules, etc.

	Sponsored Projects	Consultancy Projects
New Projects	5	-
Ongoing	19	-
Completed	10	-

During the year 2016-2017, the Department has supported many student technical activities such as Mars Rover, Student Satellite, Autonomous Underwater Vehicle (AUV) etc. and students have also been engaged in national and international competitions as participants / organizers.

Notable among the various activities that have been carried out during 2016-2017 are:

- Pratham satellite designed by IIT Bombay students under the mentorship of IIT Bombay faculty and ISRO scientists has created a rare opportunity for students to conceptualise and realise complex projects. The project gave students an opportunity to work in a diverse team towards a common goal. The Pratham satellite was launched by ISRO on 26th September, 2016 on PSLV 35 vehicle. Pratham beacon signal was received on September 28, 2016 and later on December 17, 2016.
- Center of Propulsion Technologies (CoPT) was set up with funding from DRDO and in partnership with IIT Madras. 39 projects in Phase-1 of CoPT were approved with an outlay of approximately Rs.109 crores over 5 years.
- Setting up and commissioning of anechoic chamber facility for aeroacoustic noise measurements involving high-speed jets.
- SciPy India 2016, Python for education and scientific computing was held at IIT Bombay on December 10-11, 2016. It was organized and funded by the FOSSEE project also being undertaken at the Department.

Department of Biosciences & Bioengineering

The Department of Biosciences and Bioengineering comprises of two broad areas representing Biotechnology and Biomedical Engineering. The Department aims to create an ambience for the efficacious pursuit of scholarly activity in research and education, and endeavours to produce the leaders of tomorrow in this field.

Academic Programmes: The academic programs currently consist of the DBT supported MSc Biotechnology program, MTech in Biomedical Engineering program, and the PhD program. All these programs are well regarded nation-wide. The department has introduced a new introductory Biology course (BB101) for all first year undergraduate students.

	Student Intake	Degrees Awarded
MSc	26	23
MTech	18	21
DD(MSc+PhD)	29	01
DD(MTech+PhD)	-	01
MPhil	-	01
PGDIIT	-	02
PhD	-	10

R&D Activities: Research in the department encompasses both basic biology and applied bioengineering topics.

Several new cutting edge facilities were added over 2016-17, such as Ultracentrifuge facility, FACS facility, to name a few.

Extensive interactions with various groups in Electrical Engineering, Chemical Engineering, Aerospace Engineering, Computer Science, Chemistry and Mathematics made the departmental research activities truly interdisciplinary.

	Sponsored Projects	Consultancy Projects
New Projects	27	-
Ongoing	101	-
Completed	24	-

Department of Chemical Engineering

The Department of Chemical Engineering is one of the largest departments in the Institute in terms of number of faculty members, students enrolled and research funding received. Currently, the department has in its roll 40 core faculty, 10 Emeritus Fellow/ Professor Emeritus /adjunct /visiting faculty/ 15 Post-doctoral fellows/ research associates.

With the support of Tata Trusts, the Tata Centre for Technology and Design has been established with an aim to develop solutions to challenges faced by resource-constrained communities within India and across the world using an end-to-end innovation approach.

Academic Programmes: The academic programmes offered by the Department are the BTech (4-years), MTech (2-years), Dual Degree (5-year) and PhD programme (~5-year). The Department has a total of 816 students (528 BTech/ Dual Degree, 61 MTech and 227 PhD students), 27 supporting staff and ~150 research assistants.

	Student Intake	Degrees Awarded
BTech	120	93
DD (BTech + MTech)	-	39
MTech	63	18
PhD	56	24

The Department has seen a steady increase in the strength of doctoral students resulting in a vibrant research culture. This reflected an increase in the output of research publications of the department (3.4 journal articles per faculty per year).

R&D Activities: The Department has a strong focus on excellence in education and research. The diverse research areas of the department, including Biological Systems Engineering, Soft Matter Engineering, Process Systems Engineering, Catalysis and Reaction Engineering, Thermodynamics and Molecular Simulations and Energy, Environment & Sustainability, has a strong focus in the subjects relating to Healthcare, Energy and Materials.

	Sponsored Projects	Consultancy Projects
New Projects	29	10
Ongoing	93	31
Completed	12	05

During 2016-17, the department received research grant from government and private agencies to the tune of Rs. 20 crore with 60 new sponsored and consultancy projects.

Department of Chemistry

From a small department that started in 1965, the Department of Chemistry at IIT Bombay has grown into a major centre for teaching and research in the area of chemical sciences in India. The Department organized 21 international conferences on Organic Synthesis during 2016-17. Today the department has 39 faculty members with expertise in various areas of chemistry and allied subjects and a large number of motivated young students assisting the faculty in their research.

Academic Programmes: The Department offers Masters in Chemistry (2-years), BS in Chemistry (4-years), PhD program. The general Chemistry program of the Department, consists of two theory and two laboratory courses in the core curriculum of the first year BTech programme. The Department also offers an additional course to third year BTech/Dual Degree MTech (Chemical Engineering) students. The Department has three well established academic programmes leading to BS, MSc, and PhD degrees: 4-year BS with entrance through JEE, 2-year MSc for post BSc students with entrance through JAM, and PhD in Chemistry.

	Student Intake	Degrees Awarded
BS (4 Year)	32	-
MSc (2 year)	45	37
DD (MSc + PhD)	-	-
PhD	62	57

R&D Activities: The Department of Chemistry is involved in research of both basic and applied nature in frontier areas through sponsored research projects, and as part of the MSc and PhD programmes. Major areas of research activities carried in the Department include Biophysical Chemistry, Coordination Chemistry, Bio-inorganic Chemistry, Organometallic Chemistry, Bio-organic Chemistry, Chemistry of Natural Products, Synthetic Organic Chemistry, Photochemistry and Spectroscopy, Polymer Chemistry, Thermodynamics, Electrochemistry, Solid State Chemistry and Physics, and Catalysis and Theoretical Chemistry.

	Sponsored Projects	Consultancy Projects
New Projects	19	-
Ongoing	97	-
Completed	26	-

During 2016-17, several eminent personalities visited the Department and gave lectures. Prof. Uday Maitra, Department of Organic Chemistry, IISc Bangalore delivered the Professor A.K. Lala Memorial Lecture on October 2, 2016 .

Department of Civil Engineering

The Department of Civil Engineering has been a part of IIT Bombay since its inception in 1958. Over the years, the Department has grown tremendously, and is now recognised as one of the major engineering Departments in the country. It has developed strong links with the building and construction industry and the academia, both inside and outside the country. Besides high quality teaching and instruction at both UG and PG levels, the Department is actively involved in basic and applied research. With its multifaceted faculty, it provides technical advisory support through various R&D projects and consultancy to infrastructural industry, academic and research institutions. The Department has 17 full-time and 5 adjunct faculty members.

Academic Programmes: The Department is running MTech and PhD programmes with its traditional BTech programme in Civil Engineering. The Department has started MTech programme in the area of construction technology and management from the academic year 2016-2017.

	Student Intake	Degrees Awarded
BTech	117	102
DD (BTech + MTech)	-	8
MTech	92	44
MTech + PhD	-	1
PhD	54	14

R&D Activities: The Department has a strong focus in the research areas of Structural Engineering, Geotechnical Engineering, Water Resources Engineering, Transportation Systems Engineering, Remote Sensing, Ocean Engineering, and Construction Technology & Management. It has 17 high-end teaching and research laboratories in all these areas. The Department is actively involved in basic and applied research, and consultancy. It provides high quality technical advisory support through various R & D projects and consultancy to various organizations the faculty members have taken up 398 consultancy jobs worth Rs. 25.98 crores.

	Sponsored Projects	Consultancy Projects
New Projects	33	-
Ongoing	73	-
Completed	17	-

The Department has also conducted the 12th edition of the biennial international conference TPMDC during December 19-21, 2016, which saw a participation of over 300 budding young researchers and professionals.

Department of Computer Science and Engineering

The Computer Science and Engineering (CSE) Department at the Indian Institute of Technology (IIT) Bombay is the largest among CSE departments in any Institute in India. The Department has 48 faculty members, including three visiting faculty and two adjunct faculty.

Academic Programmes: The Department offers Bachelor of Technology (BTech), Master of Technology (MTech), Dual Degree (BTech-MTech) and Doctor of Philosophy (PhD) programmes in Computer Science.

	Student Intake	Degrees Awarded
BTech	113	90
MTech	116	107
PhD	17	4

R&D Activities: The research and teaching in the Department spans a wide spectrum of areas including algorithms, animation, artificial intelligence, compilers, combinational optimization, computer and medical vision, data mining, embedded systems, formal methods, functional programming, e-commerce, graphics, databases, image processing, machine learning, mobile computing, natural language processing, object oriented systems, parallel and distributed processing, programming languages, reinforcement learning, query processing and optimization, real time systems, security, software engineering, systems, theoretical computer science, wireless and sensor networks, verification and automation.

	Sponsored Projects	Consultancy Projects
New Projects	24	24
Ongoing	87	-
Completed	18	-

Department of Earth Sciences

The Department of Earth Sciences was constituted in 1982 from the erstwhile Geology section of the Department of Civil Engineering of IIT Bombay (where an MSc programme in Applied Geology was offered since 1964). The Department draws strength from the reputation of its 21 faculty members with specializations covering a wide spectrum of research areas in Geosciences including both Geology and Geophysics. The dynamic 21 faculty members of the Department are actively engaged in both teaching and research and contribute in reputed international scientific journals and interact with national and international scientific organizations. The close links that the Department enjoys with the industry and research organizations has worked towards elevating the level and quality of research work and facilities.

The latest addition to the list of instruments in the field of Remote Sensing and Spectral Imaging laboratory includes X-Ray Fluorescence (Wavelength Dispersive Spectroscopy) (XRF-WDS), FLIR Thermal Camera and ASD FieldSpec 4 Hi-Res NG Spectroradiometer for chemical analysis of minerals and rocks, thermal imaging and measuring reflectance in the wavelength range from 350nm to 2500nm, respectively.

Academic Programmes: The Department offers academic programmes leading to MSc (Applied Geology), MSc (Applied Geophysics), MTech (Geo-exploration), MTech (Petroleum Geoscience) and doctoral degree programmes. An MSc - PhD dual degree programme is also offered in Geology and Geophysics, respectively. All the core and elective courses included in the Geoscience programs have been specifically designed to meet industry standards and research requirements.

	Student Intake	Degrees Awarded
MSc (2-year)	53	44
MTech	35	18
PhD	34	4

R&D Activities: The research area spans but is not limited to Deccan basalt petrochemistry and palaeomagnetism, sedimentology, Vindhyan Basin evolution, microbial signature in siliciclastic sediments and recent sediment analysis, petroleum geology, electrofacies interpretations, neural network modelling, evolution of Tapti Basin, mathematical modelling of ore deposits, remote sensing applications in mineral exploration and geomorphology, micropalaeontology, microfacies analysis, fluid inclusion studies, sulphide petrology, engineering geology, hydrogeology, hydrogeochemistry, earthquake seismology, structural analysis and neo-tectonics, petrophysics, satellite geomagnetism and remote sensing.

	Sponsored Projects	Consultancy Projects
New Projects	29	25
Ongoing	131	25
Completed	39	24

The Department is equipped with state-of-the-art experimental and computational facilities for undertaking research in various fields. There is a strong collaboration with industry and a number of laboratories are established through such collaboration. Research collaborators also include researchers from several national and international universities, and research organizations. The centres that have been setup in the department include Centre for Excellence in Nanoelectronics funded by the Ministry of Communications and IT, National Centre for Photovoltaic Research set up in 2010 (by MNRE), Tata Teleservices IIT Bombay Center of Excellence in Telecom setup in 2008, Bharti Center for Communications, Power Anser Lab (with support from TCS), and Power Electronics Simulation Centre.

Department of Electrical Engineering

Since its inception in 1958, the Department of Electrical Engineering at IIT Bombay has been active in teaching and research. Currently, the department has 68 faculty members and 1300 students.

Academic Programme: Initially the department began with three programs to award degrees, namely; Bachelor of Technology (BTech), Master of Technology (MTech), and Doctor of Philosophy (PhD). Since 1996, the department is offering a five year dual degree (Bachelor of Technology and Master of Technology) in the two specializations -- Communications and Signal Processing, and Microelectronics. Since 2009 the department is offering admissions to a new, dual degree (MTech + PhD) program. This program is designed to induct bright students who have completed their BE/BTech/MSc degrees directly to the doctoral program. Total student strength at present is 1300 (including UG and PG).

	Student Intake	Degrees Awarded
BTech	59	67
MTech	130	144
DD(BTech + MTech)	64	71
PhD	51	34
DD(MTech+PhD)	1	5

R&D Activities: The research areas of the department include Communications and Signal Processing, Control and Computing, Power Electronics and Power Systems, Microelectronics and VLSI design, and Electronic Systems. In addition it has a strong Department Academic Mentorship Programs (D-AMP), under the aegis of the Institute Student Mentor Program (ISMP). D-AMP is responsible for helping out Electrical Engineering students who face academic problems.

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	Sponsored Projects	Consultancy Projects
New Projects	29	25
Ongoing	131	25
Completed	39	24

Department of Energy Science and Engineering

Energy Systems Engineering was founded in 1981 as an interdisciplinary group at IIT Bombay, offering M.Tech and PhD programmes. In 2007, the Board of Governors of IIT Bombay approved the growth of Energy Systems Engineering into a Department of Energy Science and Engineering. The Department aims to provide manpower and research inputs that are critical for the growth of India's energy sector. The ongoing research in the Department focuses on providing innovative energy technologies and systems for a sustainable future. Currently the Department has 22 core faculty and about 30 associate faculty members from other Departments and about 400 students.

Academic Programmes: The Department offers Dual-Degree BTech-MTech programme (intake through JEE), Dual-Degree MSc-PhD programme (intake through JAM), MTech programme in Energy Systems Engineering, PhD programme and a Minor programme in Energy Engineering.

	Student Intake	Degrees Awarded*
D(BTech + MTech)	30	54(27)
BTech	-	3
MTech	27	20
D(MSc+ PhD)	16	6(3)
MSc	-	1
PhD	13	14

* For the dual degree programmes, the bracket shows the number of graduates.

R&D Activities: The Department's research areas included renewables (Solar PV and thermal, wind, and biomass) thermal and electrochemical storage systems, power systems and power electronics, energy integrated and energy efficiency, and nuclear energy.

	Sponsored Projects	Consultancy Projects
New Projects	13	5
Ongoing	37	-
Completed	29	-

Some of the major ongoing projects are the National Centre for Photovoltaic Research and Education (NCPRE), the Solar Energy Research Institute for India and the United States (SERIUS), Intelligent Microgrids and Advanced Storage (IMASE), and 24x7 Solar Thermal Power (Sponsored by NTPC).

The Department organised the 16th edition of Energy Day on March 18, 2017. The event presentation by the final year students on their research work to the participants from the industry, academia, and the society at large. There were about 70 presentations with a total audience of about 200. The event concluded with a panel discussion on the future Indian energy scenario and the role of natural gas.

Department of Mathematics

The Department of Mathematics has evolved and grown in several directions. The Department has 50 faculty members including two Emeritus Fellows. The Department is involved in the formation of a National Centre for Mathematics (NCM) and National Programme on Differential Equation (NPDE). NCM is a collaborative venture of IIT Bombay with the Tata Institute of Fundamental Research designed to promote research and instructional activity for doctoral students and researchers throughout the country.

Academic Programmes: The Department offers two Master programmes, one in Mathematics [MSc (MA)] and the other in Applied Statistics and Informatics [MSc (ASI)], and also a PhD programme. There are minor programmes for undergraduates offered in both Mathematics and Statistics, in addition to the core undergraduate curriculum.

	Student Intake	Degrees Awarded
MSc (MA)	32	32
MSc (ASI)	37	37
PhD	27	27

R&D Activities: The research pursued in the Department includes a wide spectrum of interest in both Mathematics and Statistics. Continuing with its tradition, the Department has further augmented its basic research, focusing in contemporary areas of fundamental, developmental and strategic importance as well as applied and interdisciplinary research. It is also engaged in a productive collaboration with industries and reputed R&D departments in India and abroad.

	Sponsored Projects	Consultancy Projects
New Projects	3	-
Ongoing	25	-
Completed	-	-

Department of Mechanical Engineering

The Department of Mechanical Engineering is by far the largest department at IIT Bombay. It has a total 58 faculty members involved in teaching and research and more than 1400 students along with 250+ enrolled PhD students.

Academic Programmes: The Department offers, besides the flagship BTech program in Mechanical Engineering, MTech and PhD programs. The MTech programs offer specializations in Thermal & Fluids Engineering, Design Engineering, and Manufacturing Engineering. The department has introduced new elective courses; these include Introduction to Microsystems Packaging, Engineering Data Mining and Applications, Introduction to Biofluid Mechanics, Mechanisms in Crystal Plasticity.

	Student Intake	Degrees Awarded
BTech	101	81
DD(BTech + MTech)	51	50
MTech	129	49
PhD	-	8
PGDIIT	-	01
DD(MTech + PHD)	-	01

R&D Activities: Over the last decade, the Department has focused on science-based research and development, to evolve technological innovation in the areas of Thermal, Fluid, Design and Manufacturing Engineering. The Department has established state-of-the-art research facilities after procuring massive external funding from the government agencies and private industries.

The Department also offers an industry-sponsored MTech program in Materials, Manufacturing and Modeling (MMM), in collaboration with the Department of Metallurgical Engineering and Materials Science, and the Department of Mathematics at IIT Bombay.

Aerospace Innovation and Research (NCAIR), Biomedical Engineering and Technology Incubation Centre (BETIC), and Thermal Hydraulics Test Facility. In 2016, Department has received 4 research projects under Government of India's Imprint Funding scheme. The Department has organized conference on Sheet Metal Forming SMF'16 during 07-08 December. The Department, with the Department of Aerospace Engineering, has also received funding to setup a one-of-a-kind center 'Center of Propulsion Technology (CoPT).

	Sponsored Projects	Consultancy Projects
New Projects	50	29
Ongoing	100	30
Completed	18	35

Department of Metallurgical Engineering & Materials Science

The Department continues to excel in a wide variety of areas, ranging from classical metallurgy to non-metallic materials in various forms and dimensional scales for applications ranging from advanced structural components to electronic, optical, sensing, health-care and energy harvesting/conversion/storage devices. The Department has also been active in providing platforms for exchange of research and technological ideas/advancements among different researchers and industry personnel, not only from across the country, but also from across the world, in terms of organizing conferences/ workshops/ symposium; with two such events having been organized in the last one year, in addition to lectures/ seminars in different areas. The Centre for Excellence in Steel Technology, funded by the Ministry of Steel (CoEST), has been organizing the 'steel colloquium' nearly once every two months.

Four faculty members from the Department received research and teaching awards for their outstanding research and teaching contributions. The Department has recruited one young faculty member and continues to look for bright researchers.

Academic Programmes: An academic review of the MTech programme was conducted and the modified curriculum suggested, was accepted by the senate for implementation from the academic year 2016-17.

	Student Intake	Degrees Awarded
BTech	99	49
DD (BTech + MTech)	26	44
MTech	72	46
PGDIIT	-	02
PhD	36	24

R&D Activities: The research output has increased significantly, both in quantity and quality. This has been possible due to substantial funding received from government and non-government agencies. The Centre for Excellence in Steel Technology, funded by the Ministry of Steel, has initiated a number of projects in different thrust areas. Many researchers are visiting the Department and faculty is involved in extensive collaborative research.

The Department undertook 17 new sponsored projects with sanctioned outlay of Rs. 6,25,19,895. The total number of faculty involved was 34.

	Sponsored Projects	Consultancy Projects
New Projects	17	-
Ongoing	58	47
Completed	16	-

Department of Physics

The Department of Physics started in June 1958. It has a tradition of vibrant teaching and offers many research programmes.

Academic Programmes: The department offers BTech in Engineering Physics, MSc degree in Physics as well as a PhD. Keeping in line with the national science initiative on nanomaterials and nanotechnology, the Department started a five year dual degree programme leading to BTech and MTech degree in Engineering Physics with specialization in nanotechnology and nanomaterials. The Department along with Material Science and Metallurgy has started a dual degree programme of MSc in Physics and MTech in Material Science.

	Student Intake	Degrees Awarded
BTech	31	33
DD(BTech + MTech)	12	12
MSc	41	32
PhD	29	16
(MSc + MTech)[PMS (Phy. Mat. Sci.)]	9	01
DD (MSc + PhD)	-	7

R & D Activities: At present the Department houses cryogenic facilities like a helium liquefier catering to more than 15 low temperature equipment across the Institute, a workshop supporting in-house small-scale instrumentation, ultrafast optical spectroscopy setup, NMR, high resolution XRD, a clean room for thin film and semiconductor device fabrication and several material growth facilities like CVD, PLD, etc. Many of these facilities are utilized by researchers across several departments. The department has six major research groups – (i) Condensed Matter Theory, (ii) Condensed Matter Experiments, (iii) High Energy Theory, (iv) High Energy Experiments, (v) Soft Matter, Biophysics, and Non-linear dynamics, and (vi) Optics and Photonics.

	Sponsored Projects	Consultancy Projects
New Projects	8	-
Ongoing	25	-
Completed	8	-

Department of Humanities and Social Sciences

Founded in 1958, the Department of Humanities and Social Sciences (HSS) has six disciplines namely, Economics, English literature and Language, Linguistics, Philosophy, Psychology and Sociology. Its faculty offer a wide spectrum of courses at the BTech, MTech, MPhil. and PhD levels. The setting up of a Cell for Indian Science and Technology in Sanskrit (CISTS) in the Department has not only created new opportunities for research collaboration within and across the Institute, but has also provided avenues for new research areas for PhD students seeking admission into the Department. The Department has hosted visit of the Distinguished Chair Professor S. Iyenger, former Vice-Chancellor of Gujarat Vidyapith, the university founded by Mahatma Gandhi in 1920, in Gandhian Philosophy during the year 2016-17.

Academic Programmes: Since 1973, the Department has been offering a doctoral programme in all its disciplines with emphasis on inter-disciplinary topics. In 1993 the Department launched a four-semester interdisciplinary MPhil programme in Planning and Development. Facilities of the Department include a library, computer laboratory, a psychology laboratory and language laboratory.

	Student Intake	Degrees Awarded
MPhil	56	42
PhD	40	53
MPhil-PhD	-	21

R&D Activities: The Department faculty are involved in a number of research projects independently, in collaboration with faculty members from other Departments of IIT Bombay, and as part of international research networks and partnerships. Faculty members and student researchers of the Department carry out research in several cutting-edge areas and emerging sub-disciplines as well as trans-disciplinary themes such as computational linguistics, climate studies, organizational justice, digital media, innovation, gender and environmental change.

	Sponsored Projects	Consultancy Projects
New Projects	11	01
Ongoing	10	01
Completed	-	-

During the year 2016-17, the Department had organised following national and international workshops and seminars :

- Workshop on ‘Democracy and Civility’, which is a part of a collaborative project funded under UKIERI.
- Seminar talk on “Why should a pencil or a paper-clip matter to philosophy?” by Prof. Manjari Chakrabarty, Visva-Bharti, Shantiniketan, and on “What Can the Human Sciences Contribute to Phenomenology?” and “The Reversibility of Landscapes” by Prof. Kenneth Liberman.

Industrial Design Centre

Industrial Design Centre (IDC) at IIT Bombay offers an excellent environment for academics, research and applications in the field of design. The Centre interacts with industries and institutions for promotion and awareness of design. In the area of design practice, IDC offers professional design consultancy and advisory services to industries and other organizations. The potential for innovation at IDC lies fundamentally in terms of solving real-world problems.

Academic Programmes: IDC has a well-established Master of Design degree (MDes) programme in Industrial Design, Visual Communication, Animation Design, Interaction Design, Mobility and Vehicle Design and minor courses as well as a PhD programme in Design. The Department in 2015 started a four-year, eight semester Bachelor of Design (BDes) programme (for which the admission is carried through the undergraduate Common Entrance Examination for Design (UCEED)) and a five-year, ten semester dual degree BDes + MDes Programme. The BDes + MDes is a five-years ten year course, which is available only at the end of the third year. Both these programmes are credit-based and offer the flexibility to progress at one's own pace.

	Student Intake	Degrees Awarded
BDes	30	-
MDes	56	51
PhD	3	2

R&D Activities: IDC undertakes research and development in the field of Product design, Communication design, interaction design, mobility & vehicle design, and animation and film making. The projects at IDC are subjected to address cultural needs, livelihood and sustainability issues, humanizing technologies for mass use, addressing communication, interaction and product needs of the under-served, typography in local language, interfaces for masses, and conservation and development of ethnic craft techniques.

	Sponsored Projects	Consultancy Projects
New Projects	4	-
Ongoing	31	3
Completed	9	-

Design and Degree Show (DDS) 2016 was organised by the graduating batch during June 19-21, 2016. The show was inaugurated by Mrs. Rajashree Birla. Mr. Balakrishna Mahajan of Ticket Design, Mr. Pankaj Jhunjha, Automotive designer, TATA motors. The multitalented architect and artist Mr. Ajit Rao and Mr. Prakash Moorthy, from the Shrishti School of Design were the guest speakers during show. A 3-day refresher course 'Expo CD' on the finer aspects of Communication Design specifically meant for IT and media professionals was held during July 21-23, 2016. It was aimed to provide information to the participants about the overall aspects of Communication Design for the Digital media, a deeper understanding of Communication Graphics, Methods for Structuring and Visualization of Information as well as exposure to creative processes for solving communication problems. The Department has also organised three day workshops Expo Pdi and Expo info Design during August 25-27, 2016 and September 22-24, 2016 respectively. The Typography Day 2017 was organised during February 23-25, 2017 at the Colombo Department of Integrated Design, University of Moratuwa, Sri Lanka in collaboration with the Industrial Design Centre, IIT Bombay with support from India Design Association (InDeAs) and Aksharaya.

The event featured one-day workshop on Typography and Calligraphy followed by a two-day international conference dedicated to 'Typography and Diversity'. The conference was devoted to addressing issues faced by type designers, type users and type educators. The conference included presentations by invited keynote speakers, eminent academicians, blind juried papers, industry professionals, research scholars and students. The event also hosted an exhibition of selected posters and typographic works of students and faculty members from design institutes.

Shailesh J. Mehta School of Management

Today, Shailesh J Mehta School of Management has occupied its distinct place in the globe as an institute of excellence in management education and research. The School currently has 23 full-time faculty members in all core fields of management.

The year 2016-17 was marked by further strengthening and consolidation of the academic programmes of the School.

Academic Programmes: The School of Management offers doctoral program (PhD) in Management, full-time Master of Management, Executive MBA (E-MBA): Jointly by the Shailesh J. Mehta School of Management IIT Bombay, India and Olin Business School Washington University in St. Louis USA, certificate programmes for Executive Education: short and long duration in-house and open Management Development Programmes for the corporate executives/ professionals of all fields, and BTech (minor courses in all areas of management).

	Student Intake	Degrees Awarded
MMgt	111	115
PhD	10	08
E-MBA	22	27

R&D Activities: Faculty members of the School are engaged in many research/ consultancy projects in all fields of management. Management Development Programmes (MDPs) exclusively for the corporate houses as well as open for all professionals are always on at the School and reshaping the managers, executives and entrepreneurs as future leaders.

	Sponsored Projects	Consultancy Projects
New Projects	-	-
Ongoing	13	3
Completed	2	2

During 2016-17, the school organized doctoral consortium (sponsored by Deloitte) of PhD Scholars, from January 24-25, 2017 at IIT Bombay to offer a platform for young scholars from all over the country to interact with eminent scholars in academia as well as industry experts in understanding the advances in theory and applications in management. The theme of the consortium was 'Advances in Theory and Applications in Management'. About 31 PhD scholars from premier academic institutions in India presented their work during the consortium in the areas of Economics and Finance, Information System and Technology Management, International Business, Marketing, Operations Managements, Organizational Behavior and Human Resource Management, Quantitative Techniques and Decision Science, and Strategic Management.

The research papers were selected from over hundred submissions following two rounds of review by a panel of experts. The two-day event included lectures from distinguished speakers from academia and industry on the theme and presided over panel discussions. Distinguished scholars from academia included Prof. Ramadhar Singh, Distinguished University Professor, Ahmedabad University; Prof. Pulak Ghosh, Professor, IIM Bangalore; Prof. Neharika Vohra, IIM Ahmedabad; Prof. Jayati Sarkar, IGIDR, Mumbai; and Prof. Sandeep Krishnamurthy, Dean and Professor, UW Bothell School of Business. Industry experts included Mr. Gyanendra Singh, National Manager, Analytics at Experian Credit Information Company of India, Mr. Alok Shukla, National Head, Rural Sector, Bharti AXA General Insurance. Best paper awards (top five papers and two consolation prizes) were also presented during the consortium.

Centre for Environmental Science & Engineering

The Centre for Environmental Science and Engineering (CESE) was established in 1985. The Centre has a core group of 13 faculty members (12 regular and 1 emeritus) with multi-disciplinary background and diversifying research interests. Apart from this, professionals from consultancies and government organizations come for delivering the lectures time to time.

Academic Programmes: The centre has started a dual degree MSc – PhD programme in July 2010 in addition to already existing MTech and PhD programmes. In addition to these three programmes, the Centre is running a minor in Environmental Science and Engineering for undergraduates studying in other departments at IIT Bombay. A dual degree BTech- MTech programme will also be started from 2018. In addition to the above programmes, CESE offers an Institute core course “Environmental Studies: Science and Engineering” to undergraduates and MSc – PhD students. Besides, the centre runs several elective courses for sensitizing students across all disciplines towards the urgent need for protection and restoration of environment by adapting environment friendly lifestyles.

	Student Intake	Degrees Awarded
MTech	14	18
DD (MSc + PhD)	05	-
PhD	03	07

R&D Activities: The ongoing research activities of the Centre are focused towards addressing the priority areas (local and global) set by major national agencies like MHRD, CPCB, SPCB, MNRE, DBT, MoEF, CSIR, DST. In addition, the Centre has already established strong links and collaborations with leading industries, academic institutions and national/international agencies by conducting sponsored research and offering consultancy and technical services. The research activities of CESE are supported by excellent experimental and computational facilities, competent and dedicated technical staff and high quality students. The Centre is also actively engaged in organizing workshops and CEP courses for benefiting professionals from other academic institutions, industries and governmental sectors.

	Sponsored Projects	Consultancy Projects
New Projects	6	1
Ongoing	9	3
Completed	8	10

Centre of Studies in Resources Engineering

The Centre of Studies in Resources Engineering is a teaching academic unit of IIT Bombay. The Centre is noted for its research in the areas of mineral exploration, synthetic aperture radar image analysis, hyperspectral image analysis, GPS applications, high performance computing, and so on. The Centre's work was presented in some of the prestigious conferences, such as IEEE's IGARSS Symposium in Beijing in July 2016, IEEE WHISPERS Symposium in Los Angeles, and several others. The Centre organised a conference on Distributed and Embedded High Performance Computing, which was well attended by experts as well as young researchers. A joint workshop to highlight the research and development in the area of advanced image processing by IIT Bombay and University of Trento, Italy was organised during 2016-17. The Centre played a major role in developing new algorithms involving polarimetric synthetic aperture radar images and deep learning and applications.

Academic Programmes: In addition to undergraduate minor in Geoinformatics for BTech and dual-degree undergraduate students of the Institute, the Centre offers MTech and PhD program. In Geoinformatics and Natural Resources Engineering, it has about 110 students in Master's and doctoral programs.

	Student Intake	Degrees Awarded
MTech	22	20
PhD	14	15

R&D Activities: The Centre has been actively working on many research and development activities covering geoinformatics and applications.

	Sponsored Projects	Consultancy Projects
New Projects	5	3
Ongoing	14	2
Completed	5	1

Centre for Technology Alternatives for Rural Areas

The Centre for Technology Alternatives for Rural Areas (CTARA) was set up in 1985 to cater to the technology needs of rural areas.

Academic Programmes: The Centre offers MTech program in Technology and Development and a PhD program. It also offers Technology and Development Supervised Learning (TDSL) courses to BTech students across the Institute. The course work provides an over view of development issues, resource analysis, rural needs assessment, technological interventions and impacts, and has a strong field component. Teaching and research is aimed at providing relevant solutions to the rural areas. In order to do this effectively, CTARA has developed linkages with NGOs, government departments and ministries, and industry. A new course 'Development Engineering' aimed to prepare undergraduate students for a career in development and provide a bridge between their disciplinary training and key problems related to the sector, was approved by the senate during the year. The course is also a part of the Unnat Maharashtra Abhiyan (UMA) framework, and likely to be administered all across Maharashtra.

	Student Intake	Degrees Awarded
MTech	33	33
PhD	9	4

R&D Activities: The major research area at the Centre are the sectors of agriculture and food, appropriate technology, drinking water, energy, environment, health, planning and policy and governance.

	Sponsored Projects	Consultancy Projects
New Projects	7	-
Ongoing	23	5
Completed	3	-

Centre for Formal Design and Verification of Software

The importance of formal methods based software engineering in design and verification of safety critical software was the primary inspiration behind Department of Aerospace Engineering (DAE) establishing the Centre for Formal Design and Verification of Software (CFDVS) through Board of Research Nuclear Sciences (BRNS), and in collaboration with IIT Bombay and Tata Institute of Fundamental Research (TIFR). CFDVS started functioning more than a decade back, in 1999. Although the initial focus of the Centre was on design and verification of software, it was quickly realized that the scope of activities needed to be expanded to include both software and hardware systems, in order to provide a comprehensive approach to design and verification of safety-critical systems. Over the past 18 years, CFDVS has established itself as a national R & D Centre in the area of formal verification of high-integrity software and hardware. The Centre has contributed to several R&D programs in formal verification, and has taken up sponsored industrial projects from various government organizations like Vikram Sarabhai Space Centre (VSSC), Aeronautical Development Agency (ADA), Defence Research and Development Laboratory (DRDL) and Defence Research and Development Organization (DRDO), and also from high-profile private organizations like Intel, Microsoft Research, Texas Instruments, General Motors, etc. Establishing CFDVS has benefited DAE in terms of research and development of advanced formal verification tools.

During the past 18 years, tools and techniques developed at CFDVS have been applied successfully to small and medium sized problems, both from the academia and industry. This has proved the ability to handle the technological challenges involved in addressing complex problems at the small to medium scale. The Centre focuses on automated techniques for larger real-life systems, and to make the resulting technologies available to the end-user community in India. This can reap significant benefits in verification projects undertaken

at DAE, ISRO, DRDO etc. for two reasons. First, aligning with a global effort in formal verification (the Grand Challenge Problem) would allow leveraging on and building on significant work in the public domain being done by other research groups elsewhere in the world. This not only avoids re-inventing the wheel, but also helps bootstrap quickly so that researchers at CFDVS can work on developing cutting-edge formal verification capabilities beyond those already available today. Second, since the technology is intended to be developed in CFDVS, issues related to technology transfer from foreign organizations to DAE, ISRO, DRDO etc. can be effectively circumvented. Therefore, there exists a strong possibility for the Centre to be a part of the worldwide effort to address the Grand Challenge Problem in Computing, while continuing to develop theories, prototype tools and techniques for problems relevant in the Indian context.

Workshop: The Centre organised a workshop on ‘Formal Verification and Analysis Tools’ from February 19-21, 2017. Around 50 people from DRDO, VSSC, VECC, BARC, TIFR, ITER, NPCIL, ISRO, VECC-DAE, participated in the workshop. The objective of the workshop was to provide a user-centric exposure to the tools and techniques developed at CFDVS, so that a wider set of users can benefit from the technologies developed over the past decade. The workshop covered a detailed demonstrations of state-of-the-art formal verification tools available from other labs around the world. The primary objective of the workshop intended for designers and developers working on safety critical applications in sectors such as defence, space, nuclear energy, telecommunications, transport etc. It also intended for researchers and academicians interested in applications of formal methods in formal design and verification of systems. Yet another objective of the workshop was to seek feedback on important problems faced by the user community, in which formal methods could be fruitfully exploited.

Centre for Urban Science and Engineering

The Centre for Urban Science & Engineering (C-USE) at IIT Bombay is an interdisciplinary centre for research, teaching and skilled manpower development with the primary mandate of improving urban quality of life. The Centre aims to combine science and technology with sustainable, equitable and human-friendly design to deliver innovative and holistic services to improve the life of the rapidly urbanizing population in the developing world.

Academic Programme: The Centre runs PhD programme offering following specialisations in Planning and Design: Housing, Land use policies, Public Spaces, Risk Management; Policy and Governance: Housing Economics, Health, Education, Employment, Environment; Infrastructure: Building, Transportation & Land use, Urban water, Waste Management, Smart Energy; and Informatics: Citizen Science, Cyber-Physical Systems, Urban Knowledge, Geospatial Technologies. The overall on roll student strength this year is 20.

	Student Intake	Degrees Awarded
PhD	5	-

R&D Activities: The research activities of the Centre focus on new products and solutions related to housing, transport, water management, energy efficiency, urban informatics, health, governance, urban poverty and citizen science while mitigating the effects of natural disasters and climate change.

	Sponsored Projects	Consultancy Projects
New Projects	-	-
Ongoing	12	-
Completed	-	-

Centre for Research in Nanotechnology and Science

IIT Bombay is one of the leading institutions in the country for research in the area of Nanotechnology. The Institute has recently consolidated its Nanotechnology research activities through the formation of a Centre for Research in Nanotechnology & Science (CRNTS). The formation of this centre has been made possible through a generous grant from the Department of Science & Technology (DST), Government of India.

The Centre hosts Sophisticated Analytical Instrument Facility *(SAIF) which houses a variety of major analytical instruments which are operated and maintained by a dedicated and qualified group of scientists and engineers. It is an integral part of IIT Bombay and operated with an 'open access policy'. During the year SAIF provided facilities for the analysis of 40,158 samples. The 'Electron Microscopy course' was held in April 2016. Lectures delivered during the course were on 'Bio & Cryo TEM Sample preparation', 'Instrumentation, Beam-Specimen interactions (SEM)', 'Imaging (SEI, BSE)' and 'SEM Application'.

Academic Programme: The centre offers PhD programme in Nanotechnology.

	Student Intake	Degrees Awarded
PhD	19	05

R&D Activities: This is one of the leading centres in the country for research in the area of Nanotechnology. At IIT Bombay, over 60 faculty members from 10 different departments/ schools are working together in the broad areas of Nanotechnology, with support from various government agencies are private industries. This research has resulted in over 500 high quality publications in the last 8 years in international journals and conference proceedings and a large number of patents.

Some of the research activities at IIT Bombay in the Nanotechnology area are at par with some of the best institutions in the world. IIT Bombay has also been selected as one of the two institutions in the country for setting up a 'Centre of Excellence in Nanoelectronics' by the Ministry of Communications & Information Technology (MCIT), Government of India.

	Sponsored Projects	Consultancy Projects
New Projects	-	-
Ongoing	4	1
Completed	1	-

Industrial Engineering and Operations Research

Industrial Engineering and Operations Research (IEOR) at IIT Bombay is an interdisciplinary programme that offers PhD and MTech degrees in IEOR and an MSc-PhD Dual Degree in Operations Research. IEOR has eight faculty members and one Emeritus Fellow. Together with other Institute faculty members who are associated with the programme in teaching and research, IEOR has a depth and breadth in capability that makes the programme unique in the country. Prof. C.S. Lalitha, University of Delhi and Prof. TES Raghvan University of Chicago visited the department during the year.

Academic Programmes: IEOR is participating in the IIT Bombay Monash Academy PhD programme, with one of its research scholars in the joint PhD programme. The programme currently has 19 PhD scholars, 39 MSc-PhD Dual Degree students and 42 MTech students.

	Student Intake	Degrees Awarded
MTech	30	17
MSc (2 year)	-	3
PhD	3	2
MSc+MPhil	-	2
MS	-	01
MSc+PhD	11	1

R&D Activities: Faculty members served as referees for several journals and international conferences. The department hosted visitors from Mercedes Benz R and D in October 2016. Faculty members visited various universities to deliver talks at Game Theory and Optimisation Conference at IIT Madras and on Optimal Control during March 2017.

	Sponsored Projects	Consultancy Projects
New Projects	4	-
Ongoing	8	-
Completed	-	-

Systems and Control Engineering

The Systems and Control group, formed in 1977, is a unique interdisciplinary program in the country that offers post-graduate education (MTech/ PhD) in the broad area of Systems and Control. The group has 9 core faculty members and about 11 associated faculty members from other academic units of the Institute.

Academic Programmes: The group offers post-graduate education (MTech/ PhD) in the broad area of Systems and Control. The average doctoral strength is around 25 and the MTech intake every year is around 12.

	Student Intake	Degrees Awarded
MTech	18	4
PhD	3	7

R&D Activities: The research focus of the core group is in the areas of Nonlinear Control, Robotics, Path-planning, Embedded Control, Coordination of Autonomous Vehicles, Multi-agent Systems, Sliding Mode Control and Applications, Fractional-order Modelling and Control, Optimization and Optimization-based control, Stochastic Processes, Game Theory, Stochastic Control, Optimization, Economics, Information Theory and Combinatorial Coding Theory. In addition, Research in the Areas of Process Control, Identification, Behavioural Theory, Matrix Computation, Automotive Control are being pursued by the associate faculty members.

The experimental lab at Systems and Control is geared towards introducing students to hardware and software that implement control theories learnt as part of coursework.

	Sponsored Projects	Consultancy Projects
New Projects	8	1
Ongoing	15	-
Completed	3	-

Climate Studies

The Interdisciplinary programme in Climate Studies was initiated at the Indian Institute of Technology Bombay in January 2012 as one of the first doctoral programmes in India addressing research related to climate change. Over 24 faculty participants are drawn from nine departments across IIT Bombay with expertise in climate science, technology assessment and policy.

Academic Programme: The group aims to achieve educational excellence through a doctoral curriculum of courses in two broad tracks of climate science and climate policy, supplemented by elective courses on a broad range of theoretical and practical topics.

	Student Intake	Degrees Awarded
PhD	5	1

R&D Activities: The group focuses on the research areas including Detection, attribution and prediction of climate extremes, Factors affecting the Indian monsoon, Aerosol radiative processes, effects on clouds and rainfall, LES of cloud processes, Causality analysis and data assimilation; Climate change impacts on cities; Drivers and Costs of Adaptation; Vulnerability analysis at national, sub-national and community levels; Climate mitigation; Strategies for low-carbon development. Long-term goals include the creation of a pool of multi-disciplinary researchers to serve the growing national need for climate change professionals.

	Sponsored Projects	Consultancy Projects
New Projects	4	-
Ongoing	1	-
Completed	-	-

Education Technology

The Inter-Disciplinary Programme in Education Technology started in the Institute in 2010-11. In addition to Institute courses at a PhD level, the group organizes short-term intensive courses and MOOCs on effective teaching-learning and educational research methodologies through CEP and the Teach 10000 Teachers project and IITBombayX. Faculty members and research scholars of the group play a significant role in the organization international conference, carry out sponsored projects for the National Mission on Education through ICT (NMEICT) and provide consultancy to educational technology industries. The group has organised three international conferences viz ICCE 2016, T4E 2016 and LaTiCE 2016 during 2016-17.

Academic Programme: The group offers PhD programme in Educational Technology. The PhD students include engineering college teachers from colleges in and around Mumbai. The group continues to offer core courses and elective in educational technology content and methods. These Courses have had enrollment from BTech and PhD students in other academic programmes within the Institute.

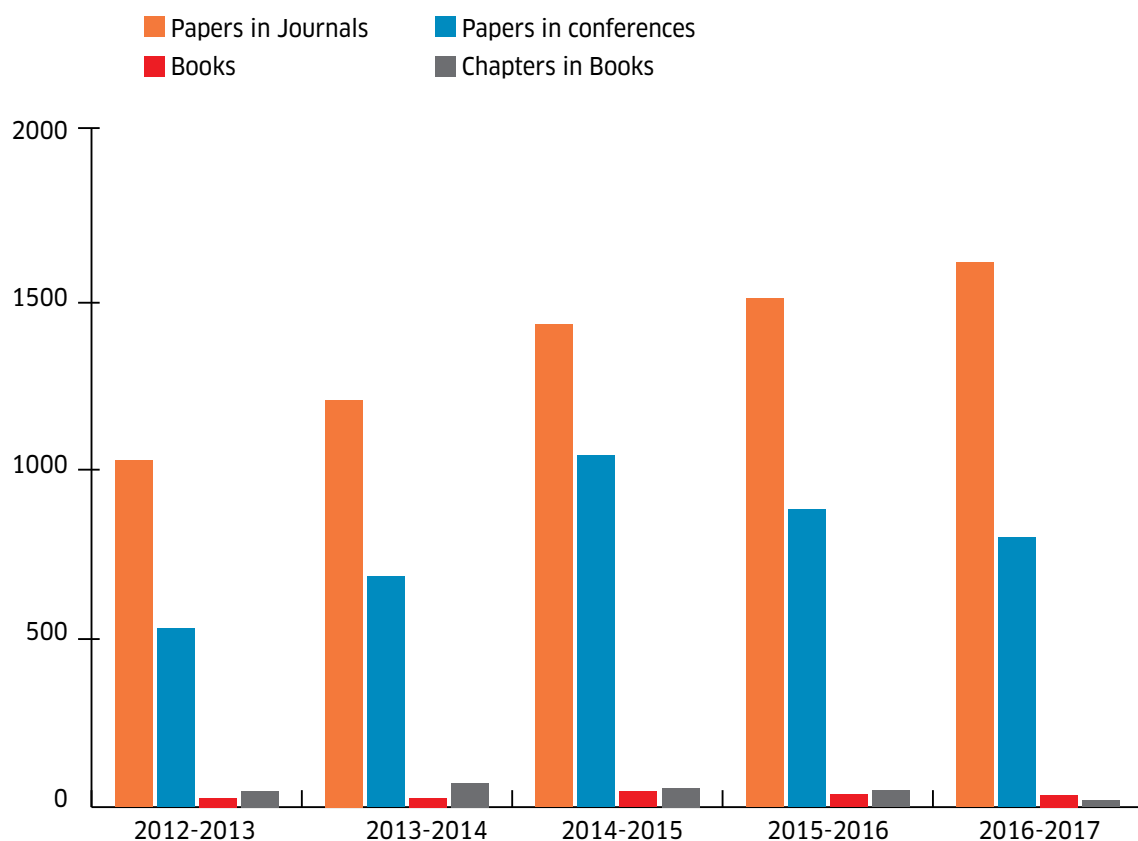
	Student Intake	Degrees Awarded
PhD	19	5

R&D Activities: The main areas of focus of the R&D activities of the group are: Technology-enhanced learning environments for thinking skills (TELoTS), Develop students' which are pan-domain cognitive skills such as, engineering design, problem-posing, estimation, algorithmic thinking, modeling, data representation & analysis. Design, develop and evaluate TElOTS systems for various thinking skills in different domain; Teacher use of educational technology (TUET). Develop and evaluate modes of training such as MOOCs and blended learning. Develop tools to assist teachers in technology integration, analytics; Discipline based education research. Technology-enhanced learning of specific topics - Action research of in engineering courses.

	Sponsored Projects	Consultancy Projects
New Projects	-	-
Ongoing	4	1
Completed	1	-

Publications

The number of publications by faculty members of IIT Bombay are steadily increasing. From 1026 papers published in national and international journals during the year 2012-13, the total number of papers published in 2016-17 has increased by 589 papers in mere five years, talking the total number of papers published to 1615. Similar trends can be observed for the papers presented in conferences and books published authored by the Institute's faculty, in the graph given below:



Year	Papers in Journals	Papers in conferences	Books	Chapters in Books
2012-13	1026	530	29	50
2013-14	1206	686	30	75
2014-15	1430	1044	46	59
2015-16	1507	882	39	52
2016-17	1615	800	38	22

Facilities

Infrastructure Development

The infrastructure projects that were completed during the year include 'Retrofitting of Staff Hostel and Hostel No. 1 except 'A' wing.

Some projects started earlier year and nearing completion are 'Guest House No. 3' with 96 rooms and 48 utility apartments, a 300 seat dining hall and a conference room facility, and Common building for the 'Department of Energy Science and Engineering' and 'Centre for Environmental Science and Engineering'.

The construction work of Hostel 18 (1000 capacity) has started in March 2017 and is now proceeding at a fast pace.

The projects that are in pre-execution stages are Type B-Faculty Housing Building 'A' (78 flats) and Facility for Executive MBA programme. All new projects are being designed and built to meet minimum GRIHA-3 standards. Many other projects such as IIT Bombay Science Research Park (phase-I) and a new building for Rahul Bajaj Technology Innovation Centre – Building for Society for Innovation and Entrepreneurship (SINE), Industrial Research Consultancy Centre and Industrial Design Centre are at various stages of planning.

Apart from these, building projects that would be constructed in the near future include Hostel 17 (1000 student capacity), Steel Centre, development of Workshops/Labs, Centre for Propulsion Technology, Common building for Estate Office, National Centre for Aerospace Innovation & Research, Tata Centre for Technology & Design, DS Foundation Centre for Entrepreneurship and Bio-medical Engineering Technology Incubation Centre, Type B-Faculty Housing Buildings (2 Nos. with 78 flats each), Central Animal Facility and Married Students Apartments (400 units). The Design Consultants for these projects have been appointed after undertaking a 'Concept Design' competition.

Central Library

IIT Bombay's Central Library housed in a huge 3-story building having central air-conditioned with state-of-the-art amenities provide a vibrant ambiance to the students, faculties, staff, alumni, and corporate/member users for study, research and access to reference materials both on-line and off-line. It holds a huge collection of books, back volume of journals, monographs, standards, thesis/ dissertation and subscription of current journals / magazines etc. in the varied areas of engineering, sciences, technology, humanities and social sciences both in print and electronic format. The institutional repository of IIT Bombay publications also attract large number of users from academia and industries throughout the year.

The library collection was used by 16,791 members during the year. The institutional repository of IIT Bombay publication, with over 20,172 records, has also attracted more than 4,01,159 hits during 2016-17. During this year, 757 Masters degree dissertations, 350 PhD theses and 254 dual degree were submitted online.

The budget of Central Library, typically for a given year, is about Rs.18.17 crores. Central library subscribed to more than 15,890 e-journals and e-resources and 235 print journals and added about 1,404 volumes including books, theses, reports, standards, pamphlets and other reading materials during the year. It also acquired 1244 e-books during the year. All the library collection can be accessed through online-public access catalogue.

In addition to the above, the library also renders services like reference and consultation, arranging materials from other libraries through inter-library-loan, providing the book bank facility for IIT Bombay students belonging to economically and socially-weaker sections of the society and arranging the user awareness programmes to enhance their awareness about library resources, services and activities. The library allows users to self check-out books as well

as renew borrowed books online. It facilitates interlibrary loan facilities of books and other informational documents for its members as and when required. It also provides internship facilities to Library Science students from other educational sectors. It handled over 75,882 loan transactions of books and other documents for its members during the year. Central library also offers services to industry and corporates, IIT Bombay alumni and engineering (educational) institutions, professional members and has earned over Rs.16,79,000 for the services rendered.

The library is open from 0900 to 2300 hrs on all working days and from 1000 to 1700 hrs on holidays (except three national holidays and two festival holidays). The library remains open till 0100 hrs on all days during examinations. However, around-the-clock air-conditioned reading hall facility with 150 seating capacity for the bonafide users of the library is also available.

The library interacts with its members/users mainly through its homepage (www.library.iitb.ac.in) which is dynamically updated during the year to make it more user-friendly. The library provides wi-fi connectivity. The library extensively uses social media like blog, Facebook and Twitter for improved communication and interaction to post current and interesting information and news items.

Librarian's Day 2016 was celebrated on August 12, 2016 on the 124th birth anniversary of Dr. S. R. Ranganathan, the father of Library Science in India for the first time in the Central Library.

IIT Bombay established new facility for students with visual-impairment at Central Library. This facility was inaugurated on January 4, 2017 by the Director Prof. Devang Khakhar. The facility was set up with the aim to empower and encourage visually-challenged students to pursue education/ research. Bibliotheca/ Libre8 self checkout kiosk has been procured and installed during the year. Under NVLI project, the staff have undergone training programme in library automation.

The Central Library successfully conducted 100% physical stock verification of the library books from May 25, 2016 to June 24, 2016 on recommendation of library committee and with the approval of the Director.

Computer Centre

The Computer Centre continues to provide computational, network infrastructural facilities and services to the IIT Bombay user community.

Network and Connectivity

The Centre manages the campus network and is responsible for the availability of intra-campus connectivity of all the departments, hostels, residential complexes and internet connectivity of Institute with the outside world. In addition, about 1080 wireless access points provide wi-fi access at various departments and other key locations on campus. The following activities were undertaken during the year:

- The total Internet bandwidth for IIT Bombay campus users have been around 1000 Mbps from NKN on Vodafone:
- BGP routing to connect to the three ISPs through simple load balancing using open source software.
- Internet access is by NATting via four Class C address ranges recently acquired from APN.
- Web access is through proxy and 'direct access' where a legitimate user authenticates the IP address.
- Users at the residences have a separate web access account and employees do not have to share their passwords with family.
- Transport layer security has been purchased via digital certificate from GeoTrust.

Few external WiFi access points have been deployed on campus to cover student's hostels. Access through IITB-Wireless for IIT Bombay users, IITB-Guest for guests of IIT Bombay and EduRoam for visitors with affiliated with EduRoam partners have been made available along with these wi-fi access point. Currently the facility is being used by about 100 user groups to a total of around 350 research scholars.

A new cluster was bought which could fit within the power and cooling capacity of the existing Data Centre. The new system is equipped with 49 HPE Apollo 6000 server with a theoretical peak of 45 TF. Each server has 2 X Intel Xeon 2680 v3 processors

and 128 GB of RAM. The system is also connected to a 100 TB of parallel file system as storage. Currently there are 15 users from different research groups using the Corona facility.

National Knowledge Network: IIT Bombay continued to be a member of the National Knowledge Network (NKN) during the year. This multi-gigabit network initiative started by the National Informatics Centre (NIC) is being used by CDEEP to conduct distance education programmes. Staff from the Computer Centre represented IIT Bombay in the national level meet of the NKN.

Grid Computing Facility GARUDA: The grid computing facility GARUDA is also supported by the Computer Centre allowing the users of the Institute to access the available resources on the National Grid.

Hardware/Software Infrastructure : All service offerings at the Computer Centre are based on OPEN SOURCE Software Systems. Computer Centre has registered as official mirror for various flavors of Linux Operating Systems on its anonymous FTP server which is available to the user community at large. A new disk storage system having a capacity of 175 RAW data has been purchased to replace the 7-year-old storage system.

The Institute continues to be a member of Microsoft Developer Network Academic Alliance (MSDNAA) software licensing programme. This allows the user community to use most of the Microsoft software products in a non-production environment. Campus-wide license of AVG anti-virus software has been in operation.

The Institute Software Committee solicits, specifies and negotiates the purchase of useful commercially-available licensed software for the IIT Bombay academic community.

Software packages meant for scientific and technical computation such as Abaqus, SPSS, Labview, OriginLab, Cisco's webex for video conferencing facility etc that are available through appropriate licenses schemes are procured, upgraded and administered by Computer Centre as per the requirements of the students, faculty, scientists and staff.

The Computer Centre encourages and has installed Open Source Software Systems for Office Automation in about 775 PCs deployed in the various administrative sections of the Institute. Additionally 30 Desktop PCs with

Microsoft Windows operating systems (Under appropriate Volume Licensing scheme), appropriate antivirus software, and other essential software as per requirement are also used for various administrative activities. The use of Open Source operating systems and software has eliminated to a great extent the menace of the spread of computer virus and thus has optimised the IT support overheads required for Network Management and PC maintenance.

User awareness sessions: At appropriate intervals and as per requirements, Computer Centre conducts a two hour training session on the usefulness of the applications under the Open Source Operating Systems for office automation and also appraises about the IT Infrastructure facilities provided by the Computer Centre for the administrative staff of the Institute.

IP CCTV surveillance activity of the Institute: The Computer Centre continues to play a secondary role by providing technical support to install and run the newly acquired IP-based Security Surveillance Systems having 284 IP cameras and storage for the security section.

The computer network set up by the Computer Centre enables the Electric Maintenance Division to monitor the power distribution systems, check the status of various lifts, functioning of UPS systems, etc. in the Institute. The Telephone Exchange also runs about 1000 new IP telephones (Voice over IP) using the computer network of the Institute. The schedules of the availability of doctors at the IIT Hospital is uploaded on the web site of the hospital and this information is accessible over the IITB LAN.

Projects for the Near Future: Expansion planned for WiFi access: Process for providing additional 400 wireless access points for the academic area for "blanket coverage":

The HPC roadmap: Current infrastructure is about eight years old and upgradation of this facility is planned in west wing on the ground floor of the Old CSE building.

Space for about 100 racks is divided into three parts viz. Central HPC facility of the Institute; Data Centre for the Computer and backup services for the different services in IIT Bombay (mail servers of departments, data from ASC, IRCC, Academic Office, etc).; and Bring Your Own Hardware facility: Resources

Currently, the centre is in the process of building a new Data Centre with major modification to the existing building premises. It will be used to house all the HPC systems of IIT Bombay. This Data Centre will also be used to house the new servers. The centre is also creating a facility to promote Bring Your Own Hardware model, so that all the small clusters/ server scattered over the campus can be brought under the same roof, which will help in reducing power consumption as well as the operational cost.

- An integrated mail and calendar system for the Institute
- Extend IMAP service to all departments
- Increase storage allocation for email and BigHome
- Lifetime email to alumni and all faculty/staff

Centre for Distance Engineering Education Programme (CDEEP) has taken a leap in reaching out to more institutions/ organisations in India and abroad. During the year, CDEEP recorded and transmitted 25 courses, covering 11 disciplines at IIT Bombay. It now has an archive of 347 full semester long courses. This year, 95 courses were supplied to 51 individuals on demand. The viewership of courses through web stood at 4514. It has connected 81 institutions all over India and out of these institutions, 43 have signed MoU with IIT Bombay as Remote Centers (RC). The Centre, as its continued parallel activity, covered 80 events, including 54th Annual Convocation, 58th Foundation day, Institute Colloquia and talks by distinguished speakers on campus. The Centre continued its support to various distance education and educational outreach projects being executed at IIT Bombay.



Organization



Mr Dilip Shanghvi
Chairman, Board of Governors



Prof. D.V. Khakhar
Director



Prof. A.K. Suresh (from 16.01.2017)
Prof. Subhasis Chaudhuri (upto 15-01-2017)
Dy. Director (Academic & Infrastructural Affairs)



Prof. P.M. Mujumdar
Dy. Director (Finance & External Affairs)



Prof. P.V. Balaji
Dean (Research & Development)



Prof. Amitava De (from 17.03.2017) Prof. Narayan Rangaraj (upto 16-03- 2017)
Dean (Academic Programmes)



Prof. Ravi Sinha
Dean (Alumni & Corporate Relations)



Prof. B.V.S. Viswanadham
Dean (Infrastructure Planning & Support)



Prof. Soumyo Mukherji
Dean (Student Affairs)



Prof. R.O. Dusane
Dean (International Relations)



Prof. Abhay Karandikar (from 09.02.2017) Prof. J.K. Verma (upto 08.02. 2017) Dean (Faculty Affairs)



Prof. Y.M. Desai
Dean (Administrative Affairs)



Dr. R. Premkumar
Registrar

IIT Council

The Minister In-charge of Technical Education in the Central Government	1.	Mr. Prakash Javadekar, Hon'ble Minister of Human Resource Development, Government of India, Shastri Bhavan, New Delhi – 110 001.	Chairman
Chairman of Each Institute (Ex-officio)			
Kharagpur	2.	Dr. Srikumar Banerjee, Chairman, BoG, IIT Kharagpur (Chairman, RP-Sanjiv Goenka Group Pvt. Ltd., Kolkata).	Member
Bombay	3.	Mr. Dilip Shanghvi, Chairman, BoG, IIT Bombay, Mumbai-400076 (Managing Director, Sun Pharmaceutical Industries Ltd., Sun House, CTS No. 201 B/1, Western Express Highway, Goregaon (E), Mumbai – 400 063).	Member
Madras	4.	Dr. Pawan Goenka, Chairman, BoG, IIT Madras. Chennai – 600 036 (Executive Director and President, Mahindra & Mahindra, Mahindra Towers GM Bhosale Marg, Worli, Mumbai).	Member
Kanpur	5.	Mr. R.C. Bhargava, Chairman, BoG, IIT Kanpur, Kanpur – 208 016. (Chairman, Maruti Udyog Ltd., 220, Sector 15A, Noida – 201 301)	Member
Delhi	6.	Mr. Kumar Mangalam Birla, Chairman, BoG, IIT Delhi, New Delhi – 110 016. (Chairman, Aditya Birla Group, 3rd Floor, S.K. Ahire Marg, Worli, Mumbai – 400 030)	Member
Guwahati	7.	Dr. Rajiv I. Modi, Chairman, BoG, IIT Guwahati, Guwahati – 781 039. (Chairman & Managing Director, Cadila Pharmaceuticals Limited, Cadila Corporation Campus, Sarkhej-Dholka Road, Bhat, Ahmedabad -382210, Gujarat)	Member
Roorkee	8.	Prof, Ashok Misra, Chairman, BoG, IIT Roorkee, Roorkee – 247 667 (Chairman – India, Intellectual Ventures India Consulting Pvt. Ltd., 69 Adarash Vista, Basavanagar, Bangalore – 560 037).	Member
Bhubaneswar	9.	Mr. Pankaj Ramanbhai Patel, Chairman, Board of Governors, IIT Bhubaneswar, Bhubaneswar (Odisha). (Chairman & Managing Director, Cadila Healthcare Limited, Zydus Tower, Satellite Cross Road, Ahmedabad – 380015, Gujarat)	Member

Gandhinagar	10.	Prof. Sudhir K. Jain, Actg. Chairman, Board of Governors, Indian Institute of Technology Gandhinagar, President Research, PSG Institution, PSG College of Technology Campus, New Administrative Block, Peelamadu, Coimbatore, T.N. 641004.	Member
Hyderabad	11.	Dr. B. V. R. Mohan Reddy Chairman, Board of Governors, Indian Institute of Technology Hyderabad. (A.P.) (Chairman and Managing Director, Infotech Enterprises Ltd. Plot No. 11, Software Unit Layout, Infocity, Madhapur, Hyderabad – 500081.)	Member
Jodhpur	12.	Prof. C.V.R. Murthy, Actg. Chairman, Board of Governors, Indian Institute of Technology Jodhpur, Rajasthan.	Member
Indore	13.	Prof. Pradeep Mathur, Actg. Chairman, Board of Governors, Indian Institute of Technology Indore, Madhya Pradesh	Member
Mandi	14.	Mr. Subhodh Bhargava (from 02.01.2017), Prof. M. Natarajan (upto 01.01.2017), Chairman, Board of Governors, Indian Institute of Technology Mandi, Mandi, Himachal Pradesh (Chairman, TATA Communications Ltd., New Delhi)	Member
Patna	15.	Mr. Ajai Chowdhry, Chairman, Board of Governors, Indian Institute of Technology Patna, Bihar (Founder HCL, 10, Ishwar Nagar, New Delhi -110065)	Member
Ropar	16.	Ms. Lila Poonawalla Chairman, Board of Governors, Indian Institute of Technology Ropar, Punjab (Padmashree Mrs. Lila Poonawalla, Former CMD, Alfa Laval-Tetra Pak India, Chairperson Lila Poonawalla Foundation, Fili Villa, 101/102, Survey No.23, Balewadi, Baner, Pune 411 045)	Member
Varanasi	17.	Prof. Girish Chandra Tripathi, Chairman, Board of Governors, IIT (BHU), Varanasi and Vice-Chancellor, Banaras Hindu University, Varanasi -221 005 (U.P)	Member
Director of each Institute (Ex-officio)			
Kharagpur	18.	Prof. Partha P. Chakrabarti, Director, IIT Kharagpur, Kharagpur – 721 302.	Member
Bombay	19.	Prof. D.V. Khakhar, Director, IIT Bombay, Mumbai – 400 076.	Member
Madras	20.	Prof. Bhaskar Ramamurthi, Director, IIT Madras, Chennai – 600 036.	Member
Kanpur	21.	Prof. Indranil Manna, Director, IIT Kanpur, Kanpur – 208 016.	Member

Delhi	22.	Prof. V. Ramgopal Rao (from 13.04.2016), Prof. R.K. Shevgaonkar (upto 12.04.2016), Director, IIT Delhi, Hauz Khas, New Delhi – 110 016.	Member
Guwahati	23.	Prof. Gautam Biswas, Director, IIT Guwahati, Guwahati – 781 039.	Member
Roorkee	24.	Prof. Ajit Kumar Chaturvedi (from.09.01.2017), Prof. Pradipta Banerji (upto 08.01.2017), Director, IIT Roorkee, Roorkee – 247 667.	Member
Bhubaneswar	25.	Prof. R.V. Raja Kumar, Director, Indian Institute of Technology Bhubaneswar, Samantapuri (Rear side of Hotel Swosti Plaza), Jaydev Vihar, Bhubaneswar – 751 013, Odisha.	Member
Gandhinagar	26	Prof. Sudhir K. Jain, Director, Indian Institute of Technology Gandhinagar, Vishwakarma Govt. Engg. College (VGEC) Campus, Chandkheda, Visat- Gandhinagar Highway, Ahmedabad – 382424.	Member
Hyderabad	27	Prof U.B. Desai, Director, Indian Institute of Technology Hyderabad, Ordnance Factory Estate, Yeddumailaram – 502205, Andhra Pradesh	Member
Jodhpur	28	Prof. C.V.R Murty Director, Indian Institute of Technology Jodhpur, IIT Rajasthan Camp Office, Department of Computer Science & Engineering, MBM Engineering College, Jodhpur – 342 011.	Member
Indore	29	Prof. Pradeep Mathur, Director, Indian Institute of Technology Indore, Institute of Engineering and Technology, DAVV Campus, Khandwa Road, Indore – 452 017.	Member
Mandi	30	Prof. Timothy Gonsalves, Director, Indian Institute of Technology Mandi, PWD Rest House, 2nd Floor, Near Bus Stand, Mandi – 175 001, Himachal Pradesh	Member
Patna	31	Prof. Pushpak Bhattacharyya, Director, Indian Institute of Technology Patna, Govt. Polytechnic, Pataliputra's Colony, Patna – 800 013.	Member
Ropar	32	Prof. Sarit Kumar Das, Director, Indian Institute of Technology Ropar, Nangal Road, Rupnagar, Punjab – 140 001.	Member
Varanasi	33	Prof. Rajeev Sangal, Director, Indian Institute of Technology (BHU), Varanasi – 221005 (UP)	Member
Chairman, University Grants (Ex-officio)	34	Prof. Ved Prakash, Chairman, Commission University Grants Commission, Bahadurshah Zafar Marg, New Delhi – 110 002.	Member

Director-General, Council of Scientific & Industrial Research Ex-officio)	35	Dr. Girish Sahni, Director General (DG) of Council of Scientific & Industrial Research (CSIR), Govt. Of India, Anusandhan Bhawan, 2, Rafi Marg, New Delhi – 110 001.	Member
Chairman of the Council Of the Indian Institute of Science, Bangalore (Ex-officio)	36	Dr. P. Rama Rao, Chairman, Governing Council of IISc. Bangalore, (and Former Vice Chancellor, University of Hyderabad, Balapur, Hyderabad 50005) Indian Institute of Science Campus, Bangalore – 560 012.	Member
Director of the Indian Institute of Science, Bangalore (Ex-officio)	37	Prof. Anurag Kumar, Director, Indian Institute of Science, Bangalore – 560 012.	Member
Three Nominees of the Central Government			
To represent the Ministry concerned with Technical Education	38	Mr. Ashok Thakur, Special Secretary, Ministry of Human Resource Development, Department of Higher Education, Shastri Bhawan, New Delhi.	Member
To represent any other of Finance	39	Mr. Ashok Lavasa, Secretary (Expenditure), Ministry of Finance, Department of Expenditure, North Block, New Delhi – 1.	Member
To represent any other Ministry	40	Mr. Ajay Prakash Sawhney Secretary, Department of Information Technology, Electronics Niketan, CGO Complex, Lodhi Road, New Delhi – 110003.	Member
Nominees of the Visitor Council for Technical Education (AICTE)	41	Prof. Anil D. Sahasrabudhe, Chairman, All India Council for Technical Education (AICTE), 7th Floor, Chanderlok Building, Janpath, New Delhi – 110 001.	Member
Nominees of the Visitor (minimum three) (maximum five)	42	Prof. Ashok Jhunjhunwala, Professor, Department of Electrical Engineering (Te Ne T) Group, Indian Institute of Technology Madras, Chennai – 600 036 (T.N.)	Member
	43	Dr. T. Ramasami, Secretary, Department of Science & Technology, Ministry of Science & Technology, Technology Bhawan, New Mehrauli Road, New Delhi -110016.	Member
	44	Prof. Ashok Mishra, Chairman – India, Intellectual Ventures India Consulting Pvt. Ltd., # 701- Raheja Paramount, 138-Residency road, Bangalore – 5600025.	Member
	45	Prof. S.K. Joshi, 250- National Physical Laboratory, Dr. K S Krishnan Marg, South Patel Nagar, Pusa, New Delhi – 110012	Member

	46	Prof. R.C. Budhani, 250- National Physical Laboratory, Dr. K S Krishnan Marg, South Patel Nagar, Pusa, New Delhi – 110012	Member
Three Members of Parliament (2 from Lok Sabha) (One from Rajya Sabha)	47	Mr. Ninong Ering, Hon'ble Member of Parliament (Lok Sabha), 92, South Avenue, New Delhi – 110 011.	Member
	48	Mr. Abhishek Singh Hon'ble Member of Parliament (Lok Sabha), Chattisgarh Sadan, Near Safdarjung Hospital New Delhi.	Member
	49	Ms. Vasanthi Stanley, Hon'ble Member of Parliament (Rajya Sabha), C-501, Swaran Jayanthi Sadan, Dr. Bishamber Dass Marg (Near R.M.L), New Delhi-110001.	Member
	50	Mr. R. Subrahmanayam, Additional Secretary (TE), Secretary (IIT Council) Ministry of Human Resource Development, Department of Higher Education, Shastri Bhawan, New Delhi.	Member
	51	Ms. Darshana M. Dabral, Joint Secretary & Financial Advisor (JS&FA), Ministry of Human Resource Development, Department of Higher Education, New Delhi.	Member

Members of the Board of Governors

Nominated by Visitor	Mr. Dilip Shanghvi, Managing Director, Sun Pharmaceutical Industries Ltd., Sun House, CTS No.201 B/1, Western Express Highway, Goregaon (E), Mumbai – 400 063.	Chairman
Ex-officio	Prof. D.V. Khakhar, Director, IIT Bombay, Powai, Mumbai – 400 076.	Member
Council Nominees (Four)	Prof. Anurag Kumar Director, Indian Institute of Science, Bangalore – 560012.	Member
	Prof. Rohini Godbole Centre for High Energy Physics, Indian Institute of Science, Bangalore - 560012	Member
	Prof. Vijayalakshmi Ravindranath Chairperson, Centre for Neuroscience, old TIFR Bldg., Indian Institute of Science, Bangalore – 560 012.	Member
	Mr. K. Ananth Krishnan Vice President & Chief Technology Officer Tata Consultancy Services, Tidal Park, Taramani, Chennai – 600 113.	Member

State Government Nominees (Three)		
Maharashtra	Principal Secretary, Higher & Technical Education, Government of Maharashtra, Mantralaya, Mumbai – 400 032.	Member
Dadra & Nagar Haveli	Hon'ble Administrator U.T. of Daman & Diu and Dadra & Nagar Haveli, Silvassa	Member
Goa	Mr. Ramachandra (Dinar) Balkrishna Bhatkar, First Floor, Vaikunth Niwas Near Youth Hostel, Miramar, Panaji, Goa - 403001	Member
Senate Two	Prof. Amiya K. Pani Professor, Department of Chemistry, IIT Bombay Mumbai 400 076	Member
	Prof. Abhiram Ranade Professor, Department of Computer Science & Engineering, IIT Bombay, Mumbai - 400 076	Member
Ex-officio	Dr. R. Premkumar, Registrar, IIT Bombay, Mumbai – 400 076	Secretary

Members of the Finance Committee

Mr. Dilip Shanghvi Chairman, Managing Director, Sun Pharmaceutical Industries Ltd., Sun House, CTS No.201 B/1, Western Express Highway, Goregaon (E), Mumbai – 400 063.	Chairman
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Prof. D.V. Khakhar Director, IIT Bombay, Powai, Mumbai – 400 076.	Member (Ex-officio)
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Mr. R. Subrahmanyam, Additional Secretary, Ministry of Human Resource Development, Deptt. of Higher Education, Government of India, Shastri Bhavan, New Delhi – 110 115.	Member
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Mr. V. B. Aras, Vice President – Internal Audit, L & T Finance Services, L & T Finance Ltd., The Metropolitan, 4th Floor, C-26/C-27, E- Block, Bandra Kurla Complex, Bandra (East), Mumbai – 400 051.	Member
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Ms. Darshana M. Dabral Joint Secretary & Financial Advisor Ministry of Human Resource Development Government of India, Shastri Bhavan, New Delhi - 110 115.	Member
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Prof. P. M. Mujumdar Dy. Director (Finance & External Affairs), IIT Bombay, Powai, Mumbai – 400 076.	
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Dr. R. Premkumar Registrar, IIT Bombay, Powai, Mumbai – 400 076.	Secretary (Ex-officio)
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Building and Works Committee

Prof. D.V. Khakhar Director, IIT Bombay, Powai, Mumbai – 400 076.	Chairman\
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Superintending Engineer Office of the Supdt. Engineer, Mumbai Central Circle-1, CPWD, 5th Floor, Old CGO Building, 101 MK Road, Mumbai – 400 020.	Member
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Superintending Engineer Mumbai (P.W.) Circle 25 Murzban Road, Fort, Mumbai – 400 001.	Member
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Mr. K. Srinivas Head, Architectural & Civil Engg. Division, BARC, North Site, Trombay, Mumbai – 400 085.	Member
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Mr. Vidyadhar K. Phatak Retired Principal Chief, Town and Country Planning Division, Mumbai Metropolitan Region Development Authority 1/304, Kairav, GE Link, Ram Mandir Road, Goregaon (W), Mumbai – 400104.	Member
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Prof. B.V.S. Viswanadham Dean (Infrastructure Planning & Support), IIT Bombay, Powai, Mumbai – 400 076.	Member
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Dr. R. Premkumar Registrar, IIT Bombay Powai, Mumbai – 400 076	Member-Secretary (Ex-officio)
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Heads of Departments

Prof. Avijit Chatterjee (from 03.04.2017)

Prof. Ashok Joshi (upto 02.04.2017)

Aerospace Engineering

Prof. Rinti Banerjee (from 01.06.2016)

Prof. Rohit Manchanda (upto 31.05.2016)

Biosciences & Bioengineering

Prof. R.D. Gudi (from 01.03.2017)

Prof. K.V. Venkatesh (upto 28.02.2017)

Chemical Engineering

Prof. Krishna P. Kaliappan

Chemistry

Prof. K.V. Krishna Rao

Civil Engineering

Prof. Uday Khedkar (from 28.04.2016)

Prof. S. Sudarshan (upto 27.04.2016)

Computer Science & Engineering

Prof. G. Mohan

Earth Sciences

Prof. B.G. Fernandes

Electrical Engineering

Prof. D. Parthasarathy

Humanities & Social Sciences

Prof. Neela Nataraj

Mathematics

Prof. S.S. Joshi

Mechanical Engineering

Prof. N. Venkataramani

Metallurgical Engineering & Materials Science

Prof. C.V. Tomy

Physics

Prof. Rangan Banerjee

Energy Science and Engineering

Heads of Centres

Prof. G.V. Sreekumar (from 03.10.2016)

Prof. B.K. Chakravarthy (upto 02.10.2016)

Industrial Design Centre

Prof. Anindya Dutta (from 31.08.2016)

Prof. Indradev Samajdar (upto 30.08.2016)

Centre for Research in Nanotechnology and Science & SAIF

Prof. B.K. Mohan

Centre of Studies in Resources Engineering

Prof. Sanjeev Chaudhari

Centre for Environmental Science and Engineering

Prof. G. Sivakumar

Centre for Formal Design and Verification of Software

Prof. P. M. Mujumdar

Centre for Aerospace Systems Design and Engineering

Prof. Milind Sohoni

Centre for Technology Alternatives in Rural Areas

Prof. Varsha Apte

Computer Centre

Prof. Sridhar Iyer (from 10.02.2017)

Prof. V.M. Gadre (upto 09.02.2017)

Centre for Distance Engineering Education Programme

Prof. Pradipta Banerjee (from 28.02.2017)

Center for Urban Science & Engineering

Prof. Sanjay Mahajani

Tata Centre for Technology & Design
Heads of Schools

Head of School

Prof. S. Bhargava

Shailesh J. Mehta School of Management

Convenors of Interdisciplinary Programmes

Prof. Narayan Rangaraj (from 29.03.2017)

Prof. N. Hemachandra (upto 28.03.2017)

Industrial Engineering & Operations Research

Prof. B. Bandyopadhyay

Systems & Control Engineering

Prof. Sridhar Iyer (10.02.2017)

Prof. V.M. Gadre (upto 9.02.2017)

Education Technology

Prof. Chandra Venkataraman

Climate Studies

Summary Of Accounts

Balance Sheet As At 31/03/2017

(Amount in Rupees)

Particulars Sources Of Funds	Schedule	Current Year 2016-2017	Previous Year 2015-2016
Corpus / Capital Fund	1	2,219,237,325	2,001,032,664
Designated / Earmarked / Endowment Funds	2	5037,739,820	4,430,977,025
Current Liabilities And Provisions	3	17,542,178,179	16,439,253,455
Total (A)		24,799,155,324	22,871,263,144
Application Of Funds			
Fixed Assets			
Tangible Assets	4	4,659,928,405	4,526,051,619
Intangible Assets	4	9,992,253	0
Capital Works-In-Progress	4	8,438,147,545	7,706,544,970
Investments From Earmarked / Endowment Funds	5	41199481	40,268,320
Investments – Others	6	1,450,000,000	0
Current Assets	7	7,310,644,665	7,460,596,226
Loans, Advances And Deposits	8	2,889,242,975	3,137,802,009
Total (B)		24,799,155,324	22,871,263,144
Significant Accounting Policies	24		

Income & Expenditure For The Year Ended 31/03/2017

Particulars	Schedule	Current Year 2016-2017	Previous Year 2015-2016
Income			
Academic Receipts	9	711,957,810	717,136,565
Grants/Subsidies (Irrevocable Grants Received)	10	4,078,649,068	3,870,100,000
Income From Investments	11	970,569,812	714,313,987
Interest Earned	12	3,796,551	4,488,402
Other Income	13	462,683,450	395,641,249
Prior Period Income	14	0	1,696,198
Total (A)		6,227,656,691	5,703,376,401
Staff Payments And Benefits(Establishment Expenses)	15	4,032,202,018	3,883,341,837
Academic Expenses	16	948,247,898	880,524,349
Administrative And General Expenses	17	1,008,437,001	1,019,173,409
Transportation Expenses	18	3,942,011	3,551,999
Repairs & Maintenance	19	502,773,308	612,302,622
Finance Costs	20	581,539	769,454
Other Expenses (Write Off)	21	1,138,903	3,670,923
Transfer To Ircc Fund			109,240,600
Transfer To Donation Fund			101,664,207
Depreciation	4	561,571,100	362,928,822
Total (B)		7,058,893,777	6,977,168,221
Balance being excess of Income over Expenditure (A-B)		-831,237,086	-1,273,791,820
Adjusted from Capital Fund (Depreciation)		561,571,100	362,928,822
Adjusted from Capital Fund (Write off)		1,138,903	3,670,923
TRANSFER TO IRCC FUND		388,739,868	
Transfer to General Reserve – Main Account (I)		-779,393,557	-907,192,075
Transfer to General Reserve – Donation Fund (II)		122,126,605	
Transfer to / from Designated fund		0	0
Building Fund		0	0
Others(specify)		0	0
Balance Being Surplus/(Deficit) Carried To Corpus/Capital Fund (I+II)		-657,266,952	-907,192,075
Significant Accounting Policies	23		
Contingent Liabilities And Notes On Accounts	24		

Note: The Value of 779,393,557/- is arrived after adding deficit of Rs. 298,32,279/- (Non Plan Rs.7677457/- and Plan Recurring Rs. 22,154,822/-) & Rs. 749561278/- actuarial value in r/o Leave Encashment, Gratuity and Pension

Receipts And Payments For The Period From 01/04/2016 To 31/03/2017

Receipts	Amount In Rs	Payments	Amount In Rs
I Opening Balances		I Expenses	
a) Cash in hand	450,525	a) Establishment Expenses	2,611,953,029
b) Bank Balances		b) Academic Expenses	703,333,022
I. In Current Account	201,996,790	c) Administrative Expenses	795117020
II. In Deposit Account	0	d) Transportation Expenses	3,787,990
III. In Saving Account	404,061,274	e) Repairs and Maintenance	500,340,941
		f) Prior Period Expenses	0
II Grant Received		II Payment against Earmarked / Endowment Funds	5,067,796
a) From Government of India	4,445,000,000		
b) Grant in aid due in 2015-16 received in 2016-17	328,500,000		
c) From State Government	0		
d) From other sources	0		
III Academic Receipts		III Payment against Sponsored Projects / Schemes	1,210,419,118
a) Fees from Students	401,475,922		
b) Other Receipts from Students	107,684,576		
c) All India Entrance Examination Receipts	205,945,127		
IV Receipts against Earmarked / Endowment Fund	354,450,674	IV Payment against Sponsored Fellowships and Scholarship	135,066,401
V Receipts against Sponsored Projects / Schemes	3,308,736,492	V Investments and deposits made	
		a) Out of Earmarked / Endowment Fund	0
		b) Out of Own Funds	
VI Receipts against Sponsored Fellowships and Scholarship	122,864,347	VI Term deposits with Schedule Banks	7,046,184,355
VII Income on Investment from		VII Expenditure on Fixed Assets and Capital Work in Progress	
a) Earmarked / Endowment Fund	0	a) Fixed Assets	943,210,107
b) Other Investment	0	b) Work-in-progress	640,866,746

VIII Interest Received on		VIII Other Payment including Statutory Payments	0
a) Bank Deposits	660,829,753	a) Other Adjustable Account	969,822,945
b) Loans, Advances etc.	0		
c) Saving Bank accounts	0		
d) Accrued Interest	96,164		
IX Investment Encashed	5,233,197,328	IX Refund of Grants	0
X Term Deposits with Schedule Bank Encashed	0	X Deposits and Advances	
		a) Advances Account	376,496,198
		b) Refundable Deposits	163,369,797
		c) Recoverable Deposits	700,000
XI Other Income (Including Prior Period Income)		XI Other Payment	
a) Continuing Education Programme	6,092,481	a) Grant from other organizations	156,666,633
b) Miscellaneous Receipts	193,579,544	b) Sundry Creditors	137,632,532
c) Guest House Receipts	368,7639	c) Loan - Inter Department	280,000,000
		d) Surplus transfer to Endowment	0
		e) Other Payment – IRCC	1,487,296,775
		e) Other Payment – Donation	1,310,991
XII Deposits and Advances		XII Closing Balances	
a) Advances Account	173,965,724	a) Cash in hand	888,249
b) Refundable Deposits	111,558,390	b) Bank Balances	
c) Recoverable Deposits	1,550,000	I. In Current Account	162,228,555
		II. In Deposit Account	0
XIII Miscellaneous Receipts Including Statutory Receipts	0	III. In Saving Account	88,364,835
a) Other Adjustable Accounts	192,553,780		
XIV Any Other Receipts			
a) Grants from other Organisations	211,634,746		
b) Sundry Debtors	211,869,487		
c) Loan - Inter Department	726,000,000		
d) Other Receipt – IRCC	805,96,7954		
e) Other Receipt – Donation	6,375,319		
Total	18,420,124,035	Total	18,420,124,035



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