INDIAN INSTITUTE OF TECHNOLOGY
BOMBAY

THE OFFICE OF THE DEAN ALUMNI AND CORPORATE RELATIONS

Activity REPORT

2021-2022

TABLE OF CONTENTS

TABLE OF CONTENTS

.

TABLE OF CONTENTS

TABLE OF CONTENTS

DEAN ACR MESSAGE

Greetings from IIT Bombay!

I am pleased to share the IIT Bombay Annual Activity Report 2022 with you. This year, we have much to celebrate. The Institute continued its pathbreaking mission of nurturing world-class education and research ecosystems. We are grateful to our partnering organizations -IIT Bombay Heritage Foundation and IIT Bombay Alumni Association for their outstanding support over the years. We are also thankful for the generous support received from our alumni, corporates, and friends.

Alumni participation included strategic advice, guest lectures, Alumination, being a part of the department advisory boards, offering financial and technical support towards the top priorities in scientific research, student financial aid, faculty development, infrastructure and more.

New Centres at IIT Bombay

With generous support from alumni, IIT Bombay witnessed the setup of various new centres on campus. Through these Centres, the Institute aims to further advance research in emerging science and technology.

In June 2021, The Koita Centre for Digital Health (KCDH) was established with a generous contribution received from its alumni Ms. Rekha and Mr. Rizwan Koita (B.Tech., Metallurgical Engineering and Materials Science and Electrical Engineering, 1992, respectively), under the aegis of the Koita Foundation (www.koitafoundation.org). This Centre is the first of its kind in India, focused on driving academic programs, research, and industry collaborations in Digital Health.

Through the generous donation of Dr. Pramod Chaudhari (B.Tech., Mechanical Engineering, 1971), the Pramod Chaudhari Alumni Continuing Education Centre (PCACEC) was established for the Alumni Continuing Education program. Through this program, the alumni can keep pace with technological advancements in engineering and science while understanding its implications on the world and specifically their businesses.

The Sunita Sanghi Centre of Aging & Neurodegenerative Diseases (SCAN) was established in Feb'22, with a focus on diagnostics and early detection of ageing and neurodegenerative diseases and movement support. The centre has been supported by a generous funding from IIT Bombay's distinguished alumnus, Mr Sharad Sanghi (BTech., Electrical Engineering, 1989) in memory of his late mother Mrs. Sunita Sanghi.

Set up in February 2020, The Centre for Machine Intelligence and Data Science (C-MInDS) aims to contribute towards the growing significance of the role of Artificial Intelligence, Data Science, and related areas in different application domains. C-MInDS is supported by founding contributions from Mr. Mohan Lakhamraju (B. Tech., Computer Science & Engineering, 1998), Mr. Beerud Sheth (B.Tech., Computer Science & Engineering, 1991), Mr. Arpit Mathur (B. Tech. & M.Tech., Computer Science & Engineering, 2006), and Mr. Kashyap Deorah and Ms. Shruti Mahajan Deorah (B.Tech. Electrical Engineering, 2003), and other contributions.

Infrastructure Projects

Over the years our alumni have contributed significantly to the institute's pursuit of excellence by setting up Class Legacy projects to help the institute in its most important initiatives and thus establishing their legacy. The institute has seen over 25 batches coming together to raise upwards of INR 80 Cr to help the institute and set up some of the most pressing needs.

Some batches initiated various projects with the funds collected as part of their Legacy Project, which is over and above the regular projects covered by the Legacy batches. Some alum-led project initiatives include the Class of 1969's support for study room projects in hostels 3 & 6. The Class of 1980 contribution towards the Design & Making Lab will allow students to gain access to top-of-the-class equipment for mechanical and electronic work including 3D printers, laser cutters, and the latest workstations with CAD (Computer-aided Design software). The Class of

1975 support towards the Tinkerers' Lab project which was aimed at providing technical resources and training to students on the campus that are interested in technical student-led activities. IIT Bombay's first-ever micro-factories will be used by students for their core academic work as well as for a wide range of extracurricular activities. Café 92 which serves as a place for students to hang out for snacks between and after their lectures.

Other initiatives include the joint activity between IIT Bombay, IIT Bombay Alumni Association, and IIT Bombay Heritage Foundation - the H5 Enhancement Project to improve living conditions in the hostel by adding common study rooms and toilet facilities. The Collaborative Classroom (CC) and Experiential Learning Laboratory (ELL), housed at the Department of Electrical Engineering (EE), will help instructors design and execute active and hands-on learning exercises. The Rahul Bajaj Technology Innovation Centre (RBTIC) will house the Society for Innovation and Entrepreneurship (SINE), Industrial Research and Consultancy Centre (IRCC), and Industrial Design Centre (IDC) School of Design.

Outreach and Events

For the first time ever, IIT Bombay hosted a reunion convocation on August 6, 2022, for students who graduated in 2020 and 2021. The Institute held a special in-person convocation ceremony for students who missed experiencing the thrill of being among their peers and classmates and physically receiving their degrees due to the pandemic.

The COVID Pandemic made IIT Bombay rethink the way the Institute imparts education to its students. To ensure that the students begin the new academic year without further delay, IIT Bombay decided to conduct extensive online classes. However, a survey of facilities required for the online system indicated that a large section of IITB's students needed financial support for procuring laptops and broadband connectivity to take these online classes. To address this issue, the Institute undertook a fund-raising drive. As part of this initiative - a total of 1,100 students were provided with financial assistance across different academic disciplines. The office of Dean ACR is grateful for the overwhelming support given by its alumni to help bright young minds at IITB continue their education in the online mode, during the pandemic.

Scholarships and Financial Aid

IIT Bombay has a robust scholarship framework in place where it helps the needy students pay for the undergraduate programmes at the Institute. Scholarships help lessen the tuition cost, reduce financial burden on families of students and nurture the spirit of philanthropy among the recipients. In the academic year of 2021-22, the Institute has successfully granted scholarships to 207 undergraduate students, covering tuition fees and mess fees.

In addition, as a part of the Financial Aid Programme, in FY 2021-22, IIT Bombay disbursed amount INR 85.31 lakhs and impacted 110 students, of which 44 were undergraduate students and 66 were post graduate students.

Chair Professorships

The Chair Professorship position is often considered the pinnacle of an illustrious career in academia. It is also a way for top academic institutes to attract some of the best faculty members from around the world. At present, IIT Bombay has total 48 Named Chair Professorships where 6 Chair Professorships were instituted in financial year 2021-22 and 5 other Chair professorships were established since April 2022 in the areas such as Sanskrit, Quantitative Finance, Climate Studies, Biostatistics and Construction Management, Healthcare, Metallurgical Engineering and Materials Science, Digital Trust, Statistics and Mathematics among others.

Corporate Engagements

FY 2022 has proven to be another fruitful year for IIT Bombay in its efforts to enhance industry collaboration and build corporate relationships. I am proud to share that IIT Bombay has more than 50 corporate partners including Bank of Baroda, National Stock Exchange, Coal India Limited, INOX, Indian Railway Catering and Tourism Corporation (IRCTC), Merck, Tecnimont and many more. Many engagements with these corporates are ongoing and have resulted in centers such as the Centre of Excellence in Oil, Gas and Energy (CoE OGE) and HDFC Ergo-IITB lab as well as other research programs. It is to be noted that The Centre of Excellence (CoE) in Oil, Gas and Energy is an interdisciplinary Centre of Excellence sponsored by Indian PSUs (IOCL, ONGC, HPCL, BPCL, GAIL, OIL & EIL).

IIT Bombay Rankings

I am pleased to state that the Institute continues to be ranked as one of the top universities of the country and among the best in the world. IIT Bombay remains the first choice for both undergraduate and postgraduate students in the country and attracts many of the top-ranked students from national entrance exams such as GATE, CEED, UCEED, NET, JAM and JEE. It is a matter of immense pride that in 2022, 47 out of the top 50 rankers in JEE Advanced have chosen IIT Bombay as their home, continuing the trend of IITB being the preferred choice for the past several years.

Moreover, IIT Bombay has been placed second in India and 172nd overall in the 2023 Quacquarelli Symonds (QS) World University Rankings. The Institute has moved up five positions from its overall ranking, as compared to 2022.

In addition to this, IIT Bombay was placed third in the 'Overall' and 'Engineering' category, and 11th in the 'Management' category in the National Institutional Ranking Framework (NIRF) in 2022. Also, the Institute also ranked fourth in the new 'Research' category.

IIT Bombay Priorities

Looking ahead, IIT Bombay seeks to develop its Infrastructure capabilities, support faculty, and students through chair professorships and scholarships, and establish research facilities in emerging technologies such as Climate Change, Drug Discovery, Circular Economy, Nanotechnology, Sensors, E-mobility, Translational Research, and many more.

One of the immediate and urgent needs of the Institute is to augment the student living facilities. The Institute needs to add about 6,000 student beds to be able to accommodate the significant increase in student intake. Alumni have stepped forward to help bridge part of this need, through Project Evergreen. The Project envisages fund raise and construction of new hostels with world-class facilities. I encourage alumni to contribute to Project Evergreen through direct financial contributions, connections, and by volunteering their time.

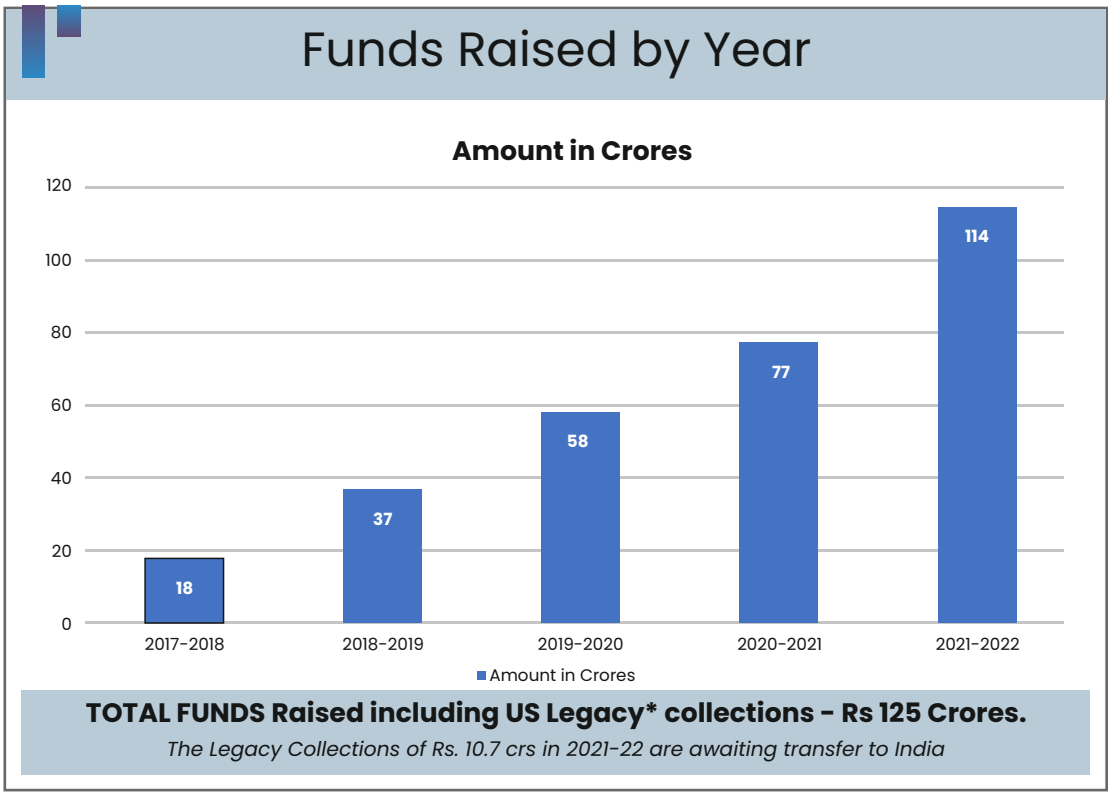
The growth of our Institute into becoming a top university in the world has been made possible by the dedication of our staff, faculty, and well-wishers. Thank you to all of you who contributed to this success! Your efforts truly make a difference, and I look forward to continuing to partner with all of you in the coming year. I wish all of you and your family all the very best of health, progress, and prosperity.

Sincerely,

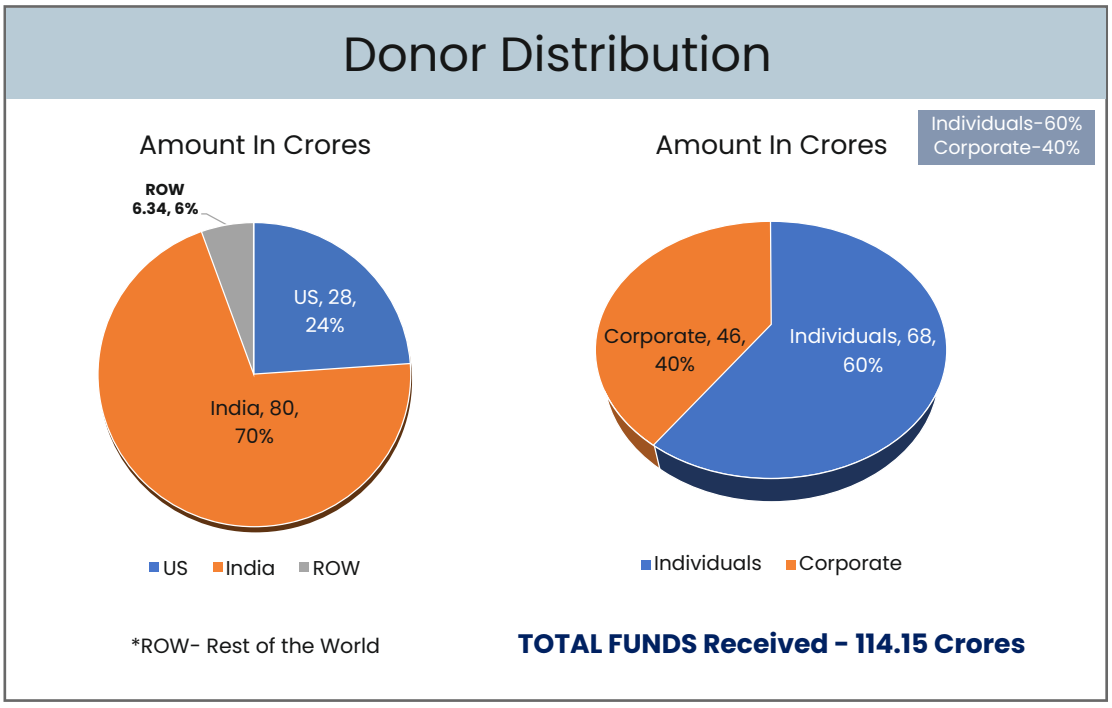
Prof. Ravindra D. Gudi, Ph.D., FNAE and FIIChE
Dean – Alumni and Corporate Relations
Institute AI & ML Chair Professor

FINANCIAL SUMMARY FY21–22

Funds collected- FY21-22



In the FY21-22, Dean ACR office raised approximately Rs. 114 Cr., a 48% increase in fund collected compared to the previous year's collection of 77 Cr. Over a 5 year period, the funds collected have increased at a CAGR of ~47%.

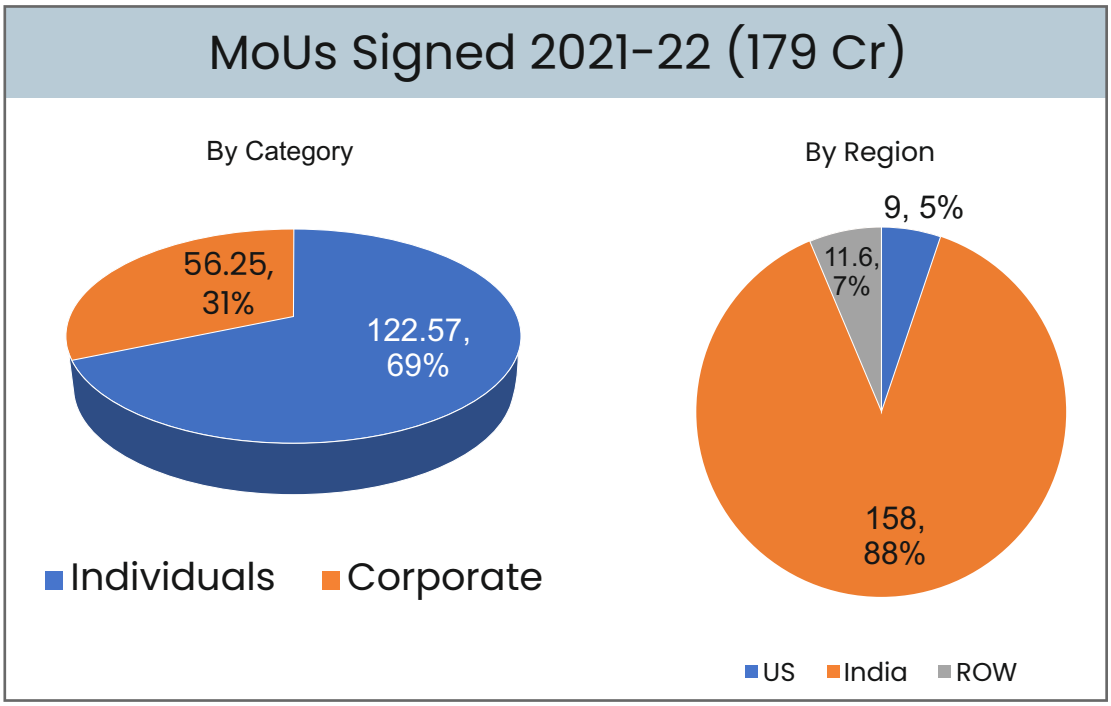


Out of the INR 114 Cr. funds collected in FY 2021-22, India contributed to ~70% of the total collections, followed by U.S at 24% and the remaining 6% from the rest of the world. Both corporate donations and individual donations played an integral role in the total funds collected. Contributions from individual donors formed the larger part of donations and stood at 60%, whereas contributions from corporates stood at 40%.

Legacy collections, which are raised from various Class Batches are an important part of total fund raising collection. In FY 2021-22 INR 10.7 Cr was collected as part of Legacy collections in India and U.S. Overall collections including U.S stands at INR 125 Cr. The total number of of unique donors in the US were 665, while the total number of donors including India were 1,233.

- ***Total no. of Unique donors in US- 665***
- ***Total no. of Donors including India -1,233***

New MOUs signed FY21-22



The total value of new MOUs signed in FY21-22 was INR 179 Cr. India donors/corporates contributed to 88% of the total value, followed by the rest of the world at 7% and 5 % from U.S. The contribution from both Individual donors and corporates/Foundations stood at 69% and 31% respectively.

New MOUs signed will serve as a strong pipeline for the Institute to fund projects in the upcoming years in various Insitute priorities in areas such as research, infrastructure, student development, faculty development and more.

STUDENT DEVELOPMENT

MERIT CUM MEANS (MCM) NAMED SCHOLARSHIP FOR IIT BOMBAY STUDENTS

Scholarships are financial aid awards that are designed to help students pay for an undergraduate programme at IIT Bombay. Scholarships differ from student loans in that they do not have to be repaid. The following are the impacts of scholarships on the students' lives:

- Scholarships help lessen the impact of tuition costs.
- Scholarships help students gain more time to focus on their studies.
- Scholarships reduce financial burden on economically weak families of students.
- Scholarships add to the number of students that are provided financial assistance from government funds.
- Scholarships help nurture philanthropy among the recipients.

Management: Office of the Dean alumni & Corporate Relations of IIT Bombay will manage the Named scholarships endowed by donors. IIT Bombay has a selection committee for awarding the aforesaid scholarships and providing the details of the students selected for the scholarships through a report by its selection committee. The Director of IIT Bombay will take the final decision based on the normal mechanism followed by the Institute for award of scholarships, taking into consideration the below selection criteria and also make recommendations of students for the award based on the report of the selection committee and relevant documents.

Eligibility & Criterion: The scholarships are awarded to the eligible students based on the following criteria:

Eligible Courses: All B.Tech., Dual Degree (B.Tech. + M. Tech.), B.S. and B. Des

Merit Criterion: For new entrants of B.Tech., Dual Degree (B.Tech. + M. Tech.), B.S. their IIT-JEE AIR and for B. Des. their UCEED Rank will be the criterion. In the subsequent years, the criterion will be their academic performance during the preceding academic year. A minimum CPI of 6 on a scale of 10 to be maintained by the student to be considered for the scholarship.

Means Criterion: The parental income is the basis for the 'means' criterion of the scholarship. At present students whose parents' annual gross income from all sources for the previous financial year doesn't exceed Rs.5,00,000/- (Five Lakhs Only), are eligible to apply for Merit-cum-Means Scholarship. When a student applies for the scholarship, copy of Income certificate issued by the Revenue Officer not below the rank of Tehsildar or the Income Tax Return (ITR)of parents for preceding year is required to be submitted with application for the scholarship every year.

Note:

- A student needs to reapply every year for the scholarship.
- The student who avails above scholarship cannot accept any other scholarship from Govt., Semi-Govt., or private sources.
- The benefits are available for the standard duration of the program on registration and satisfactory academic performance.

Purpose of Scholarship: Fee waiver for the student.

Tracking and reporting: A robust and transparent scholarship portal is available to track the award of scholarships. The payment of scholarships is done on a 6-monthly basis. The donors will be notified on the disbursement of the first and second tranche to the selected students which generally happens towards the end of August and February respectively. An annual report would also be shared with the donors detailing the no. of students supported, amount utilized and student testimonials (stories) highlighting their family background, education details (like dept., year, JEE/ UCEED score or rank/ past CPI, etc.) and how scholarship has helped them in achieving their goals.

SUMMARY OF NAMED SCHOLARSHIP AWARDEES BY CATEGORY AND GENDER

Following is the summary of the scholarship awardees for the academic year 2021-22.

Table: category wise break up of male and female scholarship awardees

Category	Female	Male	Grand Total
GENERAL	20	69	89
OBC	39	79	118
Grand Total	59	148	207

SUMMARY OF SCHOLARSHIPS GIVEN AS PER STUDENTS' YEAR OF STUDY

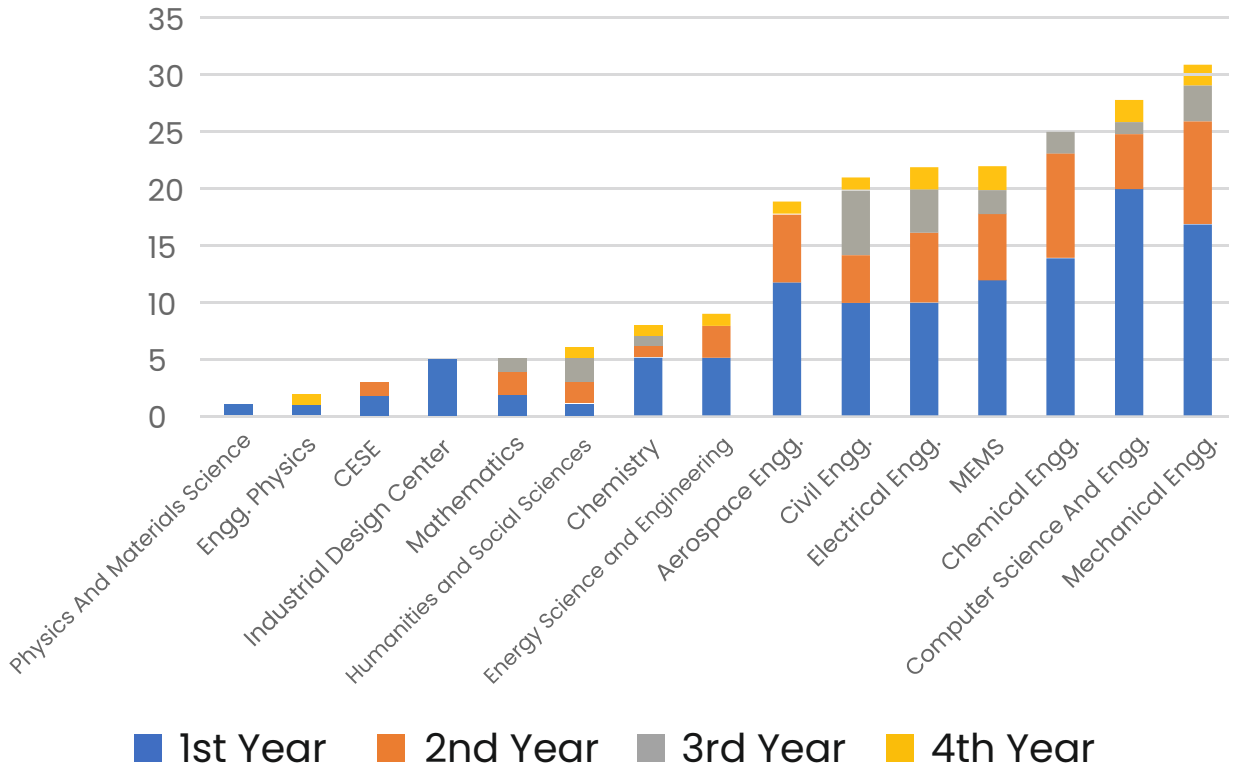


Fig: Department wise summary of scholarship awardees based on the year of study

% SHARE OF SCHOLARSHIP AWARDEES ON THE BASIS OF PARENTAL ANNUAL INCOME

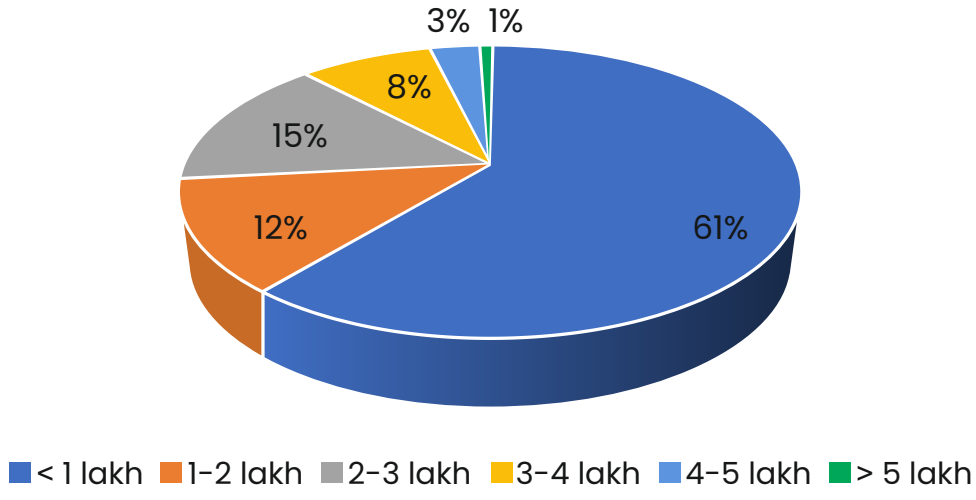
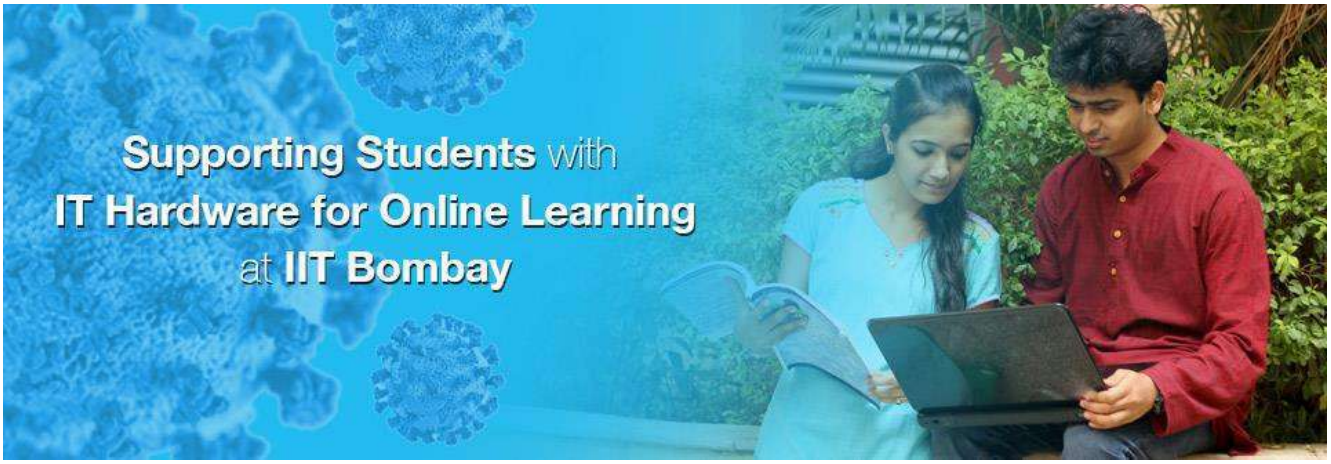


Fig: % share of different income classes in the scholarship awardees

IT HARDWARE SUPPORT FOR IIT BOMBAY STUDENTS

The COVID Pandemic made IIT Bombay rethink the way the Institute imparts education to its students. To ensure that the students begin the new academic year without further delay, IIT Bombay decided to conduct extensive online classes. However, a survey of facilities required for the online system indicated that a large section of IITB's students come from economically challenged families and required a helping hand with IT hardware (i.e. laptops and broadband connectivity) to take these online classes.

The Institute decided to undertake a fund-raising drive to support financially constrained students since the Institute did not want even a single student to miss out on the learning experience owing to a lack of money.



As a part of this initiative - a total of 1100 students were supported across different academic disciplines. The office of Dean ACR is very grateful to the overwhelming support given by its alumni to help bright young minds at IITB continue their education without any further hindrances or delays.

SUMMARY OF THE IT HARDWARE ASSISTANCE

	APPLICATION TYPE			
Degree	Desktop/Laptop	Internet Peripherals	Laptop and Internet	Grand Total
B.Des	4	2	5	11
B. S	36	3	39	78
B. Tech	215	58	384	657
Dual Degree	45	13	103	161
M. Des	1	0	0	1
M. Phil	0	0	1	1
M. Sc	64	4	80	148
M. Sc & Ph.D	5	1	11	17
M. Tech	8	1	16	25
PhD	0	0	1	1
Grand Total	378	82	640	1100

FINANCIAL AID PROGRAMME

Financial Aid Programme (FAP) is a 15-year-old honor-based system of sustainable peer-to-peer support which provides merit and need-based scholarships to all undergraduate and postgraduate students of IIT Bombay (IITB). Administered by IIT Bombay Alumni Association in collaboration with IIT Bombay and IIT Bombay Heritage Foundation, Tata Motors Ltd., and Foundation for Excellence (FFE), FAP covers the entire registration fee of students including tuition fees, mess bills, etc. Students who receive financial aid return the money as a donation once they graduate so that it may go to the next student who needs assistance. All students across all programs and disciplines are eligible for support. The FAP donors are spread across geographies and generations spanning batches between 1967 and 2020.

In addition to helping the economically and socially disadvantaged IIT Bombay students to achieve their dream of an IIT Bombay degree, FAP has in the past also undertaken various initiatives for student beneficiaries. The partnership with TML enabled the introduction of several value-added services such as volunteer interactions, counselling sessions, industrial visits, and mentoring programs into FAP. All these were aimed to increase confidence, communication, and soft skills, and ultimately the employability skills of our student beneficiaries. Until April 2017, FAP also supported the purchase of laptops and travel requirements along with tuition and mess fees for deserving students. However, due to increased tuition fees and lack of funds, the current focus is on supporting tuition and mess fees for now.

FAP SNAPSHOT: 2007 – 2022

DISBURSED
INR 10.94 CRORES

RECEIVED DONATIONS WORTH
INR 13.94 CRORES

ASSISTED
1,022 STUDENTS

UG – 304 PG – 718

HIGHLIGHTS OF FY 2021–22

Amount disbursed	**INR 85.31 lakhs**
Donation received from alumni and sponsors	**INR 69.09 lakhs**
Donation received from beneficiaries	**INR 58 lakhs**
Total number of students impacted	**110 students** (92 new + 18 repeat) **UG - 44 PG - 66**

CENTERS

ASHANK DESAI CENTER FOR POLICY STUDIES-ADCPS

The Centre was set up in 2016 to provide a fillip to the study of Public Policy. Policy Studies is a relatively nascent discipline in India. Given the increasing complexities of the economy, international relations, technology, and governance, it is imperative that this discipline takes firm roots in our polity and society. The academic community has an important role to play in this regard. In setting up this Centre, IIT Bombay hopes to make useful contributions to the field of Policy Studies.

ADCPS researchers work on diverse topics ranging from information economy and governance to natural resource management, from manual scavenging to smart cities, and from public health to corporate social responsibility.

IIT Bombay has a strong tradition of interdisciplinary research—an approach at the heart of Policy Studies. Along with its core strength in traditional science and engineering disciplines, IIT Bombay has a fully integrated Humanities and Social Science Department, a business school (SJMSOM), and a number of interdisciplinary centres such as one for design (IDC), and one for the study of technology alternatives for rural areas (CTARA). The Ashank Desai Centre for Policy Studies aims to collaborate with and contribute to these various disciplines, borrowing their strengths and offering policy expertise.

Some snippets from the launch of Ashank Desai Centre for Policy Studies

Vision

To become a centre of excellence that facilitates evidence informed and inclusive public policy.

Mission

To encourage a sustained dialogue between academia and other policy stakeholders in order to promote evidence informed and inclusive policy making and analysis; and create capacity for policy studies in the country.

Research Project Themes

- Environment, Energy and Natural Resources
- Digital Societies
- Structural Inequalities
- Technology and Society
- Markets and Governance Processes

New Research Collaborations - National

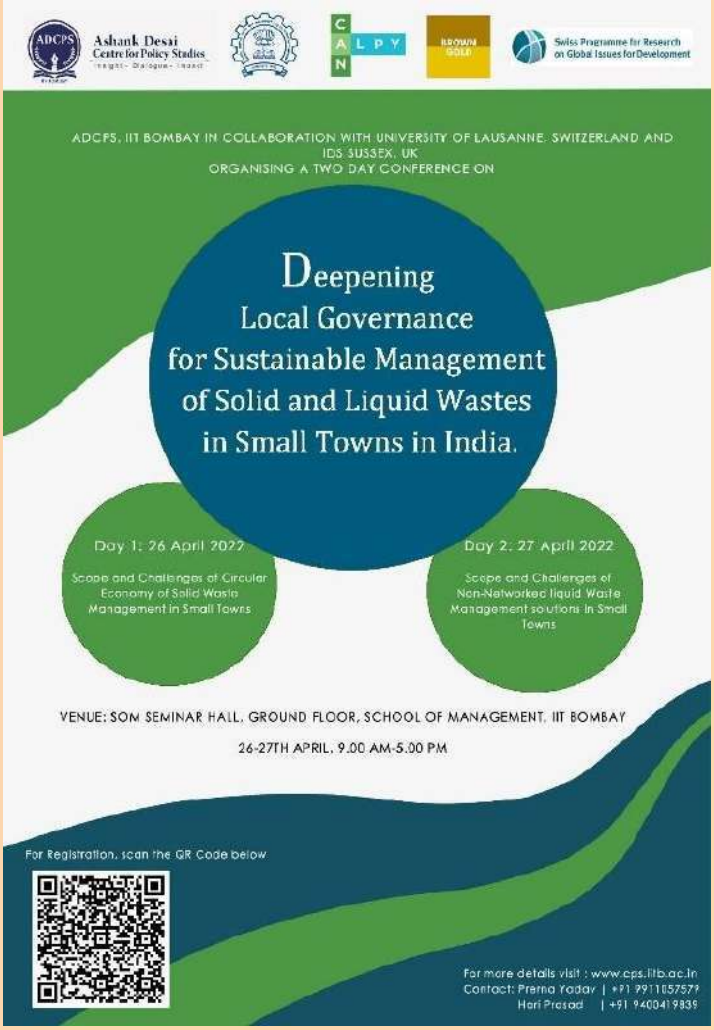
- Applied for a DST – CPR in Science Technology Grant. Awaiting the decision on it. The website for reference is www.canalpy.com
- Collaboration with Bavarian School of Public Policy on Environment and Climate Policy Process.
- Working on SPARC Project - Platform Economics in Digital India: Assessing Implementation Impact Infrastructure and Aptitude.
- Collaboration with the Kerala Institute of Local Administration, Govt. of Kerala on "Capacity Building for Local Governance"

New Research Collaborations - National

- University of East Anglia, UK and IIHS, Bangalore.
- Queen Mary University of London. (Surviving violence: everyday resilience and gender justice in rural-urban India)
- University of Lausanne, Switzerland; University of Colombo, Sri Lanka; Centre for Integrated Urban Development, Kathmandu, Nepal
- IDS Sussex, National University of Galway & SOAS, UK; IWMI, Colombo; Mekelle University, Ethiopia; Nepal Engineering College, Kathmandu.
- IDS, Sussex, UK; Norwegian University of Life Sciences, Norway; Kyoto University, Japan.

Highlights of Outreach activities

- Workshop conducted on the theme, "Enabling Advocacy & Change Through Documentaries"
- ADCPS Policy Dialogue related to aspects of Data Supply Chain was organised by the Centre
- A Conference was organized in collaboration with University of Lausanne, Switzerland and IDS Sussex, UK, on "Deepening Local Governance for Sustainable Management of Solid and Liquid Wastes in Small Towns in India".
    - o A total of 12 papers were presented in this Conference.
- Several Talks were organized after the launch of the Centre in September 2021.
- 3 Talking Policy Blogs published in 2022 Check out the Blogs here


Ashank Desai Centre for Policy Studies
Swiss Programme for Research on Global Issues for Development
ADCPS, IIT BOMBAY IN COLLABORATION WITH UNIVERSITY OF LAUSANNE, SWITZERLAND AND IDS SUSSEX, UK
ORGANISING A TWO DAY CONFERENCE ON
Deepening Local Governance for Sustainable Management of Solid and Liquid Wastes in Small Towns in India.
Day 1: 26 April 2022
Scope and Challenges of Circular Economy of Solid Waste Management in Small Towns
Day 2: 27 April 2022
Scope and Challenges of Non-Networked liquid Waste Management solutions in Small Towns
VENUE: SOM SEMINAR HALL, GROUND FLOOR, SCHOOL OF MANAGEMENT, IIT BOMBAY
26-27TH APRIL, 9.00 AM-5.00 PM
For Registration, scan the QR Code below
For more details visit : www.cps.iitb.ac.in
Contact: Prerna Yadav | +91 9911057579
Hari Prasad | +91 9400419839


Centre for Policy Studies Presents
ATELIER
Talking Policy Through Cinema
21 - 24 September 2022
pebbles
THE SARBIT DOCUMENTATION OF AN AMPHIBIAN HUNT
FUNRAL
BEST FILM ON SOCIAL ISSUES
TECH TALES
Films about digital rights in the Asia-Pacific


ADCPS
POLICY DIALOGUE
March 23, 2022
5pm - 9pm
The State, Social Platforms and the Citizen: Negotiating Democratic Rights
Prof. Eben Moglen, Columbia University, NY, USA
SPEAKERS:
DR. SUNDEEP OBEROI, Moderator, ADCPS, IIT Bombay
MS. MISHI CHOUDHARY, Software Freedom Law, NY, USA
MS. ANITA GURUMURTHY, IT for Change, India
PROF. AMUPAM GUHA, ADCPS, IIT Bombay
DATA BROKERING: PRECARITY OF DATA SUPPLY CHAIN MODELS
Justin Sherman, Duke University, NC, USA
Check ADCPS website for details
WWW.CPS.IITB.AC.IN/EVENTS
THE SOCIAL PLATFORM INFRA-STRUCTURE
5.00pm—6.10pm
DATA, PLATFORMS AND AI: A TROUBLED LEGACY
6.20pm-7.30pm
POLITICAL ECONOMY OF THE DATA SUPPLY CHAIN
7.40pm-8.50pm


Ashank Desai Centre for Policy Studies
Indian Institute of Technology Bombay
BOOK DISCUSSION
September 30, 2022
(Friday)
6:30 PM
LA 202
Politics of Urban Planning
The Making and Unmaking of the Mumbai Development Plan 2014–2034
Editors: Luca Pattaroni, Amita Bhide, Christine Lutringer
Publisher: Springer, 2022
AMITA BHIDE
Professor
TISS Mumbai
MALINI KRISHNANKUTTY
Adjunct Professor
CUSE, IIT Bombay
SHWETA WAGH
Associate Professor
IGNOU
HUSSAIN INDOREWALA
Assistant Professor
IGNOU
NAMRATHA RADHAKRISHNAN
PhD Student, ADCPS, IIT Bombay
(Moderator)

CENTRE FOR MACHINE LEARNING AND DATA SCIENCES-CMINDS

The Centre for Machine Intelligence and Data Science (C-MInDS) at IIT Bombay has been set up in February 2020 to contribute towards the growing significance of the role of Artificial Intelligence, Data Science, and related areas in different application domains. Particularly at IIT Bombay, the activities of the centre are expected to leverage the existence of a strong inter-disciplinary academic community and the important research endeavors carried out by various researchers and faculty members. The Centre aims to be engaged actively to nurture the future talent pool in AI and DS primarily through research, teaching, and collaboration with industry/government.

Academic Updates

- First Batch of 17 IDDDP students are set to graduate on Convocation Day, August 2022.
- New batch of 22 IDDDP students started in July 2022.
- First batch of M.S. by Research and PhD students started in July 2022.
- Megan Kacholia Fellowship advertised and offered to 2 women candidates.
- CMInDS Fellowships advertised and offered to 2 Ph.D. and 2 M.S. by Research students

Grand Challenge

Public Data Project (PDP)

The goal of this project is to enhance the access and analysis of public data by decision-makers, researchers, and citizens of the country. This project involves developing technology for extracting information from raw multimodal data, integrating heterogeneous data sources, providing AI-driven models for powering robust analytics spanning diverse noisy sources, and increasing the accessibility of data and analytics to end-users via natural language interfaces.

Proposed impact:

- Empowering various stakeholders with easy access to analytics over public data
- Define India specific projects for use by many Data Science research and teaching programs which invariably rely on non-Indian data.

Research Project Updates

Active research projects at the CMInDS

1. PAN-India Morphology Analyser
2. Bias in Data and Models
3. Natural Language Generation
4. Computational Humour
5. Speech to Speech Machine Translation

8 Publications

17 Research Projects

Engaging 18 IDDDP students

8 Publications

Highlights of Outreach activities

- AI.Impact Workshop exploring collaborations on Artificial Intelligence for social impact conducted on April 8th and 9th, 2022 with following themes:
  - Defence and Cybersecurity
  - Public Data
  - Indian language & speech technologies
  - Vision & image processing
- The workshop was well attended and witnessed over 100 participants in hybrid mode and 20 speakers from Industry and Academia.

Panel Discussions held at the workshop

Collaboration Partners

- Wadhwani Institute of AI
- Mahindra Defence Ltd.
- Gupshup
- R&DE, DRDO
- Google Research
- TCS Research
- Google
- TCS Research
- eGovernments Foundation
- Sharechat
- Former Director General, DRDO
- Attivo Networks

10 Faculty Members of IIT Bombay

KOITA CENTRE FOR DIGITAL HEALTH - KCDH

The Koita Centre for Digital Health (KCDH) set up at IIT Bombay, is the first of its kind in India, focused on driving academic programs, research, and industry collaborations in Digital Health.

Improving the quality, accessibility, and affordability of healthcare is one of the world's biggest priorities. Digital Health has a profound impact on the quality of care and efficiency of healthcare delivery. Consequently, there is substantial focus globally on enhancing Digital Health and Informatics. In India too, the launch of the Ayushman Bharat Digital Health Mission (ABDM) in 2021 is driving Digital Health adoption at a national scale.

KCDH was established with a generous contribution received from its alumni Rekha and Rizwan Koita, under the aegis of the Koita Foundation (www.koitafoundation.org). The centre was approved by the Board of Governors of IIT Bombay on 4th June 2021.

KCDH Vision

To become a globally renowned centre in Digital Health and Health Informatics. The centre will drive research, entrepreneurship and employment in Digital Health to transform healthcare in India, partnering closely with clinical professionals and healthcare organizations.

Research Areas

Academic Updates

- Minor and IDDDP Programs started in August 2021.
- New batch of 10 IDDDP students started in August 2022.
- PhD Programs approved in Senate
- New batch of 5 PhD students started in July 2022.
- Webinar series launched.
- Vision Plan finalized for the Centre.
- 1st Advisory Board meeting held.

Research Project Updates

- First call for Proposals – 15 projects shortlisted
- All projects in partnership with Digital Health partners

Outreach Highlights

- KCDH faculty Prof. Amit Sethi (IITB) was invited for deliberations on Operationalizing Principles of Responsible AI by NITI Aayog in July 2021.
- KCDH professor- in-charge, Prof. Ganesh Ramakrishnan spoke at HealthCare 2030 summit
- Koita Centre for Digital Health partnered with Telemedicon 2021 for the 17th International Conference in the Telemedicine Society of India.
- Internships – 5 companies providing Internships to KCDH Students
- Ayushman Bharat Digital Mission - Conducted Training for 90 State Joint Directors across India.

A glimpse at the ABDM - NHA Workshop

HDFC ERGO - IIT BOMBAY INNOVATION LAB (HEIITB)

HE-IITB Innovation Lab is a 5-year strategic partnership between HDFC ERGO and IIT Bombay, with an aim to transform the financial services sector, including insurance, to significantly increase penetration in India and create a global center of excellence for innovation in financial services and fintech, including insurance and insurtech. The lab is open to exploring projects in health-tech, med-tech, agri-tech, and other related areas. To achieve these aims, it will be critical to create a deep symbiotic relationship with driven innovators and entrepreneurs in the IIT Bombay ecosystem. Technology-driven innovation and applications leveraging areas such as artificial intelligence, machine learning, big data analytics, robotic process automation, blockchain, image processing, natural language processing, data security, and beyond will be critical to achieving this vision.

Focus Areas

HE-IITB envision to foster innovations in the following focus areas:

Insurance and insurance technologies

- Finance and fintech
- Health and medical technologies
- Agriculture
- Climate change and climate extremes

R&D Projects: Funding opportunities for faculty and students

The lab will support high-impact innovation projects by providing funding via grants, enabling engagement with the innovation-entrepreneurship ecosystem, and providing business intelligence which would include access to proprietary data for the development and testing of innovative technology and business solutions. The lab will support a wide variety of innovative projects to enable both incremental and disruptive innovation and achieve thought leadership in this domain. The lab is looking to support high-impact innovation projects by providing funding via grants to faculty-student teams at IIT Bombay. Call for Proposals for round 1 and 2 are completed.

Some of the problems that are getting solved :

- Shockwave driven needle-free device for drug delivery
- Developing low-cost telematics device for motor vehicle usage-based applications
- Insurance terminologies in Hindi and English
- Urban Flood Risk Map: Monitoring to Modeling

Incubation & Acceleration: Funding opportunities for start-ups

The lab is also planning to support start-ups in the insurance, fintech, agritech, health and medical technologies development and commercialization. In this regard, HE-IITB team-initiated discussions with several start-ups incubated at Society for Innovation & Entrepreneurship (SINE), Desai Sethi School of Entrepreneurship (DSSE) at IIT Bombay.

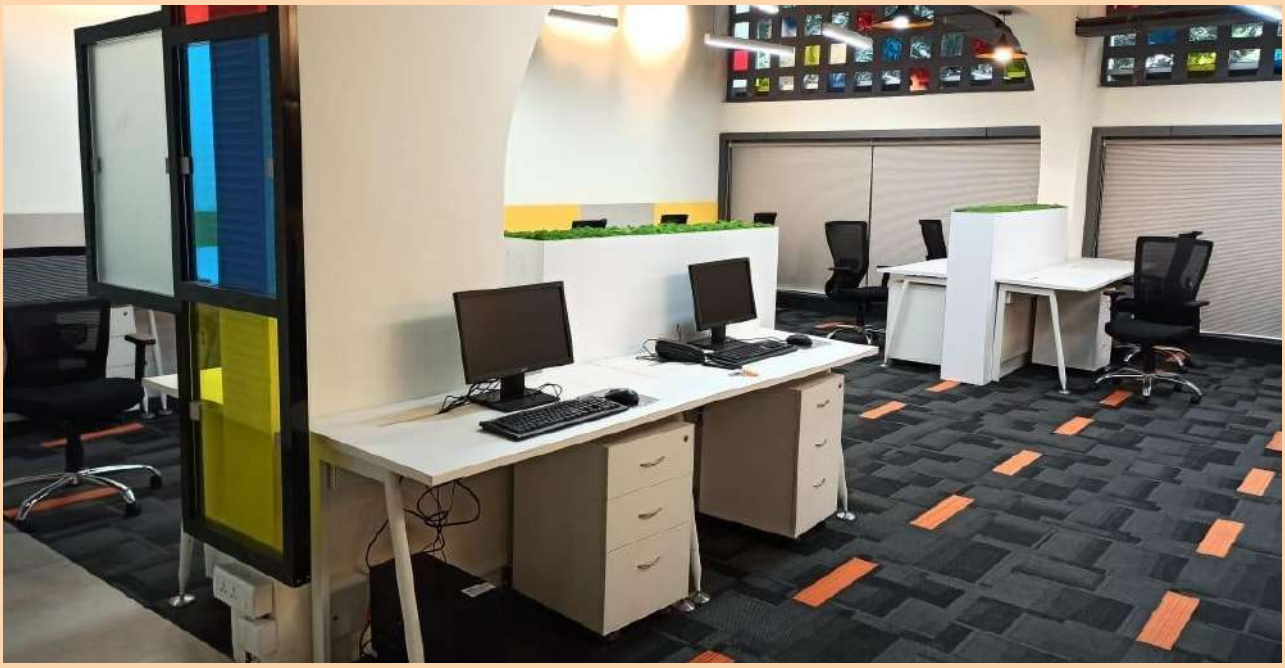
Outreach

Webinar on “India's General Insurance Industry and role of technology” – 16th September'2021

BANK OF BARODA – IIT BOMBAY INNOVATION CENTRE (BOBIC)

The Bank of Baroda has entered a strategic relationship with IIT Bombay and has set up the Innovation Centre in the campus, to evaluate and adopt emerging technologies, develop a culture of innovation, to foster innovation in the hardware space and to contribute to BoB's digital strategy.

Through the Innovation Centre, BoB intends to support 100 ideas/projects at different stages over 5 years. Such Projects are to be taken up by a specific faculty member and his /her team, based on their expertise and mutual approval of the Parties.



- **Vision:**

  To be the fountain head of Fintech innovation and create an environment that fuels the entrepreneurial spirit of and brings about transformation in the BFSI industry

- **Mission:**

  Rapid innovation through the 100 Ideas program in 5 Years

- **Focus Areas:**

  The centre undertakes collaborative projects and programs in focus areas such as FinTech, Open Banking (Sandbox), AV/VR, Robotics, IoT, Rural Economy, Social tech, GovTech, Digital Lending, Payments, Cyber Security, Robo – Advisory, Big Data, AI/NLP/ML/Data Science, Blockchain, Cloud computing and NextGen financial Hardware Devices.

The 100 IDEAS Programme: Funding opportunities for faculty and students

- **Pre-incubation:**

  The Pre-incubation Programme works towards nurturing technology entrepreneurship where students from IIT Bombay get an opportunity to turn their propositions from idea stage to Minimum Viable Product (MVP) stage. Through initiatives such as idea strengthening and emerging ventures programs, the centre provides connections, mentorship, support and seed grants to students, thus encouraging and enabling them to try out their entrepreneurial ideas in the envisioned focus areas. The timelines for these projects generally range from 3 to 6 months where upon successful outcomes students can take the project to the next stage.

- **Incubation and Acceleration:**

  The incubation programme supports early-stage start-ups by providing a supportive entrepreneurial environment that accelerates the successful development of start-up companies through an array of adequate resources and services such as mentoring, seed funding, infrastructure support, review of ventures, resource network development etc.

- **Chair professorships:**

  Through the BoBIC, two chair professorship positions in the following areas have been instituted at IIT Bombay:

  1. Digital Entrepreneurship
  2. Technology Sustainable Finance

- **R&D Projects:**

  BoBIC will support high-impact innovation and R&D projects by providing funding via project grants, enabling engagement with the innovation-entrepreneurship ecosystem, and providing business intelligence. There is also focus on supporting early-stage researchers and students at IIT Bombay towards entrepreneurship through pre-incubation support.

List of R&D projects supported through BoBIC

The following table lists the R&D projects supported through the grants received from the BoB. The projects were shortlisted by the selection committee based on the expression of interest and the detailed proposal submissions by the faculty members.

Project Name
Personalised Adaptive Tutoring System to Train the Employees
Smart ATM & Currency Chest cash demand forecasting and management
Predictive Maintenance of ATM Machines
Voice-based net banking on smartphones for illiterate and less literate users
Stress Assessment During Critical Situations Using Virtual Reality and Machine Learning
Neural Models and Post-editing system for Human-Assisted Machine Translation of English to Hindi

List of pre-incubation projects

Following are the pre-incubation projects supported by the BoBIC:

Sr. No.	Project	PI	Team
1	Start-up Portal	Prof. Ganesh Ramakrishnan	Anuj Agrawal
			Narsimha Reddy
			Vinayak Mittal
			Roma Pandya
2	Customer Experience (Present Team)	Prof. Rajendra M Sonar	Vishnu Sainath Reddy Gowducheruvu
			Swapnava Chaudhuri
			Suman Paul
	Previous Team		Nipun Iyer
			Nishchay
			Soumya

IITB students' interaction with the BoB team regarding pre-incubation projects

TECHNOCRAFT CENTRE FOR APPLIED ARTIFICIAL INTELLIGENCE (TCA2I)

About centre:

The Technocraft Centre for Applied Artificial Intelligence (TCA2I) has been established through the generous donation made by the Institute's distinguished alumni Dr. Sharad Kumar Saraf (B. Tech, Electrical Engineering, 1969) and Mr. Sudarshan Kumar Saraf (B.Tech., Mechanical Engineering and Manufacturing Engineering, 1970) through their publicly-listed company, Technocraft Industries India Limited.

TCA2I aims to help academia and industry anchorage the immense power of AI/ ML, Data Sciences and Optimisation at IIT Bombay to solve pressing challenges across various sectors, including healthcare, education, automation, and cybersecurity. The centre aims to build strong synergy with the defence sector to provide full-fledged AI/ ML – based solutions to improve the operational efficiency of defence forces. The centre will facilitate projects from all the Departments and Centres of IIT Bombay. TCA21 has funded projects in medical imaging, supply chain logistics, cybersecurity, beyond 5G technologies, electricity distribution and biological drug discovery undertaken jointly with industry partners.

The inauguration ceremony of TCA2I was held on April 08, 2022. The event included inaugural function, launch of logo and website, tour of TCA2I facility and keynote address by Dr Anil Kakodkar (Chief guest), Dr Subrata Rakshit (Director of CAIR), Vice Admiral Raman Puri, Dr Sharad Saraf, and Mr Sudarshan Saraf.

Research Projects

1. 3D Medical Image data synthesis for classification and segmentation using deep generative techniques
2. Learning Algorithms for Beam Alignment in 5G
3. Crowdsourcing
4. Automating Threat Detection and Response in Linux Endpoints
5. Assistive AI Technology Development for Tactical and Operational Planning of Supply Chains
6. AI/ML Applications for Enhanced Smart Metering for Residential Electricity Consumption
7. Robust domain adaptation strategies for vibration condition monitoring of machines at the edge
8. Pattern Recognition-AI and NMR aided HOS analysis of biological drugs
9. Categorization of Landfill Mined Residues-coarse fractions using AI and ML techniques

Outreach.

TCA2I + CMInDS workshop – AI.Impact 2022

Two-day workshop was conducted on April 08-09, 2022. The main theme this year was on the impact of AI on society and security. This year more than 20 top industry experts and academics shared insights on new developments in AI and discuss challenging problems that must be addressed so that societies can progress securely in tech enabled future.

The workshop was focussed at some of the cutting-edge advances in the application of AI in the important areas such as defence and cyber security, public information, natural language processing (NLP), and healthcare.

PRAMOD CHAUDHARI ALUMNI CONTINUING EDUCATION CENTRE (PCACEC)

Dr. Pramod Chaudhari has generously donation to establish the Pramod Chaudhari Alumni Continuing Education Centre (PCACEC) for the Alumni Continuing Education program. Through this program, the alumni can keep pace with technological advancements in engineering and science while understanding its implications on the world and specifically their businesses. The center also serves as a forum for cross-pollination of ideas, learnings, and experiences among alumni from varied industries and backgrounds. This program serves as a channel to connect the alumni community to the Institute.

The programs are structured to suit the convenience of alumni as well as faculty of IIT Bombay. The different programs under this initiative include weekend programs, spread over 3-5 weekends, professional programs, specially curated for the alumni in senior leadership positions across industry, and semester-long programs, which will help the alumni community revisit their fundamentals of engineering and science.

Activities undertaken in the center

1. Pilot course on Climate Change: Services and Solutions was started on Feb. 2022 and completed successfully. It was 10 hours course, 5 days on weekend. 162 applications received for the pilot course and 22 applicants attended the sessions. The 73% of the attendees were from India, 18% from USA and 9% from other countries.

Faculty involved in Pilot course


Prof. Subimal Ghosh


Prof. Raghu Murtugudde


Prof. Chandra Venkataraman


Prof. Pennan Chinnasamy


Prof. Subhankar Karmakar


Prof. Arnab Datta


Prof. Vikram Vishal


Prof. Rangan Banerjee


Prof. Anand B Rao

2. The second course on Urban Water Management for Future: Building Sustainability and Resilience by Prof Pradip Kalbar, Centre for Urban Science and Engineering was started on August 20, 2022 and completed successfully on September 03, 2022. It was 10 hours course spanning over three Saturdays. We received 15 applications, and 10 applicants attended the course with work experience ranging from 2 years to 30 years. Eight participants were from India and two from overseas. We also had 2 participants from Indian Civil Services in the course.
3. The third course of the Centre – Design Thinking by Prof Nishant Sharma of IDC School of Design was held on campus during September 16 – September 18, 2022. The Centre successfully hosted 15 participants on campus. Along with lectures and case studies, the course also had an element of hands-on workshop with real life problem statement. The completion of course was marked by presentation of workshop solutions and design ideas.

It was perfectly designed and managed and conducted. I am able to structure my thought process and seeing a drastic change in approaching a problem.
Thank you
Akanksha Jain, 2013 Batch
M.S., Mathematics

The very initiative of organizing this course was great. Q & A was the best part and I appreciate all the professors patiently answering all the questions.
Parag Kothari,1997 Batch
B.Tech-Chemical Engineering

The intensely interactive and openness of each and every session - typical IITB DNA anyways...
Keep the IITB flag fluttering high FOREVER!! God Bless!!
Prasad Shashikant Rangnekar, 1981 Batch
B.Tech-electrical Engineering

Way Forward

The focus are the following courses:

Corporate Competitiveness for Energetic Leaders	**Prof. Kirankumar Momaya** **Shailesh J. Mehta School of Management**
Digital Transformation	**Prof. Rajendra M. Sonar** **Shailesh J. Mehta School of Management**
Block Chain	**Prof. Piyush Pandey** **Shailesh J. Mehta School of Management**

SUNITA SANGHI CENTER OF AGING AND NEURODEGENERATIVE DISEASES-SCAN

Established in Feb'22, Sunita Sanghi Centre of Aging & Neurodegenerative Diseases (SCAN) is focussed on diagnostics and early detection of aging and neurodegenerative diseases and movement support. The centre has been supported by generous funding from IIT Bombay's distinguished alumnus, Mr Sharad Sanghi (BTech., Electrical Engineering, 1989) in memory of his late mother Mrs. Sunita Sanghi.

Fig 1: Signing of MoU on 18th Feb'22

Neurodegenerative diseases affect millions of individuals worldwide and are the primary cause of disability among the elderly section of society. These disorders are mostly characterized by the death of neuronal cells coupled with cognitive impairments and motor disabilities. In India, the contribution of these non-communicable neurological disorders to the overall disease burden has more than doubled during the last two decades. The major obstacle in managing such diseases has been the lack of robust biomarkers and disease modifying therapies that could help in early diagnosis and treatment. The current treatment strategies available for such diseases offer only symptomatic relief as there is no discovered cure yet. Therefore, early detection and intervention are crucial for the better management of neurological disorders, including Parkinson's disease and Alzheimer's disease.

The Centre with the existing expertise combined with an interdisciplinary approach, aims to decipher the mechanism of disease progression, understand molecular, cellular, and biochemical pathways using a wide range of disease-relevant in vitro, cell-based and computational studies. The Centre also envisions developing novel tools and biomarkers for the early detection, diagnosis, and prognosis of neurological disorders, including Parkinson's disease and Alzheimer's disease. The

outcome from this study can further be extrapolated for innovative diagnostics and therapeutic approaches.

Objectives

The centre aims to develop a strong capability in Aging and Neurodegenerative diseases with a key focus on the following core areas:

- Early/detection of diseases caused due to Aging and Neurodegenerative diseases such as Parkinson's (PD), Alzheimer's (AD) and Frontotemporal Dementia (FTD).
- Creating Biological age profiles (normal ageing versus ageing related disorders such as PD, AD and FTD) using Blood samples.
- Movement support - Assisted support for Aging/neurodegenerative patients - Tools/Product development
- Understanding the molecular mechanisms and development of therapeutics/tools against neurodegenerative disorders such as PD, AD and FTD.

Recent review article published in the Journal of Molecular Biology under affiliation with BSBE SCAN on:

Liquid-liquid phase separation of α-Synuclein: A new mechanistic insight for α-Synuclein aggregation associated with Parkinson's disease pathogenesis.

A lecture named 'Spinal Muscular Atrophy: The Genetics and Pathology of a Prototypical Motor Neuron Disease' was delivered by Umrao R. Monani, PhD on September 7th, 2022. Around 50 students benefited from the talk.

Fig 2: Talk on 'Spinal Muscular Atrophy' by Umrao R. Monani, PhD

DESAI SETHI SCHOOL OF ENTREPRENEURSHIP-DSSE

In 2010, IITB envisioned a dedicated centre to offer courses on innovation and entrepreneurship with the relevant content, context, and contacts to aspiring students. This vision took shape in 2014 when an alumnus of IITB, Mr. Bharat Desai and his wife Neerja Sethi donated one million dollars to start the Centre. The Centre was approved on 31 January 2014 by the Board of Governors BoG of IIT Bombay. In 2019, the BoG approved the conversion of the Centre into the School of Entrepreneurship

"Entrepreneurship has a transformative power. But this is not for everybody. The journey is tough – the path is covered with stones and thorns, not roses. Entrepreneurs need to have passion, self-belief, discipline and perseverance. We need to attract and train the best talent to embark on entrepreneurship."

- Bharat Desai (Desai Sethi Family Foundation)

Academic Activities:

DSSE offers several courses and labs relevant to innovation and entrepreneurship. These are open to under-graduate as well as post-graduate (Masters and PhD) students at the Institute. Students who complete a minimum of 30 credits receive an additional degree of B.Tech. (Minor) in Entrepreneurship.

DSSE organizes various programs related to innovation and entrepreneurship bootcamps and training in association with government, academic and industry partners like the India Innovation Growth Program with the Ministry of Science and Technology. The school has symbiotic relationships with student managed bodies like E-Cell and STAB along with the institute's business incubator SINE. The school partners with several partner institutes (such as NUS Singapore TUB Germany) and organizations (such as Asian Universities Alliance) for exchange visits of faculty and students and collaborative training programs related to innovation and entrepreneurship. DSSE conducts executive education programs for working professionals to update their knowledge and skillset in critical aspects of innovation and entrepreneurship. The school also offers dedicated programs for teachers, innovation/incubation managers and administrators from academic institutes to learn about entrepreneurship courses and programs and implement them in their institutions.

Courses offered by DSSE faculty are listed here.	
• ENT603 Introduction to Entrepreneurship	• ENT609 Marketing & Finance for Entrepreneurs
• ENT610 Managing Innovation and IP for Techpreneurs	• ENT602 Technology Venture Creation
• ENT606 Developing the Proof-of-Concept Lab	• ENT608 Developing a Proof-of-Concept Advanced Lab

To improve the overall offering to the students as well as eliminate any issues with registration and tagging by students the school restructured its courses. The Institute (via School Post-Graduate Committee (SPGC), Undergraduate Program Committee UGPC, Postgraduate Programmes Committee (PGPC), Senate Chair) has approved the new ENT courses, and it has started offering them from this academic year Autumn-2021.

The two new courses introduced are:

i) Managing Innovation and IP for Entrepreneurs

ii) Marketing and Finance for Entrepreneurs

The Proof-of-Concept- PoC Lab

The Proof-of-Concept- PoC Lab courses are conducted in the POC Lab on the ground floor of IDC School of Design. It has hand tools, power tools, digital and screen-printing facilities, Computer Numerical Control (CNC) machines, metal and wood working machines capable of prototyping using various materials suitable for fabricating proof-of-concepts of novel products.

IITB Security

Masks to Sakinaka Police

Variety of designs

IITB Hospital

@ Ecostyle factory

Mask making and free distribution by PoC Studio Team

Pre-Incubation Mentoring

DSSE facilitated the launch of the IDEAS (Innovation, Development and Entrepreneurship with Alumni Support) program - a legacy project of the Class of 1990 alumni of IIT Bombay in 2018. The program provides accelerated hands-on learning to aspiring entrepreneurs among students, scholars, and faculty. The diverse pool of mentors includes alumni entrepreneurs, industry professionals, investors and faculty members.

New Projects at DSSE

DSSE is collaborating with Rajiv Gandhi Science & Technology Commission (RGSTC), Government of Maharashtra, for a pilot project to review the projects supported by them in the last ten years, and guide selected investigators in commercializing their technologies. The pilot project will short-list

promising (commercially viable) projects, share the best practices in technology package preparation and connect interested teams to potential licensing partners. The project is scheduled to be executed in two phases of six months each and aims to support at least ten project investigators.

Other Activities in DSSE

A) Women in Entrepreneurship

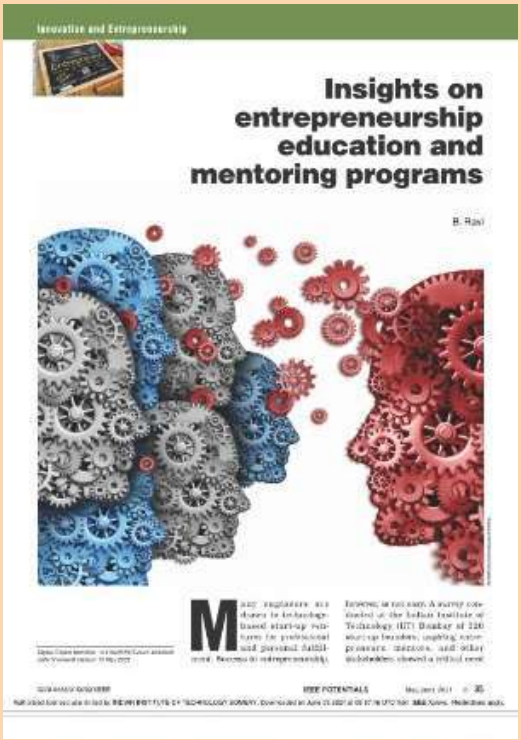
The Women in Entrepreneurship Program (WiE) is funded by Conseillers en gestion et informatique (CGI) India as a CSR initiative. The program was launched in August 2019, reaching 171 individuals in the first year, who attended at least one of the events/workshops. The program aims to create meaningful impact through a supportive ecosystem for women entrepreneurs.

The program achieves this by enabling access to knowledge, training, offering networking and community building opportunities and extending access to credit. In addition, there is an active WhatsApp group of about 150 members. This group is an eclectic mix of senior and young entrepreneurs from across India, some of their team members, IITB students, & staff.

B) Outreach Activities

Entrepreneurship SurveyProf. Ravi wrote an article titled "Insights on entrepreneurship education and mentoring programs" published in the May 2021 issue of IEEE Potential. The article is based on a survey conducted at the IIT Bombay of 326 start-up founders, aspiring entrepreneurs, mentors, and other stakeholders.

Article in IEEE, May 2021 Issue



C) External Collaboration

DSSE in collaboration with BETIC organised a 6 day online international entrepreneurship summer school in medical device innovation in collaboration with TU Braunschweig Germany from Sept 6-13, 2021. The school received 172 applications from more than 20 countries from which 152 were admitted. 25 applicants from 7 countries (India, Germany, Ghana, Turkmenistan, Iran, China, and Australia) joined the Medical Device Innovation lecture track.

Participating institutions in the summer school

D) Venture Creation

Venture creation is an important milestone in an entrepreneur's journey. It is not only the number of ventures but also the quality of ventures in a given entrepreneurial ecosystem that matter. Five DSSE students registered start-ups during 2020-21.

- PillarPlus (2020) Naman Kasliwal: Fast,coordinated and accurate MEP Drawings, BOQ and Reports.
- AiRTH (2020) Ravi Kaushik: Antimicrobial air purifier for protection against SARS CoV-2 sized particles.
- Acadpal (2020) Pratyush Sharma and Vikramaditya Patil: Platform for students to learn and practice concepts in a fun and engaging way.
- HelpNow (2020) Aditya Makkar :Quickest and safest medical response.
- Languify (2021) Lokap Sahu: Best speech and error-free writing free of cost

E) DSSE Start-ups Battling COVID-19

More than 25 start-ups including Augle, Adapt, CareNx, Faclon Labs, HelpNow, JanYu, Phabio, R2MI and others, started by IIT-B students who were inspired and empowered through DSSE courses and mentoring programmes, rose to meet the COVID challenges with fresh thinking and effective solutions.

F) New Building

The proposed building will have 7.5 levels comprising the half-basement, ground floor and six floors. It will have a built-up area of 1,15,000 sq.ft. and usable area of 63,000 sq.ft. replaced with The proposed building will have Lower Ground & Upper Floor +Ground Floor+ 6 Floors. It will have a Total Built up area is 11,300 sqm. with designed to achieve a GRIHA rating of 3 Star.

Architect's rendition of the
DSSE building and land allotted

Success stories of DSSE Alums:

a. Rephrase.ai Raises $1.5 million

Bangalore-based start-up rephrase.ai has an ambitious vision for reshaping how movies and videos are made. According to CEO Ashray Malhotra (DSSE alumni), they want to build an engine that can take any script as input and create a professional movie obviating the requirement to film. They have short-term, monetizable goal offering technology that makes it easy to create personalized sales videos. Their technology could expand fairly quickly into areas like chat-bots and education.

The start-up was part of the Techstars Bangalore program in 2019 and has recently announced that it has raised $1.5 million in seed funding led by Lightspeed Venture Partners and AV8 Ventures.

b. Faclon Raises Pre-Series A Round

Mumbai based Internet-of-things (IoT) and data management start-up Faclon Labs announced it has raised an undisclosed pre-series A from LetsVenture led by Group Satellite managing director Sarjan Shah. Faclon will use the proceedings towards product development, team building and international customer acquisitions in Malaysia, UAE and Bahrain as well as set up an office in Dubai. Over the years Faclon has invested heavily in R&D and product innovation to build comprehensive IoT infrastructure, ranging from Cloud to Gateways to challenge global players in IoT. Faclon helps in making infrastructure smart, responsive and self-learning.

c. Airth Develops First-of-its kind Antimicrobial Air Purifier

Airth, a start-up by DSSE student Ravi Kaushik is first of its kind antimicrobial air purifier . It uses patent filed & tested technology for protection against airborne diseases such as COVID-19. The device goes a step ahead of surface sanitizers and protects people within a closed space, such as an office. Airth antimicrobial air purifiers stand by their words to help organisations provide clean and pathogen-free air to their customers and employees.

Way Forward- DSSE

This is a fascinating time to be at the Desai Sethi School of Entrepreneurship. IIT Bombay was designed around a model of education that has remained fairly constant for several decades. But today many educators are looking at this model with fresh eyes. The potential disruption posed by the pandemic allows us to question how time, space, expertise, accreditation and student agency may also change within higher education. Many aspects of pedagogy in entrepreneurship are ripe for reinvention and DSSE is getting ready to lead this change.

In exploring a shifting landscape in the macro entrepreneurial ecosystem, team DSSE is carefully investing significant energy and resources in experimenting and pioneering the online learning space in entrepreneurship. The team is also considering many lenses – from how students identify an opportunity for entrepreneurship for the first time to what supporting infrastructure do they need to realize their revolutionary ideas. Like a journey through a jungle at night, we need not prepare entrepreneurship students of the future to see the entire path they are to trade but only instil a humble confidence in them – they can do it. Ours is to put the chemicals together, crystallization comes of itself. That is nature.

CENTRE OF EXCELLENCE IN OIL, GAS AND ENERGY (COE OGE)

The Centre of Excellence (CoE) in Oil, Gas and Energy is an interdisciplinary Centre of Excellence between Indian PSUs (IOCL, ONGC, HPCL, BPCL, GAIL, OIL & EIL) and IIT Bombay initiated by the Ministry of Petroleum and Natural Gas (MoPNG). It has been founded to provide a competitive advantage to India's Oil and Gas sector PSUs and its energy sector in the emerging business ecosystem driven by climate challenges, stressed resources and disrupting technologies globally.

I. Current Research Verticals

a) Gas Hydrate
b) Water Resource
c) Upstream: Reservoir Characterisation
d) Pipelines: Monitoring & Surveillance, Flow Assurance, Robotics, Alternate Materials
e) Refineries: Digitalisation, Desalter, Pitch Combustion
f) Biomass: CBG, Biofuels
g) Renewables & Storage: Hydrogen, Geothermal, Perovskites, Nano composites, Supercapacitor Materials, Battery
h) Process Modelling, Software, CFD

II. Activity Matrix

A dashboard of the activities of CoEOGE summarizing the number of projects, training courses conducted, faculty members involved, etc has been shown in table below

Table 1: CoE-OGE Project & Training Dashboard

Project Status	Mission Mode Projects	Seed Projects	PhD. Fellowship Projects	One to One Projects	Training
Completed	-	4	-	-	13
Ongoing	3	2	6	-	-
Under Approval	2	-	-	-	-
Project proposals under review	7	2	10	-	2
Research projects under conceptualization with PSUs	9	-	-	1	-
IITB Faculty Involved	21	17	16	2	26

Total Number of IITB Faculty Involved: 54; Number of IITB Depts. Involved: 11,
No of PSUs Involved: All 7

III. Research Projects

a) Mission Mode Projects

There are four mission mode projects at the centre going on currently

1. **Design and Development of of IoT solution for underwater pipeline inspection**
   PIC and member: Prof. Leena Vacchani, Prof. Hemendra Arya
   Collaborating PSU: HPCL, IOCL
2. **Portable membrane technology based unit for drilling site wastewater treatment**
   PIC and members: Prof. Swatantra, Prof. Tabish Nawaz, Mr. Pramod Kumar
   Collaborating PSU: ONGC, OIL
3. **Integrated reservoir characterization of Eocene Hydrocarbon-bearing carbonates of Mukta Field of HPB sector, Bombay Offshore Basin**
   PIC and members: Prof. Hemant Kumar Singh, Prof. Sudipta Dasgupta, Prof. Santanu Banerjee, Mr. Sanjay Pandit
   Collaborating PSU: ONGC, OIL
4. **Simultaneous Nitrification and Denitrification for Nitrogen Removal from Refinery Wastewater**
   PIC and members: Prof. Suparna Mukherji, Prof. Anurag Garg, Mr. Himanshu Sati
   Collaborating PSU: HPCL, IOCL, EIL

b) Seed Projects

There are two ongoing seed projects –

1. **Assessment of biomass availability in India for utilization in transportation, chemicals, and power sectors**
   PIC and members: Prof. Yogendra Shastri, S. Srinivas
2. **Determination of percentage proportion of end members in the oil mixture in a basin: Alternating Least Squares based Matrix Factorization**
   PIC and members: Prof. Hemant Kumar Singh
   Collaborating PSU: OIL

c) PhD Fellowship Projects

There are six ongoing PhD fellowship projects. The review of projects is conducted every six months with guide and co-guide, student, and PSU member/co-guide.

COE-OGE- CONCLAVE 2021

The conclave was conducted in Nov'21 with the theme –"Towards Smarter and Greener Energy Sector in Socially Responsible Way".

The Objectives of the Conclave were:

1. To bring experts from industry and academia together, brainstorm, identify the research problems in the focused areas of CoEOGE
2. To examine the detailed pathways available for attaining the zero-emission target, developments happening globally, and identify a roadmap which is specific to Indian conditions
3. As a platform to present the research projects undertaken by CoE-OGE

The following sessions were conducted as part of the conclave:

- Enhancing the sustainable oil & gas production from Indian reserves
- Refineries of Tomorrow: Smart, Green, Integrated, and Efficient
- Biofuels and bio-refineries
- Sustainable Wastewater Management
- Monitoring and Surveillance of Oil and Gas transportation and storage infrastructure
- Climate change: Transformation of Energy Sector

TATA CENTRE FOR TECHNOLOGY AND DESIGN- TCTD

In order to address the unmet needs of resource-constrained communities in India and around the world, the Tata Centre for Technology and Design at IIT Bombay was formed in the year 2014. With a focus on end-to-end innovation, TCTD, IITB serves as a virtual hub for research and academics that attracts graduate students and faculty members from across IIT Bombay and assists them in their efforts to create and translate suitable solutions.

The Centre has funded 110 projects of which 21 have received translational level funding. There have been seven startups and six technology transfers achieved so far. 12 of our projects have gone on to receive large external grants. Out of 39 patents applied, 8 have been granted so far and the remainder are under review. A hundred and twenty Masters and Ph.D. students have received fellowships as Tata Fellows, and have worked on various Centre projects. 7 projects teams have formed start-ups; in the 2020-21 period, this includes 3 private limited companies and a section 8 company. Brief descriptions of some of our recent translation efforts and operations through the Coronavirus pandemic are listed below.

A Spoken Language assessment tool has been developed towards providing an accessible and scalable technological solution that can provide students with rapid feedback on their pronunciation and fluency of speech. A speech recognition algorithm running on a mobile device analyzes a recording of a child reading out passages of text and estimates metrics of accuracy and fluency. The analytical engine developed has been tested by partners including Pratham and WPP who have been using this to evaluate speech proficiency in over 1500 children.

Over 1000 cottage industries manufacturing artisanal jaggery have shut down in the Kolhapur region in the last decade due to non availability of technology and skilled manpower, and an unorganized supply chain of sugarcane. A project team has come up with a mobile unit capable of continuous manufacture of jaggery. The unit is easy to use, energy efficient, and produces a product of consistent quality. The team has now created a startup (Revotech Industries Pvt Ltd.) towards marketing this innovative process in the various sugarcane cultivating regions of the country.

Another team has looked into the reclamation of waste sand from foundries, also in the Kolhapur region. This region has a large cluster of ~400 foundries (~5000 in India) servicing various engineering applications, including the casting of automotive parts. Waste sand can be regenerated using mechanical attrition and chemical treatment processes which remove dead clay and generate sand that can be reused for low grade casting needs. A startup (Deccan Crest Engineering Pvt. Ltd.) has been incorporated towards piloting this technology at large scale, and is currently serving 8-10 foundries.

Our translation project on the creation of low-cost bone and near-net-shape grafts for dental and orthopedic bone reconstruction has resulted in a startup (Effectmed Pvt. Ltd). In order to solve the issue of bone tissue degradation, the team has developed rapid ways of designing and printing 3-D bone scaffolds. Clinical trials at AIIMS Delhi have been completed and dental and orthopaedic surgeons have started recommending the use of such bone grafts.

Learn English Through Stories is an education project aimed at promoting peer collaboration and self-learning in isolated rural settings with poor infrastructure. School kids are encouraged to develop content, and to then convert their storyboards into books and interactive videos. In addition to capturing local stories of cultural importance, the students end up collectively learning aspects of production and design: they write and illustrate their stories themselves. The students and teachers of rural schools have been further benefited as the approach involved facilitates English learning, with the mentor team facilitating translations from the local vernacular. This methodology has increasingly been executed using a workshop model, and towards scaling up this rollout, the team has created a Section 8 Company (Learn Through Stories (LeTS) Foundation) being formed.

During the pandemic, the Centre undertook certain challenge driven projects in response to urgent clinical requests. CoviDialysis has been a patient coordination service undertaken during the first two waves of the pandemic, on behalf of MCGM, for the management of all Covid-19 patients in need of hemodialysis care. Such patients need bi or tri-weekly dialysis sessions and were some of the individuals at highest risk of contracting Covid and had low survival odds. More than 200 dialysis clinics across Greater Mumbai were on-boarded onto a portal rapidly put together by the Centre. As dialysis patients across the city became confirmed or suspected Covid cases, the portal allowed for their rapid redirection to dedicated Covid dialysis clinics. ~2000 Covid positive patients were redirected in the first 9 months of the pandemic (Mumbai has an estimated 10000 dialysis patients) and with timely intervention, case fatality rates were brought down from 25% at the outset of the pandemic to below 5%. BMC has labeled this effort Project Victory and created a documentary on it. Based on the success of this effort the BMC has involved us in the implementation of further public health initiatives.

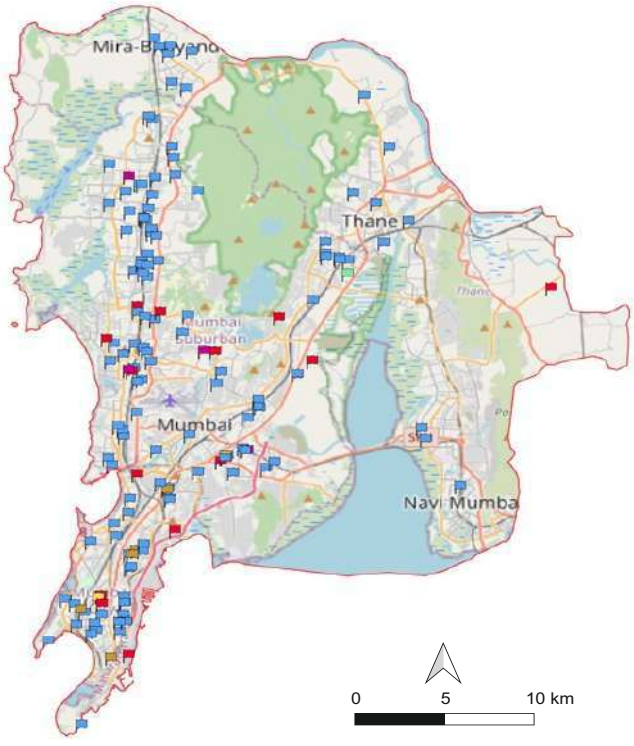
Towards better utilizing the oxygen cylinders that were in relative short supply during the second wave, a team worked on redesigning oxygen masks facilitating the recirculation of exhaled air. Our calculations implied that >95% of oxygen inhaled when on pure oxygen cylinders was exhaled out; a redesign of a mask was carried out to facilitate removal of carbon dioxide allowing for the exhalation to be recycled, extending the life of a cylinder by at least 5-fold. The blueprints for the solution (called reBreather) were subsequently open sourced and disseminated, towards allowing other groups across the country to replicate and fabricate locally. We believe, anecdotally, that this

was adopted in smaller towns where oxygen bottling capabilities were limited, towards stretching available supplies to the maximum extent possible.

The non-covid wards at the major hospitals in Mumbai continued to receive patients in their OPDs exposing themselves and hospital staff to the Covid virus. Towards decongesting these wards, a helpline platform called WWH (World Wide Helpline) was set up to allow a team of volunteers to respond to patient queries in asynchronous mode. This platform was deployed at 6 hospitals and covid centres including KEM, Mumbai. The MCGM has indicated its interest in using this to assist with delivery of public health services, post-Covid.

During the COVID-19 pandemic, TCTD also conducted its Pro-seminar coursework (a set of 3 courses) in an online mode. External speakers were invited to address the students about their organizations and to explain their work. Students conducted a COVID awareness survey telephonically in remote areas based on their respective projects. Students also conducted customer discovery interviews telephonically and came up with some important insights. The TCTD team couriered mechatronics kits to students at their homes; these were used during classes to perform experiments and subsequently to complete assignments. Presentations and exams were implemented online with active participation from students individually as well as in groups.

COVIDIALYSIS / PROJECT VICTORY

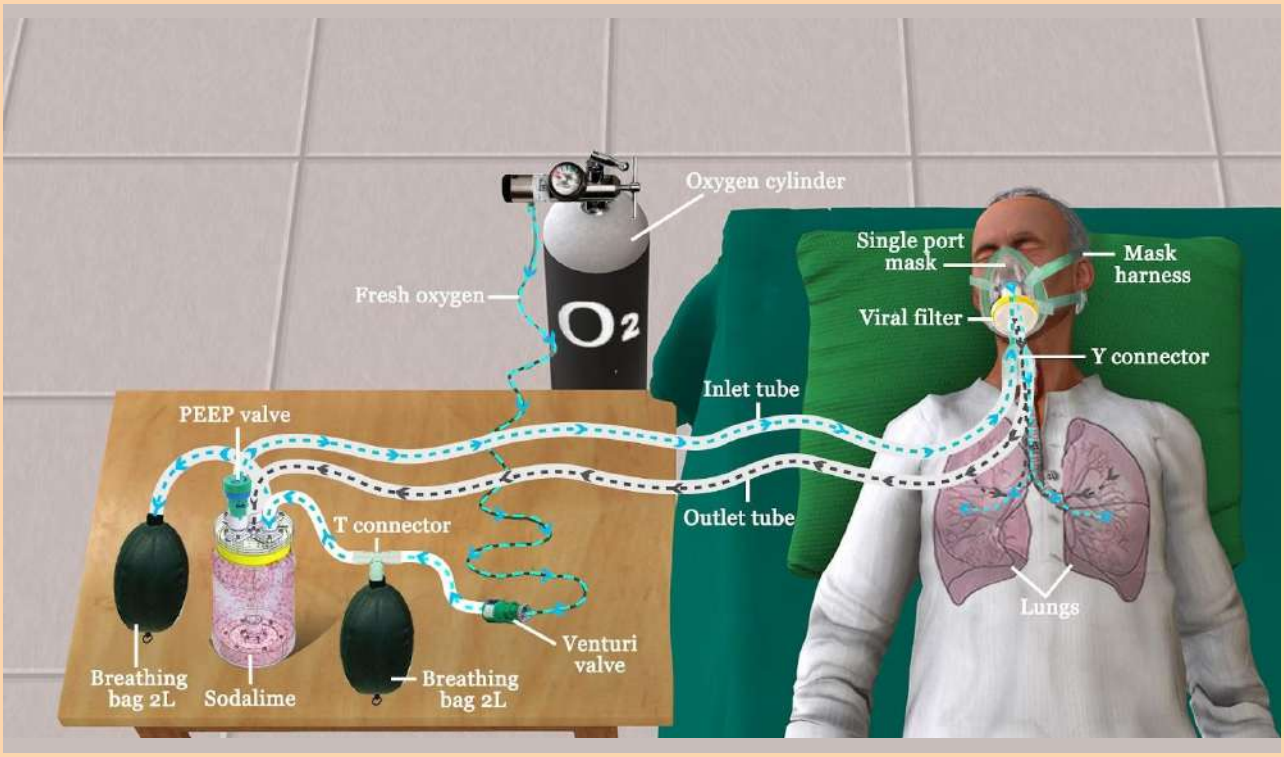


Classifying Covid facilities	
Covid negative centres:	149
Covid positive centres:	23
Covid suspect centres:	2

CENTER DETAILS

- Covid Care Center
- Dedicated Covid Health Center
- Dedicated Covid Hospital
- Covid Suspect Dialysis Facility
- Non Covid Dialysis Facility
- Non Covid Hospital with Covid Dialysis

REBREATHER



WORLD WIDE HELPLINE

LEARN ENGLISH THROUGH STORIES

SPOKEN LANGUAGE ASSESSMENT TOOL

CERVICAL CANCER SCREENING

JAGGERY

SAND RECLAMATION

Wadhwani Research Centre for Bioengineering (WRCB), IIT Bombay Activity report 2022

Wadhwani Research centre for Bioengineering (WRCB) is in its second year of phase-II. In the past year, WRCB has taken up major transformative activities to help meet its objectives around commercialization of technologies, building a professional operations team and matching funds.

1. **New leadership:** Prof. Debjani Paul joined as a Professor-in-charge in Nov 2022 and Dr. Abdur Rub joined as a Chief Executive Officer since Dec 2022.
2. **Supporting translational research projects** with a strong potential for commercialization. The 9th call for project proposals announced in February 2022 received a good response from investigators. WRCB supported 14 projects under 9th call. We announced 10th call for project proposals in September 2022 and the review process is ongoing.
3. **External Fundraising Support (EFS) Service:** The EFS service is a new addition to the bioengineering research support provided by WRCB to PIs from IIT Bombay towards raising external funds for bioengineering research. WRCB EFS team plans to provide various services at "pre-award" stages, such as sharing curated grant calendars with faculty, support for non-technical components of grant application packages for external proposals being submitted by WRCB faculty etc. We have shared 3 editions of the EFS calendar with relevant funding opportunities with faculty. In addition, the curate database is hosted on WRCB website.
4. **Newsletter:** 1st edition of newsletter was released on 30th September 2022. The next version is to be released on 31st December 2022
5. **Commercialization Pipeline:**

Commercialized 2022	Commercialization pipeline 2022	Commercialization pipeline 2023
Metflux Research Ltd. (K. V. Venkatesh)	Dipti Gupta (dry electrode based biomedical monitoring)	Maryam Shojaei & Neelesh Pandit (Tinnitus Technology)
ClarityBio Pvt. Ltd. (Pramod Wangikar)	Jayesh Bellare (Orthopedic biocomposite material)	Abhijit Majumder (Drug testing using microfluidics)
ImmunoAct Pvt. Ltd. (Rahul Purwar) Algorithmic Biologics Pvt. Ltd. (Manoj Gopalakrishnan)		

6. **Revamping Corporate Affiliate Program (CAP):** The Corporate Affiliate Program of WRCB has been redesigned and renamed as **Industry research Partnership Program (IRPP)** to highlight its main goal of promoting Industry-supported R&D projects in WRCB. The IRPP deliverables have been revised to make the program more attractive to industry. We have added HumanEdge as the newest IRPP member in 2022.

7. **Engagement with external entities:** WRCB team has strategically devised its outreach and external engagement plan to increase interactions with industry, venture capital firms, not-for-profits, biotech parks, etc. The goal is to find as many avenues as possible to garner external funding.

   a. **Consultants and mentors:** WRCB has appointed two commercialization experts (Dr. Sudhakar Bangera and Dr. G. S. Bhuvaneshwar) with complementary expertise to provide overall guidance to WRCB and its funded projects. In 2022, we added two more experts. Dr. Savita Ayyar is helping us set up the EFS service and Dr. Nishant Tikekar is supporting commercialization activities in the medical device development domain.

   b. **Ecosystem partners:** We are developing a network of ecosystem partners to provide additional support to our faculty at advanced stages of their product development. We now have Ankur Capital, Golden Jubilee Biotech Park, Axilor, KoFounderz and TiE Foundation as our ecosystem partners.

8. **Events hosted or co-hosted by WRCB:**

   a. **Event on Low Cost Diagnostics for Affordable Healthcare – 3rd June 2022**

   WRCB organised a one-day summit on "Low-cost diagnostics for affordable healthcare on 3rd June 2022. The goal of the event was to create opportunities to brainstorm with different stakeholders involved in the development of low-cost diagnostics solutions. The event was co-sponsored by Wadhwani Electronics Lab (WEL) and Society for Innovation and Entrepreneurship (SINE). Event saw participation of more than 150 people including innovators, industry experts, entrepreneurs, academicians, representatives from government and non-profit organizations.

a. IIT Bombay's Annual CSR Conclave – 6th July 2022

WRCB co-sponsored the Corporate Social Responsibility (CSR) conclave organized by IIT Bombay on July 6, 2022. The objective of the conclave was to provide a platform for socially conscious corporates to partner with the institute to address various national and global challenges such as healthcare, sustainability, and more, and create a tangible societal impact by way of technological innovations and solutions. The event provided an opportunity for WRCB to showcase its projects, meet and interact with corporate representatives, and build contacts to explore research collaborations.

c. Webinar on 'Ethics and Statutory Compliance in Bioengineering Research

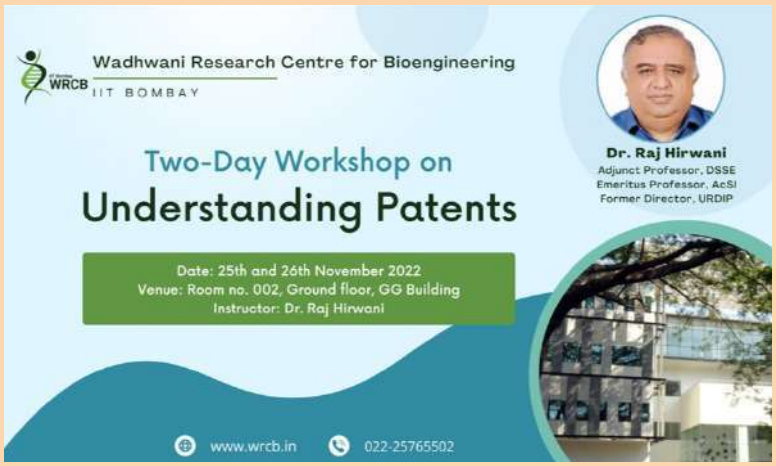
WRCB organised an interactive webinar on "Ethics and Statutory Compliance in Bioengineering Research" on Saturday, 22nd October 2022. The objectives of the webinar were two-fold: (a) familiarising faculty, staff and students with various statutory compliance requirements for research involving clinical samples and human subjects, and (b) giving an overview on how to apply for ethics approval at IIT Bombay.

WRCB invited Dr. Urmila Thatte (former chair of IIT Bombay's Institute Ethics Committee) to discuss the importance of ethics requirements and the guidelines from the Indian Council for Medical Research. WRCB also invited Dr. Sreelekha Gopinathan (Member Secretary, Institute Ethics Committee of IIT Bombay) to discuss IIT Bombay's ethics approval procedure. The webinar was attended by more than 40 people and led to an interesting discussion afterwards.

d. Upcoming events planned in 2022

WRCB is planning two more events in 2022. The first is a workshop on 'Next-generation therapeutics' on 18th November 2022. The second is two half-day workshops on patents for IIT Bombay community by Dr Raj Hirwani, the former head of CSIR's intellectual property division,


Wadhwani Research Centre for Bioengineering, IIT Bombay
announces summit on
NEXT GENERATION THERAPEUTICS
Themes
Drug discovery & delivery
Regenerative medicine (cell therapy & tissue medicine)
November 18, 2022 (Friday)
9.00 am to 5.30 pm
Prof. B. Nag Auditorium, Ground floor, VMCC, IIT Bombay
Event sponsor:
Co-sponsor:
Institute of Eminence cell, IIT Bombay


Wadhwani Research Centre for Bioengineering
IIT BOMBAY
Two-Day Workshop on
Understanding Patents
Date: 25th and 26th November 2022
Venue: Room no. 002, Ground floor, GG Building
Instructor: Dr. Raj Hirwani
Dr. Raj Hirwani
Adjunct Professor, DSSE
Emeritus Professor, AcSI
Former Director, URDIP
www.wrcb.in
022-25765502

MAJOR EVENTS ORGANISED BY DEAN ACR OFFICE

ASHANK DESAI CENTER FOR POLICY STUDIES- LAUNCH

The Institute launched the 'Ashank Desai Centre for Policy Studies' on 21st September,2021 during a Hybrid event. The launch was presided by Prof. Kaushik Basu (Professor of Economics and the Carl Marks Professor of International Studies at Cornell University), Dr. Naushad Forbes (Co-Chairman, Forbes Marshall) , Ms. Yamini Aiyar (President and Chief Executive, Centre for Policy Research), and Mr. Ashank Desai (Founder, Vice-Chairman & MD, Mastek Limited). Mr. Desai's generous donation to the Centre for Policy Studies at IIT Bombay has provided a much-needed boost to this nascent field.

The Ashank Desai Centre for Policy Studies aims to collaborate with and contribute to these various disciplines, borrowing their strengths and offering policy expertise.

ALUMINATION

The flagship event of SARC, was organized virtually from October 22- October 24,2021. The most opportune and the much-coveted three-day fest serves as a suitable medium for promoting conducive student-alumni interactions and providing deep foresight into your malleable future. The event witnessed participation of the following Alumni - Mr. Shubham Kumar - AIR 1 UPSC CSE 2020, Mr. Lalit Keshre – CEO Groww, Mr. Raj Mashruwala – Partner (Emeritus), Mr. Vinod K Meena - Lead - Business Finance & Strategy - OYO LATAM, Mr. Sagar Sambrani - Vice President, FX Options Trading Barclays Investment Bank, Mr. Ramandeep Singh – Consultant McKinsey & Company and Mr. Ashwini Jain – Founder & CEO of ForeignAdmits.

Moreover, students could get enlightened on a spectrum of topics spanning Career guidance, corporate exposure, Life Learning, and Motivational Talks.

INSTITUTE ALUMNI DAY

Institute Alumni Day' was held on **December 26,2021** in a hybrid mode. As a part of the event, **Distinguished Service Awards 2021 (DSA)** were bestowed on **five** of our alumni this year, who besides being achievers in their own chosen domains, have contributed in a notable and sustained manner to the progress of the Institute.

Chapter Service Awards 2021 (CSA) were also conferred upon nine of IIT Bombay alumni who have contributed in a very notable and sustained manner to the progress of the Chapter and also to the progress of the Institute.

On the Alumni day, the Silver Jubilee Batch (class of 1996) came together to pledge a sum of **Rs. 17 Crores** towards their legacy project, 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 event witnessed the launch of IIT Bombay's fundraising campaign **'GO IIT Bombay'** for the year 2021-2022. The campaign aims to raise funds for various campus initiatives.

CLASS OF 1996 SILVER JUBILEE REUNION

Class of 1996 celebrated its silver jubilee reunion between 24th – 26th December,2021. The reunion was attended by over 135 participants. An invigorating discussion with the Director and Dean ACR was held on various matters related to the Institute.

FOUNDATION DAY

The 63rd Annual Foundation Day celebrations were held on March 10, 2022 at IIT Bombay's campus. The Chief Guest at the event was Dr. Anil Kakodkar, a renowned nuclear physicist (Chancellor, Homi Bhabha National Institute; Chairman, Rajiv Gandhi Science and Technology Commission; and Member, Atomic Energy Commission). The Institute recognized distinguished alumni members who have excelled in their professional fields with the Distinguished Alumnus Awards (DAA) as well as the Young Alumni Achiever Awards (YAAA), which were given to young outstanding alumni members who are below 40 years of age. It was extremely heart-warming to see our alumni members and awardees accompanied by their parents. The happiness our alumni felt was nothing compared to the pride and smiles on their parents' faces when they saw their children being honored and receiving their awards amid their peers, senior Institute officials and other dignitaries who graced the occasion.

The Foundation Day celebrations also celebrated the awards instituted by two distinguished IITB alumnus, Mr. Rakesh Mathur, who has funded two Research Excellence Awards titled Prof. H.H. Mathur award and the Prof. S. C. Bhattacharya awards over the years. The awards for this year's recipients were presented during the Foundation Day celebrations on:

- Prof. Jayesh Bellare, Department of Chemical Engineering, was conferred the 'Prof. H. H. Mathur Award for Excellence in Applied Sciences'
- Prof. Jugal K. Verma, Department of Mathematics, was conferred the 'Prof. S. C. Bhattacharya Award for Excellence in Pure Sciences'.

TECHNOCRAFT CENTER FOR APPLIED ARTIFICIAL INTELLIGENCE-LAUNCH

Inauguration of TCA21 by
Chief Guest Dr. Anil Kakodkar

Address by
Mr. Sudarshan Saraf (left) and Dr. Sharad Saraf

The Technocraft Centre for Applied Artificial Intelligence (TCA2I) at IIT Bombay, established through the generous donation by the Institute's distinguished alumni Dr. Sharad Kumar Saraf (B. Tech, Electrical Engineering, 1969) and Mr. Sudarshan Kumar Saraf (B.Tech., Mechanical Engineering and Manufacturing Engineering, 1970) further elevates the Institute's position. The Centre's vision is to create a platform that can enable academia and industry sectors to leverage the benefits of Artificial Intelligence and Machine Learning techniques in various domains with a focus on working for the defence sector to build AI enabled military equipment.

This Centre was formally inaugurated on April 8, 2022 by the Chief Guest for the event Padma Vibhushan, Dr. Anil Kakodkar, a renowned nuclear physicist (Chancellor, Homi Bhabha National Institute; Chairman, Rajiv Gandhi Science and Technology Commission; and Member, Atomic Energy Commission) in presence of IIT Bombay's Director Prof. Subhasis Chaudhuri and the Saraf brothers.

CSR CONCLAVE

IIT Bombay's Annual Corporate Social Responsibility Conclave 2022, Tech for Sustainable Development, held on July 6, 2022, was a resounding success. A large number of India's biggest corporates who attended the conclave were hugely impressed at the Institute's formidable forays into critical areas of research to develop actionable, cost-effective, sustainable, and scalable solutions that can solve pressing challenges of national and global importance. These include education, healthcare, rural development and agriculture, sustainability, skills and entrepreneurship, women empowerment, social and policy development. Prof. Ravindra D. Gudi, Dean, Alumni and Corporate Relations, IIT Bombay, gave an enlightening insight to corporates present on the Institute's R&D projects in these core areas. Mr. Amarjeet Sinha, Former Advisor in the Prime Minister's Office and Retired IAS officer presided over the event as the Chief Guest in virtual mode." Ms. Sujata Saunik (IAS), Additional Chief Secretary, General Administration Department (GAD), Government of Maharashtra (India), and Takemi Fellow, Harvard University, graced the conclave as the Guest of Honour. Ms. Saunik was also a panellist in 'Climate Change Mitigation through Technology and Innovation'.

The presentations were followed by panel discussions with industry experts and faculty members on issues related to its core themes.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KCDH


July 6, 2022
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60TH CONVOCATION

August 2022 brought with it the annual 60th convocation ceremony which was held on August 20, 2022. Mr. Kumar Mangalam Birla, Chairman, Aditya Birla Group, was the chief guest and delivered the convocation address. During the main convocation session, a total of 2551 degrees were awarded to 2324 students. We achieved a major milestone as an Institute when we awarded a total of 449 Ph.D. degrees this year (the first time that any Indian academic institute has produced more than 400 Ph.D. graduates in a year).

REUNION CONVOCATION

Since the pandemic played havoc with our lives, the students from the 2020 and 2021 batches did not get to enjoy one of the best days of their college lives – their convocation ceremony in person. To make good, IIT Bombay hosted a special reunion convocation on August 6, 2022, exclusively for them. It was rewarding to see the excitement and pride on their faces as they returned to their alma mater to have a photo-op of them receiving their degrees in person, while also celebrating the event with their friends and peers.

INAUGURATION OF IIT BOMBAY'S TRUST LAB

IIT Bombay launched the 'IIT Bombay Trust Lab' on September 15, 2022. The Lab is a foundational initiative that envisions strengthening the country's digital environment and making it more trustworthy, and also working towards a secure and responsible Digital India. Established through the generous contribution made by the Institute's alumnus Dr. Shridhar Shukla (B. Tech, EE, 1983), the lab is a huge step forward in IIT Bombay's mission of creating world-class research ecosystems in key technology areas. The Lab, to be set up in the Department of Computer Science and Engineering at IIT Bombay, will be headed by Prof. Manoj Prabhakaran, Vijay and Sita Vashee Chair Professor at the Institute.

The lab was inaugurated with a special ceremony held on campus. Prof. Tal Rabin (Rachleff Family Professor of Computer Science at the University of Pennsylvania) delivered the keynote address. The vibrant event witnessed the launch of the logo and the website for the 'IIT Bombay Trust Lab' and included two panel discussions on the "Digital trust ecosystem in India" and "Technology challenges in digital trust". The moderator for the first panel discussion was Prof. G. Sivakumar (Professor at Dept. of CSE, IIT Bombay and Co-Principal Investigator, IITB Trust Lab) and the panelists were Mr. Sameer Ratolikar , Mr. Nandkumar Saravade and Ms. Rama Vedashree. The moderator for the second panel was Prof. Umesh Bellur and the panelists included Mr. Dilip Asbe, Mr. Sanjay Jain and Prof. Sandeep Shukla (IEEE Fellow and ACM Distinguished Scientist, Professor, CSE, IIT Kanpur).

IIT Bombay is grateful to Dr. Shukla for his generosity and for helping accelerate IIT Bombay's endeavour to develop innovative solutions to challenges of national and global importance.

WOMEN GEN ZERO

IIT Bombay honored and celebrated the exceptional achievements of 30 of its women alumni with a special event, the 'IIT Bombay Gen Zero Women Initiative', held at the IIT Bombay campus on Friday, September 23, 2022. The Institute felicitated its women alumni who represent the initial years of IIT Bombay since its establishment in 1958. A coffee table book, 'Her Story- IIT Bombay Gen Zero Women' and a podcast series, highlighting the inspiring journeys of these accomplished women from diverse fields such as research, business, academia, technology, public service and more were launched during this inspiring occasion. Padma Shri awardee and former captain of the Indian Women's Cricket Team Ms. Diana Edulji, and Founder & CEO, Nykaa, Ms. FalguniNayar, presided over the event.

The Institute is indebted to its alumnus, Mr.D.C. Agrawal (B.Tech, Mechanical Engineering, 1969), his late wife, Ms. Renu Agrawal and the IIT Bombay Heritage Foundation for their generous contribution to this initiative.

N. R. KAMATH DISTINGUISHED LECTURE

N.R.Kamath Distinguished Lecture was held on August 16, 2022 in a Hybrid mode. The title of the lecture was '“Recent Progress in the Design of PID Controllers”'. The speaker for the lecture was Prof. Shankar P. Bhattacharyya (Professor of Electrical Engineering, Robert M. Kennedy Professor at Texas A & M University)

LEGACY PROJECTS

CLASS PROJECTS

The institute celebrates its Alumni Day in December every year. Batch reunions held during this period have included a tradition of contributing back to IITB through a Legacy Project to support various initiatives.

The Contribution is viewed by students as:

- A token of their appreciation for the role that their years at IITB played in their professional and personal development.
- A way of helping the institute to advance its goals by supporting the institute in critical areas which are underserved by institute funding.

Following is the list of the various Class projects maintained by the Dean ACR office.

Please note that the below summary for class projects only contains projects funded by the classes as a whole and have excluded projects funded by individual large contributions.

Since these projects are funded through a common collection pool, without making a distinction between where the donations have been collected from, we have proportioned the total cost in proportion of funds received via HF as compared to the total funds received to give a more accurate picture of the contributions made via the HF funds utilization.

CLASS OF 1969

Due to the increase in the intake of students and doubling of room occupancy, most students preferred to study in study rooms instead of their own rooms. But hostels especially the old legacy ones did not have a dedicated study room. Hence with the generous funding from class of 1969 has supported the creation of study rooms in hostel 3 & 6, which were in requirement of study rooms.

The batch also has supported the conversion of lighting into campus to LED which will not only increase the quality of lighting in the institute, but also save a significant amount of cost for the institute. These lightings will also help reduce the carbon footprint of the institute and help it towards its aim towards sustainability.

Along with these the batch also generously supported the Financial Aid Program which is used to provide aid to economically needy students.


Hostel 6 study room after furnishing.

CLASS OF 1971

The Class of 1971 will be visiting the campus in December 2022 to celebrate their golden jubilee reunion. We are in discussion with the batch leaders to figure out what is the best use of the legacy funds collected.

CLASS OF 1972

The Class of 1972 will be visiting the campus in November 2022 to celebrate their golden jubilee reunion. We are discussing with the batch leaders to identify the best use of the legacy funds collected.

CLASS OF 1980

The Class of 1980 had their Ruby Reunion in 2020. They decided to support the creation of the Design & Making Lab in DESE 108.

The UG students working in the Design and Making Lab.

Design & Making Lab: The proposed Design and Making Lab will be utilized to conduct the Engineering Drawing Workshop for all the Undergraduate 1st year students. Every year, more than 1400 students enroll for the workshop and this number keeps growing. The lab will allow students to gain access to top-of-the-class equipment for mechanical and electronic work including 3D printers, laser cutters, the latest workstations with CAD (Computer-aided Design software), and a complete electronics setup.

The lab will introduce students to the latest design and making practices akin to industry standards and will generate a sense of excitement among first year students. This will invigorate the inner engineer among students and encourage them to find innovative solutions to problems. This lab will immensely benefit generations of students to come, thanks to the generosity of the Class of 1980.

Along with that the batch also provided significant support for student aid in the form of student Scholarships and financial aid program. Some of the alums also donated towards improvement of hostel infrastructure which will be used towards the maintenance and upkeep of hostels. The batch also provided funding for COVID assistance during he peak of the pandemic thus helping the institute cope with the pandemic.

CLASS OF 1981

The Financial Aid Programme (FAP) originated in July 2007 with a generous endowment by the Class of 1981. The objective was to provide educational funding to IIT Bombay students with social and economic disadvantages. Since its inception in 2007, FAP has supported hundreds IITB students with donors spread across geographies and generations spanning batches between 1967 and 2020.

The class also supported Mess Workers Incentive Fund which was used for the benefit of mess workers working in hostel mess. The batch also provided Fellowships to promote research in the Centre for Technology Alternatives for Rural Areas (CTARA).

CLASS OF 1982

IIT Bombay is undergoing this rapid growth phase even as other institutions in India and abroad are planning to expand too. This creates significant challenges in attracting faculty to IIT Bombay. The Young Faculty award (YFA) was established by Class of 1982 to attract outstanding young faculty and augment current faculty to support IIT Bombay's pursuit of excellence in research and academics. The YFA has been awarded from 2010 onwards and has now been supported by all batches. It has become one of the most successful alumni-funded projects at IIT Bombay with each subsequent batch contributing to the YFA fund. Till now upward of 404 talented faculty have been awarded with the YFA. The list of this years YFA recipients has been shared below in the YFA section.

CLASS OF 1984

The Retired Faculty Wellness Fund (RFWF) is a supplementary medical insurance program, initiated by the Class of 1984 as gurudakshina for their retired teachers. Faculty who retired prior to 2003 had no medical coverage offered from the Institute. Many of the teachers were well into their 70s and lacked adequate medical coverage at a time when they needed it the most. Thus, the corpus for Retired Faculty Wellness Fund was created with over 150 faculty members as beneficiaries. The initiative provides supplementary medical insurance from ICICI Lombard to all retired faculty members (and spouses) who retired prior to 2003.The entire annual premium for this closed group

policy is paid out of the Retired Faculty Wellness Fund. The initiative began as a legacy project by the class of 1984 and was supported by other successive batches. Over the 6 years, this initiative has also witnessed a landmark expansion in terms of the scope of its impact. The program has been instrumental in providing support in terms of health insurance for hundreds of faculty who have now retired from IIT Bombay.

CLASS OF 1985

The generous funding from class of 1985 has supported Chair Professorship in Technology and Sustainable Development. Prof. Parag Bhargava (2021-2024) from Department of Metallurgical Engineering and Material Science currently presides the chair.

The Class of 1985 has also supported Entrepreneurship Cell: Eureka, Retired Faculty Wellness Fund and Young Faculty Award. Details of the projects have been given in separate sections below.

IIT Bombay's Class of 1985 supported Eureka through sponsoring events, awarding prizes, helping create a seed fund and supporting outreach activities. In 2010, THOMSON REUTERS declared 'Eureka!' as "Asia's Largest Business Model Competition."

CLASS OF 1986

Class of 1986 is the first batch to initiate a project for students' mental wellbeing. The objective was to create awareness, augment life and productivity skills amongst the IITB students. They gregariously promoted the importance of Preventive and Positive Mental Health Work through mentor trainings, professional counselling, workshops, exhibitions and films, parents' orientation programs and other outreach activities. Narcotics Control Board complimented IITB on the initiative of involving students in spreading awareness against substance abuse.

Positive self-affirmation exercise with students.

CLASS OF 1990

The Class of 1990 had their silver jubilee Reunion in December 2015. The batch initiated various projects with the funds collected as part of their Legacy Project over and above the regular projects covered by the Legacy batches. These projects are listed below:

1. **IIT Bombay Vaccination Drive:** In the institute's effort to secure the campus by vaccinating all campus residents, IIT Bombay had to raise funds for staff that could not afford the vaccines. Class of 90 responded immediately to the call and funded the vaccination of more than 100 of the staff on a very urgent basis.
2. **IDEAS:** Innovation, Development & Entrepreneurship Program with Alumni Support was initiated to provide resources and to foster innovation at IIT Bombay for furthering entrepreneurship.

   The IDEAS program has come into full force since August 2018. Students have benefitted in finding their entrepreneurial drive, learned to choose an idea to pursue and figured out the right steps to create the venture. 19 teams have participated in two cohorts of Level 1 program and 10 teams were selected in the first cohort of Level 2. 10 teams out of these are still actively pursuing their ideas. In total, the teams have so far raised more than Rs. 12 Crore in grants, prizes, or equity financing beyond the IDEAS program. We see that there are many noteworthy startups out of IDEAS that decipher a real problem and have become even more germane in the post-COVID world. For example, 'HelpNow' which is a med cab/ambulance provider reducing the exigency response time, 'Apli.AI' which provides a platform for companies to appoint from nationwide campuses digitally, 'AiRTH' which has prospered a quirky and highly coherent filter to purify the air and many more. The work done by IDEAS is extremely commendable and is like a beacon of light that clears the vision and path of IITB students.
3. **Clean Green Campus Program:** The objectives of the Clean Green Campus Program are - to facilitate creation of a Model Clean, Green Campus at IIT Bombay that will be the Benchmark of every other academic institute in India, and to institutionalize a legacy project that is inspiring and sustainable for every future batch to contribute.

   Bio-Gas Plant: As part of the Clean Green Campus Program a 2-tonne Bio-Gas plant was set up to utilize food waste from a set of hostels and to increase the green energy footprint of the campus.

Biogas Plant instituted by the Class of 1990.

The plant will reduce energy costs and drive sustainability. As IITB had one precedent of a poorly functioning earlier bio-gas plant and the Class of 1990 had to work twice as hard with the Dean – IPS to ensure that this plant was in the right place, had affordable setup and running costs, and had the appropriate resourcing and systems to ensure that it functioned to capacity. The site is just off H-12/13/14. It is fed food waste from five to six hostels and the energy generated is piped to the 12/13/14 kitchen; With over two tons of organic waste fed to the plant each day, the plant generates around 144 Cubic Meters of Biogas daily which is enough to supplement 3 - 4 industrial scale LPG cylinders daily. Apart from repurposing the waste, the project saves more than 15 Lakh Rupees in LPG cost every year, effectively paying for itself over the span of four to five years.

Eco-Friendly Fans installed in the hostels

Energy Efficient Bulbs and Fans: Apart from the biogas plant, energy efficient LED Bulbs and BLDC fans were fitted into Hostels 12, 13 & 14. The bulbs consume 30% less electricity compared to normal bulbs while the fans save up to 40% energy compared to normal fans for the same output. This has significantly worked towards reducing the energy consumptions of these hostels and reducing their carbon footprint.

We hope the other batches and hostels will follow suit, and this will be the norm in all buildings across the campus.

With the precedent set up by the class of 1990, such bio-gas plants and energy efficient light bulbs will become a part of every new hostel that comes up at IITB.

4. **ARTS@IIT Bombay:** As part of the class project various art projects were installed at some of the most prominent locations in the campus. These will serve as a reminder of the contributions of our alumni to the institute.

Hands Reaching out Structure mad efrom thesteel rods extraaed from the demolition of the infinity corridor

Terracotta Horsescreated by tradibonal pottersfrom Pudukkottai outside of IDC; Donated by the CI ass of 1990.

CLASS OF 1991

1991 Batch Leaders at the Silver Jubilee Reunion held in Dec 2016

The Class of 1991 had their silver jubilee Reunion in December 2016. The class has generously supported the retired faculty wellness fund which is being used for the benefit of IITB faculty which retired without health insurance.

We are in discussions with the batch to figure out the best use of the remaining funds collected as part of the legacy project.

CLASS OF 1992

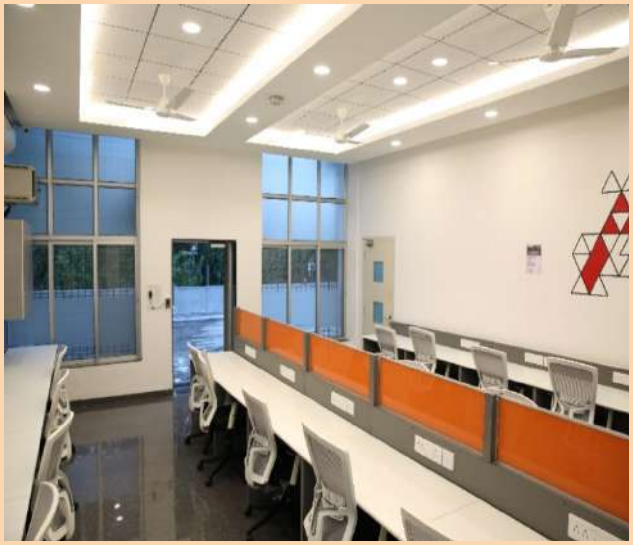
Along with the usual projects the 1992 batch undertook a number of novel initiatives as part of their Legacy Project focusing on a wide variety of issues.

1. **Café 92:** Some of the fondest moments in any student's life in IIT Bombay are the ones spent socializing with friends at the various cafes around the campus. More than tutorials and exams, students after graduating, remember the Maggie and chai they shared at such hangout spots. To facilitate the same, the batch of 1992 has started the initiative of building a café called Café 92. It will serve as a center for students to hang out between and after their lectures. We are certain that this café will be fondly remembered by the students even years after they graduate. The café has become the center of attraction for students. once the campus reopens.

Café 92: Cafe instituted by the class of 1992 as part of their legacy project

2. **PROJECT BANDHU:** IIT Bombay has one of the most high-pressure environments among institutes in India in terms of the expectations from students. With ambitious and top performing students coming from all over India, the competition in IIT Bombay is ferocious and expectations to excel are tremendous. This constant pressure can lead to mental illnesses ranging from mild disorders to serious issues like depression and anxiety. According to a survey conducted by the project, more than 60% students suffered from mental ailments with no recourse. As a result, the batch of 92 has started the project BANDHU, an aid for students who need help. As part of the program, various initiatives like 24*7 online counselling, a self-help website, socio- emotional workshops etc., have been started. With more than 7.5k users till now and more than 12 workshops conducted with 100+ students, the program has been immensely successful and beneficial for students from all fields.

2. **Hostel Study Rooms:** Most of the students prefer to study in study rooms as opposed to hostel rooms that can be cramped and distracting. Until now, only the study rooms in the departments or the library were available. This was a matter of inconvenience for students given the long commute from their hostels. In addition, the number of study rooms was proving to be insufficient given the increase in the student capacity on campus. Therefore, the batch of 1992 created air-conditioned study rooms for hostels 3, 9 and 11 which will be highly beneficial for the students in these hostels. It is envisaged that study rooms will become an inherent feature of all hostels in the future.

Renovated Study rooms in Hostel 3 & 9

CLASS OF 1993

1993 Batch Leaders at the Silver Jubilee Reunion held in Dec 2018

The class of 1993 continued the tradition of support to the young faculty award and the retired faculty wellness fund by donating generously to those projects.

Along with this, the class of 93 also wished to focus on the building and maintenance of infrastructure. Hence, they agreed to fund the maintenance of a 240 seater lecture hall which has been named the "class of 1993 Lecture Hall" to honor the donation.

Inauguration of the Class of 93 Lecture Hall

We are in discussion with the batch leaders to determine utilization of balance funds.

CLASS OF 1994

The projects undertaken by the class of 94 are as follows:

1. **IIT Bombay Covid Vaccination Drive:** In the institute's effort to secure the campus by vaccinating all campus residents, IIT Bombay had to raise funds for staff that could not afford the vaccines. Class of 94 responded immediately to the call and funded the vaccination of more than 200 of the staff on a very urgent basis.

2. **Growth India Telescope:** GROWTH-India is part of the "Global Relay of Observatories Watching Transients Happen" – an international collaboration spanning sixteen institutes across nine countries. The focus of the interdisciplinary project is to undertake continuous studies of cosmic sources that have rapidly varying properties, like emission from gravitational wave events, young supernovae, and near-earth asteroids. The Growth India Telescope is a robotic telescope set up in collaboration with Indian Institute of Astrophysics, in Ladakh and is one of the few such facilities in outside of Europe and US. It has helped in interdisciplinary research work at UG and PG level and is instrumental in the research carried on by IIT Bombay as part of the Growth India Project. Most recently IITB students discovered 2020 QG, the closest asteroid that flew past Earth without impacting it by the use of this telescope.

   The project was in immediate need of funding in order to retain access to the telescope. The Batch of 1994 generously agreed to use part of the donations collected as part of the Silver Jubilee Legacy Project which has allowed us to maintain access to the telescope and ensure continuation of ongoing research.

3. **IT Hardware Scholarship (Covid – 19 support):** Due to the pandemic, the classes at IIT Bombay had to be shifted online thus necessitating the use of laptops/computers. A lot of students faced financial issues due to the pandemic and were not in a position to procure a laptop. Towards helping these students this batch has generously donated towards IT Hardware Support which has benefitted upward of 200 students. UG and PG Students were provided with a laptop and broadband connection which is helping them immensely in seamlessly attending online classes, virtual projects, and their coursework.

CLASS OF 1995

The class of 1995 continued the tradition of support to the young faculty award and the retired faculty wellness fund by donating generously to those projects.

The class of 1995 also donated to IIT Bombay Covid Vaccination Drive. In the institute's effort to secure the campus by vaccinating all campus residents, IIT Bombay had to raise funds for staff that could not afford the vaccines. Class of 95 responded immediately to the call and funded the vaccination of more than 200 of the staff on a very urgent basis.

CLASS OF 1996

The Class of 1996 met in December of 2021 for silver jubilee reunion this year. Along with funding the young faculty awards and retired faculty wellness fund , thus continuing the tradition of support to these alumni led initiatives, the class of 1996 has also decided to introduce two novel initiatives:

a. **Funding Student Tech Teams:** Over the years the number of tech teams in IIT Bombay has increased significantly with most of them creating spectacular submissions for competitions both local and abroad. The quality of their work and the competitions they can participate in are currently restricted by the funding available to them. Hence the class of 1996 has decided to create an endowment which will be used to fund such student tech teams and help them shine both at home and abroad.

b. **Endowment for Entrepreneurship:** Over the years the institute has also seen an increase in the number of startups incubated as part SINE which is the IIT Bombay Incubator for tech-based startups. To help SINE in its journey to attract the best startups and promote newer and innovative technology, the batch will set up a fund which will be used for the benefit of SINE.

CLASS OF 1997

The Class of 1997 is meeting for silver jubilee reunion this year in december. The batch is collectively working on raising fund and post reunion we will be in discussion with the batch leaders for fund utilization.

CLASS OF 1998

The generous funding from class of 1998 has supported Chair Professorship in Quantum Computing. Prof. R. B. Sunoj (2020-2023) from Department of Chemistry currently presides the chair.

The class of 1998 as part of their reunion set up a travel fund for students to be able to travel abroad to publish and present their research. This initiative has been undertaken in an attempt to incentivize quality research and provide international exposure to our students while at the same time improving the IITB brand name. The batch set up travel fund in 2019. But unfortunately, due to the pandemic and subsequent travel lockdown, the fund is largely unutilized.

OTHER BATCHES

We are in discussion with class of 1978, 1989 and 1996 of how best to allocate the funds collected as part of their legacy project.

OTHER INITIATIVES BY LEGACY BATCHES/REGULAR GIVING

A. RISE- Student Rural Immersion Program:

One of the goals of IIT Bombay is to create talent that will solve societal problems and change the society for the better. To be able to solve these problems, it is necessary that our students are exposed to them first, so that they get an understanding and appreciation of the problems and issues faced by people.

With this in mind, the Student Rural Immersion Program (RISE) was started. As part of this program UG students are embedded in rural areas so that they are exposed and sensitized to the problems being faced by rural India. Anchored by CTARA this program has been widely popular and successful.

Unfortunately, due to the COVID pandemic outbreak, the activities of the program had to be stopped. But we hope that we are able to restart the program soon and continue to develop talent to solve the problems of rural India.

B. Retired Faculty Wellness Fund:

The Retired Faculty Wellness Fund (RFWF) is a supplementary medical insurance program initiated by Class of 1984 as 'GURUDAKSHINA' for their teachers who had retired prior to 2004. The program was initiated as regular medical coverage was not available to those IITB faculty who had retired prior to 2003. The RFWF provides supplementary medical insurance from ICICI Lombard to all retired faculty members (and their spouses) who retired prior to 2004. Every year each Silver Jubilee Batch provides funding which goes into paying the premiums of the insurance program.

C. Young Faculty Awards:

IIT Bombay is undergoing this rapid growth phase even as other institutions in India and abroad are planning to expand too. This creates significant challenges in attracting faculty to IIT Bombay. The project focuses on attracting outstanding young faculty to replace retiring faculty and to augment current faculty to support IIT Bombay's pursuit of excellence in research and academics. The "Young Faculty Joining Bonus", initially a Class of '82 Legacy Project, has been awarded from 2010 onwards and has now been supported by all batches. The YFA award beneficiaries in the year 2021-22 are:

Sr.No.	Name of employee or applicant	Name of the Department
1	Amuthan Ramabathiran	Aerospace Eng.
2	Rahul Maitra	Chemistry Dept
3	Amber Jain	Chemistry Dept
4	Piyush Pandey	SJM Sch of Mgnt
5	Prabhir Vishnu Poruthiyil	CPS
6	Ankit Jain	Mech. Eng.
7	Arnab Dutta	Chemistry Dept
8	Himadri Dhar	Physics Dept.
9	Deepak Singh	C.S.R.E.
10	R. Ganesh	Mech. Eng.
11	Avradeep Pal	M.E.M.S.
12	Avishek Ranjan	Mech. Eng.
13	Karthik Sasihithlu	Enrgy Sci & Eng
14	Albert Thomas	Civil Eng.
15	Rohan Chinchwadkar	SJM Sch of Mgnt
16	Vijayshankar Dandapani	M.E.M.S.
17	Saikat Mazumdar	Maths Dept.
18	Venkata Sai Vamsi Botlaguduru	C.E.S.E.
19	Monika Bhattacharjee	Maths Dept.

Sr.No.	Name of employee or applicant	Name of the Department
20	Nagendra Kumar	Aerospace Eng.
21	Biswabandan Panda	Comp Sci & Eng.
22	Srinivasan Ramakrishnan	Chemistry Dept
23	Biplab Banerjee	C.S.R.E.
24	Aditi Chaubal	Humanities & Ss
25	Dwaipayan Mukherjee	Electrical Eng.
26	Mithun Chowdhury	M.E.M.S.
27	Sanjog Nagarkar	Chemistry Dept
28	Parmeshwar Udmale	C.T.A.R.A.
29	Anand Singh	Earth Sciences
30	Eswar Rajasekaran	Civil Eng.
31	Mrinal Kumar	Comp Sci & Eng.
32	Deepoo Kumar	M.E.M.S.
33	Vidhya Soundararajan	Humanities & Ss
34	Nitesh Yelve	Mech. Eng.
35	Rahul Sapkal	CPS
36	Pinom Ering	Civil Eng.
37	Ayan Bhattacharya	Maths Dept.
38	Ramkumar Rajendran	Edu. Technology
39	Asish Sarangi	Enrgy Sci & Eng
40	Sakthi Chinnasamy	Earth Sciences
41	Tabish Nawaz	C.E.S.E.
42	Rohit Gupta	Aerospace Eng.
43	Mahendra Shahare	Humanities & Ss
44	Avinash Bhardwaj	Mech. Eng.

Sr.No.	Name of employee or applicant	Name of the Department
45	Harsha Hutridurga Ramaiah	Maths Dept.
46	Rohit Gurjar	Comp Sci & Eng.
47	Jason Picardo	Chemical Eng.
48	Anupam Guha	CPS
49	Snehal Awate	SJM Sch of Mgnt
50	Deepak Jain	Electrical Eng.
51	Maniraj Mahalingam	Physics Dept.
52	Aravind Balan	Aerospace Eng.
53	Satish Mulleti	Electrical Eng.
54	Soham Mujumdar	Mech. Eng.
55	Dipanshu Bansal	Mech. Eng.
56	Swati Pall.	D.C
57	Pramod Kumar	Physics Dept.
58	Souvik Banerjee	Humanities & Ss
59	Amit Singh	Mech. Eng.
60	Chirag Deb	Urban Sci & Eng
61	Srinidhi Balasubramanian	C.E.S.E.
62	Dhwanil Shukla	Aerospace Eng.
63	Hridis Kumar Pal	Physics Dept.
64	Swatantra Pratap Singh	C.E.S.E.
65	Arun Mascarenhas	I.D.C
66	Bharatkumar Suthar	Chemical Eng.
67	Nitin Kumar	Physics Dept.
68	Debraj Das	Maths Dept.
69	Triratna Muneshwar	M.E.M.S.

Sr.No.	Name of employee or applicant	Name of the Department
70	Satish Maurya	Earth Sciences
71	Karthikeyan Lanka	C.S.R.E.
72	Manoranjan Sahu	C.E.S.E.
73	Abir DeComp	Sci & Eng.
74	Ishita Sengupta	Chemistry Dept
75	Subrato Banerjee	Humanities & Ss
76	Rajesh Patkar	Bio-sci Bio-eng
77	Raile Ziipao	Humanities & Ss
78	Smriti Haricharan	Humanities & Ss
79	Siddhartha Santra	Physics Dept.
80	Durga	A.M.E.M.S.
81	Swaprava Nath	Comp Sci & Eng.
82	Debanjan Bhowmik	Electrical Eng.
83	Abhishek Chakraborty	C.E.S.E.
84	Naina Manjrekar	Humanities & Ss
85	Mrinal Kaul	Humanities & Ss
86	Abhijit Gogulapati	Aerospace Eng.
87	Saptarshi Ghosh	Humanities & Ss
88	Piyush Pandey	SJM Sch of Mgnt
89	Chidambar Kulkarni	Chemistry Dept
90	Debanjana Mitra	Maths Dept.
91	Pennan Chinnasamy	C.T.A.R.A.
92	Srineash V.K.	Civil Eng.
93	Darshan Shah	Mech. Eng.
94	Shiladri Chakraborty	Electrical Eng.
95	Vishal Dixit	Climate Studies

A. HATS:

The cooks and mess workers who work hard every day in hostel messes to ensure that the students are well fed are often underappreciated. Hence to appreciate their crucial contributions towards the development of the students, every year the mess employees who have completed 10 years and 25 years of service are given a monetary bonus of around Rs. 50,000 as a token of appreciation. This fund comes through the generous contribution of the Alumni, who have themselves benefited from the hard work of these workers.

For HATS, In FY 21-22, $ 10000 have been committed and will be disbursed in due course of time.

B. Financial Aid Program (FAP):

The Financial Aid Program (FAP) was started in 2007 by the Class of 1981 to provide educational funding students with social and economic disadvantages.

The FAP scholarship is a peer-to-peer scholarship with the students expected to pay back the scholarship when they are financially stable in the future once they graduate, which will then go to funding other needy students. All students across all programs and disciplines are eligible for support.

FAP covers the entire registration fee of students including tuition fees, mess bills, etc. Other value additions added in recent years include mentoring opportunities, industrial visits, etc. Most students donate back the money in timelines suited to their individual situations once they secure a job, thus keeping the endowment perpetual and growing.

Almost each legacy batch adds some amount of money to the endowment pool thus ensuring that the endowment continues to grow and help students in need.

CHAIR PROFESSORSHIPS

Halepete Family Chair of Artificial Intelligence Research

Prof. Soumen Chakrabarti

Email: soumen@cse.iitb.ac.in
Department of Computer Science and Engineering

This Chair Professorship has been established through the generous donation by Mr. Sameer Halpete, an IIT Bombay alumnus (EE, '93) for advancing research in Artificial Intelligence related areas.

We are grateful to the Halepete family for their recognition and generous support of our research program. Our group has already benefited from generous GPU gifts from Nvidia since 2016. We expect such continued support to make it easier for us to attract talent and deliver publishable and useful research in the domain of natural language understanding, knowledge representation and inference.

-Prof. Soumen Chakraborti

TEACHING AND RESEARCH HIGHLIGHTS

During the previous year (the third and final year of the chair professorship pending renewal), Prof. Soumen and his team focused on the following problems.

Question answering

Knowledge graphs (KGs) like Wikidata provide a wealth of structured knowledge about the world. Many KG facts (e.g., person president-of nation) are associated with periods of validity. Question answering (QA) over such KGs involve temporal reasoning, e.g., "who was the prime minister of Japan when the first moon landing happened?" Challenging temporal KGQA datasets are still few. In collaboration with Google, Prof. Soumen and his team released the CronQuestions dataset, and a promising baseline QA system called CronKGQA. A topic of much recent interest is multi-modal QA, involving not only text but also KGs, tables, images, audio, and video. In collaboration with IBM Research, they released the AITQA table QA data set.

In contrast to earlier open-domain but relatively homogeneous tables from Wikipedia, AITQA includes challenging domain-specific scientific and business documents, encountered in industrial settings, which exhibit some unique characteristics:

(a) they contain tables with a much more complex layout than Wikipedia tables (including hierarchical row and column headers),

(b) they contain domain-specific terms, and

(c) they are typically not accompanied by domain-specific labeled data that can be used to train Table QA models.

An accompanying paper was presented at NAACL 2022. In related work, they found some of the reasons why systems attuned to simpler settings falter when challenged with such domain-specific complexity, and proposed a method called T3QA (topic transferable table QA) that mitigates some of the limitations. Another area of interest is QA spanning text and images. E.g., we may be shown an image of poachers standing on a murdered elephant, and asked "what are these animals poached for?", use image recognition to extract objects from the image {gun, people, elephant, trees, rocks} and rewrite the query to "what are elephants poached for?" and solve this using conventional QA methods. In collaboration with IBM, they released S3VQA, a data set that tests the ability for such object recognition and effective query rewrites.

Multilingual knowledge transfer

NLP research has lurched at diverse speeds in different languages. Large labeled and unlabeled resources are easy to come by in "high resource languages" (HRLs) but not in "low resource languages" (LRLs). Even the best cloud-based NLP services offered by Google, IBM and AWS falter in many Indian LRLs. Among prominent NLP tasks that are seriously limited by LRL data availability is open information extraction or OpenIE, which seeks to extract (subject, relation, object) textual triples from free text sources. Prof. Soumen and his team have designed AACTrans, a system that effectively transfers labeled OpenIE data in a HRL to LRLs, so new OpenIE systems can be trained for LRLs. They have also worked on canonical relation classification in LRLs, and how to transfer labeled

relation classification datasets from a HRL to LRLs. They have released an accompanying dataset, IndoRE, for Indian language relation extraction. Multilingual KGs like Wikidata have similar language skew: most entity nodes and relation edges have aliases specified in HRLs, but few have LRL annotations. Transfer of knowledge between KGs in different languages can help augment all of them. They have built a multi-task KG alignment system that jointly infers missing KG triples and infers entity and relation alignments.

Neural graph representation and search

Modern search systems convert multimodal inputs such as queries, text, tables, and images to a uniform graph format. This means classic relevance ranking, which evolved in the information retrieval community, must be generalized from vector-space document relevance to measures of graph matching. Many discrete notions of graph matching, such as isomorphism, are computationally intractable. Therefore, neural graph representations and trainable relevance ranking algorithms are needed to go with them. Graph neural networks (GNNs) aggregate a node's neighbourhood information through symmetric functions like sum or average and lose valuable spatial signals. On the other hand, recurrent aggregators are sensitive to the order in which nodes of a graph are presented, which is undesirable. Prof. Soumen and his team designed PermGNN, a method to train recurrent aggregators with adversarial reordering's of nodes which makes graph representations order-invariant but gives better predictive power than typical GNNs. Given training instances, each having a query graph, a few relevant graphs, and some sampled irrelevant graphs from a large corpus, can a system learn graph relevance ranking related to subgraph isomorphism? They answered this in the positive through our IsoNet graph search system.

Social network analysis

Prof. Soumen and his team also worked on two problems related to social networks. One goal was to predict the behavior of an “information cascade” such as an initial tweeting of a news article, followed by a cascade of responses, replies and retweets. Predicting the intensity of a cascade in its early stages is valuable for advertising and misinformation control. They detected some shortcomings in state-of-the-art cascade prediction algorithms based on point processes, and two potential signals to exploit. First, the popularity of the cascade root influences cascade size; but the effect falls off rapidly with time. Second, there is a measurable positive correlation between the novelty of the root content (with respect to a streaming external corpus) and the relative size of the resulting cascade. Responding to these observations, Prof. Soumen and his team propose GammaCas, which outperforms seven recent and diverse baselines significantly on a large-scale dataset of retweet cascades coupled with time-aligned online news. The other goal was to detect and label stance in social media text, strongly motivated by hate speech detection, poll prediction, engagement forecasting, and concerted propaganda detection. They designed a system called SANDS, a new semi-supervised stance detector, along with two new tweet datasets comprising over 236,000 politically tinted tweets from two demographics (US and India) posted by over 87,000 users, their follower-followee graph, and over 8,000 tweets annotated by linguists.

SERVICE AND PUBLIC ENGAGEMENT/ AFFILIATIONS

- Jury member, IEEE John von Neumann Medal, 2021-2022.
- Reviewer for TACL 2020–2022, ACL rolling reviews (ARR) 2020–, WSDM 2021.
- Systems provisioning and planning committee, CSE, IITB.
- Building and space committee, CSE, IITB.

TRAINING OF HIGHLY QUALIFIED PEOPLE

	Masters students	Doctoral Students
Supervised	3	1
Co-supervised	-	4
Graduated	3	-

LIST OF PUBLICATIONS AND PRESENTATIONS

- VarScene: A Deep Generative Model for Realistic Scene Graph Synthesis. With Tathagat Verma, Vishwa Vinay and Abir De. ICML 2022.
- Incomplete Gamma Integrals for Deep Cascade Prediction using Content, Network, and Exogenous Signals With Subhabrata Dutta, Shravika Mittal, Dipankar Das, and Tanmoy Chakraborty. IEEE TKDE 2022.
- AIT-QA: Question Answering Dataset over Complex Tables in the Airline Industry With Yannis Katsis, Saneem Ahmed Chemmengath, Vishwajeet Kumar, Samarth Bharadwaj, Mustafa Canim, Michael Glass, Alfio Gliozzo, Feifei Pan, Jaydeep Sen, and Karthik Sankaranarayanan. NAACL 2022.
- Alignment-Augmented Consistent Translation for Multilingual Open Information Extraction With Keshav Kolluru, Muqeeth M, Shubham Mittal, and Mausam. ACL 2022.
- Interpretable Neural Subgraph Matching for Graph Retrieval With Indradyumna Roy, Venkata Sai Velugoti and Abir De. AAAI 2022.
- Semi-supervised stance detection of tweets via distant network supervision With Subhabrata Dutta, Samiya Caur, and Tanmoy Chakraborty. WSDM 2022.
- Active Assessment of Prediction Services as Accuracy Surface Over Attribute Combinations With Vihari Piratla and Sunita Sarawagi. NeurIPS 2021. code

- Redesigning the Transformer Architecture with Insights from Multi-particle Dynamical Systems With Subhabrata Dutta, Tanya Gautam, and Tanmoy Chakraborty. NeurIPS 2021. Spotlight paper.

- A Data Bootstrapping Recipe for Low-Resource Multilingual Relation Classification With Arijit Nag, Bidisha Samanta, Animesh Mukherjee and Niloy Ganguly. CoNLL 2021. data

- T3QA: Topic Transferable Table Question Answering With Saneem Chemmengath, Vishwajeet Kumar, Samarth Bharadwaj, Jaydeep Sen, Mustafa Canim, Alfio Gliozzo and Karthik Sankaranarayanan. EMNLP 2021.

- Multilingual Knowledge Graph Completion With Joint Relation and Entity Alignment With Harkanwar Singh, Prachi Jain, Sharod Roy Choudhury, and Mausam. AKBC 2021.

- Integrating Transductive and Inductive Embeddings Improves Link Prediction Accuracy With Chitrank Gupta, Yash Jain, and Abir De. CIKM 2021.

- Question Answering over Temporal Knowledge Graphs With Apoorv Saxena and Partha Talukdar. ACL 2021. code trackback Select, Substitute, Search: A New Benchmark for Knowledge-Augmented Visual Question Answering With Aman Jain, Mayank Kothyari, Vishwajeet Kumar, Preethi Jyothi, and Ganesh Ramakrishnan. SIGIR 2021. code

- Joint Autoregressive and Graph Models for Software and Developer Social Networks With Rima Hazra, Hardik Aggarwal, Pawan Goyal, and Animesh Mukherjee. ECIR 2021. (Data.)

- Adversarial Permutation Guided Node Representations for Link Prediction With Indradyumna Roy and Abir De. AAAI 2021.

- Differentially Private Link Prediction With Protected Connections With Abir De. AAAI 2021.

Artificial Intelligence and Machine Learning Chair Professor

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Department of Chemical Engineering

"The AI & ML chair professorship at IIT Bombay has been a great step to intensify research efforts in this emerging area and identify collaborative opportunities to solve large scale industrial problems. I feel privileged to be the first occupant of this chair position. It has enabled me and my co-researchers to substantially enhance the state-of-the-art technology in AI & ML by integrating knowledge about the physics as well as the wealth of information in the data. We plan to bring in some paradigm shifts in the way the AI & ML algorithms are applied to leverage higher integrity-based decision making. A big thank you to Mr. Adil Zainulbhai for instituting this chair professorship."

-Prof. Ravindra Gudi

TEACHING AND RESEARCH HIGHLIGHTS

Prof. Ravindra Gudi has focused broadly in the areas of distilling data to generate knowledge and use the latter for performance enhancement in manufacturing systems. The key difference in his research has been to incorporate first-principles /physics-based knowledge into the AI & ML approaches. His research has sought to make a modest contribution to recoin AI as Augmented Intelligence.

Prof. Gudi's research has resulted in several improvements in the paradigms of neural networks, fuzzy logic, advanced classification algorithms and statistical data processing. His research has been translated into important industry-oriented applications and has also been patented.

The key applications resulting from the research are as follows:

Teaching Highlights:

In addition to contributing to teaching at the graduate level, the following industry courses and webinars were presented:

Invited talks & Continuing Education Programs

- Professional Bodies: (i) Institution of Engineers (India) – Acharya PC Ray Invited Lecture on "Exciting Opportunities in AI & ML for the Industry" (2021), (ii) Award Lecture "Performance Assessment of process systems", International Society of Automation meeting, October (2015).
- Industry Platform: Talk on "Digitalization and AI &ML opportunities in the Oil & Gas", Invited talk under the aegis of Centre of Excellence in Oil & Gas, delivered to the PSU employees (2021).
- Academic Institutions: IIT Jodhpur, NIT- Jaipur, NIT-Jullundur, Manipal University, MVJIT, Ramrao Adik, (2015 to 2021).

Continuing Education Programs in AI & ML

- In-house CEP programs at Aditya Birla Science and Technology Centre
- In-house CEP program at Reliance Industries (Upstream Business)
- In-house CEP program for Yokogawa Technology Industries, Bangalore
- In-house CEP program for DCM (Sugar Business)

Research Highlights:

The following sponsored research projects were initiated during this chair professorship:

1. Engine performance monitoring and integrity analysis in fighter aircrafts (Funding agency: DRDO) (Project funding 45 Lakhs) (2017-2019)
2. Low-Cost Innovative Technology for Water Quality Monitoring and Water resources management for urban and rural water systems in India, (Funding agency DST, under the EU-India water co-operation program Horizon 2020) (https://www.lotus-india.eu/) (Project Funding: 8 Crores with IIT Guwahati as Co-PI institute)

The following industry projects were initiated during this chair professorship:

i. Advanced Intelligence for Demand Forecasting using AI & ML Approaches, (Project with Yokogawa Technology India Limited), Project funding Rs 18 lakhs – Ongoing since 2022)

ii. AI & ML based Development of Predictive model and advanced decision support for quality control and optimization of Heavy fuel oil consumption in Alumina Calciner, (Project Funding from Aditya Birla Metals Business; Funding Rs 8 Lakhs – Ongoing since 2021)

iii. Advanced Intelligence for Demand Forecasting using AI & ML Approaches, (Project Funding from Linde Air Products; Funding Rs 4.5 lakhs – Ongoing since 2021)

iv. Soft sensors for high performance integrity of locomotive engines, (Ongoing), (Project Funding from General Electric, Bangalore; Funding Rs 36 lakhs – Completed 2019)

v. Progress Cavity Pump Failure Analysis in large coal bed methane fields", (Project Funding from Reliance Industries Limited, Rs 12 Lakhs (Ongoing since 2018)

vi. Closed loop model refinement", (Project Funding from Honeywell Technology Solutions, Bangalore, (Rs 8 lakhs), (completed 2018)

Service and Public Engagement/ Affiliations:

(At IIT Bombay)

- Dean (Alumni & Corporate Relations), IIT Bombay, (Feb 2022 to current)
- Professor-in-Charge, IIT Research Park (May 2020 to Feb 2022)
- Professor and Head (Chemical Engineering) (March 2017 to May 2020)
- Professor-in-charge, CE & QIP, IIT Bombay (2015- 2017)
- Institute GIAN coordinator (2016 to current))
- Member of Advisory Committee to Dean (R&D), Dean (IPS), Research park (at various time since 2016)
- Other departmental level positions held: Convenor (faculty search committee), Member of DPC, DPGC, DUGC, Secretary DFM, Co-ordinator of M-Tech Admissions, Faculty co-ordinator for DAMP (weak student mentorship)

(At National level)

- Executive Council Member, Indian Institute of Chemical Engineering, (2020-ongoing)
- Member, DST-SERB-PAC for Chemical and Environmental Engineering, 2018 - 2021·
- President, Advanced Control and Dynamic Optimization Society (ACDOS, India), (2018 - 2020)
- Member, Evaluation Committee, Rashtriya Ucchatar Shikhsa Abhiyaan, (2017)
- Member of Apex Body, Ucchatar Avishkar Yojana,(2017)
- Principal Co-ordinator and NQCC Chair (QIP) under AICTE appointment (2015 - 2017)
- Advisor–SAP for Jadhavpur University (Chemical Engineering) under (UGC appointment) (2015 - 2018)
- Expert Member, DRDO committee on Gas Turbine Enabling Technologies, (since October 2010 - 2017)
- Member of Faculty Selection Committees (IIT-Madras, IIT-Hyderabad, IIT-Delhi, IIT Kanpur, IIT Tirupati, IIT Jammu, JKLU, GITAM & others)
- Member of Board of Studies (NIT-K, NIT-T, SVNIT, Sastra, Banasthali)

(International level appointments as Chairperson and Journal Editorships)

- Elected to the Executive Council, International Federation of Automatic Control (IFAC), (2020-2023)
- International Reviewer for Strategic Project Grants of National Science Foundation (NSF, USA) (Since 2016). International Reviewer for Strategic Project Grants of National Science and Engineering Research Council, Canada (2008 onwards)
- International Reviewer for Strategic Project Grants of National Qatar Research Foundation, Qatar (2012 - current).
- Associate Editor, IFAC Journal of Process Control, (January 2010 onwards).
- Associate Editor, Frontiers in Control Engineering, (August 2021 onwards).
- Editor-in-Chief, 'The Exponent', Honeywell Technology Journal, (2008 - 2010) (Founding Editor)
- Member, IFAC Awards Committee, (2011 - 2013)
- Member, IFAC Industrial Achievement Award selection committee
- Member, EU-India Expert Group for EUCLID (European Union collaboration initiative with India) - support action for collaboration in networked monitoring and control systems technologies (January 2010 – 2013).
- International Reviewer for Strategic Project Grants of National Science and Engineering Research Council, Canada (2008 onwards).
- International Reviewer for Strategic Project Grants of National Qatar Research Foundation, Qatar (2012 - current).
- Organizing Secretary (IFAC conferences DYCOPS 2013 and CAB 2013)
- Conference Administrator (IFAC ACODS – 2016) and Associate Editor for 10 other IFAC conferences

TRAINING OF HIGHLY QUALIFIED PEOPLE

PhD student guidance in AI & ML area

- Misra, Shamik,'Enterprise Wide Optimization: Rigorous Modelling & Computationally Efficient Approaches', (IITB Excellence in PhD thesis Award (2018))
- Abhilasha Maheshwari, "Advanced Decision Support Systems for Water Quality Management in Distribution Networks", (IITB Excellence in PhD thesis Award (2021))
- Rahul Patel, PMRF, "Physics Inspired Approaches in AI & ML", (On-going)

- Nimish Pankhedkar, "Looping combustion based CO2 valorization" (On-going)
- Aadil Bharoocha, " Optimization & Control methods in large scale water distribution networks" (On-going)

	Masters students	Doctoral Students
Supervised	3	4
Graduated	1	3

LIST OF PUBLICATIONS AND PRESENTATIONS 2021

Publications

3. Pankhedkar, N., Dwivedi, A., Gudi, R., Biswas, P., " Intensified Chemical Looping Combustion Based Polygeneration for CO2Valorization to Value-Added Chemicals (Methanol and DME)", Industrial and Engineering Chemistry Research, 61(32), pp. 11861-11879, (2022).
4. Abokifa, A.A., Maheshwari, A., Gudi, R.D., Biswas, P., "Closure to "influence of Dead-End Sections of Drinking Water Distribution Networks on Optimization of Booster Chlorination Systems" , Journal of Water Resources Planning and Management,147(11),07021016, 2021
5. Misra, Shamik; Pravin, P. S. ; Gudi, Ravindra; Bhartiya, Sharad, "Integration of Supply and demand side management using renewable power sources: Application on an Air Separation Plant", Industrial & Engineering Chemistry Research, 60, 9, 3670–3686, (2021).
6. Maheshwari, A., Abokifa, A., Gudi, R.D., Biswas, P., "Optimization of disinfectant dosage for simultaneous control of lead and disinfection-byproducts in water distribution networks", Journal of Environmental Management, 276, 111186, (2020).
7. Misra, S., Kapadi, M. and Gudi, R.D., ""A Hybrid Time Based Framework for Maritime Inventory Routing Problem", Industrial & Engineering Chemistry Research 59(46), (2020)
8. Misra, S., Gudi, R.D., Kapadi, M.D., "A Multi Grid Discrete Time Based Framework for Maritime Distribution Logistics & Inventory Planning for Refinery Products", Computers and Industrial Engineering, Volume 146, , 106568 (2020).
9. Maheshwari, A., Misra, S., Gudi, R.D., and Subbiah, S., "A Short-term Planning Framework for the Operation of Tanker based Water Distribution System in Urban Areas", Industrial and Engineering Chemistry Research, 59, 20, 9575–9592 (2020).
10. Pravin PS, Misra S., Gudi, R D, Bhartiya S., "A reactive scheduling and control framework for integration of renewable energy sources with a reformer-based fuel cell system and an energy storage device", Journal of Process Control, Volume 87, 147-165, (2020).

11. Maheshwari A., Abokifa A., Biswas P., Gudi, R.D., "Framework for Evaluating the Impact of Water Chemistry Changes in Full-Scale Drinking Water Distribution Networks on Lead Concentrations at the Tap", Journal of Environmental Engineering, 146(7), (2020).
12. Abokifa, A.A., Maheshwari, A., Gudi, R.D., Biswas, P., "Influence of Dead-End Sections of Drinking Water Distribution Networks on Optimization of Booster Chlorination Systems ", Journal of Water Resources Planning and Management, 145(12), (2019).
13. Maheshwari, A., Prasad, V., Gudi, R.D., Biswas, P., "Systems engineering based advanced optimization for sustainable water management in refineries, Journal of Cleaner Production, 224, pp. 661-676, (2019).
14. Pravin, P.S., Bhartiya, S., Gudi, R.D., "Modeling and predictive control of an integrated reformer-membrane-fuel cell-battery hybrid dynamic system", Industrial and Engineering Chemistry Research, 58(26), pp. 11392-11406, (2019).
15. Misra, S., Kapadi, M., Gudi, R.D., Saxena, D., "Resource Optimization and Inventory Routing of the Packaged Liquefied Gas Supply Chain", Industrial and Engineering Chemistry Research, 58(18), pp. 7579-7592, (2019).
16. Misra, S., Saxena, D., Kapadi, M., Gudi, R.D., Srihari, R., "Short-Term Planning Framework for Enterprise-wide Production and Distribution Network of a Cryogenic Air Separation Industry", Industrial and Engineering Chemistry Research, 57(49), pp. 16841-16861, (2019).
17. Maheshwari, A., Abokifa, A., Gudi, R.D., Biswas, P., "Co-ordinated, Decentralization based Optimization of Disinfectant Dosing in Large Scale Water Distribution Networks", Journal of Water Resources Planning and Management, Volume 144 Issue 10, (2018).
18. Misra, S., Saxena, D., Kapadi, M., Gudi, R; Srihari, R., ""Enclave Optimization: A Novel Multi Plant Production Scheduling Approach For Cryogenic Air Separation Plants", Industrial and Engineering Chemistry Research, 57(15), pp. 5301-5322, (2018).
19. Pravin, P. S., Gudi, R. D., Bhartiya, S., "Dynamic modeling and control of an integrated reformer-membrane-fuel cell system", Processes, 6(9),169, (2018).

AI & ML related Patents (During last 3years)

Granted

1) SYSTEMS AND METHODS FOR REAL TIME CLASSIFICATION AND PERFORMANCE MONITORING OF BATCH PROCESSSES, US Patent 8090676 (2021) Filed
2) System and method facilitating decision making for disinfectant dosing in water in Water Distribution Network", (PCT/IN2019/050427, Filed, 2018).
3) A System and Method for Vehicle based distribution of water, (Indian Patent Application Number 201921031020, Filed 2019).

Class of 1998 Chair for Quantum Computing

Prof. R B Sunoj

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Department of Chemistry

"Instituting a chair professorship position in interdisciplinary domains is a reflection of current trends. I have been working at the interface of chemical science and machine intelligence over the last few years where the complementary advantages are being harnessed for accelerated discovery of reaction of high contemporary value. The support through this scheme is very much appreciated in furthering our research efforts in the Institute."

– Prof. R B Sunoj

TEACHING AND RESEARCH HIGHLIGHTS

Teaching Highlight 2022:

For Prof. Sunoj, it has been a different and challenging experience to learn and teach in the online mode. He had to evolve various methods to engage a class size of 350+ B.Tech. first year students from the CS and EE departments. He organized informal interactions where he cleared doubts and held problem solving sessions. All this was in addition to the live 'virtual class room' where he resorted to a conventional method of teaching via a black board, all while in front of a camera. I look forward to the next batch in a real class settings.

Research Highlight 2022:

Prof. Sunoj and his team forayed into the world of machine intelligence as applied to chemical catalysis and pursued a decade-long effort in the transition state modelling for organic reactions. Various representation learning methods built on the concept of transfer learning using nature language processing were customized to discover new catalysts. If his team is able to generate ML-based reaction discovery it could have a transformative impact in the chemical space.

Service and Public Engagement/ Affiliations:

Prof. Sunoj has been an elected member of leading scholarly academies (WATOC, APATCC, IUPAC) as well as on the editorial board of various journals published by the American Chemical Society as well as the Royal Society of Chemistry. Active participation in the board meetings have helped in conveying the need for wider representation and equity in the constitution of scientific bodies. At the national level, he has been on the national high powered technical committee of the ministry of earth science for their vision of high performance computing projects. He has delivered science popularization lectures to school and college students as well as teachers. In addition, Prof. Sunoj has served as a member of the panel of experts in recruitment for various IITs.

TRAINING OF HIGHLY QUALIFIED PEOPLE

	Masters students	Doctoral Students	Post-doctoral students
Supervised	2	9	1
Co-supervised	0	1	0
Graduated	28	20	0

LIST OF PUBLICATIONS AND PRESENTATIONS 2022

Publications

- Tribedi, S.; Kitaura, K.; Nakajima, T.; Sunoj, R. B. 'On the Question of Steric Repulsion versus Noncovalent Attractive Interactions in Chiral Phosphoric Acid Catalyzed Asymmetric Reactions' PhysChemChemPhys. **2021,** 23, 18936.
- Unnikrishnan, A.; Sunoj, R. B. 'Iridium-Catalyzed Regioselective Borylation through C-H Activation and the Origin of Ligand-Dependent Regioselectivity Switching' J. Org. Chem. **2021,** 86, 15618.
- Sunoj, R. B. 'Coming of Age of Computational Chemistry from a Resilient Past to a Promising Future' Isr. J. Chem. **2022,** 62, e202100106. [Invited contribution to 'Rosarium Philosophorum on Computational Chemistry']
- Ghosh, S.; Shilpa, S.; Athira, C.; Sunoj, R. B. 'Role of Additives in Transition Metal Catalyzed C-H Bond Activation Reactions: A Computational Perspective' Topics in Catalysis **2022**, 65, 141. [Invited article in the special issue 'Computational Catalysis: A Land of Opportunities']
- Das, M.; Gogoi, A. R.; Sunoj, R. B. 'Molecular Insights on Solvent Effects in Organic Reactions as Obtained through Computational Chemistry Tools' J. Org. Chem. **2022**, 87, 1630. [Invited contribution in the special issue 'Solvation Effects in Organic Chemistry']
- Hassan, M. M.; Mondal, B.; Singh, S.; Haldar C.; Chaturvedi, J.; Bisht, R.; Sunoj, R. B.; Chattopadhyay, B. 'Ir-Catalyzed Ligand Free Directed C-H Borylation of Arenes and Pharmaceuticals: Detailed Mechanistic Understanding' J. Org. Chem. **2022**, 87, 4360.
- Tribedi, S.; Sunoj, R. B. 'Chirality Transfer from Double Axially Chiral Phosphoric Acid in a Synergistic Enantioselective Intramolecular Amination' Chem. Sci. **2022**, 13, 1323.
- Das, M.; Sharma, P.; Sunoj, R. B. 'Machine Learning Studies on Asymmetric Relay Heck Reaction – Potential Avenues for Reaction Decelopment' J. Chem. Phys. **2022**, 156, 114303. [Invited article for a special topic on 'Chemical Design by Artificial Intelligence']
- Hoque, M. E.; Bisht, R.; Unnikrishnan, A.; Dey, S.; Hassan, M.; Rai, N.; Sunoj, R. B.; Chattopadhyay, B. 'Ir-Ctalyzed Ligand Controlled Remote Para-Selective C-H Activation and Borylation of Twisted Aromatic Amides' Angew. Chem. Int. Ed. **2022**, 61, e202203539.

  Singh, S.; Sunoj, R. B. 'Harnessing Natural Language Processing for Chemical Catalysis using Transfer Learning' Digital Discovery **2022**, 1, 303.
- Singh, S.; Sunoj, R. B. 'Transfer Learning for Substrate Generation and Yield Predictions for Fluorination of Alcohol' iScience **2022**, 25, 104661.
- Das, S. K.; Das, S.; Ghosh, S.; Roy, S.; Pareek, M.; Roy, B.; Sunoj, R. B.; Chattopadhyay, B. 'Iron-Catalyzed C(sp2)-H and C(sp3)-H Amination: Scope, Regioselectivity, Late-Stage Amination and Mechanism' Chem. Sci. **2022**, (Accepted).

Presentations

- Online mode 3 presentations were given (IIT Delhi, Ben Gurion university Israel, Alphonso college, Kottayam)

Erach and Meheroo Mehta Advanced Education Technology Chair Professor

Prof. Kannan M. Moudgalya

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Department of Chemical Engineering

"The pandemic has made us realise the importance of technology-based education. The National Education Policy 2020 has articulated its importance. In light of these, the value of the Chair has increased. Thanks, Ruyintan, for visualising such a requirement and establishing this Chair".

– Prof. Kannan Moudgalya

TEACHING AND RESEARCH HIGHLIGHTS

Prof. Moudgalya and his team worked on conducting different types of workshops. They initially organized several one-day workshops on multiple topics and trained around 100 people or more each time. This was later modified to a three-day workshop for better efficacy. For CBSE teachers they designed a five-day workshop of three-hour duration every day and used the online discussion forum effectively. Prof. Moudgalya has also written a paper on the same for a conference organised at McMaster university. The paper was later accepted in a prestigious journal – "Journal of Higher Education Theory and Practice".

SERVICE AND PUBLIC ENGAGEMENT

During the early part of the pandemic, 8,000 colleges from 200 affiliated universities used Spoken Tutorial-based training in a big way, training lakhs of students and teachers.

The Spoken Tutorial team joined hands with the FOSSEE project and conducted four hackathons:

- Making available Open-Source Software as Scilab Toolboxes – 750 students participated in it
- QGIS based mapathon to produce maps that cover different aspects of life such as agriculture, climate change, transportation, natural resources, child care, medical, education, and rural and urban development – 10,000 students participated in it
- eSim circuit simulation marathon – 3,000 students participated in it
- Synfig Studio 2-D animation hackathon to create a three-minute animation of the Panchatantra tales – 1,000 people participated in it

All of these events were extremely successful and Prof. Moudgalya has written LinkedIn Articles on all of them.

The health and nutrition part of the workshops have been very successful, which photos below of mothers and babies attest.

LIST OF PUBLICATIONS AND PRESENTATIONS

(Kannan Moudgalya, Nancy Varkey, Vishnu Raj and K. Sanmugasun- daram), A Timed Discussion Forum for Novice Users and Self-Learners of Spoken Tutorials, Journal of Higher Education Theory and Practice, pp. 213-220, Vol. 21(2), 2021.

(Peter Fritzson, Adrian Pop, Karim Abdelhak, Adeel Ashgar, Bern- hard Bachmann, Willi Braun, Daniel Bouskela, Robert Braun, Lena Buffoni, Francesco Casella, Rodrigo Castro, Rüdiger Franke, Dag Fritz- son, Mahder Gebremedhin, Andreas Heuermann, Bernt Lie, Alachew Mengist, Lars Mikelsons, Kannan Moudgalya, Lennart Ochel, Arun- kumar Palanisamy, Vitalij Ruge, Wladimir Schamai, Martin Sjölund, Bernhard Thiele, John Tinnerholm, Per Ostlund), The OpenModelica Integrated Environment for Modeling, Simulation, and Model-Based Development. Modeling, Identification and Control. 2020;41(4):241- 295, November 2020, DOI 10.4173/mic.2020.4.1

Made countless presentations during the last one year, as all the meetings were online, and many people wanted to know about our method of training in the open-source software, and using Spoken Tutorials.

TRAINING OF HIGHLY QUALIFIED PEOPLE

	Masters students	Doctoral Students
Supervised	1	1

Major Bhagat Singh Rekhi Chair – Prof. Pushpak Bhattacharya

Prof. Pushpak Bhattacharya

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Department of Computer Science and Engineering

"The Major Bhagat Singh Rekhi Chair Professorship is a highly coveted position and I am delighted to be an occupant of the same. The award has facilitated my research and development significantly. Major Bhagat Singh Rekhi was a dynamic and inspiring personality and one who motivated others to excel. His worthy son Mr. Kanwal Rekhi has contributed so much to his alma mater IIT Bombay. My chair professorship is another example of this noble gesture."

– Prof. Pushpak Bhattacharya

TEACHING AND RESEARCH HIGHLIGHTS

Teaching Highlight 2021 (April 2021 to March 2022):

Prof. Pushpak is teaching two highly sought after, timely and popular courses:

1. **CS626: Semester-1:** Speech, Natural Language Processing and the Web (enrolment 100)
2. **CS772: Semester-2:** Deep Learning for Natural Language Processing (enrolment more than 100)

His teaching is contributing to creation of the AI talent pool that India and the world needs so crucially[NM1] . TThe global natural language processing market size is expected to experience exponential growth by reaching USD 127.26 billion by 2028. There are many theoretical and practical challenges to be solved in this area which are highly machine learning driven.

Prof. Bhattacharyya's students are industry captains and professors in top educational places and researchers in top AI-ML research labs.

RESEARCH HIGHLIGHT 2021

Prof. Pushpak, arguably, led the most visible and one of the best NLP and Machine Learning groups in the country. His team published papers in top journals and conferences. He has made the tools and resources freely downloadable from his lab website

"Computation for Indian Language Technology (http://www.cfilt.iitb.ac.in) and is contributing immensely to the NLP eco-system (especially with a focus on Indian Language Processing). He hopes to maintain this momentum of contribution to NLP's R&D. The Bhagat Singh Rekhi Chair Professorship has proven to be of significant help in their endeavours.

SERVICE AND PUBLIC ENGAGEMENT/ AFFILIATIONS

Positions of Responsibility and Honor

- General Co-Chair, CODS-COMAD-23, Mumbai. January 2023.
- Professor Incharge, IIT Bombay-Monash Australia Academy,2021-2024. (https://www.iitbmonash.org/)
- General Chair, Int'l Conf. on NLP (ICON 2021), NIT Silchar, Dec 21.
- President, NLP Association of India. 2021-22.
- Editor Journal of Natural Language Engineering Cambridge University Press (inducted 2021).
- General co-Chair AIMLSys Conference, 23-25 October, 2021, Ba)ngalore, India.
- Member of the Governing Council (GC) of Centre of Advance Financial Research and Learning (CAFRAL), Reserve Bank of India.

- Member Core Faculty, Center for Machine Intelligence and Data Science (C-MInDS), IIT Bombay.
- Prof. Incharge Data and Information Sciences Program, under Institute of Eminence, IIT Bombay.
- Chairman AI Standardization Committee, BIS, Ministry of Commerce

B. Sponsored/Consultancy Projects:

Ministry of Electronics and IT	VIDYAAPATI: A Speech to Speech Machine Translation System for Bengali, Hindi, Konkani, Maithili, Marathi	Approx Rs 10 Cr	2022-24.	Consortium of IIT Bombay(Lead), CDAC Kolkata, CDAC Pune, Goa University, IIT Patna, ISI Kolkata, Jadavpur University, Jawaharlal Nehru University.
Ministry of Electronics and IT North Bengal	ISHAAN: A Speech to Speech Machine Translation System for Assamese, Bodo, English, Hindi, Manipuri, Nepali	Approx Rs 15 Cr	2022-24.	Consortium of IIT Bombay (Lead), Guahati University, IIIT Manipur, NIT Silchar, University.
Verisk Analytics	Gift Grant in Explainability	Approx Rs 25L	2022-23.	

2021

Accenture Labs	Gift Grant in Bias Detection	Approx Rs 35L	2021-22.
Adobe Labs	Gift Grant in Sentiment and Emotion Analysis	USD 25K	2021-22.
Eros Now	Automatic Script Generation	Approx Rs 30L	2021-22.

LIST OF PUBLICATIONS AND PRESENTATIONS

Publications (April 2021 to March 2022, reverse chronological):

1. A. Tiwari, S. Saha, and P. Bhattacharyya. A knowledge infused context driven dialogue agent for disease diagnosis using hierarchical reinforcement learning. Knowledge Based Systems

Journal (KBS), 108292. 2022.

2. T. Saha, S. Reddy, S. Saha and P. Bhattacharyya, Identifying Mental Health Disorders from Counseling Conversations, IEEE Transactions on Computational Social Systems (IEEE TCSS), doi:10.1109/TCSS.2022.3143763..
3. Varad Bhatnagar, Prince Kumar and Pushpak Bhattacharyya, Investigating Hostile Post Detection in Hindi, Neurocomputing Journal, Elsevier, Volume 474, 14 February 2022.
4. Soumitra Ghosh, Swarup Roy, Asif Ekbal and Pushpak Bhattacharyya, CARES: CAuse Retrieval for Emotion in Suicide notes, ECIR, Stavanger, Norway, 10-14 April 2022.
5. Sabyasachi Kamila, Asif Ekbal, Md Hasanuzzaman and Pushpak Bhattacharyya, Investigating the Impact of Emotion on Temporal Orientation in a Deep Multitask Setting, Scientific Reports, Nature, Sci Rep 12, 493, January 2022.
6. Chanchal Suman, Aditya Gupta, Sriparna Saha and Pushpak Bhattacharyya, A Multimodal Personality Prediction System, Knowledge Based Systems Journal (KBS), Volume 236, January 2022.
7. Tirthankar Ghoshal, Tanik Shaikh, Tameesh Biswas, Asif Ekbal and Pushpak Bhattacharyya, Novelty Detection: An NLP Perspective, Computational Linguistics Journal (CL), MIT Press, 2021.
8. Jyotsna Khatri, Tamali Banerjee, Rudra Murthy and Pushpak Bhattacharyya, Simple measures of bridging lexical divergence help unsupervised neural machine translation for low-resource languages. Machine Translation 35, 2021.
9. Kamal Kumar Gupta, Asif Ekbal and Pushpak Bhattacharyya, Augmenting Training Data with Syntactic Phrasal-Segments in Low-Resource Neural Machine Translation, Machine Translation (JMT). Machine Translation 35, 2021.
10. Tejas Dhamecha, Rudra Murthy, Samarth Bharadwaj, Karthik Sankaranarayanan and Pushpak Bhattacharyya, Role of Language Relatedness in Multilingual Fine-tuning of Language Models: A Case Study in Indo-Aryan Languages, EMNLP 21, 7-11 Nov, 2021, Dominican Republic.
11. Anirudh Mittal, Pranav Jeevan P, Prerak Gandhi, Diptesh Kanojia and Pushpak Bhattacharyya, "So You Think You're Funny?": Rating the Humour Quotient in Standup Comedy, EMNLP 21, 7-11 Nov, 2021, Dominican Republic.
12. Akash Banerjee, Aditya Jain, Shivam Mhaskar, Sourabh Dattatray Deoghare, Aman Sehgal, Pushpak Bhattacharya, Neural Machine Translation in Low-Resource Setting: a Case Study in English-Marathi Pair, MT Summit 2021.
13. Tamali Banerjee, Rudra V Murthy, Pushpak Bhattacharya, Crosslingual Embeddings are Essential in UNMT for distant languages: An English to IndoAryan Case Study, MT Summit 2021.
14. Girishkumar Ponkiya, Diptesh Kanojia, Pushpak Bhattacharyya and Girish Palshikar, FrameNet-Assisted Noun Compound Interpretation, in Finding of Joint Conference of the 59th Annual Meeting of the Association for Computational Linguistics and the 11th International Joint Conference on Natural Language Processing (ACL-IJCNLP 2021), Bangkok, Thailand, August 1-6, 2021.

15. Shubham Dewangan, Shreya Alva, Nitish Joshi and Pushpak Bhattacharyya, Experience of Neural Machine Translation between Indian Languages, Machine Translation, Vol. 35, Springer, Accepted. DoI
16. Chanchal Suman, A. Naman, Sriparna Saha and P. Bhattacharyya, A Multimodal Author Profiling System for Tweets, IEEE Transactions on Computational Social Systems (TCSS), vol. 8, no. 6, Dec. 2021.
17. Kumar Saunack, Kumar Saurav and Pushpak Bhattacharyya, How low is too low? A monolingual take on lemmatisation in Indian languages, Annual Conference of the North American Chapter of the Association for Computational Linguistics (NAACL21), Online, June 6–11, 2021.
18. Tulika Saha, Apoorva Upadhyaya, Sriparna Saha and Pushpak Bhattacharyya, Towards Sentiment and Emotion aided Multi-modal Speech Act Classification in Twitter, Annual Conference of the North American Chapter of the Association for Computational Linguistics (NAACL21), Online, June 6–11, 2021.
19. Deeksha Varshney, Asif Ekbal and Pushpak Bhattacharyya, Modelling Context Emotions using Multi-task Learning for Emotion Controlled Dialog Generation, 16th Conference on European Chapter on Computational Linguistics (EACL21), Virtual Conference, April 16-23, 2021.
20. Nikhil Saini, Drumil Trivedi, Shreya Khare, Tejas Dhamecha, Preethi Jyothi, Samarth Bharadwaj and Pushpak Bhattacharyya, Disfluency Correction using Unsupervised and Semi-supervised Learning, 16th Conference on European Chapter on Computational Linguistics (EACL21), Virtual Conference, April 16-23, 2021.
21. Diptesh Kanojia, Prashant Sharma, Pushpak Bhattacharyya, Gholamreza Haffari and Malhar Kulkarni, Cognition-aware Cognate Detection, 16th Conference on European Chapter on Computational Linguistics (EACL21), Virtual Conference, April 16-23, 2021.

PRESENTATIONS

(APRIL 2021 TO MARCH 2022, REVERSE CHRONOLOGICAL)

1. Panelist: Techfest of IIT Jodhpur called "Prometeo", Future Trajectory of IITs, 1 March, 2022.
2. Invited talk, Accenture Distinguished Researcher Speaker Series, Social Bias Detection in Movie Domain, 16 Feb, 2022.
3. Keynote, CODS-COMAD 2022, “Alice in Wonderland”: Navigating the Landscape of Multilinguality for NLP, 8 December, 2021.
4. Keynote, Wikimedia Technology Summit, Low Resource Machine Translation, IIIT Hyderabad, 20 November, 2021.
5. Invited Lecture, Foundation Day Lecture Series, Low Resource Natural Language Processing, Central Institute of Indian Languages, 17 November, 2021.
6. Inaugural Address, Explainability and Cognition, AICTE Faculty Development Program, National Institute of Technology (NIT) Jamshedpur, 1st October, 2021.

7. Inaugural Talk, Explainability and Cognition, Computer and AI Talk Series, Banaras Hindu University, CSE Dept, 27th September 2021.
8. Invited Lecture, Text Mining, CEP Course on Business Data Analytics, Continuing Education Program, IIT Bombay, 26th September, 2021.
9. Invited Talk, Machine Translation in Low Resource Setting, Workshop on Building and Using COmparable Corpora (BUCC), as part of RANLP'21, 6th September 2021.
10. Keynote, AI For Society: the Role of Natural Language Processing (with case studies in automatic essay grading, sentiment analysis, machine translation and Information Extraction), International Conference on Emerging Technologies, Mahindra University, 27th August, 2021 ,
11. Panelist, Evaluation opportunities and challenges for MT of Linguistic Code Switched Data, CALCS @ NAACL 2021 Panel Discussion, 11th June, 2021. Virtual.
12. Talk, "Justice Delayed, Justice Denied": Technology can Help, SAIL Panel, IIT Kharagpur. 4th June, 2021. Virtual.

TRAINING OF HIGHLY QUALIFIED PEOPLE

(APRIL 2021 TO MARCH 2022)

	Masters students	Doctoral Students	Other RA/ TA
Supervised	39	7	6
Co-supervised	2	2	4
Graduated	15	2	--

Subrao M. Nilekani Chair Professor

Prof. S. Sudarshan

Email: sudarsha@csc.iitb.ac.in

Department of Computer Science and Engineering

"Occupying the Subrao M. Nilekani chair continues to be a privilege and a recognition that I cherish deeply."

Prof. S. Sudarshan

TEACHING AND RESEARCH HIGHLIGHTS

Prof. Sudarshan has focused on four major areas of research.

- One area of focus has been the XData system, which is the only system of its kind to help automatically detect errors in SQL queries, and also grade student queries by assigning partial marks.
- A second area of focus was on holistic optimization of database applications. Prof. Sudarshan and his team are exploring automatic rewriting of Python programs to optimize data access. There is significant scope for optimizing programs used for ML pipelines. A paper on this topic was published at the DBPL workshop in Sep 2021, and another is in preparation currently. A PhD student (external) and an MTech student are building a system for this task which they believe will have significant impact.
- The third area of focus is on query optimization for streaming data, and a PhD student has been working on this topic. The focus is on queries that have deadlines, and how to schedule them to meet deadlines while minimizing cost compared to continuous streaming query evaluation. A paper on this topic was submitted for publication.
- The fourth area is on fake news detection. They have been developing a system called Kauwa Kaate, which is designed to help users factcheck forwards that they receive on WhatsApp or similar platforms (a common means of spreading fake news in India. The continuing focus is on answering queries that include images and videos, which is not supported by existing search engines.

SERVICE AND PUBLIC ENGAGEMENT/ AFFILIATIONS

Prof. Sudarshan has been serving as Deputy Director (Academic and Infrastructural Affairs) at IIT Bombay, since July 2020. Along with the usual responsibilities, he has been in charge of the Covid Taskforce, which has managed to successfully navigate the perils of Covid, taking a number of actions to minimize covid spread, while also ensuring research and academic activities continued with as little disruption as possible.

Among other service roles:

- Chaired the Jury of the ACM India Early Career Research Award
- On the program committee of ACM SIGMOD and Procs. VLDB
- On the Senate of IIIT Sri City, and
- chaired two committees related to software applications for Ministry of Defence.
- Is PC Chair of the prestigious ACM SIGMOD conference 2024

He has also been acting as Public Interest Director on the Board of the National Stock Exchange of India, one of the leading stock exchanges in the world, where he also chairs the Standing Committee on Technology.

LIST OF PUBLICATIONS AND PRESENTATIONS

Bhushan Pal Singh, Mudra Sahu, S. Sudarshan: Optimizing Data Science Applications using Static Analysis. DBPL 2021: 23-27

TRAINING OF HIGHLY QUALIFIED PEOPLE

(INDICATE THE NUMBERS BELOW)

	Masters students	Doctoral Students
Supervised	4	2
Co-supervised	-	-
Graduated	4	-

Himanshu Patel - Chair for Applied Biosciences

Prof. Rohit Srivastava

Email: rsrivasta@iitb.ac.in

Department of Biosciences and Bioengineering

"I am extremely grateful to Shri Himanshu Patel who has the vision for an Aatman Nirbhar Bharat in funding this Chair for Applied Biosciences in the Department of Biosciences and Bioengineering. This Chair position will encourage many of our Dept faculty to work in translational technologies and I am extremely delighted to be the first recipient of this prestigious Chair in the Institute. I look forward to continuing the development and commercialization of affordable medical devices to cater to the rural population of India."

- Prof. Rohit Srivastava

- Department of Biosciences and Bioengineering

TEACHING AND RESEARCH HIGHLIGHTS

Teaching Highlight 2022:

Prof. Rohit Srivastava teaches two electives in the Department of BSBE, both of which see huge enrolment from students every year.

- The Biomedical Microsystems course teaches students the basics of microfabrication before moving on to the applications in Biomedical Engineering. Every year the enrolment exceeds 250 students and there is considerable excitement when the course is offered.
- Bio-Nanotechnology discusses the application of Nanotechnology in Biomedical Engineering and has encouraged students to pursue a future path in this field.

He has also taught BB101 course 2 years in a row with over 800 students taking the course where he discusses the Introduction and Applications of Biomedical Engineering to first year students. He hopes to be able to continue teaching these relevant courses to incoming students every year so that more and more students get excited to take up Bioengineering as a career option!

RESEARCH HIGHLIGHT 2021

Prof. Srivastava has been able to establish his own successful research program pursuing micro and nano-scale devices such as biosensors, bio-nanotechnology and finally mapping out to Point-of-care diagnostic devices. His team has already commercialized four point-of-care diagnostic devices such as SYNC- Bluetooth integrated glucometer for diabetes management, UChek- routine urine analysis system, CareMother- a smartphone-based platform to integrate doctors and pregnant women to screen and identify risk-prone pregnancies for maternal and neonatal healthcare in the rural areas.

His team has also clinically validated and transferred numerous healthcare technologies to the companies such as Smartsense™- affordable and portable blood electrolyte analyzer with integrated blood plasma centrifuge; Uridsa- a low-cost, portable colorimetric device to diagnose kidney-related disorders; ElectroFinder- Portable and rapid detection device to sodium and potassium level in critical care patients.

Prof. Rohit and his team have clinically validated several technologies like PorFloR- Fluorescence strips and device for detection of orthopedic implant-associated infection such as C-reactive protein (CRP) and interleukin-6 (IL-6); Cholcheck- Affordable LFA-based complete cholesterol panel and detection device; Insulin Infusion Pump- Continuous insulin infusion pump, along with hollow silicon microneedle patch and the flexible reservoir for diabetes management. His group has also developed many affordable, novel, biodegradable plasmonic nanoparticles for minimally-invasive cancer theranostic application. The group has also indigenously developed economical, novel, resorbable bone screw and drug loaded chitosan sponges for orthopedic applications.

They have secured several prestigious grants to support our ongoing work in affordable healthcare, and the rural, maternal and neonatal healthcare research areas are likely to yield continued support because of high social and economic impact. Their lab has filed more than 130 Indian and US patent applications with more than 25 granted patents. This is representative of their grasp of the

importance of their work as well as the importance of knowledge protection to increase the likelihood that it will eventually be of use to commercial entities.

Prof. Rohit believes that the key indicators of his team's success are the awards and recognitions that they receive. Prof. Rohit has been awarded the highest scientific honor, the **Shanti Swarup Bhatnagar Prize 2021** in **Medical Sciences**, the Abdul Kalam Technology Innovation National Fellowship, Shri Om Prakash Bhasin Award for Excellence in Health and Medical Sciences, DBT National Bioscience Award, DBT Tata Innovation Fellowship Award, the DBT Process and Product Commercialization Award, NASI Reliance Industries Platinum Jubilee Award, Stars in Global Health-GCC Canada, Stanford MedTech Award, Lockheed Martin Corporation, US DBT IYBA Award, INAE Young Engineer Award and Gandhian Young Technological Innovation awards in last ten years. The awards are examples that he and his team have reached a level of accomplishment and visibility that is desirable for all faculty members.

He has been instrumental in encouraging more than 10 of his students to setup Companies either through a Technology Business Incubator (TBI) or otherwise. He is also on the panel of several companies where he mentors them through start-up grants. His efforts have been recognized nationally and internationally and he has been elected **Fellow of Indian National Academy of Engineering (FNAE), Fellow of National Academy of Sciences, India (FNASc), Royal Society of Chemistry (FRSC), London** and **Fellow of Royal Society of Biology (FRSB), London.** His Nanobios Laboratory at IIT Bombay is focusing on developing technologies that can be commercialized and brought to use for the common man in India.

SERVICE AND PUBLIC ENGAGEMENT/ AFFILIATIONS

Within 10 years of joining IIT Bombay, Prof. Rohit was handed charge of Department of BSBE as the Head of the Dept and he believes that he has led from the front by hiring faculty, getting Centre grants, involving all faculty in several interdisciplinary work, nominating more faculty for awards and fellowships. He is a part of all expert BIRAC panels for last 12 years and is on more than 30 several expert panels of BIRAC, DBT, ICMR and DST.

He is an Academic Mentor to NIPER Ahmedabad, SAC Member of CBMR Lucknow and several other institutes proving mentorship at the National level.

TRAINING OF HIGHLY QUALIFIED PEOPLE

	Masters students	Doctoral Students	Post-doctoral students
Supervised	90+	60+	15+
Graduated	90	40	10+

LIST OF PUBLICATIONS AND PRESENTATIONS 2021

Publications

1. Thomas J, Thangavel P, Peh WY, Jing J, Yuvaraj R, Cash S.S, Chaudhari R, Karia S, Rathakrishnan R, Saini V, Shah N, Srivastava R, Tan YL, Westover B and Dauwels J , Automated Adult Epilepsy Diagnostic Tool Based on Interictal Scalp Electroencephalogram Characteristics: A Six-Center Study, International Journal of Neural Systems,2021, 31 (05), 2050074
2. Banavath R, Srivastava R, Bhargava P, Nanoporous Cobalt Hexacyanoferrate Nanospheres for Screen-Printed H2O2 Sensors, ACS Appl. Nano Mater. 2021, 4, 5, 5564–5576
3. Gudlur S, Goyal G, Pradhan A, Ho JCS, Srivastava R, Liedberg B, Cationic Liposomes Enable Shape Control in Surfactant-Free Synthesis of Biocompatible Gold Nanorods, Chemistry of Materials 2021 33 (12), 4558-4567
4. Thangavel P, Thomas J, Peh Wei Y, Jing J, Yuvaraj R, Cash Sydney S., Chaudhari R, Karia S, Rathakrishnan R, Saini V, Shah N, Srivastava R, Tan Y, Westover B and Dauwels J, Time–Frequency Decomposition of Scalp Electroencephalograms Improves Deep Learning-Based Epilepsy Diagnosis, International journal of neural systems,2021, 31 (08), 2150032
5. Mishra SK, Hole A, Reddy BPK, Srivastava R, Chilakapati MK, De A, Raman micro-spectroscopic map estimating in vivo precision of tumor ablative effect achieved by photothermal therapy procedure, Nanomedicine: Nanotechnology, Biology and Medicine,2021 37, 102437
6. Bindra, A. K., Sreejith, S., Prasad, R., Gorain, M., Thomas, R., Jana, D., Nai, M. H., Wang, D., Tharayil, A., Kundu, G. C., Srivastava, R., Thomas, S., Lim, C. T., Zhao, Y. L., A Plasmonic Supramolecular Nanohybrid as a Contrast Agent for Site-Selective Computed Tomography Imaging of Tumor, Advanced Functional Materials 2021, 2110575.
7. Kiran P, Debnath SK, Neekhra S, Pawar V, Khan A, Dias F, Pallod S, Srivastava R., Designing nanoformulation for the nose-to-brain delivery in Parkinson's disease: Advancements and barrier, Wiley Nanomedicine and Nanobiotechnology, 2021. e1768
8. Debnath SK, Srivastava R, Potential application of bionanoparticles to treat severe acute respiratory syndrome coronavirus-2 infection, Frontiers in Nanotechnology, section Biomedical Nanotechnology, 2021
9. Debnath S.K.,Debnath M, Srivastava R , Omri A; Intervention of 3D printing in health care: transformation for sustainable development. Expert Opinion on Drug Delivery. 2021. Vol 18, Issue 11, 1659-1672
10. Banavath, Ramu; Nemala, Siva; **Srivastava,** Rohit; Bhargava, Parag: Non-enzymatic H2O2 sensor using liquid phase high-pressure exfoliated graphene. J. Electrochem. Soc. 2021 (accepted)
11. Lakkakula, J; Krause, R.W.M.; Divakaran, D; Barage,S; **Srivastava, R**.; 5-fu inclusion complex capped gold nanoparticles for breast cancer therapy. Journal of Molecular Liquids. 2021 (accepted)
12. Jain, N. K.; Bavya, M. C.; Vinil, S. B.; Meena, H.; Prasad, R.; **Srivastava, R.**; Nanoengineered photoactive theranostic agents for cancer. Nanophotonics. 2021 (accepted)

13. Khan, A.; Jain, N. K.; Gandhi, M.; Prasad, R.; **Srivastava, R.**; Photo-Triggered Nanomaterials for Cancer Theranostic Applications. Nano Life 2021, 11, 2130004.
14. Singh, A.; Kulkarni, M.; Dwivedi, J.; **Srivastava, R.**; Shivhare, P. Effects of Co-morbidities on Promising Biomarkers for Development of Point-of-care Diagnostic Kit for Pre-eclampsia. Biosensors and Bioelectronics 2021 (submitted)
15. Kaur, A.; Sivaramapanicker, S.; Prasad, R.; Gorain, M.; Rijil, T.; Deblin, J.; Nai, M. H.; Kundu, G.; **Srivastava, R.**; Lim, C. T.; Zhao, Y. Direct Anchoring of Plasmonic Nanoparticles on Organic Aggregates as A Supramolecular Nanohybrid for Site-Selective Computed Tomography Imaging of Tumor. ACS Nano 2021 (revision submitted)
16. Jain. N.; Prasad, R.; Meena, B.; Chauhan, D.; **Srivastava, R.** Impact of Nanotechnology in Rural Area for Health and Safety: Farmers in Natural Agroengineering. ACS Chemical Health & Safety 2021 (submitted)
17. Singh, B.; Bahadur, R.; Rangara, M.; Gandhi, M. N.; **Srivastava, R.** Influence of Surface States on the Optical and Cellular Property of Thermally Stable Red Emissive Graphitic Carbon Dots. ACS Appl. Bio Mater. 2021, 4 (5), 4641–4651.
18. Debnath, S. K.; **Srivastava, R.**; Debnath, M.; Omri, A. Status of Inhalable Antimicrobial Agents for Lung Infection: Progress and Prospects. Expert Rev. Respir. Med. 2021, 1–20.
19. Debnath, S. K.; **Srivastava, R.** Drug Delivery With Carbon-Based Nanomaterials as Versatile Nanocarriers: Progress and Prospects. Front. Nanotechnol. 2021, 3, 15.
20. Banavath, R.; **Srivastava, R.**; Bhargava, P. Improved Non-Enzymatic H2O2 Sensors Using Highly Electroactive Cobalt Hexacyanoferrate Nanostructures Prepared through EDTA Chelation Route. Mater. Chem. Phys. 2021, 267, 124593.
21. Mehta, J. M.; Jain, N. K.; Chauhan, D. S.; Prasad, R.; Kumawat, M. K.; Dhanka, M.; Shanavas, A.; **Srivastava, R.** Emissive Radiodense Stealth Plasmonic Nanohybrid as X-Ray Contrast and Photo-Ablative Agent of Cancer Cells. Mater. Today Commun. 2021, 27, 102181.
22. Jejurkar, V. P.; Yashwantrao, G.; Kumar, P.; Neekhra, S.; Maliekal, P. J.; Badani, P.; **Srivastava, R.**; Saha, S. Design and Development of Axially Chiral Bis(Naphthofuran) Luminogens as Fluorescent Probes for Cell Imaging. Chem. - A Eur. J. 2021, 27 (17), 5470–5482.
23. Singh, D.; Singh, P.; Pradhan, A.; **Srivastava, R.**; Sahoo, S. K. Reprogramming Cancer Stem-like Cells with Nanoforskolin Enhances the Efficacy of Paclitaxel in Targeting Breast Cancer. ACS Appl. Bio Mater. 2021, 4, 3670–3685.
24. Chauhan, D. S.; Dhasmana, A.; Laskar, P.; Prasad, R.; Jain, N. K.; **Srivastava, R.**; Jaggi, M.; Chauhan, S. C.; Yallapu, M. M. Nanotechnology Synergized Immunoengineering for Cancer. Eur. J. Pharm. Biopharm. 2021, 163, 72–101.
25. Pradhan, A.; Mishra, S.; Basu, S. M.; Surolia, A.; Giri, J.; **Srivastava, R.**; Panda, D. Targeted Nanoformulation of C1 Inhibits the Growth of KB Spheroids and Cancer Stem Cell-Enriched MCF-7 Mammospheres. Colloids Surfaces B Biointerfaces 2021, 202, 111702.
26. Prasad, R.; Jain, N. K.; Yadav, A. S.; Jadhav, M.; Radharani, N. N. V.; Gorain, M.; Kundu, G. C.; Conde, J.; **Srivastava, R.** Ultrahigh Penetration and Retention of Graphene Quantum Dot Mesoporous Silica Nanohybrids for Image Guided Tumor Regression. ACS Appl. Bio Mater. 2021, 4, 1693–1703.

27. Singh, B.; Bahadur, R.; Neekhra, S.; Gandhi, M.; **Srivastava, R.** Hydrothermal-Assisted Synthesis and Stability of Multifunctional Mxene Nanobipyramids: Structural, Chemical, and Optical Evolution. ACS Appl. Mater. Interfaces 2021, 13, 3011–3023.
28. Khan, A.; Dias, F.; Neekhra, S.; Singh, B.; **Srivastava, R.** Designing and Immunomodulating Multiresponsive Nanomaterial for Cancer Theranostics. Front. Chem. 2021, 8, 631351.
29. Mhatre, O.; Reddy, B. P. K.; Patnaik, C.; Chakrabarty, S.; Ingle, A.; De, A.; **Srivastava, R.** PH-Responsive Delivery of Anti-Metastatic Niclosamide Using Mussel Inspired Polydopamine Nanoparticles. Int. J. Pharm. 2021, 597, 120278.
30. Kaur, J.; **Srivastava, R.**; Borse, V. Recent Advances in Point-of-Care Diagnostics for Oral Cancer. Biosens. Bioelectron. 2021, 178, 112995.
31. Dhanka, M.; Pawar, V.; Chauhan, D. S.; Jain, N. K.; R.S., P.; Shetty, C.; Kumawat, M. K.; Prasad, R.; **Srivastava, R.** Synthesis and Characterization of an Injectable Microparticles Integrated Hydrogel Composite Biomaterial: In-Vivo Biocompatibility and Inflammatory Arthritis Treatment. Colloids Surfaces B Biointerfaces 2021, 201, 111597.
32. Thomas, J.; Thangavel, P.; Peh, W. Y.; Jing, J.; Yuvaraj, R.; Cash, S. S.; Chaudhari, R.; Karia, S.; Rathakrishnan, R.; Saini, V.; Shah, N.; **Srivastava, R.** et al. Automated Adult Epilepsy Diagnostic Tool Based on Interictal Scalp Electroencephalogram Characteristics: A Six-Center Study. Int. J. Neural Syst. 2021, 31, 2050074.
33. Peh, W. Y.; Thomas, J.; Bagheri, E.; Chaudhari, R.; Karia, S.; Rathakrishnan, R.; Saini, V.; Shah, N.; **Srivastava, R.;** Tan, Y. L.; et al. Multi-Center Validation Study of Automated Classification of Pathological Slowing in Adult Scalp Electroencephalograms Via Frequency Features. Int. J. Neural Syst. 2021, 2150016.

GRANTED PATENTS

No.	Title of the IDF	Name of Inventors	IPA no.
P1	Room temperature synthesis of bio-compatible porous silica nanoparticles using lipid as a structure directing agent	Rajendra Prasad, Deepak Chauhan and Rohit Srivastava	***Granted Indian Patent No: 401827 on 15 June 2020***
P2	Phytosomal nanoformulation of *cissus quadrangulari* s as local application for bone healing	Shreya Agrawal, Dhirendra Bahadur, Kritika Braroo, Gautam Shetty, Arun Mullaji and **Rohit Srivastava**	***Granted Indian Patent No: 401738 on23 Jan 2017***

No.	Title of the IDF	Name of Inventors	IPA no.
P3	Composite poly meric nano formulation	Piyush Kumar, **Rohit Srivastava**	***Granted Indian Patent No: 389292 on 15th February 2022***
P4	A system for correction of refractive errors without human intervention	Bhushan Namdeorao Kharbikar, Ajay Vijay Suryavanshi, Nitin Tukuram Pawar, Anupam Shridhar Bam, Amey Pralhad Kulkarni, Prof. Rohit Srivastava	***Granted Indian Patent No: 388060 on 31st January 2022***
P5	Polycaprolactone based plasmonic nanoshells and applications thereof	Deepak Singh Chauhan Pradeep Kumar Reddy, Mukti Vats, Rajendra Prasad and **Rohit Srivastava**	***Granted Indian Patent No: 359768 on 26th February 2021***
P6	A method for preparation of ultra -small polymeric nanoparticles	Abhijeet Joshi, Maruthi Prasanna, Rashmi C haudhari and **Rohit Srivastava**	***Granted Indian Patent No: 359332 on 24th February 2021***
P7	A process for preparation of chitosan -based hydrogel	Vaishali Pawar and **Rohit Srivastava**	***Granted Indian Patent No: 356496 on 22nd January 2021***
P8	Drug delivery system	Radhika Poojari, Dulal Panda and **Rohit Srivastava**	***Granted US Patent No US10888551B2 on 12th January 2021***
P9	A composite comprising of doxorubicin -alginate conjugate and non -steroidal anti -inflammatory agent and process for preparation thereof	Vaishali Pawar, Vivek Bhaskar Borse and **Rohit Srivastava**	***Granted Indian Patent No: 355324 on 05th January 2021***

No.	Title of the IDF	Name of Inventors	IPA no.
P10	TPGS comprised gold coated poly- (lactic-co-glycolic acid) nanostructures and a process for its preparation	Deepak Singh Chauhan, Radhika Poojari, Aravind Kumar Rengan, Asifkhan Shanavas, Abhijit De, Amirali Bakarali Bukhari and **Rohit Srivastava**	***Granted Indian Patent No: 354678 on 29th December 2020***
P11	Triple action concoction for the complete postoperative management after partial or total knee replacement and process for preparation	Vaishali Pawar, Gautam Shetty, Arun Mullaji and **Rohit Srivastava**	***Granted Indian Patent No: 354046 on 18th December 2020***
P12	A process for synthesis of protein derived branched gold nanostructures	Sisini Sasidharan, Dhirendra Bahadur and **Rohit Srivastava**	***Granted Indian Patent No: 353933 on 17th December 2020***
P13	Fluorescent gold nanorods and method of preparation th ereof	Rajendra Prasad, Deepak Singh Chauhan, Janhavi Devrukhar, Ramkrishn Gupta and **Rohit Srivastava**	***Granted Indian Patent No: 350710 on 3rd November 2020***
P14	Hemosealant composition and process for preparation thereof	Shruti Mankar, Yasodha kannan Sivasa my and **Rohit Srivastava**	***Granted Indian Patent No: 347890 on 28th September 2020***
P15	Cyclodextrin capped gold nanostructures and a method of preparation thereof	Jaya Raju Lakkakula, Deepika Divakaran Tharayil, Mukeshchand Thakur, Mukesh Kumar Kumawat and **Rohit Srivastava**	***Granted Indian Patent No: 346767 on 15th September 2020***

No.	Title of the IDF	Name of Inventors	IPA no.
P16	Dual therapeutic disintegrable gnr -liposome nanohybrid for plasmonic photothermal cancer theragnostic	Deepak Singh Chauhan, Rajendra Prasad, Selvaraj Kaliaperumal and **Rohit Srivastava**	***Granted Indian Patent No: 345343 on 27th August 2020***
P17	Targeted polymeric nano -complexes as drug delivery system	Radhika Poojari, Dulal Panda and **Rohit Srivastava**	***Granted Indian Patent No: 344742 on 21st August 2020***
P18	Nano -in-micro formulation as biosensors	**Rohit Srivastava**, Abhijeet Joshi and Rashmi Chaudhary	***Granted Indian Patent No: 339797 on 29th June 2020***
P19	Near infra -red hybrid nanomaterials and graphene oxide for theranostics applications	Deepak Singh Chauhan, Mukesh Kumar Kumawat and **Rohit Srivastava**	***Granted Indian Patent No: 339645 on 29th June 2020***
P20	Pharmaceutically active formulation for healing bone fractures	Gautam Shetty, Arun Mullaji, Shreya Agrawal and **Rohit Srivastava**	***Granted Indian Patent No: 339 582 on 26th June 2020***
P21	Zein -gold nanoshells and applications thereof	Deepak Singh Chauhan, Arunkumar P., Indulekha S. and **Rohit Srivastava**	***Granted Indian Patent No: 319491 on 30th August 2019***

No.	Title of the IDF	Name of Inventors	IPA no.
P22	Multifunctional polymeric nanocarrier	Radhika Poojari, Dulal Panda and **Rohit Srivastava**	***Granted Indian Patent No. 317866 on 07th August 2019***
P23	Drug delivery system	Radhika Poojari, Dulal Panda and **Rohit Srivastava**	***Granted Indian Patent No. 315542 on 04th July 2019***
P24	Multilayer nanocomposite	Asifkhan Shanavas, Dhirendra Bahadur, Dhirenkumar Sonara, Mohd Aslam and **Rohit Srivastava**	***Granted Indian Patent No: 271416 on 19th February 2016***
P25	Glucose biosensor system coupled with an anti inflammatory module and methods for using the same	**Rohit Srivastava**, Rahul Dev Jayant and Ayesha Chaudhary	***Granted US Patent No US 8916136 B2 on 23rd Dec 2014***
P26	Biosensor for health monitoring and uses there of	Ayesha Chaudhary and **Rohit Srivastava**	***Pub.No.:US2012/0016217A1 Pub. date: 19 -01-2012***
P27	Biodegradable fluorescent liposomal nanocomposites and method of preparation thereof	Rajendra Prasad, Deepak Singh Chauhan, Janhavi Devrukhar, Ramkrishn Gupta and **Rohit Srivastava**	***Granted Indian Patent No: 372447 on 22th July 2021***

Prof. T. R. R. Mohan Chair in Material Sciences and Microelectronics

Prof. Indradev Samajdar

Email: indra@iitb.ac.in

Department of Metallurgical Engineering & Materials Science

"It's an honor to be the first recipient of the chair named after Prof. TRR Mohan - an excellent academician, and a friend."

– Prof. Indradev Samajdar

(Department of Metallurgical Engineering and Materials Science)

TEACHING AND RESEARCH HIGHLIGHTS

Academic Background

Ph.D. : Drexel University, USA, 1994.

MS: University of Texas at El Paso, USA, 1991.

B.E.: Jadvpur University, India, 1987.

Research Interests

Crystallographic Texture

Microstructural Engineering

Thermomechanical Processing

PATENTS

1. "A Randomized Grain Boundary Austenitic Stainless Steel and a Process Thereof"; Application no. 1090/MUM/2002 dt 6-12-02. (Names: V. Kain, P.K. Dey, D.N. Wasnik and I. Samajdar). – Indian Patent
2. "Development of a very high resistance to sensitization in austenitic stainless steel through special heat treatment resulting in grain boundary structure modification"; Application no. 893/MUM/2008 dt 21-April-08. (Names: R.K. Dayal, Parvathanandini, Baldev Raj, S. Mulke and I. Samajdar).– Indian and US Patent.

AWARDS & RECOGNITIONS

1. H.H. Mathur Award of Research Excellence, IIT Bombay, 2016.
2. Institute Chair Professor (2014-2017, 2017-2020), Prof. TRR Mohan Chair Prof. (2021-Cont.).
3. Adjunct Professor: Monash University.
3. Fellow of INAE (Indian National Academy of Engineers) and EMSI (Electron Microscopy Society of India).
4. Metallurgist of the year: IIM-NMD (Indian Institute of Metals – National Metallurgist Day), 2011.
5. MRSI (Materials Research Society of India) Medal Lecture

PUBLICATIONS

1 Text Book

2 32 Papers in International Peer Reviewed Journals

MAJOR SPONSORED RESEARCH PROJECTS
(ONGOING & RECENTLY COMPLETED)

- Tata Steel (Reduction of Iron Ore) – 50 Lakhs. Ongoing. As PI.
- Tata Steel + SERB-IRRD (Hole Expansion Ratio in Dual Phase Steel) – 1 crore. Ongoing. As PI.
- Tata Steel + JSW (Residual Stresses in Hot Rolling): 70 lakhs. Ongoing. As PI.
- DAE (Deformation Processing of Titanium) – 70 Lakhs. Ongoing. As PI.
- ISRO (Maraging Stainless Steel) – 40 Lakhs. As PI.
- DRDO (Bulb Bar Rolling) – 70 Lakhs. As Co-PI.

Projects below 40 lakhs are not mentioned.

BOOK

B. Verlinden, J. Driver, I. Samajdar, R. D. Doherty, Thermo-Mechanical Processing of Metallic Materials, ISBN–978-0-08-044497-0, Pergamon Materials Series – series ed. R.W. Cahn, Elsevier, Amsterdam, 2007.

TRAINING OF HIGHLY QUALIFIED PEOPLE

Under his supervision 30 PhD students graduated, 3 are going to defend their thesis, 11 students are – ongoing and of these 11, 6 are co-supervised.

PUBLICATION LIST 2021-2022

(PEER REVIEWED JOURNALS)

1) M. I. Khan, A. Sarkar, H. K. Mehtani, P. Raut, A. Prakash, M.J.N.V. Prasad, I. Samajdar, and S. Parida (2022): Microstructure and Aqueous Corrosion in Carbon Steel: An Emerging Correlation, Mater. Chem. Phys., 126623, 1-13.

2) Soudip Basu, Anirban Patra, Balila Nagamani Jaya, Sarbari Ganguly, Monojit Dutta and Indradev Samajdar (2022): Study of microstructure-property correlations in dual phase steels for achieving enhanced strength and reduced strain partitioning, Materialia, 25, 101522, 1-14.

3) Namit Pai, Aditya Prakash, Indradev Samajdar and Anirban Patr (2022): Study of Grain Boundary Orientation Gradients through Combined Experiments and Strain Gradient Crystal Plasticity Modeling, IJP, 156, 103360, 1-29.

4) Aditya Prakash, Tawqeer Nasir Tak, Abu Anand, Namit N. Pai, S.V.S. Narayana Murty, Chandra Veer Singh, P. J. Guruprasad and Indradev Samajdar (2022): Mechanistic Origin of Orientation Dependent Substructure Evolution in Aluminum and Aluminum-Magnesium Alloys, MMTA, 53A, 2689-2707.

5) Arnab Sarkar, Soudip Basu, Amulya Bihari Pattnaik, Balila Nagamani Jaya, Shyamprasad Karagadde, Indradev Samajdar, Hemant Kumar, Ravi Kumar, R. Mythili, Chanchal Ghosh, Arup Dasgupta and Shaju Albert (2022): The Defining Role of Micro-Fissures on the Mechanical Behavior of Laser Welded Fully Austenitic Stainless Steel, MMTA, 53A, 2116-2129.

6) Ashish Dhole, Amrita Bhattacharya, René de Kloe, Rohit Kumar Gupta, Amol A. Gokhale, and I. Samajdar (2022): Orientation Dependent Interface Morphology and Oxide Stability in a Commercial Niobium Alloy: Explaining Experimental Results with Density Functional Theory, Acta Mater., 229, 117793, 1-12.

7) Sushil K. Giri, Saurabh Kundu, Aditya Prakash, S. Cicale, L. Albini and Indradev Samajdar (2022): Defining the Role of Hot Band Annealing in High Permeability Grain Oriented (GO) Electrical Steel, MMTA, 53, 1873-1888.

8) Arijit Lodh, Khushahal Thool and Indradev Samajdar (2022): X-ray Diffraction for the Determination of Residual Stress of Crystalline Material: An Overview, TIMM, 75(4), 983-995.

9) H. K. Mehtani, M. I. Khan, P. Raut, S. Parida, M.J.N.V. Prasad, D. Fullwood, R.D. Doherty and I. Samajdar (2022): Oxidation in Iron-Copper and Iron-Phosphorous Binary Alloys: Relating Alloying and Metal-Oxide Crystallography with Oxidation Resistance, Oxidation of Metals, 97, 417-440.

10) Ujjal Tewary, Dennis Paul, H. K. Mehtani, Shishira Bhagavath, Alankar Alankar, Goutam Mohapatra, Satyam S. Sahay, Ajay S. Panwar, Shyamprasad Karagadde and Indradev Samajdar (2022): The Origin of Graphite Morphology in Cast Iron, Acta Mater., 226,11760.

11) P. Raut, D. Fuloria, S. Baka, S. Chatterjee, C. Ghosh, N. Venkatramani, and I. Samajdar (2022): Electropulsing Induced Plastic Deformation in an Interstitial Free Steel, MST, 38(2), 90-104.

12) Riya Mondal, Parvej Raut, Sunil Kumar Bonagani, Saurabh Kumar, P.V. Sivaprasad, G. Chai, V. Kain and I. Samajdar (2022): Relating Hot deformed Microstructures and Corrosion Performance in a Super Duplex Stainless Steel, JMEPEG, 31, 1478-1492.

13) Aditya Prakash, Tawqeer Nasir Tak, Namit N. Pai, S.V.S. Narayana Murty, P. J. Guruprasad, R.D. Doherty and Indradev Samajdar (2021): Slip Band Formation in Low and High Solute Aluminum: A Combined Experimental and Modeling Study, MSMSE, 29, 085016 (27 pages), 1-27.

14) M. I. Khan, Aditya Prakash, H. Mehtani, P. Raut, Namit Pai, A. Sarkar, MJNV Prasad, S Parida and I. Samajdar (2021): The Defining Role of Plastic Deformation on Resistance to Aqueous Corrosion of Interstitial Free Steel, MMTA, 52A, 4597-4608.

15) Soudip Basu, Balila Nagamani Jaya, Anirban Patra, Sarbari Ganguly, Monojit Dutta, Anton Hohenwarter and Indradev Samajdar (2021): The Role of Phase Hardness Differential on the Non-Uniform Elongation of a Ferrite-Martensite Dual Phase steel, MMTA, 52A, 4018-4032.

16) Ujjal Tewary, Devesh Mukherjee, Alankar Alankar, Goutam Mohapatra, Satyam S. Sahay, Indradev Samajdar and Shyamprasad Karagadde (2021): An Integrated Multi-Scale Model for Graphite Growth Mechanism in Industrial Cast Iron, MMTB, 55B, 633-651.

17) H. K. Mehtani, M. I. Khan, B. Nagamani Jaya, S. Parida, M.J.N.V. Prasad and I. Samajdar (2021): The oxidation behavior of iron-chromium alloys: The defining role of substrate chemistry on kinetics, microstructure and mechanical properties of the oxide scale, JALCOM, 871, 159583.

18) Ashish Dhole, Amrita Bhattacharya, Rohit Kumar Gupta, Amol A. Gokhale and I. Samajdar (2021): The Role of the Metal-Oxide Interface's Terminating Layer on the Selective Cold Cracking of a Commercial Niobium-Hafnium-Titanium (C-103) Alloy, JALCOM, 856, 157427.

19) S. Dasari, A. Sarkar, A. Sharma, B. Gwalani, D. Choudhuri, V. Soni, S. Manda, I. Samajdar, and R. Banerjee (2021): Recovery of Cold-worked Al0.3CoCrFeNi Complex Concentrated Alloy through Twinning Assisted B2 Precipitation Resulting in Excellent Strength-Ductility Combination, Acta Mater., 202, 448-462.

Prof. Tarun Kant Chair in Computational Mechanics

Prof. Deepankar Choudhury

Email: dc@civil.iitb.ac.in

Department of Civil Engineering

"I am honoured to be the first occupant of this named Chair Professor position – Prof. Tarun Kant Chair Professor, for the research contributions made in the area of Computational Mechanics. Sincere thanks to the Institute and the donors to start this named Chair Professor position after our respected former colleague at IIT Bombay, Prof. Tarun Kant, who is a well renowned expert in the domain of Computation Mechanics through his own outstanding research contributions to the field. He is probably the first Civil Engineer in India to become fellow of all national science and engineering academies of India. After being selected as the first recipient of Prof. Tarun Kant Chair Professor position, I'm humbled and will continue with more research in the domain of Computational Geomechanics with emphasis on Geotechnical Earthquake Engineering and Foundation Engineering. Thanks, and best regards,"

– Prof. Deepankar Choudhury.

TEACHING AND RESEARCH HIGHLIGHTS

Prof. Choudhury joined IIT Bombay after finishing his PhD at IISc Bangalore in 2002. He completed his post-PhD work experience as a Lecturer at IIT Kanpur. He has since been a teacher/researcher in the Civil Engineering department and has been focused in the domain of Geotechnical Engineering since July 2003.

Teaching:

Prof. Choudhury has taught all of the Geotechnical Engineering core courses in both the Undergraduate and Postgraduate levels. He also taught the fundamental core UG 1st year Engineering Mechanics course at IIT Bombay and later mentored other IITs - IIT Gandhinagar in 2009 and at IIT Dharwad in 2017.

At IIT Bombay, he developed and started two new theory courses at the UG and PG level in his area of expertise "Geotechnical Earthquake Engineering". He also developed web-based courses under the NPTEL – Govt. of India distance education initiative. In phase 1- he developed "Foundation Engineering" and in Phase-2 he developed video-based courses on "Soil Dynamics" and "Geotechnical Earthquake Engineering"- both of which are very popular all over the world and broadcast frequently in the Swayam Prabha channel launched by the Govt. of India.

He also wrote a text book on "Foundation systems for high-rise structures" with his German collaborators which was published by CRC Press UK, and is in great demand worldwide. Prof. Choudhury received the "Prof. S. P. Sukhatme Excellence in Teaching Award" at IIT Bombay in 2017. This award was given to him based on the evaluation he received at the Institute-level for over a decade of outstanding teaching record and students' feedback.

Research:

Prof. Choudhury established a new research laboratory called the Geotechnical Earthquake Engineering Laboratory (GEEL) at IIT Bombay where he and his research students continue to carry out scholarly research in the areas of Geotechnical Earthquake Engineering, Foundation Engineering, Soil-Structure Interaction, Computational Geomechanics, Disaster Management, Soil Dynamics, Railway Geotechnics, Seismic Hazards etc.

His research team introduced new "pseudo-dynamic method of analysis" which is now popular worldwide as a robust technique for obtaining closed-form design solutions for earthquake resistant designs of various geotechnical structures.

Prof. Choudhury's research group and his collaborators introduced the seismic analysis and design for the recently developed "Combined Pile-Raft Foundation" and this is being applied in various mega projects worldwide. One of these projects is the most important nuclear power plant foundation design for the upcoming new NPP which is uniquely founded on soil strata unlike other NPP where rock strata were used. International design manuals and newly proposed Indian standards on CPRF are also using some of the research outcomes of Prof. Choudhury's team.

The fundamental research work on earthquake resistant closed-from design solutions obtained both analytically and verified numerically is the biggest strength of his research in terms of field data and validation. Other national mega prestigious projects like the longest sea bridge of India – MTHL of Mumbai used his research findings for practical application of seismic design of foundations considering site-specific studies.

India's largest petroleum terminal at Motihari adopted Prof. Choudhury's design methods with field tests of DMT and CPT in order to make the site stable with respect to earthquake hazards for oil tank foundations, especially considering the high seismicity of the region.

IIT Bombay honoured Prof. Choudhury with the institute research award in 2009 and, again, in 2017. Prof. Choudhury has received various young scientist awards for his outstanding research from various science and engineering academies of India. Additionally, he has received multiple international awards of repute like the Humboldt Fellowship (experienced category) of Germany, JSPS Fellowship of Japan, TWAS-VS Fellowship of Italy, BOYSCAST Fellowship of India for his acclaimed research.

Many of his former PhD scholars from IIT Bombay have also received the Best PhD thesis awards from the Institute and from other societies, both in India and abroad.

Prof. Choudhury is the only geotechnical engineer of India who is the fellow (FNASc) of the oldest science academy, i.e. the National Academy of Sciences, India (NASI). He is also an elected fellow (FASCE) of the American Society of Civil Engineers (ASCE), USA and received the Prof. C. S. Desai Medal from IACMAG, USA and APACM Award from Australia and Shamsher Prakash Award from India and USA. As a member of IBC of USA and IS code committee of India, Prof. Choudhury updates many provisions in design codes with recent research findings for practical implementation. Details of his research works and publications are available at: www.civil.iitb.ac.in/~dc/

SERVICE AND PUBLIC ENGAGEMENT/ AFFILIATIONS

- Head, Dept. of Civil Engineering, IIT Bombay, Mumbai, India. Since March 2021 to till date.
- Prof. T. Kant Chair Professor, Dept. of Civil Engineering, IIT Bombay, India. 2021-2024.
- Advisory Board Member, Dept. of Civil Engineering, IIT Jodhpur. Since Feb. 2021 to till date.
- Member of Board of Studies (BoS), Goa Engineering College (GEC), Goa University, India. Since 2021 to till date.
- National Organising Chairperson of GATE 2021 (Graduate Aptitude Test in Engineering).
- Chairperson of GATE 2020 (Graduate Aptitude Test in Engineering) at IIT Bombay.
- Institute Chair Professor, Dept. of Civil Engineering, IIT Bombay, India. 2017-2020.
- Visiting Professor, Incheon National University, South Korea. May-June 2017

- Mentor and Professor, IIT Dharwad, Karnataka, India (on deputation). Jan-April 2017.
- Academic Council Member, Veermata Jijabai Technological Institute (VJTI), Mumbai, India. Since January 2016 to till date.
- National Organising Vice-Chairman of IIT-JEE (Advanced) 2015 (Joint Entrance Exam – Adv.).
- Founding Member of National Joint Seat Allocation Authority, JoSAA 2015.
- Adjunct Professor, Academy of Scientific and Innovative Research (AcSIR), India, affiliated to CSIR-CBRI Roorkee, Roorkee, India. 2013 to 2020.
- Visiting Professor, Technical University Darmstadt, Germany. May-July 2013, May-July 2014.
- Humboldt Fellow (experienced category), Technical University Darmstadt, Germany. Jan-June 2010, May-July 2011, May-July 2012.
- Mentor and Associate Professor, IIT Gandhinagar, Gujarat, (on deputation). Jan-April 2009.
- JSPS Fellow, Kagoshima University, Japan. May-July 2009.
- Associate Professor, Dept. of Civil Engineering, IIT Bombay, India. April 2007 to May 2012.
- BOYSCAST Fellow, University of California Berkeley, USA. April-October 2006.
- Visiting Fellow, University of Wollongong, NSW, Australia. May-June 2005.
- Visiting Scientist, National University of Singapore, Singapore. May-July 2004.
- Assistant Professor, Dept. of Civil Engineering, IIT Bombay, India. July 2003 to March 2007.
- Lecturer, Dept. of Civil Engineering, IIT Kanpur, Kanpur, India. November 2002 to June 2002.

TRAINING OF HIGHLY QUALIFIED PEOPLE

(INDICATE THE NUMBERS BELOW)

	Masters students	Doctoral Students	Post-doctoral students
Supervised	21	21 + 10 (ongoing) + 1 (AcSIR)	2 + 3 (ongoing)
Co-Supervised	0	4 + 1 (ongoing) + 1 (AcSIR)	0
Graduated	21	21+4+2 (AcSIR)	2

LIST OF PUBLICATIONS IN 2021

International Journal

1. Chaidul Haque Chaudhuri and Deepankar Choudhury (2021); "Buried pipeline subjected to static pipe bursting underneath: A closed-form analytical solution", Geotechnique, (ISSN: 0016-8505, Impact Factor: 5.458/2020) ICE, London, U.K. (in press, available online since September 27, 2021 with doi: 10.1680/jgeot.20.P.167).

2 Ritwik Nandi and Deepankar Choudhury (2021); "Evaluation of passive earth resistance using an improved limit equilibrium method of slices", International Journal of Geomechanics, ASCE, (ISSN: 1532-3641, Impact Factor: 3.819/2020) USA, Vol. 21, No. 11, pp. 04021207_1-10, doi: 10.1061/(ASCE)GM.1943-5622.0002183.

3. Aniruddha Bhaduri and Deepankar Choudhury (2021); "Steady-state response of flexible combined pile-raft foundation under dynamic loading", Soil Dynamics and Earthquake Engineering, (ISSN: 0267-7261, Impact Factor: 3.718/2020) Elsevier, U.K., Vol. 145, No. 2, pp. 106664_1-10, doi: 10.1016/j.soildyn.2021.106664.

4. Girish Patil, Deepankar Choudhury and Apurba Mondal (2021); "Three-dimensional soil-foundation-superstructure interaction analysis of nuclear building supported by combined piled-raft system", International Journal of Geomechanics, ASCE, (ISSN: 1532-3641, Impact Factor: 3.819/2020) USA, Vol. 21, No. 4, pp. 04021029_1-16. doi: 10.1061/(ASCE)GM.1943-5622.0001956.

5. Kedar Birid and Deepankar Choudhury (2021); "Bearing capacity of ring foundations over a rock mass using numerical analysis" Geomechanics and Geoengineering: An International Journal, (ISSN: 1748-6025, Impact Factor: 0.34/2020), Taylor & Francis, UK, (in press, available online since October 5, 2021 with doi: 10.1080/17486025.2021.1975050).

6. Kedar Birid and Deepankar Choudhury (2021); "Depth factors for ring foundations in cohesive soil using numerical analysis", International Journal of Geotechnical Engineering, (ISSN: 1938-6362, Impact Factor: 1.26/2018), Taylor & Francis, UK, (in press, available online since May 5, 2021 with doi: 10.1080/19386362.2021.1921435).

7. Chaidul Haque Chaudhuri and Deepankar Choudhury (2021); "Semianalytical solution for buried pipeline subjected to horizontal transverse ground deformation", Journal of Pipeline Systems Engineering and Practice, ASCE, (ISSN: 1949-1190, Impact Factor: 1.952/2020) USA, Vol. 12, No. 4, pp. 04021038_1-15, doi: 10.1061/(ASCE)PS.1949-1204.0000541.

8. Vansittee Dilli Rao and Deepankar Choudhury (2021); "Deterministic seismic hazard analysis for the Northwestern part of Haryana state, India, considering various seismicity levels", Pure and Applied Geophysics, (ISSN: 0033-4553, Impact Factor: 2.335/2020) Springer, USA, Vol. 178, pp. 449-464, doi: 10.1007/s00024-021-02669-3.

9. Girish Patil, Deepankar Choudhury and Apurba Mondal (2021); "Estimation of the response of piled raft using nonlinear soil and interface model", International Journal of Geotechnical

Engineering, (ISSN: 1938-6362, Impact Factor: 1.26/2018), Taylor & Francis, UK, (in press, available online since Dcember 26, 2020 with doi: 10.1080/19386362.2020.1859250).

10. Kedar Birid and Deepankar Choudhury (2021); "Undrained bearing capacity factor Nc for ring foundations in cohesive soil", International Journal of Geomechanics, ASCE, (ISSN: 1532-3641, Impact Factor: 3.819/2020) USA, Vol. 21, No. 2, pp. 06020038_1-14, doi: 10.1061/(ASCE)GM.1943-5622.0001900.

11. Kshitija Nadgouda and Deepankar Choudhury (2021); "Seismic bearing capacity factor Nge for dry sand beneath strip footing using modified pseudo-dynamic method with composite failure surface", International Journal of Geotechnical Engineering, (ISSN: 1938-6362, Impact Factor: 1.26/2018), Taylor & Francis, UK, Vol. 15, No. 2, pp. 171-180, doi: 10.1080/19386362.2019.1707994.

National Journal

12. Deepankar Choudhury, Shibayan Biswas, Milind patil and Sujatha Manoj (2021); "Solutions for foundation systems subjected to earthquake conditions", Indian Geotechnical Journal, (ISSN: 0971-9555), Springer, India, Vol. 51, No. 1, pp. 165-181, doi: 10.1007/s40098-021-00508-9.

13. M. K. Pradhan, Praveen Kumar, V. S. Phanikanth, Deepankar Choudhury and K. Srinivas (2021); "An experimental investigation for soil-pile interaction under harmonic load", Indian Geotechnical Journal, (ISSN: 0971-9555), Springer, India, (in press, available online since January 3, 2021 with doi: 10.1007/s40098-020-00471-x).

International Conference

14. C. H. Chaudhuri and D. Choudhury (2021); "Simplified analytical solution of buried pipeline subjected to pipe bursting underneath", Proceedings of the 17th World Conference on Earthquake Engineering (17WCEE), September 27-October 2, 2021, Sendai, Japan, Paper ID 4f-0014, pp. 1-11.

Edited Book / Book Chapter

15. Mahdi O. Karkush and Deepankar Choudhury (2021); "Modern Applications of Geotechnical Engineering and Construction", Edited Book, Lecture Notes in Civil Engineering, Geotechnical Engineering and Construction, Springer Nature, (ISBN 978-981-15-9398-7, Online ISBN: 978-981-15-9399-4), Singapore, LNCE Vol. 112, pp. 411-428, doi: 10.1007/978-981-15-9399-4.

16. Anurag Sahare and Deepankar Choudhury (2021); "Seismic ground response analysis for soil site in Johor, Malaysia", In Edited Book entitled 'Geohazards', Lecture Notes in Civil Engineering, Editors, Madhavi Latha Gali and P. Raghuveer Rao, Developments in Geotechnical Engineering, Springer Nature, (ISBN 978-981-15-6232-7, Electronic ISBN: 978-981-15-6233-4), Singapore, Vol. 86, pp. 411-428, doi: 10.1007/978-981-15-6233-4_29.



Prof. Deepankar Choudhury with some of his former and present PhD students of Geotechnical Earthquake Engineering laboratory


N.R. Kamath Distinguished Institute Chair Professorship

IIT Bombay has established the N R Kamath Chair Professorship for Institutional Excellence. This is the most prestigious chair of the Institute and was established in the memory of Prof. N R Kamath, who served IIT Bombay as a faculty member. The late Prof. N R Kamath was an outstanding teacher and technologist and had a profound influence on his students. Prof. Kamath played a decisive role as an academician and administrator during the formative years of not just the Chemical Engineering Department but also the Institute. He played a visionary role in setting up the teaching and research agenda for the department and was a motivating force for both the faculty and students of the department. During his era, he was a role model and mentor to many young faculty and students.

As a fitting tribute to the pioneering role he played in shaping the destiny of the Institute, the alumni of IIT Bombay have established this chair to honor his immense contribution to the Institute. The chair has been occupied by many eminent personalities in academia.

• Prof. Kaushik Basu

C. Marks Professor of International Studies
Professor of Economics at Cornell University (USA).

He is the former Chief Economic Adviser (2009 to 2012) to the Govt. of India and former Senior Vice President and Chief Economist (2012 to 2016) to the World Bank. In 2008, he was conferred the Padma Bhushan by the President of India and in June 2017 he began a three-year term as President of the International Economic Association.

• Prof. Samir Mitragotri

Hiller Professor of Bioengineering
Hansjorg Wyss Professor of Biologically Inspired Engineering
Core Faculty Member at Wyss Institute for Biologically Inspired Engineering.

He is the first recipient of the N. R. Kamath Chair Professorship for Institutional Excellence at IIT Bombay. Prof. Mitragotri's research has impacted areas of Bioengineering such as transdermal drug delivery, oral drug delivery, bio-inspired nanoparticles for drug delivery and bio-synthetic hybrid systems for drug delivery and immunotherapy.

• Prof. Manjul Bhargava

R. Brandon Fradd Professor of Mathematics at Princeton University
Adjunct Professor at the Tata Institute of Fundamental Research in Mumbai
Stieltjes Chair at Leiden University in the Netherlands.

He is recognized worldwide as one of the foremost mathematicians and leading experts in Number Theory. An accomplished classical Indian musician he is also deeply interested in Indian languages. Prof. Bhargava was awarded the Padma Bhushan (2015) and the Rajasthan Ratna (2016).

• Prof. Madhu Sudan

Gordon McKay Professor of Computer Science (Harvard John A. Paulson School of Engineering and Applied Sciences

He received the Rolf Nevanlinna Prize at the 24th International Congress of Mathematicians (2002), ACM's Distinguished Doctoral Dissertation award 1993 and Gödel Prize (2001). He is a Fellow of ACM (2008) American Mathematical Society (2012), has won the Infosys Prize in mathematical sciences (2014), and was elected to the National Academy of Sciences (2017).

• Prof. Bruce Hajek

Center for Advanced Study Professor of electrical and Computer Engineering
Professor in the Coordinated Science Laboratory
Hoeft Chair in Engineering at the University of Illinois at Urbana-Champaign.

He was elected into the National Academy of Engineering in 1999 for drug delivery and bio-synthetic hybrid systems for drug delivery and Immunotherapy.

• Dr. Rakesh Agarwal

President and Founder, Data Insights Laboratories, San Jose, USA
He is a member of the National Academy of Engineering, both USA and India, a Fellow of ACM, and a Fellow of IEEE. He has been both an IBM Fellow and a Microsoft Fellow.
He has also been the Rukmini Visiting Chair Professor at the Indian Institute of Science, Bangalore, India, a Visiting Professor at EPFL, Lausanne, Switzerland, and a Visiting Professor and JSPS Fellow at the Kyoto University, Japan. ACM SIGKDD awarded him its inaugural Innovations Award and ACM SIGMOD the Edgar F. Codd Award. He was named to the Scientific American's First list of top 50 Scientists.

• Prof. Herbert Huppert

Professor of Theoretical Geophysics, University of Cambridge

At various times visiting scientist at the Australian National University, University of California at San Diego, Canterbury University, Caltech, MIT, University of New South Wales, University of Sydney, Tata Institute at Mumbai, University of Western Australia, the Weizmann Institute and the Woods Hole Oceanographic Institute.

Birth anniversary celebration of Prof. N. R. Kamath - September2021

Details of the mega-event on the birth anniversary of Prof. N. R. Kamath were discussed. A webinar titled 'Chemical Engineering: Chemistry to Computers', was held on the birth anniversary of Prof. N. R. Kamath on September 8, 2021, highlighting the thoughts and perspectives of esteemed thinkers and experts on chemical engineering, tracing the path of the discipline from chemistry to computers.

The speakers at the webinar included:

- Prof. M. M. Sharma, Emeritus Professor of Eminence, Institute of Chemical Technology (ICT) shared his perspective on the evolution of Chemical Engineering.
- Dr. R. A. Mashelkar, Chairman, National Innovation Foundation, Reliance Innovation Council, KPIT Technologies Innovation Council who discussed the Future of Chemical Engineering and Engineering of our Future.
- Prof. Devang Khakhar, Professor (Dept of Chemical Engineering), (Former Director IIT Bombay) explained the role of Computation in Chemical Engineering.

This event received an overwhelming response, from over 300 participants who attended this webinar from across the globe. The celebrations were very well received and there were interesting takeaways from the question-and-answer session held during this event.

The committee thanked Mr. Himatsingka for conceptualizing this unique initiative, and Prof. Ravindra Gudi who helped develop this concept and design the event.

Webinar #1: Dr. Anand Garde

Dr. Anand Garde delivered a virtual lecture on "Evolution of Zirconium Alloys for LWR Nuclear Power during the past more than 60 years" on February 15, 2022.

Dr. Anand Garde graduated with a B. Tech. in Metallurgical Engineering from IIT Bombay in 1967 and followed by M. S. in Metallurgical Engineering from Syracuse University in 1970 and finally finished his Ph. D. in Materials Science, University of Florida in 1973. He had an illustrious career in the area of Zirconium and was awarded the 2019 Kroll Zirconium Medal for Lifetime Achievement at the 20th ASTM International Symposium on Zirconium in Nuclear Industry.

Prof. Indradev Samajdar was the coordinating professor for conducting this lecture.

Vijay & Sita Vashee Chair Professor

Prof. Manoj Prabhakaran

Email: mp@csc.iitb.ac.in

Department of Computer Science and Engineering

"Thank you for your support in fostering excellence at IIT Bombay. The chair professorship is indeed a recognition and incentive, and the no-strings attached funding it brings with it a valuable resource."

Prof. Manoj Prabhakaran

TEACHING AND RESEARCH HIGHLIGHTS

Prof. Prabhakaran moved to IIT Bombay from UIUC in late 2016. His main focus is on advanced theoretical cryptography tools (e.g., "secure multi-party computation (MPC)"), and translating them to practical applications. On the theoretical end, he and his team has made advances in characterizing multi-party computations that admit highly secure protocols. He and his team have also discovered surprising positive and negative results with secure computation in a minimalistic model of "One-way communication." Prof. Prabhakaran and his team has also developed a theoretical model of secure computation (called "Zero-Communication Reduction") with applications to questions in computational complexity theory, as well as cryptography. In a different line of work, they have extended the foundations of "Differential Privacy," a highly influential framework for obtaining privacy guarantees in statistical databases. Other recent and ongoing work focus on emerging theoretical concepts like "Witness Encryption" and "Obfuscation." On the practical side, they are developing a programming language for implementing MPC protocols. Prof. Prabhakaran and his team have also designed a "Functionally Encrypted Database" offering provable security guarantees, and efficiency that is adequate for many applications. Finally, they have proposed a paradigm called "CellTrees" for distributed data repositories, as an alternative to blockchains, offering scalability and functionality guarantees not available in Blockchains.

SERVICE AND PUBLIC ENGAGEMENT

Prof. Prabhakaran serves as a member on steering committees at the reputed Theoretical Cryptography Conference (TCC), as well as a new premier conference on Information Theoretic Cryptography (ITC). He also serves as an Associate Editor for the Journal of Cryptology, the leading journal in the field. He has served as General Chair for TCC 2018, and as a Program Committee Chair for Indocrypt 2020.

Prof. Prabhakaran has contributed lectures to various instructional workshops in India, most recently to two workshops held at IISc and TIFR Bangalore, and given invited keynote talks at conferences in India.

He has also been engaging with the public on topics related to cryptography and security. He has served on a panel for school children, given a public lecture, submitted an affidavit on a court case in the Madras High Court (since then transferred to the Supreme Court) on security aspects of WhatsApp, and written an article on the security aspects of India's "Aadhaar" scheme.

TRAINING OF HIGHLY QUALIFIED PEOPLE

(INDICATE THE NUMBERS BELOW)

	Masters	PhD	Postdoc	Others
Supervised	3	4	1	About 20 undergrads
Graduated	2	-	1	About 15

LIST OF PUBLICATIONS AND PRESENTATIONS

Publications since occupying the chair:

(Author names sorted alphabetically, as is the convention in this research community)

- Suvradip Chakraborty, Manoj Prabhakaran, Daniel Wichs, "Witness Maps and Applications", to appear at PKC 2020.
- Navneet Agarwal, Sanat Anand, Manoj Prabhakaran, "Uncovering Algebraic Structures in the MPC Landscape", EUROCRYPT 2019
- Sibi Raj B. Pillai, Manoj Prabhakaran, Vinod M. Prabhakaran, Srivatsan Sridhar, "Optimality of a Protocol by Feige-Kilian-Naor for Three-Party Secure Computation", INDOCRYPT 2019
- Anasuya Acharya, Manoj Prabhakaran, Akash Trehan, "An Introduction to the CellTree Paradigm (Invited Paper)", ICISS 2019
- Shweta Agrawal, Rachit Garg, Nishant Kumar, Manoj Prabhakaran, "A Practical Model for Collaborative Databases: Securely Mixing, Searching and Computing," ESORICS 2020.
- Varun Narayanan, Manoj Prabhakaran, Vinod Prabhakaran, "Zero-Communication Reductions," TCC 2020.
- Shweta Agrawal, Yuval Ishai, Eyal Kushilevitz, Varun Narayanan, Manoj Prabhakaran, Vinod Prabhakaran, Alon Rosen, "Cryptography from One-Way Communication: On Completeness of Finite Channels" ASIACRYPT 2020.
- Aarushi Goel, Abhishek Jain, Manoj Prabhakaran, Rajeevalochana Raghunath, "On the Role of Point-to-Point Channels inSecure Multiparty Computation" TCC 2021.
- Guru-Vamsi Policharla, Manoj Prabhakaran, Rajeev Raghunath, and Parjanya Vyas, "Group Structure in Correlations and its Applications in Cryptography," ITC 2021.
- Shweta Agrawal, Yuval Ishai, Eyal Kushilevitz, Varun Narayanan, Manoj Prabhakaran, Vinod Prabhakaran, Alon Rosen, "Secure Computation from One-Way Noisy Communication, or: Anti-Correlation via Anti-Concentration," CRYPTO 2021.

- Kaartik Bhushan, Ankit Misra, Varun Narayanan, Manoj Prabhakaran, "Secure Non-Interactive Reducibility is Decidable," TCC 2022.
- Saumya Goyal, Varun Narayanan, Manoj Prabhakaran, "Oblivious-Transfer Complexity of Noisy Coin-Toss via Secure Zero Communication Reductions," TCC 2022.
- Anasuya Acharya, Carmit Hazay, Vlad Kolesnikov, Manoj Prabhakaran, "SCALES: MPC with Small Clients and Larger Ephemeral Servers," TCC 2022.
- Ran Canetti, Suvradip Chakraborty, Dakshita Khurana, Nishant Kumar, Oxana Poburinnaya, Manoj Prabhakaran, "COA-Secure Obfuscation and Applications," Eurocrypt 2022.
- Pratyush Agarwal, Varun Narayanan, Shreya Pathak, Manoj Prabhakaran, Vinod Prabhakaran, Mohammad Ali Rehan, "Secure Non-Interactive Reduction and Spectral Analysis of Correlations," Eurocrypt 2022.
- Aman Bansal, Rahul Chunduru, Deepesh Data, "Flexible Accuracy for Differential Privacy," AISTATS 2022.
- **Selected Talks:**
- "Correlations in Cryptography," CSA50 - Pratiksha Trust Workshop on Theoretical Computer Science, IISc Bangalore, January 2019
- "Zero-Communication Reductions," Workshop on Lower Bounds in Cryptography, Bertinoro, Italy, July 2019.
- "Extending the Foundations of Differential Privacy," Indocrypt (Keynote), Hyderabad, December 2019.
- "On the CellTree Paradigm," ICISS (Keynote), Hyderabad, December 2019.
- "Zero-Communication Reductions," MPC Theory and Practice Workshop, IISc Bangalore, January 2020.
- "Advanced Cryptography for Emerging Digital Government Applications", Expert Circle: Securing processes in the governmental environment through encryption technologies (Keynote), TU Munich, September 2022.

Biswas Palepu Distinguished Chair Professor Chemistry

Prof. Ramaswamy Murugavel

Email: rmv@chem.iitb.ac.in
Department of Chemistry

"As I have expressed many times to you during your visits to IIT Bombay, creation of this chair at the Department of Chemistry goes to show your love and commitment to the department. I am happy to be the second occupant of this chair after Professor H B Singh. The department and I once again thank you for this kind gesture and look forward to your continued interaction with the department in the coming years. A Big Thank You."

Prof. Ramaswamy Murugavel

TEACHING AND RESEARCH HIGHLIGHTS

Prof. Murugavel's laboratory employs an organic-soluble organophosphates as the building block to assemble polyhedral molecules that resemble many of the secondary building units (SBUs) of zeolite materials. Reaction of this phosphate with a divalent metal such as Zn2+ in a donor solvent (L) leads to the isolation of tetranuclear metal phosphates [(RO)PO3Zn(L)]4 whose inorganic core resembles the zeolitic D4R SBU. Recently, Prof. Murugavel and his team found out that it is possible to isolate even larger SBUs through small variations in the reaction conditions. Thus, hitherto unknown discrete clusters with D6R and D8R SBU like cores (Zn6O18P6 and Zn8O24P8 cores, respectively) have been isolated by switching the solvent from methanol to acetonitrile and the co-ligand from DMSO to either 4-formylpyridine or 4-cyanopyridine. A rationalization of these building principles will be presented in this lecture, apart from highlighting the use of this class of compounds as molecular magnets, and phosphorus-based perovskites, and energy related applications.

To carry out major research grants have been obtained from SERB, DST, CSIR, and MHRD. The current outlay of the sponsored projects is roughly Rs. 4.5 Crores.

SERVICE AND PUBLIC ENGAGEMENT

Prof. Murugavel has been the Vice-President of Chemical Research Society of India (CRSI), where he played an important role in getting PhD students engaged in CRSI activities and then becoming life-members of the society. He continues to work with small colleges and less endowed research institutions by not only visiting these places and talking to the students and teachers (through Combined Academies Workshops, INSPIRE camps, etc.) but also hosts research interns in his laboratory for students originating from such institutions. He also serves in several national committees related to funding and policy, recruitment, etc.

TRAINING OF HIGHLY QUALIFIED PEOPLE

(INDICATE THE NUMBERS BELOW)

	Master Students	Doctoral Students	Postdoctoral Students	Others (RA&TA)
Supervised	1	14	3	1
Co-Supervised	0	0	0	0
Graduated	30	24	10	25

LIST OF PUBLICATIONS AND PRESENTATIONS

Publications:

1) High-pressure crystallographic and magnetic studies of pseudo-D5h symmetric Dy(III) and Ho(III) Single Molecule Magnets, M. Norre, C. Gao, S. Day, S. Gupta, A. Borah, R. Murugavel, G. Rajaraman, and J. Overgaard, Inorg. Chem. 2020, 58, 717-729.

   DOI: 10.1021/acs.inorgchem.9b02962

2) Editorial: Special issue on 150 years of the periodic table, E. D. Jemmis, J. N. Moorthy, and R. Murugavel, J. Chem. Sci. 2019, 131: 113.

   DOI: 10.1007/s12039-019-1714-6

3) An Unprecedented Structural and Functional Mimic for Copper Amine Oxidase, R. Jangir, M. Ansari, D. Kaleeswaran, G. Rajaraman, M. Palaniandavar, and R. Murugavel, ACS Catalysis, 2019, 9, 10940-10950.

   DOI: 10.1021/acscatal.9b02326

4) Ceramic and Framework Phosphates Derived from Mono and Diesters of Phosphoric Acid R. Murugavel, Emergent Materials, 2019, 2,273-294.

   DOI: 10.1007/s42247-019-00054-4

5) Facile Exfoliation of Single-Crystalline Copper Alkylphosphate van der Waals Solids to Single-Layer Nanosheets and Enhanced Supercapacitance ,G. A. Bhat, S. Halder, D. Chakraborty, S. Verma, R. Vaidhyanathan and R. Murugavel, Angew. Chem. Int. Ed., 2019, 58, 16844–16849.

   DOI: 10.1002/anie.201910157

6) Compositional Control as the key for achieving highly efficient OER electrocatalysis with cobalt phosphates decorated nanocarbon florets, J. Saha, S. Verma, R. Ball, C. Subramaniam, and R. Murugavel, Small, 2019, 1903334.

   DOI: 10.1002/smll.201903334

7) A Single-electron Single-ion Cerous Magnet, Sandeep K. Gupta, S. Shanmugan, T. Rajeshkumar, G. Rajaraman and R. Murugavel, Dalton. Trans. 2019, 48, 15928-15935.

DOI: 10.1039/c9dt03052b

8) Hitherto unknown eight-connected frameworks formed from A4B4O12 metal organophosphate heterocubanes, K. Sharma, S. K. Gupta and R. Murugavel, Chem. Commun. 2019, 55, 7994-7997. DOI: 10.1039/C9CC01893J

9) Bimetallic nanoparticles anchored on core-shell support as an easily recoverable and reusable catalytic system for efficient nitroarene reduction, R. Antony, R. Marimuthu, and R. Murugavel, ACS Omega, 2019, 4, 9241-9250. https://doi.org/10.1021/acsomega.9b01023

10) A Compelling and Complete Account of p-Block Chemistry, A review of the book "The Chemistry of the p-Block Elements: Syntheses, Reactions and Applications" by Anil J. Elias. Reviewed by R. Murugavel, Resonance, 2019, 24, 115-116. https://doi.org/10.1007/s12045-019-0761-0

Presentations:

1) "MolecularMetalPhosphates:Sensors,Catalysts andMagnets",Plenary Lecture Presented at the FCASI-2018, University of Rajasthan, Dec. 21-22, 2018.

2) "A decade plus of metal phosphate chemistry: What have we learnt?", Invited lecture presented at the IISER, Thiruvananthapuram, January 29, 2019.

3) "Molecular and Framework Metal Phosphates: Applications as Sensors, Catalysts and Molecular Magnets" Invited lecture presented at the Manonmaniam Sundaranar University, January 30, 2019.

4) "Molecular Metal Phosphate Materials: Applications as Sensors, Catalysts, and Molecular Magnets", Invited Lecture presented at the Recent Developments in Chemical Research, IIS University, Jaipur, Feb. 1-2, 2019.

5) "NewerSyntheticStrategiesforCovalent Organic and Covalent Metal-Organic Frameworks (COFs and CMOFs)", Invited talk at the "ChemPhysMat-2019" (CNR@85), JNCASR, Bangalore, Feb 20-22, 2019.

6) "TheScienceofPorousSolids:Past,Present,and Future",NationalScienceDaySymposium and SASTRA-CNR Rao Award Acceptance Talk at SASTRA University, Thanjavur, February 28, 2019.

7) "Controlling of Dimensionality of Metal Phosphates: A Chemical Synthesis Approach to New Materials" Invited lecture at VIT University, Vellore, March 09, 2019.

8) "Controlling of Dimensionality of Metal Phosphates: A Chemical Synthesis Approach to New Materials" Invited lecture at BHU, Varanasi, March 11, 2019.

9) "Controlling of Dimensionality of Metal Phosphate Frameworks", Presented at the 47th National Seminar on Crystallography, Anushaktinagar, Mumbai, June 20, 2019.

10) "Molecular & Framework Metal Phosphates: Sensors, Catalysts and Magnets", Lecture presented at ICMAT-2019, Singapore, June 24-28, 2019.

11) "Controlling of Dimensionality: A Chemical Synthesis Approach to New Materials", Invited lecture presented at IIT Indore (Prof. Ila 75th Birthday Symposium), July 13-15, 2019.

12) "Controlling of Dimensionality: A Chemical Synthesis Approach to New Materials", invited lecture at the Indo-German conference "Emerging Trends in Chemistry and Materials" August 28-29, 2019.

13) "Controlling Dimensionality of Metal Phosphate Frameworks: A Chemical Synthesis Approach to New Materials", Invited Plenary Lecture at CRIKC Conference, Nov. 02-03, 2019.

14) "Elevating Lanthanide Single-Ion Magnetism: Role of Symmetry and Axiality", Invited lecture presented at the MTMM-2019", IISER Bhopal, Nov. 27-30, 2019

15) "Thermally Labile Metal Mono and Dialkylphosphates: Ideal Precursors for Ceramic and 2- D Materials", Plenary lecture presented at the MTIC-2019, IIT Guwahati, December 11-14, 2019.

16) "Thermally Labile Metal Mono and Dialkylphosphates: Ideal Precursors for Ceramic and 2- D Materials", Plenary lecture presented at the ICACSEM-2020, Dept. of Physical Chemistry, University of Madras, January 09, 2020.

17) "Organophosphates as Precursors for New Materials for Energy Applications", Invited lecture at NCU@10 Mini Symposium (10th Anniversary Of New Chemistry Unit), JNCASR, Bangalore, January 10, 2020.

Dr. P. K. Kelkar Chair of Excellence in Nanotechnology

Prof. Souvik Mahapatra

Email: souvik@ee.iitb.ac.in

Department of Electrical Engineering

"It is indeed an honour to be selected as the P K Kelkar chair professor of IIT Bombay. I look forward to continue making contribution towards teaching undergraduate and advanced graduate courses and research in semiconductor devices"

Prof. Souvik Mahapatra

TEACHING AND RESEARCH HIGHLIGHTS

Teaching Highlight 2021:

Prof. Mahapatra introduced a new graduate level course on advanced CMOS and flash memory devices, which gives the students an exposure to latest industry practices. Also taught a course on advanced transistors.

Research Highlight 2021:

Prof. Mahaptra works on CMOS and flash memory reliability, close interaction with several leading semiconductor industries in the fab-tool, EDA, IDM, memory, and fabless ecosystem.

SERVICE AND PUBLIC ENGAGEMENT/ AFFILIATIONS

Chair of the Reliability Physics (Sub-committee of IEEE Electron devices society).

TRAINING OF HIGHLY QUALIFIED PEOPLE

(2020 - 2021)

	Masters students	Doctoral Students
Supervised	9	12
Co-supervised	-	2
Graduated	6	2(+2)

LIST OF PUBLICATIONS AND PRESENTATIONS (2020-2021

Publications

- Modelling of HKMG Stack Process Impact on Gate Leakage, SILC and PBTI
  DimpleKochar;Tarun Samadder; SubhadeepMukhopadhyay;Souvik Mahapatra
  2021 IEEE International Reliability Physics Symposium (IRPS)
  Year: 2021 | Conference Paper | Publisher: IEEE

- Stochastic and Deterministic Modelling Frameworks for Time Kinetics of Gate Insulator Traps During and After Hot Carrier Stress in MOSFETs
  SatyamKumar; TarunSamadder;Karansingh Thakor; UmaSharma;Souvik Mahapatra
  2021 IEEE International Reliability Physics Symposium (IRPS)
  Year: 2021 | Conference Paper | Publisher: IEEE

- A Theoretical Framework for Trap Generation and Passivation in NAND Flash Tunnel Oxide During Distributed Cycling and Retention Bake
  TarunSamadder; SatyamKumar; KaransinghThakor; SouvikMahapatra
  2021 IEEE International Reliability Physics Symposium (IRPS)
  Year: 2021 | Conference Paper | Publisher: IEEE

- Analysis of Sheet Dimension (W, L) Dependence of NBTI in GAA-SNS FETs
  NilotpalChoudhury; TarunSamadder; RaviTiwari; HuimeiZhou; RichardG.Southwick; MiaomiaoWang; SouvikMahapatra
  2021 IEEE International Reliability Physics Symposium (IRPS)
  Year: 2021 | Conference Paper | Publisher: IEEE

- A Physical Model for Bulk Gate Insulator Trap Generation During Bias-Temperature Stress in Differently Processed p-Channel FETs
  Tarun Samadder; Nilotpal Choudhury; Satyam Kumar;Dimple Kochar; Narendra Parihar;Souvik Mahapatra
  IEEE Transactions on Electron Devices
  Year: 2021 | Volume: 68, Issue: 2 | Journal Article | Publisher: IEEE

- Benchmarking Charge Trapping Models with NBTI, TDDS and RTN Experiments
  SharangBhagdikar; SouvikMahapatra
  2020 International Conference on Simulation of Semiconductor Processes and Devices (SISPAD)
  Year: 2020 | Conference Paper | Publisher: IEEE

- TCAD Incorporation of Physical Framework to Model N and P BTI in MOSFETs
  RaviTiwari; NilotpalChoudhury; Tarun Samadder; Subhadeep Mukhopadhyay; Narendra Parihar; Souvik Mahapatra
  2020 International Conference on Simulation of Semiconductor Processes and Devices (SISPAD)
  Year: 2020 | Conference Paper | Publisher: IEEE

- A TCAD Framework for Assessing NBTI Impact Under Drain Bias and Self-Heating Effects in Replacement Metal Gate (RMG) p-FinFETs
  UmaSharma;Souvik Mahapatra
  2020 International Conference on Simulation of Semiconductor Processes and Devices (SISPAD)
  Year: 2020 | Conference Paper | Publisher: IEEE

- Modelling of HCD Kinetics Under Full VG – VD Space, Different Experimental Conditions and Across Different Device Architectures
  UmaSharma; SouvikMahapatra
  IEEE Journal of the Electron Devices Society
  Year: 2020 | Volume: 8 | Journal Article | Publisher: IEEE

- A Stochastic Framework for the Time Kinetics of Interface and Bulk Oxide Traps for BTI, SILC, and TDDB in MOSFETs
  SatyamKumar; R.Anandkrishnan; NarendraParihar;Souvik Mahapatra
  IEEE Transactions on Electron Devices
  Year: 2020 | Volume: 67, Issue: 11 | Journal Article | Publisher: IEEE

- TCAD Framework for HCD Kinetics in Low VD Devices Spanning Full VG/VD Space
  UmaSharma; MengDuan; HimanshuDiwakar; KaransinghThakor; HiuYungWong; SteveMotzny; DenisDolgos; SouvikMahapatra
  IEEE Transactions on Electron Devices
  Year: 2020 | Volume: 67, Issue: 11 | Journal Article | Publisher: IEEE

- Modeling of DC - AC NBTI Stress - Recovery Time Kinetics in P-Channel Planar Bulk and FDSOI MOSFETs and FinFETs
  NilotpalChoudhury; NarendraParihar; NileshGoel; A.Thirunavukkarasu; SouvikMahapatra
  IEEE Journal of the Electron Devices Society
  Year: 2020 | Volume: 8 | Journal Article | Publisher: IEEE

- Analysis of BTI, SHE Induced BTI and HCD Under Full VG/VD Space in GAA Nano-Sheet N and P FETs
  NilotpalChoudhury;UmaSharma; HuimeiZhou; RichardG.Southwick; MiaomiaoWang; SouvikMahapatra
  2020 IEEE International Reliability Physics Symposium (IRPS)
  Year: 2020 | Conference Paper | Publisher: IEEE

- Hot Carrier Degradation in Cryo-CMOS
  W.Chakraborty; U.Sharma; S.Datta;S. Mahapatra
  2020 IEEE International Reliability Physics Symposium (IRPS)
  Year: 2020 | Conference Paper | Publisher: IEEE

- BTI and HCD Degradation in a Complete 32 ×64-bitSRAM Array including Sense Amplifiers and Write Drivers under Processor Activity
  Victor M. vanSanten; SimonThomann;Chaitanya Pasupuleti; PaulR.Genssler; NarendraGangwar;Uma Sharma; JörgHenkel;Souvik Mahapatra; HussamAmrouch
  2020 IEEE International Reliability Physics Symposium (IRPS)
  Year: 2020 | Conference Paper | Publisher: IEEE

- Analysis of The Hole Trapping Detrapping Component of NBTI Over Extended Temperature Range
  NilotpalChoudhury; NarendraParihar;Souvik Mahapatra
  2020 IEEE International Reliability Physics Symposium (IRPS)
  Year: 2020 | Conference Paper | Publisher: IEEE
- A Cycle-by-Cycle HCD and BTI Compact Model to Calculate FinFET Based RO Ageing Using SPICE
  UmaSharma;Chaitanya Pasupuleti; NarendraGangwar; A.Thirunavukkarasu; SouvikMahapatra
  2020 4th IEEE Electron Devices Technology & Manufacturing Conference (EDTM)
  Year: 2020 | Conference Paper | Publisher: IEEE
- A Model for Hole Trapping-Detrapping Kinetics During NBTI in p-Channel FETs: (Invited paper)
  NilotpalChoudhury;Narendra Parihar; NileshGoel; AThirunavukkarasu; SouvikMahapatra
  2020 4th IEEE Electron Devices Technology & Manufacturing Conference (EDTM)
  Year: 2020 | Conference Paper | Publisher: IEEE
- A Review of Hot Carrier Degradation in n-Channel MOSFETsPart I: Physical Mechanism
  Souvik Mahapatra; Uma Sharma
  IEEE Transactions on Electron Devices
  Year: 2020 | Volume: 67, Issue: 7 | Journal Article | Publisher: IEEE
- A Review of Hot Carrier Degradation in n-Channel MOSFETs—Part II: Technology Scaling
  Souvik Mahapatra;Uma Sharma
  IEEE Transactions on Electron Devices
  Year: 2020 | Volume: 67, Issue: 7 | Journal Article | Publisher: IEEE
- Modeling of NBTI Using BAT Framework: DC-AC Stress-Recovery Kinetics, Material, and Process Dependence
  Souvik Mahapatra; Narendra Parihar
  IEEE Transactions on Device and Materials Reliability
  Year: 2020 | Volume: 20 Issue: 1 | Journal Article | Publisher: IEEE

Presentations:

- Invited tutorial speaker, IEEE International Reliability Physics Symposium, Dallas, TX, USA (online mode).
- Different talks (online mode) as per IEEE EDS events.
  Different talks (online mode) to Industry (Intel, Micron, Western Digital, Applied Materials, Synopsys).

Class of 1985 Chair for Technology & Sustainable Development Chair

Prof. Parag Bhargava

Email: pbhargava@iitb.ac.in

Department of Metallurgical Engineering & Materials Science

"The theme of the chair, "Technology and Sustainable Development" is inspirational. It seemed like a coincidence that while I became an occupant of the chair, I seemed to be headed naturally towards the theme. I have been cultivating interest in areas such as nutrition, apps to support efforts towards tackling malnutrition, development of conductive pastes for metallization of solar cells, materials recycling / upcycling, materials recovery from end-of-life solar cells. On a different note, I have been emphasizing to students, semester after semester that greater efforts must be made in identifying unsolved problems / unaddressed needs / improvements needed in what we see around, encounter, or use. The solutions can follow! This can help break the more prevalent attitude of being satisfied with everything as it is (Chalta Hai!)"

– Prof. Parag Bhargava

TEACHING AND RESEARCH HIGHLIGHTS

Teaching Highlight 2021:

Prof. Bharagava's teaching philosophy primarily has been to motivate students on a path of discovery and learning by self. To achieve this in his departmental introductory course (Materials & Technology) he always begins with discussion on engineering, its role in shaping the society and economy, the role of innovation etc.

Besides the formal curriculum he has always included projects which require some hands-on thinking within the constraints of a large class and this year there was an additional challenge of teaching in an online mode. He conducted short quizzes of low weightage at the beginning of each class based on the content covered in previous class to keep the students a bit focussed on the content. This year he also gave students a project on identification of a new need/ unsolved problem / improvement needed. The identification of the above was to be supported by interviews of at least 15 – 20 stakeholders.

This was done by the whole class in teams of two. Each student was asked to disassemble chosen machines, devices etc that they could find at home to make the students realize the interdisciplinary nature of engineering (non-compartmentalized), the challenge and excitement of manufacturing and the fact that devices, machines always use a range of materials including metals, ceramics, polymers, semiconductors, composites etc.

The students were required to study the function of each part, the materials that the parts are made of and the methods by which these parts are manufactured and whether they are produced in India. The students showed the disassembled components and made presentations in the class on their project findings. In view of the limitations of a written exam, the students were also evaluated through a viva in small groups.

Prof. Bhargava has also been emphasizing on thinking over gathering information as well as applications of the knowledge. Most questions in the exams were designed such that they do not need reproduction of content from lectures or memorization but require on-the-spot thinking about resolving the problems related to application of knowledge. Students found these exams challenging as it was a novel idea. He showed them some exotic components / materials in the online mode towards the end of the course. They got to see a transparent bullet proof ceramic material, an automotive clutch, a MIG aircraft engine turbine blade, a reticulated ceramic foam filter, vibration damping phenomenon, ceramic foam filter used in foundries, soft ferrite based mini transformer and other materials.

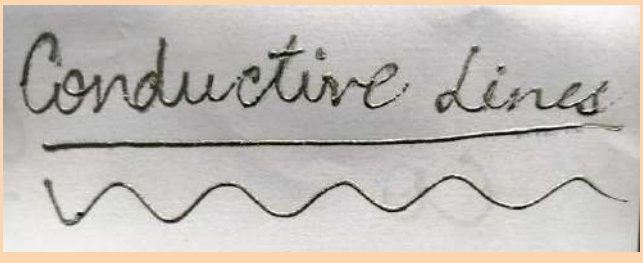
The other course that Prof. Bhargava taught was Colloid and Interfacial Science. The classroom discussions started with a wide range of applications related to the course theme to build excitement among the students. Besides the regular course content, they were asked to do several small projects. The students were asked to find a video related to colloid science and technology,

play it for the class explaining what they found interesting and why. In another project, they were asked to identify a product that is based on colloidal science and technology and to justify through a presentation, how colloidal principles help or play role in the application/product and the material system in use. Lastly, they had to make a presentation based on a research article.

Research Highlight 2021:

Pictures of tube filled with silver paste for making circuits on paper for educational purposes

Most of Prof. Bhargava's work is centred around particulate materials. His group, while working on basic research, has always maintained a keen interest in application oriented or product development research. He and his group has also been undertaking research on scaling up of previously developed processes in our lab. One of the themes in their lab has been the development of materials need for printed electronics, sensors etc. This year saw continued development of process of producing shape and size-controlled silver powders, silver pastes and inks for use in pens to be able to make conducting patterns on paper, textiles for educational purposes, development of screen printable silver pastes for circuitry, sensors etc. Work was also carried out on developing screen printable electroactive carbon pastes for use in electrochemical sensors. Screen printed electrodes and H2O2 (electrochemical) sensors were developed.



To work towards commercialization of silver-based products, Prof. Bhargava and his team have started work towards scaling up the synthesis of silver powders, nanowires. One of the key bottlenecks in wet chemical synthesis of the silver powders and nanomaterials is the step of washing and filtration to remove ionic impurities and organic additives. To overcome the challenges, they have started evaluating the use of cross flow filtration technique which has shown promise in preliminary trials of reducing process time from days to just a few hours.

They are helping a company in developing WC/Ag (Silver) based contact materials with low silver content for industrial applications. Initial efforts have shown results which have not been reported anywhere else in the world.

They are also working on developing the silver paste for solar Photo Voltaic applications which has gained tremendous importance in view of the increasing interest and solar cell production capacity in the country. Currently there is no manufacturer of these pastes in India. Recently, a company has shown interest in licensing this technology from them.

Some amount of work is also being done on dental materials. In the recent times intra oral scanners have become popular with dentists and widespread use of this technology also requires development of lower cost photo-polymerizable resins for the dental labs to be able to print dental models of the patients while keeping the overall cost of the prostheses affordable. In view of this, work was carried out on examining various resin material formulations for use with (Digital Light Processing) DLP machines to 3D print the dental models. Further work is required to see its acceptability by dental labs. We have also been developing glass-ceramics for dental crowns. A lithium-based glass-ceramic composition has been developed and is now being examined for its suitability for use by dental labs. At the same time newer glass-ceramic compositions are being examined from the viewpoint of enhanced strength for use as layering or veneering materials for dental crowns.

Besides the above areas of research, one of the undergraduate students has taken up an interesting theme of work based on class projects on upcycling of plastic waste that Prof. Bhargava had assigned to students (pictures below). The goal was to be able to make a simple machine which is low cost, portable and can be used at the level of housing societies to upcycle the plastic waste generated in the societies. This machine holds the promise of minimizing plastic waste ending up in landfills. The student is working on designing the machine to be able to "weld" or fuse plastics to make larger sheets which could then be used as a feed material for making various objects of common use.

Pictures of a raincoat and a pot made from milk bag pouches as part of a class project

SERVICE AND PUBLIC ENGAGEMENT

Prof. Parag Bhargava was invited to be a guest speaker at the UNESCO Centre for peace virtual summer camp 2021 to address children and youth delegates from over ninety different countries. He spoke on renewable energy and ways in which young people could contribute to help address environmental issues.

He conducted a session for the youth on finding inspiration for a higher purpose such that they discover their passion and ideas for self-growth and to contribute meaningfully to the society (https://www.youtube.com/watch?v=_FAAnT7w-BA)

He was the chair for organizing the Annual Technical Meeting of the Indian Institute of Metals which had participants from academia and industry from all over the country. He also organized and moderated a panel discussion on "Entrepreneurship in Metallurgy & Materials Domain: Opportunities, Challenges and Journeys."

Prof. Parag Bhargava has been working with children for many years to support their holistic growth. A few years ago, he and his team started five libraries for the underprivileged communities in the nearby settlements outside IIT (https://www.youtube.com/watch?v=44LOYnmq0OE).

Each library was reaching out to an average of around 30 – 40 families. He also used to teach spoken English to a few children and engage with them in meaningful discussions at the libraries. The number of functioning libraries got reduced to two in number during the pandemic. He has also been advising a company (OMOTec) that is in the domain of teaching Robotics and Mechatronics

to children and youth. He has been reviewing the projects that children have been doing on addressing real world problems.

Besides being a co-founder of small manufacturing ventures with his own students (ANTS Ceramics, Digident, Metwiz Materials) he has been mentoring a few companies the recent ones being Languify and Manastu Space.

During the month of August 2021, Prof. Bhargava conducted a session on "Innovation through Collaborative thinking": Exploring the power of exhaustive thinking together for IIT Bombay students. The session involved a few interactive exercises which covered the art of asking questions as an engineer and how even seemingly difficult problems can be solved by thinking together. The session was organized by "The Curious Community", a Facebook group launched by EnPoWER (Engineering Oriented Promotion of Work Experience and Research) which is a student body within IIT Bombay.

At the institute level, Prof. Parag Bhargava is an IIT B Research Park Executive Committee member, Tata Centre for Technology and Design Executive Committee member, IRCC Advisory Committee member and DSSE Post-Graduate committee member.

TRAINING OF HIGHLY QUALIFIED PEOPLE

(INDICATE THE NUMBERS BELOW)

	Masters students	Doctoral Students	Postdoctoral Students	Other(RA&TA)
Supervised	2	5	1	0
Graduated	105	27	3	18

LIST OF PUBLICATIONS AND PRESENTATIONS

Publications

1. Non-Enzymatic H2O2 Sensor Using Liquid Phase High-Pressure Exfoliated Graphene, R Banavath, SS Nemala, R Srivastava, P Bhargava, Journal of The Electrochemical Society 168 (8), 086508 (2021)
2. Improved non-enzymatic H2O2 sensors using highly electroactive cobalt hexacyanoferrate nanostructures prepared through EDTA chelation route, R Banavath, R Srivastava, P Bhargava, Materials Chemistry and Physics 267, 124593 4 (2021)
3. Nanoporous Cobalt Hexacyanoferrate Nanospheres for Screen-Printed H2O2 Sensors, R Banavath, R Srivastava, P Bhargava, ACS Applied Nano Materials 2 (2021)

4. First-principles study of Cs2Ti1-xMxBr6 (M = Pb, Sn) and numerical simulation of the solar cells based on Cs2Ti0.25Sn0.75Br6 perovskite, P Shrivastava, B Kavaipatti, P Bhargava, International Journal of Energy Research 45 (5), 8049-8060 (2021)
5. Natural solvent facilitated high-shear exfoliated graphene nanoplatelets enabled economically efficient and stable DSSC, SS Nemala, S Ravulapalli, P Kartikay, R Banavath, S Mallick, P Bhargava, Mayank Bhushan, Debananda Mohapatra, Materials Letters 287, 129263 (2021)

Presentations

1. Wet chemical synthesis of nano powders and associated challenges in their large-scale production, CIPET, Jan 2021
2. Role of engineers in socio-economic transformation of the country, PICT, Pune May 2021
3. Finding Inspiration for Learning, Career and Life through Identification of a Higher Purpose, Zep Nagpur, June 2021
4. Powder Injection Molding, Powder Metallurgy Short Course, Organized by Powder Metallurgy Association of India, College of Engineering, Pune (COEP), Sept 2021

India Value Fund Chair in Humanities & Social Sciences

Prof. K. Narayanan

Email: knn@iitb.ac.in

Department of Humanities & Social Sciences

"The IVF Chair focusses on linking HSS with the engineering and technology disciplines and I have always aimed to Strengthen the interface between science, technology and social sciences, through my own research work as well as organising seminars, conferences and workshops."

- Prof. K. Narayanan

TEACHING AND RESEARCH HIGHLIGHTS

Teaching Highlight 2022:

Associated Faculty: Climate Studies, CUSE, CPS, and Education Technology

Teaching during the last Five Years:

- No of courses participated in teaching: 23
- No of theory courses taught: 14.
- Courses at BS [economics], BTech, MPhil, MTech and PhD. Core courses as well as Elective courses consisting of theoretical as well as contemporary relevant courses like Applied Economics and Indian Economy.
- Recipient of (Departmental) Excellence in Teaching Award 2021

Research Highlight 2022: Projects undertaken currently

- Prof. Naryanan is working on a collaborative project among 20 institutions spread over India and UK, led by University of Cambridge, funded by UK government [159,000 UK Pounds], since April 2018 on finding Technological Solutions for Sustainable Food Supplies.
- He led a team of 8 faculty members and 14 research scholars to prepare the State Action Plan on Climate Change [SAPCC] for Rajasthan. This project was undertaken at the Inter-Disciplinary Program in Climate Studies. Report submitted and received well recognition. The full report can be downloaded from:

https://environment.rajasthan.gov.in/content/dam/environment/Env/Pdf_Files/Draft%20of%20State%20Action%20Plan%20on%20Climate%20Change%202022.pdf

- Prof. Narayanan is working on Low-cost Innovative Technology for water quality monitoring and water resources management for urban and rural water systems in India. This project is jointly conducted with Prof. Ravi Gudi of Chemical Engineering as Project In charge and funded by DST, Government of India.
- He is also working on Customer Selection for Demand Response in SMART energy: Customer Attitude Survey Algorithms for Selecting Customers and the Effectivity. This project is jointly conducted with Prof. Krithi Ramamritham of Computer Science and Engineering as Co-PI and is funded by Tata Consultancy Services.
- Prof. Narayanan has helped UNDP in the year 2021-22 to prepare the ICT Policy for Lesotho. This project was undertaken as a consultancy work funded by UNDP, Lesotho.

These are over and above other projects in the field of industrial and development economics.

SERVICE AND PUBLIC ENGAGEMENT/ AFFILIATIONS

- Prof. Narayanan has guest edited Special Issues of journals: Innovation and Development [Taylor & Francis] and Science, Technology and Society [Sage].
- He is a Member of Editorial Board of Journal of Industrial Statistics, Sarvekshana [published by CSO, Government of India], Springer Nature Business and Economics, and Asia Pacific Journal of Regional Science.
- He has been invited for various lectures / talks during the last 5 years:
  - University of Tokyo [3 times],
  - Nagoya University,
  - KU Leuven -Belgium,
  - University of Maastricht,
  - Institute of Social Studies -The Hague,
  - Freie University -Berlin,
  - University of Kassel,
  - Mercator Research Institute on Global Commons and Climate Change -Berlin,
  - University of Sydney,
  - University of East Anglia - Norwich,
  - Kingston University - London and
  - University of Cambridge along with a long list of Institutions/ Universities in India as well.
- He was nominated by Government of India to represent the country at the (a) Intergovernmental Panel on Climate Change [IPCC] special meeting [held in March 2009 at Oslo, Norway], and (b) United Nations Framework Convention on Climate Change [UNFCCC] special meeting [held in April 2009 at Cairo, Egypt].
- He is an honorary member secretary, Forum for Global Knowledge Sharing [Knowledge Forum], http://fgks.in since November 2018.
- He is the external referee for faculty selection and promotions in University of Cambridge, New York University, University of Jaffna and University of Malaya apart from several other IITs and Universities in India.

TRAINING OF HIGHLY QUALIFIED PEOPLE

(INDICATE THE NUMBERS BELOW)

	Masters students	Doctoral Students	Postdoctoral Students	Other(RA&TA)
Supervised	23	28	2	10
Co-Supervised	0	6	0	3
Graduated	21	22	1	8

LIST OF PUBLICATIONS AND PRESENTATIONS

Publications

1. Dore, Poornima and Narayanan, K. (2022): Regional Economic Diversity – What Does the India Story Tell us? [London: Oxford University Press].
2. Goswami, Asmita and Narayanan, K. (2022): "Technological Efforts, Firm Ownership and Productivity: A Study of Information Technology Service Firms in India", South Asia Economic Journal, [Sage] Vol. 23 No.1, pp. 86–109.
3. Dore, Poornima and Narayanan, K. (2020): "Inter temporal differences in regional development", Area Development and Policy, [Routledge] Vol. 5, No. 4, pp. 376-389.
4. Thomas, Ronny and Narayanan, K. (2020): "Analyzing the role of market share reallocation and average productivity improvements in aggregate productivity growth: Evidence from Indian manufacturing", Journal of Public Affairs, [John Wiley & Sons] Vol. 20 No.4, pp. 1-11.
5. Pradhan, Kalandi Charan and Narayanan, K. (2020): "Does climate risk induce labour migration?: Evidence from Semi-Arid Tropics region of India", Journal of Public Affairs, [John Wiley & Sons] Vol.20, No.3, pp. 1-15.
6. Narayanan, K. and Sahu, Santosh Kumar (2020): "Firm-Level Productivity and Exports: The Case of Manufacturing Sector in India", in Accelerators of India's Growth – Industry, Trade and Employment, Aggarwal, Suresh Chand, Das, Deb Kusum and Banga, Rashmi [Eds.] pp. 159-176 [Singapore: Springer Nature].
7. Roy, Indrajit and Narayanan, K. (2020): "Push Factors of Outward FDI—A Cross-Country Analysis of Developed and Developing Countries", in FDI, Technology and Innovation, Siddharthan, N. S. and K. Narayanan (eds.), Chapter 7, pp. 169-204, [Singapore: Springer Nature].
8. Pradhan, Kalandi Charan and Narayanan, K. (2019): "Intensity of labour migration and its determinants: insights from Indian semiarid villages", Asia Pacific Journal of Regional Science, [Springer], Vol.3, No.7, pp. 955-994.

9. Roy, Indrajit and Narayanan, K. (2019): "Outward FDI from India and its impact on the performance of firms in the home country", Journal of Asia Business Studies, [Emerald], Vol. 13, No.1, pp. 1-28.
10. Pradhan, Kalandi Charan & Narayanan, K. (2019): "Weather variation and temporary labor migration: a panel data analysis for select semi-arid villages in India", Migration and Development, [Taylor and Francis], Vol.8, No.3. https://doi.org/10.1080/21632324.2019.1605745

Presentations

1. Delivered a Special Talk on the occasion of "Clean Air and Blue Skies" on 7th September 2022, organised by the State Pollution Control Board, Government of Rajasthan in Jaipur.
2. Invited to deliver a talk on Regional Diversity of Development in India, Goa University, on 27th August 2022.
3. Kasthala, S., Inamdar, A. B., Parthasarathy, D., and Narayanan, K. "A framework to assess anthropogenic vulnerability caused by coastal conservation policies". Poster presentation in the session: Observational Gaps in Coastal Zones Monitoring in Terms of Natural and Human-Induced Forcing Factors, Response, and Evolution, at the American Geophysical Union's (AGU) Fall meeting. 13-17 December 2021.
4. 2. Kasthala, S., and Narayanan, K. "Agriculture Vulnerability to Climate Change in Arid and Semi-arid Regions: A study of Rajasthan, India". Oral presentation in the session: Emerging Agroecosystem Adaptation, Mitigation, Monitoring, and Assessment Trends, at the American Geophysical Union's (AGU) Fall meeting. 13-17 December 2021.
5. Kasthala, S., Punyamoorty, V., Parthasarathy, D., Narayanan, K., and Inamdar, A. B. "A Machine Learning Approach to Clustering Indian Coastal Villages Based on Vulnerability to Climate Change". Oral Presentation at the 16th Symposium on Societal Applications: Policy, Research and Practice, American Meteorological Society's (AMS) 101st Annual Meeting. 10-15 January 2021.
6. Kasthala, S., Inamdar, A. B., Parthasarathy, D., and Narayanan, K. "Anthropogenic Vulnerability – Changes in Coastal policies and their Impact on Coastal Vulnerability". Poster presentation at the American Geophysical Union's (AGU) Fall meeting. 1-17 December 2020.
   *A brief news story on the on-going Anthropogenic Vulnerability work was published in the science news magazine - Eos, published by AGU.
   https://eos.org/articles/human-activity-makes-indias-coastlines-more-vulnerable
7. Goswami, Asmita and Narayanan, K. (2020): "Revisiting the Growth of Service Sector in India: Is there a Role of Technology?", presented at the 2020 Asian Conference on Innovation and Policy, organised by Asian Society for Innovation and Policy, Jiju Islands, Republic of Korea, September 24-26 [Received the Best Paper Award].

8. Narayanan K, Bino Paul, and Unmesh Patnaik (2019): "The triad of Labour, Innovation and Enterprises: emergent dynamics in Asia", 14th Annual International Conference of Knowledge Forum, held at IIT Madras, October 11-13.
9. Goswami, Asmita and Narayanan, K. (2019): "Firm Ownership, Productivity and Technological Efforts: A Study of Information Technology Service Firms in India", 14th Annual International Conference of Knowledge Forum, held at IIT Madras, October 11-13.

Hindustan Aeronautics Limited Chair

Prof. Anil Kottantharayil

Email: anilkg@ee.iitb.ac.in

Department of Electrical Engineering

The HAL R&D Chair Professorship has significantly raised my profile within IIT Bombay and in the larger academic community, and I would like to thank the HAL and the IIT Bombay administration for conferring this honour on me. I believe that I have been able to deliver on the expectations of the Chair Professorship.

– Prof. Anil K.

TEACHING AND RESEARCH HIGHLIGHTS

Prof. Anil's research has focussed on solar photovoltaics, including the development of high efficiency silicon solar cells, reliability of photovoltaic modules, recycling of end-of-life photovoltaic panels, and mitigation of soiling on photovoltaic panels. Presently his research group is developing PERC solar cells with efficiencies exceeding 20%. The focus is on joint research with equipment vendors and material research groups to fill significant gaps in the manufacturing landscape in the country. The group has been working with Sahajanand Laser Technology Limited to develop a laser system for ablation of thin dielectric films for solar cell fabrication, academic research groups in the country working on silicon crystal growth and silver paste to evaluate the materials they develop in solar cells. These are expected to help the country develop indigenous technologies and highly skilled manpower in this sector. On the reliability front, they have investigated the optimum method for translation of field measured performance of photovoltaic panels to standard test conditions for benchmarking. These investigations are expected to pave the way for robust on-field assessment of the performance of photovoltaic panels and secure the financial viability of solar asset owners. Prof. Anil has chaired a committee appointed by the Secretary of MNRE to develop a report on various technology options for "Circular Economy on Solar Panel Waste" and gathered a panel of experts from the industry and academia. The report of the committee was submitted to MNRE in September 2021. Soiling of PV panels reduce the energy yield of PV powerplants. His groups have been working on characterizing the reliability of anti-soiling coatings with the aim to develop a test standard for such coatings. Recently they have started working to develop algorithms for assessing the soiling losses from energy generation data of powerplants with a startup company. He has developed an online course on silicon solar cells, and IIT Bombay has given in-principle approval for delivering this course through the continuing education program of the institute.

PUBLICATIONS SINCE MARCH 2021

8 journal publications and 3 granted Indian patents. h-index: 32, i-10 index: 83.

Graduated: 6 PhD students (total 21 till date), 3 M. Tech students

SERVICE AND PUBLIC ENGAGEMENT

During 2021-22, Prof. Anil delivered an IEEE distinguished lecture in Bangladesh (onine mode), delivered a PV tutorial at a faculty development program in KL University, delivered a talk at an Indo-Japanese workshop (online) on solar cell technologies. He organized a joint workshop on "Diagnostic Technologies for PV Powerplants" with the National Thermal Power Corporation, organized an Indo-UK Soiling workshop with Loughborough University, and organized an Indo-Norwegian workshop on "Silicon Crystal Growth" with SINTEF, Norway. Prof. Anil has been a member of project progress review committees for the Ministry of Electronics and Information Technology, and the Department of Science and Technology and has reviewed several proposals for the Ministry

of New and Renewable Energy. He has also been a member of panel of experts for the selection of INSPIRE faculty for DST, recruitment of faculty members at the Central University of Rajasthan, and NIT Kozhikode. He has been a reviewer for the journals titled Solar Energy Materials and Solar Cells, IEEE Electron Device Letters, IEEE Journal of Photovoltaics, Sustainable Energy Technologies and Assessment, Solar Energy, and Surfaces and Interfaces. Prof. Anil has also been an examiner for 3 PhD thesis from institutions other than IIT Bombay.

He has been a visiting faculty at the St. Thomas College, Thrissur, Kerala, and developed and delivered an online certificate course on Silicon Solar Cells to the students of MSc Physics. He has also been the Head of the Centre for Research in Nanotechnology and Science, and the Sophisticated Analytical Instrument Facility at IIT Bombay during June 2018 to Jan 2022, and served on various institute level committees as part of the assignment

LIST OF PUBLICATIONS AND PRESENTATIONS

Journal publications:

1. Yogeswara Rao Golive, Anil Kottantharayil, Narendra Shiradkar (2022), Improving the accuracy of temperature coefficient measurement of a PV module by accounting for the transient temperature difference between cell and backsheet, Solar Energy, https://doi.org/10.1016/j.solener.2022.03.049
2. Yogeswara Rao Golive, Anil Kottantharayil, Narendra Shiradkar (2022), Sensitivity of accuracy of various standard test condition correction procedures to the errors in temperature coefficients of c-Si PV modules, Progress in Photovoltaics: Research and Applications, https://doi.org/10.1002/pip.3559
3. K.P. Sreejith, Ashok Kumar Sharma, Prabir Kanti Basu, Anil Kottantharayil (2022), Etching methods for texturing industrial multi-crystalline silicon wafers: A comprehensive review, Solar Energy Materials and Solar Cells, Vol. 238, 111531, https://doi.org/10.1016/j.solmat.2021.111531
4. Umang Desai, Devan P Vasudevan, Anil Kottantharayil and Aparna Singh (2021), Prediction of vibration induced damage in photovoltaic modules during transportation: finite element model and field study, Engineering Research Express, Vol. 3, No. 4, 045045. https://doi.org/10.1088/2631-8695/ac3d12
5. K. P. Sreejith, Ashok Kumar Sharma, Prabir Kanti Basu, Anil Kottantharayil (2021), "A Comprehensive Investigation of the Potential of Metal Assisted Chemical Etched (MACE) Nano-textures over Conventional Micron-sized Iso-textures for Industrial Silicon Solar Cell Applications", Solar Energy, 230, 874-882. https://doi.org/10.1016/j.solener.2021.10.035
6. Yogeswara Rao Golive, Anil Kottantharayil, Juzer Vasi and Narendra Shiradkar (2021), "Determining the optimal standard test condition correction procedure for high-throughput field I–V measurements of photovoltaic modules", Progress in Photovoltaics Research and Applications, 1- 14. https://doi.org/10.1002/pip.3457

7. Ashok KumarSharma, Suchismita Mitra, Sreejith K P, Durga Prasad Khatri, Almouzzam Khana, Anil Kottantharayil, Hemanta Ghosh (2021), "A comprehensive analysis of recombination and resistive losses in silicon solar cells induced by co-firing process", Surfaces and Interfaces, 25, 101260, https://doi.org/10.1016/j.surfin.2021.101260
8. Narendra Chundi, Ganesh Kesavan, Easwaramoorthi Ramasamy, Sudhanshu Mallick, Anil Kottantharayil, Shanmugasundaram Sakthivel (2021), "Ambient condition curable, highly weather stable anti-soiling coating for photovoltaic application", Solar Energy Materials and Solar Cells, 230, 111203, https://doi.org/10.1016/j.solmat.2021.111203

Indian Patents Granted:

1. Method for deposition of metal oxide on a substrate (2022), Kalaivani S., and Anil Kottantharayil, Indian patent number 391027 granted on 2 March 2022.
2. Method of fabricating inverted pyramid on crystalline silicon using lithography free fabrication technique (2021), Sandeep S. S., Anil Kottantharayil, Indian patent number 374367 granted on 12 August 2021.
3. Method providing functionalization of graphene (2021), Robin Singla, and Anil Kottantharayil, Indian patent number 368329 granted on 01 June 2021.

TRAINING OF HIGHLY QUALIFIED PEOPLE

(INDICATE THE NUMBERS BELOW)

	Master Students	Doctoral Students	Postdoctoral Students
Supervised	2	5	1
Co-Supervised	1	2	1
Graduated	3	7	0

D. L. Shah Chair Professor for Innovation

Prof. Devendra Narain Singh

Email: dns@iitb.ac.in
Department of Civil Engineering

Thanks a lot for introducing me to the legendry philanthropist Mr. D. L. Shah. It's very motivating to realize his vision and philosophy over-all QUALITY of life in India. Fortunately, my professional activities also fall in line with this philosophy and occupying the chair sponsored by the Trust has boosted my confidence to move ahead with more energy and enthusiasm to pursue my mission Quality of Life in manmade environment.

– Prof. D N Singh

TEACHING HIGHLIGHTS

Prof. D. N. Singh teaches "Geotechnical Engineering-I" and "Geotechnical Engineering-II" courses to undergraduates of IIT Bombay. He is offering an unconventional course "Environmental Geomechanics" for Postgraduates of IIT Bombay to encourage the research acumen. These courses are subsequently offered through online platforms such as NPTEL and CDEEP. These courses are benefiting professionals and students all over the world.

RESEARCH HIGHLIGHTS

Prof. Singh has successfully innovated, developed, and publicized Geoenvironmental Engineering in the realm of Civil Engineering education and practice. Through trans-disciplinary research, he has demonstrated the importance, relevance, and urgency of revising the classical concepts and theories, and a need to imbibe the influence of various environmental factors that govern the durability and performance of natural and anthropogenic geomaterials. His research is primarily focused on addressing the challenges and providing solutions to the problems (viz., waste disposal, energy requirements, development of sustainable infrastructure etc.) that the society and industry are facing by large. Some of his most innovative contributions are geomaterial characterization by employing various Energy Fields, and development of needs-based, affordable, and in-house instrumentation for establishing biological, chemical, thermal, electrical, and magnetic properties of the multi-phase and multi-component geomaterials and mechanisms prevailing in them. He has established a unique state-of-the-art Environmental Geotechnology Laboratory, which is attracting several national and international collaborations. He has recently launched a virtual Center for Geoenvironmental Research and Innovation (CeGReIn) to foster applied R&D, worldwide. He is also leading the Mission IBPs to develop executable roadmap and policies for valorisation of industrial by-products (IBPs) with an aim to create waste to wealth to welfare.

SERVICE AND PUBLIC ENGAGEMENT

Prof. Singh is actively involved in guiding several local and national organizations in dealing with the issues and development of new strategies. At present, he is guiding MCGM and GHMC in assessing the decomposition status of municipal solid waste in Capped Landfills. Further, guiding M/s. MSRDC, M/s. MahaGenco, M/s. Tata Projects Ltd, M/s. Ramky Enviro Engineers Ltd., and M/s. MMB in development of new structures and also helping in the retrofitting of the existing infrastructure in different parts of the nation. Further, guiding M/s. MMB, M/s. MbPT, and other major ports in India in valorisation of dredged sediments through the project funded by Ministry of Ports, Shipping and Waterways (MoPSW). Moreover, he is chairing a National wide mission (W2W Mission, PSA, New Delhi) in assessing and development of strategies for Plastic waste and construction and demolition (C&D) waste management.

Prof. Singh has been elected as a Vice-president of South Asia, International Society of Environmental Geotechnology, which has facilitated putting my focus on the importance of the Environmental Geotechnology in fulfilling the sustainable development goals (SDGs). In this direction to help the scientific community and new generations who are keen to learn this subject, a book on "Environmental Geotechnology: Meeting Challenges through needs-based instrumentation" was authored by myself and published by World Scientific Publishing Company, Singapore. Furthermore, guiding the industries such as M/s. Hindalco Industries Ltd. in the efficient management of industrial by-products and spear heading the concept of CCUS in industrial setups on a global scale.

LIST OF PUBLICATIONS AND PRESENTATIONS

1. Mohammad, A., Goli, V.S.N.S, Singh, D. N, "Discussion on Challenges, opportunities, and innovations for effective solid waste management during and post COVID-19 pandemic, by Sharma et al. (2020)", Resources, Conservation and Recycling (2021). https://doi.org/10.1016/j.resconrec.2020.105175.
2. Mohammad, A., O Kelly, B.C., Singh, D.N., "NovADEC: Novel Approach for Determination of the Elemental Content of organic matter", International Journal of Environmental Analytical Chemistry (2021).
   https://doi.org/10.1080/03067319.2020.1863956.
3. Lijith, K.P., Sharma, V., Singh, D.N., "Investigations on the Influence of Ice-Content on Shear Strength Characteristics of Soils", Lecture Notes in Civil Engineering(2021), https://doi.org/10.1007/978-3-030-64518-2_108.
4. Kuntikana, G., Syed, S., Singh, D.N.,et al., "Amelioration of bauxite residues by sequential slurry carbonation", Materials Performance and Characterization(2021), https://doi.org/10.1520/MPC20190240.
5. Mohammad, A., Goli, V.S.N.S., Barroso, P.M.,et al., "Effect of physico-chemico-biological and operational parameters on composting of organic fraction of municipal solid waste and gaseous products emission: review", Environmental Technology Reviews(2021).
   https://doi.org/10.1080/21622515.2021.1989060.
6. Feng, Y., Chen, L., Merey, S.,et al., "Simulation of gas production from hydrate reservoirs (AT1) of Eastern Nankai Trough Japan", Environmental Geotechnics(2021). https://doi.org/10.1680/jenge.19.00177.
7. Goli, V.S.N.S., Paleologos, E.K., Farid, A., et al., "Extraction and Characterization of Microplastics from Organic Solid Matrices and their Remediation", Environmental Geotechnics (2021). https://doi.org/10.1680/jenge.21.00072.

8. Chandana, N., Goli, V.S.N.S., Mohammad, A., Singh, D.N., "Characterization and Utilization of Landfill-Mined-Soil-Like-Fractions (LFMSF) for Sustainable Development: A Critical Appraisal", Waste and biomass Valorization (2021). https://doi.org/10.1007/s12649-020-01052-y
9. Goli, V.S.N.S., Singh, D.N., "Comments on Incorporation of Xuan-paper waste residue in red mud/waste polyethylene composites", Journal of Hazardous Materials (2021). https://doi.org/10.1016/j.jhazmat.2020.124161.
10. Chen, L., Feng, Y., Merey, S.,et al., "Corrigendum to Numerical investigation on gas production from Shenhu (China): Influence of layer inclination and horizontal inhomogeneities", Journal of Natural Gas Science and Engineering(2021). https://doi.org/10.1016/j.jngse.2021.103825
11. Mohammad, A., Osinski, P., Koda, E., Singh, D. N., "A case study on establishing the state of decomposition of municipal solid waste in a bioreactor landfill in India", Waste Management and Research (2021). https://doi.org/10.1177%2F0734242X211045607.
12. Liu, B., Xie, Y. H, Tang, C.S et al, "Bio-mediated method for improving surface erosion resistance of clayey soils", Engineering Geology(2021). https://doi.org/10.1016/j.enggeo.2021.106295.
13. Shashank, B.S, Kuntikana , G., Jiang, N,J., Singh, D.N, "Investigations on biosorption and biogenic calcite precipitation in sands", Soil Use and Management(2021). https://doi.org/10.1111/sum.12611.
14. Lijith, K.P., Sharma, V., Singh, D.N., "A methodology to establish freezing characteristics of partially saturated sands", Cold Science and Technology (2021), https://doi.org/10.1016/j.coldregions.2021.103333.
15. Mohammad, A., Goli, V.S.N.S., Chembukavu, A.A., Singh, D.N., "DecoMSW: A Methodology To Assess Decomposition Of Municipal Solid Waste For Initiation Of Landfill Mining Activities", Journal of Solid Waste Technology and Management (2021). https://doi.org/10.5276/JSWTM/2021.465.
16. Goli, V.S.N.S., Singh, D.N., Baser, T., "A critical review on thermal treatment technologies of combustible fractions from mechanical biological treatment plants", Journal of Environmental Chemical Engineering(2021). https://doi.org/10.1016/j.jece.2021.105643.
17. Okelly, B.C., El-Zein, A., Liu, X.,et al, "Microplastics in soils: An environmental geotechnics perspective", Environmental Geotechnics (2021). https://doi.org/10.1680/jenge.20.00179.
18. Vaverková, M.D., Paleologos, E.K., Dominijanni, A., et al, "Municipal solid waste management under Covid-19: Challenges and recommendations", Environmental Geotechnics (2021). https://doi.org/10.1680/jenge.20.00082.
19. Tang, C.S., Paleologos, E.K., Vitone, C.,et al, "Environmental geotechnics: Challenges and opportunities in the post-Covid-19 world", Environmental Geotechnics (2021). https://doi.org/10.1680/jenge.20.00054.
20. Paleologos, E.K., O'Kelly, B.C., Tang, C.-S., "Post Covid-19 water and waste water management to protect public health and Geo-environment", Environmental Geotechnics (2021). https://doi.org/10.1680/jenge.20.00067.

21. Paleologos, E.K., O'Kelly, B.C., et al., "Sustainable environmental geotechnics practices for a green economy", Environmental Geotechnics (2021). https://doi.org/10.1680/jenge.21.00091.

22. Mondal, S, Singh D.N, Tang, A.M, Pereira, J.M, "A finite difference model for undefined end boundary to analyse the heat transfer in dry sands", International Journal of Geotechnical Engineering (2022). https://doi.org/10.1080/19386362.2020.1854972.

23. Jiang, N.J, Wang, Y.J, Chu, J et al., "Bio-mediated soil improvement: An introspection into processes, materials, characterization and applications", Soil Use and Management (2022). https://doi.org/10.1111/sum.12736.

24. Joseph, J., Rakshith, S., Singh, D.N., Tang,C.S, "MI-EC k u: A novel methodology for estimating unsaturated hydraulic conductivity of porous media", Acta Geotechnica (2022). http://doi.org/10.1007/s11440-022-01500-0.

25. Lijith, K.P., Sharma, V., Singh, D.N, "Shear Strength Characteristics of Frozen Fine Sands under Direct Shear Testing Conditions", International Journal of Geomechanics (2022). http://doi.org/10.1061/(ASCE)GM.1943-5622.0002228.

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27. Lijith, K.P., Srinivasa Rao, R., Narain Singh, D., "Investigations on the influence of wellbore configuration and permeability anisotropy on the gas production from a turbidite hydrate reservoir of KG Basin",Fuel(2022). https://doi.org/10.1016/j.fuel.2022.123562.

28. Han, X.-L., Jiang, N.-J., Yang et al, "Deep learning based approach for the instance segmentation of clayey soil desiccation cracks", Computer and Geotechnics(2022). https://doi.org/10.1016/j.compgeo.2022.104733.

29. Goli, V.S.N.S., Singh, P., Singh, D.N., Tak, L.K., "Investigations on characteristics of landfill-mined-soil-like-fractions and their dependency on organic matter",Process Safety and Environmental Protection (2022). https://doi.org/10.1016/j.psep.2022.04.052.

30. Goli, V.S.N.S., Singh, P., Singh, D.N., "A comprehensive methodology for determining buffering capacity of landfill-mined-soil-like-fractions",Science of the Total Environment (2022). https://doi.org/10.1016/j.scitotenv.2022.155188.

INVITED EXPERT LECTURES

1. Mission IBP's: Valorisation of industrial by-products, International Virtual short-term Course on futuristic prospects of Geo-environment and Geotechnical issues of Coal Mine Overburden and Mine tailings, Indian Institute of Technology (ISM), Dhanbad, March 18,2021

2. Sustainable development through Environmental Geotechnology, ATAL Academy, online FDP, NIT Goa, June 21, 2021.
3. Bio-reactor Landfills: A Retrospection, AICTE Sponsored one-week Short-Term Course on Design of landfills and waste contaminants systems, IIT Bhubaneswar, July 5, 2021.
4. Geo-mechanical Characteristics of Gas Hydrates Bearing Sediments, ISEG Webinar July 13-14, 2021.
5. Sustainable Development for Swachh, Unnat and AtmaNirbhar Bharat, July 30, 2021.
6. National Workshop on Solid Waste Management, Organized under DST cluster IITD, July 30-31, 2021.
7. 4th Indian National Academy of Engineering (INAE) Youth Conclave, Pandemic and Engineering Intervention, Organized by Prof. D.N. Singh (Organizer, IITB), NITIE and ICT, September 24, 2021.
8. Geotechnical and environmental characterization, Third International Symposium on Coupled phenomena in Environmental Geotechnics, October 20-21,2021.
9. Carbon Capturing Utilization and Storage: Opportunities and Challenges, ATAL FDP Programme, Government Engineering College Kozhikode, Kerala, December 17, 2021.
10. Indo US scoping workshop on carbon utilization and conversion, Organized by DST India and DoE USA, February 18, 2022.
11. Suction Measurements for Multiphase Geomaterials: The way Forward, two days short training course on Application of Unsaturated Soil mechanics on analysis of slope, Organized by IIT Mandi and Durham University, February 25-26, 2022.
12. Environmental Geotechnology: The way Forward, ISEG 1st Webinar Series, April 7, 2022.
13. Environmental Geotechnics, IGS Baroda.

TRAINING OF HIGHLY QUALIFIED PEOPLE

Supervision	Masters students	Doctoral Students	Post-doctoral students	B. Tech Students	Interns and RA
Supervised	-	Mr. Arif Mohammad, Mr. Ganaraj kuntikaran	Dr. Arif Mohammad	B. Priyanka, Love Kush Tak, Romsha Jayapriya.	Mahesh Jadhav (RA), Sahil Dharival (NPTEL Intern), Harshvardhan Meena (NPTEL Intern).
Graduated	**0**	**2**	**1**	**3**	**3**

Larsen & Toubro Chair Professorship

Mahesh S Tirumkudulu

Email: mahesh@che.iitb.ac.in

Department of Chemical Engineering

I would like to thank the funders of the L&T chair professorship for their support of my research and outreach activities. The funding has enabled my students to travel to research meetings and international conferences. The funding has also provided flexibility in the purchase of consumables and small equipment, which is often not possible from traditional funding sources. The support has contributed significantly to generating preliminary research results that has led to research collaboration with several industries.

– Prof. Mahesh Tirumkudulu

TEACHING AND RESEARCH HIGHLIGHTS

The research contributions of Prof. Mahesh have been primarily in fluid mechanics and colloids & interfaces. In the area of colloids of interfaces, the focus was on understanding the phenomena of drying and consolidation of colloidal dispersions with applications in diverse industries related to semiconductor, paints and coatings, and ceramics. The recent work of his group was on the physics of cracking and buckling in drying colloidal dispersions has investigated several aspects such as dynamics of fracture with possible extensions to hydraulic fracture and conditions of buckling of drying colloidal drops. They have also investigated failure of drying polymer films with applications in pharmaceutical and consumer goods industry. This has led to several collaborations with the industry such as Pfizer Inc (US) and Unilever India Ltd and ongoing discussions with at least two other multinational companies.

In the area of fluid mechanics, he and his research group investigate the physics of atomization, which find applications in diverse processes such as combustion, spray drying, spray painting and nebulizers.

Besides fundamental research, they have also been working on technological solutions for resource constrained settings. In this respect, his team has developed a novel tire sealant that seals tire punctures instantly without the need for tire repair. They recently received a US patent for the same. In the area of biomedical devices, they are developing low-cost blood smear machines and blood cell counters for measuring complete blood counts. Patents have been filed for both technologies and they are being licensed for commercialization.

Prof. Mahesh and his research group have been teaching the course on Solid Mechanics to chemical undergraduate students along with conducting labs for them for the last 2-3 years. To increase interaction with the industry, he initiated a new course in 2021 titled, "Introduction to Chemical Engineering Applications in Industry", where experts from the pharmaceutical industry gave a semester long lecture on the unit operations in the manufacture of pharmaceutical products. In the coming semester, he, and his colleague (Prof Venkat Gundabala) have initiated a two-semester course for the 3rd and 4th semester students in the new Tinkerer's lab, where the students will design and build chemical engineering and biomedical devices/instruments.

SERVICE AND PUBLIC ENGAGEMENT

In the last couple of years, Prof. Mahesh gave research seminars to students and faculty of IIT Madras and American University of Sharjah. Our research group presented their work in international conferences such as the annual AIChE meeting (US), Institute of Physics conference (UK) and Complex fluids symposium (India).

LIST OF PUBLICATIONS AND PRESENTATIONS

1. MA Mir and MS Tirumkudulu*, "A low-cost flow cell for flow cytometry", Biosensors and Bioelectronics, 211, 114334 (2022)
2. BS Tomar, MS Tirumkudulu*, W Yu, A Berchielli and P Doshi "Osmotic tablet coatings: Drying stress, mechanical properties and microstructure", Int J Pharm, 617, 121611 (2022)
3. A Badar and MS Tirumkudulu*, "Moving cracks in drying colloidal films", Soft Matter, 18, 2252 - 2275 (2022)
4. MS Tirumkudulu* and VS Punati, "Solventborne Polymer Coatings: Drying, Film Formation, Stress Evolution, and Failure", Langmuir, 38, 2409?2414 (2022)
5. VS Punati and MS Tirumkudulu*, "Modeling the Drying of Polymer Coatings", Soft Matter 18, 214-227 (2022)

F Naaz, M Agrawal, S Chakraborty, M S Tirumkudulu* and KV Venkatesh*, "Ligand sens- ing enhances bacterial flagellar motor output via stator recruitment", eLife, 10:e62848 DOI: 10.7554/eLife.62848 (2021)

TRAINING OF HIGHLY QUALIFIED PEOPLE

(INDICATE THE NUMBERS BELOW)

	Masters students	Doctoral Students	Postdoctoral Students	Other(RA&TA)
Supervised	3	10	2	1
Co-Supervised	0	1	0	0
Graduated	2	2	1	0

Our research group (L to R):

Om Prakash Bamboriya, Sesan Nayak, Vatika Jhanjee, Mahrukh Mir, Bhawana Tomar, Krishnayan Haldar, Mahesh Tirumkudulu and Venugopal Punati.

(Missing students: Megha Agrawal, Farha Naaz, Atiya Badar, Anwesha Mohanty, Venugopal Punati, Mayur Khogade, Faiz Ahmed, Kushak Dhinoja)

Tata Centre Chair Professorship in Frugal Engineering

Maryam Shojaei Baghini

Email: mshojaei@ee.iitb.ac.in

Department of Electrical Engineering

For any professional and at every stage, being supported and being supportive mutually co-exist. The support from TATA Trust and honor of being recognized as TATA Trust Chair Professor in Frugal Engineering and financial support have been strong encouragement in two aspects:

1. Driving the projects in the two domains of affordable healthcare and agriculture technologies to the translation level including my TCTD IIT-Bombay (TATA Center for Technology and Design) project
2. Supporting Ph.D. scholars and translation level projects with the financial support under TATA Trust Chair Professor in Frugal Engineering

In my all invited talks and social media such as TIH-IoT IIT-Bombay (Technology Innovation Hub) and LinkedIn page, TATA Trust Chair Professorship is the label which attracts attention. Particularly my product-oriented research projects get linked to frugal engineering too.

I would like to thanks TATA Trust for supporting IIT-Bombay and hence, supporting us to prove how recognition and support create a difference. I will provide more detailed information in the next sections for the teaching and research highlights, considering a part of it was completely managed and carried out during pandemic lockdown.

– Prof. Maryam

TEACHING AND RESEARCH HIGHLIGHTS

1. **Affordable Tinnitus detection device and tinnitus treatment with E-medicine**

- One of the selected projects of TCTD IIT-Bombay, which has secured 3 rounds of funding for the product development.
- The device and application software are protected by Indian patent.
- The prototype has reached to clinical investigation stage. MoU between IIT-Bombay and Hinduja Hospital is being finalized.

2. **Recent book publication**

Flexible Bioelectronics with Power Autonomous Sensing and Data Analytics

by S. Sonkusale, M. Shojaei Baghini, S. Aeron (with contributions from Laxmeesha S., S. Malik, M. Ahmad, G. Saini)

Publisher: Springer International Publishing, ISBN/EAN3030985377 9783030985370, 2022

(https://link.springer.com/book/10.1007/978-3-030-98538-7)

3. **The World's First Quantum Tunneling Enabled Spiking Neural Network Chip on 45nm SOI Technology from India**

   https://www.iitb.ac.in/en/research-highlight/worlds-first-quantum-tunneling-enabled-spiking-neural-network-chip-45nm-soi

- This AI Chip Hits New Ultralow Power Lows", IEEE Spectrum News, June 2022 (https://spectrum.ieee.org/low-power-ai-spiking-neural-net).
- "Quantum Tunneling based Ultra-compact and Energy Efficient Spiking Neuron enables Hardware SNN", A. K. Singh, V. Saraswat, M. Shojaei Baghini and U. Ganguly (The World's First Quantum Tunneling Enabled Spiking Neural Network Chip on 45nm SOI Technology), Accepted for publication in IEEE Transactions on Circuits and Systems I (Regular Papers), 2022.
  (DOI: https://doi.org/10.1109/TCSI.2022.3172176)

4 **Texas Instruments (TI) partial funded research on wearable pulse oximeters**

- "SpO2 Measurement: Non-Idealities and Ways to Improve Estimation Accuracy in Wearable Pulse Oximeters", D. Berwal, A. Kuruba, A. M. Shaikh, A. Udupa and M. Shojaei Baghini, IEEE Sensors Journal, June 2022.
  (DOI: https://doi.org/10.1109/JSEN.2022.3170069)Sensors Journal, June 2022.
  (DOI: https://doi.org/10.1109/JSEN.2022.3170069)

5 **Several novel test chips (ASIC's) designed, fabricated, tested with the application board demonstration for the healthcare applications**

- The most recent test chip: "Continuous-Time Hybrid ΔΣ Modulators for Sub-μW Power Multichannel Biomedical Applications", Laxmeesha S. and M. Shojaei Baghini, IEEE Transactions on VLSI Systems, April 2022 (One of the popular papers of April 2022 and selected paper by IEEE Transactions on VLSI Systems, April 2022. (DOI: https://doi.org/10.1109/TVLSI.2022.3140222)
  (https://www.linkedin.com/company/ieeetvlsi/posts/?feedView=all)

6 **Executive member of TIH-IoT IIT-Bombay and PI of two projects recently selected for agriculture technologies** by TIH IIT-Bombay (https://www.tih.iitb.ac.in/team/)

SERVICE AND PUBLIC ENGAGEMENT

1) Fellow of Indian National Academy of Engineering
2) Editor, Transactions of INAE from March 2022
3) 63 Invited talks till date
4) Distinguished lecturer IEEE Sensor Council (2022-2024)
5) Member of International Advisory Committee for IEEE Sensor Application Conference 2023
6) One of the 3 TPC chairs International VLSI Design Conference 2022 (Sister Conf. of IEEE DAC) (https://www.vlsid.org/)
7) Coordinator and one of the instructors of MHRD Sponsored Swayam ARPIT Course "Electronic Systems for Sensing", 2019-2020.
8) Track Chair, Analog/Mixed-Signal/RF/5G and invited speaker
9) International VLSI Design Conference 2020 (Sister Conf. of IEEE DAC) (https://embeddedandvlsidesignconference.org/)
10) Organizer and one of the instructors of SPARC course on "Flexible Bioelectronics - Sensors, Electronics, Energy Harvesting, and Data Analytics." (co-organizer: Pramod Murali), sponsored by MHRD Government of India, December 2019, IIT-Bombay.

11) Track Chair, Sensor Networks, IEEE Sensors Conference 2019

(http://ieee-sensors2019.org/)

12) Co-organizer (Organizer: Prof. Ashwin A. Seshia, Cambridge Univ.): DST-UKIERI workshop:"Emerging Sensor Technologies and Data Analytics for Air Quality Monitoring", November 2018, IIT-Delhi

13) Track Chair, Sensor Networks, IEEE Sensors Conference 2018

(http://ieee-sensors2018.org/

14) Research collaborations with faculty members of Electrical Engineering, Chemical Engineering and Biosciences & Bioengineering, IIT-Bombay

15) Research collaboration with faculty from Monash University, Australia (IIT-Bombay Monash Research Academy)

16) Research collaboration with faculty from NYCU Taiwan

Industry collaborations in the last 5 years (Texas Instruments, Qualcomm, Intel, Global Foundries)

LIST OF PUBLICATIONS AND PRESENTATIONS 2022

1. "Quantum Tunneling based Ultra-compact and Energy Efficient Spiking Neuron enables Hardware SNN", A. K. Singh, V. Saraswat, M. Shojaei Baghini and U. Ganguly (The World's First Quantum Tunneling Enabled Spiking Neural Network Chip on 45nm SOI Technology), Accepted for publication in IEEE Transactions on Circuits and Systems I (Regular Papers) , 2022.

   (DOI: https://doi.org/10.1109/TCSI.2022.3172176)

2. "An Efficient Inductive Rectifier Based Piezo-Energy Harvesting Using Recursive Pre-charge and Accumulation Operation", S. Sankar , P. Chen, and M. Shojaei Baghini, Accepted for publication in IEEE Journal of Solid State Circuits , 2022.

   (DOI: https://doi.org/10.1109/JSSC.2022.3153590)

3. "This AI Chip Hits New Ultralow Power Lows", IEEE Spectrum News, June 2022 (https://spectrum.ieee.org/low-power-ai-spiking-neural-net).

4. "SpO2 Measurement: Non-Idealities and Ways to Improve Estimation Accuracy in Wearable Pulse Oximeters", D. Berwal, A. Kuruba, A. M. Shaikh, A. Udupa and M. Shojaei Baghini, IEEE Sensors Journal , June 2022.

   (DOI: https://doi.org/10.1109/JSEN.2022.3170069)

5. "Continuous-Time Hybrid ΔΣ Modulators for Sub-μW Power Multichannel Biomedical Applications", Laxmeesha S. and M. Shojaei Baghini, IEEE Transactions on VLSI Systems , April 2022 (One of the popular papers of April 2022 and selected paper by IEEE Transactions on VLSI

Systems, April 2022, https://www.linkedin.com/company/ieeetvlsi/posts/?feedView=all).

(DOI: https://doi.org/10.1109/TVLSI.2022.3140222)

6. "A Portable Low-Voltage Low-Power ppm-level Resistive Sensor Measurement System", M. Ahmad, S. Malik, H. Patel and M. Shojaei Baghini, IEEE Sensors Journal, February 2022. (DOI: https://doi.org/10.1109/JSEN.2021.3134022)
7. "Non-Faradaic Electrochemical Impedance based Bacteria Sensing using Functionalized Microfabricated Interdigitated Electrodes", R. Patel, M. Vinchurkar, R. Patkar, T. Naik, A. Adami, F. Giacomozzi, B. Pramanick, R. Ramesh, L. Lorenzelli, M. Shojaei Baghini, Accepted Poster in MNE Eurosensors Conference 2022, Belgium.
8. "Design of 2.87 GHz Frequency Synthesizer with Programmable Sweep for Diamond Color Defect based CMOS Quantum Sensing Applications", A. S. Edakkadan, K. Saha, M. S. Baghini and A. Srivastava, Accepted in IEEE ISCAS Conference 2022, USA.
9. "Energy Efficient Leaky Integrate and Fire Neuron Circuit using Hybrid CMOS-NEMS in 65 nm CMOS Technology", S. Saha, M. Goel, V. Ramgopal Rao and M. Shojaei Baghini, Proc. of IEEE MEMS Conference 2022, Japan.
10. "An EMI-Immune PAM-4 Transmitter with Input Level Shifter in 130-nm BiCMOS Technology", M. Singh Choudhary, S. Goyal, N. S. A. Kumar Pudi, Jean-Michel Redoute and M. Shojaei Baghini, IEEE Letters on Electromagnetic Compatibility Practice and Applications, December 2021.

    (DOI: https://doi.org/10.1109/LEMCPA.2021.3112574)
11. "Passivation of Solution-Processed a-IGZO Thin-film Transistor by Solution Processable Zinc-Porphyrin Self-assembled Monolayer", M. B. Zalte, T. R. Naik, A. Alka, M. Ravikanth, V. Ramgopal Rao, and M. Shojaei Baghini, IEEE Transactions on Electron Devices, November 2021.

    (DOI: https://doi.org/10.1109/TED.2021.3111542)
12. "An Accurate Digital Converter for Lossy Capacitive Sensors", S. Malik, Laxmeesha S., M. Ahmad, T. Islam and M. Shojaei Baghini, Elsevier Sensors and Actuators: A. Physical, November 2021. (DOI: https://doi.org/10.1016/j.sna.2021.112958)
13. "A 500 nW to 1 mW Input Power Inductive Boost Converter with MPPT for RF Energy Harvesting System", G. Saini, Laxmeesha S. and M. Shojaei Baghini, IEEE Journal of Emerging and Selected Topics in Power Electronics , October 2021.

    (DOI: https://doi.org/10.1109/JESTPE.2020.2979005)
14. "A Methodology to Emulate the Effect of EMI in Circuit Simulators for Wireline Communication Channel", M. S. Choudhary, N. S. A. K. Pudi, J. Redoute and M. Shojaei Baghini, IEEE Letters on Electromagnetic Compatibility Practice and Applications, September 2021.

    (DOI: https://doi.org/10.1109/LEMCPA.2021.3079803)

15. "Maximum Lifetime Convergecast Tree in Wireless Sensor Networks", J. John, G. Kasbekar and M. Shojaei Baghini, Elsevier Ad Hoc Networks, September 2021.
(DOI: https://doi.org/10.1016/j.adhoc.2021.102564)
16. "A 400 mV 160 nW/Ch Compact Energy Efficient ΔΣ Modulator for Multichannel Biopotential Signal Acquisition System", Laxmeesha S. and M. Shojaei Baghini, IEEE Transactions on Biomedical Circuits and Systems , August 2021.
(DOI: https://doi.org/10.1109/TBCAS.2021.3098722)
17. "An energy Harvesting System for Time-Varying Energy Transducers with FOCV based Dynamic and Adaptive MPPT for 30 nW to 4 mW of Input Power Range", G. Saini and M. Shojaei Baghini, Elsevier Microelectronics Journal, August 2021.
(DOI: https://doi.org/10.1016/j.mejo.2021.105080)
18. "A Dual-Slope Based Capacitance-to-Time Signal Conditioning Circuit for Leaky Capacitive Sensors", S. Malik, Laxmeesha S., K. Kishore, S. Lashkare, T. Islam, S. A. Akbar and M. Shojaei Baghini, IEEE Transactions on Instrumentation and Measurement, July 2021. (DOI: https://doi.org/10.1109/TIM.2021.3101325)
19. "Nanophotonic Crystal Waveguide with Embedded Piezoresistor on MEMS Cantilever for Sensing Applications", V. S. Palaparthy, S. G. Surya, A. Gajarushi, S. A. Chandorkar, T. Kundu, M. Shojaei Baghini and V. Ramgopal Rao, IEEE Sensors Journal, June 2021. (DOI: https://doi.org/10.1109/JSEN.2021.3067718)
20. "High Resolution Frequency Measurement Techniques for Relaxation Oscillator Based Capacitive Sensors", Laxmeesha S, S. Malik, S. Aeron, S. Sonkusale and M. Shojaei Baghini", IEEE Sensors Journal, June 2021.
(DOI: https://doi.org/10.1109/JSEN.2021.3068351)
21. "Impact of Thermal Effects on the Performance of the Power Gating Circuits using NEMS, FinFETs and NWFETs", S. Saha, U. S. Kumar, M. Shojaei Baghini, M. Goel and V. Ramgopal Rao IEEE Transactions on Electron Devices, June 2021.
(DOI: https://10.1109/TED.2021.3074349)
22. "Efficient 1 V Boost Converter Using Sub-50 mV NEMS without Body Bias", S. Saha, G. Saini, M. Shojaei Baghini, M. Goel and V. Ramgopal Rao, IEEE Transactions on Electron Devices, June 2021. (DOI: https://doi.org/10.1109/TED.2021.3070560)
23. "A Solution Processed Amorphous InGaZnO Thin-Film Transistor Based Dosimeter for Gamma-ray Detection and its Reliability", M. B. Zalte, V. Kumar, S. G. Surya, M. Shojaei Bhagini, IEEE Sensors Journal, May 2021.
(DOI: https://doi.org/10.1109/JSEN.2021.3061955)

124. "Voltammetry Based Handheld Measurement System for Soil pH", M. Singh, R. Patkar, M. Vinchurkar and M. Shojaei Baghini, Elsevier Journal of Electroanalytical Chemistry, March 2021. (DOI: https://doi.org/10.1016/j.jelechem.2021.115086)

25. "Towards a Low Cost Fully Integrated IGZO TFT NO2 Detection and Quantification: A Solution-processed Approach", M. T. Vijjapu, S. Surya, M. Zalte, S. Yuvaraja, M. Shojaei Baghini and K. N.Salama, Elsevier Sensors and Actuators: B. Chemical, March 2021. (DOI: https://doi.org/10.1016/j.snb.2021.129450)

26. "Hybrid Pattern Recognition For Rapid Explosive Sensing With Comprehensive Analysis", V. S. Palaparthy, Shambhulingayya.N. D, S. G. Surya, S. Chandorkar, S. Mukherji, M. Shojaei Baghini and V. Ramgopal Rao, IEEE Sensors Journal, March 2021.
(DOI: https://doi.org/10.1109/JSEN.2020.3047271)

27. "Stand-by Power Reduction using Experimentally Demonstrated Nano Electro-Mechanical Switch in CMOS Technologies", S. Saha, A. Singh, M. Shojaei Baghini, M. Goel and V. Ramgopal Rao, IEEE Transactions on Electron Devices, February 2021.
(DOI: https://doi.org/10.1109/TED.2020.3041434)

28. "Design and Development of a Robotic Hand with Embedded Sensors Using 3D Printing Technology", Laxmeesha S., S. Malik, M. Ahmad, K. M. Ehsan, A. M. Shaikh, D. Berwal, S. Sonkusale and M. Shojaei Baghini, Springer Transactions of the Indian National Academy of Engineering, January 2021.
(DOI: https://doi.org/10.1007/s41403-021-00198-y)

29. "Design and Implementation of 0.23 nJ/bit Reference-Spur-Free FSK/OOK Transmitter at 400 MHz for Wearable Health Monitoring", A. Srivastava, Devashi D. and M. Shojaei Baghini, Proc. of IEEE BioCAS Conference 2021, Germany.

30. "A temperature compensated soil specific calibration approach for frequency domain soil moisture sensors for in-situ agricultural applications", J. John, V. Palaparthy, A. Dethe and M. Shojaei Baghini, Proc. of IEEE SAS 2021, Virtual Conf.

31. "Investigating Heater Resistance Tolerance of the Heat-Pulse Sensor for Accurate Soil Moisture Measurements on Vadose Zone Soil", V. Palaparthy, J. John and M. Shojaei Baghini, Proc. of IEEE SAS 2021, Virtual Conf.

32. "Impedance Based Biosensor for Agricultural Pathogen Detection", R. Patel, M. Vinchurkar, R. Patkar, G. Pranjale and M. Shojaei Baghini, Proc. of IEEE Nano 2021, Canada.

33. "Low Power Extended Range Multi-Modulus Divider Using True-Single-Phase-Clock Logic", P. Kulkarni, S. Garg, S. Agrawal and M. Shojaei Baghini, Proc. of International VLSI Design Conference (Sister Conf. of IEEE DAC), 2021, India.

34. "Leaf extract as Ethanol Sensing Layer in Organic transistors", T. R. Naik, R. Patel, M. Shojaei Baghini, AAAFM-UCLA 2021, USA.

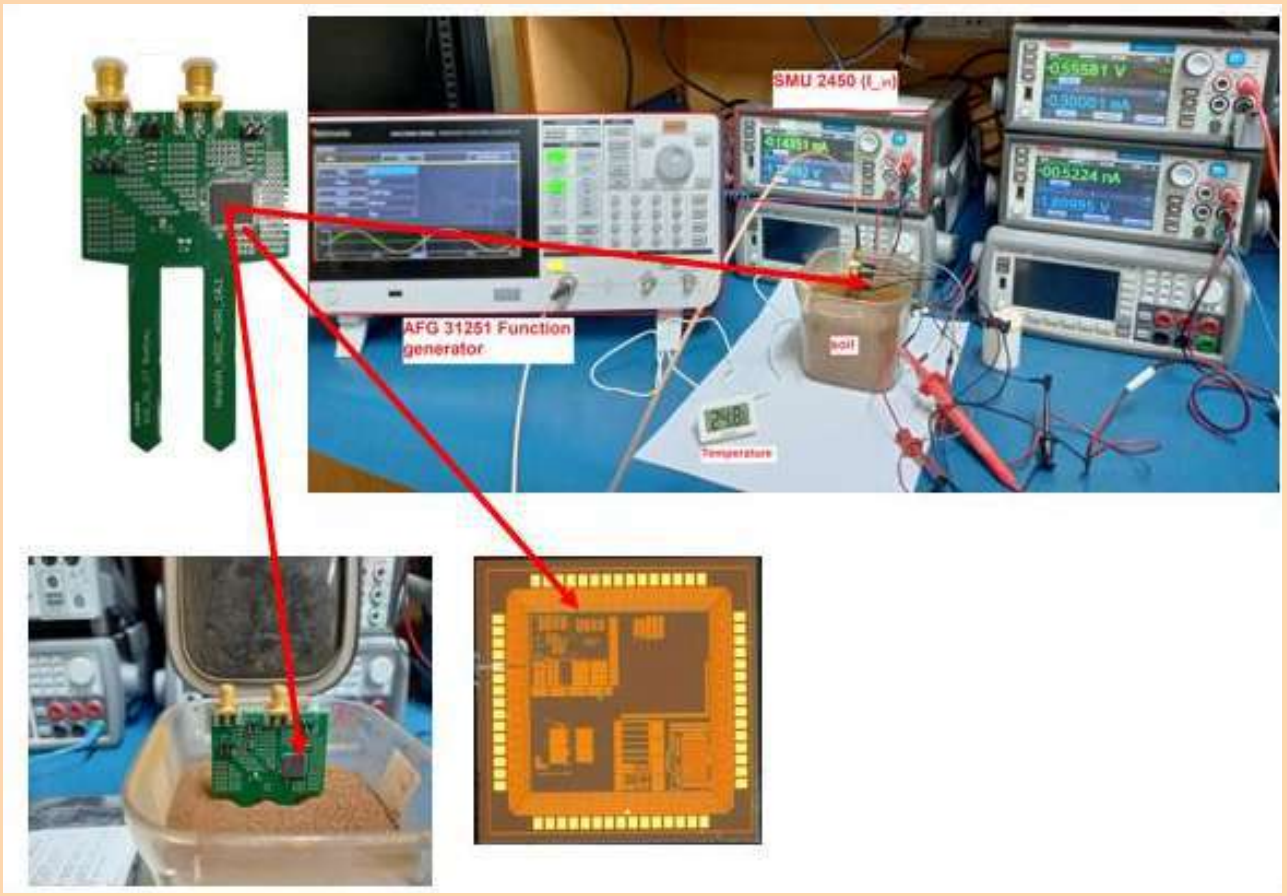
35. "Poly (3-hexylthiophene) nano composites with green synthesized nanoparticles for environmental sensing applications", R. Patel, T. R. Naik, M. Vinchurkar, M. Shojaei Baghini, AAAFM-UCLA 2021, USA.

TRAINING OF HIGHLY QUALIFIED PEOPLE
(INDICATE THE NUMBERS BELOW)

	Masters students	Doctoral Students	Post-doctoral students	Other RA/ TA
Supervised	165	49	3	15 Research staff members
Co-supervised	5	10	1	0
Graduated	155	34	2	12

PHOTOS / IMAGES

The World's First Quantum Tunneling Enabled Spiking Neural Network Chip on 45nm SOI Technology from India (Please refer to item 3 of research highlights section for the detailed information and publications/news).



The ASIC designed and then fabricated in SCL Chandigar (Fully indigenous mixed-signal IC) as a part of NNetRA project, Agriculture Technologies

Right side: Chip Micrograph of ASIC-AGRI 10.1

Ramakrishna Bajaj Chair Professorship

Prof Nishant Sharma

Email: nishantsharma@iitb.ac.in

Industrial Design Center

I would like to express my sincere gratitude to the Bajaj family and IIT Bombay for the Ramakrishna Bajaj Chair professorship. This prestigious chair means a lot to me and has led me to explore the areas that impact human lives. Through the courses, research, outreach activities and projects, I have been able to contribute with innovative design solutions for real world problems. This award has brought new purpose in my work, and I would like to strengthen it further. Thanks again.

– Prof. Nishant Sharma

TEACHING HIGHLIGHTS

Since the support was awarded, Prof. Nishant have been teaching four courses per semester. As design pedagogy involves hands-on assignments and projects and for last 1.5 years, Prof. Nishant have been developing assignments that are based on real world problems. He particularly

mentions about the courses Mobility Design 1 and Mobility Design 2, where we explored the mobility problems faced by disabled and elderly. He is glad to share that some of the innovative solutions developed by students under my guidance, have gone ahead for patents and some are in the process.

RESEARCH HIGHLIGHTS

This year has been very rewarding for Prof. Nishant, ever since the grant was given. Along with his colleagues, research scholars and masters students, he was able to publish one book charter, one journal paper, two patents and six conference papers. Their research has been very user centric and from the spectrum of our publications, one will notice the diverse areas like trucking in India, mobility for disabled & elderly, women & public transport, adoption of natural farming etc. The common thread in all these areas is designing for the real context that matters to the real user.

SERVICE AND PUBLIC ENGAGEMENT

Prof. Nishant has secured CSR funds to develop Electric version of Tricycle for Paraplegics and other assistive mobility devices for differently abled. He and his team will be manufacturing and distributing around 100 units of `manual version of Tricycle for Paraplegics for an NGO based in Pune. Talks are on, the project to start soon. These tricycles will be used by the poor people with mobility disability for them to start a small mobile shop selling items like pickles, papads, perishable goods, fruits, vegetables, grocery etc. User evaluation and testing of tricycles was done in Pune. Around 12 people with special needs came forward and used the tricycle. They were happy with the product. His team is also working on the feedback received from them.

The team has had a few meetings with Additional Secretary and team, Department of Social Welfare, Government of Maharashtra. Tremendous interest has been shown in their work for the disabled. They are also discussing the possibility of giving access to these tricycles to the needy across the state.

Prof. Nishant has developed online and offline 'Design Thinking' courses for industry professionals, scientists, college teachers and students. In these 1.5 years, Prof. Nishant have conducted two long term (5-6 months, class once a week) courses and 4 short term (3-5 days, full time).

LIST OF PUBLICATIONS AND PRESENTATIONS

Book Chapter:

Kant, V., Arun Babu*, K., Karthikeyan*, V., V., Sharma, N.,. Sociotechnical Dimension of Trucking in India: Possibilities for Digitalization. In Nocera, J. A., Makori, E. & Robles-Flores, J.A.. Innovation Practices for Digital Transformation in the Global South. Springer. (accepted)

Journal Paper

Kant, V., Karthikeyan*, V., V., Sharma, N., Ecological Interface Design and Emergent Users: Designing for Small-Scale Trucking Ecology in India. Human Factors and Ergonomics in Manufacturing & Service Industries (under review)

Patents Filed

1. PAT/ID/206390010-1/21-22

   LPG cylinder Lifting Device

   Submitted on- 02-01-2022

2. PAT/ID/206390010-2/21-22

   Walking cane with seating arrangement

   Submitted on 02-01-2022

Conference papers:

Dhriti Dhaundiyal, Nishant Sharma "Unpacking tacit needs of women in Mumbai local trains" Paper to be presented "9th International Conference on Research Into Design: Design in the Era of Industry 4.0" IISc Bangalore, India. 9 - 11 January 2023

Dhriti Dhaundiyal, Nishant Sharma "Situating Personal Possessions in Public Transport" Paper to be presented at "9th International Conference on Research Into Design: Design in the Era of Industry 4.0" IISc Bangalore, India. 9 - 11 January 2023

Dhriti Dhaundiyal, Nishant Sharma "Tacit need capture through participatory research to increase female access to public transport in new Indian cities" Conference Paper to be presented at "RGS-IBG Annual International Conference 2022: Participatory methods for recovery and transformation", Royal Geographical Society (with the Institute of British Geographers). August, 2022

Agnivesh Sharma, Nishant Sharma "Participatory research with marginal Indian farmers; Identifying post-harvesting challenges and developing affordable storage space. conference paper "Royal Geographical Society (with IBG) Annual International Conference 2022." 30 August- 2 September 2022 at Newcastle University, United Kingdom.

Agnivesh Sharma, Nishant Sharma "Design Challenges in Permaculture Adoption in India- case Study of wheat and Soyabean." conference paper "9th International Conference on Research Into Design" 9 - 11 January 2023 at IISc Bangalore, India.

Darshan Chavhan, Vivek Kant, Nishant Sharma "Mobility and Vehicle Design challenges for delivery executives in the online food delivery industry: Insights from a field study", 9th International Conference on Research Into Design, 9 - 11 January 2023 at Indian Institute of Science, Bangalore, India.

TRAINING OF HIGHLY QUALIFIED PEOPLE

(INDICATE THE NUMBERS BELOW)

	Masters students	Doctoral Students
Supervised	07	3
Co-supervised	03	0
Graduated	10	0

Photos / Images

Bajaj Group Chair Professor

Prof. Supratik Chakraborty

Email: supratik@cse.iitb.ac.in

Department of Computer Science and Engineering

It has been an honour and privilege to hold the Bajaj Group Chair Professor position in the Department of Computer Science and Engineering at IIT Bombay. I am immensely thankful to the Bajaj Group for instituting and generously supporting this position. In addition to the prestige and visibility that Bajaj Group's name brings to this position, the contingency grant that comes along with this Chair Professorship has been extremely helpful for supporting conference travel, for supporting students and in general for helping my group's research activities. This has indeed made arranging for travel support or for student support, sometimes on short notice, so much easier, thereby allowing me to devote more time to research, teaching, and outreach activities. I hope to do justice to the faith reposed in me by offering me this Chair Position.

– Prof. Supratik Chakraborty

TEACHING AND RESEARCH HIGHLIGHTS 2021 – 22

Over the past year, Prof. Supratik designed and offered a new course titled "Formal Methods in Machine Learning" for advanced undergraduate and post-graduate students. Machine learning is increasingly pervading our lives, and the technology is being deployed in applications where the cost of an error or bias can be very high. Examples of such applications include autonomous or semi-autonomous vehicles, screening of applications for admission, employment, bail etc. Unfortunately, state-of-the-art machine learning algorithms provide very weak guarantees about corner-case situations. The purpose of this course is to use formal methods to help prove guarantees about machine learning components used in real-life systems. This is a very nascent area, and the course is primarily based around research papers published over the last few years.

On the research front, Prof. Supratik and his collaborators have broken new ground in automated Boolean functional synthesis. They are now recognized as one of the topmost groups in the world in this area, and he (along with my collaborators) have recently given two tutorials on this topic in AAAI 2022 and IJCAI 2022 (among the topmost conferences in artificial intelligence). In addition, Prof. Supratik was invited to give a series of invited talks on this topic at the Simons Institute for Theoretical Computer Science (USA) and Isaac Newton Institute for Mathematical Sciences (UK). They have also designed new algorithms for proving properties of parametric programs with loops manipulating arrays. This work has been recognized by an invitation to submit a detailed paper in the STTT journal, and by invitations to speak on this topic at several places including at the Isaac Newton Institute for Math Sciences (UK). Prof. Supratik has also bagged a new NSF-DST project on explaining black-box machine learning models for autonomous and semi-autonomous vehicles, and he and his group have already shown how ideas from control theory, machine learning and formal methods can be harnessed to elucidate the nuanced landscape of explanations of black box models.

SERVICE AND PUBLIC ENGAGEMENT

Prof. Supratik has been elected Vice President of the India Council of Association for Computing Machinery (ACM), which is the topmost professional body worldwide for computing professionals. His elected term is from July 2022 to June 2024.

In addition to this, Prof. Supratik continues to serve as a member of the ACM India Council for the past several years. In his role as a Council member, he continues to nurture and coordinate the ACM India Doctoral Dissertation Award, which is the topmost award for a Computer Science doctoral dissertation coming from an Indian institute/university.

From 2022, Prof. Supratik is serving as an Associate Editor of Transactions of the Indian National Academy of Engineering.

Prof. Supratik has also been serving as a Research Advisor to the Foundations of Computing group at Tata Consultancy Services, helping the group come up with solutions to several industrial problems for deployment in the real world.

In addition, he has continued my interactions with the Kendriya Vidyalaya Sangathan, that administers close to 1300 Kendriya Vidyalayas around the country, helping them with their online admission process. I also continue to help Kendriya Vidyalaya IIT Bombay in my role as an Ex-Nominee Chairperson, on matters related to academics and infrastructure.

LIST OF PUBLICATIONS AND PRESENTATIONS 2021 – 22

Book chapter

S. Akshay and S. Chakraborty, "Synthesizing Skolem Functions: A View from Theory and Practice", chapter in Handbook of Logical Thought in India (eds. S. Sarukkai and M. Chakraborty), July 2022, Springer

Referred papers

Journal papers:

1. S. Chakraborty, A. Gupta and D. Unadkat, "Full-Program Induction: Verifying Array Programs sans Loop Invariants", accepted for publication in International Journal on Software Tools for Technology Transfer, Springer
2. S. Akshay, S. Chakraborty, S. Goel, S. Kulal and S. Shah, "Boolean Functional Synthesis: Hardness and Practical Algorithms", in Formal Methods in System Design, Vol 57, Issue 1, pages 53-86, 2021 Aldol Condensation of Acetaldehyde", Industrial & Engineering Chemistry Research 2021, 60 (5), 2058–2069.

Conference papers:

3. J. Yang, S. Chakraborty and K. S. Meel, "Projected Model Counting: Beyond Independent Support", accepted for publication in Proceedings of International Symposium on Automated Technology for Verification and Analysis (ATVA), October 2022
4. S. Akshay and S. Chakraborty, "On Synthesizing Computable Skolem Functions for First Order Logic", accepted for publication in Proceedings of International Symposium on Mathematical Foundations of Computer Science (MFCS), August 2022
5. S. Akshay, S. Chakraborty, and D. Pal, "On Eventual Non-negativity and Positivity of the Weighted Sum of Powers of Matrices", in Proceedings of International Joint Conference on Automated Reasoning (IJCAR), pages 671–690, August 2022

6. H. Torfah, S. Shah, S. Chakraborty, S. Akshay and S. Seshia, "Synthesizing Pareto-optimal Interpretations for Black-Box Models", in Proceedings of International Conference on Formal Methods in Computer-Aided Design (FMCAD), pages 153–162, October 2021

7. S. Chakraborty, D. Unadkat and A. Gupta, "Diffy: Inductive Reasoning of Array Programs using Difference Invariants", in Proceedings of International Conference on Computer-Aided Verification (CAV), Volume 2, pages 911–935, July 2021

8. P. Shah, A. Bansal, S. Akshay and S. Chakraborty, "A Normal Form Characterization for Efficient Boolean Skolem Function Synthesis", in Proceedings of IEEE International Symposium on Logic in Computer Science (LICS), pages 1–13, July 2021

TRAINING OF HIGHLY QUALIFIED PEOPLE
(INDICATE THE NUMBERS BELOW)

	Masters students	Doctoral Students	Post-doctoral students	Other RA/ TA
Supervised	1	1	1	2
Co-supervised	2	0	0	0
Graduated	3	1	0	0

PHOTOS / IMAGES

From L to R: Shubham Goel, S. Akshay, Supratik Chakraborty, Shetal Shah and Sumith Kulal – the team that developed BFSS (Blazingly Fast Skolem Synthesizer) at IIT Bombay

G K Devarajulu Chair Professorship

Prof. Ramesh Kumar Singh

Email: rsingh@iitb.ac.in

Department of Mechanical Engineering

"It is a great honor for me to hold the G K Devarajulu Chair, which had been previously held by the illustrious educator late Prof. S. K. Maiti. IIT Bombay alumni have been extremely generous in supporting their alma mater in a variety of spheres. Recognizing the contributions of their teachers and mentors by establishing new chairs and sustaining the existing ones is an excellent way to give back to the Institute. It will go a long way in nurturing IIT Bombay's pursuit of academic excellence.

We appreciate your continued engagement with IITB. Wishing you all the very best. Many Thanks!"

– Prof. Ramesh Singh

TEACHING AND RESEARCH HIGHLIGHTS

As a teacher, Prof. Ramesh actively supports the students' endeavour to create new knowledge by pushing their limits of thinking and analysis in every academic activity they engage. He is a great believer in "learning by doing" and was instrumental in establishing and nurturing the Tinkerers' Lab (TL) at IIT Bombay. He envisions TL as a safe space for students to experience the pure joy of figuring out how to make things and, more importantly, how to make them work. He extends the same philosophy in the undergraduate Design and Manufacturing courses he teaches. The academic rigor must be complemented by substantial experiential learning.

He and his research group work in various emerging manufacturing technologies and systems development. The key distinguishing feature of their work is an emphasis on the translational aspect so that the scientific research carried out in the lab gets deployed in real-world applications. A huge technology gap exists between Indian industries and their international counterparts. One of the key research activities of their lab is to engage with the Indian Industries to bridge this gap by fostering industry-academia collaboration to strengthen the manufacturing ecosystem in India for Atmanirbhar Bharat. Prof. Ramesh has mentored two start-ups by former students based on the translational research conducted in the lab.

TEACHING HIGHLIGHT 2022

This year IIT Bombay transitioned from two years of online instruction to off-line instruction. The lack of exposure to experiential learning in the lab and hands-on projects had adversely affected the learning outcomes and skill development. Prof. Ramesh took remedial steps to enhance the experiential learning by enhancing the project component in the manufacturing course, which was appreciated by the students. This semester, Prof. Ramesh is teaching Machine design where the major component will be experiential learning via design projects. These projects will expose the students to the complete design process: market need, conceptual design, physical embodiment, components analysis/synthesis and prototype fabrication.

RESEARCH HIGHLIGHT 2022

Prof. Ramesh , with his team, started a new area of research in dynamic stability of high-speed micromachining via real-time monitoring and machine control. This work will deploy signal processing and artificial intelligence to build smart machines. Another active area of his lab's research is additive manufacturing. This year they developed novel metal matrix composites for engineered thermophysical response. In addition, they are developing the process and machine for ultra-hard thick coatings for Reico Industries. He along with his lab members were invited to speak at different international and national fora to present the cutting-edge research carried out in our lab. They are also closely working with Tata Power, Jay Chemicals, Bharat Forge, and Aditya Birla Science and Technology Company and providing solutions to the problems they are facing.

SERVICE AND PUBLIC ENGAGEMENT

Prof. Ramesh is an Executive Committee member of the International Institute of Micromanufacturing and the International Forum on Micromanufacturing. He serves on the academic advisory council for Sardar Patel College of Engineering, Mumbai. He is actively involved in curriculum development and faculty recruitment at Plaksha University, a new technical university supported by collective philanthropy. He is a member of the Independent Expert Committee for DRDO's flagship public outreach program, "Dare to Dream", where innovative solutions in areas of national security were sought from start-ups and individuals.

At the institute level, he currently serves as the Associate Dean, Infrastructure Planning and Support-II. He served on many Institute and Department committees, such as the Faculty Search Committee and Department Policy Committee.

LIST OF PUBLICATIONS AND PRESENTATIONS

Journal Papers:

1. Anandita, S., Singh, R. K., Singh, R. and Mote, R., "On the Evolution of Metal-Bonded Microgrinding Tool Topography due to Wear," submitted to Tribology International
2. Dhale, K., Banerjee, N., and Singh, R., "Investigation of a Novel Sub-Surface Work Hardening Phenomenon in Micro-Turning of Zr-Based Bulk Metallic Glass," revised version submitted to Intermetallics
3. Alya, S., Ankamreddy, B., and Singh, R., "Investigation of Bonding Strength and Failure Mechanisms in Free-Form Laser Directed Energy Deposition via Novel 'Tapered Key in a Slot' Tests," revised version submitted to CIRP Journal of Manufacturing Science and Technology.
4. Birla, S., Alya, S., and Singh, R., "An Integrated Image Processing Approach for Micro-Defect Detection," accepted for publication, Journal of Micromanufacturing.
5. Dhale, K., Nilanjan B., Outeiro, J., and Singh, R., "Investigation of the softening behavior in severely deformed micromachined sub-surface of Zr-based bulk metallic glass via nanoindentation." Journal of Non-Crystalline Solids 576 (2022): 121280.
6. Mittal, R. K., and Singh, R., "Investigation of gyroscopic effect on the stability of high speed micromilling via bifurcation analysis." Journal of Manufacturing and Materials Processing 5, no. 4 (2021): 130.
7. Vundru, C., Singh, R., Yan, W., and Karagadde, S., "A comprehensive analytical-computational model of laser directed energy deposition to predict deposition geometry and integrity for sustainable repair." International Journal of Mechanical Sciences 211 (2021): 106790.

8. Alya, S., Vundru, C., Ankamreddy, B., and Singh, R. "Modeling of Deposition Geometry in Laser Directed Energy Deposition over Inclined Surfaces for Restoration and Remanufacturing." Transactions of the Indian National Academy of Engineering 6, no. 4 (2021): 1057-1069. (Invited Paper)

Conference Papers:

9. Ghosh, G., Jain, P., Saigal, A., Singh, R., "Microstructure and Mechanical Properties Of Inconel 718/ Yttria-Stabilized Zirconia (YSZ) Metal Matrix Composite Coating Produced By Laser Directed Energy Deposition Technique," ASME -International Mechanical Engineering Congress and Exposition-2022, Columbus, OH, USA (Accepted)
10. Sahoo, P., Kumar, S., Mittal, R. K., Singh R., Barshilia H., "Influence of Hydrogen-Free DLC Coated Micro Ball Endmills on Machining Response and Tool Wear in High-Speed Micromilling of Ti6Al4V," 5th World Congress on Micro and Nano Manufacturing, KU Leuven, Belgium (Accepted)
11. Ali, I., Vishnu, N., Singh, R., and Marla, D., "Investigation of Oxide Layer Removal of Low Carbon Steel Using Nanosecond Pulsed Laser Via Response Surface Methodology," 5th World Congress on Micro and Nano Manufacturing, KU Leuven, Belgium (Accepted)
12. Alya, S., Ankamreddy, B., and Singh, R., "A Novel 'Tapered key in a slot' Technique for Characterization of Bonding Strength in Laser Directed Energy Deposition," 50th North American Manufacturing Research Conference, 2022, Purdue University, IN, USA.
13. Hashemitaheri, M., Mittal, R. K., Cherukuri, H., and Singh, R., "Extracting the In-Process Structural Dynamics Parameters in Micro-Milling Operations," Manufacturing Science & Engineering Conference (MSEC), 2022, Purdue University, IN, USA

Presentations:

1. Keynote lecture at 10 years celebration of Engineering Development at CEAT Tyres, April 2022
2. Invited lecture on Industry-Academia Interaction at CMTI, Bengaluru, Jan. 2022
3. Invited lecture on Metal Additive Manufacturing (MAM)-2021 at VNIT, Nagpur, Dec. 2021
4. Invited lecture on Laser based Manufacturing and Precision Engineering, IIT Indore, June 2021

TRAINING OF HIGHLY QUALIFIED PEOPLE

(INDICATE THE NUMBERS BELOW)

	Masters students	Doctoral Students	Post-doctoral students	Other RA/ TA
Supervised	4	2	4	4
Co-supervised	0	3	0	0
Graduated	75	17	2	15

PHOTOS / IMAGES

Our research group at Machine Tools Lab, IIT Bombay.

Tata Centre Chair Professorship for Frugal Engineering

Sanjay Mahajani

Email: sanjaym@che.iitb.ac.in

Department of Chemical Engineering

Tata Chair Professorship was awarded to me based on my work that I did for Tata Centre of Technology and Design at IIT Bombay, which was also funded by Tata Trusts. My association with the Centre and my involvement in the socially relevant projects have helped me immensely to learn how market-driven and socially oriented projects are different. Working on these projects is challenging but enjoyable. It changed my perspective and gave new directions to my research and professional life. My sincere thanks to Tata Trusts for introducing this chair professorship!

– Prof. Sanjay Mahajani

TEACHING AND RESEARCH HIGHLIGHTS 2021

1. Process and Product development in Jaggery making: Prof. Mahajani and his team are working on a multi-institute project which involves field research in sugarcane belt. New prototypes based on our patented jaggery powder plants are in place and close to commercialization.
2. Waste foundry sand reclamation: The mechanical attrition-based technology developed by IITB is transferred to a start-up. Chemical reclamation process is developed and being tested in the field.
3. Biomass and RDF gasification: They have tested our patented downdraft gasifier for the blend of RDF in biomass.
4. He has also been engaged in the research on catalysis, reaction engineering and process intensification. The work involves catalyst and process development for bulk and fine chemicals. The concept of reactive distillation and reactive chromatography are applied to several chemicals such as phenyl ethyl acetate, ethyl chloroacetate, triacetin etc.

LIST OF PUBLICATIONS AND PRESENTATIONS

Please provide list of all publications and presentations during the last one year

1. Haseen Siddiqui, Ankita Gupta, Sanjay M.Mahajani, Non-equimolar transient grain model for CO2-gasification of single biomass char pellet, 293, Fuel, 2021
2. Kamal, S., Nabar, R., Mahajani, S. "Fixed-Bed Reactor with Side Injection: A Promising Option for the Aldol Condensation of Acetaldehyde", Industrial & Engineering Chemistry Research 2021, 60 (5), 2058–2069.
3. Khan, M. M., Mahajani, S.M., Jadhav, G. N., " Transformation of bentonite used in green sand molds during metal casting process and its relevance in sand reclamation", Applied Clay Science, Volume 206, 106072, 2021

   A. Fazil, Sandeep Kumar, Sanjay M. Mahajani, Downdraft co-gasification of high ash biomass and plastics, Energy, 123055, 2022

TRAINING OF HIGHLY QUALIFIED PEOPLE

(INDICATE THE NUMBERS BELOW)

	Masters students	Doctoral Students	Post-doctoral students
Supervised (ongoing)	06	12	3
Co-supervised (ongoing)	03	03	0
Graduated	05	03	0

Research team 2022-23

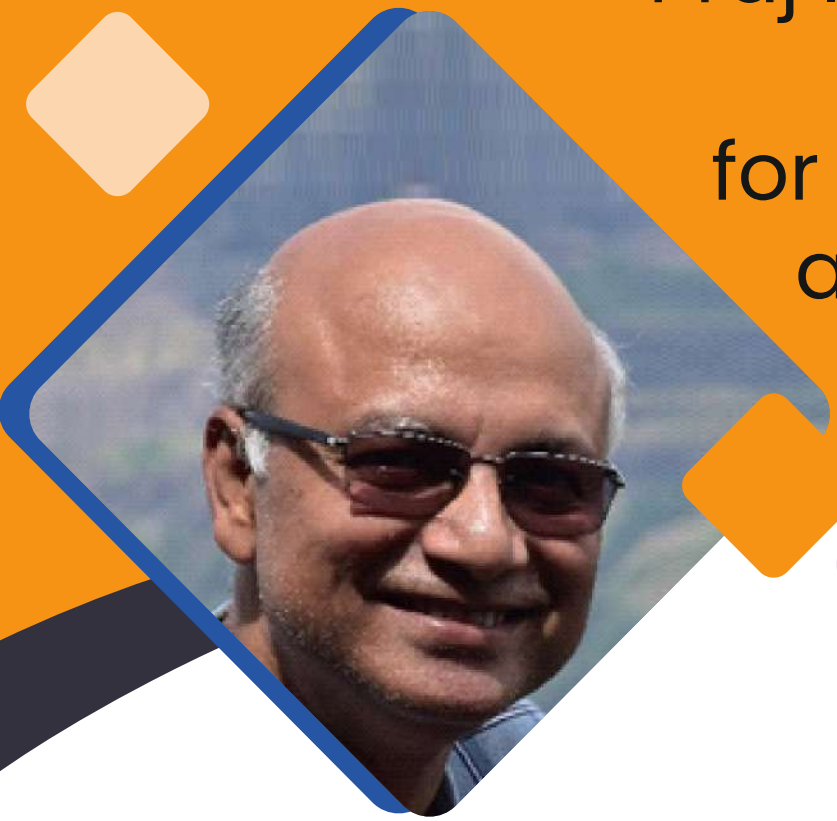
Research team 2021-22

The mobile and stationery jaggery powder plants based on IITB technology installed in Kolhapur

Sand Reclamation

Plant for sand reclamation based on IITB Technology- transferred to Deccan Crest Pvt Ltd.

Praj Industries Chair Professorship for Energy Science and Engineering



Prof. Santanu Bandyopadhyay

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Department of Energy Science and Engineering

TEACHING AND RESEARCH HIGHLIGHTS 2021

- Departmental Awards for Excellence in Teaching, IIT Bombay (2021)
- Energy Systems Modelling and Analysis (EN 618)
- Power Generation and System Planning (EN 302 and EN 642)

EDITOR/EDITORIAL BOARD

- Co-Editors-in-Chief, Process Integration and Optimization for Sustainability, Springer Nature.
- Associate Editor, Journal of Cleaner Production, Elsevier.
- Associate Editor, Clean Technologies and Environmental Policy, Springer Nature.
- Associate Editor, South African Journal of Chemical Engineering, Elsevier.
- Editor, Transactions of the Indian National Academy of Engineering, Springer Nature.

- Member–Editorial Board, Chemical Engineering Transactions, Italian Association of Chemical Engineering.
- Member–Editorial Board, International Journal of Energy Technology and Policy, Inderscience.

TRAINING OF HIGHLY QUALIFIED PEOPLE

	Masters students	Doctoral Students	Post-doctoral students	Other RA/ TA
Supervised	3 (on going)	3 (on going)	0	0
Co-supervised	0	2 (on going)	0	0
Graduated	3	2	1	0

LIST OF PUBLICATIONS AND PRESENTATIONS 2021

Publications

Journal (10)

N. Thomas, A. Jana, and S. Bandyopadhyay, Effect of Policies and COVID-19 Cases on Mobility and Activity Participation during 300 Days of COVID-19: Panel Data Analysis of Asian Countries, Journal of Eastern Asia Society for Transportation Studies, 14, 16-35, 2021.

S. Jain, H. H. Chin, J. J. Klemeš, and S. Bandyopadhyay, Multi-Objective Pinch Analysis for Resource Conservation in Constrained Source-Sink Problems, Industrial & Engineering Chemistry Research, 60, 17596–17610, 2021.

S. Kamat and S. Bandyopadhyay, Optimum Integration of Regeneration in Heat Integrated Water Networks through a Hybrid Approach, Process Integration and Optimization for Sustainability, 5, 707-727, 2021.

H.H. Chin, P.S. Varbanov, J.J. Klemeš, and S. Bandyopadhyay, Subsidised Water Symbiosis of Eco-Industrial Parks: A Multi-Stage Game Theory Approach, Computers and Chemical Engineering, 155, #107539, 2021.

A. Jana, A. Sarkar, N. Thomas, Krishna Priya G.S., S. Bandyopadhyay, T. Crosbie, D. A. Ghanem, G. Waller, G. G. Pillai, and D. Newbury-Birch, Rethinking Water Policy in India with the Scope of Metering towards Sustainable Water Future, Clean Technologies and Environmental Policy, 23, 2471-2495, 2021.

S. Kamat and S. Bandyopadhyay, A Hybrid Approach for Heat Integration in Water Conservation Networks through Non-isothermal mixing, Energy, 233, #121143, 2021.

S. Kamat and S. Bandyopadhyay, Bi-objective Pinch Analysis of Heat Integrated Water Conservation Networks, Journal of Cleaner Production, 312, #127676, 2021.

R. R. Tan, K. B. Aviso, and S. Bandyopadhyay, Pinch-Based Planning of Terrestrial Carbon Management Networks, Cleaner Engineering and Technology, 4, #100141, 2021.

S. Jain and S. Bandyopadhyay, Targeting Segregated Problems with Common Resources through Pinch Analysis, Journal of Cleaner Production, 301, #126996, 2021.

M. Pyakurel, K. Nawandar, V. Ramadesigan, and S. Bandyopadhyay, Capacity Expansion of Power Plants Using Dynamic Energy Analysis, Clean Technologies and Environmental Policy, 23, 669-683, 2021.

BOOK CHAPTER (1)

Krishna Priya G.S. and S. Bandyopadhyay, Carbon Constrained Electricity Sector Planning with Multiple Objectives, In: Advances in Carbon Management Technologies, Volume 2 (ISBN: 9781003056157), Ed. S. K. Sikdar and F. Princiotta, CRC Press, Boca Raton, 347-364, 2021.

EDITORIAL (3)

S. Bandyopadhyay, All forms of energy are equal, but some forms of energy are more equal than others (Editorial), Clean Technologies and Environmental Policy, 23(10), 2021.

S.S. Kachhwaha, N.B. Desai, and S. Bandyopadhyay, Thermal engineering for sustainable technologies (Editorial), Clean Technologies and Environmental Policy, 23(4), 2021.

S. Bandyopadhyay, D.C.Y. Foo, and R.R. Tan, Milestones and Best Papers 2017–2020 (Editorial), Process Integration and Optimization for Sustainability, 5, 2021.

Presentations

CONFERENCE PAPERS (7)

S. Jain, H. H. Chin, S. Bandyopadhyay and J. J. Klemeš, P-graph approach for multi-index segregated resource conservation network, Proceedings of the International Conference on Cleaner Production and Sustainability (CPS 2021), Manila, Philippines, December 12-13, 2021.

S. Kamat and S. Bandyopadhyay, Optimization of Heat Integration in Water Networks with variable regeneration temperatures, paper presented online in the 5th SPIL International Scientific Conference: Energy, Water, Emission & Waste in Industry and Cities (SPIL 2021), Brno, Czech Republic, November 4-5, 2021.

R. R. Tan, S. Bandyopadhyay and D. C. Y. Foo, Graphical Method for Optimizing Peer-to-Peer Carbon Trading, paper presented online in the 5th SPIL International Scientific Conference: Energy, Water, Emission & Waste in Industry and Cities (SPIL 2021), Brno, Czech Republic, November 4-5, 2021.

A. Ray, N. Kazantzis, D. C. Y. Foo, V. Kazantzi, R. R. Tan and S. Bandyopadhyay, Financial Pinch Analysis for Selection of Energy Conservation Projects with Uncertainties, Proceedings of the 24th Conference on Process Integration, Modeling and Optimisation for Energy Saving and Pollution Reduction (PRES 2021), pp. 109-114, Brno, Czech Republic, October 31-November 3, 2021.

S. Jain, H. H. Chin, J. J. Klemeš and S. Bandyopadhyay, Optimising Segregated Resource Conservation Network with Cross-Zonal Transfer for Multiple Resources and Qualities, Proceedings of the 24th Conference on Process Integration, Modeling and Optimisation for Energy Saving and Pollution Reduction (PRES 2021), pp. 103-108, Brno, Czech Republic, October 31-November 3, 2021.

N. Thomas, A. Jana and S. Bandyopadhyay, Effect of Policies and COVID-19 Cases on Mobility and Activity Participation during 300 Days of COVID-19: Panel Data Analysis of Asian Countries, paper presented in the 14th International Conference of the Eastern Asia Society for Transportation Studies (EASTS), Hiroshima, Japan, September 12-14, 2021.

Krishna Priya G.S., G. G. Pillai, A. Jana, S. Bandyopadhyay, T. Crosbie and D. A. Ghanem, An Analytic Hierarchy Process (AHP) Framework for Feature Evaluation of Smart Electricity Meters in India, paper presented in the 56th International Universities Power Engineering Conference (UPEC), Teesside University, UK, August 31-September 3, 2021.

KEYNOTE LECTURES IN CONFERENCES (5)

Power Pinch Analysis at 3rd International Conference on Energy and Power (ICEP 2021), Chiang Mai, Thailand, November 18-20, 2021.

Incorporating Uncertainties in Pinch Analysis at 24th Conference on Process Integration for Energy Saving and Pollution Reduction (PRES'21), Brno, Czech Republic, October 31-November 3, 2021.

Pinch Analysis for Heat Integrated Water Allocation Networks at Advances in Thermal-Fluids Engineering (ATFE 2021), Gandhinagar, India, March 25-26, 2021.

Pinch Analysis and Sustainable Developments at International Conference on Green Technologies for Sustainable Development (GTSD-2021), Nadiad, India, March 9-11, 2021.

Pinch Analysis for Sustainable Developments at New Frontiers in Energy and Environmental Sustainability (NFEES-2021), Gandhinagar, India, February 27-28, 2021.

Maharashtra Pollution Control Board (MPCB) Chair Professorship

Prof. Anurag Garg

Email: a.garg@iitb.ac.in

Department of Environmental Science and Engineering

I sincerely thank to Maharashtra Pollution Control Board (MPCB) for the Chair Professorship position in Environmental Science and Engineering Department at IIT Bombay. The support from MPCB is extremely helpful for conducting applied research in the priority areas requiring significant attention in the state of Maharashtra. The findings of the ongoing research should be helpful in finding sustainable and efficient solutions in the field of solid waste management, wastewater treatment and remedial measures for the contaminated rivers. The associated contingency funding is sufficient to initiate more research studies. As Chair Professor, I have plans to reach out to some major institutions in the state to enhance collaborative activities and capacity building. I am already working with industries, municipal corporations and MPCB on different problems in the state. I again thank the Pollution Control Board for the Chair Professor position, and all the support to perform research and other allied activities.

– Prof. Anurag Garg

TEACHING AND RESEARCH HIGHLIGHTS

For past 9 months (since December 2021), Prof. Anurag has taught many courses on various aspects of environmental engineering (such as solid waste management, hazardous waste management, Industrial wastewater treatment and reuse, biological treatment processes, environmental hydraulics) in which fundamental and application were discussed with students. The courses primarily covered characteristics of different kinds of waste, their remedial measures and recycling potential.

MAJOR ONGOING RESEARCH ACTIVITIES INCLUDE THE FOLLOWING

- Development of community scale forced aeration composting system for household wet biodegradable waste with a provision for odour removal – field trials are in progress
- Development of efficient hydrothermal pretreatment for cooked food or restaurant waste and sewage sludge with higher resource recovery
- Resource recovery from biomethanated spent wash (from distilleries) after catalytic wet oxidation process
- Working on various pretreatment methods for sugarcane bagasse to find better opportunities for its valorisation with lower environmental impacts
- Hydrothermal pretreatment of pressmud from sugar industry with an aim for improved resource recovery
- Study on the recovery of salt and destruction of sulphides and phenolics from spent caustic stream generated from petroleum refineries
- Prediction of gas generation from old municipal solid waste dumpsites
- Working on simultaneous nitrification and denitrification process for nitrogen rich wastewater and wastewater from oil refinery – work is in collaboration with a Professor in Environmental Science and Engineering Department
- Research on various advanced oxidation processes for the removal of toxic and persistent organic pollutants found in industrial wastewaters
- Investigation on the utilisation of sewage and industrial sludge as adsorbent and catalysts for wastewater treatment processes

SERVICE AND PUBLIC ENGAGEMENT
(SINCE DECEMBER 2021-TILL DATE)

- Coordinator of a half-day Session on "Sustainable Wastewater Management in Oil and Gas Sector" which was a part of Conclave organized by Centre of Excellence in Oil, Gas and Energy, IIT Bombay on 15th December 2021
- Member on the Technical Committee (formed by MPCB) for scrutinizing applications for change in product-mix with "no increase in pollution load" since 2017
- Member, Deonar dumping ground Monitoring Committee formed by BMC on the direction of Honorable High Court, Mumbai
- Co-PI, Project on Kasardi River restoration funded by MPCB
- Working with Oil Refineries for developing sustainable treatment technologies for the valorisation of highly polluted wastewater streams
- Currently engaged in discussions with few municipal corporations for municipal solid waste dumpsite closure plan, operation of existing biogas plants (for wet household waste), and sewage sludge management
- At IIT Bombay, encouraging campus community to promote waste reduction (the top most priority in waste hierarchy) with the help of volunteers
- Planning to reach out the alcohol distilleries and sugar industries for in-kind support to test our technologies for respective waste streams
- Member of few Joint Committees constituted on the direction of Honourable National Green Tribunal
- Visiting Professor at School of Water, Energy and Environment, Cranfield University, UK since 2019
- Expert member, E3OW theme of CSIR-NEERI

LIST OF PUBLICATIONS AND PRESENTATIONS
(SINCE DECEMBER 2021-TILL DATE)

Patent:

- S. Singh, A. Garg. "Development of Efficient Waste-Derived Catalysts for the Degradation of Chlorinated Organics". (Patent No.: 392817; Date of Grant: 24/03/2022; Application No.: 201921053201; 20/12/2019).

JOURNAL PUBLICATIONS

1) I. Khatri, A. Garg. Potash recovery from synthetic potassium rich wastewater and biomethanated distillery effluent using tartaric acid as a recyclable precipitant. Journal of Environmental Technology & Innovation, 2022. (Available online)

2) N. Davison, J. E. Borbolla-Gaxiola D. Gupta, A. Garg, T. Cockerill, Y. Tang, Xueliang Yuan, A. B. Ross Potential Greenhouse Gas Mitigation for Converting High Moisture Food Waste into Bio-Coal from Hydrothermal Carbonisation in India, Europe and China. Energies 15 (4), 1372 (total pages = 37). (Available online)

3) P. Mondal, S. Mukherji, A. Garg. Performance of Treatment Schemes Comprising Chromium-Hydrogen Peroxide Based Advanced Oxidation Process for Textile Wastewater. Environmental Science and Pollution Research, 2022, total pages = 12. (Available online)

4) S. Singh, A. Garg. Performance Evaluation of Black Liquor Derived Photocatalysts for the Oxidation of Synthetic and Simulated Pulp Bleaching Wastewaters. Industrial & Engineering Chemistry Research, 2022, 61 (10), 3516-3529.

5) I. Khatri, A. Garg. Use of Heterogeneous Activated Carbon Supported Copper Catalyst for Catalytic Wet Oxidation of Biomethanated Spent Wash: Reaction Kinetics, Catalyst Stability, Catalyst Deactivation Kinetics and Biochemical Methane Potential. Journal of Water Processing Engineering, 2021, total pages = 12. (Available online)

6) D. Gupta, S. M. Mahajani, A. Garg. Hydrothermal Carbonization of Household Wet Waste – Characterization of Hydrochar and Process Wastewater Stream. Bioresource Technology, 2021, total pages = 7. (Available online

CHAPTERS IN BOOKS

1) D. K. Singh, A. Garg. A Review on Hydrothermal Pretreatment of Sewage Sludge: Energy Recovery Options and Major Challenges. In "Advanced Organic Waste Management: Sustainable Practices and Approaches", Editors: C. M. Hussain & S. Hait, Elsevier publication, 2022, pp. 297-314.

2) Merin S. James, A. Garg. Electrochemical Treatment of Sulphidic Spent Caustic Waste Stream Generated from Petroleum Refineries. In "Advances in Chemical, Bio and Environmental Engineering" Book Series "Environmental Science and Engineering" Scopus Indexed (Springer proceedings), Editors: Jatinder Kumar Ratan, Deepak Sahu, Nitin Naresh Pandhare, Anjireddy Bhavanam, 2022, pp. 1121-1130. (Work was presented in CHEMBIOEN-2021)

Apart from the above, four abstracts have been submitted to conferences and symposium in India as well as abroad. Prof. Anurag's students presented our work in various conferences.

PRESENTATIONS/ TALKS

1) A lecture on "Anaerobic Treatment – Fundamentals" in a in-house short course on "Compressed Biogas: Technology, Scale-up, and Business" organized by Centre of Excellence in Oil, Gas and Energy, IIT Bombay on 25th April 2022.

2) A talk on "Food-processing effluent characteristics and treatment" in a symposium on "Sustainable Developments in Local Land and Food Systems: Socioeconomic, Technological, and Environmental Aspects" funded by Shastri Indo-Canadian Institute (SICI) on March 22, 2022.

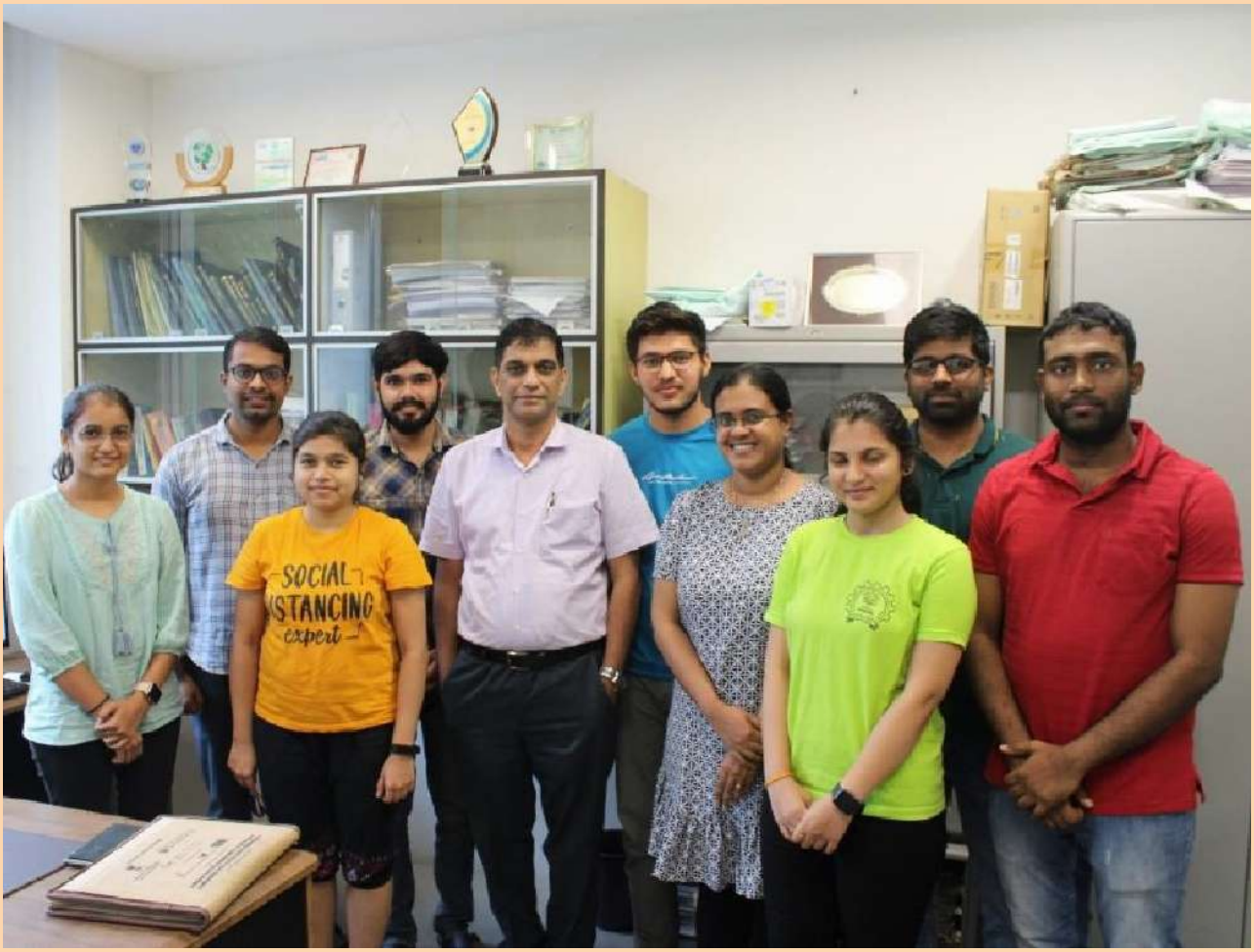
3) A Guest lecture on "Importance of Swachata, Sustainability, Clean & green Environment" for the Inaugural function of Swachata Pakhwada celebrated by Directorate (Directorate of Construction Services & Estate management, Department of Atomic Energy) on 16th February 2022.

4) A lecture on "Urban Municipal Solid Waste Management Opportunities and Challenges" in Continuing Education Programme on "Sustainable Urban Systems" organized by Centre for Urban Science and Engineering, IIT Bombay on 8th January 2022.

TRAINING OF HIGHLY QUALIFIED PEOPLE

(INDICATE THE NUMBERS BELOW) (SINCE DECEMBER 2021-TILL DATE)

	Masters students	Doctoral Students	Post-doctoral students
Supervised	3 as main supervisor	7	1
Co-supervised	1	1	0
Graduated	2	2 (including 1 as co-guide)	0


SOCIAL
STANCING
expert

Pramod Chaudhari Chair Professorship for Green Chemistry and Biotechnology.

Prof. Gautam K Lahiri

Email: lahiri@chem.iitb.ac.in
Department of Chemistry

I would like to extend my deep sense of gratitude for offering me the prestigious Chair Professorship which indeed encourages me further to achieve greater heights in terms of our research and other academic activities.

– Prof. Lahiri

TEACHING AND RESEARCH HIGHLIGHTS

Prof. Gautam has been involved in teaching a wide variety of courses covering both undergraduate/postgraduate students and PhD scholars.

His research group at IIT Bombay is actively involved in pursuing research work primarily in the directions of establishing delicate electronic structural features of redox non-innocence assemblies via experimental/theoretical investigations as well as looking into the role of redox towards molecular functionalization and catalysis under environmentally benign condition.

SERVICE AND PUBLIC ENGAGEMENT

I have also been actively involved in supervising PhD degree of many research scholars and to deliver our research outputs both at the National and International platforms.

LIST OF PUBLICATIONS AND PRESENTATIONS

Publications:

1. Bidirectional Noninnocence of Hinge-like Deprotonated Bis-lawsone on Selective Ruthenium Platform: a Function of Varying Ancillary Ligands
   Y. Arya, S. K. Bera, J. L. Priego, R. Jimenez-Aparicio and G. K. Lahiri
   Dalton Trans., 2022 (doi: 10.1039/D2DT01466A)
2. Recent Developments in First-row Transition metal complex-catalyzed CO2hydrogenation
   C. Das, J. Grover, Tannu, A. Das, D. Maiti, A. Dutta and G. K. Lahiri
   Dalton Trans., 2022, 51, 8160
3. Diruthenium and TrirutheniumCompounds of the Potential Redox active Non-chelated η1-N,η1-N-Benzothiadiazole Bridge
   S. Dey, A. S. Hazari, S. M. Mobinand G. K. Lahiri
   Dalton Trans., 2022, 51, 8657
4. Directing Group Assisted Rhodium Catalyzedmeta-C–H Alkynylation of Arenes
   S. Sasmal, G. Prakash, U. Dutta, R. Laskar, G. K. Lahiri and D. Maiti
   Chem. Sci., 2022, 13, 5616
5. Redox-Induced Intramolecular C–C Coupling of Acyclic Bis(2-pyridylmethylene)ethylene diamine on a Ru(acac)2Platform
   M. Biswas, S. Dey, S. Panda, A. Dutta and G. K. Lahiri
   Inorg. Chem., 2022, 61, 6347
6. Diosmium Compounds Bridged by Bis(imidazole)-p-quinone Ligands
   S. Dhara, M. A. Ansari, B. Schwederski, V. Fillippou, W. Kaim and G. K. Lahiri
   Dalton Trans., 2022, 51, 4058

7. Inner-Sphere Electron Transfer at the Ruthenium-Azo Interface
   S. Panda, A. Singh, S. Dey, K. W. Huang and G. K. Lahiri
   Dalton Trans., 2022, 51, 2547

8. Group 6 Transition Metal-based Molecular Complexes for Sustainable Catalytic CO2 Activation
   B. Rajeshwaree, A. Ali, A. Q. Mir, J. Grover, G. K. Lahiri, A. Dutta and D. Maiti
   Catal. Sci. Technol., 2022, 12, 390

9. Metal-to-Ligand Charge Transfer Induced Valence Tautomeric Forms of Non-Innocent 2,2-Azobis(benzothiazole) in Ruthenium Frameworks
   A. Singh, S. Dey, S. Panda and G. K. Lahiri
   Angew. Chem. Int. Ed., 2021, 60, 11206

10. The Indigo Isomer Epindolidione as Redox-Active Bridging Ligandfor Diruthenium Complexes
    M. Kumari, S. K. Bera, S. Blickle, W. Kaim and G. K. Lahiri
    Chem. Eur. J., 2021. 27, 5461

11. Radical versus Nonradical States of Azobis(benzothiazole) as a Function of Ancillary Ligands on Selective Ruthenium Platforms
    A. Singh, S. Dey, S. Panda and G. K. Lahiri
    Inorg. Chem., 2021, 60, 18260

12. Osmium(II)-Coordination Induced C–C Bond Functionalization of Bis-lawsone
    Y. Arya, S. K. Bera, S. Panda and G. K. Lahiri
    Inorg. Chem., 2021, 60, 11883

13. Ruthenium-Benzothiadiazole Building Block Derived Dynamic HeterometallicRu-Ag Coordination Polymer and Its Enhanced Water Splitting Feature
    S. Dey, B. Singh, S. Dasgupta, A. Dutta, A. Indra and G. K. Lahiri
    Inorg. Chem., 2021, 60, 9607

14. Synthesis, Characterization, and Water Oxidation Activity of Isomeric RuComplexes
    M. A. Hoque, A. D. Chowdhury, S. Maji, J. Benet-Buchholz, M. Z. Ertem, C. G. Suriñach, G. K. Lahiri and A. Llobet
    Inorg. Chem., 2021, 60, 6852

15. Structural and Electronic Forms of Doubly Oxido/Pz and Triply Oxido/(Pz)2 Bridged Mixed Valent and Isovalent Diruthenium Complexes (Pz = pyrazolate)
    S. K. Bera and G. K. Lahiri
    Dalton Trans., 2021, 50, 17653

16. Redox Induced Oxidative C-C Coupling of Noninnocent bis(heterocyclo)methanides
    S. Panda, R. Baliyan, S. Dhara, K. -W. Huang and G. K. Lahiri
    Dalton Trans., 2021, 50, 16647

17. Redox Induced S-S Bond Cleavage of 2, 2′-dithiobisbenzothiazole - Leading to a [2Ru2S] Core Analogous to [2Fe-2S] Cluster
    S. Dhara, S. Panda and G. K. Lahiri
    Dalton Trans., 2021, 50, 12408
18. Noninnocence of Deprotonated 1, 2-bis((1H-pyrrol-2-yl)methylene) Hydrazine Bridge in Diruthenium Frameworks-A Function of Co-ligands
    M. Kumari, S. K. Bera and G. K. Lahiri
    Dalton Trans., 2021, 50, 9891
19. Variable electronic structure and spin distribution in bis(2, 2'-bipyridine)-metal Complexes (M = Ru or Os) of 4,5-dioxido- and 4,5-diimido-pyrene
    M, ChatterjeeS. Mondal, A. S. Hazari, S. Zalis, W. Kaim and G. K. Lahiri
    Dalton Trans., 2021, 50, 4191
20. Redox Induced Tunable Functionalization of Picolylamines on Selective Ru-Platform
    A. Singh,S. Dey, S. Panda and G. K. Lahiri
    Eur. J. Inorg. Chem., 2021, 473
21. Copper Mediated Chemo-and Stereoselective Cyanation Reactions
    S. M. Mobin, P. Chandra, N. Choudhary, G. K. Lahiri, D. Maiti
    Asian J. Org. Chem., 2021, 10, 1897
22. Organopalladium Intermediates in Coordination Directed C(sp3) –H Functionalizations
    A. S. Suseelan, A. Dutta, G. K. Lahiri and D. Maiti

Trends in Chemistry., 2021, 3, 188 **(Invited Article)**

Presentations

1. MS University- Baroda (25th June 2022)
2. **FS-CHM 2022,** IISER Thiruvananthapuram (8th April 2022)
3. IIT Bhubaneswar (7th February 2022)
4. **Advance Research in Molecular and Material Science (ARM2S-2022)**, Indian Chemical Society (1st January 2022)

TRAINING OF HIGHLY QUALIFIED PEOPLE

(INDICATE THE NUMBERS BELOW)

Supervised	Masters students	Doctoral Students	Post-doctoral students
Co-supervised	1. Sarbajeet Chakraborty	1. Sanchaita Dey	1. Dr. Sudip Kumar Bera
		2. Suman Dhara	2. Dr. Mahendra Awasthi
		3. Sudip Maiti	3. Dr. Teja Chitrala
		4. Aditi Singh	
		5. Maya Kumari	
		6. Yogita Arya	
		7. LitonSeikh	
		8. Jagrit Grover	
		9. Yogesh Bairagi	
		10. Mitrali Biswas	
		11. Chandan Das	
		12. Anwesha Banerjee	
Graduated	1. Pradip Bhuin (2021)	1. Sheuli Sasmal (2021)	
	2. Sachchidanand Vishvakarma (2021)	2. Sudip Kumar Bera (2022)	
	3. Krishnendu Dey (2022)		

NEWLY APPOINTED CHAIR PROFESSORSHIPS IN 2022

JITENDRA K. & MEENA J. MEHTA CHAIR PROFESSOR

Prof. Siddhartha Ghosh
Email: sghosh@civil.iitb.ac.in
Department of Civil Engineering

ACADEMIC BACKGROUND

- PhD in Civil Engineering from the Department of Civil and Environmental Engineering, University of Michigan, Ann Arbor, USA. (1999-2003)
- Master of Technology (Structural Engineering) from the Department of Civil Engineering, Indian Institute of Technology Kanpur, India. (1997-99)
- Bachelor of Civil Engineering from the Department of Civil Engineering, Jadavpur University, Kolkata, India. (1993-97)

RESEARCH INTERESTS

- Structural Reliability and Risk Analysis
- Uncertainty Quantification in Civil/Structural Engineering
- Resilience of Critical Infrastructure Systems
- Life-Cycle Maintenance and Ageing Management
- Topology, Shape and Size Optimisation of Structures
- Structural and Cold-Formed Steel
- Structural Shells and Membranes

BRIEF PROFILE

After completing my Ph.D. from the University of Michigan in 2003, I joined IIT Bombay, where I have held various academic positions in the last two decades. My research interests are primarily in the application of probabilistic methodologies in civil infrastructure risk reduction. In recent years, I have supervised postgraduate students working in the areas of value of information in structural health monitoring, analysis and design of tensile membranes, risk analysis in earthquake engineering, uncertainty quantification, and the use of topology optimization in structural deisgn; besides managing the 'Structural Safety, Risk and Reliability (SSRR) Lab'. I teach graduate and undergraduate courses in structural engineering and probabilistic methods. I have conducted consultancy works in the areas related to structural dynamics, structural reliability, bridge safety, and design, NDT & retrofit of steel and RC structures. Currently, I am the convenor of Beureau of Indian Standards' working groups on 'tensile membrane structures' and 'structural health monitoring'.

Madhuri Sinha Chair Professor

Prof. Soumyo Mukherji

E-mail: mukherji@iitb.ac.in

Professor, Department of Biosciences and Bioengineering

ACADEMIC BACKGROUND

- B.Tech. Instrumentation Engineering, IIT-Kharagpur
- M.S. Colorado State University (Fort Collins, USA)
- PhD. University of North Carolina (Chapel Hill, USA)

RESEARCH INTERESTS

- Biosensors and Bioinstrumentation: This includes physical, chemical, and biological sensing systems (macro and micro) for medical / biological applications in the fields of health, environment and national security.
- Cardiac Electrophysiology

HONORS

- Fellow of the Indian National Academy of Engineers (INAE)

Anantrao Jagtap Chair Associate Professor Construction Technology and Management

Prof. Venkata Santosh Kumar

Email: venkatad@civil.iitb.ac.in

Department of Civil Engineering

ACADEMIC BACKGROUND

- B. Tech in Civil Engineering from Indian Institute of Technology Madras
- PhD in Building Technology and Construction Management Division of Department of Civil Engineering, IIT Madras.

RESEARCH INTERESTS

Information Management in Construction, BIM and ML applications in Construction Management, Contracts and disputes in Construction, Infrastructure Management and governance, Project Delivery models for mega infrastructure projects

AWARDS / HONORS / RECOGNITION

- Highly Commended Paper Award (2022), 22nd CIB World Building Congress, Australia
- Department Excellence in Teaching Award (2021), Civil Engineering Department, I.I.T. Bombay
- Best Paper Award, Indian Lean Construction Conference (2019), ILCC 2019 held at Pune
- Second Best Paper Award, PMI RAC (2019), Project Management Institute
- Fulbright Nehru Doctoral and Professional Research Fellowship (2012), Global Projects Center, Stanford University
- Best Original Research Article Award (2012), Engineering Projects Organizations Society, USA
  L&T Endowment Prize for Academic Achievement (2006), Civil Engineering Department, I.I.T. Madrass

BRIEF PROFILE

Venkata Santosh Kumar Delhi is an Associate Professor at Civil Engineering Department at IIT Bombay. He has obtained his PhD in Construction Management from Department of Civil Engineering, IIT Madras. He is also an alumni of IIT Madras having graduated with a Bachelor's of Technology in Civil Engineering as topper of the batch. He was also a Fulbright Nehru Doctoral and Professional Research Fellow at Global Projects Center, Stanford University, USA in 2012.

Currently, he is part of the Construction Technology and Management Specialization in Civil Engineering Department, IIT Bombay. His research interests include Information Management on Large Engineering Projects. Particularly, he works on Building Information Modelling (BIM), AI/ML applications in Construction Management, Construction Contract Management, AR/VR/MR applications to Construction Safety and Planning. He is also actively involved in a number of projects that aim at providing policy and strategy guidance to various governmental agencies and private companies.

Dr. P.V. Sukhatme Chair in Biostatistics

Prof. Ranjith Padinhateeri

Email: ranjithp@iitb.ac.in

Department of Biosciences and Bioengineering

ACADEMIC BACKGROUND

- Ph.D in Biological Physics at IIT Madras
- Post-doctoral research at University of Illinois, Chicago in USA and Institute Curie, France

AWARDS / HONORS / RECOGNITION

- IIT Bombay Research Publication Award in 2020
- National Bioscience Award, Department of Biotechnology (DBT), India, 2018
- Senior Innovative Young Biotechnologist Award, DBT, 2013-14
- Innovative Young Biotechnologist Award (IYBA) DBT, 2009-10
- Excellence in Teaching award – IIT Bombay, 2014.

BRIEF PROFILE

Prof. Ranjith joined IIT Bombay as an Assistant Professor in 2009. He teaches courses on Mathematical Modeling and Simulation of Biological processes, Biostatistics, Biological Thermodynamics, and Biophysics.

Prof. Ranjith's research interest is to understand biology by analysing data using ideas from statistics and making models based on physical principles. He and his team developed computational models to discover how genetic information is organized inside living cells. Their research explained the statistical nature of the organization of the genetic information into a folded polymer structure called chromatin.

Prof. Ranjith's research has been published in reputed international journals like PNAS, Nucleic Acids Research, JACS, PLOS Computational Biology, and Biophysical Journal.

Rahul Bajaj Chair Professor

Prof. Atul Sharma

Email: atulsharma@iitb.ac.in

Department of Mechanical Engineering

ACADEMIC BACKGROUND

- PhD., Indian Institute of Technology Kanpur, 2004.
- M.E, Indian Institute of Science Bangalore, 1998.
- B.E, National Institute of Technology Raipur, 1994.

RESEARCH INTERESTS

Computational Fluid Dynamics and Heat Transfer, and Computational Multi-Phase Dynamics (CMPD) involving (a) Computational Multi-Fluid Dynamics (CMFD) and (b) Computational Fluid-Structure Interactions (CFSI).

AWARDS

- IIT Bombay "Research Dissemination Award 2020" in recognition of "outstanding efforts to disseminate" research through a text book on "Introduction to Computational Fluid Dynamics" and review article on "Level Set Method for Computational Multi-Fluid Dynamics", 2020.
- IIT Bombay "Departmental Award for Excellence in Teaching 2019" in recognition of significant contributions to the teaching activities of the institute.

BRIEF PROFILE

Dr. Atul Sharma contributions are on development of a range of novel and efficient computational tools, their applications to numerous time-consuming simulations, and analysis of the resulting big-data for various problems in Computational Fluid Dynamics (CFD). For Computational Multi-Fluid Dynamics and Computational Fluid-Structure Interactions, he demonstrated numerous innovative applications and provided scientific understanding of various types of problems: fish-like swimming, energy harvesting from flow-induced vibrations, sustaining nucleate boiling at zero gravity, and for self-cleaning surfaces. He also demonstrated simulations for industrial problems on circuit breaker, power transformer, and printed circuit heat-exchangers. He proposed a physical, insightful, and comprehensive approach for CFD, in his well-received textbook, to enable his vision of MAKE CFD-SOFTWARE IN INDIA!

Prof. Sharma is a Fellow of Indian National Academy of Engineering (INAE). His wide-variety of research is published as 96 articles in 37 different well-recognized international-journals, 82 conference-proceedings, and 14 chapters in 5 edited-books; and appeared in cover page of top-class journals (JFM, POF and Langmuir). He contributed as a CFD consultant at Global R&D, Crompton Greaves Limited, Mumbai, served as Secretary, National Society of Fluid Mechanics and Fluid Power, and presently, an associate-editor for "Sadhana" from the Indian Academy of Sciences.

Sumati and Atmaram Kotwal Sanskrit Acharya Chair

Prof. Malhar Kulkarni

Email: malhar@hss.iitb.ac.in

Department of Humanities and Social Sciences

ACADEMIC BACKGROUND

- Ph.D. in Sanskrit, University of Pune

AWARDS / HONORS / RECOGNITION

- Maharshi Badarayana Vyas award from the President of India - 2009
- Excellence in Teaching Award at IIT Bombay in 2017

BRIEF PROFILE

Prof. Kulkarni has a long and illustrious career in the Sanskrit language. He trained in traditional and modern methods of Sanskrit learning. After joining IIT Bombay, he collaborated with Professor Pushpak Bhattacharyya, Department of CSE, IIT Bombay, and developed the Sanskrit Wordnet.

Prof. Kulkarni has also created the Corpora and Dependency Tree Bank of Marathi which can be applied in the field of Natural Language Processing (NLP) and Computational Linguistics. He is a member of the Centre for Indian Language Technology (CFILT), CSE, IIT Bombay. As part of CFILT, he worked towards developing a language teaching/learning aid called Shabdamitra.

His other accomplishments in Sanskrit include contributing to the development of the Textual History Tool (THT) which uses phylogenetic methods to track down the history of texts. He is currently collaborating with Eivind Kahrs, University of Cambridge, UK, on a critical edition of the Kasikavrtti (7th Century CE). He is also editing the 16th century commentary, Suktiratnakara, on the Vyakarana Mahabhasya of Patanjali, for publication.

Over the years he has published his creative writing extensively in Sanskrit, as well. These include short stories, verse poems, plays, and translations. He also provides cricket commentary in Sanskrit. Prof. Malhar Kulkarni teaches Paninian grammar and Philosophy of Language at the Department of Humanities and Social Sciences, IIT Bombay.

Shaliesh Mehta Chair Professor

Dr. Vinish Kumar Kathuria

Professor (Economics)

Shailesh J. Mehta School of Management

PIC - IITB-BoBIC

ACADEMIC BACKGROUND

- B. Tech. (Electrical) – Regional Engineering College (Now NIT), Kurukshetra, India (1985-89).
- P.G. Diploma (International Marketing) – Dept. of Commerce, Delhi School of Economics, Delhi University, Delhi, India (1992-93).

- P.G. Diploma (Development Policy) – Indira Gandhi Institute of Development Research (IGIDR) (Deemed University), Mumbai, India (1993-94).
- Ph.D. (Economics) – Indira Gandhi Institute of Development Research (IGIDR) (Deemed University), Mumbai, India (1994-98).
- Post-doc (Environmental Economics) – Environmental Economics Unit, University of Gothenburg, Sweden (2000-2001).

RESEARCH INTEREST

- Economics of Regulation
- Productivity Measurement
- FDI and Technology Transfer
- Renewable Energy

AWARDS / HONORS

- Outstanding Reviewer Award (2020) by Emerald Publisher for their "International Journal of Developing Issues".
- Visiting Chair Professor (Contemporary India) at the International Business division, University of Sydney, Sydney (Australia) from Sep 3, 2017 to Dec. 1, 2017.
- Top Researcher in Economics among all Business school researchers of the country and featured in the top 5% researchers of the business schools (Omega, 2016) (http://www.sciencedirect.com/science /article/pii/S0305048316000359).
- Distinguished Alumni Award (2015) NIT Kurukshetra: Awarded distinguished alumni award in the area of Education by my alma mater – National Institute of Technology (formerly Regional Engineering College, REC) Kurukshetra on Dec. 13, 2015.
- Adjunct Professor in Jiangsu University, PR China (2014).
- Mahalanobis Memorial Medal-National Award 2010 in Quantitative Economics (given by The Indian Econometric Society, TIES).
- Fulbright Senior Researcher at the Department of Economics, University of Colorado at Boulder, Colorado US from October 2, 2006 to July 29, 2007.
- UNESCO Ph.D. Thesis Award 2000-01: Ph.D. thesis among 8 theses selected by the Scientific Steering Committee of the UNESCO for their 'Management of Social Transformation (MOST)' program for the year 2000-01.

Prof. James R. Isaac Chair Professorship

In the year, 2000, Mr. Vincent Fernandes, (B.Tech EE, 1975) has donated to endow a Chair professorship for attracting and retaining gifted young faculty in the area of computer science and engineering through IIT Bombay Heritage Foundation.

Mr. Fernandes had requested that the Chair be named as James R. Isaac Chair in honour of Prof. J. R. Isaac, who had played a crucial role in shaping his career in Computer Science and Engineering and subsequent successes as a professional.

Prof. Rohit Gurjar, occupied this Chair for a period of 3 years, 2018 - 2021. The Chair is presently vacant.

Forbes Marshall

In 2008, Dr. Naushad Forbes, kindly instituted the Forbes Marshall Chair Professorship in Energy Science and Engineering. This Chair Professorship was established to elevate research and development activities in the Energy Science and Engineering Department.

Prof. Rangan Banerjee presided over this Chair Professorship for a period of 3 years from 2019 - 2022 before he was appointed as Director of IIT Delhi in February 2022. The Chair is vacant and advertised. The advertisement was released on September 15, 2022 and the last date to apply is October 31, 2022.

Newly established Chairs

These Chairs are presently advertised and the last date for receiving faculty applications is October 31, 2022.

INOX Chair in Cryogenics: The vision of this Chair is to conduct advanced research in the niche area of Cryogenics.

The Kelkar Family Chair in Quantitative Finance by Mr. Ram Kelkar: The objective of this Chair is to support education and research in Quantitative Finance, an interdisciplinary field at the intersection of finance, statistics, and technology.

Vinaya and Samir Kapoor Chair in Climate Studies: This is the first-ever Chair Professorship in Climate Studies. This initiative directly supports the mission of the Institute in being a thought-leader in Climate Studies.

Bank of Baroda Sustainable Technology Chair: The vision of this Chair is to help create new project assessment methodology using emerging technologies for financing new projects, especially in sectors like energy, construction, transportation, and infrastructure, among others.

OTHER INITIATIVES/ PROGRAMS

HOSTEL 5

The H5 Enhancement Project was initiated to improve living conditions in the hostel by adding common study rooms and toilet facilities. A joint initiative between IIT Bombay, IIT Bombay Alumni Association, and IIT Bombay Heritage Foundation, the project has been spearheaded by our alumni Dhananjay Saheba (B.Tech. '77 EE), Ajit Jawle (B.Tech. '77 Civil Engg. H5), Suhas Mehta (B.Tech. '83 Civil Engg. H5), Nitin Doshi (B.Tech. '79 Civil Engg. H5) and Nandkishore Nemade (B.Tech. '82 Chem. Engg. H5). Under their stewardship, around 170 alumni from H5 (batches 1964 to 2018) successfully raised INR 5.5 crores and implemented the hostel's refurbishment in June, 2021. Today Hostel 5 boasts of freshly painted walls, air-conditioned study rooms, and additional restroom facilities among other provisions to ensure a holistic living environment for present and future students.

RAHUL BAJAJ TECHNOLOGY INNOVATION CENTRE -RBTIC

The Rahul Bajaj Technology Innovation Centre (RBTIC) at the Indian Institute of Technology Bombay was inaugurated on Friday, June 10, 2022 by Dr. R.A. Mashelkar, former Director-General of the Council of Scientific and Industrial Research (CSIR) in presence of Bajaj family members.

The Centre was a long-cherished dream by Padmabhushan late Shri. Rahul Bajaj, Former Chairman of Bajaj Group, to promote innovative ideas and research activities and realize them into ventures and support existing industries.

RBTIC will house the Society for Innovation and Entrepreneurship (SINE), Industrial Research and Consultancy Centre (IRCC) and Industrial Design Centre (IDC) School of Design. It is a 7-floor multi-department academic building that includes a welcoming lobby, two exhibition halls, a few academic and conference spaces, classrooms and office spaces. This Centre will help pursue excellence in innovation and help to achieve the goals of the Institute in years to come.

PROJECT EVERGREEN

On 25-Aug-21, IIT Bombay signed a pioneering partnership agreement with its alumni organizations — IITB Alumni Association (IITBAA) and IITB Heritage Foundation (IITBHF) pertaining to funding, designing and building a new world-class hostel complex. The new hostel complex will boast of 3 towers. Two of these, H7 and H8, will replace the erstwhile H7 and H8. The third, H21, will house the growing numbers of women students at IIT Bombay. It will be close to Powai Lake, which has been one of the key features of H7. The fund-raising, design and construction of this new hostel complex is being spearheaded by the alumni community with project management support from IITBAA. The INR 150 crores-worth project (approx. $20M) will be implemented in two phases. Phase 1, which largely coincided with FY 2021-22 and the opening months of the current financial year, has been limited to design development and statutory permissions for the construction of the hostel complex. The scope encompassed developing designs and cost estimates for construction, determining the possibility of raising the amount required for construction, and obtaining BMC and other statutory and regulatory permissions for the construction of the hostel complex. From an outreach and fund-raising perspective, Phase 1 included a communication campaign to raise awareness about this project among alumni. In addition, pledges were collected for funding the construction in Phase 2 .

HSS ANNEX

IIT Bombay held the groundbreaking ceremony of its new Humanities and Social Sciences (HSS) Annex Building, on August 24, 2022. The Institute's alumnus Mr. Abhay Pandey (B.Tech., Computer Science, 1993), Co-founder and General Partner at A91 Partners (a late-stage venture capital firm) as well as Dr. Sharad Saraf (B.Tech, EE, '69), Chairperson, Board of Governors and a Distinguished Alumnus and his brother Distinguished Alumnus Mr. Sudarshan Saraf (B.Tech., Mech. Engg. and Manuf. Engg, 1970), also owners of Technocraft Industries India Ltd., have generously contributed to the HSS Annex Building Project.

The HSS Annex Building, as envisioned by Mr. Abhay Pandey, will strengthen the B.S. Economics Programme at IIT Bombay. In addition, the facility will conduct classes in the Humanities, and Social and Behavioural Sciences. Upon its completion, the HSS Annex Building will also be the future home of the Technocraft Centre for Applied Artificial Intelligence (TCA2I), supported by Technocraft Industries.

IIT Bombay is thankful to its alumni for their generosity towards their alma mater's continued progress.

GMP FACILITY

Mr. Raj Nair, (B.Tech., Metallurgical and Material Science Engineering, 1971) has generously donated for construction of a sophisticated and very capital-intensive BSL3 GMP Lab at the Department of Biosciences & Bioengineering (BSBE) at the Institute. The proposed facility located at BSBE Department is expected to facilitate the progression of breakthrough translational research from the laboratory stage to the market by manufacturing materials required for human clinical trials.

Mr. Raj Nair is also program-managing the project along with a fellow alumnus Mr Ajit Jawle. This facility will be used by the researchers in BSBE and other Departments on campus to manufacture nanomaterials, tissue-engineered grafts, CAR-T constructs, drug nanoparticles, etc. for conducting clinical trials. Several faculty members specialise in these areas and the GMP lab can help shorten the time it takes to get their life-saving solutions to the market. Mr. Nair's vision for this initiative is that India and IIT Bombay become a place where the output of research will result in bold and impactful solutions for the masses that facilitate a 10X improvement - better, cheaper, or faster - than the existing solutions anywhere in the world so that thousands of patients suffering from difficult-to-treat diseases will benefit.

INVENTION FACTORY

Invention Factory India was a six-week summer program in which IIT students from across India, working in teams of two, Prototype, Pitch and Patent inventions that each team has conceived of in the program's first intensive week. Teams competed for substantial prize money for the “Best Inventions” as determined by an illustrious panel of judges who select the inventions, with functioning prototypes, that successfully meet an important societal or consumer need.

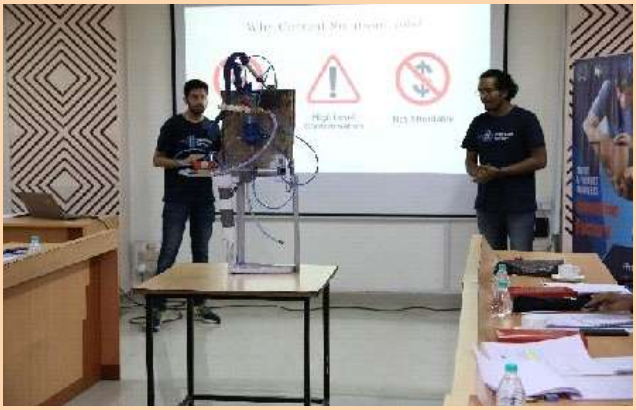
A total of 10 inventions were developed by the student teams during this period. For each of these inventions, a provisional patent application will be filed, one in the US and one in India.

Three teams were declared the winners of the programme on the basis of their unique and solution-oriented inventions.

- Sripriya Konda and Shaan Sapru from IIT Kharagpur were placed first and took home a cash prize of Rs. 2 Lakhs for successfully developing a 'Smart Clubfoot Brace.'This device is a smart corrective brace for kids with an objective to ensure a higher compliance rate, enabling every baby with clubfoot to sleep comfortably.
- The second position was bagged by Arpit Upadhyay and Mohit Jajoriya, IIT Bombay who won a cash prize of Rs. 1 Lakh for inventing a 'Hand Pump with an Integrated Water Purification System.'The objective of this product is to provide citizens with easy access to clean drinking water, especially those in rural areas. The specialty of this product is that it performs reverse osmosis without electricity.
- Rahul Bansal, IIT Ropar and Phalgun Vyas, IIT Madras came third and won a cash prize of Rs. 50,000 for developing an 'Active Thermoregulatory Vest'.

It is a lightweight, power-efficient and user-friendly vest that allows the consumer to set the temperature of the vest as per their comfort. The specialty of this vest is that it provides a cooling effect to the body during summers and keeps the body warm during winters.

First Prize
Smart Club foot Brace



Second Prize
Hand Pump with an Integrated Water Purification System

Third Prize
Active Thermoregulatory Vest

Final Jury members with all 20 participants

COLLABORATIVE CLASSROOM (CC) AND EXPERIENTIAL LEARNING LABORATORY (ELL)

Dr. Hemant Kanakia, an IIT Bombay alumnus (B.Tech, Electrical Engineering, 1975) and founder of Maker Bhavan Foundation, inaugurated the Collaborative Classroom (CC) and Experiential Learning Laboratory (ELL) at the Department of Electrical Engineering (EE) at IIT Bombay. These facilities will help instructors design and execute active and hands-on learning exercises, which have been shown to improve learning outcomes for students.

The CC will facilitate active learning in the courses at the Department of EE and has a capacity of 60 students. The ELL will facilitate hands-on learning and has a capacity of 50 students. The ELL has a maker-area with double-paned glass walls, that houses equipment such as 3D printers, laser cutter, vacuum forming, desktop CNC milling machine, 3D scanner, lathe and hand-operated power tools for machining and making fixtures for projects.

Both the facilities have been funded by the Maker Bhavan Foundation, which partners with science and engineering colleges of India to provide access to world-class facilities, resources and expertise towards designing and supporting programs that integrate new methods of teaching and learning into their existing curriculum.

The Institute's collaboration with Maker Bhavan contributes to IIT Bombay's continued mission of providing state-of-the-art facilities to its students to augment their learning and growth. IIT Bombay is deeply grateful to Dr. Hemant Kanakia for his generous donation.

DISSEMINATION OF INNOVATIVE RURAL TECHNOLOGIES ON A PILOT SCALE-UP IN THE AREAS OF OPERATION OF CIL AND ITS SUBSIDIARIES

The main objective of this project is to facilitate 'pilot scale-up' of various rural technologies that are ready for dissemination. The pilot scale-ups will facilitate in identifying the gap areas or minor shortcomings in the technologies at field level. This will provide an opportunity for the technology institutes to make suitable modifications/changes in the technology prior to its large-scale dissemination. Another important objective of the pilot scale-up is generation of awareness about the technology among stakeholders.

A GIS mapping tool was developed for the monitoring of CSR projects of CIL. The tool provides spatial visualization of CSR projects of CIL. The tool displays the year wise, district wise and domain wise data of CSR projects. The tool also provides additional project details in excel, JPG and PDF formats. URL: https://mygeoinfo.in/.

2.1. Conduct three trainings of Market Mirchi e-marketing portal

Dissemination of 'marketmirchi.com', an open access e-marketing platform designed for farmers, artisans and entrepreneurs in rural areas undertaken under CIL project. In-person training programs for rural farmers, artisans, entrepreneurs, Farmers Producer Organizations, women SHG and SHG federations are conducted for the dissemination. The training programs mainly focus on hand-holding the end-users regarding how to use the e-marketing platform for buying and selling their products. During this quarter, 10 training programs were conducted in five CIL districts in Madhya Pradesh and Odisha. The districts include Betul, Jharsuguda (MP), Angul, Sambalpur and Sundargarh (Odisha). Total 484 participants including members of FPOs and SHGs attended the trainings.

2.2. Disseminate two units of Chironji decorticator

Dissemination of Chironji decorticator is undertaken for reducing drudgery (of women) and breakage percent (of Chironji nut) and increasing efficiency (of decortication) and income (for producer group). During this quarter, one unit was installed in Waghdara village of Yavatmal district in Maharashtra. The tribal community in the village belongs to Kolam, one of the Primitive and Vulnerable Tribal Groups (PVTG) in India. Total 2.5 quintals of raw Chironji was decorticated and 50 Kgs of Chironji nuts were sold. Location for another unit is identified as Ekamba village in Yavatmal district. The unit will be installed in Sep 2022 when harvesting season begins. A baseline survey was also conducted to assess marketable surplus of Chironji available in 8 villages of Yavatmal.

2.3. Develop a CSR monitoring tool for CIL

A GIS mapping tool was developed for the monitoring of CSR projects of CIL. The tool provides spatial visualization of CSR projects of CIL. The tool displays the year wise, district wise and domain wise data of CSR projects. The tool also provides additional project details in excel, JPG and PDF formats. URL: https://mygeoinfo.in/

2.4. Identify new locations and technologies ready for dissemination

RuTAG has identified some new technologies ready for dissemination in CIL districts mentioned below.

Sr. No.	Name of technology	Domain	Target Group	Benefits
1	Sustainable water supply system with a hydraulic isolation structure (shaft)	Drinking water and irrigation	PHE Department, Gram Panchayats, NGOs, Farmers	Low-cost installation for equitable distribution of water with equal pressure to all beneficiaries
2	Gasifier-based community cooking system	Energy	Ashram Schools, Canteens	Complete replacement of LPG and wood for cooking in remote areas
3	Taraltech	Water	Rural households	A low-cost device for 99% microbe-free safe water
4	Vegetable vending cart	Agriculture	Vendors	Improved and user-friendly vegetable cart prototypes by IITB
5	Solar Chai ka Thelaa	Livelihood	Tea vendors	Uses the efficiency of induction cooking and insulation- prototype by SoUL IITB

Number Of Trainings: **10**

Number Of Participants: **484**
(Farmers from FPO and SHG)

Number Of Districts: **5**

MP
Betul, Jharsuguda

Odisha
Angul, Sambalpur, Sundargarh

Number of Unit: **1**

Number of Beneficiaries: **10**
(Women SHG from Kolam Pvtg)

CIL District Covered: **Yavatmal**

Chironji Decorticated: **2.5quintals**

Chironji Sold: **50kgs**

AWARDS

FACULTY AWARDS

Prof. H. H. Mathur and Prof. S. C. Bhattacharya AWARD

IIT Bombay every year gives 'Prof. H. H. Mathur Award for Excellence in Applied Sciences" and 'Prof. S. C. Bhattacharya Award for Excellence in Pure Sciences'. These awards were instituted through generous contribution of Mr. Rakesh Mathur.

This year-Prof. Jayesh Bellare, Department of Chemical Engineering, was conferred the 'Prof. H. H. Mathur Award for Excellence in Applied Sciences' and Prof. Jugal K. Verma, Department of Mathematics, the 'Prof. S. C. Bhattacharya Award for Excellence in Pure Sciences'.

The awards were conferred on the Foundation Day. The Talk Sessions sharing informative and enlightening insights into their research work were held on 16th March, 2022, at VMCC, Lecture Hall, IIT Bombay.

Prof. Jayesh Bellare's discourse on "Resorbable Nanomaterials and Nanomedicines for Healthcare" and Prof. Jugal K. Verma's discussion on his research on "Multivariate Polynomial Equations and Mixed Volumes of Newton Polytopes" were truly enthralling.

The talk sessions generated a lot of interest, followed by vibrant interactive question-answer sessions. About 80-100 people attended the talk sessions.

Prof. S. C. Sahasrabudhe Lifetime Achievement AWARD

IIT Bombay recently renamed the Institute's 'Lifetime Achievement Award' to 'The Prof. S. C. Sahasrabudhe Lifetime Achievement Award' to honour the memory of the legendary Prof. Sahasrabudhe and his contributions to the Institute. This prestigious award is given to a dedicated faculty member of IIT Bombay to recognise their distinguished career in the institute's service. Alumni have played a pivotal role in this endeavour.

We are happy to announce that Prof. Kriti Ramamritham, Department of Computer Science was the recipient of the first Prof. S. C. Sahasrabudhe, Lifetime Achievement Award for the year 2020-21. Prof. A.K.Suresh, Department of Computer Science was the recipient of the award for the year 2021-22.

PROF JAGANMOHAN AWARD

Prof Jaganmohan was a Faculty member at IITB from June 1, 1958 to August 31, 1992. His brother Dr. Shivram Murty (Alumnus of IITB) has set up this award in memory of his elder brother. The criteria for this award is excellence in teaching. The award has been set-up for Faculty members in Mechanical Engineering. The awardees will be decided by Final year students of B.Tech, Dual Degree & M.Tech. There will be no more than two awards each year. Each awardee will receive Rs.1,00,000/- along with a certificate of appreciation. An Awardee will not be considered for the award for the next three years. The award for 2021 was conferred on Prof. Avinash Bhardwaj

D.P. JOSHI EXCELLENCE IN TEACHING AWARD

This award was set up from the generous donation of one of our Distinguished Alum Mr. Narendra Joshi in memory of his late Father Shri. D. P. Joshi. The award has been set-up for Faculty members in Mechanical and Aerospace Engineering. The awardees will be decided by student survey of the respective Departments. The awardee will receive Rs. 25,000/- each along with a certificate of appreciation. The award for 2021 was conferred on Prof. Prabhu Ramachandran and Prof. Krishnendu Haldar.

HOTCHAND LALA AND JAMUNABAI LALA AWARD

This award is set up from the generous contribution by one of our Alums Dr. Jay Lala. The award is in memory of his Father and Mother Shri. Hotchand Lala and Smt.Jamunabai Lala.The award has been set-up for Faculty members in Aerospace Engineering. The awardee will receive Rs. 25,000/- each along with a certificate of appreciation. The award for 2021 was conferred on Prof. Anirudha Sinha and Prof.R.S.Pant

EXCELLENCE IN TEACHING AWARD

IIT Bombay celebrated Teachers' Day virtually with Prof. K. Vijay Raghavan, the Principal Scientific Advisor and a distinguished scientist, being the Chief Guest of the program. On the same day, 15 of our faculty members were conferred the Prof. S.P. Sukhatme Excellence in Teaching Award, whereas 2 of our faculty members were conferred with Dr. PK Patwardhan Award. For the first time, we also recognized class toppers of the undergraduate programs in this event.

YOUNG FACULTY AWARD

IIT Bombay is undergoing this rapid growth phase even as other institutions in India and abroad are planning to expand too. This creates significant challenges in attracting faculty to IIT Bombay. Given the current hiring spurt, the Young Faculty Award program was designed to have a substantial long-lasting impact on IIT Bombay and its faculty profile. YFA awards can ensure 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. Class of '78, '83, '84, '85, '88,'89, '90, '91, '92 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 IITB to maintain its long-term competitiveness. Numbers of YFA award beneficiaries in the year 2021-22 were 95.

ALUMNI AWARDS

YOUNG ALUMNI ACHIEVER AWARDS (YAAA)

The Young Alumni Achiever Awards are for alumni who have made outstanding achievements in their chosen field of work and are below 40 years of age. These awards were instituted in the year 2011. This award is also given during the Foundation Day celebrations of IIT Bombay every year. Two alumni have received the award during 2022.

DISTINGUISHED ALUMNUS AWARDS (DAA)

IIT Bombay is recognized as one of the centers of academic excellence. The students graduating from the Institute are of the highest caliber, who have reached positions of eminence in industry, business, public sector, academic and research institutions or as entrepreneurs. The Institute had long felt the need to recognize the alumni of IIT Bombay, who have excelled in their field of work and made the Institute proud. With this intention, the Distinguished Alumnus Awards (DAA) have been instituted. The first DAA were presented on the occasion of Silver Jubilee celebrations of the Institute in 1983. In 1996, the awards were made an annual feature and have been bestowed on a few distinguished alumni every year since then. The award is given during the Foundation Day celebrations of IIT Bombay every year. Thirteen alumni have received the award during 2022.

DISTINGUISHED SERVICE AWARDS (DSA)

Distinguished Service Awards have been instituted at IIT Bombay in the year 1999. These awards recognize alumni who have contributed in a very notable and sustained manner to the progress of the premier Institute. The award consisting of a certificate memento and an Uttaria is presented on Alumni Day, celebrated every year in the month of December.Five of our alumni will receive the award this year. They have been chosen from among the nominations received from various stakeholders such as alumni and faculty of IIT Bombay. Five alumni have received the award during 2021.

CHAPTER SERVICE AWARDS (CSA)

Chapter Service Awards instituted during the Diamond Jubilee year of IIT Bombay, in 2018. It is awarded to alumni who have contributed in a very notable and sustained manner to the progress of the Chapter. The award consisting of a certificate, memento and an Uttaria is presented on Alumni Day, celebrated every year in December. Nine alumni will receive the award this year. They have been chosen from among the nominations received from various stakeholders such as Chapter Leaders, Chapter Members and alumni of IIT Bombay. Nine alumni have received the award during 2021.

STUDENT AWARDS

Convocation awards are prestigious awards presented to graduating students during the institute convocation in the month of August every year. These awards reflect the highest academic distinction and research contribution earned by a student in an academic and/or research program. The following table lists the convocation awards presented to the graduating students on the 60th convocation held in the month of August 2022.

Award Name	Department	Awardee Name (s)
Prof. Ganapathy Shanmugam excellence award in Sedimentology and Petroleum Geology	Earth Sciences	Prakhar Agarwal
Late Prof R Subrahmonia Ayyar Academic Excellence Award	Civil Engg	Vivitsa Jain Kumari Prerna Mallik
Praj Industries Academic Excellence Award	DESE	Sanidhya Anand Amit Vivek Joshi
IEOR Alumnus Endowment: Excellence in Doctoral Dissertation Award	IEOR	Sandhya Tripathi
IEOR Alumnus Endowment: Best Masters' Thesis Award	IEOR	Akshat Bansal Ankita Prasad
Baishnab and Kasturi Acad Excellence Awd	DESE	Bishal Pandey
Ramesh Chandra Sinha Academic Excellence Award	CSE	Shreya Pathak
Manorama Sinha Academic Excellence Award	Civil Engg.	B. Priyanka
Mrs.Charusheela Dange Award-ENGG PHYSICS	Physics	Himansh Rathore
Ajit Shelat Gold Medal For Best Acd. Per	Electrical Engg. CSE	Rupak Kundu Nishant Saurabh

Award Name	Department	Awardee Name (s)
Prof. Hira Lal Memorial Award	Chemistry	Sagnik Chatterjee
Kanitkar Merit Award	Civil Engg.	Bhuvan Aggarwal
Smt. Jayalakshmi & Sri R. Narasimhan Award	Civil Engg.	Ritik Dhalwani Sautrik Chaudhuri
Smt. Andal & Sri N. P. Narayanan Award	Civil Engg.	
Indira Manudhane Student Excellence Award	Chemical Engg.	Arjun Varun Yennemadi
Dr. Gargi Vishnoi Memorial Prize	BSBE	Navalkar Ambuja Pradip
Late Akshay Dhoke Memorial Award	Electrical Engg.	Koustav Jana
Prof. K C Khilar Prize Excl. Phd & Maste	Chemical Engg.	Farha Naaz Ginoya Darshak Shashikantbhai
Mrs. Rama Mathur Memorial Prize	Mathematics	Ujjwal Kumar Sana Poonam Nayak
Tulsiram Devidayal Prize	Mechanical Engg	Dhisale Manthan Nitin
Prof. R. P. Singh Memorial Prize	Physics	Siddharth Tiwary
Prof. M. N. Gopalan Prize (m. Sc)	Mathematics	Raika Saha
Prof. K. C. Mukherji Memorial Prize/Awar	Electrical Engg.	Parth Nilesh Dodhia
Shri Ashok Chaturvedi Memorial Prize	Mechanical Engg.	Dhisale Manthan Nitin
Prof. A. B. Biswas Memorial Award & Shri Prakash Krishnan Award	Chemistry	Sagnik Chatterjee
Dilip R. Limaye Academic Excellence Award	CSE	Mohammad Ali Rehan
Bhavesh Gandhi Memorial Fellowship	Electrical Engg	Katha Ganguly Vaibhav Pachaulee Vaidya Mithilesh Mandar

Award Name	Department	Awardee Name (s)
Chandrashekhar Prize	Chemical Engg.	Diptashree Banerjee
Prabhulal Bhatnagar Memorial Prize	Mathematics	Ruma Rani Maity
Shri R. Vembu Iyer Memorial Prize		Ashwini Kumar Chandan Pradhan
Malini Vyavahare (Indore) Memorial Award	Electrical Engg.	Suhasinee Jain
Prof. S. N. Sinha Memorial Award/Mems Dept.	MEMS	Atharva Arvind Lokhande
Shubhada Mulekar Joshi Award	BSBE	Shreya Chakraborty
Digamber & Nilima Joshi Award	HSS	Tsering Nurboo
Late Pranab Ranjan Sen Award (M. Tech.)	MEMS	Aditya Nishith Shah
K. Seshia Research Excellence Award	Physics	Sankalp Gambhir Gattu Mytraya Guru Kalyan Jayasingh
Dr. P. V. Sukhatme Prize	Mathematics	Ujjwal Kumar Sana Akash Biswal Raika Saha Indraneel Mukhopadhyaya
R. G. Manudhane PhD Excellence Award	Chemical Engg.	Annesha Sengupta Damini Jaiswal
R. G. Manudhane M. Tech student Excellence Award Best M.Tech Thesis	Chemical Engg.	Patel Janak Maheshbhai Shrita Singh
S. C. Mehrotra Award in Civil Engg.	Civil Engg.	Rishabh Sharaff Sunandinee Mehra Bhuvan Aggarwal
B.K. Nilakhe Award	Physics	J V S Shreya

Award Name	Department	Awardee Name (s)
Shri Ram Kumar Gupta Merit Award	Chemical Engg.	Akshat Shirish Zalte
Urvish Medh memorial Prize (for Electrical Engg.)	Electrical Engg.	Joel Anto Paul
		Atharva Abhijit Tambat
		Waciar Mirza
		Nishant Mittal
Smt. Prakashvati Devi Gupta Merit Award	Chemical Engg.	Dev Moxaj Desai
Prof. A. K. Mallik Award	MEMS	Kunind Omprakash
		Sahu
M. N. Vartak Memorial Prize	Mathematics	Rajat Garg
T. K. Subraminan Prize for Academic Excellence	Mechanical Engg.	Hiya Akhil Gada
Aditya Choubey Memorial Prize	Electrical Engg.	Atharva Abhijit Tambat
Rakesh Mathur Excellence Award	CSE	Harshit Gupta
Hindi Vidya Bhavan Gold Medal	SJM SOM	Divyansh Sood
Abhijeet Banerjee SJMSOM Silver Medal	SJM SOM	Pulkit Jindal
Miss Jayati Deshmukh Memorial Gold Medal	CSE	Mohammad Ali Rehan
Prof. Madhav Kulkarni Lt. Col. Gold Medal	Civil Engg.	Jaymal A. Lodha
Vidyasagar Nehra Gold Medal	Civil Engg.	Jaymal A. Lodha
Sharad Maloo Memorial Gold Medal	CSE	Pratyush Agarwal
Rajit Bhagwati Memorial Gold Medal	ESED	Abhinav Agrawal
Dr. Shankar Dayal Sharma Gold Medal	CSE	Shreya Pathak

NAIK AND RASTOGI EXCELLENCE IN PHD THESIS AWARD

A total of 35 students received this Award for excellence in Ph.D. research and thesis.
These students span across 20 departments.

Sr. No.	Name	Thesis Title	Department
1	Abhinav Sinha	Cooperative Nonlinear Guidance and Control Using Impact Time	Aerospace Engineering
2	Amlan Barai	Mechanoresponsive regulation of cancer invasion and radioresistance	Bioscieces & Bioengineering
3	Arpan Pradhan	Lipid Nanoformulations of Microtubule Targeting Agents for Cancer Therapy	
4	Devyani Varshney	Bayesian Techniques for State and Parameter Estimation of Nonlinear systems subjected to Nonlinear Disturbances	Chemical Engineering
5	Deepak Gupta	Development of multi-functional low-cost scaffold for bone reconstruction	
6	Sai Krishna Reddy Adapa	Structure and Thermodynamics of Clay-Water Interface Investigated Using Molecular Simulation	
7	Arnab Dey	Cobalt-Catalyzed Directed C-H Activation and Annulation Reactions to Access Biologically Relevant Carbo- and Heterocyclic Scaffolds	Cobalt-Catalyzed
8	Jayeeta Saha	Designing, Probing and Manipulation of Electrocatalytic Interfaces for Water Splitting	

Sr No	Name	Thesis Title	Department
9	Sourav Dey	Deciphering the Origin of Magnetic Anisotropy in Lanthanide and Actinide Single Molecule Magnets using DFT and Ab initio Calculations	
10	Pawar Nishant Mukund	Modeling the influence of time pressure on driving performance and safety	Civil Engineering
11	Prashant Motwani	Experimental and Finite Element Studies Towards Characterization of BFRP Bars for Prestressing Applications	
12	Aatish Anshuman	Reactive Transport Simulation in Groundwater & Contaminant Source Identification by Inverse Modelling Using Meshfree Based Numerical Methods and Simulation Optimization Models	
13	Sarigamala Karthik	Looking beyond interfacial morphologies through surface enhanced coronal architectures for hybrid energy storage	CRNTS
14	Saptarshi Sarkar	Algebraic Products and its Applications to Logic : Countable Words and Mazurkiewicz Traces	Computer Science and Engineering
15	Subhadip Dey	Development of Target Scattering Descriptors for Crop Characterization Using SAR Data	Centre for Studies in Resources Engineering
16	Jeetika Malik	Adaptive thermal comfort and occupant behaviour in low-income housing of Mumbai, India	Centre for Urban Science & Engineering

Sr.No.	Name	Thesis Title	Department
17	Sheetal Jain	Segregated targeting for resource conservation networks using pinch analysis	Department of Energy Science & Engineering
18	Divyamahalakshmi M	Development of Cathode Materials for Rechargeable Magnesium-ion Battery	
19	Tathagata Roy Choudhury	The Formation of Glauconite in Relation to Warming Events	Earth Science
20	Dhiman Nag	Combating Green Gap in InGaN Based Optoelectronics	Electrical Engineering
21	Kaustav Dey	Passivity-based Decentralized Small-Signal Stability Criteria for Power Systems	
22	Aditya Dilip Chaudhari	Time Optimal Feedback Control of Kinematic Pursuers and Evaders	
23	Kota Srinivas Reddy	Modeling and Analysis of Cache-aided Content Delivery Networks	
24	Lashkare Sandip Gangadharrao	Design and Development of Pr1-xCaxMnO3 RRAM for Neuromorphic Computing	
25	Pisharody L Krishnakumar	Concentration and Detection of Viruses from Water Samples	Environmental Science & Engineering Department
26	Aparajita Singh	Estimation of technical efficiency, environmental efficiency and shadow price of pollutants in the Indian leather industry	Humanities and Social Sciences
27	Sushruth Ravish	Naturalizing Moral Epistemology: A Methodological Investigation	

Sr. No.	Name	Thesis Title	Department
28	Bappa Bisai	Operator theory on two domains related to μ-synthesis	Mathematics
29	Jadhav Ravi Sudam	Application of Thermodynamically Consistent Onsager-Burnett Equations for Benchmark Flow Problems in Rarefied Gas Dynamics	Mechanical Engineering
30	Vijai Laxmi	Design and Development of Microdevices for Platelet Rich/Poor Plasma Separation from Blood	
31	Gulshan Kumar	Whole-field investigation of bubble growth characteristics and heat transfer mechanisms in nucleate flow boiling	
32	Baloji Adothu	Reliability of Thermoplastic Polyolefin and Ethylene Vinyl Acetate for c-Si PV Module Encapsulation	Metallurgical Engineering & Material Sciences
33	Chanchal Kumar Barman	Topological quantum materials: An ab-initio Physics	Physics
34	Suryawanshi Pravin Dhondiba	Modeling of Supply Chains of Perishable Products under Risk and Resilience	Shailesh J. Mehta School Of Management
35	Mohammed Rayyan Sheriff	Linear Inverse Problems and Dictionary Learning	Systems and Control Engineering

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