

# ANNUAL REPORT 2018-19



**IIT BOMBAY**







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# Director's Report



By  
*Prof. Subhasis Chaudhuri*  
*Director, IIT Bombay*  
(From: April 18, 2019)

Indian Institute of Technology Bombay (IIT 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 be ahead in the competitive professional environment.

In the recent past, IIT Bombay has raised the quality of its research and training to a greater height and now is focused on improving its research output further and to have more social engagements to help the country benefit in socially relevant problems.

IIT Bombay has moved up in the range from 141-150 last year to 111-120 this year in the Quacquarelli Symonds (QS) Graduate Employability Rankings 2020. The Institute stands among the top 24% in the 2020 QS Graduate Employability Rankings. On the national front, IIT Bombay stood second in the Atal Rankings of Institutions on Innovation (ARIIA) 2019 under the category of government-funded institutions.

IIT Bombay has started MTech in Education Technology, Masters in Public Planning and Policy and Masters in Urban Design and Engineering from the academic year 2019-20. The Institute has inducted the 5th batch of IITB-Olin School of Business Joint EMBA program recently (On October 8, 2019).

At its 57th Convocation, held on August 10, 2019, the Institute awarded 2407 degrees

(including 385 PhD degrees along with undergraduate and postgraduate degrees) to its students who have completed all their degree requirements during the current academic year.

Four of IIT Bombay faculty members have been inducted into the Fellowship of Indian National Academy of Engineering (INAE) in September 2019 – Prof. D. Manjunath and S. A. Khaparde, both from the Department of Electrical Engineering, Prof. Sachin Patwardhan, Department of Chemical Engineering and Prof. Supratik Chakrabarty, Department of Computer Science and Engineering. Two of our faculty members, Prof. Subimal Ghosh, Department of Civil Engineering and Prof. R. Sunoj, Department of Chemistry have been declared the winners of Shanti Swarup Bhatnagar Prize - 2019 by Director General, Council of Scientific and Industrial Research. (CSIR)

IIT Bombay has been awarded two Guinness World Records to its credit, one for the 'Largest environmental sustainability lesson' and the other for the 'Most people assembling solar lamps simultaneously'. Also we received the global grand prize of \$100,000 by IEEE Empower a Billion LIVES competition.

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.

## KEY FOCUS

- To instill among all the theme of excellence
- To improving its research output further and to have more social engagements to help the country benefit in socially relevant problems.





# Director's Report



By  
*Prof. Devang V. Khakhar*  
*Director, IIT Bombay*  
*(Upto April 17, 2019)*

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. The Ministry of Human Resource Development granted the status of Institution of Eminence (IoE) to IIT Bombay on July 9, 2018. IIT Bombay attracts the brightest students from the country for its Bachelor's, Master's and Doctoral programmes. The institute provides the cutting-edge education and ensures that its students are also of exceptionally high quality. IIT Bombay continues to be the most sought-after destination for undergraduate (UG) and postgraduate (PG) studies and attracts the top performers in national examinations such as GATE, CEED, NET, JAM and JEE. Among 23 IITs in the country, 47 out of top 50 rankers and 64 of top 100 rankers in JEE 2019 have joined IIT Bombay.

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 2018-19, a two-year Master's Programme in Education Technology was introduced. The 2-year program will cover some integral areas of study such as emerging educational technologies, research methods & statistics, designing learning environments, and adaptive learning.

With our theme - Research That Makes a Difference, IIT Bombay has been making concerted efforts to align its R&D focus with the national goal of achieving technological self-reliance. The R&D revenues for the financial year 2018-19 was Rs. 332.82 crores. There were 133 patent (including 97 Indian patents, 10 PCT, 6 US Patents, 1 (EU) Other foreign patent, 6 Trademark and 13 Design) applications filed during the year. The Institute

signed 50 MoUs with various universities and received governmental and ministerial delegations from countries across the globe for exploring areas of collaboration and co-operation.

The Institute has been able to attract outstanding faculty members from not just India but also other parts of the globe. The Institute has 667 faculty members on-rolls, many of whom are acknowledged globally 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 61 years of its existence, more than 57,500 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. The success of the Institute in diverse area is due to these efforts.

## 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



**Hon'ble Prime Minister of India Shri. Narendra Modi presenting degrees to the graduating students at the 56th Convocation**

IIT Bombay continues to make forays into newer territories pertinent to undergraduate and postgraduate education. At postgraduate level, a two-year Master's Programme in Education Technology has been introduced. The 2-year program will constitute (a) course work, covering some of the integral areas of study such as emerging educational technologies, research methods and statistics, designing learning environments, adaptive learning; (b) an 8-week long summer field work for a holistic perspective of various disciplines involved in the domain, and understand their interplay through practical experience, and also (c) a project work.

IIT Bombay continues to be a sought-after destination for UG and PG studies and attracts the top performers in national examinations such as GATE, CEED, UCEED, NET, JAM and JEE (ADV). Among 23 IITs in the country, 47 out of top 50 rankers and 64 of top 100 rankers in JEE 2019 have joined IIT Bombay. Similar trends are observed for the candidates qualifying in other entrance examinations as well.

At the 56th Convocation, a total of 2621\* degrees were awarded. These include 337\* PhDs, 54\* Dual Degree (MTech/MPhil+PhD) and 32\* Dual Degree (MSc+PhD), 7 MS (by Research), 6 Dual Degree (MSc+MTech), 2 Dual Degree (MSc+MPhil), 615 MTech, 63 MDes, 27 MPhil, 106 MMgt, 246 two-year MSc, 22\* EMBA, 25 five-year integrated MSc, 400 Dual Degree (BTech+MTech), 651 BTech Degrees, 14 BS, and 14 PGDIIT.

With an increase in undergraduate (UG) and postgraduate (PG) intake, the student population has undergone significant changes in the last 10 years. In 2007-08, the number of on-roll UG students was 2504 (45.46%) while the number of PG students was 3003 (54.53%) (Masters – 1652, PhD – 1351). This has changed to 3653 (43.88%) and 4671 (56.11%) for UG and PG students, respectively, in 2012-13. Presently, the Institute has about 10549 students of which 4330 (41%) are UG and 6219 (58.93%) are PG.

In order to continue imparting high-quality and holistic education to the much larger student population, the Institute continues

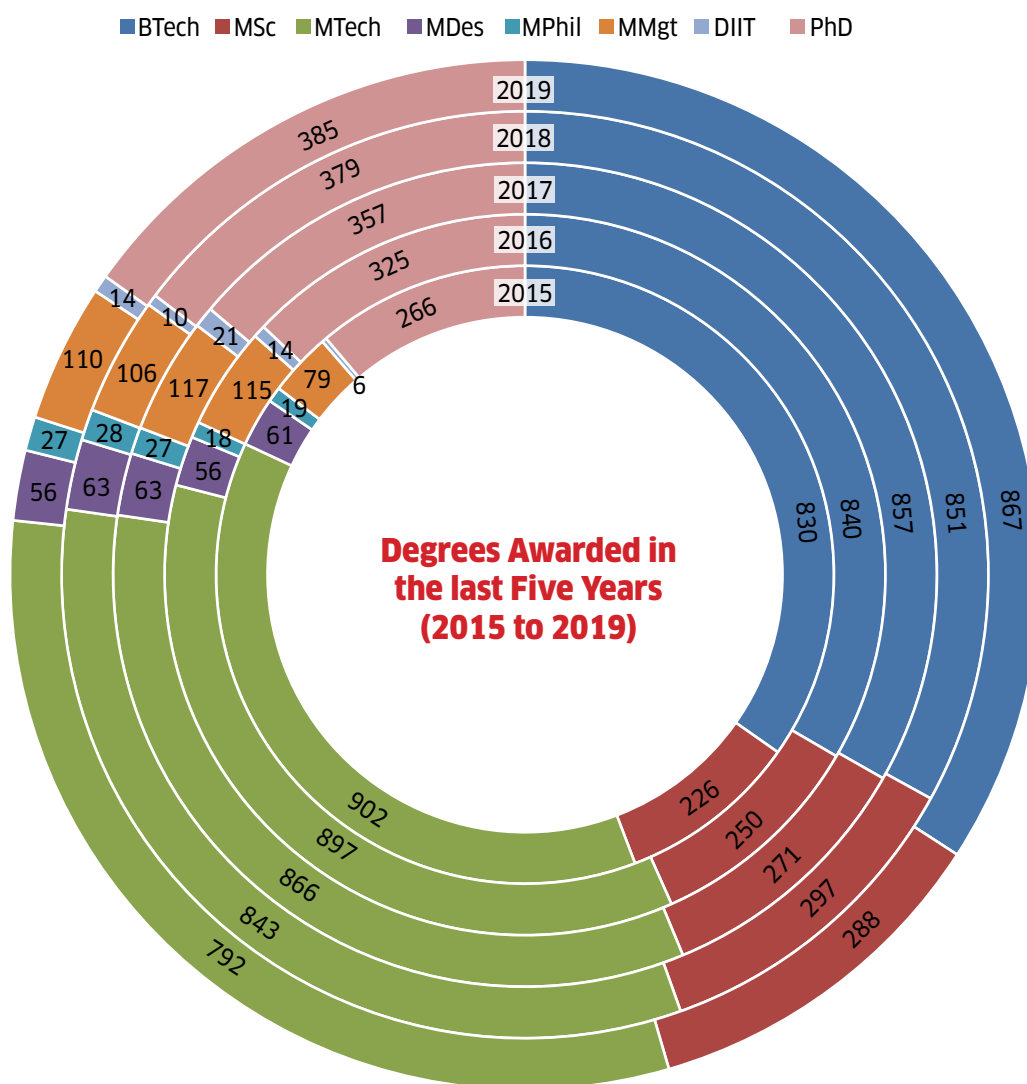
to modify and evolve processes which can effectively address the changing situations.

The PhD student strength has increased in leaps and bounds in the last 15 years. From 763 PhD students in 2002-03, the number has gone up to 2046 in 2012-13 and currently stands at about 3171.

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

380. A significant fraction of these are in the engineering discipline. All students involved in research at the Institute are given an opportunity to interact with research community at the national and international level by providing funds to attend international conferences. During the academic year 2018-19, 374 students were granted financial assistance for attending international conferences and an amount of Rs.4.3 Crores was utilised for this purpose.

### Degrees Awarded in the last Five Years (2015 to 2019)



Years	BTech	MSc	MTech	MDes	MPhil	MMgt	DIIT	PhD
2019	867	288	792	56	27	110	14	385
2018	851	297	843	63	28	106	10	379
2017	857	271	866	63	27	117	21	357
2016	840	250	897	56	18	115	14	325
2015	830	226	902	61	19	79	6	266
<b>Total</b>	<b>4245</b>	<b>1332</b>	<b>4300</b>	<b>299</b>	<b>119</b>	<b>527</b>	<b>65</b>	<b>1712</b>

# Research And Development Activities

Research and development activity at IIT Bombay has continued its rapid momentum. The receipts for R&D projects during FY 2018-19 is Rs. 362.08 crores.

IIT Bombay has stood second in the Atal Rankings of Institutions on Innovation Achievements (ARIIA) 2019 under the category of government-funded institutions. The ARIIA ranking was announced and winners were felicitated by the Hon'ble President of India Shri. Ram Nath Kovind on April 8, 2019 at a function held in New Delhi.

Atal Ranking of Institutions on Innovation Achievements (ARIIA) was initiated by the Ministry of Human Resource Development (MHRD), Government of India on August 30, 2018, to systematically rank all major higher educational institutions and universities in India on parameters related to "Innovation and Entrepreneurship Development" amongst students and faculties. The parameters used for consideration for ARIIA rankings include budget, facilities, awareness, entrepreneurship, commercialization, learning methods and governance.



Certificate awarded by MHRD for Atal Ranking of Institutions on Innovation Achievements (ARIIA) Ranking 2019

## 1. R&D Activities

During the year 2018-19, new R&D projects were initiated in all 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).

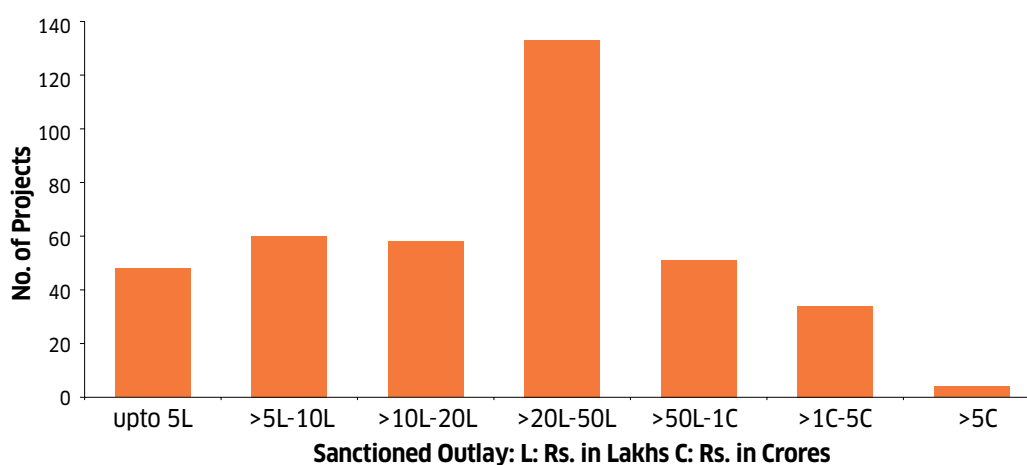
**Table 1: Information on new projects sanctioned during last 3 years**

Year	Sponsored Projects		Consultancy Projects	
	Number	Sanctioned outlay (Rs. in crores)	Number	Project outlay (Rs. in Crores)
2018-19	388	214.6	745	104.16*
2017-18	303	186.1	703	64.70
2016-17	297	499.3	627	60.5

\* includes GST for Indian party/ clients

For the sponsored projects, the sanctioned outlay during FY 2018-19 ranges from few lakhs (in Rs.) to 25 crores and the distribution of outlay ranges is shown in the Figure 1.

**Figure 1: Distribution of sponsored projects - sanctioned outlay ranges**



#### a) External grants for R&D

The total money received for R&D activity in FY 2018-19 was Rs. 332.82 crores (Table 2). This includes grants received in the year for new projects sanctioned and ongoing projects.

**Table 2: Money received for R&D in 2018-19**

Project Type	Number Funds received (Rs. in crores)
Sponsored Projects	286.50
Consultancy Projects	70.93
Royalty	2.49
Equipment usage	2.16
Total	362.08

#### Some of the Major Sponsored Projects Initiated

- Nanoelectronics network for research and application**  
Sanctioned outlay: Rs. 24.8 crores over four years  
Funding agency: Ministry of Electronics and Information Technology
- Flexible perovskite solar cells and intermediate module**  
Sanctioned outlay: Rs. 8.30 crores over four years  
Funding agency: Ministry of New and Renewable Energy



- **Water Innovation Center: Technology Research & Technology**  
Sanctioned outlay: Rs. 4.4 crores over four years  
Funding agency: Department of Science and Technology
- **Saturation and permeability of gas hydrates in simulated reservoir conditions**  
Sanctioned outlay: Rs. 5.08 crores over two years  
Funding agency: Gas Hydrate Research & Technology Centre, Oil and Natural Gas Corporation
- **Self-Administered microneedle technologies for intradermal sustained depot delivery of contraceptives**  
Sanctioned outlay: Rs. 4.69 crores over two years  
Funding agency: Bill and Melinda Gates Foundation, USA
- **Application of spoken tutorials under NMEICT Phase II**  
Sanctioned outlay: Rs. 4.28 crores over two years  
Funding agency: Ministry of Human Resource Development
- **Visualizing data through animation and illustrated stories**  
Sanctioned outlay: Rs. 3.46 crores over two years  
Funding agency: UK Arts and Humanities Research Council and Medical Research Council, UK
- **Creating livelihood in Jawhar & Mokhada, Palghar, Maharashtra**  
Sanctioned outlay: Rs. 3 crores over three years  
Funding agency: Ministry of Tribal Affairs
- **Manufacturing of Gas Turbine engine components by diffusion bonding and super plastic forming process**  
Sanctioned outlay: Rs. 2.99 crores over three years  
Funding agency: Aeronautics Research & Development Board

In addition, Government of India has continued to sanction more projects under the schemes called **IMPacting Research INnovation and Technology (IMPRINT)** and **Uchhatar Avishkar Yojana (UAY)** focussing research to solve major engineering and technology challenges in selective domains including manufacturing industry needed by the country. Thus it aims to enable, empower and embolden the nation for inclusive growth and self-reliance. Under IMPRINT-II scheme, a project in the area of Nano Technology is jointly funded by Science and Engineering Research Board, Department of Science and Technology and Sanrachana Structural Strengthening Pvt. Ltd. with an outlay of Rs. 1.34 crores over three years. Under UAY scheme, a project in the manufacturing area was jointly funded by Ministry of Human Resource Development and GE India Industrial Private Limited with an outlay of Rs. 2.74 crores over three years.

#### **Scheme for Promotion of Academic and Research Collaboration (SPARC) Projects:**

The Ministry of Human Resource Development (MHRD) initiated new scheme called ‘Scheme for Promotion of Academic and Research Collaboration (SPARC)’. It aims at improving the research ecosystem of India’s higher educational Institutions by facilitating academic and research collaborations between Indian Institutions and the best institutions in the world to jointly solve problems of national and/ or international relevance. The scheme proposes to enable productive academic cooperation by supporting the following critical components that can catalyze impact making research, namely:

- Visits and long-term stay of top international faculty/ researchers in Indian institutions to pursue teaching and research
- Visits by Indian students for training and experimentation in premier laboratories worldwide
- Joint development of niche courses, world-class books and monographs, translatable patents, demonstrable technologies or action research outcomes and products
- Consolidation of bilateral cooperation through academic and research partnerships through workshops in India
- Publication, dissemination and visibility through a high-profile annual International Conference in India

The expected outcomes include tangible results in terms of large quantity of high-quality research publications, solution to key national and international problems, development of niche courses, high-quality text books and research monographs, imbibing of best practices from top international academicians and researchers, strong bilateral cooperation and improved world reputation and ranking of Indian institutions.

MHRD approved 12 project proposals submitted by faculty members from the Institute under this scheme with a total outlay of ~Rs.7 crores spread over 2 years. Amongst them, 8 projects received funds during FY 2018-19. During these interactions, IIT Bombay researchers (faculty and students) will collaborate with their counterpart from universities located in United Kingdom, USA, Canada, Australia and Germany.

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

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

**Some typical/ representative consultancy projects initiated during this year:**

- Alleviation of voltage sag
- Climate resilient design for MGNREGA works
- Demonstration of Gensets Engine Fluid Coolers using Panel Heat Exchanger
- Design of multipurpose Cyclone Shelters for Disaster Management Activities in Odisha
- Developing Assessment Tools for Recruitment in Industry
- Development of Advanced Semiclassical Transport Module
- Development of Automation Systems for MIDC Water Supply Scheme
- Development of Base Station Antennas & Broadband Antenna for Handheld Applications
- Development of High-Speed Micromachining Centre
- Feasibility analysis of Micro-Hemispherical Resonator Gyroscope Fabrication in Silicon
- Food processing- Process Optimization
- Microstructure study of Bupivacaine and Amphotericin B
- Modification & strengthening of existing Cargo Berths at Deen Dayal Port Trust, Gujarat
- Multi-objective reinforcement learning for Drilling Optimization
- Nitrogen recovery study
- Pectin extraction and Purification
- Performance analysis of Smart Network Stack
- Process Improvements in Manufacture of Excel Fibre

- Redesigning of Retail Visual Identity Elements of retail outlets and supply locations
- Road safety audit
- Simulation of Fatty Alcohol Hydrogenator Reactor
- Study of Geotechnical and Geological issues in Mumbai-Ahmedabad High Speed Rail Project
- Study on Network Applications Platform (Open R) enhancements for Terragraph
- Synthesis of Next Generation Precursors for Metal Atomic Layer Deposition and Electroplating
- Technology, Product and Market Strategies for Powertrain Controls
- Topographic and Bathymetric survey of Hatnur Dam upstream

#### **b) Internal grants for R&D**

The Institute provided internal funding for supporting faculty research and student activities. Around Rs. 22 crores were sanctioned for these activities which included the following:

- Seed grant for initiation of research for new faculty
- Augmenting research facilities and maintenance of central and national research facilities
- Augmenting Research resources of faculty recipients of Research Publication Award, Impactful Research Award, Research Dissemination Award and Early Research Achiever Award
- Leverage Grants and Bridge Grants
- Research Internships and Fellowships for PhD Students
- Student Research/ Competition/ Event: Projects such as ADVITIY-2nd Student Satellite project, Autonomous Underwater Vehicle (Matsya)-IIT Bombay, Exoskeleton for Flight (Exofly), IIT Bombay Racing, International Aerial Robotics Competition, Mahindra Rise Driverless Car Challenge, Mars Rover, Robocon AUB Asia Pacific Robot Contest, Student Design Competition-2019 (American Society of Mechanical Engineers) and Team Shunya

#### **c) R&D Awards grants from External Agencies**

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

##### **Council of Scientific and Industrial Research awarded**

- Shanti Swarup Bhatnagar Prize for Science and Technology in Engineering Sciences (two awardees)

##### **Department of Science and Technology awarded**

- J.C. Bose Fellowship in Chemistry & Mathematics
- Faculty Innovation in Science Pursuit for Inspired Research (INSPIRE) grant in Environmental Science & Engineering, Electrical Engineering and Physics
- Swarnajayanti Fellowship in Life Science, Earth & Atmospheric Sciences and Engineering Science
- Ramanujan Fellowship Awards in Metallurgical Engineering & Physics

##### **Indian National Academy of Engineering**

- Abdul Kalam Technology Innovation National Fellowship for Translational Research in Engineering



### **Qualcomm India Pvt. Ltd.**

- Qualcomm Innovation Fellowship India 2018 in the area of Underwater Image Processing

## **2. Licensing Activities**

### **a) Entrepreneurship: (4)**

Rights to technology/ Intellectual Property (4 nos.) created in the Institute were given to researchers for incubation/ entrepreneurship activity in SINE/ elsewhere include:

- ImmunoACT Pvt. Ltd.
- NeelAgil technologies Pvt. Ltd.
- Virya Batteries Pvt. Ltd.
- Heatonics Biotech Pvt. Ltd; C-Camp, Bengaluru

### **b) Technology transfers: (11)**

Royalties for different IP licensed in the past continued to be received and some technologies were licensed in this year. These (11 IPs) are:

- Cool Roof Coating Technology
- Fuel Additives for Improving Efficiency
- Hindi Morphological Analyser
- Hum Chitra Banatahai
- OptiPX-Software for Bid Matching in Power Exchange
- Software for Forecasting Load (Web STLF)
- Solar Air Heater for Organic Waste Composter
- Transport cross connect switch-720 Gbps
- Tube Heat Exchangers
- Waste Water Vapourizer Technology
- Web based software for Transmission Usage Cost and Loss Allocation (WebNetUse)

## **3. Dissemination/ Outreach Activities**

### **a) TEDxIITBombay Programme**

A TEDxIITBombay event under the category 'University Event' was organized on January 19, 2019 at the Institute as part of the Institute's 'Diamond Jubilee' celebrations with the theme 'Science (f)or People'. Following 6 speakers spoke ~16 Minutes each on a variety of subjects varying from education to health to social entrepreneurship to science:



- Prof. N. B. Ballal (Faculty, Metallurgical Engineering and Materials Science)
- Prof. Milind Sohoni (Faculty, Computer Science and Engineering)
- Dr. Sheetal Kale (Chief Medical Officer, IIT Bombay Hospital)
- Ms. Suhani Mohan (Alumna, Metallurgical Engineering and Materials Science)
- Ms. Chandni Rajendran (Alumna, IDC School of Design)
- Mr. Tejas Kotwal (Student, Mathematics)

The talks can be viewed at [www.ted.com/tedx/events/31640](http://www.ted.com/tedx/events/31640):

The event was attended by Institute functionaries, faculty members and students. The curation committee included Prof. M. P. Gururajan, Prof. Rohit Manchanda, Prof. Rakesh Mote, Prof. Purushottam Kulkarni, Prof. Sudesh Balan and Prof. Kavi Arya. Prof. Sudesh Balan also managed the production. Organiser of the event was Ms. Rusheeda Rajamohanan, Office of the Dean (R&D).

#### **b) India Intellectual Property Convention**

IIT Bombay participated in the Research and Development (R&D) exhibition organised by the Confederation of Indian Industry (CII) and the Department of Industrial Policy and Promotion, Ministry of Commerce and Industry, Government of India in conjunction with the 'India Intellectual Property Convention' on April 26, 2018 at Hotel Le-Meridien, New Delhi. This convention was organised on the occasion of World Intellectual Property Day, aimed to showcase India's Intellectual Property (IP) prowess to the global community. The convention had focused sessions on case study presentations of IP creators and owners, IP administrators, IP legal service providers, IP enforcers and IP educators. Also had a session on IP challenges and opportunities for women in India. The Convention was attended by professionals concerned with IP - academicians, legal and enforcement officials. The event was inaugurated by former Hon'ble Justice Arjan Kumar Sikri, Supreme Court of India and the concluding address was given by Mr. Suresh Prabhu, former Hon'ble Minister of Commerce and Industry, Government of

India. IIT Bombay exhibited posters (digital) and videos giving a glimpse of the R&D activities at IIT Bombay and IPs developed in the Institute. 'R&D Highlights', 'Partner with Us', 'Glimpses of Research' were distributed to visitors for information. IIT Bombay stall attracted a good number of participants.

#### **c) Global Exhibition on Services**

IIT Bombay participated in the Research and Development (R&D) exhibition '4th Global Exhibition on Services (GES)' organised by the Department of Commerce, Ministry of Commerce & Industry, Government of India, in association with the Government of Maharashtra, Services Export Promotion Council (SEPC) and Confederation of Indian Industry (CII). GES was held at the Bombay Exhibition Centre, Goregaon (East), Mumbai during May 15-18, 2018. The fourth edition of GES showcased 22 sectors such as IT, Telecom, Banking and Financial Services, Education, Environment Healthcare, Yoga and Wellness, Skilling, Logistics and Tourism and Hospitality. IIT Bombay was part of the focused pavilion on educational services. The event was inaugurated by Hon'ble President of India Shri. Ram Nath Kovind on May 15, 2018 in the presence of Shri. CH. Vidyasagar Rao, former Hon'ble Governor of Maharashtra, Mr. Suresh Prabhu, former Hon'ble Minister of Commerce & Industry, Government of India, Mr. Devendra Fadnavis, former Hon'ble Chief Minister of Maharashtra and other dignitaries. Over 600 exhibitors across the world and about 500 foreign participants from 100 countries participated in the event. About 50,000 visitors from trade organisations, industry, government and general public, from both India and abroad, visited the exhibition.

IIT Bombay exhibited posters giving a glimpse of the R&D activities at IIT Bombay, academic programmes, industry interactions and technology transfers. It also displayed posters on technologies developed in the Institute and Institute videos. R&D brochures were distributed to visitors for information dissemination. IIT Bombay stall attracted an overwhelming response and posters/ brochures were very well received.



**IIT Bombay's display at the Global Exhibition on Services**

#### **d) R&D Exhibition on Idea and Innovation**

Institute organised R&D exhibition displaying some of the research and development

activities carried out at IIT Bombay on August 11, 2018 (Convocation Day) in the campus. The exhibition displayed 23 products and prototypes by the seven research teams in the areas of design, energy, environment and healthcare, information and communication technologies, manufacturing and security. Five SINE incubated companies also displayed their products. Four models and prototypes developed by student technical teams were also displayed. Also R&D booklets and videos were displayed and distributed to visitors.

Hon'ble Prime Minister Shri. Narendra Modi visited the exhibition. Some of the other dignitaries visited included Shri. CH. Vidyasagar Rao, former Hon'ble Governor of Maharashtra, Mr. Prakash Javadekar, Hon'ble Ex-Minister of Human Resource Development, Government of India, Mr. Devendra Fadnavis, former Hon'ble Chief Minister of Maharashtra among others.



**IIT Bombay team at the exhibition during Hon'ble Prime Minister's visit on August 11, 2018**

#### **Products exhibited included following:**

- ECR routers – 2 ECR1000 and 4ECR1010 along with single ECR100
- One SDN router with 8 cards, fiber, SFP+ and patch panels / cords
- RAM mounting tray
- Prosthetic limb
- Type3 Body Armour
- Handheld Explosive Detector
- TouchHB™: Non invasive Haemoglobin Detection
- Ucheck™: Portable Urine Analyzer





**IIT Bombay students at the exhibition during Hon'ble Prime Minister's visit on August 11, 2018**

- Sync™: Glucometer and Affordable Strips
- Smart Stethoscope: For Remote Auscultation and Visualization
- Laparoscopy Instrument: for Complex Abdominal Surgeries
- Prosthetic Leg: For Improved Fit and Function (Walking Gait)
- Custom Medical Devices: for Accurate Maxillofacial Surgeries
- Portable Sodium Potassium Detection: Electrofinder
- Lateral Flow Assay for Tuberculosis
- UridSa™: Portable Albumin Creatinine Ratio Analyser
- HemeSense™: Portable Hemoglobinometer Vein Tracer
- Ultra-safe Li-ion / Li-Po Batteries
- Low cost Ferrite based submersible BLDC motor for PV water pumps
- Rooftop transformer less Grid connected inverter system with battery Storage and GAN based convertor
- Wind Augmentation PurifYing Unit (WAYU)
- Post Box for Indian Postal Services
- Cilika Smartphone Microscope
- Incubated company: MedPrime Technologies
- Netra PRO
- Incubated company: ideaForge Technology
- h2e Mini – 50 kg – 100 W solid oxide Fuel Cell System
- Incubated company: H2E Power Systems
- Braille me
- Incubated company: Inceptor Technologies (Innovision)
- Fetal heart monitor & Care mother kit
- Incubated company: CareNx Innovations
- Pratham: Satellite launched by ISRO
- ADVITIY: Satellite
- Mars Rover: 6-wheel mobility system for Sub-system Integration
- Matsya 4.0: Autonomous Underwater Vehicle



**IIT Bombay's stall at FISITA 2018 World Automotive Congress**

#### **e) FISITA 2018 World Automotive Congress**

IIT Bombay participated in the R&D Exhibition of 37th FISITA 2018 World Automotive Congress held at Chennai Trade Centre during October 2-5, 2018 hosted by the Society of Automotive Engineers India (SAEINDIA). The conference-cum-exhibition was focussed on the theme 'Disruptive technologies for affordable and sustainable mobility'. Significant research and discoveries in subjects like powertrain and emissions, fuels and lubricants and vehicle concepts were discussed and related products were displayed during this conclave. The conference was featured by international leaders and experts such as Prof. Helmut List, Mr. Dan Nicholson, Dr. Asim Eskandarian, Dr. Anand Gopalan, Dr. Sumantran, Mr. Greg Moran, Mr. Eric Schaeffer and Dr. Frank Zhao to name a few. Over 200 plus exhibitors across the world had showcased products and excellence in services. IIT Bombay exhibited posters giving a glimpse of the R&D activities at IIT Bombay, industry interactions and technology transfers. It also displayed posters on technologies developed in the Institute and Institute videos. R&D brochures were distributed to visitors for information dissemination. IIT Bombay stall attracted an overwhelming response and posters/brochures were very well received. IRCC staff interacted with visitors on all four days giving information about the exhibits, potential applications and answering other queries.

#### **f) International Engineering Sourcing Show - VIII**

IIT Bombay participated in the International Engineering Sourcing Show (IESS)– 8th edition organised by the Engineering Export Promotion Council, Ministry of Commerce and Industry at the Chennai Trade Centre, Chennai from March 14-16, 2019. The event had Malaysia as the Partner country. The event was inaugurated by Dr. Anup Wadhawan, Commerce Secretary, Government of India and Ms. Datuk K. Talagavathi, Deputy Secretary General, Ministry of International Trade and Industry, Government of Malaysia. The theme of the show was 'Smart Engineering', with Innovation and Technology; Industrial and Electrical Machinery; Future Factory; and Subcontracting as the four broad product groups. Future Factory included Industrial Internet of Things and Smart Factory Design as sub-groups. The event had an exclusive Technology and Innovation Pavilion where IIT Bombay, IIT Madras, IIT Ropar and other research institutions participated and showcased 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 exhibited general posters giving a glimpse of the R&D activities at IIT Bombay, Academic Programmes, Industry Interactions, Tech Transfers, etc.; posters on technologies developed in the Institute; and IIT Bombay videos. R&D Brochures were distributed to visitors for information dissemination. The stall attracted an overwhelming response mostly from R&D personnel and the posters/brochures were very well received.





**IIT Bombay team demonstrating project work during TechConnect 2018**

#### **g) TechConnect 2018**

‘TechConnect 2018’ was organised during Techfest event held at Institute between December 14-16, 2018 to showcase R&D exhibits (155 exhibits - working models, demonstrations, products and posters) from 18 academic units. The event was inaugurated by Prof. Devang V. Khakhar, former Director, IIT Bombay. Stalls from the Office of Dean (R&D) and Academic Office exhibited posters on technology development and distributed respective brochures to visitors. The event attracted very large footfalls of students and general public. Main organisers of this event were Prof. Suryanarayana Doolla, Department of Energy Science and Engineering and Prof. Chandra Sekher Yerramalli, Department of Aerospace Engineering (Faculty Coordinators), Mr. Prathamesh Sagare (Overall Student Coordinator) and Dr. V. Arumugam (IRCC Coordinator).

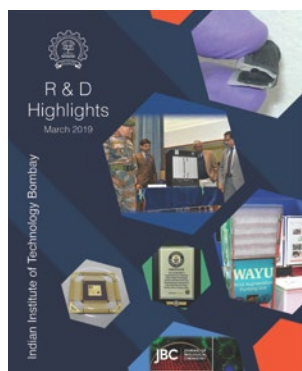
#### **h) Publications of Booklets:**

Brochures titled ‘R&D Highlights’, ‘PARTNER WITH US’ highlighting the

possible modes of interactions between IIT Bombay and Industry and ‘Innovations licensed to industry’ high lighting some technologies and products developed and deployed were updated.

New booklets titled ‘Research Bytes and Research Snapshots’ were published, disseminating some of the outcomes of R&D efforts undertaken at IIT Bombay. Research Bytes is a compilation of 50 research articles that provide a gist and flavour of R&D output of the Institute. Research snapshots contains web links (QR codes) which directs the reader to the online version of the article and enable sharing on personal digital device. The effort will felicitate wide circulation of research articles to public at large. It was released by Dr. Akshay Bellare, India Leader & Vice President and General Manager, Honeywell Technology Solutions Lab. Pvt. Ltd., Bengaluru on National Education Day function held on November 12, 2018 in the Institute.

These brochures were distributed in various industrial forums like India Intellectual



**Cover pages of R&D publications**



**Institute functionaries, faculty, staff and participants at the inauguration of TechConnect 2018**

Property Convention, Global Exhibition on Services, FISITA 2018 World Automotive Congress, R&D Exhibition on Idea & Innovation, International Engineering Sourcing Show – VIII, TechConnect 2018 as well as to visitors of the Institute to disseminate information on R&D activities and industry interactions of the Institute.

#### **4) Augmentation of Research Infrastructure**

As part of creating and upgrading infrastructure for enabling R&D, the Institute has approved procurement of the following major state-of-the-art equipment and infrastructure support facility:

- Advanced Rheometer Facility
- Behavioural Lab
- Bi-axial Testing Machine including Electromagnets
- Eddy current dynamometer, Gaseous emission analyse and Combustion analysis instrument



**(L to R) Prof. Devang Khakhar, former Director, IIT Bombay, Chief Guest Dr. Akshay Bellare, Honeywell Technology Solutions India, Prof. P.V. Balaji, former Dean (R&D) and Prof. Anil Kulkarni, former Asso. Dean (R&D) during the release of 'Research Bytes' Brochure.**



- Inductively Coupled Plasma-Optical Emission Spectrometer (ICP-OES) Facility & upgradation of Geochemistry Lab
- In-flight earthquake actuator with accessories for large beam centrifuge facility
- Liquid Nitrogen Plant
- Micro-X-Ray Fluorescence
- Multi-material 3D Printing facility
- Multiplexed Quantitative Imaging Cell Analysis System (Incucyte)
- NMR-400 MHz facility
- Repetitive Transcranial Magnetic stimulation setup
- Three-axis angular motion simulator
- UHV sputter deposition system, Dipstick system and Wire bonder
- Ultra High Performance Liquid Chromatography Tandem Mass Spectrometry with Quadrupole and Orbitrap Mass Analyzer
- Upgradation of existing Laser Scanning & Spinning Disc Confocal Microscope facility with accessories
- Vertical tube furnace setup
- Vibration spectroscopy for Quasi-Particle interaction

In addition, several equipment and facilities were procured from external grants.

## 5) Intellectual Property (IP) Protection Activities

During the year, 133 intellectual properties (patent, Trademark, etc) applications were filed. A list of all Indian and international IPR filings and granted is given in Table 4.

**Table 4: Patents & other IPR Applications filed & granted during 2018-19**

IP type	Applications filed (No.)	Granted (No.)
Indian Patent	<b>97</b>	<b>20</b>
PCT	<b>10</b>	-
US Patent	<b>6</b>	<b>15</b>
Other foreign patent (EU)	<b>1 (EU)</b>	<b>1 (Korean)</b>
Trademark	<b>6</b>	<b>8</b>
Copyright	<b>13</b>	<b>1</b>
Design	<b>1</b>	<b>3</b>

### Areas of IP filings:

Biochemistry for therapeutic treatment, Biocompostible packaging, Biomedical devices, Chemical process, Chemistry and chemical, Combustor, IOT, Membranes, Microfluidics, Multilevel Converter, Network Provider, Photovoltaics, Point of Care Devices, Polymer Technology, Sealant, Sensors, Waste control, Water Technology etc.

As in the previous year, pro-active efforts were taken to assess the possibility of intellectual property in the work of MTech/ Dual degree student to file for possible protection. Out of 807 reviewed abstracts, 42 were shortlisted for a possible filing of patent applications and filing process is ongoing.

Proactive efforts continued for licensing of these technologies, products and designs.

Nearly 100 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, organizations, universities and government, both national and international.



## 6) Awards for IP and R&D Activity:

### i) Clarivate Analytics India Innovation Awards 2018



Prof. A. K. Suresh, Deputy Director (Academic and Infrastructural Affairs) receiving 'Top Innovator in the Academic Institution category for the year 2018' award on behalf of IIT Bombay at a ceremony held on May 16, 2018 in Bengaluru

The Institute was awarded top Innovator in the Academic Institution category for the year 2018 by Clarivate Analytics (formerly the Intellectual Property and Science division of Thomson Reuters) for its spirit of innovation in R&D for its highest number of unique patent families published during 2015-17. 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 12 Indian Innovators as the award winners based on various patent metrics – volume, grant success rate, extent of globalization and Influence of innovation (citations).

### ii) SoULS team won National Solar Chulha Challenge

IIT Bombay's Solar Urja Lamps (SoULS) team won the first prize in the National Solar Chulha Challenge conducted by Oil and Natural Gas Corporation (ONGC). The ONGC Solar Chulha Challenge was aimed at developing cost effective and efficient solar powered stove system in line with the vision of the Hon'ble Prime Minister to touch people's lives by providing them safe and low-cost alternative for clean household cooking. The team was led by Prof. Chetan Singh Solanki (DESE) and Prof. Jayendran Venkateswaran (IEOR). The prize carries a cash award of Rs. 10 lakhs and an additional support to make 1000 solar chulhas. The award was presented by Mr. Dharmendra Pradhan, Hon'ble Minister of Petroleum and Natural Gas and Skill Development and Entrepreneurship, Government of India on April 24, 2018 at New Delhi.



SoULS team of IIT Bombay receiving first prize in national level Solar Chulha Challenge conducted by ONGC

### iii) mBillionth South Asia Award

Prof. Ravi Poovaiah, IDC School of Design and team won mBillionth South Asia Award 2018 for Jellow communicator under the category 'Inclusion and Empowerment'. mBillionth Awards is a platform established by Digital Empowerment Foundation to identify, recognise and felicitate mobile-based initiatives that are striving to facilitate and enhance communities. The award was selected based on its social impact, user friendliness, usability, user experience, among others. The award was given on October 3, 2018 at New Delhi.



Jellow Communication System created by Prof. Ravi Poovaiah (Inset) and his team from IDC School of Design won the prestigious 'mBillionth South Asia Award' for Inclusion and Empowerment

## 7) Focussed Initiatives

Initiatives were taken to promote and facilitate research and development work and encourage students to focus on research and development. Some highlights are given below:

### a) Enhancing Industry Partnership

The Institute continued its efforts to enhance its interaction with industry. Visits by industries 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 signed to establish a formal association.

Around 300 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 and/ or approached Institute to explore research collaborations include:

ACG Pharma, Aditya Imaging Information Technologies, AGD Biomedicals, Analog Devices, Applied Materials, BASF Chemicals, Bharat Electronics Ltd. (BEL), Bharat Forge, BHGE, BPCL, British Petroleum, Bureau of Indian Standards (BIS), Crompton Greaves, Dassault Systems, ERM, Ernst and Young, Facebook, GAIL, Godrej & Boyce, Golcha Group, Google, Greenleaf Airconditioning Services - UAE, Grintex India, Gujarat Power Corporation Ltd., HAL, Henkel Adhesive Technologies, Hershey India, Hilti, Hindustan Coca Cola Beverages, Honeywell Technology Solutions, HPCL, IBM, Infosys, Intel, IOCL, J&J, JSW Steel, Karamtara Engg., Kirloskar Pneumatic Company, L&T, LIC, Mercedes Benz, NEC

Technologies, NRB Bearings, Oil India Ltd., ONGC, Puretronics, QualiSoft Technologies, Reliance Infrastructure, Reliance Jio Infocomm, Rises Analytics Solutions, Samta Foundation, Samta Mines & Minerals, Sanofi-Synthélabo, SBI, Semiconductor Research Corporation, Siemens, Sun Pharma, Suzlon, TATA Chemicals, TATA Consultancy Services, TATA Consulting Engineers, TATA Motors, Torrent Pharmaceuticals, Tyromer, Ubisoft Entertainment India, Vedanta, Viacom18 Media, Virgin Hyperloop One, Waman Hari Pethe Sons, Whiterabbit.ai and etc.

#### **b. Institute Ethics Committee (IEC)**

Institute Ethics committee has reviewed 51 proposals during the year. Out of these, 30 proposals have been approved and the remaining are currently under review.

To efficiently review proposals involving human participation (for varied nature of research and varying degree to risk, duration of projects etc.), the Institute is in the process of streamlining process of ethical review. For this purpose, Institute has set up two committees to (i) define optimal workflow of IEC (ii) take up regulatory consultants to advise IIT Bombay to proceed as per regulatory compliances.

#### **c. Healthcare Consortium**

The consortia partners continue to interact on one-on-one basis to carry out multi-disciplinary research.

### **8. Incentives for R&D**

IIT Bombay Research and Consultancy awards were instituted at the Institute in the year 2004 by the Institute to encourage and recognise the outstanding research and consultancy works carried out by its faculty members. These awards are now called as:

- a) IIT Bombay Research Publication Award
- b) IIT Bombay Impactful Research Award
- c) IIT Bombay Research Dissemination Award
- d) IIT Bombay Early Research Achiever Award



The winners of these awards are as follows:

Award Name	Names of Award Recipients
<b>Research Publication Award</b>	<b>Prof. Gopalan Rajaraman</b> , Department of Chemistry <b>Prof. Subimal Ghosh</b> , Department of Civil Engineering <b>Prof. Supratik Chakraborty</b> , Department of Computer Science and Engineering <b>Prof. Saurabh Lodha</b> , Department of Electrical Engineering <b>Prof. Asmita Mukherjee</b> Department of Physics
<b>Impactful Research Award</b>	<b>Prof. C. Subramaniam</b> , Department of Chemistry <b>Prof. Ganesh Ramakrishnan and Prof Parag Chaudhuri</b> , Department of Computer Science and Engineering <b>Prof. Rahul J. Patil</b> , Shailesh J. Mehta School of Management
<b>Research Dissemination Award</b>	<b>Prof. Vivek Agarwal</b> Department of Electrical Engineering <b>Prof. Ramasubramanian K.</b> , Department of Humanities and Social Sciences
<b>Early Research Achiever Award</b>	<b>Prof. Chandra M. R. Volla</b> , Department of Chemistry <b>Prof. Siddhartha Chaudhuri</b> , Department of Computer Science and Engineering <b>Prof. B. Krishna Das</b> , Department of Mathematics <b>Prof. Sourav Pal</b> , Department of Mathematics

#### Prof. Krithi Ramamritham Award for creative research

The Prof. Krithi Ramamritham Award for creative research was instituted in 2016 at IIT Bombay by Prof. Jayant Ramaswamy Haritsa, Indian Institute of Science, Bengaluru. This is awarded for highly creative and original research contribution made primarily at IIT Bombay by a faculty member in any engineering discipline. The award is intended to be given for a specific accomplishment and not for cumulative career performance. The award carries a citation and a cash incentive of Rs. 1,00,000 (Rupees one lakh). Prof. Krithi Ramamritham Award for creative research for the year 2017 was awarded to Prof. Pradeep R. Nair, Department of Computer Science and Engineering in recognition of his significant research contributions in the area of 'Predictive modeling of Perovskite solar cells'.



Winners of Research Publications and other awards along with guest

Also, rewards for research excellence, technology development and transfer efforts, were given during the year and the winners are as follows:

Award Name	Names of Award Recipients
<b>S.C. Bhattacharya Award for Excellence in Pure Sciences</b>	<b>Prof. M. Ravikanth,</b> Department of Chemistry
<b>H.H. Mathur Award for Excellence in Applied Science</b>	<b>Prof. Ashwin Gumaste,</b> Department of Computer Science and Engineering
<b>Dr. P.K. Patwardhan Technology Development Award</b>	<b>Prof. Udayan Ganguly and his team</b> Department of Electrical Engineering

The award recognition included cash awards, research grants and arranging Institute-wide dissemination through lectures and electronic media.

#### Research Internship awards:

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 subjective to them not getting any support from parent organization/ government (MHRD).

- No. of applications received: 418
- No. of Intern selected: 81
- No. of Intern joined: 64
- Other contingency expenditure per intern: Rs. 50,000/
- Poster presentation: 62 Interns showcased their research work on May 3, 2019 at VMCC.

### 9. Dissemination/ Outreach for IIT Bombay Academic Community

Workshop on Central facilities was held on February 28, 2019 and March 1, 2019 to disseminate information about the central facility (CF) - capability, usage and research output to the academic community. Conveners of thirty nine central facilities made presentations on technical specification, capability, types of experiments carried out and the usage. About 120 faculty members and students attended the workshop. Parallel Poster presentations were held showcasing the detailed research output (technical) obtained from the facility by the students.

Lectures by domain experts (faculty members from Institute) on the work of **Winners of the Nobel Prize 2018** were organised at the Institute on October 31, 2018. A large number of faculty members and students attended the lectures.

Two **Workshops on ‘Intellectual Property (IP) and its management’** were organised for faculty, students and staff of the Institute. The main objective of the workshop was to generate awareness amongst the inventors in regard of protection and commercialisation of different Intellectual Property (IP) Rights.

First session was conducted on October 10, 2018, wherein presentations were made on the following topics:

- Introduction to IP
- IP policy of IIT Bombay
- IP protection - Process and Procedure at IIT Bombay
- Prior art Search
- IP Licensing - Process and Procedure at IIT Bombay
- Inventorship Participants: Nearly 75
- Second session was conducted on March 19, 2019, in an interactive question-answer format followed by hands-on exercise by Orbit intelligence (Patent database search provider)

The awareness programs was attended by nearly 60 participants and appreciated by all.

## 10. Safety activities at the Institute

The initiative towards safety measures during R&D activities was continued. Efforts are being taken to make short videos on machine safety, electrical safety, biosafety and cryogenics safety and make it public. Safety audits were conducted in K.V. School, Nano Electronics Mechanical Systems (NEMS) and Micro Electronics Mechanical Systems (MEMS) Proto. Fab. Facility (NMPF) at Electrical Engineering Department, five students' hostels and IDC School of Design and findings and recommendations were submitted to respective authorities. Institute safety initiatives: Posters and videos were displayed in the international vision zero conference held in the campus during February 18-20, 2019. As part of this conference, organizers had organised



Prof. Sudesh Balan and his team from IDC School of Design, receiving the award for Fire Safety, Indian Safety Song and Video Contest.

‘Indian Safety Song and Video Contest 2019’. IIT Bombay’s entry ‘Fire Safety’ video was awarded second prize that carried a citation and cash incentive of Rs. 40,000.

## **11. Online processes (R&D activities)**

Online interface of R&D activities (in drona & IRCC website) continued to make it more user friendly and few of the activities automated during the year are as follows:

- Module for submitting TAP request by faculty member in Drona and entire approval process
- Facility to view the SAP bill and PO details in Drona was first released to IRCC staff
- Process to get direct SAP data into Drona
- Online approval process for project staff honorarium payment
- Process for generation and printing barcode on the A4 size paper
- Project staff administration: Negative balance (project) alert at the time of recruitment/ extension, attendance report and automatic salary calculations
- Searchable interface and sending reminder for faculty notice for the ‘Unclaimed Funds’
- Modification in IDF submission portal and updating areas of specialization / keyword
- Updation of SEED TAP proposal submission module

## **12. Project Manpower**

Number of Project staff/ fellow working in various projects as on March 31, 2019 is 1826. Among them, 712 joined during the FY 2018-19.

# Outreach Programmes

The Continuing Education and Quality Improvement Programme (CE & QIP) office at IIT Bombay has 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 2018-19.

A number of short-term training programs (STTP), which are funded by the All India Council for Technical Education (AICTE) as QIP courses, for faculty members of engineering colleges and GIAN training programmes funded by the Ministry of HRD, Government of India were conducted. Eminent faculty from foreign institutions were invited to deliver lectures and tutorials for GIAN courses. 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 various QIP courses.

Many of Institute's CEP courses for the industry are 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.

The CEP course on "Piping Engineering" (contact version) has reached another milestone and has crossed its 73rd edition in 2018. About 10,000 engineers have registered in the last 25 years.

In terms of the overall performance of CE&QIP during 2018-19, a total of 115 CEP courses were conducted with about 1720 participants from across disciplines as well as industries, organizations and institutions, with a revenue of around Rs. 6 crore.

Under the QIP category, 5 PhD students from AICTE approved engineering colleges were admitted. In addition, 8 teachers were inducted into PhD programme under the advance admission scheme who would be joining the Institute for the regular programme from July 2019. Further, 18 short-term courses (STC) were conducted for college teachers under the sponsorship from AICTE and a total of 615 participants from various engineering institutions/ colleges attended these courses.





# Faculty Achievements And Recognitions

During the year, 23 faculty members (20 Assistant Professor Grade I, two Associate Professor and one Professor) on regular basis and 12 on Assistant Professor Grade II joined the Institute. The number of full-time faculty members on-the-roll of the Institute has risen to 667 comprising 318 Professors, 01 Professor (Contract), 171 Associate Professors, 157 Assistant Professors (Grade-I), and 20 Assistant Professors (Grade-II). In addition, there are 40 adjunct faculty members and 194 post doctoral fellows on-the-roll. Around 9 faculty members retired – seven of whom were re-employed during the year.

The Institute provided financial assistance to 254 faculty members for participating in international conferences. In addition, 38 faculty members travelled abroad for attending international conferences using external funding and seven faculty members went abroad on Fellowship for research work.

## Leadership for Academicians Programme (LEAP) – An initiative by the

### Ministry of Human Resource Development

IIT Bombay had successfully organized a month-long leadership development training programme for academicians in Mumbai during February 8 to March 8, 2019 and also a week-long program at the Nanyang Technological University (NTU) in Singapore during March 18-22, 2019. As part of the programme, ‘Outdoor Team Building’ session was conducted at Garudmaachi, Lonavala during March 2-3, 2019.

The objective of the programme was to provide the participants the required leadership skills in faculty-student management, team building ork (synergy), developing the required infrastructure, introducing new pedagogy, new institution building, financial planning, innovation and incubation, addressing gender related issues, understanding the governance structure, alumni and international relationship, pursuit of excellence in teaching and research, general administration and academic interpersonal relationship.



Prof. Devang Khakhar, former Director (top rt. corner) and faculty participants at the Leadership for Academicians Programme (LEAP)



**Institute functionaries Prof. K.P. Kaliappan, Dean (FA), Prof. A.K. Suresh, Dy. Director (AIA), Prof. P.V. Balaji, former Dean (R&D) and faculty members during LEAP**

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. Amit Agrawal**, Department of Mechanical Engineering has been awarded the prestigious “S.S. Bhatnagar Award” for 2018 under Engineering discipline.

**Prof. Anirudha Joshi**, IDC School of Design has been elected as the Vice President for Finance in the ACM SIGCHI Executive Committee. SIGCHI is the premier international Society for professionals, academics and students in human technology and human-computer interaction (HCI).

**Prof. Aparna Singh**, Department of Metallurgical Engineering and Material Sciences

received the prestigious “Young Metallurgist of the Year Award” instituted by the Indian Institute of Metals.

**Prof. Ashwin Gumaste**, Department of Computer Science and Engineering has been awarded the prestigious “S. S. Bhatnagar Award” for 2018 under Engineering discipline.

**Prof. Ashwin Gumaste**, Department of Computer Science and Engineering has been elected as Fellow of the Indian Academy of Engineering.

**Prof. Avik Bhattacharya**, Centre of Studies in Resources Engineering (CSRE) has been appointed as the Editor-in-Chief of ‘IEEE Geoscience and Remote Sensing Letters (GRSL)’.

**Prof. B. Bandyopadhyay**, Convener, Systems and Control Engineering has been appointed as member of IEEE Fellow Evaluation Committee of IEEE Industrial Electronics Society for the year 2018. He also has been appointed as Associate Editor of IET



Control Theory and Application (former IEE Control theory and Application, UK) for a period of three years w.e.f April 2018.

**Prof. B. Bandyopadhyay**, Convener, Systems and Control Engineering has been awarded “Distinguished Lecturer (DL) Award” for the IEEE Industrial Electronics Society to lecture on Sliding Mode Control and Event Triggered Sliding Mode control to the IEEE IES/IAS/ PELS joint Chapter in Rio de Janeiro, Brazil in April 2019.

**Prof. B. Bandyopadhyay**, Convener, Systems and Control Engineering has been invited to serve as one of the Guest Editors for a special issue on ‘Recent Advances in Sliding Mode Control under Network Environment’ in ISA Transaction (Elsevier) to be published in early 2020.

**Prof. B. Krishna Mohan**, Centre of Studies in Resources Engineering has been invited to serve as Associate Editor of the “Journal of Indian Society of Remote Sensing (JISRS)”.

**Prof. B. Ravi**, Department of Mechanical Engineering and his team, The ‘Smart Stethoscope’ developed at BETiC, IIT Bombay by the team comprising of Adarsha, Tapas and Dr. Rupesh guided by Prof. B. Ravi won the first prize of INR one million at Swissnex-DST AIT Programme in Zurich. Their startup company Ayu Devices is incubated in SINE (May 2018), IIT Bombay. \*The story is prominently featured in Forbes India (May 11 issue) in a special report called ‘Innovation Nation’. \*<http://www.forbesindia.com/article/innovation-nation/the-rugalininnovators-at-iitbombay/50065/1>

**Prof. B. Ravi**, Department of Mechanical Engineering has been selected by INAE for the prestigious ‘Abdul Kalam Technology Innovation National Fellowship’ for a period of three years.

Two former students of IDC School of Design guided by **Prof. B. K. Chakravarthy**, Trivikram A and Avinash Prabhune have won the Gandhian Young Technological Innovation (GYTI) Award/ Appreciation 2018 for their projects “Low Cost Vein Detector” and “Window-mounted Solar Cooker”

respectively.

**Prof. C. Amarnath**, Department of Mechanical Engineering has been awarded “Dedicated Service Award” for his love and passion for mechanisms by International Federation for the Promotion of Mechanisms and Machine Science.

**Prof. Chandra M. R. Volla**, Department of Chemistry has been selected to receive the “Alkyl Amines – ICT Foundation Day Young Scientist Award- 2018” by Institute of Chemical Technology, Mumbai.

**Prof. Chandra M. R. Volla**, Department of Chemistry has been elected to receive the “NASI-Young Scientist Platinum Jubilee Award”.

**Prof. Chetan S. Solanki**, Department of Energy Science and Engineering received the “Best Poster Award” in 7th edition of the World Conference on Photovoltaic Energy Conversion (WCPEC-7), in Hawaii (June 10-15, 2018).

**Prof. Chetan S. Solanki**, Department of Energy Science and Engineering, Solar Urja through Localization for Sustainability (SoULS, [www.soulsiitb.in](http://www.soulsiitb.in)), initiative of IIT Bombay led by Prof. Solanki has won the Grand Regional Award in South Asia regional round of IEEE’s held at IIT Madras and also won Skill Council for Green Jobs Award for “Outstanding Contribution in Solar Training Domain”.

**Prof. Chetan S. Solanki**, Department of Energy Science and Engineering, SoULS team of IIT Bombay has won first prize in national level “Solar Chulha Challenge” conducted by ONGC under Ministry of Petroleum and Natural Gas in recognition of his excellent academic and research work.

**Prof. Chetan S. Solanki**, Department of Energy Science and Engineering and Prof. Jayendran Venkateswaran, Industrial Engineering and Operations Research, Solar Urja through Localisation for Sustainability (SoULS) initiative of IIT Bombay has won Renewable Energy (RE) India Award 2018 for “Excellence in RE Skilling”. SoULS has trained more than 5000 women in rural India.

SoULS has conceptualized localized Solar PV module manufacturing and established first such, all-women and owned and run factory of solar PV module, called Durga Energy. The Durga Energy won “Start-up of the Year Award” in RE India Award.

SoULS has also won “Skoch Environment Gold Award” for 2018. So far more than 3 million solar study lamps have reached students, which is estimated to have more 140 million tons of CO<sub>2</sub> saving.

The SoULS team achievement are led by Prof Chetan Solanki, Department of Energy Science and Engineering and Prof. Jayendran Venkateswaran, Industrial Engineering and Operations Research. All these awards have been given in Delhi in September 2018

**Prof. Dipendra Prasad**, Department of Mathematics has been conferred with the prestigious The world Academy of Sciences (TWAS) prize for the year 2019.

**Prof. G. G. Ray**, IDC School of Design has been presented the “IEA Award for Promotion of Ergonomics in Industrially Developing Countries” at the 20th Triennial Congress held in Florence, Italy.

**Prof. G. K. Lahiri**, Department of Chemistry has been invited to join the Editorial Board of “Journal of Chemical Sciences” as an Associate Editor for a period of three years.

**Prof. G.K. Lahiri**, Department of Chemistry has been conferred the prestigious J. C. Bose fellowship from SERB, New Delhi.

**Prof. G. K. Lahiri**, Department of Chemistry has been elected as Fellow of Indian National Science Academy this year.

**Prof. J. M. Vasi**, Department of Electrical Engineering has been awarded the “Life Time Contribution Award in Engineering 2018” by Indian National Academy of Engineering (INAE).

**Prof. Jayendran Venkateswaran**, Industrial Engineering and Operation Research received the Best Poster Award in 7th edition of the World Conference on Photovoltaic Energy

Conversion (WCPEC-7), in Hawaii (June 10-15, 2018).

**Prof. K. Ramasubramanian**, Department of Humanities and Social Sciences has been appointed as the Editor of the “Indian Journal of History of Science”.

**Prof. K. Ramasubramanian**, Department of Humanities and Social Sciences has been elected as Fellow of Indian National Science Academy.

**Prof. Kirankumar S. Momaya**, SJM School of Management was invited to serve as President-Elect, Global Institute of Flexible Systems Management 2019.

**Prof. M. Ravikanth**, Department of Chemistry has been elected as Fellow of the National Academy of Sciences, India.

**Prof. Madhusudan Manjunath**, Department of Mathematics has been elected as an Associate of the Indian Academy of Sciences.

**Prof. Manasa Ranjan Behera**, Department of Civil Engineering has been awarded the “Prof. R J Garde Research Award” by Indian Society for Hydraulics (ISH).

**Prof. Maryam Shojaei**, Department of Electrical Engineering and her team won the “best Paper Award” in International VLSI Design Conference 2019.

**Prof. N. S. Punekar**, Department of Bioscience and Bioengineering authored book titled “Enzymes: Catalysis, Kinetics and Mechanisms” has been published by Springer.

**Prof. Neela Nataraj**, Department of Mathematics has been appointed as the member of the Executive Committee (EC) of International Mathematical Union (IMU) of the International Committee for Women in Mathematics (CWM) for three years, starting from January 2019.

**Prof. Neela Nataraj**, Department of Mathematics has been invited to join the Editorial board of ‘Computational Methods in Applied Mathematics’.

**Prof. Nina Sabnani**, IDC School of Design won the “Big Little Book Award (BLBA) for Illustration-2018” at the prestigious Tata Lit Live 2018 at NCPA, Mumbai on November 18, 2018 at the Tata Lit Live. The Big Little Book Award is a first of its kind award instituted by the Parag initiative of Tata Trusts and ‘Literature Live!’ to recognize and honour significant contribution of such authors and illustrators to children’s literature in Indian languages.

**Prof. Pankaj Dutta**, SJM School of Management has been appointed as an Associate Editor of ‘OPSEARCH’, published by Springer.

**Prof. Parinda Vasa**, Department of Physics has been awarded the Homi Bhabha Fellowship for a period of two years.

**Prof. Pradeep R. Nair**, Department of Electrical Engineering has been selected for the award of “Professor Krithi Ramamritham Award for Creative Research-2017” in recognition of his significant research contributions in the area of ‘Predictive modeling of Pervs-kite Solar cells’.

**Prof. Pushpak Bhattacharya**, Department of Computer Science and Engineering has been appointed as the Chairman of the Advisory Committee to Andhra Pradesh Government to enable Artificial Intelligence in the Government’s secretariat-cum-office.

Also, **Prof. Bhattacharya** shall be leading a national initiative (NITI Aayog teaming up with IITs) to create NLP-stack and virtual assistants in Indian Languages which will involve extensive use of Natural Language Processing and Machine Learning Technology.

**Prof. Pusphak Bhattacharyya**, Department of Computer Science and Engineering has been conferred the “Distinguished Alumnus of IIT Kharagpur” award for 2018.

**Prof. R. Murugavel**, Department of Chemistry has been selected to receive the “SAS-TRA-CNR Rao Award” in Chemistry & Materials Science for the year 2019.

**Prof. Rahul Patil**, SJM School of Manage-

ment has received the “Best Professor in Supply Chain Management Award -2018” by DNA team.

**Prof. Rajesh Gupta**, Department of Energy Sciences and Engineering has received “Best Paper Award’ in R&D category along with his PhD Students from Indian Society for Non-Destructive Testing, for the year 2018.

**Prof. Ranjith Padinhateeri**, Department of Biosciences and Bioengineering has been selected to receive the “National Bioscience Award for Career Development (2017-18)” by the Department of Biotechnology.

**Prof. Rashmi Gupta**, Department of Humanities and Social Sciences has been appointed as an Associate Editor of ‘Frontiers in Psychology’ journal.

**Prof. Ravi Poovaiah**, IDC School of Design: Jellow Communication System, created by Prof Ravi Poovaiah and his team won the prestigious “mBillionth South Asia” Award for Inclusion and Empowerment! (<http://mbillionth.in/>). It is also shortlisted to apply for the United Nations World Summit Awards.

\*Jellow Communicator is a friendly Augmentative and Alternative Communication (AAC) solution that uses icons to aid communication in people learning to speak or with difficulty with speech and language. The easy-to-learn interface and visually appealing icons of Jellow make it is an ideal solution for beginner-level communicators. <http://www.dsourc.in/tool/jellow/>

**Prof. Rohit Srivastava**, Department of Biosciences and Bioengineering has been selected to receive the NASI Reliance Industries Platinum Jubilee Award (2018) for application oriented innovations in physical sciences.

**Prof. Ruchi Anand**, Department of Chemistry has been selected to received the “Janaki Ammal National Woman Bioscientist Award” (Young category) for the year 2018 from Department of Biotechnology, Ministry of Science and Technology.

**Prof. S. V. Kulkarni**, Department of Electri-

cal Engineering has been selected as IEEE Fellow.

**Prof. Samir Maji**, Department of Biosciences and Bioengineering has been invited to join the Editorial Board of the Journal of Biological Chemistry (JBC) for a five-year term beginning January 1, 2019 and ending December 31, 2024.

**Prof. Santosh Gharpure**, Department of Chemistry has been chosen to receive the Chemical Research Society of India (CRSI) Bronze Medal for the year 2019.

**Prof. Shyamprasad Karagadde**, Department of Mechanical Engineering has been elected as an Associate of the Indian Academy of Sciences.

**Prof. Soumen Chakrabarti**, Department of Computer Science and Engineering has been elected as Fellow of Indian National Science Academy.

**Prof. Soumyo Mukherji**, Department of Biosciences and Bioengineering, Two projects by Prof. Mukherji's students Ms. Debasmita Mondal and Mr. Sourabh Agrawal have won the Gandhian Young Technological Innovation (GYTI) Award/ Appreciation 2018 for the project "Smartphone-based Impedimetric Disposable Biosensor for Detection of Cardiac Biomarkers".

**Prof. Sudhir Ghorpade**, Department of Mathematics have been invited to join the Editorial Board of the "IEEE Transactions on Information Theory" as an Associate Editor for Coding Theory.

**Prof. Suhas Joshi**, Department of Mechani-

cal Engineering has been elected as a Fellow of the Indian National Academy of Engineering (INAE).

**Prof. Sujit Jogwar**, Department of Chemical Engineering has been appointed as the Associate Editor of the Journal of Process Control (Elsevier Publication) from January 2019.

**Prof. Suryendu Dutta**, Department of Earth Sciences has been selected for "National Geo-science Award-2017" for extraordinary achievements and outstanding contributions in the field of Fundamental and Applied Geosciences.

**Prof. T. N. Singh**, Department of Earth Sciences has been nominated to the Governing Council of IIT Kanpur as a member for a period of three years in recognition for his excellent academic and research work.

**Prof. V. Jothiprakash**, Department of Civil Engineering received Indian Society of Technical Education (ISTE)'s "U.P. Government National Award for Outstanding Work Done in Specific Areas of Engineering and Technology for the year 2017" in recognition of work done in the area of Interaction with Industry in Hydrology and Water Resources Engineering.

**Prof. Varun Bhalerao**, Department of Physics has received the 'Vainu Bappu Gold Medal' for the year 2016 by Astronomical Society of India in the field of Astronomy and Astrophysics.

**Prof. Vikram Vishal**, Department of Earth Sciences has been elected to receive the "NASI-Young Scientist Platinum Jubilee Award".

# Student Activities

The 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, cricket, athletics tracks and much more. Along with studies, sports activities too are conducted throughout the year. All the events are organized by a capable Institute Sports Council headed by General Secretary, under the able guidance of Sports Officers, Chairman (Sports) and Dean (Students Affairs). IIT Bombay led a PAN-IIT agenda to include chess and squash (girls) in Inter IIT sports meet this year.

For effective practice throughout the semester, it was proposed to recruit more sports officers. Five sports officers have been recruited for hockey, badminton, aquatics, football and squash. The number of permanent coaches has now increased from 4 to 9. The Senate has approved introduction of NSO chess and water polo to establish these sports from a fundamental level. A coach was hired to ensure professional training in NSO chess. With the inclusion of chess in Inter IIT from 2019, this step is highly beneficial.

A bouldering wall is being constructed beside the badminton courts. Climbing as a sport will be introduced to promote adventure activities in-house itself. The athletics' throw pit has been relocated to the area beside the football field to ensure the safety of users of gymkhana. Water coolers were installed at two locations: Football ground and the second floor of New Gymkhana. Resoiling of the whole Gymkhana grounds was initiated during the year. Biometric entry machines have been installed at six different locations: squash courts, table tennis hall, board games room and screening room in new SAC, swimming pool, badminton court to ensure safety and to implement the provision of paid gymkhana access to staff and faculty.

## Inter IIT and Institute teams:

- **Personalised Wellness and Training Program:** Collaborated with a

professional agency C4 Wellness to provide personalised training to Institute team players

- A professional physiotherapy service was hired for the Institute teams during Inter-IIT practice, which received hugely positive feedback from the players
- Expert Talk on nutrition and conditioning by Dr. Shilpa Desai was organised for the Institute team players on 'Integrated Wellness First 360 Concept'
- **Contingent Fun Weekend:** Ideated Satoliya (Seven stones) tournament, a fun event to increase contingent bonding along with games like football and table tennis
- **The following were conducted for the Inter-IIT teams:** Late Night Messing; procurement of kits; Advanced Summer Camp; Contingent Leader selections

**Cultural Activities:** The student cultural activities in the Institute saw huge growth in 2018-19 spearheaded by the move to inculcate hostel culture, taking freshers into account. Some of the activities conducted are:

- **Freshman Professional Amateur-Arcade:** The Freshers Cultural Competition with the revamped professional amateur format was initiated in September. The freshers paired up with the seniors from their hostels and put up some mesmerising performances in genres of dance, music, dramatics, literary arts and speaking arts.
- **In-Sem Cult School:** The year saw the greatest number of cultural school courses held. Classes for various genres were conducted both in-summer and in-sem as well.
- **TEDx Talks:** The first ever TEDx Talk of IIT Bombay took place in January 2019. The Institute Cultural Council collaborated with IRCC and Dean R&D office for the same. The license and all the necessary permissions were obtained. Institute Cultural Council handled all





Overall runners-up in Inter-IIT Cultural Meet 2017 and overall champions in Inter-IIT Cultural meet 2018

the publicity and online outreach for the event. ICC also took charge of the execution and helped in organising the event with great success.

- **Flagship Events:** The Cultural Clubs introduced Literarium this year. Also flagships like Halloween Night, Vision and Film Fest were reintroduced despite the cramped up calendar. Surbahaar was successfully executed in the first semester itself. Not only this, an approval of amount of Rs.14.5 lakhs was obtained for executing these flagships under Diamond Jubilee banner.
- **Cultural Mascot:** Cultural Mascot realized as Pippo, the official mascot for IIT Bombay Culturals, was launched. It not only helped in publicity but unified culturals.
- **Cultural Open:** Several art forms such as mono-acting and solo singing were organised in Pahal and Freshiezza. Cypher and B-Boying groups were created and several jamming sessions for the same were held. The idea was to promote events that do not have their GC and cultivate a culture for them.
- **General Championships:** Not only were GCs for this year executed well, but also new GCs like English Poetry and Street Play got approved and executed. A separate script bank to help hostels get an idea about scriptwriting was also created and circulated.
- **Ek Bharat Shreshtha Bharat:** Events under Ek Bharat Shreshtha Bharat were conducted in collaboration with MHRD to show and promote the diverse culture of India. States were paired up and performances from each state were showcased. The reports on conduct of the event were sent to MHRD.
- **International Cult:** A separate introductory session was conducted for foreign exchange students to help them understand and make it feasible for them to enter the cultural clubs. Prof. Swati Patankar, Dean (International Relations) attended the session. The event greatly helped in catering to the international students as a definite increase in number was witnessed during events.
- **IIT Culturals App:** For the first time ever, an app was launched for Culturals at IIT Bombay. It not only helped in reaching out to people but also made publicity much more cheaper and feasible.
- **Inter- IIT Cultural Meet:** IIT Bombay participated in the third Inter-IIT Cultural meet held at IIT Roorkee.



**AAVHAN 2019:** The third edition of Aavhan was successfully conducted with over 4000 athletes participating across 16 different sports from all over the country. Aavhan Expo was introduced to showcase wholistic aspects of sports like Sports Management, Elite Athlete Training, Nutrition etc. by collaborating with organisations including C4 Wellness, India Olympics 2020, Sportz Consult etc. The team had organised first-ever FIDE Rated Chess tournament with around 500 players, introduced kabaddi on a competitive scale with 12 teams participating and IIT Bombay Half Marathon with participation of over 4000 runners. Training was provided to the Institute runners for the marathon. The English Premier League Trophy and Carabao Cup was showcased followed by the International football player Paul Dickov discussing the footballing culture in India and Eurpoe.



**Student Solar Ambassador Program (SSAP)** – Techfest 2018-19 made a Guinness World Record for “The most LED lights lit simultaneously” as part of its social initiative Student Solar Ambassador Program. Over 1,25,000 students were reached as a part of the campaign. Approximately 5,800 students attended the event and a record was set up as 2,819 LED lights were lit simultaneously in IIT Bombay on October 2, 2018.

## TECHFEST

IIT Bombay’s annual international science and technology festival called TechFest is widely recognised as Asia’s largest science and technology festival. On the eve of IIT Bombay’s Diamond Jubilee celebrations, the 22nd edition of Techfest was a grand success with a footfall of more than 1,55,000 among other highlights. Some of the activities organised as part of Techfest 2018 are as follows:

### His Holiness The Dalai Lama at Techfest:

Techfest is known for its mind-blogging lineup of lecture series, which attracts children and adults alike. The 22nd edition was no different, with none other than His Holiness The Dalai Lama, Nobel Peace Prize 1989 enlightening an audience of 2500+ with his words on “Relevance of ancient Indian education sytem in the Modern World”. Other speakers from the lectures series were Gaur Gopal Das, International life coach and Simon Taufel, Former ICC Elite Umpire.



His Holiness The Dalai Lama in conversation with IIT Bombay students during Techfest 2018

### **TechConnect (IIT Bombay R&D Expo):**

Promoting the enormous amount of research work happening in IIT Bombay has always been one of the prime motives of Techfest.

As a part of the IIT Bombay Diamond Jubilee celebrations, TechConnect was executed in a larger scale attracting huge crowds of more than 90,000 people across the three days. It showcased various flagship projects of IIT Bombay including IIT Bombay Racing and



SoULS. Exhibitions: The 22nd edition saw various unique first-of-its-kind exhibitions like Android U (Japan), Furhat Robotics (Sweden) and B-Human (Germany). For the first time in India, Techfest brought 'Android U', one of the most intelligent and dynamic Android from the Hiroshi Ishiguro Lab in Japan.

**International Full Throttle:** The first edition of International Full Throttle was held with an international arena setup, in which drivers with world rank 9, 19 and 38 participated from France, Spain and Portugal. A total of



more than 20 Indian teams participated in this first edition. It was the first time in India such a race track was created.

**International Robowars** - Robowars witnessed participation of 18 International teams from 7 countries including USA, Mexico, Iran, Brazil, Nepal, Russia and Bangladesh. Techfest has one of the largest battle arena in Asia and the best robots from all over the world converging to battle it out to decide who takes the glory. Abish Mathew was the artist performer during the event.



**Innovation Challenge:** Twelve students who won the Innovation Challenge were sent on a fully-funded trip to International Smart Camp in Russia organized by Rosatom. Other 9 winners are being sent to Vikram Sarabhai Space Centre (VSSC). Reaching out to over 4,00,000 students in India, Techfest, organised by ROSATOM South Asia in Yekaterinburg, Russia, the camp was attended by Top 12 winners of the Techfest Innovation Challenges who spent 10 days in Russia.

## **MOOD INDIGO**

Mood Indigo 2018, IIT Bombay's annual cultural festival and Asia's largest college cultural festival, was held during December 27- 30, 2018. Attracting a footfall of over 1,43,000 people from around 1700+ colleges pan India, Mood Indigo entertained the visitors with an incredible array of artists, both national and international. The four-day fiesta centred around the theme of "A Montage of Dreams" served the visitors with best festive feelings.

The 48th edition of Mood Indigo (MI) was much special than its previous editions as it coincided with the Diamond Jubilee



Mood Indigo 2018 saw a conglomerate of over 210 events spanning across multiple genres. With the presence of over 230 national and international artists, we continued our legacy of providing the most assorted and entertaining experience to the crowd.

YouTube sensations and a part of the renowned YouTube channel TVF, Amol Parashar, Navin Kasturia and Manvi Gagroo also graced the Humor Fest. Comedian illusionist Karan Chauhan performed at the festival for the first time at Mood Indigo. The International Music Festival had crowd relishing the performances from international artists and bands like Oxland, Tarq Bowen, Klaus Falschlunger and Between the Jars. Increasing the magnificence of IMF by adding an Indian touch to it, Indian youth sensations like Prateek Kuhad, Aditi Ramesh and The Yellow Diary amazed the crowd with their brilliant performances. In addition to this, Mood Indigo saw performances from artists belonging to various cultures from Ukraine, UK, South Africa, Canada, Brazil, Indonesia, etc. Increasing the take-back value for the crowd, Mood Indigo included 50+ Interactive and DIY workshops ranging from skateboarding, parkouring, slacklining, pottery etc.



Fusion Nite has always been known to feature rare and exclusive talent and 2018 was no different. Ace musician and music producer Papon headlined the night with a great set. EDM Nite featured the famed musician duo of Ummet Ozcan from the Dutch and India's electronic sensation Progressive Brothers. Popular Nite saw a full house crowd to witness composers Salim-Sulaiman, singer Bhoomi Trivedi and sensation drummer Darshan Doshi and Aditya Narayan. For the first time at Mood Indigo, a heavy stage production was used along with 3D Interactive visuals which made the concerts more engaging and interactive for the crowd.



**Abhishek Upmanyu, stand-up comedian performing during Mood Indigo 2018**



**Prof. Soumyo Mukherji, former Dean (Student Affairs) welcoming Lt. Governor of Puducherry Kiran Bedi during Mood Indigo 2018**

**Competitions:** Known to attract the best student talent from across the country. Mood Indigo saw competitions in the field of dramatics, dance, film and photography, music, debating, creative writing and informal events with a quirky twist. Face of genre program was introduced wherein eminent personalities like Pritam, Nitish Tiwari, Shalmali Kholgade, Sharad Saxena, Sushant Singh Rajput promoted the competitions, and mentored the participants for the final rounds of the competitions. Throughout the day, people were witnessed showcasing their exclusive talents at carefully selected public hotspots under ‘MI’s Got Talent’ which received an extraordinary response in the form of cheers from the crowd. To end the competitions, the grandest Dance competition, ‘Choreonite’ saw thousands of people the best dancing groups of the country into live action. The relentless energy at the jam-packed convocation hall radiated throughout the venue. To add a cultural flavour to the festival, various competitions in the classical and folk art 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 15%. Under the “Live Your Passion” campaign, the participants received various incentives which included airing of the finals of the competition on Sony Music, performing opportunity at Jaipur International Films Fest, Canvas Laugh Club, Prithvi

Theatre, performances and exhibitions at prestigious stages like Kala Ghoda, Indian Arts Festival and internship opportunities under renowned personalities like Nitesh Tiwari, Nritya Shakti Mohan and academics like Dance Fit Academy and summer internship in institutions like Point Blank School of Music. The competitions saw participation from over a thousand colleges panning across various cities like Mumbai, Delhi, Jaipur, Hyderabad, Ahmedabad and Bangalore. The multicity campaign, our on-ground eliminations, expanded its reach to 8 major cities. The participants also participated in the social campaign - “See Through My Eyes”

**Media and Publicity:** A great deal of media houses and online and offline partners helped in carrying out the publicity of the festival. The team had an extensive coverage deal from the media partners including TV, Facebook, Twitter and Instagram. Associating with Snapchat helped get good publicity local newspapers and magazines helped the organisers in reaching those regions where Mood Indigo wasn’t present before. A newsletter, named Mirage was published in association with Hindustan Times, which was distributed in over 60,000 households in Mumbai. To inform the various colleges in Mumbai about the different competitions conducted during Mood Indigo, a Contingent Leader meet was held for the first time. The college publicity drive was revamped to reach out to the various colleges in Mumbai.



The Media Team continued other avenues of publicity like outdoor hoardings and multiplexes.

## 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 reached out to 700+ colleges around India to establish E-Cells in their institutes. E-Cell has worked to spread awareness and promote latent entrepreneurship spirit amongst people by conducting following initiatives:

During 2018-19, E-Cell initiated closed room funding session leading to IIT Bombay startups receiving an investment of Rs.70 lakhs. Three startups received on-spot funding in 'The Ten Minute Million' with total funding of Rs. 48 lakhs.

**Eureka ! :** Eureka provides a platform for potential ideas and early stage startups to evaluate their plan in the risk-free environment of a competition. To promote entrepreneurship among the school students, the E-cell team initiated the b-plan competition Eureka! Junior conducting training workshops in ten schools for classes of 6th to 10th std. Mentoring opportunities provided in the B-Model competition Eureka! was extended to 3 days. The team established a closed community of IIT Bombay startups for development of the entrepreneurial ecosystem of the Institute.

**The Entrepreneurship Summit:** The

Entrepreneurship Summit (E-Summit 2019) 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. The team conducted pre-summit at the Convocation Hall with Hon'ble Minister Nitin Gadkari as the highlight speaker along with celebrity entrepreneur, Kunal Kapoor.

E-Summit 2019 hosted Mr. Niranjana Hiranandani, former Hon'ble Minister Suresh Prabhu, Mr. Gururaj Deshpande, Mr. Madhukar Parekh as the highlight speakers along with Indian Heads of leading global firms like Pepsico, Tata Motors, Infosys, Amul, Disney, Intel etc. This year more than 15 foreign speakers from various corporates like Tata Technologies, Expedia etc. visited the campus during E-Summit 2019. Social initiative on Cyber Security was organised by conducting awareness workshops in more than 20 schools and reaching out to 4000 + students in Mumbai.

## Technical Council

Following are the major achievements/progress made under the Technical Council for the year 2018-19:

**Organisation of 7th Tech Meet:** Inter IIT Tech Meet was hosted during December 18-20, 2018. All 23 IITs hosting 750+ students participated in 10 competitions during the meet. Two of the major events, mid-term reviews in domains of Healthcare and Sustainability were also organised. Internal collaborators included BETiC lab, Tata Centre and CSRE Department and companies



Giscle Systems, being awarded for winning on-the-spot funding at IIT Bombay's Ten Minute Million Challenge during E-Summit



The Hon'ble Minister of Road Transport and Highways Mr. Nitin Gadkari during the pre-summit of E-Cell at IIT Bombay on January 5, 2019





**IIT Bombay Contingent: Overall Runners Up at 7th Tech Meet**

like Reliance Jio, BARC India, Drona Aviation were external collaborators. Under Graduate Academic Council (UGAC) jointly organised the Student Academic Conference as part of the 7th Tech Meet. The Engineers' Conclave had 70+ student projects from all IITs and a good number of faculty and students visited and appreciated the projects.

**Inter IIT Tech Meet 2017-18:** IIT Bombay secured overall second position with two golds and medals in all the events participated.

Institute Technical Summer Projects (ITSP): 52 out of 60 projects were completed during the year with ITSP display being done at Tinkerer's Lab (TL) in the beginning of the Semester.

- ITSP 2019 was launched with projects having field visits in the areas of agriculture and rural development. student groups visited Jawhar & Mokhada districts in Maharashtra in March and will work on projects related to water management and rural development.
- Other domain specific projects in healthcare and gaming (Hardware ) launched.
- Tinkerers' Lab: Major equipments acquired during the year at the lab include: Power Tools, 3D Printers (one resin and 2 FDM based), Manual

Milling Machine and Soldering-Station. A complete dedicated section for power tool with personal protection equipment was upgraded. The lab has 2 (TL open projects) and 30 Arduino Makerthon projects ongoing.

#### **External Collaborations/ Competitions:**

Sessions and guidance were given for participation in external competitions by Autodesk, KPIT etc and MHRD. In Smart India Hackathon 2019, one team won in software edition with 16 teams registering compared to 7 last year. Talks and workshops conducted in collaboration with UBER, CrowdStrike, Xlabs, Nutanix, Wadhvani AI, Discovery India & Team Indus, Ubisoft, Godrej and Bitgrit Inc.

#### **InstiApp:** IIT Bombay Developers

Community launched the InstiApp with 5000+ users across Android, iOS. All student utilities like Insight Articles, placement updates, mess menu and event updates of institute councils, department councils and IBs integrated. Complaints portal integration in progress.

**New GCs Introduced:** Hostel Hack GC and Zero-waste GC were launched to develop strategies for reducing hostel water, electrical consumption and demonstrate PoC for the same. Aeromodelling introduced Chuck Glider GC and Astronomy introduced SunDe GC.

# Placement

The presence of world-class research facilities, vigorous institute-industry collaborations, international exchange programs, interdisciplinary research collaborations and industrial training opportunities help the students of IIT Bombay to excel and be ahead in the competitive professional environment.

The placement drive at IIT Bombay was a year-long event, which started in the month of July 2018 and ended on June 30, 2019. The placements were successfully completed in two phases, clearly demonstrating the demand of our graduates among the top recruiters in various segments of the economy. Interview procedure of phase 1, the main event of on-campus placements, was conducted during December 1-16, 2018, which witnessed participation of 361 companies including Pre-Placement Offers (PPO). A total of 1695 students registered for placements and 1996 students registered for internship programs. The registered students belonged to engineering, science, humanities and design departments of IIT Bombay in Bachelor's, Master's and PhD programs. The phase 2 was conducted from January 15 to June 30, 2019.

The first event was the "orientation" held in July, during which the Professor-in-Charge and placement staff along with the student representatives addressed the students giving information of the complete placement procedure. Next came the conduct of preparatory activities by the placement cell, in collaboration with other firms. Companies started filling up the "Job Announcement Forms (JAF)" in August, which were released to the students in late September. Pre-Placement Talks (PPT) and Career Fair were organized to facilitate interactions between the registered students and the companies. A few companies conducted extra screening levels prior to the interviews. For the students of IDC School of Design, the interviews were conducted from December 11-15, 2018, during phase 1.

December 1, 2018, the first day of campus placement, witnessed some of the giant corporates offering coveted jobs across sectors

and recruiting in large numbers, which was pivotal for the success of the placement season 2018-19. Placement of 184 students took place that day, re-affirming the faith of top recruiters in IIT Bombay graduates. The placement season saw the presence of several "core" engineering companies on the first day, and recorded an all-time highest number of job offers.

## Student Preparations

The key focus of the placement office is to prepare students for their placement and internships. Keeping the students well prepared for what they are likely to face in the corporate world is the responsibility of every academic Institute, and the team at IIT Bombay takes every necessary step to train and guide the students accordingly. Students are exposed to challenging and research-based academics, and host of sports along with cultural and organisational activities on this vibrant campus. The first event conducted in this endeavour was "Boot Camps", in collaboration with Career Cell, for profiles of coding, consulting, finance, analytics etc. In addition, preparatory programmes were arranged to enhance communication skills, group dynamics and interview skills. Overall, these programmes provided an insight into the job domains and prepared the job aspirants to face the challenges of the future. The students were assigned mentors for guidance and a series of aptitude tests were conducted to improve the problem-solving skills. The preparatory activities sourced information from various alumni, where the alumni background was mapped according to student preference. Various department level activities were conducted to cater to individual domain requirements.

## Placement Common Aptitude Test (PCAT)

The Placement Office strives to facilitate the recruitment process in the most convenient and optimal manner possible. This year, IIT Bombay's Placement Common Aptitude Test (IITB-PCAT) was conceptualized to

step-up the quality and provide objectivity in assessments during the placement process. Every year, hundreds of students at IIT Bombay write about 80 company-aptitude tests during their placements. These aptitude tests are quite exhaustive and stressful when conducted in parallel with the regular curricular activities of the Institute. On an average, a student gets a break of 2-3 hours before each day of placement, where the increased stress levels can affect the performance in the interview, adversely. IITB-PCAT is a standardized test, designed to minimize the number of aptitude tests conducted by the recruiting companies.

#### **Standardization of IITB-PCAT:**

The IITB-PCAT is on par with the aptitude tests conducted by third parties for recruitment across campuses. Professor-in-Charge of IIT Bombay Placements oversees the conduct of the test. The test has operating procedures and standards similar to those of JEE and GATE, conducted by IITs in the country. The recruiting companies are invited to subscribe to PCAT, and the test scores are shared with the interested companies through the Job Announcement Forms (JAF).

- The test assesses a student's ability in three domains – Quantitative aptitude, logical reasoning/ data interpretation and verbal aptitude.
- Each of these sections (domains) are timed separately to assess the relative performance.
- The students are given an opportunity to attempt three PCATs during a placement season. The best performance (best of three tests) in each of the sections is disclosed as the final score to the subscribing recruiter. This gives a more reliable index of a student's performance as against a single score normally obtained from a company test.
- Each subscribing recruiter is asked to submit a preferred weightage for the three sections (Quantitative, Verbal and Logical) based on their shortlisting criterion. The final weighted score is calculated and the student-shortlist is prepared for each firm, offering flexibility as that of the third-party test.

#### **Diverse Recruiters**

While the placement season has seen recruiters from the entire spectrum of the industry, the initial part of the season was dominated by a variety of firms from sectors like engineering and technology, oil and gas, IT/ Software, electronic hardware, data analytics, consulting, finance/ banking and Fast Moving Consumer Goods (FMCG). There were opportunities provided by the firms with vast learning, travelling experience and varied work culture. Most of these firms are world leaders in their respective domains. We also had some of the major start-ups as recruiters, which were screened based on the financial and technical status. The informal work culture, opportunity to make immediate and visible contributions, chance to own equity etc. seemed to be the attractions offered by such start-ups.

#### **Engineering and Technology**

About 382 engineering students selected from IIT Bombay have expressed a strong commitment to the core companies in the choice of employment. This is primarily attributed to the highly challenging work profile and remuneration package offered to IIT Bombay graduates by the recruiters. Large group of students opted for science, engineering and technology-oriented jobs operating in various sectors of the economy.

#### **IT/ Software**

IIT Bombay students, known for programming skills, have continued to attract recruiters through campus placement over the past several years. This trend was strong this year. Around 186 students have been offered IT/ Software jobs by over 59 companies through campus placement.

#### **Consulting**

Over 120 consulting offers were made by several global leaders, who visited IIT Bombay for campus placement this year. These organisations work with large corporations across the world, helping them resolve complex business problems. With high quality of recruits these companies took last year, their return to the campus was marked by a renewed vigour.

### Research & Development

With an increased demand for high-end products and services, a larger number of companies strive to develop cutting-edge products. The placement season witnessed an increase in the number of organisations hiring fresh graduates for research and development sector. This sector has observed a steady growth, offering premier jobs, where 81 positions were offered by 23 organizations in 2018-19.

### Data Analytics

The outstanding analytical and reasoning skills of IIT Bombay graduates continued to draw recruiters from the rapidly growing field of data analytics. There were 171 job offers from 43 organisations, making the sector one of the biggest recruiters after engineering and information technology. This trend, observed over the last few years, seems to have taken strong roots in the Institute.

### Financial Services

The financial, banking and fintech companies were prominent recruiters this year. With many of the top global companies of this sector preferring IIT Bombay, the sector saw participation of prestigious companies to recruit the brightest and the best from the campus. A variety of job profiles were opened up in the sector as these companies admire the analytical and computational skills of the IIT Bombay graduates. Over 116 offers were made by 27 financial service firms this year. The graduating students of IIT Bombay have

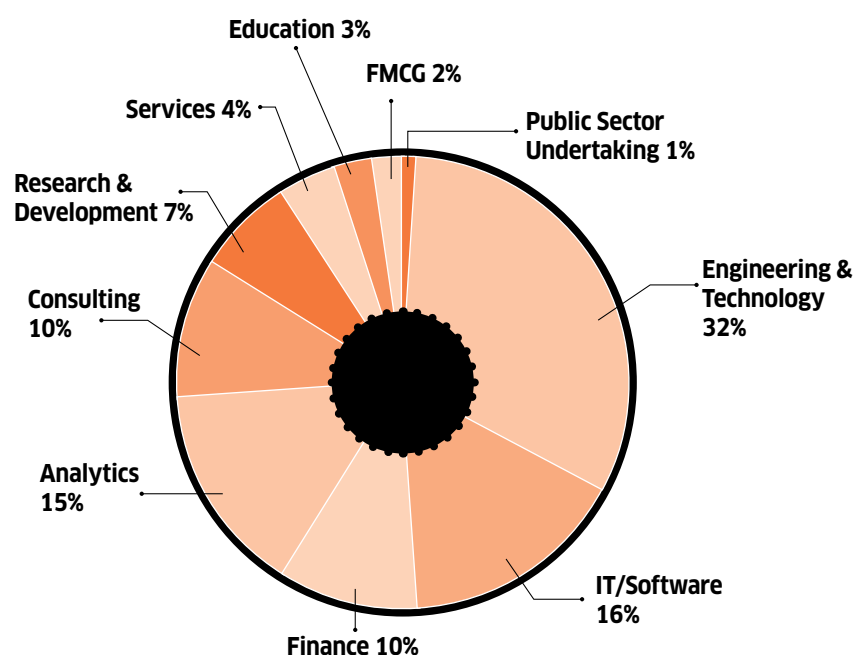
taken the next step in their lives. They have joined the top recruiters in various segments of the economy. The firms participating in the placement seasons over the years appreciated the efforts put in by the students to deliver their best. The new recruiters got a glimpse of the glorified campus placement activities and we look forward to strengthening our relations with them over the years to come. The months of training that students endured were fruitful with the efforts of the placement office including the student placement team, combined with excellent academic system and the opportunity for all-round development. The importance of the efforts, are reflected well in the QS World Ranking and NIRF Ranking of IIT Bombay as well, since placement is a major contributing factor here. This year witnessed several new organizations visiting IIT Bombay for the first time and efforts shall be required to foster long-term relationship with all these organizations in the near future. Judging from the increased corporate competitiveness, heightened student aspirations, a rapidly changing job market and an increasingly insecure global economy, it is clear that campus placements will be more intensely sought by both students and companies. Following this, the recruiters have shown that they want to capture and nurture the fresh minds of students, which is also why the number of pre-placement offers were the highest ever this year. Placement team has achieved greater milestones and overall number of students getting placed has remained good with our constant endeavors to create a good placement season.

**Table 1:** Distribution of offers made in different sectors of Economy:

Sr. No.	Sector	Number of Offers
1	Engineering & Technology	382
2	IT/ Software	186
3	Finance	116
4	Analytics	171
5	Consulting	120
6	Research & Development	81
7	Services	51
8	Education	34
9	FMCG	28
10	Public Sector Undertaking	17
	<b>Total</b>	<b>1186</b>



**Figure 1:** Distributions of offers made in various sectors



**Table 2: Program-wise statistics:**

Some students in pursuit of their career might initially register for campus placement and then decide to convert their academic programme to PhD or Dual Degree. All registered students do not necessarily participate actively in campus placements, opting for higher studies abroad or in different stream is an alternate option. It is important to note that students also get placed through channels other than campus placements. The program-wise placement data is provided in Table-2 and Figure-2.

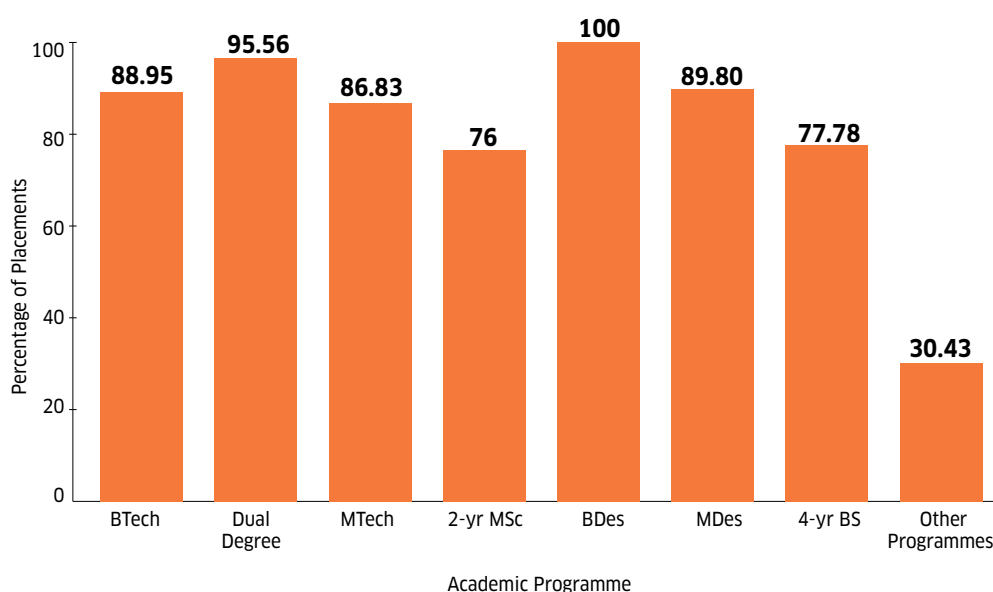
Note: Participated count excludes students, who opted for higher studies or had other career options, and hence de-registered from the placement process.

**Table 2:** Programme-wise placement data 2018-19:

Academic Programme	Registered	Participated	Placed	Percent placed
BTech	612	534	475	88.95
Dual Degree (BTech+MTech)	182	158	151	95.56
MTech	524	463	402	86.83
2-yr MSc	124	75	57	76.00
BDes	22	15	15	100.00
MDes	57	49	44	89.80
4-yr BS	20	18	14	77.78
Other Programmes*	154	92	28	30.43
<b>Total</b>	<b>1695</b>	<b>1404</b>	<b>1186</b>	<b>84.47</b>

\*Includes 5-yr. Integrated MSc, BS+MSc, MTech+PhD, PhD, MSc+PhD, MPhil, IDDD, MS by Research

**Figure 2: Programme-wise placement (%)**



## Department-wise statistics

IIT Bombay provides engineering education across different Departments/ Centres/ Schools/ IDP's, spanning students from under-graduation to PhD. The placement team endeavors to get companies from core as well as non-core sectors for students. The placement statistics of students across departments including all domains of jobs offered during the placement season 2018-19 are shown in Table – 3.

**Table 3: Department-wise classification of offers:**

Deparatments	2016-17	2017-18	2018-19
Aerospace Engineering	48	53	50
Chemical Engineering	101	92	122
Chemistry	18	17	27
Civil Engineering	89	111	102
Computer Science & Engineering	181	174	207
Electrical Engineering	199	185	196
Mechanical Engineering	163	179	148
Metallurgical Engineering & Materials Science	92	104	97
Energy Science & Engineering	35	33	34
Physics	15	15	10
Mathematics (Applied Statistics and Informatics)	23	24	19
IDC School of Design	25	35	59
Bioscience & Bioengineering	12	13	15
Other Programmes	113	82	100
<b>Total</b>	<b>1114</b>	<b>1117</b>	<b>1186</b>

## Salary-wise statistics:

The jobs offered by recruiting organisations are divided into various categories based on the gross compensation packages. Factors other than compensation package like job profile, past association etc. may sometimes influence the classification of a company. Salary-wise classification of total offers made in the year 2018-19 is shown in Table-4 and Figure-3.

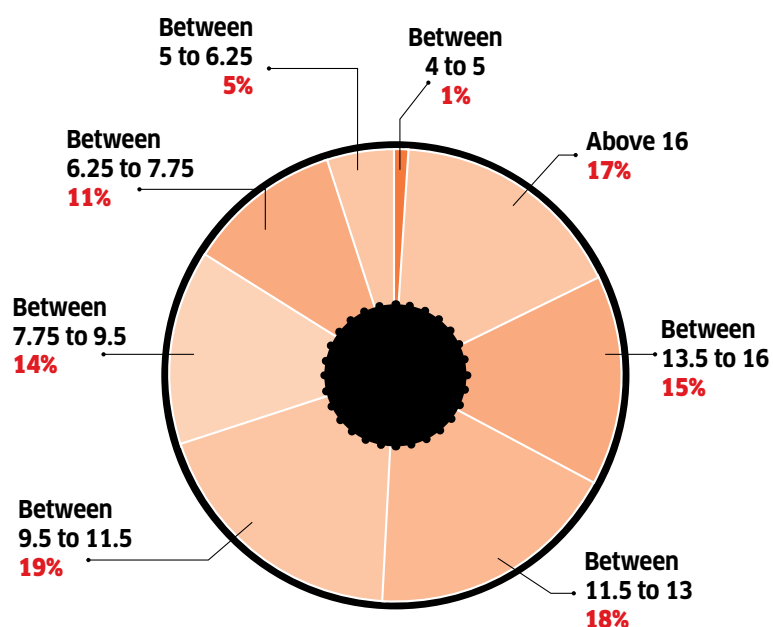
### Salary-wise classification of total offers

**Table 4:** Placement details based on compensation

Range of Gross Salary (in Lakh Rupees per annum)	Number of Organizations	Number of Offers Received
Above 16	57	204
Between 13.5 to 16	50	182
Between 11.5 to 13	56	214
Between 9.5 to 11.5	59	223
Between 7.75 to 9.5	51	163
Between 6.25 to 7.75	42	135
Between 5 to 6.25	23	57
Between 4 to 5	5	8
<b>Total</b>	<b>343*</b>	<b>1186</b>

\*Some organisations may have offered jobs in multiple salary categories.

**Figure 3:** Compensation-wise distribution of offers. (in Lakhs P.A.):



## Comparison of average salary, international and pre-placement Offers:

The average gross salary offered was Rs. 14.11 lakhs and the average CTC was Rs. 17.49 lakhs. Total number of Pre-Placement Offers (PPOs) was 131, which was all-time highest. The number of international offers was 108 including PPOs. This suggests an increasing and a positive trend in the pay package offered by various organisations. (Refer to Table-5).

**Table 5:** Average salary, international and Pre-Placement offers details:

Description	2017-18	2018-19
Average Gross Salary (in LPA*)	<b>12.32</b>	<b>14.11</b>
Average CTC (in LPA*)	<b>15.69</b>	<b>17.49</b>
Total number of International Offers	<b>75</b>	<b>108</b>
Total number of Pre-Placement Offers	<b>100</b>	<b>131</b>

\* LPA – Lakhs per annum (in rupees)

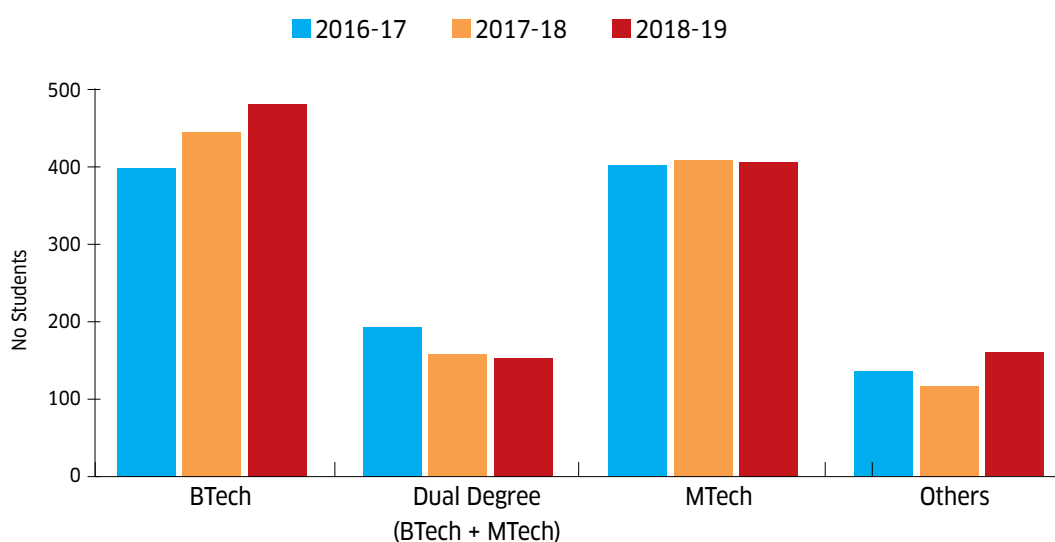
## Year-wise Placement Comparison

Despite the challenging market situations over the years, IIT Bombay managed to attract good recruiting firms in the job market. Table-6 and Figure-4 presents the comparison of students placed over the last three years.

**Table 6:** Comparison of students placed in last three years

Program	2016-17	2017-18	2018-19
BTech	394	438	475
Dual Degree (BTech+MTech)	189	157	151
MTech	396	403	402
Others	135	119	158
<b>Total</b>	<b>1114</b>	<b>1117</b>	<b>1186</b>

**Figure 4:** Comparison of students placed over the year:





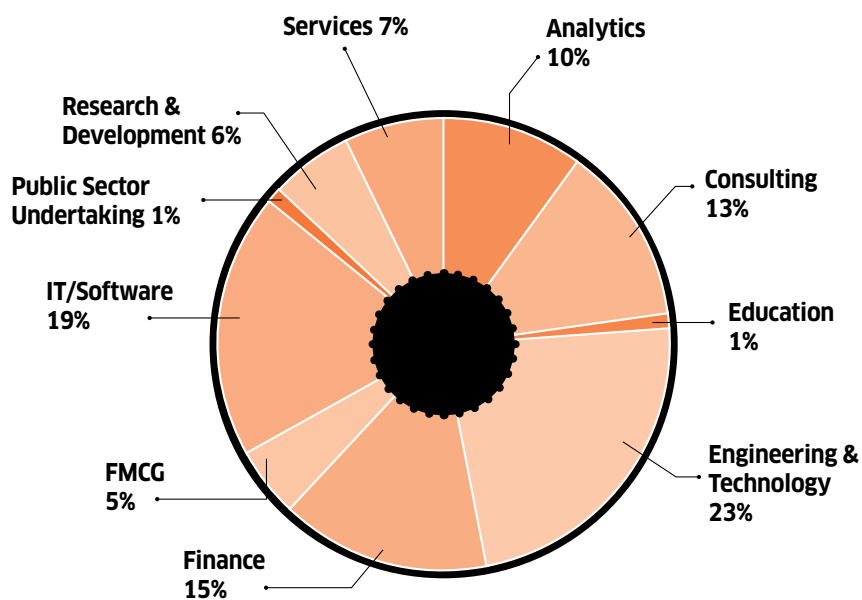
## Sector-wise statistics for different programs

BTech and MTech students maintained almost the same demand amongst companies of various sectors. Sectors like Education and Engineering & Technology expressed greater interest in students of IIT Bombay than the previous year. Sector-wise statistics for different programs are shown in Table-7 and Figures 5, 6 and 7.

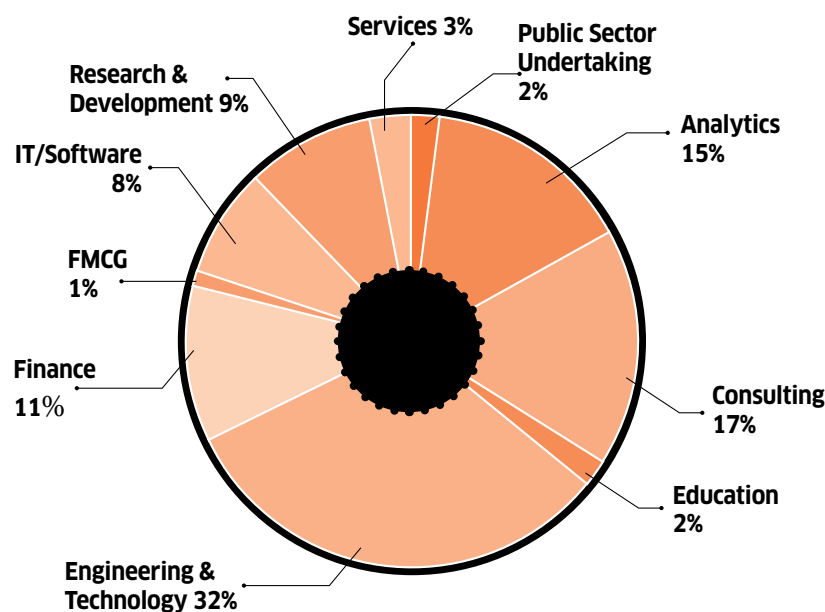
**Table 7:** Sector-wise statistics for different degree courses:

Sector	BTech	Dual Degree	MTech
Analytics	49	23	54
Consulting	61	25	15
Education	6	3	10
Engineering & Technology	109	48	195
Finance	73	17	14
FMCG	23	2	1
IT/Software	91	12	69
Public Sector Undertaking	5	3	3
Research & Development	26	14	40
Services	32	4	1

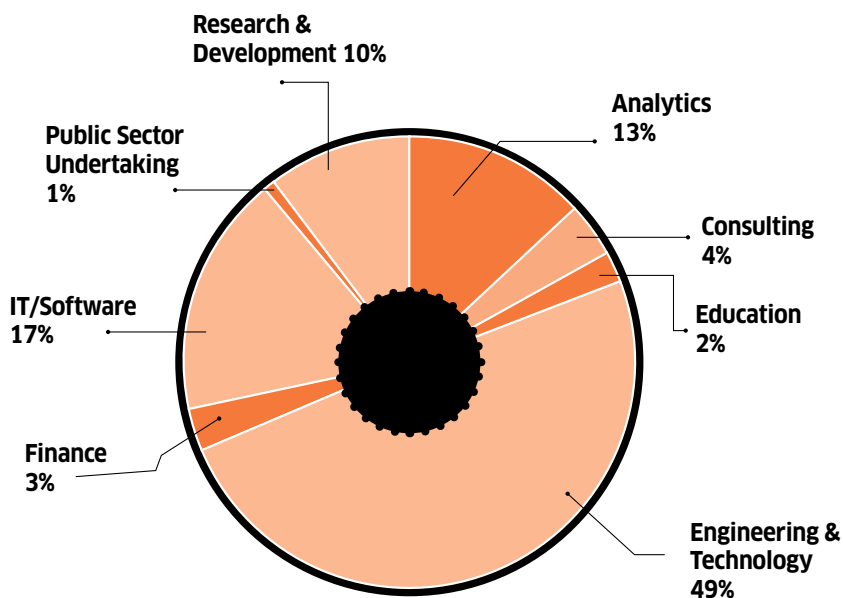
**Figure 5:** Sector-wise demand of BTech



**Figure 6: Sector-wise demand for Dual Degree (BTech+ MTech)**



**Figure 7: Sector-wise demand of MTech**



## Internship Report 2018-19

Industrial exposure and practical experience play a significant role while attempting to enter the corporate world. Internships have thus become really important as they not only provide this exposure and experience but also help in one's personal growth and development.

Students from their second and third year of Bachelor's, and first year of Master's programmes appear for the internship recruitment. Keeping the diversity of students in mind and the importance of internships in context, the Placement Office strives hard to provide students with the best of the opportunities in their field of interest. Placement Office also encourages research by providing students the research internship opportunities at esteemed universities.

The Internship Session 2018-19 started in July 2018 and continued till July 2019. It saw 1041 offers from over 475 organisations. Companies have also benefited as they have offered 162 Pre-Placement Offers (PPO) out of which 131 were accepted.

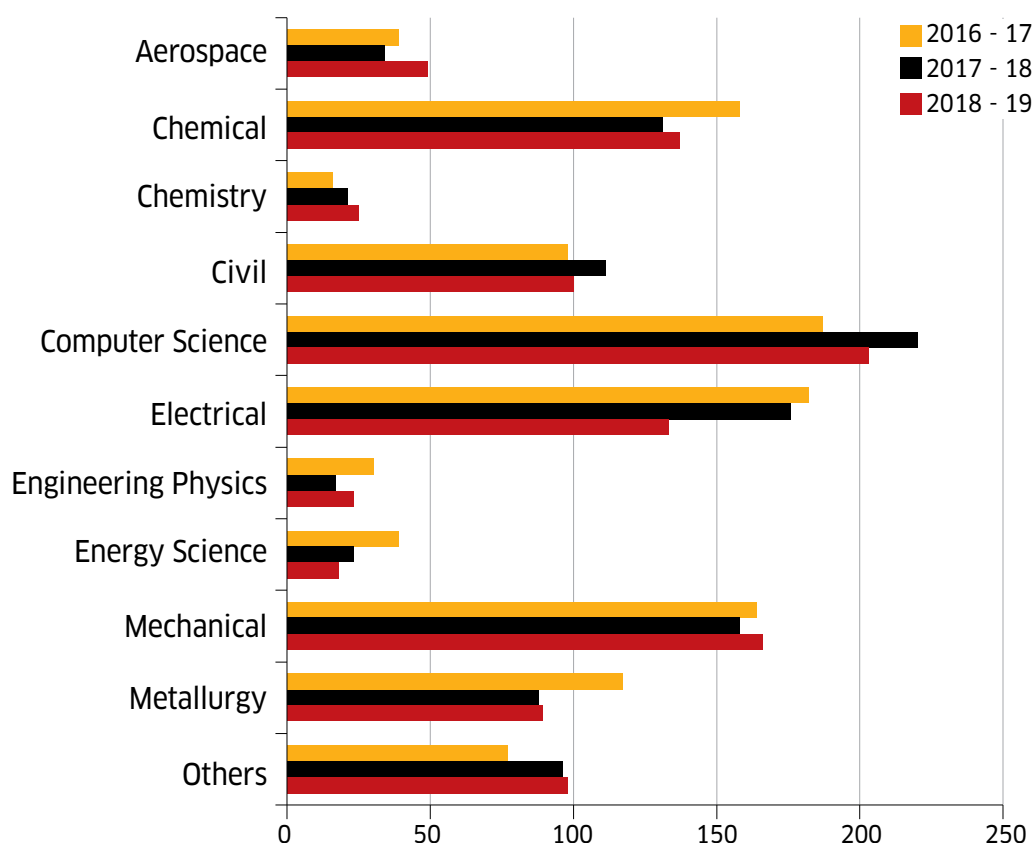
### Department-wise Internship offers:

Students from all departments were in demand by firms and universities alike for internship positions. Similar trends were observed in the previous years, continued this year as well. The demand for students from departments such as Computer Science, Mechanical and Electrical Engineering was high. A slight increase in the number of MSc and Design internships was also observed in comparison with the previous year. Figure-8 presents the department-wise distribution of internship offers made over the past 3 years.

**Table 7:** Department-wise internship offers over past three years:

Department	2016-17	2017-18	2018-19
Aerospace	39	34	49
Chemical	158	131	137
Chemistry	16	21	25
Civil	98	111	100
Computer Science	187	220	203
Electrical	182	176	133
Engineering Physics	30	17	23
Energy	39	23	18
Mechanical	164	158	166
MEMS	117	88	89
Others	77	96	98
<b>Total</b>	<b>1107</b>	<b>1075</b>	<b>1041</b>

**Figure 8:** Department-wise internship offers over past three years



### Summer vs. Winter Internship offers:

Summer internships usually begins in May and ends in mid-July, whereas winter internships are pursued in December. The number of summer internship offers exceeds the number of winter internship offers, which is attributed mainly to the longer duration available in summer.

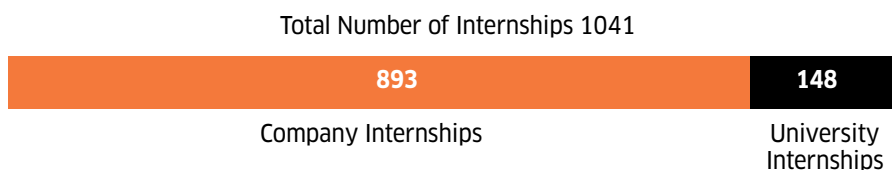
**Table 9:** Summer vs. Winter internship offers:



### Companies vs. Universities internship offers

Companies of various business sectors offer internship positions to the students. This option presents an opportunity to gain industrial exposure and broaden one's skill-set in the domain of interest. This year, the Institute started the much-awaited credit-based internship programme, by means of which the students could leverage the performance in their internship towards the academic credit requirement.

**Table 10:** Companies Vs. Universities internship offers:

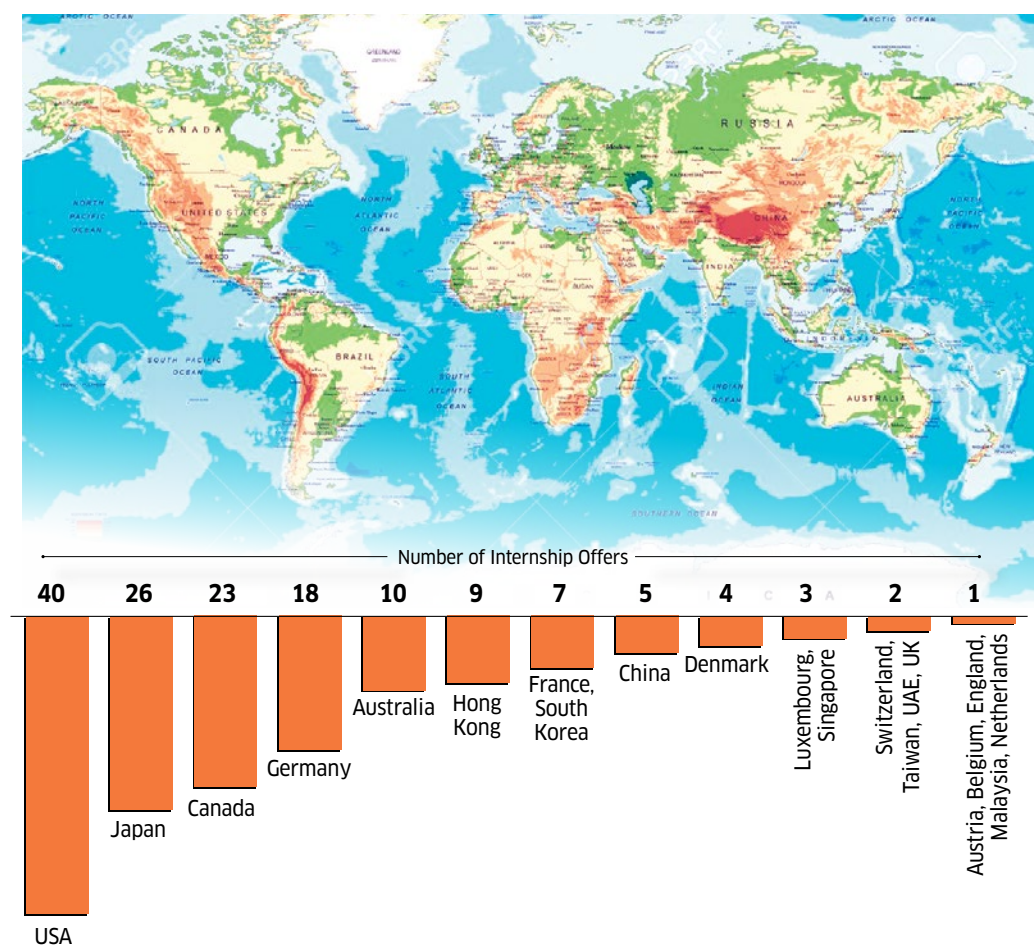


### Country-wise internship offers

Reputed foreign universities and firms have an affinity towards IIT Bombay students. The Table-11 and Figure-9 show the country-wise internship offers from different foreign firms and universities. Students have received the greatest number of internship offers from the USA followed by Japan, Germany and other counties in the world. This indicates that the preference of IIT Bombay students in other countries is comparatively high.



**Figure 9:** Country-wise distribution of international internship offers from Universities and firms



**Table 11:** Country-wise international internship offers from Universities and firms

Country	Number of Internship Offers	Country	Number of Internship Offers
USA	40	Singapore	3
Japan	26	Switzerland	2
Canada	23	Taiwan	2
Germany	18	UAE	2
Australia	10	UK	2
Hong Kong	9	Austria	1
France	7	Belgium	1
South Korea	7	England	1
China	5	Malaysia	1
Denmark	4	Netherlands	1
Luxembourg	3	Luxembourg	3

# Society For Innovation And Entrepreneurship

The Society for Innovation and Entrepreneurship (SINE), has completed 15 successful years as a technology business incubator. Set up in 2004, SINE provides start-to-end support to technology-based entrepreneurs and facilitates the conversion of research activity into entrepreneurial ventures. As an incubator, SINE runs programs which include prototyping grants, entrepreneur fellowships, bootcamps for innovators and early-stage entrepreneurs. SINE's incubation program incubates technology entrepreneurs from various streams like MedTech, fintech, Bio-Tech, AI, ML etc., for over 3-5 years in both physical and virtual formats. It also runs accelerator programs with corporate partnerships.

In the last 15 years, SINE has gained a leadership position in business incubation community in India. SINE has been selected as "Centre of Excellence" by the Department of Science and Technology, Government of India (DST-GOI). In addition, DST has also selected SINE as an implementation partner to run its nationwide program for funding innovators for prototyping their ideas. SINE has also been approved by BIRAC and the Department of Biotechnology, Government of India (DBT-GOI) for setting up a BIO-Incubator (BIONEST) to encourage the MedTech entrepreneurs. MeitY-GOI (Ministry of Electronics and Information Technology) also supports SINE.

SINE in its journey of 15 years has incubated over 140 startups founded by 360 entrepreneurs who in turn created more than 3600 employment opportunities. It has

facilitated more than 380 innovators under various programs. Nearly 26 per cent of its start-ups are based on IPs spun out of IIT Bombay. Majority of its incubated companies have received external funding, and many have expanded the ventures into international markets.

SINE actively collaborates for various initiatives with corporates, government, institutions and International organisations. SINE, while engaging with corporates, not only involves them in various activities like joint accelerator and mentoring programs, but also in product/ service/ idea validation of

incubatees. SINE also works with corporates for their CSR initiatives.

SINE, this year, has collaborated with SANOFI, a global leader in healthcare solutions and has started mentoring eight startups in healthcare space

under its mentorship program BRIDGE 2018 (Bright Ideas. Growth Enabled). SINE in its international collaboration has held programs like a two-week academia-industry training with Swissnex, Switzerland, manufacturing ecosystem ties in Taiwan through its partners National Taiwan University of Science and Technology (NTUST) and Industrial Technology Research Institute (ITRI).

Ranked 2nd in Atal Ranking of Institutions on Innovation Achievements (ARIIA), for the year 2018-19, SINE continues to administer its activities in a strategically targeted approach. Its business model, process and governance frameworks have been acknowledged by the Government (GOI) as a benchmark for other Technology Business Incubator's to follow within India.



# IIT Bombay Research Park Foundation

The IIT Bombay Research Park Foundation (IITB RPF) is a non-profit organization incorporated by IIT Bombay in 2016. The primary objective of the Research Park (RP) is to deepen the interaction between industry and IIT Bombay through physical proximity by bringing industry research and development centres on IIT Bombay campus. The IIT Bombay Research Park is a single window through which industry and academia can interact, in an environment where academic research complements technology development and productization, to make an impact on businesses, society and India.

The Research Park is in the process of constructing a 14-storey building with a built-up area of about 4,90,000 sq. ft., located near Hostel 14 between Powai and Vihar lakes. The ground breaking ceremony for the construction of the building was performed on October 10, 2018. The new Research Park building is expected to be operational by 2021. The Research Park architecture is designed to accommodate considerations of various industry sectors such as Automotive, Semiconductor, Chemical/ Bio-tech, Energy, Aerospace etc. units with various sizes to fulfil requirements of SMEs as well as large industry clients.

As an interim arrangement to accommodate RP clients, the Research Park is operating from the allocated space in the academic area on IIT Bombay campus. The Research Park currently has nine companies operational in this space: Applied Materials, Tata Power SED, Bharat Forge, Suzlon, NanoSniff Technologies, Cummins, Murata, Ubisoft and Viacom 18.

As part of its Outreach program, Research Park has been conducting various Academia-Industry meets. In 2018, two sector-specific IIT Bombay Industry meets were organised - “Data Science and Artificial Intelligence” on October 27, 2018 and “Future Innovations and Trends in Automotive Design & Smart Transportation Systems” on November 2, 2018. These events have resulted in a few companies expressing a strong desire to become the clients of Research Park, and, in forming an industry consortium on ‘Smart Mobility’.

The Research Park has also started an in-reach program to spread awareness by making Research Park presentations in the department faculty meetings. It has held in-reach sessions in the departments of Metallurgical Engineering and Materials Science, Mechanical Engineering, Chemical Engineering, Civil Engineering, Chemistry, Computer Science and Engineering, Biosciences and Bioengineering, IDC School of Design, Physics, and Electrical Engineering. So far, the response from the faculty has been enthusiastic. Research Park has also ‘reached in’ to the IIT Bombay’s student community by conducting ‘Diversity in Gaming’ event along with RP client, Ubisoft. The purpose of this event was to create an awareness amongst students about job opportunities in the gaming industry.

In the last two years, as the Research Park continues to establish itself, it has been able to attract an overall additional funding of 496 lakhs for industry-sponsored research at IIT Bombay. There were 14 joint patents/ publications between RP clients and IIT Bombay. About 53 students were hired for internships/ full-time employment at RP companies.



# 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, IIT Bombay has signed 50 MoUs with various foreign universities and received governmental and ministerial delegations from countries across the globe for exploring areas of collaboration and cooperation.

## MoUs with Foreign Universities:

- Binghamton University, USA
- Technical University of Munich, Germany
- University of Balamand, Lebanon
- Interdisciplinary Center (IDC) Herzliya, Israel
- Loughborough University, School of Business and Economics, UK
- University of North Texas, USA
- Nanyang Technological University, Singapore
- University of Stuttgart, Germany
- Ben-Gurion University of the Negev, Israel
- Kyoto Seika University, Japan
- Nottingham Trent University, UK
- Royal Melbourne Institute of Technology, Australia
- North Carolina State University, USA
- Kyushu University, Japan
- Samarkand State University, Uzbekistan
- The University of Queensland, Australia
- Samara National Research University, Russia
- Amirkabir University of Technology, Tehran
- Cracow University of Technology, Poland
- The Korea Institute of Science and Technology (KIST), Republic of Korea
- Leibniz University of Hannover, Germany

- The High Energy Accelerator Research Organization, Japan
- Koc University, Turkey
- Ecole Normale Supérieure Paris-Saclay, France
- University of Dhofar, Oman
- The University of Newcastle upon Tyne, UK
- German University of Technology in Oman
- Simon Fraser University, Canada
- UCSI University, Malaysia
- The University of Auckland, New Zealand
- Tongji University, China
- Saint-Petersburg State University, Russia
- University of Edinburgh, UK
- Genomics Research Center, Academia Sinica, Taipei, Taiwan
- National University of Singapore
- Federal University of Rio De Janeiro, Brazil
- Tashkent University of Information Technologies, Uzbekistan
- Hiroshima University, Japan
- The University of Sydney, Australia
- Syiah Kuala University, Indonesia
- Fontys University of Applied Sciences, School of ICT, The Netherlands
- The Graduate School of Engineering and The Graduate School of Information Science and Technology, The University of Tokyo, Japan
- University of Strasbourg, France
- Chubu University, Japan
- George Mason University, USA
- Technical University of Braunschweig, Germany
- Ecole Nationale Supérieure de Chimie de Lille, France
- Hong Kong Baptist University, Hong Kong
- Technical University of Denmark

## 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:

- Mr. Ade Sukendar, Consul General and Ms. Adini Fitriliah, Vice Consul from Consulate General of The Republic of Indonesia visited on April 17, 2018.
- Prof. Peter Hutchings, Dean and Provost, Dr. Asha Chand, Associate Dean International and Ms. E Marisa Furno, Asso. Director, International Partnerships from Western Sydney University, Australia visited on April 20, 2018.
- Prof. Suresh Bhargava, Associate Pro Vice-Chancellor (India) for the College of Science, Engineering and Health, and Director of the Centre for Advanced Materials and Industrial Chemistry (CAMIC), RMIT, Australia visited on April 24, 2018.
- Prof. Mary-Ann Mycek, Associate Dean and Ms. Christine Muchanic, Director - International Relations from University of Michigan, USA visited on May 21, 2018.
- Executive Vice Provost, for International Initiatives, Prof. Krishnaswami (Hari) Srihari from Binghamton University, USA visited on May 24, 2018.
- Dr. Matthias Kiesselbach, Director, Deutsche Forschungsgemeinschaft (DFG) India visited on May 24, 2018.
- Dr. Sandrine Maximilien, Attachée for Academic, Scientific and Technological Cooperation at the French Embassy in India/ French Institute in India (IFI) with her colleagues from Campus France and the Director of Alliance Française de Bombay visited on May 29, 2018.
- Dr. Matt Durnin, Head of Research and Consultancy for International Education Services and Ms. Suchita Gokam, Asst. Director, Education Services for India from British Council visited on June 6, 2018.
- Dr. Seung Cheol, Director and Ms. Malini Shridhar, Head of Admin & External Affairs from Indo-Korea Science and Technology Centre, Bangalore which is affiliated branch of Korea Institute of Science and Technology (KIST), Korea visited on June 18, 2018.
- Dr. Stephen Williams, Director and Dr. Clare Newstead, International Manager from Nottingham Trent University, UK visited on June 27, 2018.
- Dr. Maryam Qudrat, Adviser to Ministry of Higher Education in Afghanistan and faculty at California State University-Long Beach visited on June 27, 2018.
- Prof. Eric Mao, Assistant Dean of Graduate and Advanced Education at New Yorks University's (NYU) campus in Shanghai, China visited on July 6, 2018.
- Prof. Suresh Bhargava, Associate Pro Vice-Chancellor (India) for the College of Science, Engineering and Health, Royal Melbourne Institute of Technology, Australia visited on July 18, 2018.
- Dr. John Bay, Associate Dean for Research and Graduate Studies; Professor Thomas J. Watson School of Engineering and Applied Science, Binghamton University, New York visited on July 30, 2018.
- Mr. Luke Wales, Director of International Strategic Engagement & Ms. Wenwei Wu, International Development Manager, University of Birmingham, UK visited on August 3, 2018.
- Prof. Rubén Morales Menéndez, Dean (Academics), Prof. Ricardo Ambrocio Ramírez Mendoza, Dean (Research) and Prof. K. D. P. Nigam, IIT Delhi and Distinguished Professor Tecnológico de Monterrey (ITESM), Mexico visited on August 6, 2018.
- A delegation from Hokkaido University, Japan headed by Prof. Toyoharu Nawa, President, Prof. Yuki Yoshi Saito, Director, Division of International Relations, International Affairs Department, Mr. Takeshi Takano, International Cooperation Manager, Division of International



Relations, International Affairs Department and Prof. Takeo Ohgane, Graduate School of Information Science and Technology visited on August 14, 2018.

- A delegation from University of New Brunswick, Canada including Dr. John Kershaw, Assistant Vice President Academic (Partnerships), Professor of Forestry, Dr. Chris Diduch, Dean, Faculty of Engineering, Professor of Electrical and Computer Engineering, Dr. David Burns (Project Lead), Executive-in-Residence, J Herbert Smith Centre, Professor of Chemistry and former Vice-President Research of UNB, Dr. Dharendra Shukla, Chair, J Herbert Smith Centre for Technology Management and Entrepreneurship, Mr. Hannah Classen (Project Manager), Communications Officer and Mr. Dominic Blakely, Innovation and Entrepreneurship Strategist and Advisor to President visited on August 27, 2018.
- Dr. Robin Forman, Provost and Senior Vice President for Academic Affairs and Dr. Satyajit Dattagupta, Vice President of Enrollment Management and Dean of Admission, Tulane University, US visited on September 4, 2018.
- Prof. Tan Cher Ming, Director, Chang Gung University, Taiwan visited on September 6, 2018.
- Dr. Usmonov Botir Shukurillayevich, Vice Rector for Scientific Affairs and Mr. Javlonbek Abdujalilov, Head of International Relations Department, Tashkent University of Information Technologies, Uzbekistan visited on September 12, 2018.
- A senior delegation from the Ministry of Afghanistan headed by Dr. Mohammad Humayon Qayoumi, Senior advisor to President of Afghanistan, Dr. Abdul Tawab Balakarzai, Deputy Minister for Academic Affairs of the Islamic Republic of Afghanistan, and Mr. A Ghafoor Hashimi, Head of Cultural Affairs, Consulate General of the Islamic Republic of Afghanistan in Mumbai visited on September 12, 2018.
- Dr. Patrick Phelan, Dean of Graduate Programs and Professor of Mechanical and Aerospace Engineering, Dr. Raghu Santanam, Professor and Chair of the Department of Information Systems and Mr. Holly Singh, Senior Director, International Center, Arizona State University visited on September 17, 2018.
- Dr. Ted Sargent, University Professor, Canada Research Chair in Nanotechnology, Vice President International and Prof. Mark Fox, Associate Director (Research), University of Toronto visited on October 4 and 25, 2018 respectively.
- Prof. Adil Minoo Dhalla, the Managing Director of Separation Technologies Applied Research and Translation (START) Centre at NTU, Singapore visited on October 25, 2018.
- A delegation from Newcastle University including Prof. Richard Davies, Pro-Vice Chancellor for Engagement and Internationalisation, Prof. John Fitzgerald, Head of School of Computing, Dr. Gary Ushaw, Senior Lecturer and Director of Business and Engagement, Dr. Anil Namdeo, Chartered Scientist and Reader in Air Quality Management and Prof. Alison Shaw, David Goldman, Visiting Professor of Innovation and Enterprise visited on October 25, 2018.
- Prof. Yossi Rosenwaks, Dean, The Iby and Aladar Fleischman Faculty of Engineering, Tel Aviv University visited on October 26, 2018.
- A delegation from the University of Strasbourg including Prof. Irini Jacobberger, Vice-President for International Relations/ linguistic, Prof. Philippe Turek, Deputy Vice-President for International Relations/ condensed matter physics, Prof. Jay Rowell, Director of Research, Deputy Vice-President for Research/ political sociology, Asso. Prof. Valérie Lamour, Deputy Vice-President for Research/ structural biology and Mrs. Rachel Blessig-Lagala, Head of the Department of International Relations

visited on November 7, 2018.

- A delegation from University of Auckland, New Zealand including Prof. Jenny Dixon, Deputy Vice Chancellor Strategic Engagement, Prof. John Hosking, Dean of Science, Prof. Nic Smith, Dean of Engineering, Asso. Prof. Mark Barrow, Dean of Education and Social Work, Asso. Prof. Partha Roop, Associate Dean International, for the Faculty of Engineering, Dr. Sudip Ray, Senior Research Fellow Faculty of Science, Mr. Brett Berquist, Director International, Ms. Miranda Herbert, Deputy Director International and Ms. Elle Freestone, International Manager Engineering visited on November 29, 2018.
- Ms. Gwen Burrows, Executive Director, International and Ms. Vanessa C. Laufer, Director, International Relations, University of Toronto visited on November 30, 2018.
- A 11-member delegation from University of Bristol including Ms. Caroline Baylon, Director International, Dr. Kirsten Carter, Academic Director, Centre for Innovation, Dr. Nicholas Howden, Reader in Water and Environmental Engineering, Prof. David Richards, Reader in Physical Geography, Prof. Agnes Nairn, Faculty International Director for Economics, Accounting, Finance & Management, Ms. Beverly Orr-Ewing, Deputy Director International and Head of Global Opportunities, Ms. Lorna Cuckow, Deputy Director International and Head of International Partnerships and Relations, Mr. Dominic Freda, Faculty Manager, Faculty of Social Sciences, Mr. Devesh Anand, Country Advisor (India) and Mr. Robin Knowles, International Media Manager visited on November 30, 2018.
- Prof. Dr. Mukundan Thelakkat, Chair of Macromolecular Chemistry-I, Head of the project “Bayreuth-Melbourne Colloid/Polymer Network” (Faculty of Biology, Chemistry and Earth Sciences), Prof. Dr. Torsten Kühlmann, Chair of Business Administration (Human Resource Management, Faculty of Law, Business and Economics), Dr. Arnim Heinemann, Director of the International Office (also representing the Faculty of Humanity and social Sciences) and Ms. Wiebke Dörfler, Managing Director of the BayIND Bavarian-Indian Centre, University of Bayreuth, Germany visited on December 12, 2018.
- Prof. José Orlando Gomes, Vice-President & Treasurer- International Ergonomics Association, Federal Universities of Rio de Janeiro (UFRJ) visited on December 12, 2018.
- Dr. Vanessa Scherrer, Vice President for International Affairs, Prof. Christophe Jaffrelot, Researcher, Ms. Neha Khanna, Representative to India in Delhi and Ms. Sophie Collet, Representative to India in Mumbai from Sciences Po visited on December 12, 2018.
- A delegation from Iranian Embassy including Mr. Saeed Avatefi Amjad, Director of Robotics division, Mr. Mohammadreza Jahangiri, Head of Kerman Technical and Vocational Training Organization (TVTO), Mr. Majid Mollamohammadi, Director of Education KTVT, Ms. Mahnaz Najibzadeh, Director of the International Affairs and Dr. Mehdi Salem, Head of Omid Channel in Iran visited on December 14, 2018.
- Prof. Dr. Mohamed Shoukr Nada, The Cultural Counsellor, Head of the Educational Mission Bureau, The Embassy of the Arab Republic of Egypt in New Delhi, India visited on December 14, 2018.
- Dr. Pratim Biswas, Asst. Vice Chancellor, International Programs from Washington University in St. Louis visited on January 3, 2019.
- Prof. Wang Xiqin, Executive Vice President, Prof. Wang Youqiang, Library Director, Dr. Zhang Chuanjie, Asian University Alliance (AUA) Secretary and Ms. Wang Yaqian, Administrator (Policy & Programs), AUA Secretariat from Tsinghua University, China visited on

January 21, 2019

- Prof. Nancy Cromar, Pro Vice-Chancellor International, Prof. Murat Karakus Associate Dean International from the School of Civil, Environmental and Mining Engineering in the Faculty of Engineering, Computer and Mathematical Sciences, Prof. Kapil Chousalkar, School of Animal and Veterinary Sciences in the Faculty of Sciences, Mr. Michael Aust, Manager, International Development, School of Arts, Architecture and Business, Faculty of Professions and Ms. Priya Kamineni, Director International Business Development - International Recruitment from University of Adelaide, Australia visited on January 28, 2019.
- A delegation from Simon Fraser University, Canada including Prof. Andrew Petter, President and Vice-Chancellor, Prof. Joy Johnson, Vice-President, Research and International, Prof. Tania Bubela, Dean, Faculty of Health Sciences, Prof. Maureen Maloney, Professor, School of Public Policy, Mr. Ian Hand, Executive Director, VentureLabs, Mr. Darren Schemmer, Executive Director, SFU International and Mr. Yusuf Varachia, Director, International Strategic Initiatives, SFU International visited on January 30, 2019.
- A delegation from University of Sydney including Dr. Michael Spence, Vice-Chancellor, Prof. Tania Rhodes Taylor, Vice Principal (External Relations), Dr. Elizabeth Hill, Faculty of Arts and Social Sciences, Asso. Prof. Vincent Gomes, Faculty of Engineering and IT, Dr. M.D Mahbub Hassan, Faculty of Engineering and IT, Ms. Amanda Sayan, Director Partnerships, Office of Global Engagement visited on February 5, 2019.
- A joint delegation from Nara Women's University, Japan and TCS, Japan including Mr. Haruki Imaoka - President, Nara Women's University (NWU), Mr. Takashi Yoshida, Deputy Head, NWU High School, Ms. Yoko Arahori, Asst. Manager General Affairs and Planning Division, NWU, Mr. Kunihiro Arai, Head, Global Strategy Department, Gakken Holdings, Mr. Yoji Yamamoto, Industry Head, Education business unit, TCS Japan, Mr. Sunil Viswanathan, Client Partner, Education business unit, TCS Japan, Mr. Mihoko Obuchi, Evangelist, Education business unit, TCS Japan visited on February 7, 2019.
- A 4-member delegation from Saudi Arabia including Dr. Abdullah Mohammed Alshehry, Director of Human Resources at Presidency of State Security, Mr. Abdullah Yazeed Alfaifi, Director of IT Department, Human Resources Agency at Presidency of State Security, Mr. Abdulhadi Abdullah Alanazi, Head of Networks Section in the General Directorate of Communications and Information Technology at Presidency of State Security, Mr. Faisal Mohammed Alotaibi, Asst. Manager of Systems and Programs at the General Directorate of Communications and Information Technology at Presidency of State Security visited on February 13, 2019.
- A delegation from University of Victoria composed of Prof. Robert Lipson, Dean, Faculty of Science, Prof. Peter Wild, Acting Dean, Faculty of Engineering, Prof. Catherine Krull, Dean, Faculty of Social Sciences, Ms. Carolyn Russell, Director Student Ex-Recruitment and Global Engagement and Ms. Neharika Kataria, Recruitment Advisor (West Asia and Middle East) visited on February 14, 2019.
- A delegation from Nottingham Trent University (NTU) including Prof. Mark Biggs, Pro Vice-Chancellor and Head of the College of Science and Technology, Dr. Will Rossiter, Associate Professor, Nottingham Business School, Dr. Yvonne Reinwald, Lecturer in Biomedical Engineering, Mr. Christopher Crabot, College International Manager, College of Business, Law and Social Science, Dr. Clare Newstead, College International Manager, College of Science and Technology, Mr. Andrew Plant, College International Manager, College of Art, Architecture, Design and Humanities and



Ms. Vidhi Sahae, NTU Global Regional Partnership Coordinator, (South Asia, ASEAN and Australia) visited on March 1, 2019.

- Mr. Ranjith G. Rubasinghe, Founder President and CEO and Dr. Sanjeeva Maithripala, Faculty and Consultant for Research and Academic Affairs from Sri Lanka Technological Campus visited on March 14, 2019.
- Prof. Jinhui Huang, Executive Director of Sino-Canada R&D Center for Water and Environmental Safety, and Prof. Ghani Razaqpur Chair Professor and National 1000 Talent Foreign Expert Nankai University, Tianjin, China visited on March 15, 2019.

#### Contingent visits during 2018-19:

- From Canada in May 2018: A group of 24 graduating engineers from Polytechnique Montreal, Canada (called “Poly-Monde”), was on a study tour in India during May 2018. The team visited the Centre of

Studies in Resource Engineering (CSRE) and Centre for Technology Alternatives for Rural Areas (CTARA) at IIT Bombay on May 17, 2018 and interacted with the faculty members and PhD students of the Department.

- From Germany in June 2018: A high-level corporate delegation from the reputed Benteler Group, Germany comprising 30 of their top CEO's from all around the world, through Indo-German Chamber of Commerce visited IIT Bombay on June 26, 2018 to get an insight on the activities at IIT Bombay. They initially interacted with the Computer Science and Engineering (CSE), Aerospace Engineering (AE) and Metallurgical Engineering and Materials Science (MEMS) Departments wherein they were given the overview of the Department, information on curriculum and various pedagogy used by department. Besides this, they were also briefed on the functioning of International Relations and Placement departments followed by visit to NCAIR lab of Mechanical Engineering (ME) department. The CEOs were delighted to see the facilities available at IIT Bombay.



Contingent from Afghanistan



Delegation from University of Bayreuth, Germany



Contingent from Taiwan



Delegation from Iranian Embassy

- From Taiwan in September 2018: Taiwan Semiconductor Manufacturing Company (TSMC), Taiwan is the world's largest semiconductor foundry, manufacturing 9,920 different products using 258 distinct technologies for 465 different customers in 2017. TSMC has been partnering with National Chiao Tung University – International College of Semiconductor Technology (NCTU-ICST) on many talent programs, including the dual degree programs that it has with premier universities like IIT Bombay. TSMC celebrated “TSMC Day” with its first workshop in IIT Bombay on September 19, 2018 to introduce how IIT Bombay-(NCTU-ICST)-TSMC collaboration can unleash innovation and change the world. This event had huge number of student participation from the Department of Electrical Engineering exploring the opportunity.
- From Afghanistan in October 2018: India and Afghanistan have strong diplomatic relations in various areas including education. As an outcome of the visit by the Ministry of Afghanistan in September 2018 and to further strengthen this relation, a team of 20 personnel from different universities of Afghanistan visited IIT Bombay. Prof. Kannan Moudgalya along with his team imparted training in basics of edX and Spoken Tutorials, and other common topics, such as Scilab. Training on specialised topics of Open edX / IITBombayX was also given to few members of the group considering their area of specialization and work profile.
- From Colombia in October 2018: A 20-member CEO delegation from Grupo Bolivar, one of the largest and most stable financial services groups from Colombia, South America visited IIT Bombay on October 24, 2018. The delegation interacted with the professors from the Department of Computer Science and Engineering at IIT Bombay and learnt about the research work happening in the Department.
- From Japan in October 2018: The Asia mission consisting of seven director level personnel related to the Polymer Technology Executives Society from various Japanese corporations visited IIT Bombay on November 19, 2018. Besides an overview of International Relations Office, and Research and Development Office given by respective Deans at IIT Bombay, they interacted with professors from Departments of Chemical Engineering, Chemistry and Metallurgical Engineering & Materials Science and toured through the facilities at Sophisticated Analytical Instrument Facility (SAIF).
- From Netherlands in November 2018: The 17-member Netherlands delegation included faculty members from Fontys University of Applied Science. This visit was co-ordinated by personnel from Sogeti Netherlands, a fully-owned subsidiary of the Capgemini Group and a global leader in consulting, technology services and digital transformation. With an overview of activities done under International Relations office, they were also exposed to the functioning and research done by Computer Science and Engineering Department.
- From China in November 2018 and Nepal in February 2019: As part of International Youth Exchange Programme between India and China, a 100-member Chinese Youth Delegation visited IIT Bombay on November 30, 2018 and a 50-member delegation from Nepal visited IIT Bombay on February 12, 2019. These delegations comprised of young university students, entrepreneurs and officials from Ministry and Federations from China and Nepal. There was a very vibrant interactive session between these delegations and IIT Bombay students, besides a visit to Central Library and entrepreneurship display by Society for Innovation and Entrepreneurship (SINE).
- From Australia in December 2018: A group of 49 students sponsored by the Australia Government visited IIT Bombay on December 13, 2018. These students were from several Australian universities:





Contingent from Colombia



Contingent from Australia



Contingent from Netherlands



Contingent from Nepal



IIT Bombay & Western Sydney University, Australia



IIT Bombay & National Chiao Tung University, Taiwan



IIT Bombay & Leibniz University Hannover, Germany



IIT Bombay & Technical University Braunschweig



IIT Bombay & Technical University of Denmark, Denmark

to name a few, University of New South Wales, University of Newcastle and Royal Melbourne Institute of Technology. Since they were interested in tech and entrepreneurship so a session was arranged with Tata Centre for Technology and Design (TCTD). The student group was briefed about the activities of the Centre and introduced with the activity on stakeholders' analysis and business model planning on live projects followed by a lab visit.

- From Canada in February 2019: The Conference Board of Canada (CBoC) is an independent, non-aligned research institution, based in Ottawa, Canada, that conducts research and convenes leaders to address issues affecting Canada's future prosperity. Under the Conference Board banner, the Quality Network for Universities (QNU) is one of the executive networks of CBoC, bringing together Canadian university leaders to act – proactively, effectively, and with vision – in a period of far-reaching change. A 12-member delegation comprised of Vice Presidents from the QNU visited IIT Bombay on February 8, 2019. They had a very strong interactive session

with Dean of International Relations and Dean of Research and Development at IIT Bombay. Their objective was to learn about the higher education landscape in India, to understand Canada-India engagement in areas relating to academics and innovation, industry interaction and engagement with higher education institutions and to explore opportunities in India for academic and/ or research partnerships.

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

### International Students

A total of 78 international students (from countries like Afghanistan, Brazil, Canada, Denmark, Ethiopia, France, Germany, Hong Kong, Iran, Italy, Japan, Nepal, Norway, Slovakia, Sweden, Switzerland, The Netherlands, Tunisia, Turkey, UK and USA) have registered at IIT Bombay during the financial year 2018-19. They have joined IIT Bombay for course work/ project work/ post graduate studies.

### Student Exchange Programs

Sr. No.	Name of the University	No. of Students/ Programmes
1.	Aalto University, Finland	Two Dual Degree students from the Department of Electrical Engineering
2.	Augsburg University of Applied Sciences, Germany	Three BDes student from IDC School of Design
3	Colorado School of Mines, USA	One BTech student from the Department Civil Engineering, one Dual Degree student from the Department Energy Science and Engineering and one BTech student from the Department Metallurgical Engineering and Material Science respectively
4.	Technical University of Denmark	Four Dual Degree students from the Department Electrical Engineering, six BTech students from the Department Chemical Engineering, one Dual Degree student from the Department of Mechanical Engineering, one dual degree student from Department of Energy Science and Engineering, one BTech student from the Department of Aerospace Engineering respectively



5.	Ecole Nationale Supérieure Des Arts Decoratifs	One BDes student from IDC School of Design
6.	EPFL Lausanne, Switzerland	Two Dual Degree students from the Department of Energy Science and Engineering and one Masters student from SJMSOM respectively
7.	ETH Zurich, Switzerland	One Dual Degree student from the Department of Mechanical Engineering, one BTech student from Department of Physics and one Dual Degree student from the Department of Mechanical Engineering respectively
8.	Hochschule Fur Gestaltung Schwabisch Gmund, Germany	Four BDes student from IDC School of Design
9.	Holon Institute of Technology, Israel	Two BDes student from IDC School of Design
10.	KAIST, Korea	One Dual Degree student from the Department of Metallurgical Engineering and Materials Science, one BDes student from IDC School of Design and three BTech students from the Department of Computer Science and Engineering respectively
11.	Koc University, Turkey	One Dual Degree student and one BTech student from the Department of Mechanical Engineering, two BTech students from the Department of Aerospace Engineering, five Master students from SJMSOM and one Dual Degree student from the Department of Electrical Engineering respectively
12.	Kochi University of Technology, Japan	One BDes student from IDC School of Design
13.	KAIST, Korea	Two Dual Degree students from the Department of Metallurgical Engineering and Materials Science respectively
14.	KTH Royal Institute of Technology, Sweden	One Dual Degree student and one BTech student from the Department of Electrical Engineering and one BTech student from the Department of Mechanical Engineering respectively
15.	Kyoto Seika University, Japan	One BDes student from IDC School of Design
16.	Malardalen University, Sweden	One BDes student from IDC School of Design
17.	Nanyang Technological University, Singapore	Three Dual Degree students from the Department of Electrical Engineering, two BDes students from IDC School of Design, two BTech students from the Department of Mechanical Engineering and one Dual Degree student from the Department of Metallurgical Engineering and Materials Science respectively

18	National University of Singapore, Singapore	Two Dual Degree students from the Department of Electrical Engineering, two BTech students from the Department of Computer Science and Engineering and one BTech student from the Department of Mechanical Engineering respectively
19	Politecnico Di Milano, Italy	Two Dual Degree students from the Department of Metallurgical Engineering and Materials- Science
20	Simon Fraser University, Canada	One Dual Degree student from the Department of Electrical Engineering
21	Swansea University, UK	Three BDes students from IDC School of Design
22	Universidad Carlos III de Madrid	One Dual Degree student from the Department of Electrical Engineering
23	Pompeu Fabra University, Barcelona	Two Dual Degree students from the Department of Electrical Engineering and one BTech student from the Department of Mechanical Engineering respectively
24	University of Geneva, Switzerland	One Dual Degree student from the Department of Energy Science and Engineering
25	University of Toronto, Canada	Two dual degree students from the Department of Mechanical Engineering
26	Telecom Ecole de Management, Paris	Five Masters students from SJMSOM
27	Katholieke Universiteit Leuven, Belgium	Two Masters students from SJMSOM
28	SBE, Loughborough University, UK	Two Masters students from SJMSOM
29	Simon Fraser University, Canada	One BTech student from the Department of Computer Science and Engineering
30	University Carlos III de Madrid	One BTech student from the Department of Aerospace Engineering
31	University of Agder, Norway	Four Masters students from SJMSOM
32	University of Calgary, Canada	Two BTech students from the Department of Physics

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

- French (in association with the Embassy of France, New Delhi)
- Japanese (in association with Koo International Co. Ltd., Japan)
- German (in association with DAAD, New Delhi)
- Mandarin (in association with Embassy of Taiwan, New Delhi)

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



## **Joint Research Workshops**

The Office of Dean (International Relations) at IIT Bombay conducts research workshops with various institutes/ universities across the globe. The research workshops are the measures to strengthen the collaboration between the two institutes/ universities. The main objective of these research workshops is to identify collaborators with common research areas and take ahead the collaboration with a joint research student so that it is more sustainable. These workshops are very specific at times in particular research areas like IC designs, semiconductor etc. whereas few are conducted in pure sciences and others in different research areas of engineering.

### **IIT Bombay conducted joint research workshops with the following universities during 2018-19:**

- Australian National University, Australia at IIT Bombay in April 2018
- Western Sydney University (WSU), Australia at WSU, Australia in May 2018
- National Chiao Tung University, Taiwan at IIT Bombay in June 2018
- National Taiwan University (NTU), Taiwan at NTU, Taiwan in September 2018
- Nanyang Technological University (NTU), Singapore at IIT Bombay in September 2018 and January 2019
- Curtin University, Australia at IIT Bombay in December 2018
- Leibniz University Hannover (LUH), Germany at LUH, Germany in March 2019
- Technical University Braunschweig (TUB), Germany at TUB, Germany in March 2019
- Technical University of Denmark (DTU), Denmark at IIT Bombay in March 2019

# 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 with corporations. 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 2018-19, the Institute received a total donation of Rs.36.71 crores.** We express our deep gratitude and appreciation for the constant support shown by our alumni and other well-wishers to IIT Bombay. The major donors for the last financial year, among others, were Ansys, Portescap India Private Limited, Boeing and the major alumni donations were from IITB Heritage Foundation, Mr. Mohan Kavrie, Mr. Pramod Chaudhari, Mr. Abhay Pande, Mr. Mayur Datar, Prof. S. P. Sukhatme, Dr. Veena Joshi, and class of 1992, 1993 and 1998. 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 modernization 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. The YFA ensures that IIT Bombay offers a more attractive package to achieve better results in recruitment. The “Young Faculty Joining Bonus”, initially a Class of ’82 Legacy Project, has been awarded from 2010 onwards. The class of 1978, ’83, ’84, ’85, ’88, ’89, v90 and ’93 have also joined this project. 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. Number of YFA award beneficiaries in the year 2018-19 were 122.

**Chair Professorship:** The Chair Professorship is a distinguished academic position of the Institute and is conceived as an academic honour to recognize outstanding teaching/research work and achievements of the permanent faculty in the Institute. It is also used to attract outstanding academicians to join the institute as visiting faculty. Each Named Chair is supported by an endowment created from a donation to the Institute. It is envisaged that Named Chairs will also lead to establish new areas of specialization through the recruitment of accomplished researchers in specific fields of study. The endowment for a Chair is currently Rs. 1.25 crore. Interest from the endowment will be used to meet expenses of the Chair, which include an honorarium of upto Rs.30,000 per month and contingency expenses. The salary of the Chair Professor and all other benefits (housing, medical, etc.) continue to be borne from Institute funds. Donors have the prerogative of naming the Chairs. The broad area of specialization for instituting the Chair may also be specified by the donor. The total number of Chair Professors for the year 2018-19 was 84 out of which 51 were Institute Chairs and 33 were Donor named Chairs.

**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.

The alumni from various batches have initiated projects to provide better facilities to the students for their academic progress.

### Student Development:

**(a) Scholarships:** One way to nurture excellence amongst students is by awarding scholarships to deserving candidates. The scholarships may be named after the donor. The Office of Dean (ACR) also work with students and alumni to identify and to apply for relevant external fellowships and scholarships. The amount of scholarship is reviewed with the Institute Scholarship Committee from time-to-time to determine the viability of the same given the prevailing economic conditions. During the year 2018-19, about 450 scholarships of varying amounts were granted. Desai Sethi, Bhavesh Gandhi, IITBHF Named scholarships, Round Memorial, C'1990, C'1992, and Indira Foundation scholarships are some of the prominent scholarships.

**(b) Awards and Prizes:** As every year, about 45 awards and prizes of varying amounts and forms (certificates, medals, etc.) were given away during 2018-19. The awards in the name of Prof. K. C. Khillar, Mr. R. G. Manudhane, Dr. P. V Sukhatme and Shri Rakesh Mathur, Mrs. Rama Mathur awards are some of the prominent ones given during convocation.

### Major Events:

**(a) Institute Valedictory Function:** The Valedictory Function for the graduating students was organised on April 13, 2018 at the Institute's Convocation hall. Mr. Shantanu Rastogi, Managing Director, General Atlantic and IIT Bombay alumnus, and Ms. Roli Gupta, Founder and CEO, Oorjan and IIT Bombay alumnus, were the Chief Guests on the occasion. The event was graced by the presence of Institute dignitaries; Prof. Devang Khakhar, former Director, Prof. Soumyo Mukherjee, former Dean (Student Affairs), and Prof. Suhas Joshi, Dean (Alumni and Corporate Relations). The outstanding contribution awards were also given out to felicitate the members of the Student Alumni Relations Cell who have contributed

substantially to the Institute as members of Dean (Alumni and Corporate Relations) Office. The awardees were Mr. Deepankar Varshney, Mr. Gaurav Sinha, Mr. Harsh Sethi and Mr. Pranay Nahar.

**b) Alumination:** The flagship event of SARC, IIT Bombay 'Alumination' was organised during October 6-7, 2018. It is IIT Bombay's largest platform for bilateral exchange between the IIT Bombay alumni and students on a spectrum spanning career guidance, corporate exposure, life learning and motivational talks. The meet offered a wide array of choices in fields ranging from core to non-core personal level mentoring, from talks to workshops to mock interviews and group discussions.

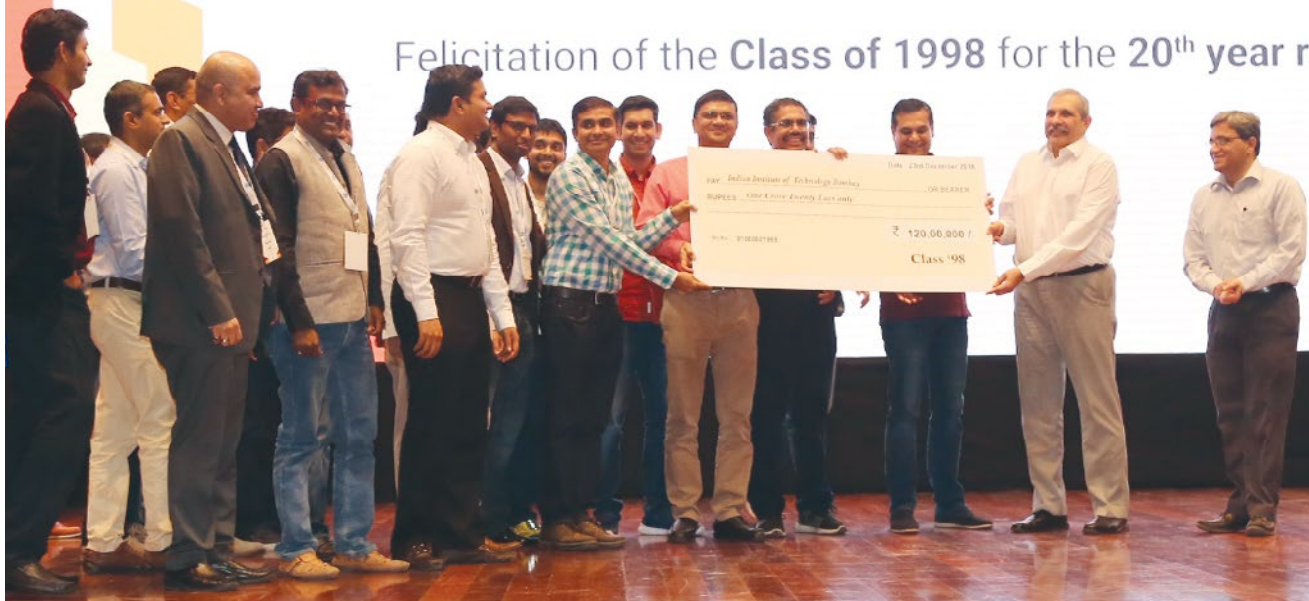
**c) US Roadshow by IIT Bombay:** In the USA, the Diamond Jubilee celebrations were orchestrated on both coasts. Over 600 IIT Bombay alumni along the west coast attended the DJ Alumni Gala Dinner at California on October 17, 2018 and the Faculty Alumni Meet had a footfall of more than hundred on October 16, 2018. Along the east coast, Chicago was met with a count of around 100 alumni who gathered for lunch on October 20, 2018 and more than 300 alumni attended the celebrations in New York on October 21, 2018. Many distinguished alumni were felicitated in recognition of their remarkable work followed by the gala dinner.

**d) Diamond Jubilee Events in India:** For the first time, alumni meets were conducted in four cities in India on the occasion of the Diamond Jubilee of the Institute. In India, celebrations were hosted at Bangalore on October 26, 2018 and was attended by 430 alumni; at Hyderabad on October 27, 2018 and attended by 210 alumni; at Pune on November 3, 2018 and attended by more than 450 alumni; and at Delhi on November 17, 2018, attended by around 425 alumni.

**e) Institute Alumni Day and Presentation of Distinguished Service Awards (DSA):** The annual Alumni Day on December 23, 2018 was graced with the presence of more than 1200 alums. The Alumni Day, saw three of the alumni, who have contributed in a notable and sustained manner to the progress of the Institute, being honoured with the

## DIAMOND JUBILEE ALUMNI DAY CELEBRATIONS 2018

Felicitations of the Class of 1998 for the 20<sup>th</sup> year reunion



Class of 1998 for the 20th year reunion during Alumni Day Celebrations 2018

‘Distinguished Service Awards’. The DSA were conferred on Mr. D.C. Agrawal (BTech (Hons), 1969, Mechanical Engineering), Dr. Rajkumar P. Singh (MTech, 1975, Metallurgical Engineering and Materials Science) and Mr. Ravishankar G (BTech, 1990, Electrical Engineering). The Chapter Service Awards (CSA), instituted during the Diamond Jubilee year celebrations was conferred on Mr. R. Srinivasan (BTech, 1973), Mr. Sanjiv Sood (BTech, 1983), Mr. Deepam Morparia (BTech, 1985), Mr. Nitesh Dixit (BTech, 2003), Mr. Sanjay Bhandari (BTech, 2004) and Mr. Santosh C. Bhoosthali (MTech, 2007).

During this event, the Class of 1993 presented their ‘Silver Jubilee Class Legacy Project’ and pledged to contribute a record-breaking amount of Rs. 25 crores to the Institute. The amount is pledged by nearly 140 students, out of the 850 students in the batch. Mr. Abhay Pandey, General Partner at A91 Partners (CSE, BTech, H8) has been the largest contributor of the 1993 batch, who donated Rs. 10 crore. A Legacy Project is a project adopted by the batch celebrating its Silver Jubilee anniversary, for the betterment of the Institute and of the people associated with it, as a way of giving back to the alma mater and to leave behind a lasting legacy and remembrance of their silver jubilee reunion. The Class of 1998 too pledged a sum of Rs.

1.50 crore to the Institute this year.

The reunion sprawled over a span of three days consisting of Silver Jubilee Reunion (SJRU) of class of 1993, Decennial Reunion of class of 2008 and several other reunions of the batch of 1962, 1963, 1968, 1978, 1988, 1993, 1998, 2003, 2008, and 2013 and finally ending with the Alumni Day celebrations on December 23, 2018. The Alumni Reunion celebration included joint sports activities, hostel and department visits, networking events, cocktail dinners and a few informal activities. The occasion also hosted some great professors from the times of the student years of the alumni to honour and felicitate them as well as revive memories.

### f) Foundation Day and Distinguished Alumnus and Young Alumnus Achievers Award

**Award :** The 60th Foundation Day of the Institute was celebrated on March 8, 2019. During the function, 14 alumni were honoured with the Distinguished Alumnus Awards and eight Young Alumnus Achiever Awards by the Chief Guest Prof. S. P. Sukhatme, Former Director, IIT Bombay and Former Chairman, Atomic Energy Regulatory Board (AERB). 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



Alumni 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:**

- Mr. Raj Nair, BTech, 1971 Metallurgical Engineering
- Prof. Nitin Samarth, MSc, 1980, Physics
- Dr. Ajei Gopal, BTech, 1982, Mechanical Engineering
- Dr. Das Narayandas, BTech, 1982, Metallurgical Engineering & Materials Science
- Mr. Kaizad Mistry, BTech, 1984, Electrical Engineering
- Dr. U. Kamachi Mudali, MTech, 1984, Corrosion Science & Engineering
- Prof. Kaivan Munshi, BTech, 1986, Civil Engineering
- Vice Admiral Gurtej Singh Pabby, MTech, 1987, Systems & Control Engineering
- Dr. Lalitesh Katragadda, BTech, 1990, Aerospace Engineering
- Dr. Shashidhar Thakur, BTech, 1990, Computer Science & Engineering
- Prof. Amol Dighe, BTech, 1992, Physics
- Mr. Rizwan Koita, BTech, 1992, Electrical Engineering
- Prof. Vishal Misra, BTech, 1992, Electrical Engineering
- Prof. Nikhil Koratkar, BTech, 1995, Aerospace Engineering

**The recipients of the Young Alumni Achiever Awards are as follows:**

- Dr. Ameet Jain, BTech. 2001, Computer Science & Engineering

- Mr. Shantanu Rastogi, Dual Degree (BTech+MTech), 2002, Electrical Engineering
- Dr. Parag Agrawal, BTech, 2005, Computer Science & Engineering
- Mr. Sourabh Pagaria, Dual Degree (BTech+MTech), 2005, Mechanical Engineering
- Mr. Pranay Jivrajka, BTech, 2010, Chemical Engineering
- Mr. Ankit Bhati, Dual Degree (BTech+MTech), 2011 Mechanical Engineering
- Mr. Manoj Meena, Dual Degree (BTech+MTech), 2011 Electrical Engineering
- Ms. Suhani Mohan, BTech, 2011, Metallurgical Engineering and Materials Science

**g) Named Lectures: The following lectures were organised during the year by the Office of Dean (ACR):** Indira Foundation Distinguished Lecture – The Indira Foundation Distinguished Lecture was delivered on October 29, 2018 by Prof. Billie F. Spencer Jr. (Nathan M. And Anne M. Newmark Endowed Chair in Civil Engineering, University of Illinois at Urbana-Champaign on ‘Advances in Computer Vision-based Civil Infrastructure Inspection and Monitoring’.

**Prof. C.V. Seshadri Lecture in Chemical Engineering:** The annual Institute Distinguished Lecture in Chemical Engineering in memory of Prof. C. V. Seshadri was delivered by Prof. Animangsu Ghatak, Department of Chemical Engineering, IIT Kanpur on “Adhesion and Fracture of Soft Materials” on November 26, 2018.

# Institute Events



**Chief Guest Hon'ble Prime Minister of India Shri. Narendra Modi unveiling the plaque for the new building of the Department of Energy Science & Engineering and Centre for Environmental Science & Engineering in the presence of Hon'ble guests Shri. Prakash Javadekar, former Minister of Human Resource Development, Shri. CH. Vidyasagar Rao, former Governor of Maharashtra, and Shri. Devendra Fadnavis, former Chief Minister of Maharashtra on August 11, 2018**

## 56th Convocation

The 56th Convocation of IIT Bombay was held on August 11, 2018. Shri Narendra Modi, Hon'ble Prime Minister of India, was the Chief Guest and delivered the Convocation Address. Shri Prakash Javadekar, former Hon'ble Minister of Human Resource Development, Shri CH. Vidyasagar Rao, former Governor of Maharashtra, and Shri Devendra Fadnavis, former Chief Minister of Maharashtra, were the Guests of Honour. During the 56th Convocation ceremony, 2621 students were awarded the degrees. The degree of Doctor of Science (Honoris Causa) was conferred on Dr. Romesh T. Wadhvani, Founder, Chairman and CEO of Symphony Technology Group. Hon'ble Prime Minister of India Shri Narendra Modi also unveiled the plaque for the new building of the Department of Energy Science & Engineering and Centre for Environmental Science & Engineering during his visit.

## 60th Foundation Day

IIT Bombay celebrated its 60th Foundation Day on March 8, 2019. Prof. S. P. Sukhatme, former Director of IIT Bombay was the Chief Guest for the function. The Chief Guest also released the Diamond Jubilee Brochure, Book on Chair Professors and Infrastructure

Calendar on the occasion. The Institute celebrated 60th anniversary on the Foundation Day by honoring its select alumni for their achievements in diverse fields. The Institute honored 14 outstanding alumni this year with the Distinguished Alumnus Awards and eight with Young Alumnus Achievers Awards. The 'Prof. S.C. Bhattacharya Award for Excellence in Pure Sciences' was conferred on Prof. M. Ravikanth, Department of Chemistry. The 'Prof. H.H. Mathur Award for Excellence in Applied Sciences' was conferred on Prof. Ashwin Gumaste, Department of Computer Science and Engineering.

## Teachers' Day

The Diamond Jubilee Year Teachers' Day was celebrated on September 5, 2018. Prof. Jayant B. Udgaonkar, Director, Indian Institute of Science Education and Research, Pune was the Chief Guest. The "Prof. S. P. Sukhatme Excellence in Teaching Award-2018" and the "Dr. P. K. Patwardhan Technology Development Award-2017" were presented to select faculty members in recognition of their contributions in the field of teaching and research on the occasion.

## International Day of Yoga:

IIT Bombay celebrated the International

Yoga Day on June 21, 2018 at the Institute's badminton court in the gymkhana ground. Dr. Hasit Joshipura, Head of Corporate Centre at Larsen & Toubro Limited, was the Chief Guest of the event. The celebrations included a workshop on "Pain Management" on June 4, 2018, a lecture by Ms. Nitika Gambhir, a practicing yoga therapist and diet and fitness consultant on June 12, 2018, screening of a documentary film titled "Yoga - A tradition in the eyes of modernity" on June 14, 2018, camps for practicing common yoga protocol during June 16-19, 2018 at different locations on campus, a symposium on "Research on Yoga Based Practices" titled "Relevance of Ancient Science of Yoga to Modern Obstetrics", "Yogic Thoughts on Research in Pranayama", "Positive Impact of Sudarshan Kriya – An Overview of Scientific Studies", "Matter, Mind and Beyond – The Yoga Perspective" and "Yoga: An Evolution Conserved Strategy for Wellness" was held on June 18, 2018, and a lecture on "Yoga – A classical approach in modern times" by Shri Subodh Tiwari, CEO, Kaivalyadam Yoga Institute on June 20, 2018.

**Van Mahotsav 2018** was celebrated on July 7, 2018. About 2000 saplings of 15 varieties were planted on the hill slope beyond the pipeline at rear side of Hostel 3 and 4 on the IIT Bombay campus.

**57th Interim Convocation:** IIT Bombay awarded degrees to 168 students at its 57th Interim Convocation on February 23, 2019. The function was presided by Mr. Dilip Shanghvi, Chairman of the Board of Governors, IIT Bombay and Prof. Devang Khakhar, former Director, IIT Bombay. The degrees were conferred upon those PhD students who have completed all the requirements during the period from August 2018 to January 2019 and have requested for the degree to be awarded earlier than the 57th Convocation.

**Matrihasha Diwas:** IIT Bombay celebrated Matrihasha Diwas (Mother Tongue Day) on February 21, 2019 to promote the use of mother tongue in the Institute. Dr. Anita Agnihotri, renowned Bengali writer and IAS Officer, was the Chief Guest of the function. Dr. Agnihotri, in her address, spoke about

the importance of "Matrihasha Diwas" and elaborated the historical background of the international observance of the day.

### **Inauguration of Water Innovation Centre**

Prof. Devang Khakhar during his tenure as the Director, IIT Bombay inaugurated the multi-institutional Department of Science and Technology sponsored Water Innovation Centre: Technology, Research and Education (WICTRE) on March 26, 2019. The WICTRE is envisioned to develop academia-industry partnership and undertake foundational research activities in various areas of water purification to address the societal needs in Indian as well as in global scenario. It has been set up to study rivers and industrial effluents and to develop a model for purification and desalination of water bodies.

### **Institute Lectures/ Colloquia**

**Prof. Kaushik Basu**, Professor of Economics and Carl Marks Professor of International Studies at Cornell University, Ithaca (New York) and former Chief Economist of the World Bank and Chief Economic Adviser to the Indian Government, spoke on "What Ails the World Economy and What should India Do?", at an N. R. Kamath Chair lecture on August 1, 2018.

**Justice Ruma Pal**, Former Justice, Supreme Court of India, spoke on "Gender Justice and Constitutional Law", at Institute Lecture Series on the Indian Constitution on September 18, 2018.

**Dr. Suresh M. R.**, Director, Systems Reliability & Quality and Occupational Health & Safety (DSRQ and DOHS), Indian Space Research Organization/ Headquarters (ISRO HQ), Bengaluru, spoke on "Quality Practices in ISRO", at the Steel Colloquium Lecture Series on September 19, 2018.

**Mr. S. Ramadorai**, Chairman of Bharathidasan Institute of Management, National Skill Development Agency NSDA, National Skill Development Corporation, AirAsia India, Tata Technologies and Tata Advanced Systems, spoke on "Skill Ecosystem - Journey to Vocationalization of Education", at an Institute Lecture (in memory of Late Nani Palkhiwala) on September 25, 2018.

**Prof. Roop Mallik**, Professor, Tata Institute of Fundamental Research (TIFR), Mumbai, spoke on “The Nobel Prize in Physics - 2018: Optical Tweezers and Nanoscale Biological Machines”, at an Institute Lecture on October 24, 2018.

**Dr. Adil Minoo Dhalla**, Managing Director, Separation Technologies Applied Research and Translation (START) Centre, Singapore, spoke on “From Challenges to Leadership: Water and Environmental Technologies in Singapore”, at an Institute lecture on October 25, 2018.

**Prof. Billie F. Spencer Jr.** (Nathan M. and Anne M. Newmark Endowed Chair in Civil Engineering, University of Illinois at Urbana-Champaign), spoke on “Advances in Computer Vision-based Civil Infrastructure Inspection and Monitoring”, at an Indira Foundation’s Distinguished lecture on October 29, 2018.

**Prof. Kiyoshi Ueda**, Institute of Multidisciplinary Research for Advanced Materials, Tohoku University, Japan, spoke on “Making invisible visible using invisible light”, at IIT Bombay Diamond Jubilee Distinguished Lecture Series on December 5, 2018.

**Dr. Tim Fox**, Chair, IMechE Process Industries Division Board, Royal Academy of Engineering, Independent Consultant Visiting Professor of Clean Energy and Public Engagement at Exeter University, UK, spoke on “The ‘Cold Economy’: A New Approach to Cooling”, at an Institute Lecture on February 1, 2019.

**Prof. Mark D. Zoback**, Benjamin M. Page Professor of Geophysics at Stanford University. Director of the Stanford Natural Gas Initiative and Co-Director of the Stanford Center for Induced and Triggered Seismicity, Stanford University, USA, spoke on “What’s New in an Old Industry: Oil & Gas in an Era of Decarbonization”, at IIT Bombay Diamond Jubilee Distinguished Lecture Series on February 1, 2019.

**Prof. Dominique Thierry**, French Corrosion Institute Brest, France, spoke

on “Atmospheric Corrosion of Galvanized Steel and Zinc Alloyed Steel”, at the Steel Colloquium Lecture Series on February 5, 2019.

**Prof. Rohini Godbole**, FASc, FNA, FNASc, FTWAS, D. Litt. (S.N.D.T. Univ.) Professor, Indian Institute of Science (IISc), Bangalore, spoke on “Women in Science: status, goals and action plans”, at the IIT Bombay Gender Cell Diamond Jubilee Distinguished Lecture on February 22, 2019.

**Mr. Mohandas Pai**, Co-Founder and Chairman, Aarin Capital, spoke on “India@2030: How Tech Entrepreneurship will create a \$10 Trillion Economy” at the New India Manthan – Leadership Talk organized by MHRD and hosted by IIT Bombay on March 1, 2019 at its campus.

**Prof. Herbert Huppert**, Emeritus Professor of Theoretical Geophysics, Department of Applied Mathematics and Theoretical Physics (DAMTP), University of Cambridge, spoke on “The fluid mechanics and politics of carbon storage to avert climate catastrophe”, at IIT Bombay Diamond Jubilee Distinguished Lecture on March 4, 2019.

**Prof. Dominique Bonvin**, Professor, EPFL, Switzerland spoke on “Real-Time Optimization – Methods and Applications”, at an Institute Distinguished lecture (in memory of Professor K.C. Khilar) on March 7, 2019.

**Prof. David Y. H. Pui**, Distinguished McKnight University Professor, LM Fingerson/TSI Inc. Chair in Mechanical Engineering, University of Minnesota, Minneapolis, USA, spoke on “Green Technologies & Sustainable Environment”, at the IIT Bombay Diamond Jubilee Distinguished Lecture on March 8, 2019.

**H. E. Mr. Kenji Hiramatsu**, Ambassador of Japan to India, spoke on “Special Strategic and Global Partnership”, at an Institute Lecture on Transformed partnership between Japan and India on March 11, 2019.

**Prof. Shubha Tole**, Professor, Department of Biological Sciences, Tata Institute of Fundamental Research (TIFR), Mumbai,



delivered two lectures as a part of IIT Bombay Gender Cell Diamond Jubilee Lecture Series titled “Towards a Blueprint for Building the Brain” and “What is it like to be a woman in science: a session for men and women” on March 12, 2019.

**Prof. Ashoke Sen**, Distinguished Professor, Harish Chandra Research Institute (HRI), Allahabad, spoke on “Can we survive in a metastable universe?”, at the IIT Bombay Diamond Jubilee Distinguished Lecture on March 17, 2019.

**Prof. Yamuna Krishnan**, Department of Chemistry, University of Chicago, spoke on “DNA Nanotechnology enters the world of Precision Medicine”, at an Infosys Prize Lecture on March 28, 2019.

## Conferences

### Steel Symposium 2018

The Centre of Excellence in Steel Technology at the Department of Metallurgical Engineering and Materials Science organized a Steel Symposium at IIT Bombay during May 16-17, 2018. The symposium consisted of presentations by Masters and PhD students of IIT Bombay, who are working on various aspects of Steel. A few selected PhD students from other Institutes in India also presented their research work on ‘Steel’ during the symposium.

### Research Scholar Symposium and ChEmference 2018

The Department of Chemical Engineering organized Research Scholar Symposium and ChEmference 2018 at IIT Bombay during May 18-20, 2018. The three-day ChEmference is a national level conference in the field of chemical engineering and technology in India. The themes of the conference were aligned among a quintet of research areas as biotechnology and biosystems engineering; energy and environment; materials engineering; process systems engineering; and Transport, colloids and interfacial science.

### ICALT 2018

The 18th IEEE International Conference on Advanced Learning Technologies

(ICALT 2018) was organised by the IDP in Educational Technology at IIT Bombay during July 9-13, 2018. ICALT 2018 provided a forum for researchers and practitioners from academic institutions and industry to discuss the use of emerging technologies in teaching and learning. The focus of the conference was on the design, development, use and evaluation of technologies such as data analysis, cloud computing, maker spaces, 3-D printing, earable technologies, augmented reality and intelligent systems for their potential to transform teaching, learning and assessment both in formal education at all levels and informal learning.

### Carbon Capture, Storage And Re-Use In India

The Department of Earth Science, IIT Bombay in association with Carbon Capture Journal, UK organised a conference on “Carbon Capture, Storage And Re-Use (CCUS) in India” during October 11-12, 2018. The theme of the conference was “Is India CCUS Ready?”. Students from India and abroad presented their papers on Carbon Capture and Carbon Storage and Reuse during the poster competition held on the first day of the conference.

### AFITA/ WCCA 2018

Asia-Pacific Federation for Information Technology in Agriculture (AFITA)/ World Congress on Computers in Agriculture 2018 was organized by the Indian Society of Agricultural Information Technology (INSAIT) and was hosted by the Centre of Studies in Resources Engineering (CSRE) at IIT Bombay during October 24-26, 2018. Hon’ble Vice President of India Mr. M. Venkaiah Naidu inaugurated the AFITA/ WCCA 2018 conference on October 24, 2018. former Hon’ble Governor of Maharashtra Shri CH. Vidyasagar Rao and the former Minister of Technical and Higher Education, Government of Maharashtra Mr. Vinod Tawde were the Guests of Honour. The conference was aimed to weave consolidated ideas, research outcomes, innovations and inventions to transform the agricultural revolution with ingenuity.

### NCCPS-2018

The FOSSEE (Free/ Libre and Open



**Organising team of the 51st Annual Convention and International Conference of Operational Research Society of India (ORSI)**

Source Software for Education) project team in association with the Department of Chemical Engineering organized the National Conference on Chemical Process Simulation 2018 (NCCPS-2018) on November 26, 2018 at IIT Bombay. The objective of the conference was to bring together students and faculty working in the area of process simulation; retain the interest of students for recruitment, thereby helping the industry.

#### **Conference on “Next Frontiers in Civil Engineering: Sustainable and Resilient Infrastructure”**

The Department of Civil Engineering, IIT Bombay organized a national conference on “Next Frontiers in Civil Engineering: Sustainable and Resilient Infrastructure” during November 30 – December 1, 2018 at its campus. The conference aimed to highlight the role of Civil Engineering towards the creation of a sustainable and resilient society.

#### **Fluid Mechanics and Fluid Power Conference**

The Department of Mechanical Engineering at IIT Bombay organized 7th International and 45th Fluid Mechanics and Fluid Power Conference during December 10-12, 2018 at its campus. It is an annual conference aimed to bring together researchers working on various aspects of Fluid Mechanics and Fluid Power to discuss their work and learn through interactions and brainstorming sessions. More than 600 papers in 36 different tracks were presented during the three-day conference.

#### **51st Annual Convention and International Conference of Operational Research**

#### **Society of India (ORSI)**

The Industrial Engineering and Operations Research (IEOR) organized the 51st Annual Convention and International Conference of Operational Research Society of India (ORSI) during December 16-19, 2018. ORSI is a leading platform to share information, among academia and industry, on the latest theory, methods, techniques, applications and the practice of OR. The program hosted more than 120 presentations, from participants across 10 countries, covering all areas of OR. Attendees include academicians, industry professionals and students. The conference featured keynotes by Eitan Altman (INRIA, France), Kavita Ramanan (Brown University), Nicholas Hall (President INFORMS, Ohio State University, USA), Sven Leyffer (Argonne National Labs, USA), Dr. Vittal Prabhu (Penn State University, USA), Luis Rabelo (University of Central Florida, USA), and Suvrajeet Sen (Univ of Southern California, USA). The conference also included a panel discussion, thematic parallel sessions, final round of “Best Practice Award”, exhibition hall, product demonstrations, Blitz Talks @ Foyer, and awards.

#### **SciPy India 2018**

The FOSSEE (Free/ Libre and Open Source Software for Education) project at IIT Bombay organized SciPy India 2018 during December 21-22, 2018. The conference provided opportunities to spread the use of the Python programming language in the Scientific Computing community in India. The conference featured a variety of workshops in two parallel tracks; Basic and Advanced level, invited talks, and paper

presentations.

#### **4th World Congress On Disaster Management**

The 4th World Congress on Disaster Management (WCDM-2019) was organized at IIT Bombay during January 29 - February 1, 2019 to deliberate on some of the most critical issues and challenges of implementation of the global frameworks on building resilience to disasters.

Organized jointly by the Government of Maharashtra, Disaster Management Initiatives and Convergence Society (DMICS), Indian Institute of Technology Bombay (IIT Bombay) and Tata Institute of Social Sciences (TISS) Mumbai, WCDM-2019 was designed to be the largest assembly on disaster management outside the UN system.

#### **National Symposium On Cryogenics And Superconductivity (NSCS-27)**

The 27th National Symposium On Cryogenics And Superconductivity (NSCS-27) was jointly organized by the Indian Cryogenics Council and IIT Bombay during January 16-18, 2019 at IIT Bombay campus. The bi-annual symposium provided an important platform for young researchers, scientists and technologists to interact closely with the experts and practicing engineers from diverse background.

#### **National Environmental Conference**

National Environmental Conference was organized by the Department of Environmental Science and Engineering during January 31- February 2, 2019.

#### **Deshpande-Gopalakrishnan Symposium**

Desai Centre for Entrepreneurship, IIT Bombay in collaboration with IIT Madras organized the second Deshpande-Gopalakrishnan Symposium on Innovation and Entrepreneurship during January 20-22, 2019 at IIT Bombay. The core objective of the symposium was to foster and nurture the entrepreneurial spirit surging across India.

#### **International Vision Zero Conference**

A three-day international conference on Vision Zero in Occupational, Safety and Health was jointly organized by the Directorate

General, Factory Advice service and Labour Institutes (DGFASLI), Ministry of Labour and Employment, Government of India, German Social Accident Insurance (DGUV), Germany with IIT Bombay and International Social Security Association – Manufacturing, Construction and Mining during February 18-20, 2019 at IIT Bombay. The conference provided a forum for promoting safety and health at work by exchanging knowledge, practices and experience.

#### **AZeotropy: India's Largest Chemical Engineering Symposium**

The Department of Chemical Engineering organized Azeotropy – the annual Chemical Engineering Symposium during March 16-17, 2019 at IIT Bombay campus. The symposium was aimed to bring together students, industry and academia. The symposium comprised of diverse events including a unique blend of Chemical Engineering-based competitions, lecture series, panel discussion, exhibitions, workshops and informal events. AZeotropy 2019 was focused on the theme “Nanotechcellence – demystifying the nanoworld”.

#### **Biosciences and Bioengineering**

**Symposium:** The Department of Biosciences and Bioengineering organized a two-day national symposium during February 15-16 2019. The symposium was organized into the four sessions based on broad four themes, namely (i) Frontiers in Biosciences and Bioengineering, (ii) Language of Infection, (iii) Understanding biosystems: the interplay of structure and information and (iv) Translating our research: from lab to user.

The objective of the symposium was:

To invite distinguished scientists from across India, across areas in biosciences and bioengineering to visit our department so that our students can listen and interact with the best scientists to showcase work done in IIT Bombay to the visiting scientists.

Interaction of the visitors with faculty members of IIT Bombay may lead to future collaborations.

#### **Workshops**

Student Solar Ambassadors Workshop

IIT Bombay as part of its Diamond Jubilee celebrations, organized an unique one-day training workshop called “Student Solar Ambassadors Workshop” on October 2, 2018 at its campus. The workshop was organized jointly by MNRE, IIT Bombay and State Rural Livelihood Mission (SRLM), SoULS and Techfest, IIT Bombay.

### **Proteomics Workshops**

Owing to the rapid advancements in state-of-the-art proteomics technologies, continuous expansion of our scientific understandings, and challenges associated with omics research, it has become essential to keep up with current trends and advances in proteomics research. In this light, the Department of Bioscience and Bioengineering, IIT Bombay conducted three workshops as given below at its campus:

- Basics and Advanced Proteomics Approaches during December 3-14, 2018.
- Cancer Proteogenomics Workshop during December 6 - 11, 2018.
- Trans-Proteomic Pipeline Workshop during December 12 -14, 2018.

### **Workshop on Future of Energy Research and Education**

A Diamond Jubilee Workshop on “Future of Energy Research and Education” was organized by the Department of Energy Science and Engineering during December 13-14, 2018

### **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 Writing Skill” etc. were conducted

during the year for staff of the Institute. The cell continues to send Hindi synonyms of the administrative terms through the Institute’s email (GPO).

“Hindi Pakhawada” was celebrated during September 1-14, 2018, where competitions in Hindi essay writing and dictation were organised for the student and staff members of the Institute. On the eve of Diamond Jubilee celebration of the Institute, Hindi Cell organized a Hindi Pustak Charcha on the book entitled Madhushala written by Dr. Harivansh Rai Bachchan, a noted Hindi Poet.

Hindi Book exhibition was jointly organized by Central Library and Hindi Cell during September 3-8, 2018 to encourage reading habit of the Hindi books of all the staff and students of the Institute. Shri Naresh Kumar, Assistant Director, Central Translation Bureau, Ministry of Home Affairs was the Chief Guest of the Hindi Diwas. The certificates and cash awards were distributed to the winners of the competition.

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

IIT Bombay received ‘Aashirwaad Rajbhasha Award-2018’ for outstanding achievement in Hindi Implementation on September 27, 2018. Aashirwaad organisation works to disseminate and promote the Official Language Hindi by awarding and felicitating the central government offices, public sector enterprises and nationalized banks.



# Facilities

## Infrastructure Development

During 2018-19, four major infrastructure projects namely construction of Research Park, Hostel No 17, Type 'B' housing 78 flats (Building No. B-25) and combined building for Society for Innovation and Entrepreneurship (SINE), Industrial Research and Consultancy Centre (IRCC) and IDC School of Design have commenced and the construction work is progressing at a fast pace. Apart from these projects, construction of Infinity Corridor and Vertical extension to School of Management building which were started last year are nearing completion.



During this year, the new common building for 'Department of Energy Science and Engineering' and 'Centre for Environmental Science and Engineering' was inaugurated by Honorable Prime Minister of India Shri. Narendra Modi during his visit for Convocation as the Chief Guest. The new guest house called Padmavihar Guest House having 88 Twin rooms and 48 utility apartments, with a 300 seat dining hall and a conference room facility has started operating.

The construction work of Hostel 18 (1115 capacity), which had begun in March 2017, is complete and the hostel is available for occupation from July 2019.

Some of the building projects that would be constructed in the near future are at its planning and designing state. These projects include construction of: 400 apartments for married students, Steel Centre, 78 flats for Type IIB, Multipurpose Hall, Center for Entrepreneurship, Development Centre Building, Building for Biomedical Engineering Technology and Teaching Learning Centre for Information and Communication Technology,

Centre for Propulsion Technology, Central Animal Facility and Extension to Kendriya Vidyalaya building.

We are also happy to state that under the 'Green Rating For Integrated Habitat Assessment', an initiative of Ministry of New and Renewable Energy of Government of India, our recently completed buildings 'Type H1' was provisionally certified as '3 Star' GRIHA rating and Hostel 10 and Sports Facility building were provisionally certified as '4 Star' GRIHA rating.

## Central Library

The Central Library at IIT Bombay housed in a huge 3-storey 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 library resources. The services of the library is backed by an efficient and courteous staff. It holds a vast collection of books, back volume of journals, monographs, standards, reports, thesis/ dissertation and 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 around the world throughout the year.

The library collection was used by 11,000 members during the year. The institutional repository of IIT Bombay publication now has over 22,257 records. During this year, 750 Master's degree dissertations, 391 PhD theses, and 201 Dual Degrees were submitted online.

The Central Library continues to provide access to more than 20,000 e-journals and e-resources and has added about 1,739 volumes including books, theses, reports, standards, pamphlets and other reading materials during the year. It also acquired 747 e-books during the year. All the library collection can be accessed through online-public access catalogue.

The Central Library also render user-services like reference, consultation, document delivery services, book lending, 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 organizing 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 graduates. It handled over 90,103 circulation 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. 19 lakh 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. Around the clock air-conditioned reading hall facility with 150 seating capacity for the bonafide users of the library is also available.

### Launch of Children Section at Central Library



During the Diamond Jubilee of IIT Bombay, Central Library has created Children Section with suitable furniture and reading tables to make Central Library more inclusive in the campus with great vision to inculcate reading habits, instill democratic values, social belonging and to ignite the minds of campus children at very young age. The Children Section was inaugurated by Prof. Devang Khakhar, former Director, IIT Bombay in presence of Dr. R. Premkumar, Registrar, IIT Bombay and Prof. Aniruddha Joshi, Convener,

Library Committee on March 7, 2019 at the Central Library of the Institute.

The Children Section has been created with around 1,500 books and other reading materials to meet the needs of campus school children.

### Digital Archive Portal



The Publications and Public Relations Section and Central Library have developed a Digital Archive Portal. The portal maintains collection of photos, videos, historical reports and documents of the Institute's events in digital format. The digital archive has been developed using open source software called Omeka. The archive has recorded about 60000 photos and 400 videos. The Digital Archive Portal was launched on January 15, 2019 at the Central Library.

### Document Delivery Service (DDS) agreement:

Central Library has signed Document Delivery Service (DDS) agreement with Tsinghua University, Beijing, China and Seoul National University Library, Seoul, South Korea.

**User Education Programmes:** Central Library had organised following workshop for the benefit of Institute researchers during the year:



Participants during Author's Workshop Series Event





Group photo of workshop participants

- ‘Responding to Reviewers comments’ on January 23, 2019 with speaker Dr. Yateendra Joshi, Academic Publication Trainer, Indian council of Agricultural Research.
- ‘Selecting a journal and preparing a great submission package’ on September 19, 2018
- ‘Patent Publishing in India - A paradigm shift for innovation in Academics’ on August 23, 2018
- Workshop on ‘Structuring your manuscript to impress SCI journal editors’ organized by Central Library and PG Academic Council, IIT Bombay and Wiley on June 20, 2018

**Workshop for Library Professionals:** Central Library, IIT Bombay had organized one-day workshop on “Innovative Information Literacy: active learning and engaging pedagogies” on March 8, 2019. The workshop is targeted at the Library and Information Professionals from academic and research organizations. Ms. Aditi Gupta, Engineering and Science Librarian, McPherson Library, Canada, and Dr.

Satish Kanamadi, Librarian, Tata Institute of Social Sciences (TISS), Mumbai were resource persons for this workshop.

**Workshops on Storytelling:** On the eve of the Diamond Jubilee Celebrations of the Institute, Central Library had organized storytelling and story writing sessions for the campus children.

### Hindi Pakhwada

Central Library celebrated ‘Hindi Pakhwada’ by organizing Hindi book exhibition during September 3-8, 2018 to encourage faculty, staff and students to read Hindi books. The exhibition displayed latest Hindi books including 143 books recommended by users. The exhibition showcased both Indian and international books of latest publications (published in 2017 and 2018) on all subjects of (a) Engineering, Sciences and Technology (b) Bio-sciences, Bioengineering and Biotechnology (c) Economics and Management (d) Humanities and other Social Sciences (e) Arts and Design (f) General collections like novels, biography etc. (g)



Prof. Aniruddha Joshi, Convener, Library Committee inaugurated Book Exhibition on September 3, 2018.



Participants during storytelling workshop



**Participants during National Education Day Celebration held on November 11, 2018**

Children books from all publishers including universities, professional societies and associations.

**Library Visitors:** Around 1000 visitors visited the Central Library from various schools/ colleges/ Institutes from India and abroad during 2018-19.

### **National Education Day Celebration**

IIT Bombay's Central Library has celebrated National Education Day of India on November 11, 2018. National Education Day is an annual observance in India to commemorate the birth anniversary of Maulana Abul Kalam Azad, the First Education minister of Independent India. To spread a message about the importance of education, essay competitions were conducted for the campus children on 1) My Best Teacher 2) My Favorite Book were conducted.

### **Librarian's Day Celebration**

On the 126th birth anniversary of Dr. S. R. Ranganathan the Central Library celebrated Librarian Day on August 14, 2018. Dr. S. R. Ranganathan is known as father of library movement in India.

### **Computer Centre**

The Computer Centre continues to provide improved, efficient and effective computational, network infrastructural facilities and services to the IIT Bombay user community. This year, a Cray supercomputer system with 216 CPU nodes and 64 CPU+GPU nodes for High-Performance Computing (HPC) was installed in the ground floor of the old Computer Science and Engineering building. A conference room with video conferencing facility with a seating capacity of 20 was also added to cater to the needs of the Institute.

### **Network and Connectivity**

The Centre manages the campus network and is responsible for the availability of intra-campus connectivity of with ~25000 wired nodes spread over all the departments, hostels, residential complexes and internet connectivity of Institute with the outside world. In addition, the Centre manages about 100 wireless access points providing wi-fi access at various departments and other key locations on campus. The following activities were undertaken during the year:

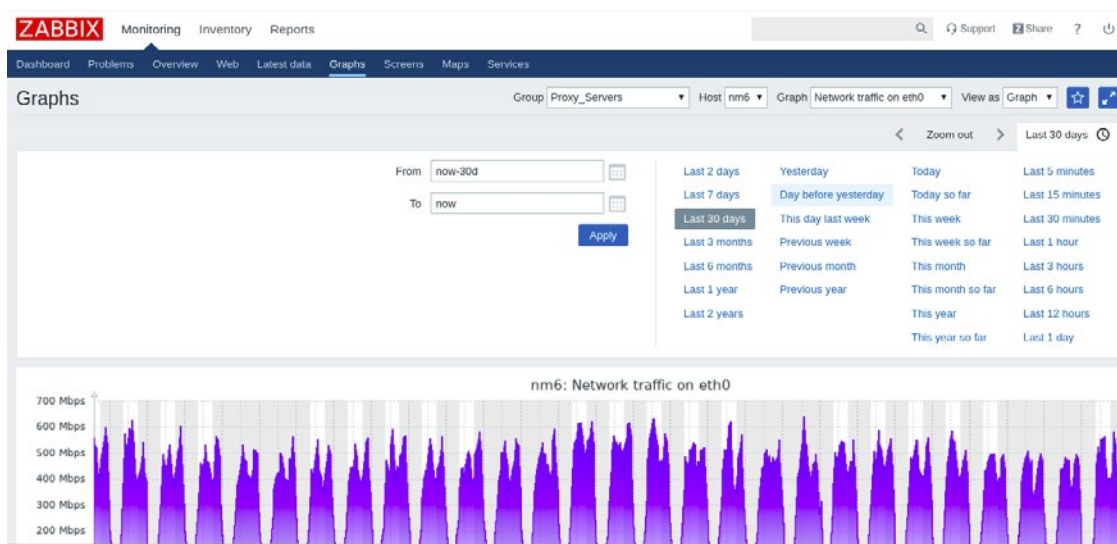
- The total Internet bandwidth was maintained for the campus community at 10 Gbps from NKN and 3 Gbps from Vodafone
- The interned bandwidth from the above two ISPs was managed with BGP (Border Gateway Protocol) routing using appropriate router switches
- Four Class C IPv4 address ranges acquired from APNIC provide internet access via NATing
- Separate password for the users at the residences for web access was managed so that the employees do not have to share their passwords with their families
- Transport Layer Security (TLS) was procured via digital certificate from DigiCert

Few external WiFi access points have been deployed on campus to cover common areas in student's Hostels. Access through IITB-Wireless for IIT Bombay users, IITB-Guest for guests of IIT Bombay and EduRoam for visitors affiliated with EduRoam partners was managed with these wi-fi access point.

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 IP telephones (Voice over IP) using the computer network of the Institute. The schedules of the availability of doctors at the IIT Hospital on the website of the hospital and other information is accessible over the IIT Bombay LAN.

**National Knowledge Network:** IIT Bombay continued to be a member of the National





**Figure. 1: Network switch monitoring by open source software ZABBIX**

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.

**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. The Computer Centre has registered IIT Bombay as an official mirror for various versions of Linux operating systems on its anonymous FTP server which is available to the user community at large.

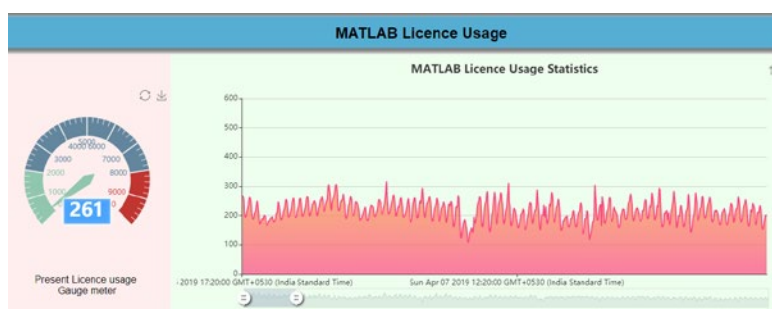
To support the ERP resources of the Institute, the Disaster Recovery (DR) system of ERP is housed in the Computer Centre. The Centre staff are involved in the management of the ERP hardware.

The Institute continues to be a member

of Microsoft Developer Network Academic Alliance (MSDNAA)) software licensing programme. This license allows the user community to use most of the Microsoft software products in a non-production environment. Volume licenses of the latest Microsoft Office Professional (with 100 activations) have been acquired to meet critical needs of the Institute. License (10,000 activations) 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 Matlab, 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 and staff in the Institute. Currently floating network licenses of proper number of the packages like Ansys, Abaqus, Autocad, Maple, Mathematica, SPSS, etc.



**Concurrent network license usage statistics for software Matlab**

are also maintained at the Computer Centre. These facilities are as per the requirement of the students, faculty, scientists, and staff in the Institute.

As a step towards paperless office and fast response in terms of searching informations among the members of the respective meetings, the Institute has started using digital meetings for its important high-level conferences. This facility has enabled the members and experts of the meetings to electronically participate over the web to review and finalize the proceedings of the conference. The Computer Centre hosts the required server and software needed for this facility.

The Computer Centre encourages and has implemented the use of 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.

#### **Word processing tools and facilities and support:**

The Computer Centre provides Open Source Operating Systems which has word processing applications (namely OpenOffice.org, LibreOffice) capable of handling various Indian languages especially Hindi for the preparation of multilingual (bilingual) documents. Documents prepared in OpenOffice.org/ LibreOffice (available for Windows as well as Mac OS) can be saved in files compatible (edit/ save) with MS-Office.

**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 users 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 IP based Security Surveillance Systems having 284 IP cameras and storage for the Security Section.

The Computer Centre has acquired, installed and manages 16 nos. of IP CCTV surveillance system that vigils critical locations of the Computer Centre building. Few offices of the departments like Computer Science and Engineering, Application Software Centre, Centre for Formal Design and Verification are housed in the Computer Centre.



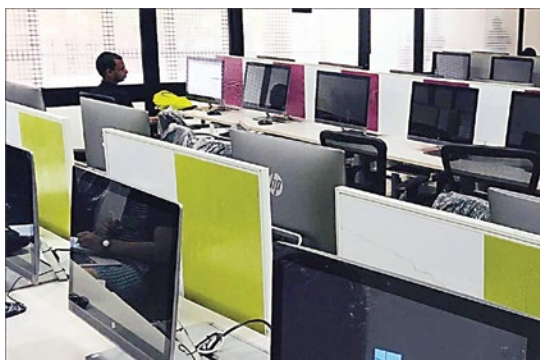
**SpaceTime HPC (Cray Systems)**

#### **High Performance Computing (HPC)**

**Facility:** As part of its continued efforts for providing excellent infrastructure for cutting-edge research and because of the growing demand for a world-class supercomputing facility at IIT Bombay, the Centre has completed the installation of a Cray system for High-Performance Computing. This system is known as “SpaceTime” with 216 CPU (2x Intel Xeon 6148) only nodes and 64 CPU + GPU (Intel Broadwell + Nvidia P100) nodes, 1000 TeraByte parallel file system as storage, 1003 TFLOPS. Total Peak Performance has enhanced the computing capabilities in various areas of modeling and simulation.

In addition, 49 nos. of 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), connected to a 100 TB of parallel file system as storage and known as Corona, continues to provide computing facilities for more than 50 users from different scientific research groups.

**General Purpose Computing nodes:** Two user halls called Bits and Bytes Lab have 120



**Bits and Bytes Labs (General purpose Computer User Halls)**

nos of HP All-in-one Intel Core i5-7500T CPU @ 2.70 GHz x 4, GeForce 930MX graphics from NVIDIA, 15.6 GiB RAM, 1 TiB hard disk desktop computers. The facilities are open for use by courses, exams, and the campus community.

The Computer Centre runs a help desk for all users as a part of its day to day activities.

A total of 13 students enrolled for the MTech program in the Department of Computer Science and Engineering and the Department of Electrical Engineering actively work for the various facilities run by the Computer Centre.

**Projects for the near future:** To enhance the performance and security of the services offered by the Computer Centre, following tasks are earmarked for the near future:

- Smart Log Analysis
- Find resource utilization by per user basis on HPC systems.
- Integration of Email and Centralized Storage Facility
- IPsec VPN

- Bare-Metal Switch Programming
- IPV4 to IPV6 Migration
- Log Analysis for spam, Web access, Security Breaches
- Automation of Labs using Ansible
- Video Conferencing (VC) Gateway
- Smart NIC programming

### **Centre For Distance Engineering Education Programme**

The Centre for Distance Engineering Education Programme (CDEEP) continued its functioning as a support unit to various 'outreach' activities of the Institute. During the year, CDEEP recorded 21 courses, covering 11 disciplines at IIT Bombay.

During the year, CDEEP provided 11 semester long courses content to National Programme on Technology Enhanced Learning (NPTEL) which are offered as Massive Open Online Course (MOOC). The Centre has an archive of 383 full semester long courses.

This year, contents of 34 courses were supplied to 27 individuals on demand. The viewership (enrolled) of courses through web stood at 3847 for 280 active courses.

The Centre continues to offer (recorded) current semester courses with certification showing grades by the course faculty to distant participants as individuals or as a group.

The Centre, covered Institute events such as Annual Convocation, Foundation day, which were webcast live having more than 9000 viewers. The Centre covered other 114 events including Institute colloquia, seminars and talks by distinguished speakers on campus.

# Departments/ Centres/ Schools and Interdisciplinary Groups

## Science & Engineering Departments:

The engineering departments at IIT Bombay offer undergraduate and postgraduate programmes leading to BTech, BS, MTech and 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. Following are the Science & Engineering Departments at IIT Bombay:

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

## Schools:

- **IDC School of Design:** The school 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
- **Shailesh J. Mehta School of Management (SJMSoM):** The school 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.

## Centres/ 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. Following are the centres at IIT Bombay:

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



### Other Centres/ Research Facilities:

Other Centres host a large number of sophisticated equipments and advanced facilities for carrying out R&D activities at IIT Bombay. Following are the research facilities at IIT Bombay:

- Application Software Centre
- Center for Aerospace Systems Design & Engineering
- 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
- Tata Teleservices- IIT Bombay Centre of Excellence in Telecommunication
- Water Innovation Centre: Technology, Research and Education (WICTRE)

### Department of Aerospace Engineering

Established in 1966-67 as the Department of Aeronautical Engineering, it was renamed as the Department of Aerospace Engineering in 1992. The department has a total of 24 faculty members. The academic programs of the department focus mainly on the Science and Engineering/ Technology of 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.

**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, Control and Design. The academic programs include four-year BTech degree program, five-year Dual Degree program, two-year MTech program and the PhD program. The department has around 350 students, out of which about 120 are in the graduate programme and 230 are in the undergraduate programme.

**R&D Activities:** During the year 2018-19, the department continued to be actively engaged

	Student Intake	Degrees Awarded
<b>BTech</b>	<b>65</b>	<b>36</b>
<b>DD(BTech+MTech)</b>	<b>15</b>	<b>09</b>
<b>MTech</b>	<b>57</b>	<b>38</b>
<b>PhD</b>	<b>16</b>	<b>09</b>
<b>DD(MTech+PhD)</b>	<b>04</b>	<b>01</b>
<b>MS</b>	<b>02</b>	<b>-</b>

in teaching, research and other professional activities such as workshops, seminars, industry interactions, projects, professional development course modules, etc.

	Sponsored Projects	Consultancy Projects
New Projects	06	13
Ongoing	15	15
Completed	03	7

The Department has extensive experimental and computational facilities that aid its research and teaching activities. Among these are the Aerodynamic Lab, which house the wind tunnels, Laser Doppler Velocity-meter (LDV), Anechoic chamber; the Instrumentation Lab which has experimental set-ups for control education, in addition to sensors, actuators and other accessories as part of mechatronics related facilities; the Structures Lab, which has facilities for composite fabrication and testing, apart from experimental set-ups for demonstrating static and dynamic aspects of structures; the Propulsion Lab, which houses axial flow compressor research test rig, low speed low turbulence wind tunnel, diffuser test rig centrifugal blower and motor control unit for air delivery; the MAV Lab, which has facilities for building & flying unmanned aircraft models, hardware in loop simulation for MAVs. The Department also has powerful serial and parallel computers which provides computational resources for sophisticated flow simulation tasks like in computational fluid dynamics and computational electromagnetics.

The Department has supported many students technical activities like Mars Rover, Student Satellite, Autonomous Under Water Vehicle, Unmanned Air Vehicle etc. and students are also engaged in national and international competitions as participants/ organizers.

#### Notable activities in the Department for the year 2018-19 are:

- **FEM software development:** Finite Element Analysis of Structures (FEAST) is ISRO's structural analysis software based on Finite Element Method (FEM) realized by Structural Engineering Entity of Vikram Sarabhai Space Centre (VSSC). Following a MoU with VSSC, an elasto-plastic module capable of doing small deformation plastic simulations of structures has been developed at the department and transferred to VSSC for implementation in FEAST<sup>SMT</sup>. The module can handle linear and nonlinear isotropic and kinematic hardening for 2D plane stress, plane strain and axisymmetric elements and 3D elements.
- **Development and Field Testing of Aerostat System for Last Mile Communication:** A height-adjustable and re-locatable sailed aerostat (Balloon) system capable of hoisting telecommunication equipment in post-disaster scenarios and in dark communication zones in hilly areas, was designed and developed by Prof. Rajkumar S. Pant and his team, at the Lighter-Than-Air Systems Laboratory of the department. It was successfully field tested for proof-of-concept basis in Ahmednagar, Maharashtra and in Dehradun, Uttarakhand with Radio Frequency, Wi-Fi Sector and police wireless VHF antennas. The project was inaugurated by the Honorable Chief Minister of Uttarakhand, Mr. Trivendra Singh Rawat, and the system demonstrated hassle-free deployment for four days on a stretch during its field test. Communication signal coverage obtained using various aforementioned antennas proved the efficacy of balloon systems for communication establishment purposes. This project was funded by Information Technology Development Agency, Government of Uttarakhand.
- **Open Source Software packages/ versions:** Open-Source software is important as it is freely available for anyone to use and modify. New versions of an online programming testing platform called online\_test ([https://github.com/FOSSEE/online\\_test/](https://github.com/FOSSEE/online_test/)) was released. A new package called Compyle (<https://github.com/pypr/compyle>) that allows one to use different high-performance computing architectures easily was made available. A new version of PySPH (<https://pysph.rtd.io>) an open source framework for Smoothed Particle Hydrodynamics (SPH)

simulations was released. Automan (<https://github.com/pypr/automan>) is a new framework for reproducible computing which was also released this year. A new version of the popular 3D scientific data visualization package called Mayavi (<https://github.com/enthought/mayavi>) has been developed. A new version of ViXeN (<https://vixen.rtfid.io>) a simple tool to facilitate easy viewing, adding, and annotating metadata associated with media is released.

The FOSSEE project (<https://fossee.in>) is funded by the MHRD and aims to promote the use of Free/Libre Open Source Software for Education. The FOSSEE Python team (<https://python.fossee.in>) has conducted more than 110 free remote workshops and trained more than 8000 people in 2018 on the Python programming language.



Mounted Omni-directional RF Antenna



Air Borne System



Sector Antennas being attached



Hon'ble Chief Minister of Uttarakhand Mr. T.S. Rawat inaugurating the system

## 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 endeavors to produce the leaders of tomorrow in this field.

**Academic Programs:** 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 14 Post Doctoral fellows

	Student Intake	Degrees Awarded
<b>MSc</b>	<b>26</b>	<b>24</b>
<b>MTech</b>	<b>26</b>	<b>16</b>
<b>PhD</b>	<b>36</b>	<b>22</b>
<b>DD(MSc+PhD)</b>	<b>-</b>	<b>06</b>
<b>DD (MTech+PhD)</b>	<b>-</b>	<b>01</b>

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

	Sponsored Projects	Consultancy Projects
New Projects	34	-
Ongoing	64	-
Completed	09	01

A high level of research output is ensured by the research infrastructure in the Department that has been built up assiduously over the years. Several new cutting edge facilities were added over 2018-19 such as MASSFIITB (Mass Spectrometry Facilities IIT Bombay), 3-D Laser Lithography.

Extensive interactions with various groups in Electrical Engineering, Chemical Engineering, Aerospace Engineering, Computer Science, Mechanical Engineering, Material Sciences, Physics, Chemistry and Mathematics make the departmental research activities truly interdisciplinary.

### Department of Chemical Engineering

The Department of Chemical Engineering is one of the largest departments in the Institute in terms of faculty members, students strength and research funds received. Currently, the department has 39 faculty members on its roll, 2 Emeritus Fellow, 2 Professor Emeritus, 6 visiting faculty and 13 Post- doctoral Fellows/ Research Associates.

**Academic Programmes :** The academic programmes offered by the Department are BTech (4-year), MTech (2-year), Dual Degree (5-year) and PhD programme (5-Year). The Department has a total of 747 students (440 BTech/ Dual Degree Students, 93 MTech and 214 PhD students).

	Student Intake	Degrees Awarded
BTech	120	113
DD (BTech+MTech)	-	09
MTech	63	29
PhD	56	23

The Department has seen a steady increase in the strength of doctoral students resulting in a vibrant research culture. This is reflected in a large output in research as seen by publication record 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 include Biological Systems Engineering, Soft Matter Engineering, Process Systems Engineering, Catalysis and Reaction Engineering, Thermodynamics & Molecular Simulations and Energy, Environment and Sustainability. The Department also has a strong focus in the subjects relating to Healthcare, Energy and Materials.

The Department has developed strong industry interaction and the faculty have been engaged in supporting various industry consultancy projects. The industry reciprocation has been strong in terms of responding to various initiatives such as Student-Industry Meet, Course on Wheels, Role Model Lecture Series and Sponsorship support to various department events.

With the support of Tata Trust, 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.



	Sponsored Projects	Consultancy Projects
New Projects	36	24
Ongoing	63	26
Completed	08	12

During 2018-19, the Department received research grant from government and private agencies to the tune of Rs. 29.4 crore with 76 new sponsored and consultancy projects.

## Department of Chemistry

The Department of Chemistry at IIT Bombay is one of the premier research and teaching hubs for chemical and chemistry-driven interdisciplinary sciences in India. Today, the Department has 38 faculty members with diverse expertise in various areas of Chemistry. The faculty is strongly supported by a large number of motivated and talented young students.

**Academic Programs:** The Department offers Masters in Chemistry (2-Year), BS in Chemistry (4-Year), Integrated MSc, Integrated (MSc+PhD) and 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 program.

	Student Intake	Degrees Awarded
BS (4-Year)	32	14
MSc (5-Year)	0	23
MSc (2-year)	45	44
DD (MSc+PhD)	0	0
MPhil	-	-
PhD	63	44

**R&D Activities:** Research problems of basic, applied and interdisciplinary nature are actively pursued in the Department through sponsored and industrial research projects. Major thrust areas of research include Biophysical Chemistry, Coordination Chemistry, Bio-inorganic Chemistry, Organometallic Chemistry, Bio-organic Chemistry, Chemical Biology, Theoretical Systems Biology, Membrane Biology, Chemistry of Natural Products, Synthetic Organic Chemistry, Photochemistry and Spectroscopy, Polymer Chemistry, Thermodynamics, Electrochemistry, Solid state Chemistry and Physics, Catalysis and Theoretical Chemistry.

Many thrust areas of research include Biophysical Chemistry, Co-ordination Chemistry, Bio-inorganic.

The year 2018-19 witnessed many great events such as scientific conferences, workshops and prestigious awards brought to the department by the hard work of faculty and students alike. The Department hosted symposium on New Frontiers of Chemical Science (NFCS); A symposium on Chemical Synthesis, American Chemical Society's premier outreach program, ACS event on Campus; IIT Bombay Diamond Jubilee symposium in Chemistry were conducted during the year. The symposium had several speakers of International repute from India and abroad.

Several eminent personalities visited the department during the year and gave lectures. Prof. Vijayalakshmi Ravindranath from IISc Bangalore delivered "Professor A. K. Lala Memorial Lecture". Prof. K. Subramanian (Retired Professor, IIT Madras) delivered on "Professor K. D. Deodhar Memorial Lecture". In the year 2018-19, approximately 55 national and international scientists gave invigorating distinguished guest lectures on varied research themes. The year was very fruitful in terms of research publications

	Sponsored Projects	Consultancy Projects
New Projects	27	15
Ongoing	53	13
Completed	04	06

## 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 recognized as one of the best and major engineering Departments in the country and ranked highly in the world for Civil Engineering. It has developed strong links with the building and construction industry and the academia, both within and outside the country. 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 49 full-time and 3 adjunct faculty members.

**Academic Programme:** The Department is running BTech, MTech and PhD programmes with its additional Dual Degree (BTech–MTech) programme in Civil Engineering. The department also hosts Postdoctoral Fellowship programme in various specializations sponsored by the Institute, Science and Engineering Research Board (SERB), sponsored research and other agencies.

	Student Intake	Degrees Awarded
<b>BTech</b>	<b>125</b>	<b>109</b>
<b>MTech</b>	<b>77</b>	<b>64</b>
<b>PhD</b>	<b>57</b>	<b>24</b>
<b>DD (BTech+MTech)</b>	<b>Converted at the end of 3rd year</b>	<b>03</b>

**R&D Activities:** The Department has strong focus in the research areas of Structural Engineering, Geotechnical Engineering, Water Resources Engineering, Transportation Systems Engineering, Remote Sensing, Ocean Engineering, and Construction Technology and Management. The Department is actively involved in basic and applied research and consultancy and provides high quality technical advisory support.

	Sponsored Projects	Consultancy Projects
<b>New Projects</b>	<b>26</b>	<b>~529</b>
<b>Ongoing</b>	<b>45</b>	<b>~379</b>
<b>Completed</b>	<b>09</b>	<b>~289</b>

**Outreach Activities/ Awards:** The students and faculty member of department have won prestigious national and international awards and recognition, and continue to bring laurels to the Department and the Institute. 16 of the department faculty members have won 23 prestigious awards this year. Quite a good number of our faculty members continue to be Editors or Associate Editors or Members of the Editorial Boards of 20 reputed International/ National Journals.

The Department disseminates the knowledge gained from its high quality research through training programs and interacts with world renowned personalities through workshops and conferences.

## Department of Computer Science and Engineering

The Department of Computer Science and Engineering (CSE) is the largest CSE department among Institutes in India. The Department has 45 faculty members, including two visiting faculty and one adjunct faculty,

**Academic Programmes:** The Department offers Bachelor of Technology (BTech), Master of Technology (MTech) and Doctor of Philosophy.

	Student Intake	Degrees Awarded
<b>BTech</b>	<b>120</b>	<b>94</b>
<b>DD (BTech+MTech)</b>	<b>-</b>	<b>03</b>
<b>MTech</b>	<b>104</b>	<b>97</b>
<b>PhD</b>	<b>04</b>	<b>08</b>
<b>MS</b>	<b>-</b>	<b>01</b>

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

	Sponsored Projects	Consultancy Projects
<b>New Projects</b>	<b>32</b>	<b>20</b>
<b>Ongoing</b>	<b>51</b>	<b>21</b>
<b>Completed</b>	<b>06</b>	<b>11</b>

## 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 26 faculty members with specializations covering a wide spectrum of research areas in Geosciences, including both Geology and Geophysics. The faculty members of the Department are actively engaged in both teaching and research and contribute significantly towards advancement of different Geoscience disciplines. The close links that the Department enjoys with the industry and research organizations has helped towards elevating the level and quality of research work and facilities. The Department has nearly 100 research scholars and 6 post-doctoral fellows.

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

	Student Intake	Degrees Awarded
<b>MSc (2-year)</b>	<b>46</b>	<b>54</b>
<b>MTech (GEO-EXPLORATION)</b>	<b>30</b>	<b>20</b>
<b>PhD</b>	<b>24</b>	<b>17</b>
<b>DD (MSc+PhD)</b>	<b>-</b>	<b>03</b>
<b>MPhil</b>	<b>-</b>	<b>01</b>

**R&D Activities:** The research areas are diverse and include igneous and metamorphic petrology, sedimentology, microbial signature in siliciclastic sediments and recent sediment analysis, organic geochemistry, micropalaeontology, microfacies analysis, ichnology, structural analysis, neotectonics, petroleum geology, remote sensing applications in mineral exploration and geomorphology, ore petrology, kimberlite petrology, fluid inclusion studies, mathematical modeling of ore deposits, engineering geology, geomechanics, neural network modelling, earthquake and theoretical seismology, gravity and magnetics, electromagnetic, electrical resistivity, electrical signal processing, geophysical modeling and inversion, petrophysics, satellite geomagnetism and remote sensing. The department has several state-of-the-art laboratories and research facilities including three major national facilities – 40Ar/ 39Ar Mass Spectrometer, Electron Probe Micro Analyzer (EPMA), and Imaging Spectroscopy laboratory.

	Sponsored Projects	Consultancy Projects
New Projects	08	18
Ongoing	23	22
Completed	05	04

Sponsored research projects, both in pure and applied geology and geophysics, were carried out in the Department.

Several eminent personalities visited the department and delivered lectures. Prof. Mark Zobach from Stanford University gave the Diamond Jubilee Lecture entitled “What’s New in an Old Industry: Oil & Gas in an Era of Decarbonization”. An International seminar entitled “Carbon Capture, Storage and Reuse in India” and a Diamond Jubilee National Seminar on Exploration Geophysics with special theme entitled “Exploration of Marine Resources” was organized by the faculty members of the Department.

## Department of Electrical Engineering

Since its inception in 1957, the Department of Electrical Engineering has been active in teaching and research. Currently, the Department has 68 faculty members and 1300 students.

**Academic Programmes:** 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 has been offering a five-year Dual Degree five-year (Bachelor of Technology and Master of Technology) in the two specializations -- Communications and Signal Processing, and Microelectronics. From the year 2019, under the revised curriculum, the Department will be admitting Dual Degree (DD) students post-JEE without a pre-assigned specialization. Students will be able to, depending on their interests, choose the specialization after spending five semesters in the Institute. The Department has initiated to admit UG students from other department to the MTech programme through Interdisciplinary programme.

Until recently, the Department of Electrical Engineering at IIT Bombay offered five MTech specializations as Communication Engineering (EE1), Control & Computing (EE2), Power Electronics & Power Systems (EE3), Microelectronics (EE4) and Electronic Systems (EE5). Specializations in Microelectronics and VLSI catered to two relatively disjoint areas of research—circuits and devices. The Department felt the need to separate the Microelectronics specialisations, namely, Solid-state Devices and Integrated Circuits and Systems. The motivation behind the split was to provide more focused training to the admitted students in either stream to increase their research productivity.

Since 2009, the Department is offering admissions to Dual Degree (MTech + PhD) program. The Department of Electrical Engineering has strong Department Academic Mentorship Programs



	Student Intake	Degrees Awarded
<b>BTech</b>	<b>69</b>	<b>66</b>
<b>MTech</b>	<b>157</b>	<b>104</b>
<b>MTech+PhD</b>	<b>-</b>	<b>08</b>
<b>DD (BTech+MTech)</b>	<b>67</b>	<b>66</b>
<b>PhD</b>	<b>56</b>	<b>41</b>

(D-AMP), under the aegis of the Institute Student Mentor Program (ISMP).

**R&D Activities:** The Department is equipped with the state-of-the art experimental and computational facilities for undertaking research and development, and consultancy activities exists in various fields. Research collaborators also include researchers from several national and international universities, and research organizations. Their strong collaboration with industry in the past two decades and number of laboratories (around 30) have been established through such collaboration.

Recently set up laboratories include MeDAL Laboratory, Stochastic Laboratory, Applied Integrated Micro Systems (AIMS) Laboratory, iCas Laboratory. The centers that have been set up 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 (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 Center.

	Sponsored Projects	Consultancy Projects
<b>New Projects</b>	<b>53</b>	<b>26</b>
<b>Ongoing</b>	<b>88</b>	<b>29</b>
<b>Completed</b>	<b>14</b>	<b>09</b>

The contributions of the department students under the guidance of faculty members has been recognized in the form of award: (a) Shraddha Kothari, Sachin Dev and Kartikey Thakar under the guidance of Prof. Saurabh Lodha, have received the ‘Best Paper Award’, ‘Best Poster Award’, and ‘Best Manuscript Award’ respectively at the IEEE International Conference on Emerging Electronics – 2018 (b) Prof. Sibi Raj Pillai and his student team (including Viswanathan Ramachandran, Research Scholar and Dr. Vinod Prabhakaran, Adjunct faculty, won the best paper award in National Conference on Communications (NCC) 2019 (c) Mr. Durgesh Tamhane, Research Scholar, won the first prize at the 17th IEEE international conference on “Sensors and Measurement” under the guidance of Prof. Siddarth Tallure. The prize carries a certificate and a cash prize of US\$2,000, and (d) Arun Kumjar Chowdhury, A. Srivastava, Prof. M. Shojaei Baghini won the Best Paper Award at the international conference on VLSID, IEEE, held in January 2019.

## Department of Energy Science and Engineering

The Department of Energy Science and Engineering is a unique blend of science and engineering working on developing sustainable energy systems and solution for the future. The Department has 25 core and about 30 associate faculty members.

**Academic programmes:** The Department offers several academic programmes that include the (BTech+MTech) Dual-Degree programme with intake through JEE, the (MSc+PhD) Dual Degree programme with intake through JAM, the MTech programme in Energy Systems Engineering, the PhD programme, and a Minor course in Energy Engineering programme.

	Student Intake	Degrees Awarded
<b>DD (BTech+MTech)</b>	<b>32</b>	<b>46 (23)</b>
<b>MTech</b>	<b>30</b>	<b>21</b>
<b>PhD</b>	<b>17</b>	<b>11</b>
<b>DD (MSc +PhD)</b>	<b>13</b>	<b>8 (4)</b>

\* For the dual degree programmes, the bracket shows the number of the graduated students.

**R&D Activities:** The Department's research areas include renewables (solar PV and thermal, wind, and biomass), thermal and electrochemical storage systems, power systems and power electronics, energy integration and energy efficiency, and nuclear energy. Some of the major ongoing projects are the National Centre for Photovoltaic Research and Education (NCPRE), the Indo-UK Clean Energy Research Centre, Intelligent Microgrids and Advanced Storage (IMASE), and the Impacting Research Innovation and Technology (IMPRINT) projects on fuel cells and hydrogen storage. A new multi-institutional R&D Centre on Hydrogen Energy Storage with Department of Science & Technology (DST) support was started in February 2019. The department was also selected as a National Resource Centre for Energy by Ministry of Human Resource Development (MHRD) that launched an online refresher course for Energy Systems Engineering for faculty members in India on the Swayam portal.

	Sponsored Projects	Consultancy Projects
<b>New Projects</b>	<b>20</b>	<b>05</b>
<b>Ongoing</b>	<b>31</b>	<b>07</b>
<b>Completed</b>	<b>03</b>	<b>03</b>

The Diamond Jubilee workshop on the 'Future of Energy Research and Education' was organized by the Department during December 13-14, 2018. The event brought together leaders from industry, research organizations and academia to discuss the challenges and opportunities in the energy sector, create roadmaps and share vision for the future. The first day of the workshop focused on Energy Research while the second day focused on Energy Education. The event was attended by around 150 participants.

The Department organized the 19th edition of Energy Day in the year 2019. The event had final year students presenting their research work to the participants from the industry, academia, and the society at large. There were around 60 flash presentations and a poster session with a total audience of about 200. The department received first prize in Oil and Natural Gas Corporation Limited (ONGC) national level 'Solar Chulha Design Challenge' awarded by Shri. Dharmendra Pradhan, Honourable Minister of Petroleum and Natural Gas in April 2018.

The new department building (shared with the Department of Environmental Science and Engineering) was formally inaugurated by the 'Hon'ble Prime Minister of India Shri. Narendra Modi on August 11, 2018 during the Institute's 56<sup>th</sup> Convocation.

## Department of Environmental Science and Engineering

The Centre for Environmental Science and Engineering (CESE) was established in 1985, and recently in February 2019, the center was awarded with the status of 'Department'. The Department has a core group of 14 faculty members with multi-disciplinary background and diversifying research interests. Apart from this, professionals from consultancies and government organizations visit for delivering lectures from time to time. The Department is expanding teaching and research activities and has started a Dual Degree (MSc+PhD) programme since July 2010, in addition to already existing MTech and PhD programmes. In addition to these three programmes, the Department is running a minor course in Environmental Science and Engineering for undergraduates studying in other Departments at IIT Bombay. A Dual Degree (BTech+MTech) programme has started from Autumn 2018 as well. In addition to the above listed programmes, the Department offers an Institute-core course 'Environmental Studies: Science and Engineering' to all undergraduates and (MSc+ PhD) students. Besides, the Department runs several elective courses for sensitizing students across all disciplines towards the urgent need for protection and restoration of the environment by adapting environment-friendly lifestyles.

**Academic Programmes:** The Department currently offers MTech, PhD, Dual Degree (MSc+PhD), Dual Degree (BTech+MTech) programmes in Environmental Science and Engineering with a strong focus in teaching and research.

	Student Intake	Degrees Awarded
<b>DD (BTech+MTech)</b>	<b>29</b>	<b>00</b>
<b>MTech</b>	<b>16</b>	<b>13</b>
<b>PhD</b>	<b>06</b>	<b>06</b>
<b>DD (MSc+Ph D)</b>	<b>07</b>	<b>02</b>

**R&D Activities:** The ongoing research activities of the Department are focused towards addressing the priority areas (local and global) set by major national agencies like Ministry of Human Resource Development (MHRD), Central Pollution Control Board (CPCB), State Pollution Control Board (SPCB), Ministry of New and Renewable Energy (MNRE), Department of Biotechnology (DBT), Ministry of Environment, Forest and Climate Change (MoEF), Council of Scientific and Industrial Research (CSIR), Department of Science and Technology (DST). In addition, the Department 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 the department are supported by excellent experimental and computational facilities. The Department is also actively engaged in organizing workshops and CEP courses for benefiting professional from other academic institutions, industries and governmental sectors.

	Sponsored Projects	Consultancy Projects
<b>New Projects</b>	<b>06</b>	<b>05</b>
<b>Ongoing</b>	<b>09</b>	<b>12</b>
<b>Completed</b>	<b>01</b>	<b>00</b>

## Department of Mathematics

The Department of Mathematics conducts basic, applied and interdisciplinary research in varied areas of Mathematics, including Algebra & Number Theory, Analysis, Geometry and Topology, Combinatorics and Theoretical Computer Science, Partial Differential Equations and Numerical Analysis, and Probability and Statistics. The current faculty strength of the department is 50. The year witnessed excellent contributions and achievements of faculty and students in research; interaction with industry and noted national and international institutes, universities and organizations and extended educational activities beyond the departmental academic programmes.

The department is also involved in teaching Mathematics-related courses in the BTech Programme of the Institute.

**Academic Programme:** The Department offers two Masters Programme - one in Mathematics [MSc (MA)] and other in Applied Statistics and Informatics [MSc (ASI)], and also a PhD programme. The department launched the 'Bachelor of Science (BS) in Mathematics' during the Academic Year 2018-19. The programme is designed to build a strong foundation in the initial semesters, while encouraging students to pursue more targeted interests in the second half of the programme through advanced elective courses within the Department of Mathematics. The curriculum also includes basic science courses and incorporates elective course from the science, engineering and humanities disciplines, allowing considerable flexibility and academic freedom. There are minor programmes for undergraduates offered in both Mathematics and Statistics, an integrated MSc programme in addition to the core undergraduate curriculum.

	Student Intake	Degrees Awarded
<b>MSc (MA)</b>	<b>30</b>	<b>28</b>
<b>MSc (ASI)</b>	<b>37</b>	<b>32</b>
<b>PhD</b>	<b>15</b>	<b>07</b>
<b>M Phil</b>	<b>0</b>	<b>01</b>

**R&D Activities:** 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 productive collaboration with industries and reputed R&D departments in India and abroad.

	Sponsored Projects	Consultancy Projects
<b>New Projects</b>	<b>14</b>	<b>02</b>
<b>Ongoing</b>	<b>21</b>	<b>00</b>
<b>Completed</b>	<b>04</b>	<b>02</b>

## Department of Mechanical Engineering

The Department of Mechanical Engineering is one of the largest departments at IIT Bombay. It has a total of 62 faculty members involved in teaching and research and more than 1100 students along with around 250 enrolled PhD students.

**Academic Programs:** The Department offers MTech and PhD programs besides the flagship BTech program in Mechanical Engineering. The MTech programme offers specializations in Thermal & Fluids Engineering, Design Engineering and Manufacturing Engineering.

	Student Intake	Degrees Awarded
<b>BTech</b>	<b>128</b>	<b>122</b>
<b>DD (BTech+MTech)</b>	<b>24</b>	<b>47</b>
<b>MTech</b>	<b>78</b>	<b>84</b>
<b>PhD</b>	<b>45</b>	<b>34</b>
<b>DD(MTech+PhD)</b>	<b>1 (Intake in 2016)</b>	<b>0</b>

**R&D Activities:** The Department has a vibrant research and development program which focuses on discovery and innovation spanning the breadth of the areas covered under Mechanical Engineering. The Department has established state-of-the-art research facilities after procuring state-of-the-art massive external funding from the government agencies and private industries. Large independent research centres such as the National Centre for Aerospace Innovation and Research (NCAIR) and the Biomedical Engineering and Technology Incubation Centre (BETiC) have spawned out of the Department. A distinguishing feature of the latest mode of operation



in research and development activities is to form a few key thematic areas, under each of which several faculty members come together to forge research plans of interdisciplinary nature. In this context, several thematic areas such as Smart Manufacturing, Advanced Manufacturing Processes, Atomistic Modeling and Simulations, Robotics, Computational and Experimental Fluid and Solid Mechanics have been identified.

	Sponsored Projects	Consultancy Projects
New Projects	32	29
Ongoing	60	25
Completed	03	15

## Department of Metallurgical Engineering & Materials Science

The Department of Metallurgical Engineering and Materials Science (MEMS) 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 critical strength of the department lies in its ability to balance between teaching and research, between traditional and emerging materials and between applied and basic research.

**Academic programme:** The Department offers four-years BTech, five-year Dual Degree (BTech+MTech), MTech, and PhD program. The curriculum for these programs has been developed in view of the present technological status and future needs. The Department also continues to design and offer new courses pertinent to the cutting-edge areas. Some of the PhD students of the Department have been receiving highly-renowned national level awards (like the SK Rangarajan Graduate Student Award by The Electrochemical Society) for their contributions in research. The classical teaching combined with short-term courses (continuing education and quality improvement programs, special training programs like Global Initiative of Academics Networks (GIAN) and Science and Engineering Research Board (SERB) Schools, etc.) have generated an excellent pool of highly-motivated and competent manpower for the country.

	Student Intake	Degrees Awarded
BTech	98	80
DD(BTech+MTech)	26	39
MTech	68	61
DD (MTech + PhD)	0	03
PhD	27	22
PGDIIT	0	03

**R&D Activities:** The Centre for Excellence in Steel Technology (associated with the Department of MEMS), funded by the Ministry of Steel (CoEST), provides a platform for critical research collaborations for Indian Steel Industry, several technological products and a wide range of sponsored research projects. Another new collaborative center funded by the Department of Science and Technology this year is the Water Innovation Centre: Technology, Research and Education (WICTRE) focuses on a very important area, considering the present needs of our country.

	Sponsored Projects	Consultancy Projects
New Projects	25	31
Ongoing	40	26
Completed	02	39

## Department of Physics

The Department of Physics, one of the oldest departments of the Institute was established in 1958. It has a tradition of vibrant teaching and offers PhD in many research topics. The Department has 46 faculty members on its roll and 30 post-doctoral fellows.

**Academic Programmes:** The Department offers four-year BTech in Engineering Physics, two-year MSc degree in Physics as well as the PhD program.

	Student Intake	Degrees Awarded
<b>BTech</b>	<b>44</b>	<b>42</b>
<b>DD (BTech+MTech)</b>	<b>0</b>	<b>08</b>
<b>MSc</b>	<b>48</b>	<b>47</b>
<b>DD (MSc+MTech)</b>	<b>0</b>	<b>03</b>
<b>PhD</b>	<b>42</b>	<b>18</b>

**R&D Activities:** The Department has five major research groups, namely Condensed Matter Physics, High Energy Physics, Statistical Physics/ Soft Matter/ Biophysics/ Non-linear dynamics, Photonics and Astronomy/ Cosmology/ Gravity. Both theoretical and experimental research are going on in most of the above fields. At present, the Department houses many important infrastructural facilities like helium liquefier, workshop supporting in-house small-scale instrumentation, a clean room for thin film and semiconductor device fabrication and several material growth facilities like CVD, PLD, ultrafast optical spectroscopy setup, NMR spectrometer, high resolution XRD, high field magnetometers, Raman spectroscopy setup for liquids and nanostructures, spatio-temporal emission and photocurrent scanning microscopy setup, magneto absorption, emission and photoconductivity setup, long time transient absorption spectroscopy setup, HPC clusters, high temperature - high pressure furnace etc. Many of these facilities are utilized by researchers across several departments.

	Sponsored Projects	Consultancy Projects
<b>New Projects</b>	<b>22</b>	<b>0</b>
<b>Ongoing</b>	<b>33</b>	<b>0</b>
<b>Completed</b>	<b>03</b>	<b>0</b>

Some of the significant research contributions during the current year include the installation of robotic telescope at Ladakh that is co-owned with Indian Institute of Astrophysics, establishment of a Langmuir Blodgett setup for structural and dynamical characterization of films at interfaces; customized low temperature magneto-optical micro spectroscopy scanning set up; customized ultra- sensitive and high-spatial resolution time delayed imaging etc. In addition to the ongoing collaborations with leading Research Institutions/ Universities from India and abroad, several new collaborations were initiated during the year 2018-19. To mark the Diamond Jubilee of the Institute, the Department hosted a symposium ‘Powai Perspectives on Physics’ and Research scholars conclave ‘Symphy 2019’.

## Department of Humanities and Social Sciences

The Department of Humanities and Social Sciences (HSS) plays a unique role in IIT Bombay. Its main thrust is on teaching and research, which is both essential and complementary to the education in science and technology. The setting up of a ‘Cell for Indian Science and Technology in Sanskrit’ (CISTS) in the Department has created new opportunities for research collaboration within the Institute and across various institutions. 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. Not

only the alumni of the Department who are well placed in academia, financial institutions, NGOs, development sector, government and private sectors but also the alumni of IIT Bombay from other departments appreciated the role of HSS Department.

The Department provides unique opportunities for students by providing an ambiance different from that of conventional university departments in the arts and social sciences, especially by facilitating conversations and discussions across multiple disciplines and research areas. It conducts regular seminar series in addition to national and international conferences, symposia and workshops. Beginning in the late 1950s as a 'Service' department, the Department has acquired a prominent stature for its teaching and research activities, well known and recognized both within and outside the country. The Department has recently launched a well-equipped 'Econometrics Laboratory', which is well equipped with both state-of-art hardware and software for carrying out research.

**Academic Programme:** Spanning the disciplines of Economics, English literature and language, Linguistics, Philosophy, Psychology, Sociology and Sanskrit, its faculty members teach a wide variety of core and elective courses for under-graduate and post-graduate students of HSS Department as well as to science and engineering departments of the Institute. The Department has a strong PhD program in all of the sub-disciplines mentioned earlier since 1973 and launched a multi-disciplinary programme 'MPhil in Planning and Development' in 1993. The Department has started a four-year undergraduate programme, 'Bachelor of Science in Economics' in 2017 and the third batch of students will be joining in the next academic year. Facilities of the Department include a library, computer laboratory, psychology laboratories and Econometrics laboratory.

	Student Intake	Degrees Awarded
<b>MPhil</b>	<b>19</b>	<b>22</b>
<b>PhD</b>	<b>40</b>	<b>23</b>
<b>BS (Economics)</b>	<b>26</b>	<b>-</b>

**R&D Activities:** The department faculties are involved in a number of research projects independently, in collaboration with faculty members of 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 within their parent disciplines 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, socio-economic and environmental policies are also being taken up as research themes in the Department.

	Sponsored Projects	Consultancy Projects
<b>New Projects</b>	<b>09</b>	<b>02</b>
<b>Ongoing</b>	<b>16</b>	<b>04</b>
<b>Completed</b>	<b>02</b>	<b>00</b>

Apart from this, 2 TAP projects and 2 internship projects are ongoing.

## IDC School of Design

IDC School of Design at the Indian Institute of Technology Bombay (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 by organizing seminars, conducting short-term courses and workshops. 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 School of Design at IIT Bombay has a well-established Master of Design degree (MDes) programme in Industrial Design, Communication Design, Animation Design, Interaction Design, Mobility and Vehicle Design and minor courses as well as PhD programme in Design. From the year 2015 onwards, IDC has started a four-year, Bachelor of Design (BDes) programme and a five-year Dual Degree (BDes+MDes) programme (available only at the end of the 3rd year). Both these programmes are credit-based and thus offer the flexibility to progress at one's own pace.

	Student Intake	Degrees Awarded
<b>BDes</b>	<b>30</b>	<b>0</b>
<b>MDes</b>	<b>62</b>	<b>52</b>
<b>PhD</b>	<b>04</b>	<b>07</b>

**R&D Activities:** IDC School of Design 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
<b>New Projects</b>	<b>05</b>	<b>06</b>
<b>Ongoing</b>	<b>18</b>	<b>07</b>
<b>Completed</b>	<b>05</b>	<b>0</b>

Design and Degree Show (DDS) 2018 was organized by the graduating batch during June 23-24, 2018. The event featured projects of the outgoing batch of Masters students of the department from five streams. The year witnessed talks by invited guests in the field of design education and practice with topics on range of subjects. The Department organized three-day workshops Expo Pdi, Expo Info Design and Typo Day 2019 during the year. A 3-day refresher course on the finer aspects of Communication Design specifically meant for IT and media professionals was held during July 19-21, 2018. The school has bagged second prize in SIAM's Automotive Design Challenge for their futuristic autonomous sports car in Auto Expo - The Motor Show 2018. The animation film, 'Maacher Jhol-The Fish Curry', directed by its alumnus of Mr. Abhishek Verma won the 65th National Film Award for Best Animation Film in April 2018.

## 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 2018-19 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) joint degree by IIT Bombay, India and Olin Business School Washington University in St. Louis, USA, certificate programmes for Executive Education: short and long-term in-house and open Management Development Programmes for the corporate executives/ professionals of all fields, BTech (Minor) courses in all areas of Management

	Student Intake	Degrees Awarded
<b>MMgt</b>	<b>115</b>	<b>107</b>
<b>PhD</b>	<b>04</b>	<b>03</b>
<b>E-MBA</b>	<b>22</b>	<b>22</b>



	Sponsored Projects	Consultancy Projects
New Projects	03	03
Ongoing	07	02
Completed	0	01

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

### Centre of Studies in Resources Engineering (CSRE)

Established in 1976, the Centre of Studies in Resources Engineering (CSRE) is a teaching academic unit of IIT Bombay. The Centre is noted for its research in the areas of mineral exploration, synthetic aperture radar and hyperspectral image analysis, GPS applications, high-performance computing, agro-informatics, cryosphere, water management and so on. The Centre's work was presented in some of the best known journals and in several prestigious conferences.

**Academic Activities:** The Centre offers MTech and PhD programs in Geoinformatics and Natural Resources Engineering, and has about 100 students in Masters and Doctoral programs. In addition, Centre also offers an undergraduate minor course in Geoinformatics for BTech and Dual Degree students of the Institute. A new course on Machine Learning for Remote Sensing I and II has been designed and offered to the students.

	Student Intake	Degrees Awarded
MTech	25	20
PhD	09	10

**R&D Activities:** The Centre has been actively working on many research and development activities through projects covering Geoinformatics and Applications. In addition, the Centre also engaged in various national and international level consultancy services in the area of Geoinformatics and its applications. The Centre has international collaborations in selected areas such as Microwave Remote Sensing, Mineral Resources and Data Sciences in Agriculture. The Centre has developed excellent infrastructure in terms of state-of-the-art software, hardware, image datasets and platforms (UAV with Hyperspectral camera).

	Sponsored Projects	Consultancy Projects
New Projects	07	06
Ongoing	13	10
Completed	05	00

### Centre for Technology Alternatives for Rural Areas (CTARA)

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

**Academic Programme:** The Centre offers an 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 overview of development issues, resource analysis, rural needs assessment, technological interventions and impacts, and has a strong field component. The teaching and research activities are aimed

at providing relevant solutions to the rural areas. In order to do this effectively, the centre has developed linkages with NGOs, government departments and ministries, and industry. The course is also a part of the Unnat Maharashtra Abhiyan (UMA) framework.

The Department of Public Enterprises (DPE) supported a CSR study unit in CTARA this year. With the support of the DPE and sponsorship from Coal India Ltd, CTARA celebrated an annual flagship event titled 'District Development Dialogue'.

UNICEF also supported the centre with fellowships in the child nutrition sector during the year 2018-19. Six students participated in an International Health Conference at Oxford University in June 2018. The center also held a workshop on Sustainable Agriculture and Nutrition with APAARI and NABARD as co-hosts.

	Student Intake	Degrees Awarded
<b>MTech</b>	<b>33</b>	<b>25</b>
<b>Phd</b>	<b>11</b>	<b>5</b>

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

	Sponsored Projects	Consultancy Projects
<b>New Projects</b>	<b>11</b>	<b>05</b>
<b>Ongoing</b>	<b>23</b>	<b>08</b>
<b>Completed</b>	<b>03</b>	<b>00</b>

### **Centre for Formal Design and Verification of Software (CFDVS)**

CFDVS has established itself as a national R&D Centre in the area of formal verification of high-integrity software and hardware. 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. Safety-Critical systems include computer based control systems used in nuclear reactors, space, avionics, process-control and robotics. Failures in such systems due to software or hardware bugs can be catastrophic both, financially and in human terms. Verification of safety critical system was the primary inspiration behind DAE's establishing the Centre for Formal Design and Verification of Software (CFDVS) through BRNS, and in collaboration with IIT Bombay and TIFR, in 1999. The Centre has contributed to several R&D programs in formal verification, and has taken up sponsored industrial projects from various government organizations like VSSC, ADA, DRDL and 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.

The laboratories are equipped with a number of personal computers, high-end servers, HPC data center and workstations. The current software resources include a number of public domain tools for formal specification and verification, advanced static analysis, dynamic analysis and testing tools (test-beds), modeling languages and related environments for real-time software supporting simulations and verification, hazard analysis tools and CASE tools and general programming environments. During the past 20 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 demonstrated our ability to handle the technological challenges involved in addressing complex problems at the small to medium scale. CFDVS is currently focusing 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.

### Ongoing Project

- FMSAFE: A Network Centre for Formal Methods in Validation and Certification Procedures for Safety-Critical ICT Systems.
- IMPRINT Project : Development of a remote healthcare delivery system early diagnosis, therapy, follow up and preventive care for NCDS cardio pulmonary.

### Centre for Urban Science and Engineering (C-USE)

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 Programmes:** The centre runs a PhD Programme offering specialization viz. Planning and Design, Housing, Land use policies, Public Spaces, Risk Management, Policy and Governance: Housing Economics, Health, Education, Employment, Environment, Infrastructure: Buildings, Transportation & Land use, Urban water, Waste Management, Smart Energy Informatics: Citizen Science, Cyber-Physical Systems, Urban Knowledge, Geospatial Technologies. The overall on roll students' strength this year is 28. The Centre has introduced a new programme of Master's in Urban Design and Engineering (MUDE) from the next academic year 2019-20. The aim of the programme is to take an interdisciplinary approach in teaching with greater emphasis on practical problem-solving.

	Student Intake	Degrees Awarded
PhD	03	01

**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.

The mission of the Centre is to be a globalized institution that would enable interactions among researchers, offer educational programs, encourage faculty and student exchanges and help them to learn from diverse contexts with the aim of making cities of the world, especially the developing world, more livable.

	Sponsored Projects	Consultancy Projects
New Projects	01	03
Ongoing	05	02
Completed	00	01

Faculty members were invited to deliver talks on topics highlighting sustainable water management, waste water management, sanitation, and alternative strategies thereof, sustainable infrastructure management, data-driven approach to health and well being, surveying urban spaces from outer space, gender and domestic energy in slum housing spaces and computer-based model for heat-stress reduction in tropical cities. Seminars and workshops were conducted that offered valuable insight on water and waste-water management, adolescent girl and urbanization, smart cities, the role of a bicycle share system in cities and evolving social networks. Conferences held during this term touched many human issues in urban life. Brilliant minds presented their studies, research, ideas and models on various topics such as modes of urban transport mainly two wheelers, AI and human senses, government framework, the role of ICT and open spaces in disaster management, human factors, ergonomics and application of remote sensing for the evaluation of green spaces.

## Centre for Research in Nanotechnology & Science (CRNTS)

IIT Bombay is one of the leading institutions in the country for research in the area of Nanotechnology. The Institute has 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. 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), Govt. of India. Significant progress has already been made in the establishment of these centres, and the facilities created at these national centres are available to all the researchers in the country.

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 operates with an "Open Access Policy". It has a vision, "to be amongst the top Analytical Instrument Laboratories in the world". During the year, SAIF provided facilities for the analysis of 35,075 samples from various domains that included academics, national labs as well as industry. Newly-installed facility include "Small Angle X-ray Scattering (SAXS)". SAIF participated in TechConnect (Science and Technology festival). The fest included poster presentation, interaction with many visitors from various domains that included academics as well as Industry and these facilitated increased awareness about the facilities at SAIF/CRNTS.

Workshops on "Orbitrap High Resolution Liquid Chromatograph Mass Spectrometer (HRLCMS) and 600 MHz Nuclear Magnetic Resonance Spectrometer (NMR)"; "ICP-AES, ICP-MS and CHNSO and its applications" and "Atom Probe Tomography and its applications" were conducted during the year 2018-2019

**Academic Programme:** The centre offers PhD programme in Nanotechnology.

	Student Intake	Degrees Awarded
PhD	16	12

**R&D Activities:** The Centre is one of the leading Centres in the country for research in the area of Nanotechnology. At IIT Bombay, over 60 faculty members from 15 different Departments/ Centres are working together in the broad areas of Nanotechnology, with support from various government agencies and private industries. This research has resulted in over 550 high quality publications in the last decade in international journals and conference proceedings and a large number of patents. Some of the research activities at IIT Bombay in the Nanotechnology area at par with some of the best institutions in the world.

	Sponsored Projects	Consultancy Projects
New Projects	01	01
Ongoing	02	01
Completed	0	01



## Centre for Policy Studies

For the recently- established Centre for Policy Studies (CPS) at IIT Bombay, 2018-19 was an important year. The Centre organised a large number of events for members of CPS and the IIT Bombay community to engage with issues of public policy and governance. During the year 2018-19, five distinct Policy Research Areas (RAs) have been established - Information Economy, Gender, Water and Sanitation, Regulatory Governance, and Public Health - to allow scholars to form research groups and conduct meaningful, evidence-informed research coalescing around these important areas of public policy.

**Academic Activities:** The second batch of PhD students were admitted during the year. The current strength of students pursuing doctoral research is 18. From the year 2019-20, the Centre will be admitting first batch of MPP (Masters in Public Policy) students.

CPS hosted eminent academicians from India and around the world including visit of Prof. Michel Bauwens, Director and Founder of the P2P foundation who conducted extensive discussions around the topic of “Cooperativism in the Digital Economy”; Prof. Des Gasper, Professor of Human Development, Development Ethics, and Public Policy at ISS of Erasmus University Rotterdam, spoke about “Understanding the Emergence of Sustainable Development Goals”,

CPS kindled discussions in the campus for the current and relevant issues of public policy. The Gender and Policy Forum organised a series of well-attended and thought-provoking talks by eminent speakers such as Wandana Sonalkar, Madhu Sarin and Padma Deosthali-Bhate as part of the Diamond Jubilee celebrations of IIT Bombay.

CPS organised a day-long Policy Colloquium with eminent speakers - Aditya Bhattacharjea, Partha Mukhopadhyay, and Sharachchandra Lele in March 2019.

A new website ([www.cps.iitb.ac.in](http://www.cps.iitb.ac.in)) and a Blog (<http://www.cps.iitb.ac.in/talking-policy/>) was launched in order to spark debate and discussion around public policy issues - within IITs, within India, and beyond. The Centre also launched a research collaboration with Queen Mary University of London as part of the Resilient Futures of India Initiative (RFII).

## Educational Technology

The Interdisciplinary Programme in Educational Technology (IDP-ET) at IIT Bombay started in the Institute in 2010-11. The IDP-ET conducts research in areas of pedagogies and tools for technology-enhanced learning. In addition to the Institute’s courses at a PhD level, the IDP-ET also organizes short-term intensive courses and MOOCs on effective teaching-learning and educational research methods through CEP, TEQIP, ‘Train 10000 Teachers project’, IITBombayX and NPTEL. The faculty members, post-doctoral research scholars and PhD students of the IDP-ET play a significant role in the organization of international conferences. Faculty members carry out sponsored projects for government organizations, and provide consultancy to educational technology industries.

As part of Diamond Jubilee celebrations, the group held three Jubilee events, Open House, Research Showcase and Technology-Enhanced Learning Symposium.

**Academic Programme:** The groups offer PhD programme in Educational Technology. From the upcoming academic year 2019-20, MTech program will also be offered. The group continues to offer core courses and electives in educational technology content and methods. These courses have received enrollment response from BTech, MTech and PhD students in other academic programmes within the Institute.

	Student Intake	Degrees Awarded
PhD	18	04

**R&D Activities:** Several R&D activities were conducted keeping in mind the main research areas of the IDP-ET that comprised of Technology-enhanced learning of Thinking Skills (TELoTS), Teacher Use of Educational Technology (TUET), Educational data analytics (EDA) and Emerge.

	Sponsored Projects	Consultancy Projects
New Projects	0	0
Ongoing	02	0
Completed	01	1

The IDP-ET focuses on the areas of development like learning resources and tools for students–technology-enhanced learning environments for concepts and problem solving; tools for educational data analytics for teachers; creation of multimedia e-books; design and development of online courses for students and teachers; guidelines and templates for teachers - effective teaching strategies, large classes, incorporation of ICT tools, teaching in new contexts such as online education and flipped classrooms.

Faculty members participated in the various conferences / symposia/ workshops / seminars/ Massive Open Online Courses (MOOC) organized for promoting conductive learning environment. Some of the presentations were made on ‘Multimodal Data during Learning with Advanced Learning Technologies, Canada’; ‘Improving uncertainty management skills of the learners in the context of Engineering Design’; ‘Investigating concreteness and abstraction in the context of Mathematics Education’ in Annual Research Meet (ARM 2019). Faculty members delivered the invited talks and chaired the conferences. The Faculty Professional Development programs included programs like Content Delivery and Assessment Methods for CS/IT Curriculum, Active Teaching Learning Strategies, Design virtual lab experiment and others. The various MOOC based programs included Designing Learner Centric, Fundamentals of 3D Visualization, Pedagogy for effective use of ICT for school teachers, Effective teaching- learning of CS in schools. Participants were engaged in interactive workshops on 3D Animation and problem-solving process and skills in Genetics.

### Industrial Engineering and Operations Research (IEOR)

Industrial Engineering and Operations Research (IEOR) at IIT Bombay is an interdisciplinary programme that offers PhD and MTech Degrees in IEOR and MSc-PhD Dual Degree in Operations Research. IEOR has nine faculty members and two adjunct professors. 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. Sponsored by McKinsey Knowledge Centre and supported by Diamond Jubilee office of IIT Bombay, IEOR Day 2019 was conducted during March 30-31, 2019 on the theme “Recent Trends in Operations Research and Management”. The event had 171 participants including students, faculty members and industry professionals. 15 invited talks, two panel discussions, poster presentations and student presentations were held during the two-day event.

**Academic Programmes:** IEOR is participating in the IIT Bombay-Monash Academy PhD programme, with two of its doctoral students in the joint PhD programme.

	Student Intake	Degrees Awarded
MTech	23	23
MSc (2 Years)	0	04
PhD	04	0
MSc+PhD	11	02

**R&D Activities:** Faculty members served as referees for several journals and international conferences. The Department hosted several visitors from academia and industry in the year. Faculty members visited various universities to pursue joint research. A new computational cluster was set up in PhD lab for research in computational methods of Operations Research.

	Sponsored Projects	Consultancy Projects
New Projects	04	01
Ongoing	07	02
Completed	01	01

## 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/ (MTech+PhD) ) in the broad area of Systems and Control. The group has 10 core faculty members and 11 associated faculty members from other academic units of the Institute. Many of the alumni of the group hold senior positions in the control and automation industry and research laboratories in the country.

**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	19	15
DD (MTech+PhD)	0	01
PhD	07	04

**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, control theory, NMR spectroscopy, nonlinear and geometric control, quantum information and control. In addition, research in the areas of Process Control, Identification, Behavioural Theory, Matrix Computation and 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	06	01
Ongoing	11	01
Completed	03	0

## Climate Studies

The Interdisciplinary Programme (IDP) in Climate Studies was initiated at the Institute, in January 2012, as one of the first doctoral programmes in India addressing research related to climate change. Over 30 faculty participants are drawn from 10 departments across IIT Bombay, who increasingly apply a depth of expertise in their fields to address the complexity of climate change. Currently, 45 students are enrolled for the doctoral programme. The curriculum includes a set of courses on fundamental and applied topics that provide intellectual grounding for critical research, analysis and application. Over a period of time, the IDP in Climate Studies is expected to emerge as an important knowledge and information resource to support national and state action responding to climate change.

**Academic Programme:** The interdisciplinary programme in Climate Studies 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. There are seminar series on a variety of topics relevant to Climate Studies by acclaimed national and international experts.

	Student Intake	Degrees Awarded
PhD	12	07

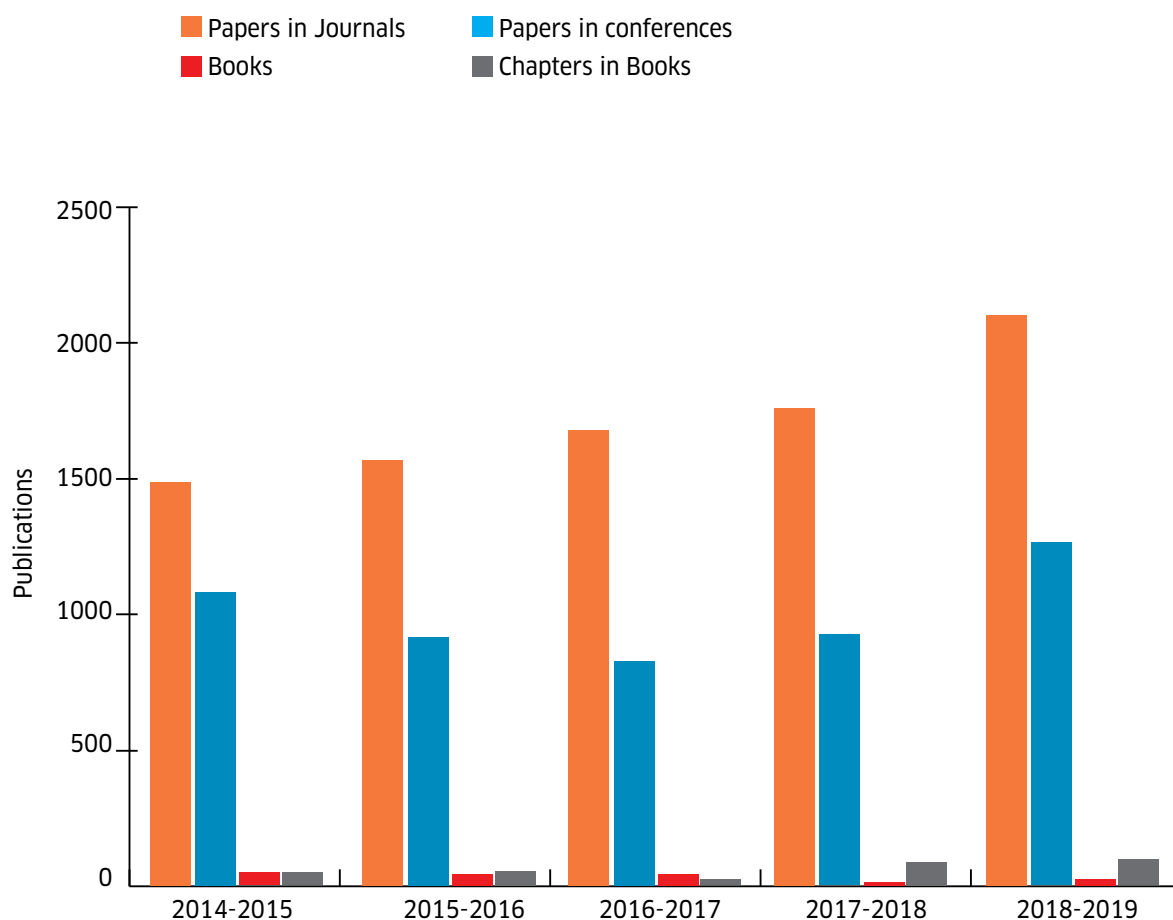
**R&D Activities:** Ongoing research at IDP in Climate Studies cuts across the domains of climate science, vulnerability and adaptation, and mitigation and policy. Investigations address improvement of model physics related to clouds, ocean mixing, aerosol processes, climate change detection and attribution, climate change impacts on cities and communities, adaptation and mitigation responses, and the assessment of climate change policies and mechanisms. Important research findings relate to trends in Indian monsoon rainfall from changes in land-use land cover pattern, variability in recycled precipitation and from fast responses to aerosol forcing. A comprehensive flood risk and vulnerability mapping is underway at city and national levels. Mitigation strategies have been assessed, regarding different scenarios of industrial development, various biofuel alternatives and opportunities to address short-lived pollutants. Long-term goals of IDP in Climate Studies include the creation of a pool of multi-disciplinary researchers to serve the growing national need for climate change professionals.

IDP in climate Studies hosted a Diamond Jubilee event on ‘Future Directions in Climate Studies’ and the book launch titled ‘Climate Change Signals and Response: A strategic knowledge compendium for India’. This book contains book chapters by various PhD students of IDP Climate studies and faculty members.



# Publications

The number of publications by faculty members of IIT Bombay are steadily increasing. From 1430 papers published in national and international journals during the year 2014-15, the total number of papers published in 2018-19 has increased by 594 papers in mere five years, taking the total number of papers published to 2024. Similar trends can be observed for the papers presented and chapters in books published authored by the Institute's faculty, in the graph given below:



Year	Papers in Journals	Papers in conferences	Books	Chapters in Books
2014-15	1430	1044	46	59
2015-16	1507	882	39	52
2016-17	1615	800	38	22
2017-18	1697	894	11	83
2018-19	2024	1225	21	89

# Organization



**Mr Dilip Shanghvi**  
Chairman, Board of Governors  
(Up to 03.04.2019)



**Prof. D.V. Khakhar**  
Director  
(Upto 17.04.2019)



**Prof. Subhasis Chaudhuri**  
Director  
(From 18.04.2019)



**Prof. A.K. Suresh**  
Dy. Director (Academic &  
Infrastructural Affairs)



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



**Prof. P.V. Balaji**  
Dean (Research & Development)  
(Upto 30.04.2019)



**Prof. Milind Atrey**  
Dean (Research &  
Development)  
(From 01.05.2019)



**Prof. Amitava De**  
Dean (Academic  
Programmes)



**Prof. Suhas Joshi**  
Dean (Alumni & Corporate  
Relations)



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



**Prof. Soumyo Mukherji**  
Dean (Student Affairs)  
(Upto 15.05.2019)



**Prof. Tapanendu Kundu**  
Dean (Student Affairs)  
(From 16.05.2019)



**Prof. Swati Patankar**  
Dean (International  
Relations)



**Prof. Abhay Karandikar**  
Dean (Faculty Affairs)  
(Up to May 9, 2018)



**Prof. K.P. Kaliappan**  
Dean (Faculty Affairs)  
(From May 10, 2018)



**Prof. P.C. Pandey**  
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
<b>Chairman of Each Institute (Ex-officio)</b>			
Kharagpur	2.	Shri Sanjiv Goenka, 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.	Dr. K. Radhakrishnan (from 19.02.2019), Mr. R. C. Bhargava (upto 18.10.2018) Chairman, Board of Governors, IIT Kanpur, Kanpur – 208 016. (Former Chairperson, Space Commission/ Secretary, Dept. of Space and former Chairman, ISRO)	Member
Delhi	6.	Chairman, Board of Governors, IIT Delhi Mr. Kumar Mangalam Birla (upto 17.01.2019) New Delhi – 110 016.	Member
Guwahati	7.	Chairman, Board of Governors, Dr. Rajiv I. Modi, Director (upto 07.02.2019), IIT Guwahati, Guwahati – 781 039.	Member
Roorkee	8.	Chairman, BoG, IIT Roorkee, Roorkee – 247 667	Member
Bhubaneswar	9.	Chairman, Board of Governors, IIT Bhubaneswar, Bhubaneswar (Odisha).	Member
Gandhinagar	10.	Chairman, Board of Governors Indian Institute of Technology, Gandhinagar	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.	Dr. R. Chidambaram (from 02.07.2018), Chairman, Board of Governors, Indian Institute of Technology, Jodhpur, Jodhpur, Rajasthan.	Member
Indore	13.	Prof. D. B. Phatak (from 18.02.2019) Chairman, Board of Governors, Indian Institute of Technology, Indore, Madhya Pradesh	Member
Mandi	14.	Mr. Subhodh Bhargava Chairman, Board of Governors, Indian Institute of Technology Mandi, Mandi, Himachal Pradesh (Chairman, TATA Communications Ltd., New Delhi)	Member
Patna	15.	Chairman, Board of Governors, Mr. Ajai Chowdhry (upto 22.10.2018) Indian Institute of Technology, Patna (Bihar) (Founder HCL, 10, Ishwar Nagar, New Delhi -110065)	Member
Ropar	16.	Chairman, Board of Governors, Indian Institute of Technology Ropar, Punjab	Member
Varanasi	17.	Chairman, Board of Governors, Prof. Girish Chandra Tripathi (upto 26.07.2018) Indian Institute of Technology (BHU), Banaras Hindu University, Varanasi -221 005, Uttar Pradesh	Member
IIT (ISM) Dhanbad	18.	Prof. D.D. Misra, Chairman, BOG IIT (ISM) Dhanbad	Member
<b>Director of each Institute (Ex-officio)</b>			
Kharagpur	19	Prof. Partha P. Chakrabarti, Director, IIT Kharagpur, Kharagpur – 721 302.	Member
Bombay	20	Prof. D.V. Khakhar, Director, IIT Bombay, Mumbai – 400 076.	Member
Madras	21	Prof. Bhaskar Ramamurthi, Director, IIT Madras, Chennai – 600 036.	Member
Kanpur	22	Prof. Abhay Karandikar, Director, IIT Kanpur, Kanpur – 208 016.	Member
Delhi	23	Prof. V. Ramgopal Rao, Director, IIT Delhi, Hauz Khas, New Delhi – 110 016.	Member
Guwahati	24	Prof. Gautam Biswas (upto 05.09.2018), Director, IIT Guwahati, Guwahati – 781 039.	Member
Roorkee	25	Prof. Ajit Kumar Chaturvedi, Director, IIT Roorkee, Roorkee – 247 667.	Member
Bhubaneswar	26	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	27	Prof. Sudhir K. Jain, Director, Indian Institute of Technology Gandhinagar, Vishwakarma Govt. Engg. College (VGEC) Campus, Chandkheda, Visat-Gandhinagar Highway, Ahmedabad – 382424.	Member



Hyderabad	28	Prof U.B. Desai, Director, Indian Institute of Technology Hyderabad, Ordnance Factory Estate, Yeddumailaram – 502205, Andhra Pradesh	Member
Jodhpur	29	Prof. Santanu Chaudhury (from 10.12.2018) Prof. C. V. R. Murty (upto 10.09.2018), Director, Indian Institute of Technology Jodhpur, IIT Rajasthan Camp Office, Jodhpur – 342 011.	Member
Indore	30	Prof. Pradeep Mathur, Director, Indian Institute of Technology Indore, Institute of Engineering and Technology, DAVV Campus, Khandwa Road, Indore – 452 017.	Member
Mandi	31	Prof. Timothy Gonsalves, Director, Indian Institute of Technology Mandi, PWD Rest House, 2nd Floor, Near Bus Stand, Mandi – 175 001, Himachal Pradesh	Member
Patna	32	Prof. Pushpak Bhattacharyya, Director, Indian Institute of Technology Patna, Govt. Polytechnic, Pataliputra's Colony, Patna – 800 013.	Member
Ropar	34	Prof. Sarit Kumar Das, Director, Indian Institute of Technology Ropar, Nangal Road, Rupnagar, Punjab – 140 001.	Member
Varanasi	35	Prof. Pramod Kumar Jain (from 01.08.2018) Prof. Rajeev Sangal (up to 15.04.2018) Director, Indian Institute of Technology (BHU), Varanasi – 221005 (UP)	Member
Dhanbad	36	Prof. Rajiv Shekhar, Director, Indian Institute of Technology (IIT) (ISM), Dhanbad, Jharkhand– 826004	Member
Tirupati	35	Prof. K.N. Satyanarayana, Director, Indian Institute of Technology, Tirupati, Andhra Pradesh– 517506	Member
Palakkad	37	Prof. P.B. Sunil Kumar, Director, Indian Institute of Technology, Palakkad, Kerala 678557	Member
Goa	38	Prof. B.K. Mishra, Director, Indian Institute of Technology, Goa, 403401	Member
Bhilai	39	Prof. Rajat Moona, Director, Indian Institute of Technology, Bhilai, Chhattisgarh 492015	Member
Dharwad	40	Prof. Seshu Pasumarthi, Director, Indian Institute of Technology, Dharwad, Karnataka 580011	Member
Jammu	41	Prof. Manoj Singh Gaur, Director, Indian Institute of Technology, Jammu, Jammu & Kashmir 181 221	Member

Chairman, University Grants (Ex-officio)	42	Prof. Dhirendra Pal Singh, Chairman, University Grants Commission, Bahadurshah Zafar Marg, New Delhi – 110 002.	Member
Director-General, Council of Scientific & Industrial Research (Ex-officio)	43	Dr. S. C. Mande, Dr. Girish Sahni, (upto 31.08.18), 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)	44	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)	45	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	46	Dr. Sukhbir Singh Sandhu, Additional Secretary (TE), Ministry of Human Resource Development, Department of Higher Education, Shastri Bhawan, New Delhi.	Member
To represent any other of Finance	47	Secretary (Expenditure), Ministry of Finance, Department of Expenditure, North Block, New Delhi – 1.	Member
To represent any other Ministry	48	Secretary, Department of Information Technology, Electronics Niketan, CGO Complex, Lodhi Road, New Delhi – 110003.	Member
Nominees of the Visitor Council for Technical Education (AICTE)	49	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)	50	Prof. H.C. Verma, Department of Physics, Indian Institute of Technology – Kanpur, Uttar Pradesh	Member
	51	Prof. Shreepad Karmalkar, Professor, Department of Electrical Engineering, Indian Institute of Technology Madras, Chennai-600 036.	Member
	52	Dr. V. K. Tewari, Professor & Former Head, (Machinery Systems, Ergonomics & Safety) Agricultural and Food Engineering Department & Rural Development Centre, Indian Institute of Technology Kharagpur, Kharagpur - 721302 (WB).	Member
	53	Dr. G. Satheesh Reddy, Scientist Advisor to Raksha Mantri and Director General, Missiles and Strategic Systems, Distinguished Scientist, DRDO	Member

	54	Prof. Vikram M. Gadre, Department of Electrical Engineering, IIT Bombay, Powai, Mumbai 400076	Member
Three Members of Parliament (2 from Lok Sabha) (One from Rajya Sabha)	55	Mr. Ninong Ering, Hon'ble Member of Parliament (Lok Sabha), 92, South Avenue, New Delhi – 110 011.	Member
	56	Mr. Abhishek Singh Hon'ble Member of Parliament (Lok Sabha), Chattisgarh Sadan, Near Safdarjung Hospital New Delhi.	Member
	57	Shri Prabhat Jha, Hon'ble Member of Parliament (Rajya Sabha), C-501, Swaran Jayanthi Sadan, Dr. Bishamber Dass Marg (Near R.M.L.), New Delhi-110001.	Member
	58	Mr. R. Subrahmanayam, Secretary (Higher Education), & the current Chairperson, BoG of six new IITs at Tirupati, Jammu, Goa, Dharwad, Bilai-Durg and Palakkad Ministry of Human Resource Development, Department of Higher Education, Shastri Bhawan, New Delhi.	Member
	59	Ms. Darshana M. Dabral, Joint Secretary & Financial Advisor (JS&FA), Ministry of Human Resource Development, Department of Higher Education, New Delhi.	Member
	60	Dr. Sukhbir Singh Sandhu, Additional Secretary (TE) Secretary ( IIT Council), 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 (upto 12.07.2018), Dr. Sukhbir Singh Sandhu (from 13.07.2018), Additional Secretary, Ministry of Human Resource Development (TE), 118-C, Shastri Bhawan, New Delhi - 110015	Member
	Prof. Rohini Godbole (upto 04.03.2019) Prof. Paresh K. Joshi (from 05.03.2019) Room 106 NIUS Building, Homi Bhabha Centre for Science Education, TIFR, V.N. Purav Marg, Mankhurd, Mumbai -400088.	Member

	Prof. Vijayalaxmi Ravindranath (upto 12.07.2018) Prof. Aniruddha B. Pandit (from 13.07.2018), U.G.C. Professor, Department of Chemical Engineering, Institute of Chemical Technology Bombay, Matunga, Mumbai - 400019.	Member
	Mr. K. Ananth Krishnan (upto 12.07.2018), Mr. Sharad Kumar Saraf (from 13.07.2018), Chairman & Managing Director, Technocraft Industries (India) Ltd., Technocraft Group, Bombay, Technocraft House, A-25, MIDC, Marol Industrial Area, Road No. 3, Opposite ESIC Hospital, Andheri (East), Mumbai – 400 093.	Member
<b>State Government Nominees (Two)</b>		
Maharashtra	Shri. Saurabh Vijay, Secretary, Higher & Technical Education, Government of Maharashtra, Mantralaya, Mumbai – 400 032.	Member
Dadra & Nagar Haveli	Shri Praful K. Patel Administrator U.T. of Daman & Diu and Dadra & Nagar Haveli, Silvassa	Member
Senate Two	Prof. K. Narasimhan Department of Met. Engg. & Mats. Science, IIT Bombay Mumbai 400 076	Member
	Prof. Chandra Venkataraman Professor, Department of Chemical Engineering IIT Bombay, Mumbai - 400 076.	Member
Ex-officio	Dr. R. Premkumar, Registrar, IIT Bombay, Mumbai – 400 076	Secretary



## Members of the Finance Committee

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<b>Mr. Dilip Shanghvi</b> 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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<b>Prof. D.V. Khakhar</b> Director, IIT Bombay, Powai, Mumbai – 400 076.	Member (Ex-officio)
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<b>Dr. Sukbir Singh Sandhu</b> 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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<b>Mr. V. B. Aras,</b> B2-1101, Mahindra Eminent, Near Patkar College, S. V. Road, Goregaon (West), Mumbai – 400 062.	Member
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<b>Ms. Darshana M. Dabral</b> Joint Secretary & Financial Advisor Ministry of Human Resource Development Deptt. Of Higher Education, Technical Section-1, Government of India, Shastri Bhavan, New Delhi - 110 115.	Member
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<b>Prof. P. M. Mujumdar</b> Dy. Director (Finance & External Affairs), IIT Bombay, Powai, Mumbai – 400 076.	Member
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<b>Dr. R. Premkumar</b> Registrar, IIT Bombay, Powai, Mumbai – 400 076.	Secretary (Ex-officio)
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## Building and Works Committee

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<b>Prof. D.V. Khakhar</b> Director, IIT Bombay, Powai, Mumbai – 400 076.	Chairman\
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<b>Superintending Engineer</b> 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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<b>Superintending Engineer</b> Mumbai (P.W.D.) Circle 25 Murzban Road, Fort, Mumbai – 400 001.	Member
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<b>Mr. K. Srinivas</b> Head, Architectural & Civil Engg. Division, BARC, North Site, Trombay, Mumbai – 400 085.	Member
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<b>Mr. Vidyadhar K. Phatak</b> (upto 21.11.2018) <b>Ms. Uma Adusumilli</b> (from 22.11.2018) Chief, Planning Division, Mumbai Metropolitan Region Development Authority (MMRDA) 6th Floor, MMRDA New Building, Bandra Kurla Complex, Mumbai – 400051	Member
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<b>Prof. B.V.S. Viswanadham</b> Dean (Infrastructure Planning & Support), IIT Bombay, Powai, Mumbai – 400 076.	Member
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<b>Dr. R. Premkumar</b> Registrar, IIT Bombay Powai, Mumbai – 400 076	Member-Secretary (Ex-officio)
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## Heads of Departments

**Prof. Avijit Chatterjee**

Aerospace Engineering

**Prof. Rinti Banerjee**

Biosciences & Bioengineering

**Prof. R.D. Gudi**

Chemical Engineering

**Prof. Anindya Datta** (from May 30, 2018 )

Prof. Krishna P. Kaliappan (upto May 9, 2018)  
Chemistry

**Prof. T. I. Eldho**

Civil Engineering

**Prof. Uday Khedkar**

Computer Science & Engineering

**Prof. S. C. Patel** (from May 30, 2018)

Prof. T. N. Singh (upto May 29, 2018)  
Earth Sciences

**Prof. B.G. Fernandes**

Electrical Engineering

**Prof. Rangan Banerjee**

Energy Science and Engineering

**Prof. Suparna Mukherji** (from July 2, 2018)

Prof. Sanjeev Chaudhari (upto July 1, 2018)  
Environmental Science and Engineering

**Prof. Pushpa Trivedi**

Humanities & Social Sciences

**Prof. K. Suresh Kumar**

(from December 28, 2018)

Prof. Neela Nataraj

(upto December 27, 2018)

Mathematics

**Prof. B.P. Puranik**

Mechanical Engineering

**Prof. K. Narasimhan** (from 18.01.2019)

Prof. N. Venkataramani (upto 17.01.2019)  
Met. Engg. & Mat. Science

**Prof. K.G. Suresh**

Physics

## Heads of Centres

**Prof. Anil Kottantharayil** (from June 22, 2018)

**Prof. Anindya Dutta** (upto June 21, 2018)  
Centre for Research in Nanotechnology and Science & SAIF

**Prof. J. Adinarayana**

Centre of Studies in Resources Engineering

**Prof. G. Sivakumar**

Centre for Formal Design and Verification of Software

**Prof. Avijit Chatterjee**

Centre for Aerospace Systems Design and Engineering

**Prof. S. B. Agnihotri**

Centre for Technology Alternatives in Rural Areas

**Prof. Sharad Bhartiya** (from March 1, 2019)

Prof. Varsha Apte (upto February 28, 2019)  
Computer Centre

**Prof. Sridhar Iyer**

Centre for Distance Engineering Education Programme

**Prof. Pradipta Banerjee**

Center for Urban Science & Engineering

**Prof. Shishir K. Jha**

Centre for Policy Studies

**Prof. K. Narasimhan**

Centre for Excellence in Steel Technology

## Head of Schools

**Prof. G.V. Sreekumar**

IDC School of Design

**Prof. S. Bhargava**

Shailesh J. Mehta School of Management

## Convenors of Interdisciplinary Programmes

**Prof. Narayan Rangaraj**

Industrial Engineering & Operations Research

**Prof. B. Bandyopadhyay**

Systems & Control Engineering

**Prof. Sridhar Iyer**

Education Technology

**Prof. D. Parthasarthy**

Climate Studies

# Summary of Accounts

## CONSOLIDATED ACCOUNT Balance Sheet As On 31/03/2019

(Amount in Rupees)

Particulars Sources Of Funds	Schedule	Current Year 2018-2019	Previous Year 2017-2018
Corpus / Capital Fund	1	2,353,334,688	1,638,971,749
Designated / Earmarked / Endowment Funds	2	6,670,001,963	5,962,612,238
Current Liabilities And Provisions	3	26,875,639,769	21,946,130,368
<b>Total (A)</b>		<b>35,898,976,420</b>	<b>29,547,714,354</b>
Application Of Funds			
Fixed Assets			
Tangible Assets	4	4,631,513,707	4,467,596,388
Intangible Assets	4	83,274,049	10,854,554
Capital Works-In-Progress	4	10,203,022,052	9,306,182,920
Investments From Earmarked / Endowment Funds	5	699,036,148	54,016,925
Investments – Others	6	2,750,000,000	2,750,000,000
Current Assets	7	10,189,764,939	9,342,230,408
Loans, Advances And Deposits	8	7,342,365,525	3,616,833,158
<b>Total (B)</b>		<b>35,898,976,420</b>	<b>29,547,714,354</b>
Significant Accounting Policies	24		



## Income & Expenditure For The Year Ended 31/03/2019

(Amount in Rupees)

Particulars	Schedule	Current Year 2018-2019	Previous Year 2017-2018
Income			
Academic Receipts	9	972252795	928765753
Grants/ Subsidies (Irrevocable Grants Received)	10	6137100000	4579460000
Income From Investments	11	856962095	1363643053
Interest Earned	12	2156156	2819801
Other Income	13	557352607	518637884
Prior Period Income	14	45184952	8092505
<b>Total (A)</b>		<b>8571008605</b>	<b>7401418996</b>
Staff Payments And Benefits (Establishment Expenses)	15	5459401753	5431230927
Academic Expenses	16	964082778	867027834
Administrative And General Expenses	17	1248236513	1192025153
Transportation Expenses	18	5567634	4337864
Repairs & Maintenance	19	425255443	411915372
Finance Costs	20	10893739	398680
Other Expenses (Write Off)	21	2374021	2063153
Prior Period Expenses	22	0	0
Depreciation	4	537085710	570619580
<b>Total (B)</b>		<b>8652897590</b>	<b>8479618563</b>
Balance being excess of Income over Expenditure (A-B)		-81888985	-1078199567
Adjusted from Capital Fund (Depreciation)		537085710	570619580
Adjusted from Capital Fund (Write off)		2374021	2063153
Transfer To Hefa		415000000	0
Transfer To IRCC Fund		367698218	746086954
Transfer to General Reserve – Main Account (I)		-368183338	-1422966411
Transfer to General Reserve – Donation Fund (II)		43055867	171362624
Balance Being Surplus/(Deficit) Carried To Corpus/Capital Fund (I+II)		-368183338	-1422966411
Significant Accounting Policies	23		
Contingent Liabilities And Notes On Accounts	24		

**Note:** Value of Rs. 368,183,338 is arrived at after adding deficit of Rs 16,709,661/- (recurring) and Rs. 351,473,677/- actuarial value provision in r/o Leave Encashment, Gratuity and Pension

### Receipts And Payments For The Period From 01/04/2017 To 31/03/2018

Receipts	Amount In Rs	Payments	Amount In Rs
<b>I Opening Balances</b>		<b>I Expenses</b>	
a) Cash in hand	198,089	a) Establishment Expenses	3,883,566,328
b) Bank Balances		b) Academic Expenses	792,576,228
I. In Current Account	544,578,408	c) Administrative Expenses	815,450,857
II. In Deposit Account	0	d) Transportation Expenses	5,262,629
III. In Saving Account	-	e) Repairs and Maintenance	394,283,212
		f) Prior Period Expenses	0
<b>II Grant Received</b>		<b>II Payment against Earmarked / Endowment Funds</b>	3,376,048
a) From Government of India (Recurring and Non Recurring)	6,762,200,000		
b) Grant in aid due in 2017-18 received in 2018-19	514,700,000		
c) From State Government	0		
d) From Other sources (details)	0		
e) Research Park	376,345,000		
f) Institute of eminence	429,700,000		
g) PMRF	6,220,000		
<b>III Academic Receipts</b>		<b>III Payment against Sponsored Projects / Schemes</b>	
a) Fees from Students	612,952,902		
b) Other Receipts from Students	121,831,977		
c) All India Entrance Examination Receipts	265,718,685		
<b>IV Receipts against Earmarked / Endowment Fund</b>	19,098,684	<b>IV Payment against Sponsored Fellowships and Scholarship</b>	100,272,585
<b>V Receipts against Sponsored Projects / Schemes</b>	0	<b>V Investments and deposits made</b>	
		a) Out of Earmarked / Endowment Fund	11,003,915
		b) Out of Own Funds	
<b>VI Receipts against Sponsored Fellowships and Scholarship</b>	178,332,462	<b>VI Term deposits with Schedule Banks</b>	13,386,828,301
<b>VII Income on Investment from</b>		<b>VII Expenditure on Fixed Assets and Capital Work in Progress</b>	
a) Earmarked / Endowment Fund	0	a) Fixed Assets	1,151,000,640

<b>b) Other Investment</b>	0	<b>b) Work-in-progress</b>	442,733,963
<b>VIII Interest Received on</b>		<b>VIII Other Payment including Statutory Payments</b>	1,460,004,666
<b>a) Bank Deposits</b>	1,000,269,219		
<b>b) Loans, Advances etc.</b>			
<b>c) Saving Bank accounts</b>			
<b>d) Accrued Interest</b>	0		
<b>IX Investment Encashed</b>	11,857,024,701	<b>IX Refund of Grants</b>	0
<b>X Term Deposits with Schedule Bank Encashed</b>	0	<b>X Deposits and Advances</b>	
		<b>a) Advances Account</b>	1,034,488,909
		<b>b) Refundable Deposits</b>	115,066,468
		<b>c) Recoverable Deposits</b>	5,172,147
<b>XI Other Income (Including Prior Period Income)</b>		<b>XI Other Payment</b>	
<b>a) Continuing Education Programme</b>	0	<b>a) Grant from other organizations</b>	223,436,796
<b>b) Miscellaneous Receipts</b>	186,326,059	<b>b) Sundry Creditors</b>	358,129,485
<b>c) Guest House Receipts</b>	10,794,517	<b>c) Loan - Inter Department</b>	15,000,000
		<b>d) Surplus transfer to Endowment</b>	
		<b>e) Other Payment - Main</b>	435,554,796
		<b>f) Other Payment – IRCC</b>	3,268,837,515
		<b>g) Other Payment – Donation</b>	248,440,668
<b>XI. Other income (including Prior Period income)</b>	0	<b>XI. Other Payments</b>	
<b>a) Advances Account</b>	75,927,079	<b>a) Cash in hand</b>	135,994
<b>b) Refundable Deposits</b>	128,679,062	<b>b) Bank Balances</b>	
<b>c) Recoverable Deposits</b>	0	<b>I. In Current Account</b>	430,653,304
		<b>II. In Deposit Account</b>	0
<b>XIII Miscellaneous Receipts Including Statutory Receipts</b>	310,231,504	<b>III. In Saving Account</b>	0
<b>a) Other Adjustable Accounts</b>	67,356,685		
<b>XIV Any Other Receipts</b>			
<b>a) Grants from other Organisations</b>	568,981,268		
<b>b) Sundry Debtors</b>	84,492,907		
<b>c) Loan - Inter Department</b>	65,000,000		
<b>d) Other Receipt – Main</b>	30,581,332		
<b>e) Other Receipt – IRCC</b>	4,291,354,362		
<b>f) Other Receipt – Donation</b>	72,380,552		
<b>Total</b>	<b>28,581,275,455</b>	<b>Total</b>	<b>28,581,275,455</b>







# INDIAN INSTITUTE OF TECHNOLOGY BOMBAY


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