

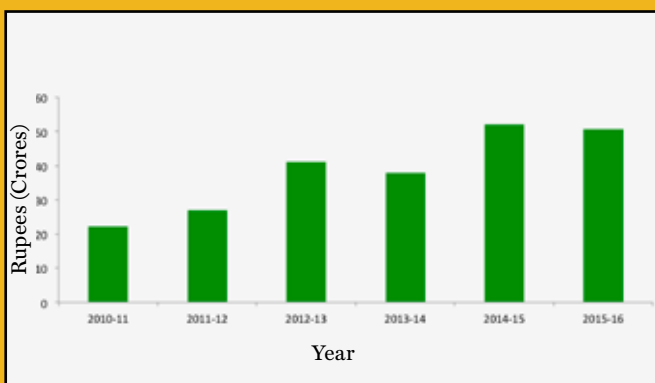


# Industry Interactions



## IIT Bombay at a glance

Campus area	530 acres (5.3 sq. km)
Academic units	27
Research centres	19
Faculty	622 full time, ~50 adjunct and part time
Students	~10,000 (2941 PhD)
Postdoctoral fellows	~130
Project staff (Research)	1380
R&D receipts for FY 2015-16	₹ 252 Cr
R&D receipts from Industries for FY 2015-16	₹ 50 Cr
Patents filed in 2016	81
Technology transfers / deployment so far	~150
Total degrees awarded in 2016	2515
PhD degrees awarded in 2016	325
Research publications since inception	~22,800
Research publications in 2016	~1800
Companies incubated	99



Industry Funding

Financial year	Research Funding (₹ in Crores)		
	National Organisations	International Organisations	Total Receipts
2010-11	170	10	180
2011-12	181	9	190
2012-13	278	16	294
2013-14	199	15	214
2014-15	227	16	243
2015-16	236	16	252
<b>2016-17 (as on 31.12.2016)</b>			<b>285</b>

IIT Bombay (IITB) engages in research, education, training, technology development and related activities in most areas of science and technology. Today, the Institute is one of the centres of academic excellence in the country and on par with some of the best institutions in the world. To fulfill its mission of promoting research that makes a difference, the Institute invites industry to be its partners.

## Benefits of collaboration

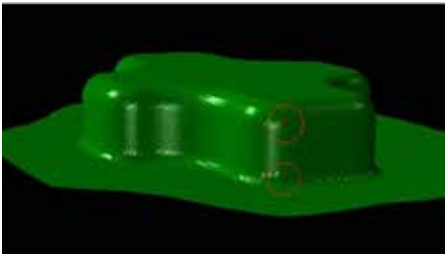


## Modes of collaboration

The Institute has active engagements with ~400 Indian and international industries. The interactions are multi-dimensional and through a variety of modes:

### Consultancy Projects

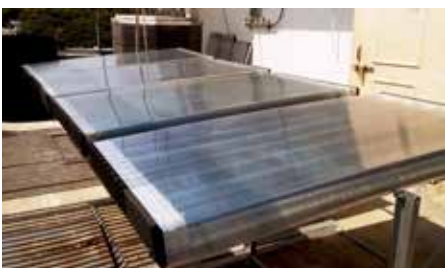
- Short term projects to solve specific problems of industry
- Expected results at the end of the project maybe defined at the beginning



Failure of Forming Technology Forum (FTF) material at 37.88 mm draw depth

### Representative themes for consultancy projects

- Technology assessment / management, project assessment
- Simulation / modeling / optimisation
- Software development
- Advisory retainership / opinion
- Trouble shooting / problem solving / testing



Non-tracking solar collectors for indoor cooking

### Examples

- Corrosion protection studies
- Improving performance of air conditioners
- Metabolic modelling and flux analysis
- Network optimisation studies for wind farms
- New criterion for failure analysis
- Process development for the synthesis of specialised chemicals
- Product designs for various applications
- Reliability of advanced high-K metal gate stacks for CMOS applications

## Sponsored Research Projects

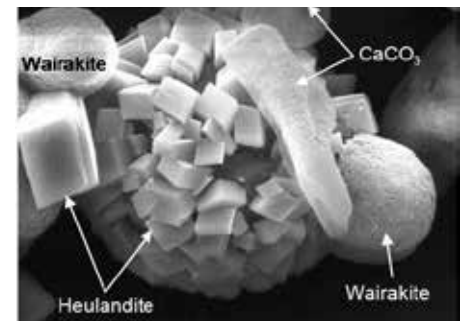
- Long term projects for new knowledge generation in current, emerging and futuristic areas
- Deliverables may include IP generation, manpower development and publications

### Examples

- Application of sensor networks and data analytics
- Development of producer gas engine modules
- Dissimilar metal welding for automotive applications
- Extraction and packaging of tender coconut water for rural sector
- Flyash zeolite characterisation for industrial applications
- Hot working of electrical steels
- Investigations of fault current limiters
- Mathematical modeling of device reliability



Tender coconut water extraction and packaging equipment



Flyash zeolite characterisation for industrial application

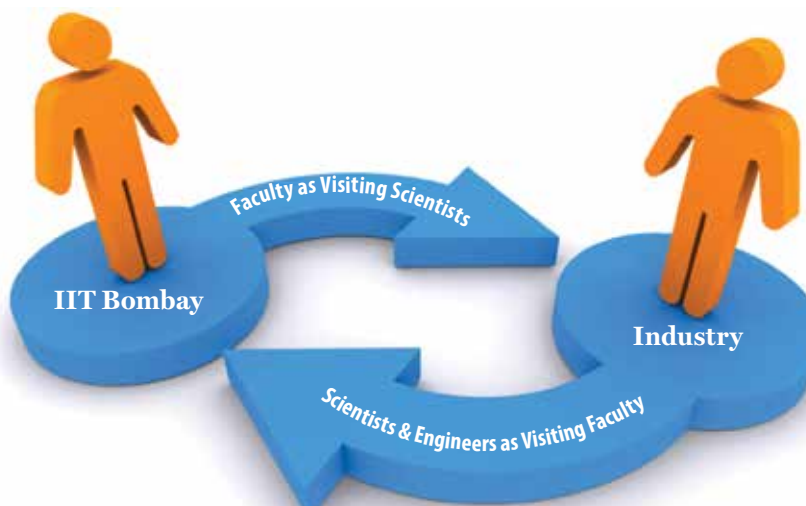
## Sponsorship of Students / Student Projects

- Industry may sponsor a student in a field of their interest
- Sponsorship includes a stipend and a contingency grant
- Visibility through skilled manpower development support

Prime Minister's fellowship scheme for doctoral research supports aspiring PhD scholars with enhanced scholarship with 50% provided by government and balance 50% by a sponsoring industry, for doing research of industrial relevance.

**Some Sponsors:** Konecranes, Areva, Lloyds, Crompton Greaves, TCS, Infosys, Intel, ...

## Research Manpower Exchange



## Sponsored Research Labs / Facilities

- Industry may sponsor a facility / lab at the Institute in an area of interest to augment infrastructure
- Such facilities and labs will be shared with the sponsoring industry; may also be open to others on a case-to-case basis



Parimal and Pramod Chaudhari cell culture facility



Cummins engine research facility



Forbes Marshall lab boiler

### Examples

- Parimal and Pramod Chaudhari Laboratory for cell culture funded by Praj Industries, Pune for drug discovery, nanotechnology and microfluidics applications.
- Applied Materials Manufacturing Laboratory: to promote research in nanoelectronics, nano-manufacturing and solar photovoltaic technology
- PowerAnser Lab: an IITB, Tata Consultancy Services and Tata Consulting Engineers partnership to bring the benefits of IT to the power sector
- Yahoo! Hadoop Cluster Lab: to help conduct research on search based technologies
- TCS-IITB Research Cell: for long-term collaboration with TCS in significant areas of computational research. Areas of collaborative work include Intelligent Infrastructure, Software Engineering, Machine Learning, Scheduling and Planning, VLSI, Power Network Analytics and Steel Technology.
- Cummins Engine Research Facility: Integration of new engine and renewable fuels technologies to support sustainable development and to improve lives, especially in rural villages.
- Forbes Marshall Energy Efficient Lab: a resource centre to enable implementation of industrial energy efficiency and collaborative research. The lab has a modern steam boiler and steam utilisation equipment with controls and on line monitoring.

## Chair Professorships

- Supports distinguished academic positions in the Institute
- Around 20 chairs have been established at IITB by industries and alumni



MoU signing for HAL R&D Chair

### Examples

- Kamalnayan Bajaj Chair
- Bajaj Group Chair
- D. L. Shah Chair
- Forbes Marshall Chair
- HAL R&D Chair
- L&T Chair
- Praj Industries Chair
- Romesh Wadhvani Chair
- Shailesh Mehta Chair
- TATA Chair



## Precompetitive Consortia

- Enables resource pooling for research in emerging areas
- Partner with IITB through a consortia for mutual benefit of all stakeholders
- Industry - Academia - Government consortia also possible

### Consortia at IIT Bombay

- Centre of Excellence in Telecom (IITB, Tata Teleservices Ltd. & DoT )
- Healthcare Research Consortium (IITB, leading hospitals, cancer research centres, medical technology companies & NGOs)
- Industry Affiliate Program, National Centre for Photovoltaic Research and Education (NCPRE)
- National Centre for Aerospace Innovation and Research (IITB, Boeing & DST )
- National Solar Thermal Power Research Testing and Simulation Facility (IITB & industries)

### Examples

- IITB, Tata Teleservices and Dept. of Telecommunication, Govt. of India have set up a Centre of Excellence in Telecommunication (TICET) for capacity building, design, fabrication and providing advisory support to telecom sector.
- National Centre for Aerospace Innovation and Research (NCAIR) is a joint initiative of IITB, Boeing and Dept. of Science and Technology, Govt. of India to provide economically viable and sustainable solutions to Indian aerospace manufacturers.
- A grid-connected 1 MWe National Solar Thermal Power Testing, Research and Simulation Facility commissioned at Gurgaon, New Delhi with funding from the Ministry of New and Renewable Energy, Government of India and industry collaboration.
- Industry Affiliate Program of NCPRE aims to support the mutual needs of industry and academia in Photovoltaic research, development, and education.
- Healthcare Research Consortium has multiple partners like TATA Memorial Centre(TMC), National Institute for Research in Reproductive Health (NIRRH), National Institute of Immunohaematology (NIIH), MGM Institute of Health Sciences (MGMIHS), P. D. Hinduja Hospital, MCGM Hospitals, TATA Trust, Span Diagnostics, Strand Life Sciences, SRL Diagnostics, A3 Remote Monitoring Technologies (A3 RMT), Drishti, InnAccel, D. Y. Patil University and Amity University.
- Sponsored by the Ministry of Steel, the Centre of Excellence in Steel Technology (CoEST) has a broad focus on creation of high quality manpower for the steel industry and focused R&D on steel technology.



TICET - unlicensed band radio



1 MWe solar thermal power plant



Outdoor testing of PV modules

## Continuing Education

- IIT Bombay offers numerous courses in various areas of technology
- Open and inhouse programs, certificate courses are offered
- Executive MBA (EMBA) program as a joint venture between IITB and Washington University, St. Louis for advancing leadership skills of senior professionals

## Research Park



Applied Materials joins as Anchor Client

- Established in the Institute in 2014 with financial support from the Ministry of Human Resource Development, Government of India
- Objective: to build an ecosystem where the research fraternity / academia and the industry work in close collaboration on research problems, technology challenges and product innovation
- Will enable technology-focused companies to co-locate R&D assets at the Institute and benefit from close interaction with faculty / student researchers, and seamless access to labs / equipment / services

## Licensing of Intellectual Property developed at IIT Bombay

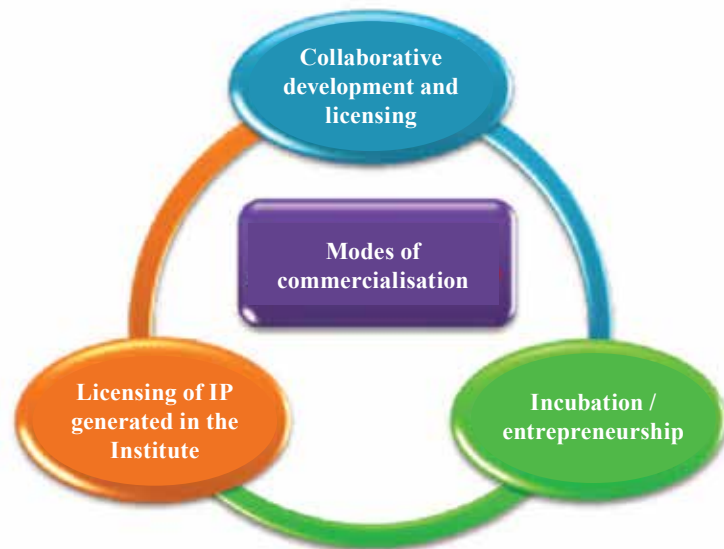
- Includes products, processes, software and designs in the areas of healthcare, energy & environment, information & communication technology, manufacturing, special needs, design, transportation, rural development and others
- Over 140 technologies licensed / deployed ([www.iitb.ac.in/Licensing](http://www.iitb.ac.in/Licensing))



Inauguration of ECR 1000 Series Router

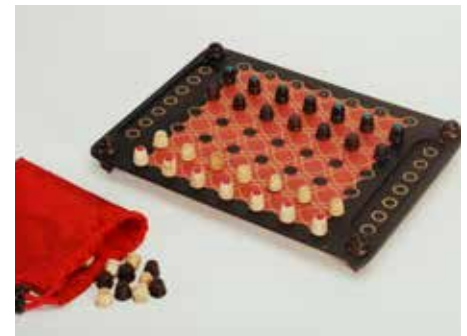


Sewage treatment plant set up at BMC, Mumbai



## Representative Technologies and Product Designs

- Corrosion simulation software
- Carrier ethernet routers
- Design of ATM enclosure
- Design of board games
- Dry sanitation system
- Extraction of natural sweetener from leaves
- GRAM Drishti for integrated rural development
- Letter box for Indian Post
- Low-cost engine management system for petrol-powered small vehicles
- Modular FRP toilet units for Railways
- Novel 4-in-1 heat pump
- Short term load forecasting
- Software for bid matching in day-ahead spot electricity market
- Steer by wire system for vehicles
- Supercritical fluid extraction system design
- Technology for hybrid coating
- Technology for fuel additives in petroleum domains
- Vermiculture technology for solid and liquid waste management



Chakra View marketed by Funskool



Unibody electric 3 wheeler



Dry sanitation system



Multi utility heat pump



Steer by wire system



Tube-tube heat exchanger with piping



Underwater hybrid coating



## Modes of Interaction

### R & D Projects



### Chair Professorship / Endowment



### Student Sponsorship



### Labs & Facilities



### Licensing



### Consortia



### Continuing Education Program



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