INDUSTRY CONNECT

@ IIT DELHI

IIT DELHI INDUSTRY DAY 2019

Director's Message

Prof.V.Ramgopal Rao
Director, Indian Institute of Technology (IIT) Delhi

We are an Institution at the helm of bringing about a positive change to our society and the world. At the Indian Institute of Technology Delhi (IITD), we believe in our vision and mission, where we aim to bring Industry, Academia, Society, and Government together to collaborate for fulfilling our societal lag with easily available, affordable, and accessible inventions and innovations through advancements in the field of Science and Technology.

We have been recognized as the 'Institute of Eminence' and feature on the list of the topmost institutions in the world listed in the Quacquarelli Symonds (QS) list of universities of 2018, globally. IITD has been recognized as #1 Unicorn producer of India with a global ranking of #4 and an Institute of National Importance by GOI under the Institutes of Technology Act.

IITD has always been at the forefront of innovative activities with a focus on the commercialization of technical solutions through patents, start-ups and spin-outs. We proudly publish over 2500 high-quality research publications, file close to 150 patents per year, and are actively involved with many technology transfers every year. We have recently started a School of Interdisciplinary Research, Department of Material Science and Engineering, and a new Department of Design to promote interdisciplinary learning and knowledge exchange. The new School of Public Policy aims towards better utilization of S&T to address the major challenges facing the country and catalyze societal engagement. Two new centres focussed on Electric Vehicles and Cyber Physical Systems are expected to give a major boost to these activities in the country. We are working on several multi-faceted techno-social and techno-commercial industry activities to develop a more fertile landscape to support innovation and create a positive societal impact.

This is the era of making significant contributions, IIT Delhi endeavors to bring about a major transformation in our community, as we open our academic and research community spaces to International Organizations, scholars, and researchers who are looking to further take their inventions from conceptualization to commercialized products while serving the masses.

I take this opportunity to welcome you to our flagship event 'Industry Day 2019' - a dynamic platform where Industry – Academia – Government come together to interact and witness cutting edge science and technological advancements from IIT Delhi. The event presents a massive opportunity to be a part of interactive discussions, recruit top talent and kindle ideas for meaningful collaborations to serve all.

Looking forward to welcoming you at the event!

Warm Regards,
Prof. V.Ramgopal Rao
Director, Indian Institute of Technology (IIT) Delhi

Dean's Message

Prof. Anurag S. Rathore
Dean, Corporate Relations, Indian Institute of Technology Delhi

IIT Delhi, where excellence meets innovation, is recognized for the endeavours taken to uplift the translational research and development at the institute through building collaborations that link the industry to our research community while creating scalable solutions for the local and global community. More than 150 of our faculty are actively involved in industry collaboration projects. Many of our faculty are co-founders of startups and have successfully transferred technologies to the industry. In the last one year alone we have worked on over 1000+ consultancy and sponsored research projects with worth of over 390 crores. Our research community is actively working with more than 200 corporate houses on diverse R&D activities. Our partnerships are focussed on merging science and engineering innovations at the Institute with the rigor and implementation capabilities of the industry to create effective solutions.

We have recently inaugurated two new Centres of Excellence for Promotion of Computational Fluid Dynamics and Incubation Centre on 3D Weaving and Structural Composites. The Centre for Automotive Research and Tribology (CART) is also a new addition, with a vision to become an internationally recognised centre in teaching, research, and technological service in electric vehicles and related areas.

Corporate Relations at IIT Delhi, aims to break the silos and support strategic, catalytic and capacity building programme and research across all academic domains. Our team actively engages in fostering industry engagements to facilitate the transfer of knowledge and emerging technologies from Academia to Industry. We strive to build bridges through these collaborative activities to provide a platform for our faculty and research scholars to transform academic research that commences from classrooms and laboratories into technologies and products that can make a positive difference to the society.

IIT Delhi-Industry ties and partnerships are primarily in the form of R&D Projects, CSR collaborations, training programs, technical collaborations, and philanthropic relationships. We are continuously working towards strengthening the already strong bond that we share with our Industry Partners, while solidifying existing connections and building new arenas to bolster global growth for every section of the society.

In our efforts to further build stronger relationships, showcase technology research projects of Industry interest being undertaken at the Institute, and harness potential disruptive collaboration opportunities between Industry and IIT Delhi, our flagship event "Industry Day 2019" marks the third edition of mega one day celebration in the realm of science and technology. Eminent luminaries and high-level decision makers in the domain of Science and Technology from Industry, Government and Academia will grace the event. In addition to the interactive thematic sessions, the day will also witness Technologies and Products that are ready for commercialization along with poster presentations.

Looking forward to spending time with you on Industry Day 2019!

Prof. Anurag S. Rathore
Dean, Corporate Relations
Indian Institute of Technology Delhi

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IIT DELHI
SELECTED AS AN INSTITUTE OF EMINENCE

IIT Delhi was selected as an Institute of Eminence (IoE) by the Human Resource Development (HRD) Ministry, on July 9, 2018. A total of 114 proposals were submitted, out of which six were finally shortlisted, including IIT Delhi. UGC had set 20 parameters to qualify for the Institute of Eminence status. IIT Delhi already excelled at many of those parameters.

At a rank of 172 globally, IIT Delhi was Number 1 in India in 2017 and Number 3 in 2018. It now targets to better its ranking to reach within top 100 in the next five years, and further to top 50 in due course of time.

As part of the new status, the Institute will get a grant of Rs. 1000 Crores over the next five years. The funds that the Institute will get will be fundamentally utilised in broadening the academic landscape, developing initiatives and collaborations across the campus. It will also help in strengthening the capabilities to translate knowledge into societal impact and establishing cross-cutting initiatives to elevate the foundation of research.

Some of the key focus areas for the Institute include establishment of advanced state-of-art labs, sustainable technology development, high-performance computing system, high-end research facilities in nanomaterial's, healthcare, energy & environment, and manufacturing. There are plans to spruce the infrastructure facilities, both in terms of housing, and academic centres.

The Institute is known for its key contributions to the country's development by virtue of having some of the best students and faculty in the country, proximity to the problems, and the ability to interact with the policy makers and the civil society. The upcoming technology park on the campus will further underpin nurture innovation and entrepreneurship for benefit of the nation.

While there is already a fertile ecosystem for start-ups, emphasis would be on technology based enterprises that build up on the extensive R&D infrastructure.

RESEARCH AND INNOVATION @ **IIT DELHI**

IIT Delhi is actively working towards catalyzing Industry-Academia collaborations with the primary focus being the need for strengthening a talented network to serve an "innovation-hungry" global marketplace. There has been a remarkable change in corporate interactions at the Institute which goes beyond the traditional model of funding research projects, to more interactive partnerships that are better suited for today's technological landscape.

We have been actively working with our corporate partners for decades. In 2018-19 alone, we worked on more than 1000 consultancy and research sponsored collaboration projects worth over 390 crores. In the last 5 years, we have partnered with more than 200 industry partners with the goal of providing scalable techno-social and techno-commercial solutions. The modality of the relationships is in the form of multi-faceted transactional, operational and strategic collaborations like sponsored projects, incubation activities, joint projects at different centers of excellence, technical consultancies, philanthropic activities, skill development programs and more. Technical and CSR collaborations provide opportunities to build a desirable ecosystem that links Industry to IIT Delhi and society by delivering solutions for the community.

Summary of Consultancy and Sponsored Research Projects

Legend:
- Sponsored Research
- Consultancy
- No. of Sponsored Research Projects
- No. of Consultancy Sanctioned

Data points:
- 2014-15: 87.1, 41.59, 490, 164
- 2015-16: 72.4, 43.35, 444, 136
- 2016-17: 110.21, 36.38, 370, 158
- 2017-18: 417.19, 34.26, 333, 282
- 2018-19: 347.52, 43.73, 349, 317
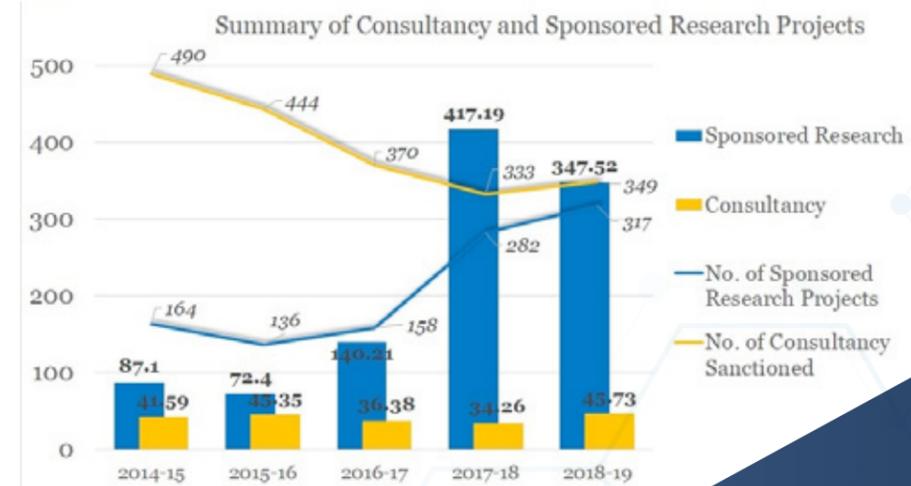
IITD was one of the first institutes in India to initiate an in-house incubator space to promote innovation and entrepreneurship. IIT Delhi's TBIU provides a significant platform for entrepreneurs to create, research and commercialize their projects into products that have a concrete impact on beginning a tangible business that provides real-world solutions. A major breakthrough in the innovation programs has helped create an ecosystem which has been successful in incubating 73 Start-ups, get approval for over 600 patents and has licensed over 92 technologies. We have been recognized as #1 Unicorn producer in India to acknowledge our work as innovative and entrepreneurial solution providers.

RESEARCH AND INNOVATION @ **IIT DELHI**

IIT Delhi recently stepped up its business orientation programs by providing students with a minor in 'Entrepreneurship', a first of its kind program. The program aims at providing students with an opportunity to learn about the essentials of driving business, market analytics and business development at an early stage in their careers. The Institute is making a visible change for women who are interested in beginning their businesses through our flagship program, "Women Entrepreneurship and Empowerment Foundation", a space that aims at strengthening the business landscape and making it friendly for women entrepreneurs.

Including the rich diversity of programs, IIT Delhi has expanded its translational research endeavors by introducing a Science Park on campus and two extensional campuses in Sonipat and Jhajjar, all aimed at creating frugal solutions. The IITD Sonipat campus offers technical space to corporates and industries to research technical areas while the IITD Jhajjar campus, strategically located next to NCI-AIIMS, would provide opportunities to collaboratively develop impactful bio-solutions. The Research Parks offer another promising avenue for the Institute and our industry partners to work closely with each other on joint and independent projects. Working together in shared facilities imparts greater focus and allows effective engagement at all levels, benefitting all the partners on their voyage to excellence.

While selecting, planning and executing one of the many possible opportunities to partner with IIT Delhi, your company's priorities and delivering value are at the heart of the relationship. Whether it is emerging global challenges in the domain of energy, sustainability, environment, healthcare, global business development; or gleaning insights from big data and analytics; or innovation and entrepreneurship; or any other area for a prospective research-based solution; collaboration with IIT Delhi will ensure that we reach the desired end together while creating new beginnings.

IIT DELHI-INDUSTRY COLLABORATION CHANNELS

TRANSACTIONAL PARTNERSHIPS: SHORT TERM COLLABORATION ACTIVITIES

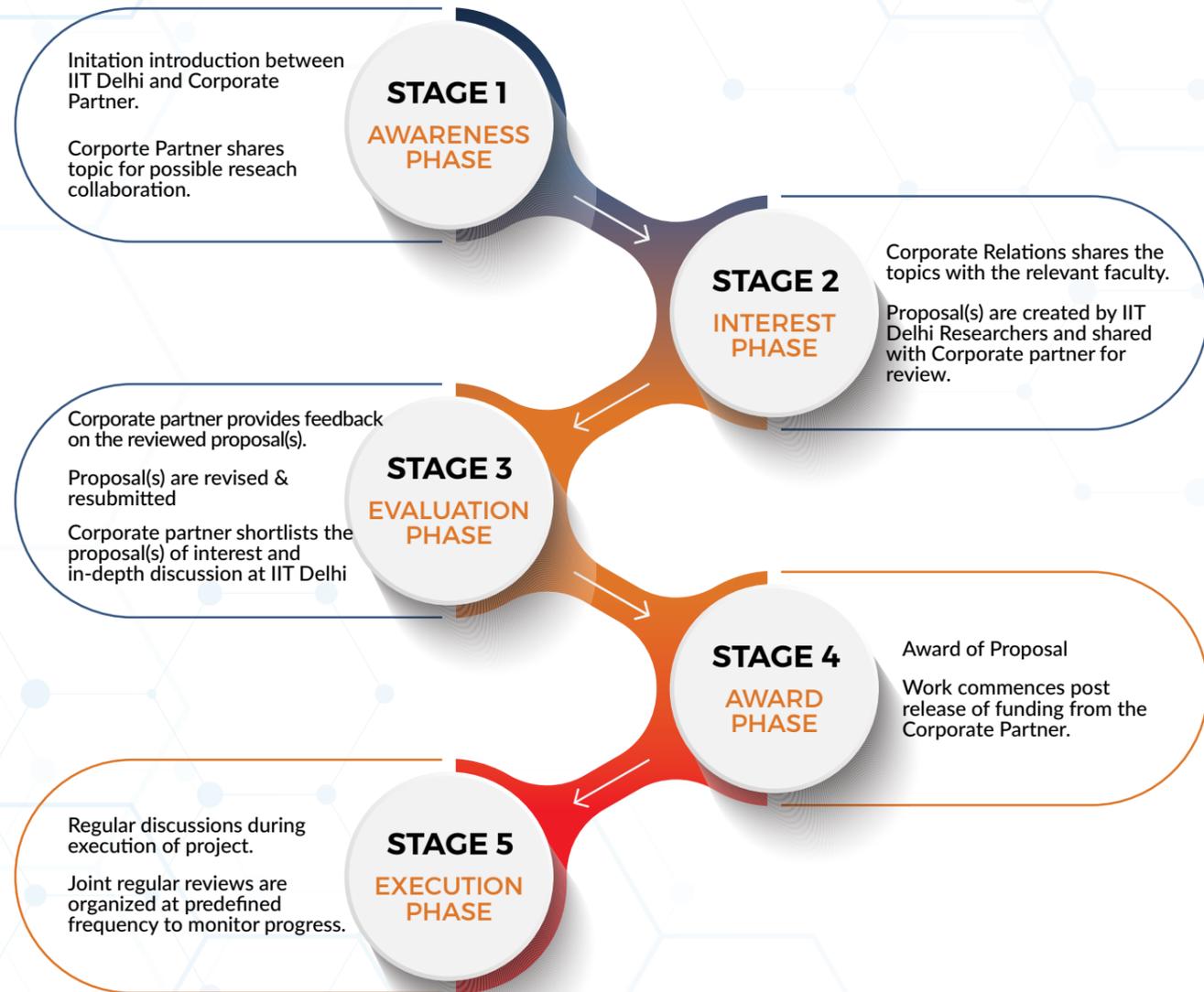|		
• Student Internships • Corporate Training Programs • Sponsored MTech/PhDs • Organizing collaborative events	• Certifications courses and • customized training/ MTech • programs for corporates. • Tech Festivals, CSR Contests, Guest • Lectures	• IITD-CEP conducts 100s of courses every year. • Customized programs are delivered by elite trainers to revitalize the workforce. • We are the ideal partner in your journey towards creating a talented and better-skilled workforce.

OPERATIONAL PARTNERSHIPS: RESEARCH COLLABORATIONS (1-3 YEARS)

Collaboration projects in selected domains with a joint agenda to address consumer needs and trends.	A model popular early on in the relationship and serves as a valuable stepping stone to develop trust and credibility before taking a leap into long term strategic association	IITD faculty is actively working with industry. In 2017-18 alone, we initiated more than 1000 consultancy and research sponsored collaboration projects worth over 475 crores.

STRATEGIC PARTNERSHIP: COLLABORATIONS TO INFLUENCE A COMPANY'S STRATEGY AND IITD'S FUTURE RESEARCH TO CREATE A MEASURABLE SOCIETAL IMPACT (3-10 YEARS)

Merging discovery-driven culture of IITD with the innovation-driven environment of the corporate.	Setting up COE focusing on the areas of mutual interest and play on our combined intellectual capital, corporate expertise, & tech leadership.	Management, execution & monitoring of joint projects. This model imparts better tech focus and more efficient utilization of resources.
Execution of one or multiple joint projects. Enables a high level of sustained focus and commitment.	Conduit for future recruitment of top talent and a stream of future recruits with significantly reduced training costs.	Collaborate and submit proposals for major academia-industry grants from government funding agencies.
Bespoke training programs for skill development.	Translating new ideas through the POC stage to start-ups.	Creation of central facilities to be shared by both partners.

PROCESS WORKFLOW FROM INTRODUCTION TO THE EXECUTION PHASE

Initation introduction between IIT Delhi and Corporate Partner.

Corporte Partner shares topic for possible reseach collaboration.

STAGE 1
AWARENESS PHASE

STAGE 2
INTEREST PHASE

Corporate Relations shares the topics with the relevant faculty.

Proposal(s) are created by IIT Delhi Researchers and shared with Corporate partner for review.

Corporate partner provides feedback on the reviewed proposal(s).

Proposal(s) are revised & resubmitted

Corporate partner shortlists the proposal(s) of interest and in-depth discussion at IIT Delhi

STAGE 3
EVALUATION PHASE

STAGE 4
AWARD PHASE

Award of Proposal

Work commences post release of funding from the Corporate Partner.

Regular discussions during execution of project.

Joint regular reviews are organized at predefined frequency to monitor progress.

STAGE 5
EXECUTION PHASE

COEs (CENTER OF EXCELLENCE) @ IIT DELHI

DST CENTRE OF EXCELLENCE IN CLIMATE MODELING

BACKGROUND

DST Centre of Excellence in climate modeling is a major initiative taken at IIT Delhi and funded by the Department of Science and Technology, Government of India to develop a modeling framework to address certain pressing issues of climate change in India, and to educate the workforce in numerical modeling of the climate.

OBJECTIVES

The researchers are developing a modeling framework for the Indian region through improved physical and computational implementations, which can simulate the regional climate of India and can be used for future climate projections at the district level to assess the impacts of climate change on agriculture, health, water resources and the energy sectors.

ACTIVITIES

- Developing a modeling framework for fine-scale projections of India's future climate to assess the impact of climate change on different sectors
- Addressing unique issues of climate variability, change and sectoral impacts in India
- Educating a new generation of researchers in numerical modeling of the Earth's system

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CENTER OF EXCELLENCE FOR PROTECH

SPONSORED BY THE MINISTRY OF TEXTILES, GOI

BACKGROUND

This COE was established last year to improve the infrastructure in PROTECH and create a more technically advanced invention for the industry. Department of Textile Technology, IIT Delhi, jointly with Northern India Textile Research Association (NITRA), Ghaziabad, has been designated as Center of Excellence for the PROTECH segment of Technical Textiles by the Ministry of Textiles, GOI.

OBJECTIVES

- To create and maintain infrastructure for manufacturers of Protective Textiles (PROTECH) in the country
- To carry out extensive technical research on world level facilities for testing and evaluation of PROTECH
- In- house, and onsite training program for core industry personnel working in areas related to the PROTECH segment of technical textiles

ACTIVITIES

- Setting up of world class facilities for testing and evaluation of PROTECH
- NABL Accreditation for the testing labs and facilities
- Development of Resource Center with IT infrastructure to serve as a knowledge and reference base for entrepreneurs and users of protective textiles.
- Facilities for in house and onsite training of personnel from the industry

AGROTECH

Department of Textile Technology, IIT Delhi has also been designated as the knowledge partner in the Centre of Excellence in AGROTECH segment. This COE, to be set up jointly by the Synthetic & Art Silk Mills' Research Association (SASMIRA), Mumbai and Navsari Agricultural University (NAU), Navsari, and will be involved in area of technical textiles used in Agriculture or AGROTECH.

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CENTRE OF EXCELLENCE IN CYBER SYSTEMS AND INFORMATION ASSURANCE

SPONSORED BY DEPARTMENT OF SCIENCE AND TECHNOLOGY, GOI

BACKGROUND

Today, Cyber Security stands at the top of both the national and international agendas. It refers to a set of techniques used to protect the integrity of the network, program and data from unauthorized access or damage. IIT Delhi has taken a lead role in addressing the various issues related to Cyber Security, Cyber Systems and Information Assurance. As a result, CoE in Cyber Systems and Information Assurance (COE-CSIA) at IITD was established, in Feb 2014. It aims to drive major developments in theory and in practice of cyber security and create safe, secure and prosperous cyberspace through academia, industry and government collaborations.

OBJECTIVES

The primary objective of the CoE-CSIA is to carry out state-of-the-art research in cyber systems and information assurance and to train manpower in this critical area.

ACTIVITIES

- Conducting Basic and Applied Research: Cyber Security, Cyber Systems, Information Assurance, Hardware Security, Embedded Systems Security, Wireless/Mobile Security, Critical Infrastructure Protection and Cyber Security Policy.

- Workshops and continuing education programs (CEP) for professionals and defense personnel on Network Security, Systems Security, Advances in Cyber security, and Cyber Security Policy

- Community Outreach Activities: Several workshops have been organized for the faculty of various engineering colleges across the country with hands-on lab sessions to 'train-the-trainers'.

- Seminar Series: COE-CSIA routinely hosts eminent experts in the area of cyber security.

- Involving Stakeholders: COE-CSIA interacts with industry, government and academia on theory and practice of information assurance and cyber security. Collaborators include universities like Univ. of Nebraska, USA, Tallinn Univ. of Tech., Tallinn, Estonia, Univ. of Maryland, USA, Kyushu Univ., Japan and the State Univ. of New York, Albany USA. The research collaborations include knowledge-sharing, faculty/ student exchanges, joint-student supervision and joint-workshops.

COE-CSIA was awarded an Indo-Japanese research project on "Security in the Ior Space". Cyber Security, Cyber Systems and Information Assurance research is done in our Cyber Security Lab.

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SUPERCOMPUTING FACILITY IN BIOINFORMATICS & COMPUTATIONAL BIOLOGY

SUCCESS STORIES

SCFBio is addressing the grand challenge of protein tertiary structure prediction. It aims at reading the genomes (including human) like Harry Potter novels. It is the only Participant from India in the server category in the global Protein structure prediction Olympics called CASP. It is among the best for low resolution models. It developed a complete, freely accessible, indigenous, software suite for computer aided Drug Discovery (Sanjeevini). SCFBio is called upon to implement Sanjeevini on the National Supercomputing Mission (NSM) platform. It developed over 45 webservers which are deployed over a High Performance Computing (HPC) environment hosted inside the SCFBio's Data Centre. The facility receives ~ 20,000 hits /day from users in 30 countries (www.scfbio-iitd.res.in/usage).

VARIOUS ONGOING ACTIVITIES AND OUTCOMES

• SCFBio has over ~100 publications with an average impact factor of 4+ and one "Nature" paper, out of which ~50 papers were published in the last five years. List of publications is available at (http://www.scfbio-iitd.res.in/publication/publication.htm)

• SCFBio, IITD has developed indigenous software suites in the area of Genomics (Chemgenome), Proteomics (Bhageerath) and Drug Design (Sanjeevini) which are freely accessible over SCFBio's web-portal (www.scfbio-iitd.res.in). Also SCFBio, IITD has developed an android based mobile app "Sanjeevini" in the area of Computer Aided Drug Discovery (CADD) which is freely available on Google Play Store. This app is first of its kind in the area of CADD. Two start-up companies have evolved (Leadinvent and Novoinformatics) so far from SCFBio. SCFBio also had fruitful collaborations with Dabur, HCL Life Sciences and NIIT. Also SCFBio forms the computational backbone to Kusuma School of Biological Sciences at IIT Delhi creating a strong collaboration between computational and experimental biology.

• 1100 students/scientists have been trained in various aspects of Bioinformatics through long term/short term training programmes at SCFBio as of Jan, 2019, out of which around 630 have been trained in the last five years. 20 PhD students have graduated from SCFBio since its inception and 12 have been awarded degrees in the last 5 years. Complete list is available at http://www.scfbio-iitd.res.in/training/training.htm

• After the last upgradation of the SCFBio's Supercomputing resources, in the year 2009, to a Multi Tera Scale Facility, a state of the art Green Data Centre was inaugurated by Dr. Renu Swarup, Secretary, Department of Biotechnology, Govt. of India and Prof. V. Ramgopal Rao, Director, IIT Delhi at SCFBio, IIT Delhi on 20th Dec, 2018. The machine, which has been hosted inside the Data Centre is based on Liquid Immersion Cooling system (LICS) developed by Fujitsu Japan and is first of its kind in Asia outside Japan. The entire machine, which occupies a space of approximately 1m3 and hosts 50 teraflops, is completely immersed inside a liquid bath. This project was funded by DBT, Govt. of India. Overall compute capacity of the facility is around 65 Tera Flops and storage capacity is around 200 Tera Bytes.

• SCFBio is committed towards providing free supercomputing access round the clock to researchers, students and scientific community in the country over the Internet. The facility's website is getting around 20,000 hits per day on an average from around 30 different countries across the globe. Also a Web Portal on Bioactivity Information of Indian Medicinal Plants was launched by DBT, Secretary on the day of inauguration of the Green Data Centre at IIT Delhi. (http://www.scfbio-iitd.res.in/plants_scfbio)

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DBT COE BIOPHARMACEUTICAL TECHNOLOGY

SPONSORED BY DEPARTMENT OF BIOTECHNOLOGY, GOI

BACKGROUND

In recognition of the need to make biotherapeutics affordable to Indians, the Department of Biotechnology, established the **Center of Excellence for Biopharmaceutical Technology (CBT) at IIT Delhi** in October 2015.

OBJECTIVES

The vision of CBT is to deliver innovation in biopharmaceutical technology to effectively address the challenges faced by the Indian biotech industry and thereby assist in the **Make in India** initiative by making India the global hub of manufacturing economical, safe and efficacious therapeutics.

ACTIVITIES

• Technology development for the biopharmaceutical industry

• Offer high quality training to academicians, industry, and other key stakeholders like CDSCO

• Examine and report on **quality of biotherapeutics** that are being sold in the Indian market

• Work with other stakeholders (DBT, CDSCO, NIB, etc.) to build a strong Brand India

OUR INDUSTRY COLLABORATORS

• ABB, India
• Agilent Technologies, India
• Ansys Corporation, India
• Applied Materials, USA
• Biocon Ltd, India
• Clensta

OUR INFRASTRUCTURE

• Microbial fermentation
• Mammalian cell culture
• Downstream processing
• Continuous processing
• Analytical characterization
• Functional characterization

KEY ONGOING PROJECTS

• Process control of microbial and mammalian bioreactors
• CFD of microbial and mammalian bioreactors
• Process platforms for continuous production of biotherapeutics
• Statistical process control for continuous processes
• Development of novel therapy for snake bite victims
• Mechanistic modeling based control of biotech processes
• Identification of Critical Quality Attributes of biotherapeutic products
• Understanding kinetics of protein aggregation and fragmentation
• Identification of novel stabilizers for protein formulations
• Use of Atomic Layer Deposition in pharmaceutical manufacturing

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RENEW POWER CENTRE OF EXCELLENCE ON ENERGY & ENVIRONMENT

BACKGROUND

IIT Delhi and Renew Power signed a MoU in Nov 2016 to set up a research facility on renewable energy, in the presence of the Honourable President of India at the Rashtrapati Bhavan, New Delhi. IIT Delhi and Renew Power established CoE in Nov 2016 to nurture talent in the domain of renewable energy. The first sponsored research project was initiated in Nov 2017.

OBJECTIVES

Establish a world-class research and development facility to develop cutting edge renewable energy solutions suited to Indian context. Foster exchange of ideas between industry, academic and policy makers from across the world. Offer research internship programmes for bright and deserving undergraduate, postgraduate and PhD students. Develop advocacy papers and research reports on renewable energy policy matters for the Govt. of India and multilateral organisations. Support and promote women entrepreneurship in the field of renewable energy.

ACTIVITIES

- Sumant Sinha Sustainability Award for research and outreach activities in sustainability
- Ongoing sponsored research projects
  - Charging infrastructures for electric vehicles
  - Strategies for grid strengthening: leveraging demand response and storage for solar integration at distribution level
  - Flexibility assessment and enhancement for strengthening
  - the grid for large scale renewable integration
- Upcoming sponsored research projects
  - Long term natural resource forecasting to enable wind and solar plant investment decisions
  - LIDAR validated large-scale CFD models to simulate and optimize wind farm operations
- Sustainability Leadership Dialogue event
- Sumant Sinha Sustainability Award for research and outreach activities in sustainability: to recognize demonstrated action and exemplary leadership by students of IIT Delhi with respect to climate change/sustainability/ environmental issues – with a view to enhance awareness and interest amongst students about this key issue.

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SCHLUMBERGER CENTRE OF EXCELLENCE FOR OIL AND GAS TECHNOLOGY

BACKGROUND

IIT Delhi and Schlumberger signed an MOU to set up Center of Excellence (COE) for Oil and Gas Technology between in April, 2017. The goal of the center is to create new technologies in the domain of Enhanced Oil Recovery (EOR) and decrease energy dependence of the nation. India is world's third largest consumer of crude oil and petroleum products in the world with 635 million metric tons (MMT) of proven oil reserves and 54 trillion cubic feet of proven natural gas reserves. Even then, about 81% of India's domestic oil consumption is imported. With renewed governmental focus on decreasing the import bill by 2022, this center will give a big boost to more advanced research work in the area of exploration and development of Oil and Gas reservoirs in the country. The Centre of Excellence will also work towards developing sustainable solutions and explore new frontiers in technology for future energy needs. The center will leverage the expertise available with IIT Delhi and the Oil and Gas industry. It will also provide an institutionalized platform for Industry - Academia interactions and will house latest software technology and modern technological tools.

OBJECTIVES

- Perform industry-academia collaborative work in the areas of enhanced oil recovery and data science.
- Hold workshops, seminars and conferences for academia and industry working in this sector.
- Propose research and training programs sponsored by funding agency for oil and gas industry.
- Develop the talent pipeline for petroleum engineering sector.

ACTIVITIES

A project titled "Data driven techniques for fault and horizon identification in oil reservoris using 3-D seismic datasets" is underway. The first publications from this project titled "Deep Learning-based Automatic Horizon Identification from Seismic Data" will be presented in Annual Technical Conference and Exhibition 2019 of Society of Petroleum Engineers.

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TELECOM OEM CENTRE OF EXCELLENCE

BACKGROUND

Indian Institute of Technology Delhi (IIT Delhi) have signed a memorandum of understanding with Ericsson (NASDAQ: ERIC) to jointly roll out a '5G for India' program. This set up is a Center of Excellence with a 5G test bed and incubation center at IIT Delhi to drive the development of the country's 5G ecosystem. This program has been conceptualized by IIT Delhi to fast-track realization of Digital India initiatives and aid application development for Indian start-ups and industries.

In addition to hosting the Center of Excellence, IIT Delhi will conduct research and development to explore how some of the country's challenges can be addressed with mobile technologies.

The first series of tests under this program began in the second half on 2017 on an NB IoT test Bed. Limited deployment and 5G trials started in mid-2018. The 5G testbed was used to demonstrate Autonomous vehicle use case in IMC 2018. Currently the upgrade to 3GPP specification compliant testbed are underway.

OBJECTIVES

Since, 5G is use-case driven technology, the Telecom OEM CoE's main intent is to help incubation centres and startups which come up with innovative 5G use cases to solve socio-economic issues most relevant in India. The Telecom COE currently houses Ericcson's 5G equipment, namely User Equipment (two numbers), Base Station, vRAN, vCore, 128 Massive MIMO antennas RF unit, 3.5GHz) with beam forming capability.

The objective of setting up the COE is to provide a testbed for use cases with an aim to create products or services as well as technical contribution to standardization processes.

ACTIVITIES

The 5G Telecom CoE was used for demonstrating a few Proof of Concept use cases which had been developed across different departments at IITD.
The use cases tested in 2018 & demonstrated in IMC 2018 are as following:

1. Autonomous Vehicle remote control
2. Limited Disaster management cases involving Drones
4. Smart bins
5. Smart Aquaponics related applications/ Development of Water Quality Monitoring Systems

Currently, work is in progress for test cases for IMC 2019. Various shortlisted 5G use cases are being evaluated.

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CENTRE OF EXCELLENCE ON SMART TECHNOLOGY ENABLED MANUFACTURING

SPONSORED BY DEPARTMENT OF HEAVY INDUSTRIES, GOI

BACKGROUND

In a major step that will help India become a global player in the field of smart manufacturing, IIT Delhi and Automation Industry Association (AIA) signed an MOU in Aug, 2017 to set up a National Center of Excellence for Smart Technology Enabled Manufacturing. The Ministry of Heavy Industries and Public Enterprises is the nodal government body for establishing the innovative platform that brings together academia, government and industry on a common platform to meet the changing demands of manufacturing for it to be competitive and free of defects. Smart manufacturing marries technological prowess with human intelligence for producing an innovative ecosystem to meet the challenges of the global market. It aims to optimally use the data, resources and integrate the different components for best viability.

OBJECTIVES

The collaboration is aimed to develop a national educational curriculum and skill building program through a vibrant incubation and administrative environment. Under the Samarth Udyog plans, IITD and AIA have joined hands and would be aided by Department of Heavy Industries (GOI) to create a Centre that helps, supports, develops technology for Indian Industry for the right understanding and implementation of concepts of Smart manufacturing.

ACTIVITIES

Technology enabled Manufacturing, or Industry 4.0 as it is referred is a revolution in manufacturing and consumption. It alters the way decisions are made regarding what to produce, where to produce, when to produce and how much to produce. The centre is at its nascent stages of operation and is specifically launched for implementation of smart manufacturing in India which it undertakes to do effectively through Awareness Building, Prototyping, Simulation and Testing Services, Consulting Services, Site Integration Services, Education and Training, Skills Certification and Research.

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JATC – JOINT ADVANCED TECHNOLOGY CENTRE

SPONSORED BY DEFENCE RESEARCH & DEVELOPMENT ORGANIZATION

BACKGROUND

Joint Advanced Technology Centre, JATC is set up towards making pivotal investments in breakthrough technologies for national security using capabilities of potential researchers amongst IIT Delhi academia. It will generate an innovation ecosystem that includes academia, industry and DRDO partners, with a constant focus on the Nation's military futuristic requirements.
Under Directed Research concept, for enabling of strong DRDO stake-holding, five important technology verticals have been planned. Out of the planned verticals, 23 projects have been launched with quantifiable deliverables in the identified 3/5 verticals.

OBJECTIVES

The center has 5 verticals
- Vertical 1: Advanced Ballistics, Special Structure and Protection Technologies' (ABSSP)
- Vertical-2: Smart and Intelligent Textile (SITEX)
- Vertical-3: Advanced Electromagnetic Devices and Terahertz (EMDTERA)
- Vertical 4: Photonics and Brain Computer Interface
- Vertical 5: Brain Machine Intelligence.

ACTIVITIES

- Research projects on the understanding of the physical phenomena, developing new high performance material and their static & high strain rate test methods and creation of research facilities.
- The development of important technologies and products including envelope material development for aerostat and airship with strain sensors, protective textiles for defense personnel, smart and intelligent soldier jacket with embedded and integrated sensors for detecting the real-time physiological characteristics and bullet penetration etc.
- Research projects to address needs for advanced Imaging, sensing and communication technologies.
- Activities under verticals 4 and 5 are in the process of research articulation and approval.
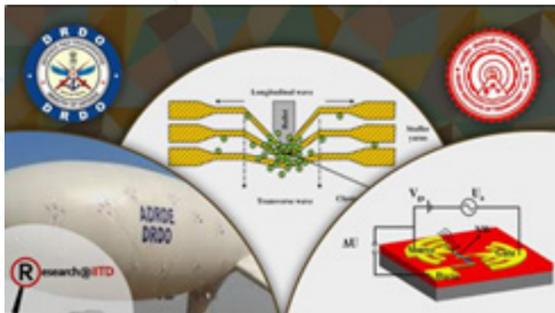
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▶ 24

CENTER OF EXCELLENCE FOR RESEARCH ON CLEAN AIR

SPONSORED BY MR ARUN DUGGAL, ALUMNUS - IIT DELHI

BACKGROUND

Delhi is one of the most polluted cities in the world and has been facing alarming levels of air pollution in recent years. Therefore, as a response to the air pollution quasi-emergency in Delhi/NCR, Indian Institute of Technology Delhi has set up the Centre of Excellence for Research on Clean Air (CERCA) to help researchers and scholars promote inter disciplinary scientific research on clean air issues and devise effective and sustainable solutions to the problem of air pollution through a collaborative, constructive and solution oriented approach. IIT Delhi's obligation to play an important role in addressing the air pollution issues in India especially Delhi/NCR by leveraging the scientific expertise and intellect of its highly qualified researchers is the main motivation behind establishment of CERCA. Mr Arun Duggal, an alumnus of IIT Delhi has sponsored this effort and was formally inaugurated by the Hon'ble Lt Governor of Delhi, Sh Anil Baijal in Feb'2018.

OBJECTIVES

- Undertake relevant research projects in the area of clean air from policy formulation perspective;
- Participation in National Clean Air Programme by helping cities to develop their clean air plans;
- Data driven analyses for causes of air pollution from different sources and their solutions;
- Studying Best Global Clean air practices and dissemination to relevant stakeholders;
- Technology development for monitoring and management of clean air;
- Health Impact studies in collaboration with other relevant institutions and feedback;
- Studies on the economic implications of clean air; Generating public information, awareness and perception w.r.t. clean air and providing recommendations to the government for strengthening clean air monitoring network.
- Knowledge sharing through workshops, brainstorming discussions and trainings, etc

ACTIVITIES

- CERCA has taken up several policy focused research projects such as Select Study of Air Pollution Reduction Programs around the World with a specific focus on Governance and Implementation Issues, regularly sensitizing relevant stakeholders through several platforms conferences and Air quality roundtables.
- Assessment and prediction of air quality using dynamically downscaled high resolution data from numerical models such as weather Research and forecasting(WRF-Chem) model sensitivity experiments;
- Monitoring Air Pollution in Delhi NCR using a Hybrid Approach: Feedback for Policy Investigators including identification of upwind districts in Punjab and Haryana from where crop burning contributes most to air pollution in Oct-Nov in Delhi-NCR;
- Identification of brick kilns clusters which contribute most to pollution in Delhi-NCR and identification of coal fired thermal power plants within a radius of 100 Kms of Delhi NCR which because of their emission levels and wind patterns cause maximum air pollution in Delhi-NCR;

CENTRE OF EXCELLENCE FOR PROMOTION OF COMPUTATIONAL FLUID DYNAMICS (CFD)

FUNDED BY ANSYS SOFTWARE PRIVATE LIMITED

BACKGROUND

With one of fast growing economies and markets in the world, there are significant demands for clean, energy efficient and safe processes for power/energy generation, production of clean fuels, chemicals, pharmaceuticals, advanced materials and so on. While meeting these growth demands and at the same time the stringent environmental regulations, it has become imperative to develop processes that are energy efficient, environmentally benign and inherently safe. Most technologically and commercially important processes in coal-based and nuclear power generation, clean coal to fuel technologies, upstream oil and gas industry, oil refining, petrochemical and chemical process industry, pharmaceutical and fine chemicals, mineral processing and metallurgical industries involve a variety of multiphase flows, heat transfer, phase change and chemical reactions. Therefore, if the efficiency of the existing processes or reactors used in the aforementioned industries is to be improved or if new-generation intensified reactors/process technologies are to be developed, it is important that the power of Computational Fluid Dynamics (CFD) based models to simulate the aforementioned processes is harnessed. This makes it important to initiate activities to develop scientific and technological (S&T) manpower in India in the area of CFD to meet aforementioned challenges. In particular, it important to encourage the participation of women students in the area of S&T, particularly for their skill development in the area of CFD to solve problems of practical interest. Further, it is also important to expose students to the area of CFD to enable their skill development in this area. In view of this, the CoE for promotion of CFD at IIT Delhi is set up with a support from Ansys Software Pvt. Ltd..

OBJECTIVES

The center has 5 verticals
- To promote education and research and to improve employability of engineering students with specific focus on women PhD candidates.
- To improve the engineering students' (Masters/PhD) skills in the area of Computational Fluid Dynamics (CFD).
- To promote industry interactions to make engineering students equipped with industry relevant know-how.

ACTIVITIES

- Promotion of education and research in the broad area of CFD and to improve employability of engineering students with specific focus on women PhD candidates
- Annual symposia and workshops on the use of CFD
- Promotion of interactions with industry

IIT Delhi, ANSYS Software enter into CSR agreement; CoE for Promotion of Computational Fluid Dynamics Inaugurated

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FOCUS INCUBATION CENTRE FOR 3D WEAVING AND STRUCTURAL COMPOSITES

FUNDED BY MINISTRY OF TEXTILES , GOI

BACKGROUND

Focus Incubation Centre for 3D weaving and Structural Composites is established with the financial support from Ministry of Textiles , Govt. of India. The center has already acquired some major facilities such as 3D weaving machine using multi beam looms as well as creel fed loom, 4-axis Filament winding machine, Compression moulding machine, VRTM system, UTM with flexural, compression, shear test modules, Impact testing both by drop weight and Izod system, Scanning Electron Microscopy, Fabric thermal tester, and many other ancillary equipment relevant to 3D weaving and composite processing.

OBJECTIVE

The basic objective of this center is to carry out fundamental research in order to develop variety of innovative 3D woven structures such as 3D solid structures, spacer fabrics, honeycombs, profiled fabrics, tubular structures, aerodynamic structures, stiffeners and 3D auxetic structures primarily suitable for structural composite preforms. The Focus Incubation Center targets to achieve following objectives as mandated by Ministry of Textiles:

- Novel Textile Structure Development
- Production of Complex 3D fabrics
- Composite Processing systems
- Testing and evaluation of preforms as well as structural composites
- Training of personnel to produce 3D fabrics and composites
- Transfer of Technology for 3D weaving and Composite processing
- Networking between Textile manufacturers and Composite industry
- Collaboration with institutions both in India and abroad

ACTIVITIES

The center develops various techniques that could be used to convert these complex 3D fabrics in to their respective composite materials. Also, the center is equipped with the facilities to characterize these materials. The characterization includes mechanical performance, structural analysis, damage analysis and surface morphology investigation of preforms as well as composites.

3D fabrics and the structural composites made out of these structures are specially designed to be used for many higher end applications such as aerospace, automotives, marine, wind energy, railway, sports, civil constructions, ballistic applications, energy absorbent components and several other applications where weight reduction is prime criteria with out compromising mechanical performance.

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RESEARCH PARKS @ IIT DELHI

Indian Institute of Technology Delhi is setting up three research parks at IIT Delhi Main Campus, Sonipat and Jhajjar locations to propel design and development of advanced technologies, incubate more start-ups and promote impactful industry collaboration activities.

Research parks provide shared platforms for industry and academia to work in close proximity thereby allowing effective engagements at all levels. The facilities will have state of the art research & development labs, training centres and convention facilities, set up by corporates jointly with IIT Delhi, incubators and centres of excellence to drive translational research and develop techno-commercial and techno-social solutions for domestic and international market.

IIT DELHI MAIN CAMPUS TECHNOPARK

It is strategically located in close proximity to IIT Delhi research talent, high-end lab facilities and provides work locations in the heart of the city. It is expected to be operational in 12-18 months

SONEPAT RESEARCH PARK

Phase-I of the Sonepat Research Park has been completed with investment of Rs. 175 crores. The facility can incubate around 15 start-ups and also comprises residential facility for the use of research teams. The incubation activities have actively started will vigour. The Phase-II of the project will accommodate close to 100 start-ups.

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JHAJJAR RESEARCH PARK

IIT Delhi's Jhajjar research park in Jhajjar district of the Haryana, will be a satellite health campus for the research and development in the Biomedical Research with the strong collaboration with the National Cancer Institute (NCI), All India Institute of Medical Science (AIIMS), Industries, international collaborators and other institutes in the Delhi and National Capital Region. This research park would provide access to an outstanding research community in an unparalleled environment and gives opportunity to work in close proximity with Industry partners to weave a symbiotic interface to give a boost to translational research and innovation activities through interdisciplinary and impactful bio-research. It will provide an organizational structure, eco-system and governance processes that can ensure long term sustainability, scope for growth, and a collaborative model of working, public/private partnership and entrepreneurship for the Health Technology Initiatives to meet the National goals.

- The campus will promote innovation and entrepreneurship for individual efforts in health technology initiatives.

- Enhance translation of knowledge generated by IITD & other institutes faculty and provide other new opportunities to them for interactions with industry to advance solution generation and translation.

- Support the entire innovation process, i.e. need to design, provisional product profile, technical market scrutiny, prototype validation, product development, product evaluation and enterprise creation in a service model.

- Train and nurture a new cadre of professionals who work at the interface level of biology, engineering and medical science.

- Engage with a network of partners to identify technologies that offer potential to accelerate optimization and perform product refinement, including clinical and field evaluation in close partnership with AIIMS Jhajjar.

- Promote industry and interactions and collaborations through the development of a health-innovation-centered industrial research park.

FEATURES OF IITD JHAJJAR HTC.

- One hour drive from IIT Delhi, Hauz Khas campus; a strategic location with the presence of AIIMS and NCI and other NCR institutes like THSTI, RCB, NBRC, PGIMS, Rohtak, SGT Jhajjar etc.
- Home to Biotech startups, to be established as a section 8 company with the ease of doing business.
- Research funding opportunity through joint research grants from GOI and others.
- Opportunity to get your product validated through GOI notified validation centre for Medtech.
- Proposed to be home for 50 + Incubator/Accelerator.
- Planned to deliver maximum built-up area for R&D and Manufacturing activities.
- Opportunity to access the AIIMS Jhajjar facilities, including animal house, Biobank/Tissue bank & research hospital for pre-clinical & clinical studies.
- Planned to conduct the unique courses on the regulatory requirements of the industry in the skill development center.

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TECHNICAL RESEARCH COLLABORATION
@ IIT DELHI

INDIA'S FIRST 5G MASSIVE MIMO RADIO

India's first 5G Massive MIMO Radio was inaugurated at IIT Delhi on April 13, 2018. Research has been conducted on Massive MIMO systems for the last five years. The lab houses India's first 5G Massive MIMO equipment, which has a 32 antenna base station. This 5G base station prototype will be used to test and verify algorithms, and also for developing a complete 5G base station which can lead to the manufacturing of 5G base stations in India with support/collaboration from industry and will also be instrumental in generating skilled manpower in this field.

In the past, compared to other developing countries like China, there has been little participation of Indian academia and industry in the standardization, R & D and manufacturing of 2G/3G/4G telecommunication equipment (e.g., base station). This is one reason why the telecom operators in India have to import equipment from foreign vendors at a very high cost. This cost is ultimately borne by the end-user who ends up paying a high tariff. If cellular telecommunication equipment is manufactured in India, then it will also be financially viable for the operators to provide broadband access in rural areas, which has been an important agenda of the Digital India program. Therefore, the initiative aims at enabling 5G RD&I though academia and industry collaboration.

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MOCK MEAT PROJECT

The increasing awareness among people about the risks of consumption and manufacturing of meat has converted the meat loving consumers towards the plant protein-based meat alternative. Almost every feature of meat production— from grazing-related cropland loss and open space, to shortfalls in feeding vast amounts of water and wheat to livestock in a hungry world, to pollution from "manufacturing farms"— is an environmental catastrophe with a wide range of risks.

Meat analog not only replicates the flavor and texture but also have the nutritional content similar to that of an actual meat. It can be defined as a mock meat that replicates certain aesthetic specification of a particular type of meat. They act as transitional food for a great gateway to vegetarianism. The meat analog market involves not only vegetarians but also non-vegetarians seeking to decrease their meat consumption for health or ethical purposes, as well as individuals following religious dietary laws like Kashrut, Halal and Buddhist.

To derive and develop high protein textured meats from plant sources, Srijan Technologies Private Ltd has funded a project to IIT Delhi to conduct research wherein various popular forms of animal based meats will be replicated from plant based sources. This will indicate healthy and tasty options for the health conscious and the weight -watchers.

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IIT DELHI-THERMAX METHANOL DEMONSTRATION FACILITY

In perfect sync with the spirit of "public-private partnership" to build big technologies indigenously, a large research team from IIT Delhi and Thermax, Pune has been awarded a major project by the Department of Science and Technology, Government of India to develop indigenous technology for methanol production from high-ash Indian coal. Thermax is charged with designing, installing and running the facility, while IIT Delhi takes on the responsibility for addressing the challenging research and development issues in catalysis, hydrodynamics and scale-up, and process technology. The project addresses the key energy challenges of the country: how to monetize the abundant coal reserves in a "clean" way with minimal environmental impact while addressing the insatiable hunger for clean energy as the country leapfrogs into the 21st century. The twin objectives of this project on Coal-to-Methanol is to build energy security of the nation using abundantly available coal and richly available renewables (solar and biomass), so that India can free itself from clutches of the crude oil lobby, while also meeting the deep cuts that we have taken as part of our INLD climate change commitments.

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DEVELOPMENT OF GAS-LIQUID DISTRIBUTORS FOR TRICKLE BED REACTORS

This project deals with the study of liquid distribution inside a trickle bed reactor generated by industrial gas-liquid distributors. In this project, the liquid hold-up distribution generated by a different standard, patented and modified gas-liquid distributors was measured using conductivity probes (developed in-house) for a laboratory-scale trickle bed at different flow rates of air and water. Further, an experimentally verified multi-phase Eulerian CFD model was developed to predict the liquid hold-up and pressure drop generated by the distributors. This experimentally validated CFD model was used to explore the possibilities of performance enhancement of existing distributors and to design new distributor configurations. Additionally, the liquid distribution was studied inside the bed for different configurations of tray arrangements using CFD. The qualitative and quantitative information available through the study carried out under this project is important in comparing the industrial distributors in terms of liquid distribution, pressure drop and applicability under different operating conditions. These studies would help the industry to understand the effect of distributor geometry, its location and arrangement on a distributor tray on the flow physics at the top and inside the bed. The methodology of the study of the liquid distribution developed in this project will not only enable us to choose a better distributor unit as per the available reactor design and flow conditions but will also help in optimizing the tray configuration to achieve uniform liquid distribution throughout the bed.

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PROCESS AUTOMATION AND CONTINUOUS PROCESS MONITORING ANALYSIS & A MODEL-BASED PREDICTIVE CONTROL WITH A VIEW TO DIGITIZE THE CONTINUOUS BIOPHARMA PROCESSINGY

This project intends to provide a technology leap for continuous biopharma manufacturing by creation and demonstration of model-based advanced controls and continuous process monitoring and verification for continuous manufacturing of biotech therapeutics. The proposed project capitalizes on a major research activity on continuous manufacturing of biotech therapeutics that is presently ongoing at IIT Delhi. Biological processes exhibit strong non-linear interactions between process variables and are complex to control, further exacerbated by the complexity of the continuous operation. This proposal aims to effectively deal with these challenges by using a combination of mechanistic and empirical modelling of the various unit operations along with advanced control schemes, and advanced analytics. This strategy can result in significant improvements in process robustness and product quality along with reliable long term continuous operation and development of IT Frameworks to enable real-time monitoring and control and orchestrated measures for real-time release and process risk management. The project plays on the strengths of the collaborating institutions - IIT Delhi and TCS and if successful would define the cutting edge technologies for global biopharma.
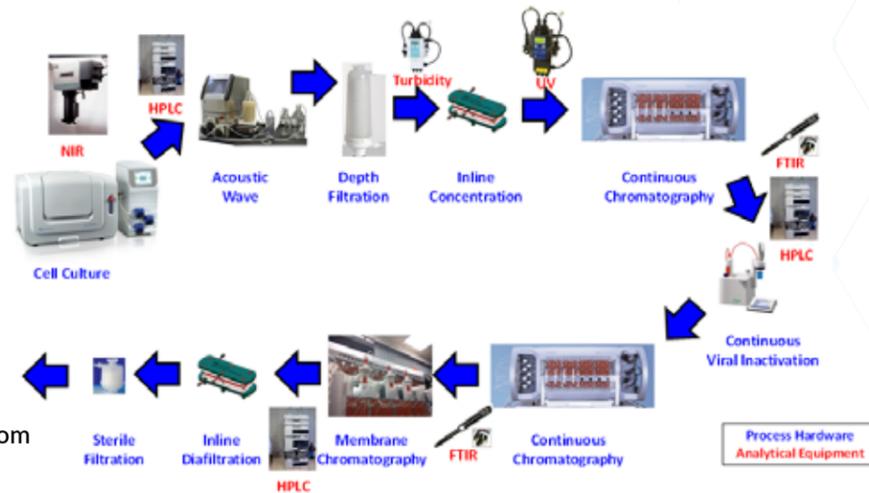
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DEVELOPMENT OF AN AFFORDABLE, AUTOMATED AND FIELD-DEPLOYABLE, POINT OF CARE SYSTEM FOR RAPID DIAGNOSIS OF TB CAUSED BY MYCOBACTERIUM TUBERCULOSIS IN PARTNERSHIP WITH VALETUDE PRIMUS HEALTHCARE PVT. LTD.

iMC2 TB assay is a one-step diagnostic product with minimum human intervention for pulmonary tuberculosis in all kinds of healthcare settings, including remotest primary healthcare centers of the country. The system does not require any existing lab set up to process and analyze the sample. Sputum sample of the suspected patient can be collected on-site (point of care) directly in the capture bottle (part of test kit). Capture bottle is prefilled with sputum processing and decontamination reagents. MTB cells will be enriched to a final volume of 10 μl followed by a collection of a fluorescent signal using in-built fluorescence detector. This whole process is completed within 60 minutes and is designed to run with minimum power, with a rechargeable battery to run off the grid if required and network connected. User interface and operation of the test will be simplified to enable healthcare personnel trained in for basic errands in healthcare centers can use the device.

The project was funded through the IMPRINT scheme of Ministry fo Human Resource Development, with Valetude Primus Healthcare Pvt. Ltd.

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CERVICAL CELL CLASSIFICATION USING HIGH-RESOLUTION DIGITAL HOLOGRAPHIC MICROSCOPE

A high-resolution Digital Holographic Microscope technology allows holographic 3D imaging of biological cells at 0.5 micro-meter lateral resolution and < 50 nm depth resolution in a single shot operation. The technology has brought improvements on traditional resolution performance of interferometric imaging systems. In collaboration with AIIMS and Phase Laboratories Pvt Ltd (incubated at TBIU-IIT Delhi), the team has built a database of cervical cell images that contains traditional 2D bright-field images as well as holographic 3D images. A statistical automated classification algorithm developed suggests 3D morphological information about the cells provided by the microscope system is highly relevant diagnostically and able to provide far superior cell classification. Holmarc Opto-Mechatronics, Kochi, has introduced a commercial microscope product based on the technology. The product is affordable and offers rich 3D information about cell morphology, which is generally not accessible to biomedical researchers.

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RAPID DIAGNOSIS OF BACTERIAL INFECTION

Antimicrobial resistance (AMR) has been recognized as one of the most important healthcare problems of this century. Due to limitations in the current microbiological methods about two-thirds of antibiotic prescriptions are unnecessary and are empirical in nature; this practice is a major cause of the emergence of AMR and its rapid spread in the last decade. An interdisciplinary team of basic scientists and engineers from seven departments in IIT Delhi have come together to form an alliance for action in diagnosis, healthcare and antimicrobial resistance (AADHAR). This team will closely work with clinicians from different part of India in a project funded as part of the IIT Delhi grand challenges initiative (supported by the MHRD) to characterize AMR signatures for Indian isolates and use this information for the development of rapid tests for pathogen identification.

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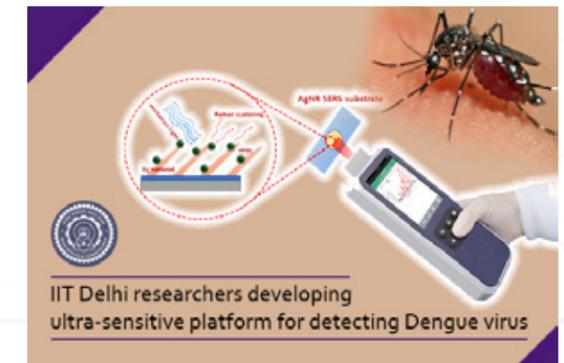
ULTRA-SENSITIVE PLATFORM FOR DETECTING DENGUE VIRUS

The incidence of dengue infections has increased dramatically over the past five decades.. About 2.5 billion of the world's population has been living at the risk of dengue infection.

A research group of IIT Delhi is developing an ultra-sensitive, rapid, portable and field-deployable platform for detection of pathogenic bacteria and Dengue virus. Besides being cost-effective, the platform will have an advantage of swift detection, the capabilities of rapid on-chip specimen detection of Dengue virus and pathogenic bacteria like *S. aureus* and *E. coli* for point-of-care diagnostics. The currently available methods for identification of bacteria/virus such as biochemical test, Polymerase chain reaction (PCR) are costly, time consuming and laborious. The novel silver nanorods based surface-enhanced Raman scattering (SERS) substrates fabricated by glancing angle deposition (GLAD) system will provide rapid and accurate detection of pathogenic bacteria and dengue virus. The SERS spectrum provides a unique "molecular fingerprint" of individual virus/bacteria based on their specific molecules. This easy portable cost-effective, rapid (results within a few minutes) and a possibility for early detection renders the high impact in health care.

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AIR POLLUTION MONITORING FROM SPACE

Short and chronic exposure to particulate matter smaller than 2.5 µm is the leading environmental risk factor for the disease burden in India. The research team at IIT Delhi has found a way to utilize high-resolution satellite data to estimate PM2.5, validate and bias correct the data against coincident in-situ data and generate 18 years (2000-2017) pollution database at city and district level. Data and analyses have revealed that 49% (82%) of the Indian population is exposed to pollution exceeding Indian (World Health Organization) annual ambient air quality standard of 40 µg/m3 (10 µg/m3).

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LOW COST SEMICONDUCTOR AND OPTICAL SENSORS BASED URBAN AIR QUALITY MONITORING NETWORK SYSTEM (SENsurAIR)

IIT Delhi, IIT Madras and Envirotech are developing Low-Cost semiconductors and Optimal Sensors based urban quality monitoring network system. It will help in monitoring high levels of pollutants in the air quality. IIT Delhi is currently working on making this affordable, and IIT Madras is developing a system whereby the data generated can be wirelessly mapped. These shall be produced & marketed by Envirotech Instruments Pvt. Ltd, New Delhi.

These low-cost sensors will be highly useful to monitor the air pollutants, map the air quality and can be used as Early Hazard Warning System for air pollution episodes in a city. Measurement of vehicular & industrial pollution and hazard identification at hazardous sites is much more convenient with the help of sensor-based real-time monitoring networks. These sensor-based monitoring networks shall be the in-thing for India's air monitoring program.

Wireless Sensor Network for Air Pollution Monitoring (WSN-APM)

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LIMESTONE CALCINED CLAY CEMENT (LC3)

Limestone Calcined Clay Cement (or LC3) is a new type of blended cement that has up to 30% lower CO_2 emissions, more affordable and durable compared to the traditional Portland cement. The cement has been developed by IIT Delhi team with funding from the Swiss government. Post scientific and technical research on this cement, it is currently under the active consideration for standardization by the Bureau of Indian Standards. Compared to a usual range of 65% to 95%, this cement contains only 40% to 50% of the energy-intensive clinker, which is used for the production. The technology will have commercial application world-wide and has attracted attention from industrial partners in Europe, North America, South-East Asia, Africa, Latin America and Middle East.

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FUNCTIONALIZED SILICA DERIVED FROM RICE HUSK ASH

Rice milling industries all over the world produces about 70 million tons of Rice Husk Ash (RHA) annually, which contains 80-90% of silica. The conventional usage of RHA is limited as a heat insulator in steel rolling mills, in cement manufacturing and brick making, but largely remains unused and causes damage to the land and the surrounding area in which it is dumped. The major constituent in RHA i.e. Silica, having a variety of applications in Rubber industry (as a reinforcement), Toothpaste, Cosmetics etc. which mainly precipitated from quartz sand-based Sodium Silicate.

Silica replaced Carbon black in the tire industry as a filler due to reduced rolling resistance which in turn reduces the fuel consumption. Due to the presence of surface hydroxyl group incorporation of silica yields poor abrasion resistance, excellent tear strength and excessive heat build-up. This situation can be overcome when the silanol surface has been reacted, either before or during mixing, with a silane functionality which can further react with elastomer. With support from The Goodyear Tire and Rubber Company, Ohio, USA, current research at IIT Delhi targets the synthesis of the new functional moiety to replace the conventional silanes as well as the synthesis of modified silica from RHA

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NANOTHERANOSTICS OF INFECTIOUS DISEASES

Bloodstream bacterial infections are a serious threat to global public health and economy. The recent figures released by National Center for Health Statistics (NCHS) in 2011 indicate that more than a million people in the US alone get affected by it each year and the sepsis mortality rate is about 28 to 50%. Robust and affordable point-of-care (POC) medical technologies are, therefore, urgently needed for rapid decision-making to initiate the proper line of treatment. Current techniques based on blood culture and serology do not have quick turnaround times or adequate sensitivities for early intervention. Moreover, antimicrobial resistance (AMR) poses a great challenge in the fight towards effective bacterial infection management. Nanotheranostics is emerging as a novel strategy combining solutions for rapid diagnosis and treatment more personalized way, and a large part of the effort is directed toward this endeavor through active projects that include

Project 1: Endotoxin assay for early bedside diagnosis of septicemia
Project 2: Portable devices for accelerated detection of infectious pathogens
Project 3: Antibacterial approach via dual targeting in bacteria-infested cancer cells
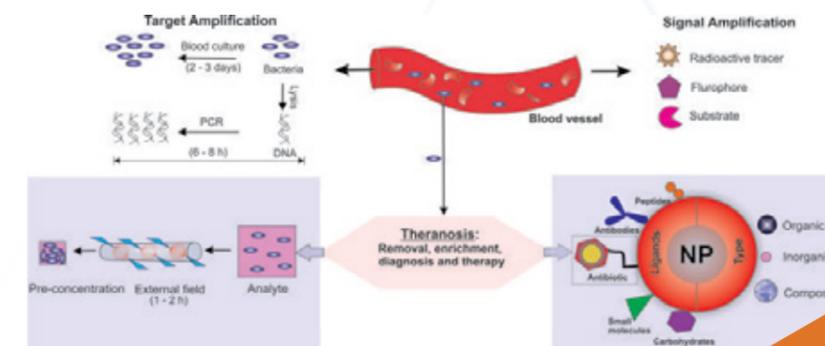
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INDUSTRIAL RESEARCH & DEVELOPMENT (IRD) UNIT, IIT DELHI

Industrial Research and Development unit at IIT Delhi was setup in the year 1975 to support the faculty members by providing specialized administrative and managerial support for the operation of Sponsored Research and Consultancy Projects and other related R&D activities by governmental, corporate and international bodies.

A number of measures have been initiated for enhancing the research profile of the institute and making our research output relevant to society and useful for industry. In the last three years (2016- 2019), several Centres of Excellence (CoE) have been instituted with the direct support from the Government and the industry. The research activities of the CoE's has helped in focussing and bringing together the research activities of the faculty members working in different departments towards problem solving relevant for various sectors.

A unique scheme named as Faculty Interdisciplinary Research Project has been initiated for bringing faculty members from across departments and institutes together for doing joint research. This has resulted in active interaction with neighbouring institutes, especially the ones having complementary expertise and research infrastructure, including AIIMS (Medicine) and NII (immunology), ICAR (Agriculture) and AIIA (Ayurveda medicine).

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THE VARIOUS ACTIVITIES OF INDUSTRIAL RESEARCH & DEVELOPMENT UNIT ARE:

- Providing administrative, managerial and accounting assistance for initiating and implementing sponsored research projects.

- Initiating Sponsored Research Enhancement Activities by providing incentives and assistance to faculty members and students.

- Setting up Centres of Excellence with support from Industry, Alumnus and Governmental bodies for carrying out focussed research in the interdisciplinary research areas focusing towards the needs of industry and aligned towards national priorities.

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GOVERNMENT SCHEMES- INDUSTRY PARTNERSHIP

1) IMPacting Research, INnovation and Technology

http://www.imprint-2.in/Imprint-II/HomePage

IMPacting Research INnovation and Technology (IMPRINT), the first-of-its-kind Pan-IIT and IISc joint initiative of Ministry of Human Resource Development (MHRD) to address major engineering challenges that the country must address to enable, empower and embolden the nation for inclusive growth and self-reliance. Projects with a clear translational objective and partially supported (at least 25%) by the industry are considered to be funded under the IMPRINT program.

2) Uchhatar Avishkar Yojana (UAY)

https://uay.iitm.ac.in/

IIT Delhi is a participating institution in the UAY scheme. It aims to promote innovation of a higher order that directly impacts the needs of the Industry and thereby improves the competitive edge of Indian manufacturing. The projects under this programme are initiated by Industry/Industries or jointly by the Industry and the Institute to address a specific need of the industry/industries. The Industry/industries should commit at least 25% of the project cost prior to the project being considered.

3) Industry Relevant R&D (IRRD) by Science and Engineering Research Board (SERB)

http://www.serb.gov.in/irrd.php

To utilize the expertise available in academic institutions and national laboratories to solve industry-specific problems for the larger benefit of society.

4) BioNEST Scheme by Biotechnology Industry Research Assistance Council (BIRAC)

https://www.birac.nic.in/bionest.php

Bio-NEST program provides support to establish bio-incubators either as a standalone entity or as a part of the academia. It connects industry and academia and enables interactions for efficient exchange of knowledge as well as facilitate technical and business mentorship.

5) Industry-Academia Research & Development Programme (IARDP)

http://www.cefipraonline.in/CEFIPRA/app_srv/cefipra/gl/jsp/industrial_icon_details.jsp

IARDP support collaborative research programme involving Industry & Academia of both the countries. The proposals that can be submitted in the framework of this programme should preferentially involve at least one industrial partner and one research partner each from India and France (2+2 Model). Closing Date: July

6) India - Sweden Collaborative Industrial Research & Development Program

http://www.dst.gov.in/callforproposals/india-sweden-collaborative-industrial-rd-programme-and-rfp-2019

Aims to foster and support the development of collaborative R&D projects that bring together companies, research organizations, academics and other collaborators from India and Sweden for the joint development of innovative products or processes. Closing Date: August

FOUNDATION FOR INNOVATION AND TECHNOLOGY TRANSFER (FITT)

FITT is an industrial interface organization established at the Indian Institute of Technology Delhi (IIT Delhi) as a Registered Society in 1992. The mission of FITT is to be an effective Interface with the Industry to foster, promote and sustain commercialization of Science and Technology in the Institute for mutual benefits. For over twenty-five years now, FITT has been in a mission mode for effecting the interface between the Institute and the industry and has been devising innovative ways to create partnerships and linkages with business and community to enable knowledge transfer for the common good. The team at FITT and academicians from IIT Delhi have been largely responsible for our successful outreach efforts including extensive S&T collaborations.

The role of FITT can be seen in:

- fostering technology development;
- technical consultancy;
- collaborative R&D;
- professional HR development programs;
- industry-site visits;
- event participation;
- corporate membership

This is necessitated by the key agenda of the Foundation to showcase and transfer the Institute's intellectual ware to industry and also inject industrial relevance in teaching and research at IITD. FITT has facilitated several short term and medium term courses on emerging technologies and several consultancy projects to cater to industry needs. Also, Department of Scientific and Industrial Research (DSIR) has recognized FITT as a Scientific and Industrial Research Organization (SIRO). As a SIRO, FITT is eligible for full custom duty exemption for import of capital goods, raw materials and technology know-how that are required for the execution of R&D programmes sponsored by the industry.

Contact
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TECHNOLOGY BUSINESS INCUBATOR UNIT (TBIU)

IITD houses Technology Business Incubator Unit (TBIU), one of the earliest incubators in the nation to promote partnership with new technology entrepreneurs and start-up companies. TBIU supports product development, product innovations, software testing, simulation and prototyping, pilot experimentation, training and other similar technology-related work. We are looking for corporate support for funding incubators, bring in business networks, expertise and mentorship, besides capital that may otherwise be out of reach for young innovators.

SOME START-UPS AT IITD TBIU

01 ANARVARAN TECHNOLOGIES PVT. LTD:
has developed a Statometer - Digital Water Level Recorder (DWLR) which can be used in piezometer wells as well as tubewells for measurement of water level data. It uses an indigenously designed and patented signal processing algorithm of acoustic waves for accurate measurements.

02 ARIANT TECHNOLOGIES & RESEARCH PVT. LTD.:
startup is working on electric fizes for ammunition to be used by Army, Navy and Ordinance Factories.

03 BOTLAB DYNAMICS PVT. LTD.:
is focusing on industry grade Unmanned Aerial Vehicles (UAVs) having sensing and imaging capabilities for various kind of application across industries. The startup is working on three features, namely,stability, endurance and networking of multiple UAVs.

04 BROWNBAG CORPORATE & SUSTAINABILITY PVT. LTD.:
is working towards finding climate solutions for sustainable development.

05 ISLP TECHNOLOGIES PVT. LTD.:
is being established as a 'Centre of Excellence' focused on Research and Development on Emerging Technologies. They are focused on improving security, privacy, and reliability in identified Industry Verticals enabling lower costs and enhanced overall user experience with improved efficiencies in terms of time and productivity.

06 FLEXMOTIV TECHNOLOGIES PVT. LTD.:
is a biomechanical product design and manufacturing company. To deliver high utility, Low cost biomechanical solutions to the people. Product/Services: Flexcrutch

07 — GREEN BAM INFRA TECH PVT. LTD.:

is a budding start-up company established in 2017 with an aim to realize green technologies and deliver sustainable systems.

Product/services: Mulit-Level Structure, Bamboo Guard Shed, Bamboo Interiors and Exteriors, Bamboo Pent House, Bamboo Farm House, Bamboo Garden Structures

08 — KRIYA LABS:

develops products and processes to produce affordable, high-quality and eco-friendly value added products from waste natural materials/ fibres.

09 — LUMINASIC PVT. LTD.:

are into developing of ASICs for CMOS image sensors. Luminasic's technology is helping to see :
- Low light imaging for autonomous mobility
- Smart security with stunning imagery and connectivity
- Medical imaging with unprecedented sensitivity
- Defense systems with disruptive cost weighted performance

10 — PHASE LABORATORIES PVT. LTD.:

are working on diagnostic application development using novel High Resolution Digital Holographic (DHM) Telescope

11 — REDROOM TECHNOLOGIES PVT. LTD.:

aims at solving real-life problems and creating a significant impact on society. Currently, we are focusing on improving sanitation conditions and providing a healthy life for women.

12 — VECMOCON TECHNOLOGIES PVT LTD:

provides core research & development for electric transportation systems with best-in-class – technology and wide range of components for high performance Electric Vehicles in B2B space.

13 — VIZARA TECHNOLOGIES PVT. LTD.:

is a technology start-up providing knowledge-based virtual reality and augmented reality solutions in various domains such as heritage preservation, tourism, real-estate, security and smart city governance.
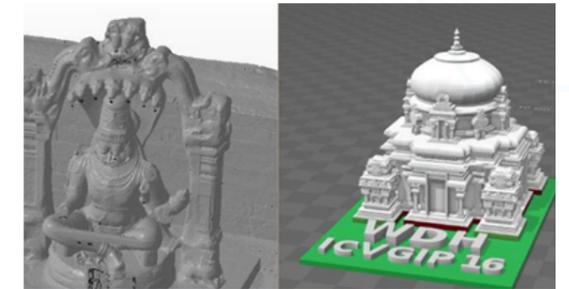
14 — MEMORABILIA:

manufactures 3D printed, scaled-down replicas of artefacts, sculptures, city-scapes or characters with AR interfaces.

15 — CERELIA NUTRITECH PVT. LTD.:

Tackling maternal malnutrition through frugal innovation. Their vision is to augment SDG 2.1, 3.1 & 3.2 through transdermal nutrient delivery systems and disrupting conventional delivery uptake modes.

16 — CLENSTA:

is an Indian startup and in association with IIT Delhi, one of the leading technology institutions in India, has been working to create innovative healthcare solutions to make hygiene accessible for anyone, anytime and anywhere. Our mantra of 'clean instantly' is driven by our aim to create products that promote complete and instant cleaning solutions without the use of water. Product/Services: Waterless Shampoo, Waterless Body Bath

17 — VIRMAT PVT. LTD.:

was incorporated in October, 2015 with the aim of providing products related to advanced simulation based training systems for minimally invasive surgical procedures. It provides complete, innovative and economical solutions to the pressing surgical training needs of India and the world in particular. Product/ Services: Silicon Brain, Micro-Suturing Pad, , Ventricular Simulator.

18 — STELLARGENE TECHNOLOGIES PVT. LTD.:

works in conjunction with scientists, clinicians and the community bringing genomic solution, they carry the vision of offering Diagnostics that enable decisions, planning that leads to publications, training which lead to empowerment.

CONTINUING EDUCATION PROGRAM/ QUALITY IMPROVEMENT PROGRAM/ TECHNICAL EDUCATION QUALITY IMPROVEMENT PROGRAM - IIT DELHI

CONTACT

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To cater to the needs of the rapidly transforming technological, business, and regulatory landscape, IIT Delhi conducts several bespoke training programs every year through a dedicated office of CEP/ QIP. We offer customized skill development courses, M.Tech. and diverse lecture series programs to serve profession-specific and company-specific needs. The course programs have different levels to serve different experience levels of corporate executives, and are designed to incorporate a balanced mix of theoretical, lab sessions, and real-life case studies. A range of short term courses, long term courses and various certificate programs are conducted with durations ranging from three days to six months. The five broad verticals of the activities include:

1 **Continuing Education Program (CEP):** Outreach programs offered to diverse organizations to take advantage of formal course work, conferences or seminars to address their training needs, to remain updated in their fields, learn new skills, change careers or enhance their marketability or improve their businesses and organizations. The programs help to increase the efficiency, employee retention, gain their loyalty, and ultimately boost organizational productivity. IIT Delhi offers open-enrolment certificates courses and professional development programmes. The diverse programmes are designed in consideration with the industry requirements and delivered by our internationally acclaimed faculty members and practicing professionals, selected for their industry expertise.

2 **Quality Improvement Program (QIP):** Endeavor to improve the quality of technical education in the country and upgrade the skills of teachers of the AICTE approved degree-level engineering institutions and National Institutes of Technology (NITs) of the country through degree programs, short term courses and curriculum development cell activities.

3 **Technical Education Quality Improvement Program (TEQIP-III):** TEQIP-III is to improve quality of technical education and enhance existing capacities of the institutions to become responsive to the global economic and technological developments.

4 **Global Initiative of Academic Networks (GIAN):** GIAN aims at tapping the talent pool of scientists and entrepreneurs, internationally to encourage their engagement with the Institutes of Higher Education in India. The program arranges guest lectures by internationally renowned experts to augment the country's existing academic resources, accelerate the pace of quality reform, and elevate India's scientific and technological capacity to global excellence.

5 **Indian Technical and Economic Cooperation (ITEC):** In ITEC Programme (fully funded by the Government of India) and its sister programme SCAAP (Special Commonwealth African Assistance Programme), 161 countries in Asia, Africa, East Europe, Latin America, the Caribbean as well as Pacific and Small Island countries are invited to share the Indian developmental experience acquired over six decades of India's existence as a free nation.

6 **Summer Faculty Research Fellow Programme (SFRF):** IIT Delhi is inviting faculty fellows from various Engineering and Science Institutes and Colleges other than IIT Delhi to come and spend the summer (06 to 08 weeks during May - July of every year) for pursuing research under the guidance of a faculty mentor of IIT Delhi.

Programs and activities conducted by CEP/ QIP—IIT Delhi are enriched with a rigorous yet interactive course design to help you stay abreast with latest global business trends. These programs allow our corporate partners to strengthen the technical skills of their employees through elite trainers and thereby revitalize the work force. We are the right partner in your journey towards creating a talented and better skilled workforce!

CSR Collaboration @ IIT Delhi

IIT DELHI- CORPORATE CSR COLLABORATION

Corporate Social Responsibility (CSR) is a strategic tool that provides a platform to enhance the livelihood of people, societies and companies through channels of improvement and innovation. The Ministry of Corporate Affairs, Government of India has mandated every company, private limited or public limited, which has a net worth of Rs 500 crore or a turnover of Rs 1,000 crore or net profit of Rs 5 crore, to invest 2% of its average net profit for immediate preceding three financial years on CSR activities. The CSR activities should not be undertaken in the normal course of business and must be with respect to any of the activities mentioned in Schedule VII of the 2013 Act.

Out of the focus areas identified under CSR (Sch VII), IIT Delhi is actively working in the following domains:

Eradicating hunger, poverty and malnutrition, promoting preventive health care and sanitation and making available safe drinking water;


Promotion of education including special education and employment enhancing vocation skills especially among children, women, elderly and the differently abled and livelihood enhancement projects;

Promoting gender equality, empowering women, setting up homes and hostels for women and orphans; setting up old age homes, day care centres and such other facilities for senior citizens and measures for reducing inequalities faced by socially and economically disadvantaged groups;

Ensuring environmental sustainability, ecological balance, protection of flora and fauna, animal welfare, agroforestry, conservation of natural resources and maintaining quality of soil, air and water;
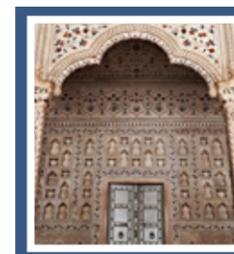
Protection of national heritage, art and culture including restoration of buildings and sites of historical importance and works of art; setting up public libraries; promotion and development of traditional arts and handicrafts;

Measures for the benefit of armed forces veterans, war widows and their dependents;

Training to promote rural sports, nationally recognized sports, Paralympic sports and Olympic sports;

Contribution to the Prime Minister's National Relief Fund or any other fund set up by the Central Government for socio-economic development and relief and welfare of the Scheduled Castes, the Scheduled Tribes, other backward classes, minorities and women;

Contribution or funds provided to technology incubators located within academic institutions which are approved by the Central Government;

Rural development projects.

CSR COLLABORATION ROUTES

CSR redefines the role of the corporates over and above their old philanthropic practices to their ability of giving back to the society, driving prosperity and creating sustainable solutions. Companies are recognized by the transformation they create, not necessarily the cash they spend. Hence, to create "impactful solutions", successful companies drive CSR activities as an integral part of their business strategy with the same passion, focus, and commitment as the commercial side of their businesses. An academic ecosystem has the ability to provide advanced yet frugal technical solutions, products and technologies for societal improvement. Industry, on the other hand, offers the energy and resources to deliver these solutions to beneficiaries at grassroots level. Jointly executing social projects also help build basic foundations to successfully establish long-term strategic business partnerships.

IITD community is engaged in a multitude of projects and infrastructure building activities under our CSR umbrella. We offer collaboration opportunities on stimulating social improvement projects, skills development (education and training), adoption of knowledge (innovation and technology transfer), promotion of entrepreneurship (start-ups and spin-offs), as well as enhancing the IITD infrastructure to build a desirable ecosystem for all.

Industry and IIT Delhi have a variety of multifaceted options to come together and propel CSR activities, which include collaborations on:

✔ **Stimulating Social Improvement Projects:**
Transferring transformational solutions from laboratories to real beneficiaries is complex and involves contributions from a broad range of actors to reach fruition. IITD's distinguished research community is involved in many research projects aimed at providing innovative solutions to different societal challenges.

✔ **Translational Research Activities:**
Partnering on a multitude of ongoing and upcoming translational research activities to provide advanced technical solutions to problems, such as safe drinking water, preventive and affordable healthcare, clean sanitation, pollution, and environmental sustainability.

✔ **Boosting Innovation Ecosystem:**
Innovation and Entrepreneurship are the two fundamental pillars towards building a successful socio-economic society. Nurturing young talent while catalyzing result-oriented CSR initiatives will help in making India an entrepreneurial & innovation hub. Technology Business Incubator Unit (TBIU), Women Entrepreneurship and Empowerment (WEE), and the Technopark offer avenues for collaborations in this respect.

✔ **Ongoing Corporate CSR Programs:**
Working together on Corporate's ongoing CSR programs through student CSR internships and faculty involvement to provide meaningful societal solutions are some options to jointly leverage CSR activities for greater overall impact while imparting invaluable professional and life skills to support our budding leaders.

✔ **Supporting Academic Ecosystem:**
Corporates utilizing CSR funds towards making the academic ecosystem more conducive towards the overall growth of students. This can involve being a part of small-mid size projects to supporting education, various green initiatives, quality housing, and technical contests.

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IIT DELHI STUDENT SUPPORT PROJECTS

● 1.1 Financial Support for Economically Weak and Girl Students: IIT Delhi strives to provide the best education and skill development to its students. Every year, a number of students from economically weak background join IIT Delhi. While the government has provided fee waivers to such students, expenses that they still incur (such as boarding and food) can be quite cumbersome for a section of students. We are looking for Corporate partners to offer financial support through scholarship programs or otherwise to such students. To encourage and support girl students in technical education, there exists an opportunity to start scholarship programs based upon demonstration of excellence in different domains.	**Funding Requirements:** INR 55,000-65,000/yr/student Min Support Amount: INR 4 LPA
● 1.2 Scholarship for Meritorious Students: The corporates have an option to award scholarships to the meritorious students regardless of their family income. This is a great step to enhance our nation's talent base and provide a platform for interaction between industry experts and academic researchers. ● For undergraduate students, the scholarships can be provided to top ranked students in different years of their B Tech program.	**Funding Requirements:** INR 1 LPA/ student (min of 4 years) INR 20 lac (perpetual)
● 1.3 For post graduate students, Corporates can also have a Research Scholar Program where the candidates are selected (based upon submitted research proposals and academic standing) for 2 years for M.Tech program and 4-5 years for PhD program. Corporates can also include support towards participation of the student in 1-2 relevant Conferences.	**Funding Requirements:** PhD Program: INR 21 lac/ 5 year program/ student; One time grant of INR 75 lac (per student for perpetual scholarship) M.Tech Program: INR 3 lac/ 2 year program/ student
● 1.4 Student Internships: There exists great opportunity to partner with IITD community on ongoing outreach activities. Student outreach internship programs and faculty involvement for delivering advanced technical solutions are some great platforms to jointly leverage CSR activities and build technical/ life skills while creating a desired impact on the society.	Program Duration: 40-60 days **Funding Requirements:** TBD

FACULTY RECOGNITION

Distinguished Chair: IIT Delhi would like to increase the number of distinguished Chairs that we have at all levels. These will help in recognition of those faculty that are performing exceptionally well, motivate others and drive innovation activities in relevant domains. Supporting Innovation Chair using CSR presents a great opportunity to propel impact research and frugal innovation activities in the domain of interest of Corporates.

Funding Requirements: Different options (INR 30 lac/6yrs to INR 1 cr/ perpetuity)
Some of the current Chair positions are:

CHAIR NAME	AREA
ABB CHAIR	Power and Automation
Central Electricity Authority Chair	Electrical Power Energy
ConsenSys Blockchain Chair	Blockchain Technology
Henry Ford Chair	Bio mechanics & Transportation Safety
Microsoft Chair (2 Positions)	Computer Science & Engineering
Modi Foundation Chair	Strategic Management
NTPC Chair	Power Generation Technology
NXP (Philips) Chair	Microelectronics and VLSI Design Tools and Technology
Petrotech Chair	Hydrocarbon Technology
Powergrid Chair	Power System Engineering
Reliance Chair	Polymer Science and Engineering
Schlumberger Chair	Applied Electronic,Semiconductor Physics or Manufacturing Process
The Hi-Tech Robotics and Autonomous Systems CHAIR	Engineering and Technology
TRIPP Chair	Transportation Planning
VOLVO Chair	Transportation Planning for Control of Accidents and Pollution
Yes Bank Chair	Climate Change Research

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INFRASTRUCTURE DEVELOPMENT PROJECTS

● **Hostel Renovations:** IIT Delhi hostel buildings have been under stress due to the increase in student intake and urgently require renovation. Comfortable living quarters give a great psychological boost to our students. We are seeking Corporate Partners to support IITD for upgradation of our hostels.

Funding Requirements:
Project Specific

● **Drinking water:** IITD has recently installed water treatment units to meet drinking water requirements of all the hostels. We are looking to install similar RO treatment systems powered by solar to promote the idea of "going green" while providing clean drinking water in the academic area as well as in other venues across IIT Delhi campus. We are seeking Corporate Partners to support this project.

Funding Requirements:
Project Specific

● **Solar Power:** IITD has always pioneered the use of economically and environmentally sustainable resources. Our community is working towards reducing our ecological impact, carbon footprint, promote sustainability and self-sufficiency by reducing our dependency on fossil fuels. We already have a 2 MW solar power system at IITD and are actively seeking Corporate Partners for additional 3 MW solar power generation together with LED lighting at various locations on campus.

Funding Requirements:
Project Specific

● **Waste Water Treatment:** Sewage (domestic waste water) from IIT Delhi is discharged to the Delhi Jal Board. We are seeking support to build an STP of 2.50 MLD capacity for treatment and reuse of the effluent at IITD. The treatment plant will be based on extended aeration technology. The high quality treated effluent would be reused for the purposes of irrigation, toilet flushing through a distribution network. In addition, we aim to build a 300 KLD Effluent Treatment Plant (ETP) to separately collect, manage and treat the hazardous laboratory waste water. The laboratory water is currently combined with domestic waste water for treatment.

Funding Requirements:
Project Specific

● **Campus Wide Internet @ IITD:** We are working towards providing a fast, reliable and secure wireless access to the students, faculty and staff. We are also looking to establish an effective cyber security system and introduce alternate methods of internet communication within the campus. Regardless of the location, devices or applications are being used on-campus, our vision is to provide f a great wireless experience accompanied with data security and ease of communication. The campus area network is expected to interconnect a variety of campus buildings. We are actively seeking Corporate Partners who can assist us both with funding as well as technical knowhow to meet the goal of "ease of use" and "zero cost" campus wide wireless, communication and data security at IITD.

Funding Requirements:
Project Specific

● Industry sponsored Discover and Learn Projects (1–2–3–4) Scheme has been started with an aim to enhance research aptitude among undergraduate students and increase the component of ‹learning by research›. Involvement of students at a very early stage of their stay at the institute and working jointly with senior students in relay mode is aimed to result in tangible outputs useful for the learning of the students.

Funding Requirements:
Project Specific

● Industry mentored ‹Student Start-up Action Scheme› in which, students are engaged in start-up actions at different stages and in different forms during their stay at the institute. The objective of this scheme is to support these students related activities by providing a supportive environment in terms of recognition, initial seed grant and expert advice. At present the scheme is mentored by Renew Power, Nokia, Ornate Solar, CERCA. Industry is invited to participate in this activity.

Funding Requirements:
Project Specific

BACHPAN SCHOOL- CONSTRUCTION WORKER SUPPORT PROGRAM

Contact
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Six mega construction projects are running on full scale on the campus of IIT Delhi. Accordingly, a large construction work-force is employed by various contractors. We often find small children running around these sites without the care of their parents, which puts them at risk and deprives them of the care they deserve at this tender age. As a responsible institution, we have initiated a Day-Care center cum school for the little children who accompany their parents to the construction site.

We are seeking support from Corporate as well as individuals to achieve our goal. We would like to extend and promote our activity to following for the welfare of construction workers:

- Mid-day meals for these kids
- One healthy, balanced meal per day for the workers.
- Nutritional supplements for the workers.
- Regular health check-ups for workers

We seek funding and implementation support from corporates who can initiate and sustain one or more of these activities. IIT Delhi will receive financial contributions in a separate account meant for this purpose.

SUSTAINABLE IIT DELHI

Sustainable IITD brings together people across the Institute with a vision to create a more sustainable, self-sufficient and green IIT Delhi campus. The student body focuses on tracking, monitoring and steering the institute towards green practices. The main goals of the squad include:

Green:
To reduce our net ecological impact and carbon footprint.
Sustainable:
To meet our present demands without compromising for the future generations.
Self-sufficient:
To manage our resources well and reduce our dependence on fossil fuels.
Students conduct many events and activities with vigor to learn about current environmental issues and develop ways to reduce our carbon footprint through our activities, academic research and innovation.

VISIT - http://sustainable.iitd.ac.in/

NATIONAL SERVICE SCHEME

NSS IIT Delhi is the IITD chapter of the National Service Scheme, institutionalized under the Ministry of Youth Affairs & Sports, Govt. of India. The team focuses on indulging in nation-building activities through various events and projects that are aimed towards the social benefit of the people/ community at large.

NSS IITD has a volunteer base of around 2000 students belonging to various disciplines working on a diverse range of social issues, such as blood donation, teaching, and environmental issues.

VISIT - http://nss.iitd.ac.in/#!/

CENTRE OF EXCELLENCE FOR BUSINESS ETHICS, CORPORATE GOVERNANCE AND CORPORATE SOCIAL RESPONSIBILITY

BACKGROUND

The Centre of Excellence for Business Ethics, Corporate Governance and Corporate Social Responsibility (CoE for BECG&CSR) at DMS was established in 2016. The CoE for BECG&CSR is an integral part of IIT Delhi and is also accredited by the National Foundation for Corporate Governance (NFCG) established by the Ministry of Corporate Affairs, Government of India, in partnership with Confederation of Indian Industry (CII), Institute of Company Secretaries of India (ICSI) and Institute of Chartered Accountants of India (ICAI). The center is being built with a vision to become a 'Think-Tank' and a 'Catalytic Institution' to bring about qualitative improvements in the Business Ethics, Corporate Governance and Corporate Social Responsibility practices of Indian companies, institutions, government organizations and NGOs, to optimize value for all stakeholders in a balanced manner.

OBJECTIVES

Implement the CSR processes including designing of the internal systems and processes as well as the externalities required.

Perform extension activities to help solve corporate problems.

ACTIVITIES

- Understanding the modalities of CSR.
- Training manpower
- Developing models depicting important stakeholders within the perspective of CSR
- Impact assessment of the CSR activities

CORPORATE FUNDRAISING

We are actively looking for new ways to grow our Centre's mandate and activities and to deliver thought leadership that directly impacts the way the world does business. We welcome support from companies, trusts, foundations and individuals. If you are interested in supporting our research effort please contact us.

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CSR FOR INNOVATION & ENTREPRENEURSHIP SUPPORT @ IITD

Innovation and Entrepreneurship are the two fundamental pillars of building a prosperous socio-economic society. Weak linkages between stakeholders (industry/ academia/ government) and India's low spending in Industrial R&D are two of the significant hurdles in boosting our innovation ecosystem. It is discouraging to find that of all avenues covered under allowed CSR activities (Schedule VII, Companies Act 2013), technology incubators have by-far attracted the least traction. Nurturing young talent while catalyzing result-oriented CSR initiatives will help set the right stones towards making India- an entrepreneurial & innovation hub.

Promoting innovation activities is a great way to create a social impact. Experience, expertise and funding support of the established companies can simplify the journey of young innovators, budding entrepreneurs and start-ups by providing them with a platform to bring their ideas to practice and check their feasibility. IITD's TBIU has incubated over 75 start-ups, filed ~ 600 patents and licensed close to 100 technologies which reflects our strength in this domain. Our successful start-ups are providing many pioneering solutions to address diverse societal challenges.

A good startup ecosystem is the fundamental need of our young entrepreneurs. Funding and support are always one of the major challenges for start-ups. We are looking for corporate support with the necessities like office space, logistical and operational support. Rendering a supporting hand to our budding leaders early-on in their entrepreneurial journey is a great way to deliver societal responsibilities and catalyze a culture of CSR innovation.

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WOMEN ENTREPRENEURSHIP AND EMPOWERMENT (WEE)

WEE is proudly the first-of-its-kind social national initiative by IITD, supported by DST, Government of India , to strengthen women ecosystem. WEE was launched in Oct 2016 with the goal to focus and ignite a fire amongst women from all walks of life to embrace entrepreneurship as a viable, fulfilling career option. In the first phase of its operation, 40 women entrepreneurs were chosen. WEE also conducts Mentorship Classes with global industry experts.

WEE's mission is 'Million making million' (Million women making million rupees (in profit) a year), to financially empower one million women by 2018 and one billion across the globe by 2025 by working in collaboration with various government or is it government's? ministries, international bodies and corporates. WEE intends to motivate and educate women to explore entrepreneurship as a viable career option.

Mentored 100 and trained 500 women entrepreneurs in urban India and 8500 in the rural

50 lacs INR grant given to WEE women entrepreneurs by DST, Government of India.

Partnered with Estonia on the e-residency project (A United Nations initiative) to give Indian women entrepreneurs an avenue to sell their products internationally. And WEE has exclusive bi-lateral discussions promoting entrepreneurship in innovation across the globe. WEE provides opportunities to promote women entrepreneurship through CSR collaboration while integrating social cause with Corporate's day-to-day business activities.

Contact
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https://weefoundation.org/

ASSISTECH

ASSISTECH is an inter-disciplinary group of faculty, research staff and students, which is engaged in using modern technology for finding affordable solutions for the visually impaired. The focus is on mobility and education which are considered as the very fundamentals to enabling any person to live independently and with dignity. Apart from working on specific solutions based on needs identified by the users themselves, the team is working towards creating an eco-system that helps to sensitize and ignite a number of young minds towards real day-to-day life challenges of the differently abled.

SMART CANE

A SmartCane solves the above challenges and empowers visually impaired through independent and safe mobility. Here's how a SmartCane works -

- An electronic travel aid which fits on top fold of the white cane.
- Enhances white cane's capability by detecting objects from knee to head height in front of a person.
- Uses ultrasonic ranging to detect obstacles, and conveys distance information to the end users through distinct vibratory patterns.
- Helps users to avoid collisions with over-hanging and protruding objects, such as tree branches, signboards, underside of parked vehicles, open glass windows, thereby enabling them to navigate in different social settings with safety and confidence.
- Informs about presence of objects before actually touching the object with the cane and thus helps in preventing unwanted contact.

RAISED LINES FOUNDATION

Learning science, technology, engineering and mathematics (STEM) subjects without using graphs, diagrams and other drawings or representations is one of the major challenges faced by students who are blind or suffer from visual impairment of any kind. This often forces them to even choose subjects out of compulsion which they might not otherwise wish to pursue. Helping such students to study sciences and other-allied subjects, Raised Lines Foundation has developed a technology, wherein, by using 3-D printing, tactile diagrams could be produced in a cost-effective and affordable way. The main aim behind this initiative is to enable learning to the visually-impaired students where they would be liberty to opt for their subject of choice rather than being forced to study theory based subject. This would even open new areas/avenues of learning and other future opportunities for them.

Contact
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http://assistech.iitd.ernet.in/

RU-TAG IIT DELHI

CONCEPT OF RUTAG

- Office of the Principal Scientific Advisor (PSA) to the Government of India has conceptualized a mission called RUTAG under the leadership of Dr. R. Chidambaram (PSA).
- One of the areas of focus of the Office of the PSA is development, delivery and dissemination of technologies for rural development.
- RUTAG is an open platform for innovating strategy, thus conceptualized as a synergizing and catalyzing mechanism.

RUTAG METHODOLOGY

- Visit rural areas to identify their needs.
- Contact rural NGOs, conduct meetings/workshops/seminars with S&T NGCOs and Govt. Institutions to identify the rural needs.
- Assessment of technology needs and the current technology status of different occupation groups, i.e. farmers, rural artisans and landless to help add value to their products and services.
- The S&T interventions and support are essentially demand-driven.

RUTAG ACTIVITIES

- RUTAG brings together technical institutions from MP, Rajasthan,Haryana, Chattisgarh and Delhi, the S&T based rural groups (NGOs) involved in grass-root implementation.
- 12 successfully completed projects.
- Publication of bi-annual newsletters.
- Introduction of RUTAG Club to popularize RUTAG challenges to engineering students.
- Working on technology intervention projects in collaboration with Engineering Projects in Community Service (EPICS),Purdue University.

Animal Driven Gear Box with Rural Applications

RUTAG PROJECTS IN PIPELINE

- Prevention of stone dust inhalation for stone carvers.
- A structure for multi-layered vermicomposting at Katra, Jammu & Kashmir.
- Contactless switch mechanism for Tulsi Bead making device.
- Ergonomically improved Palki Design for Uttarkashi.
- Ergonomic improvement of Batasha Making process.
- Design of a coconut tree climber.
- Technology/ Device to Extract Sap of Guggul Trees

Ergonomically Improved Palki Design for Uttarkashi

Range of field tested products for the users through Innovative Product Delivery:
1. Animal Driven Prime Mover
2. Batasha Making Process
3. Bullock Driven Tractor
4. Carpet Loom
5. Ground Water Level Measuring Device
6. Marble Artefacts
7. Potters Kiln for Pottery Items
8. Sheep Hair Shearing Machine
9. Treadle Pump
10. Tulsi Mala Making Device
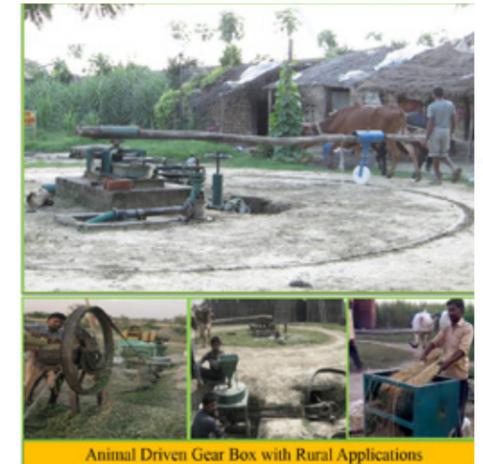
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UNNAT BHARAT ABHIYAN 2.0

Unnat Bharat Abhiyan is a unique initiative for holistic developmental inspired by the vision of transformational change in rural development processes by leveraging knowledge institutions to help build the architecture of an Inclusive India.

IIT Delhi has been designated to be the Coordinating Institute (CI) for the Unnat Bharat Abhiyan (UBA). In this capacity, IIT Delhi has been taking initiative to convene various consultative workshops and meetings. It has established the UBA Cell consisting of an Advisory Committee, an Executive Committee and a Core Working Group consisting of about forty faculty members drawn from various departments and centres of the institute. The Centre for Rural Development & Technology (CRDT) as well as the RuTAG group of IIT Delhi are fully participating in the UBA activities. It has also identified a few rural clusters for direct intervention and is in the process of networking with various participating institutions and voluntary organizations.

The main task of the coordinating institute is to facilitate mutual interaction, consultation, responsibility allocation and provide/ act as an active liaison among the mentoring institutions, the subject expert groups as well as the Ministry of HRD. It will also closely interact with the NSC in connection with the allocation of funds and other facilitating measures for effective and smooth running as well as the nation-wide proliferation of the UBA program. Needless to mention, this coordination responsibility will be carried out along with the core responsibility of direct cluster intervention and conducive ethos development within the Institute.

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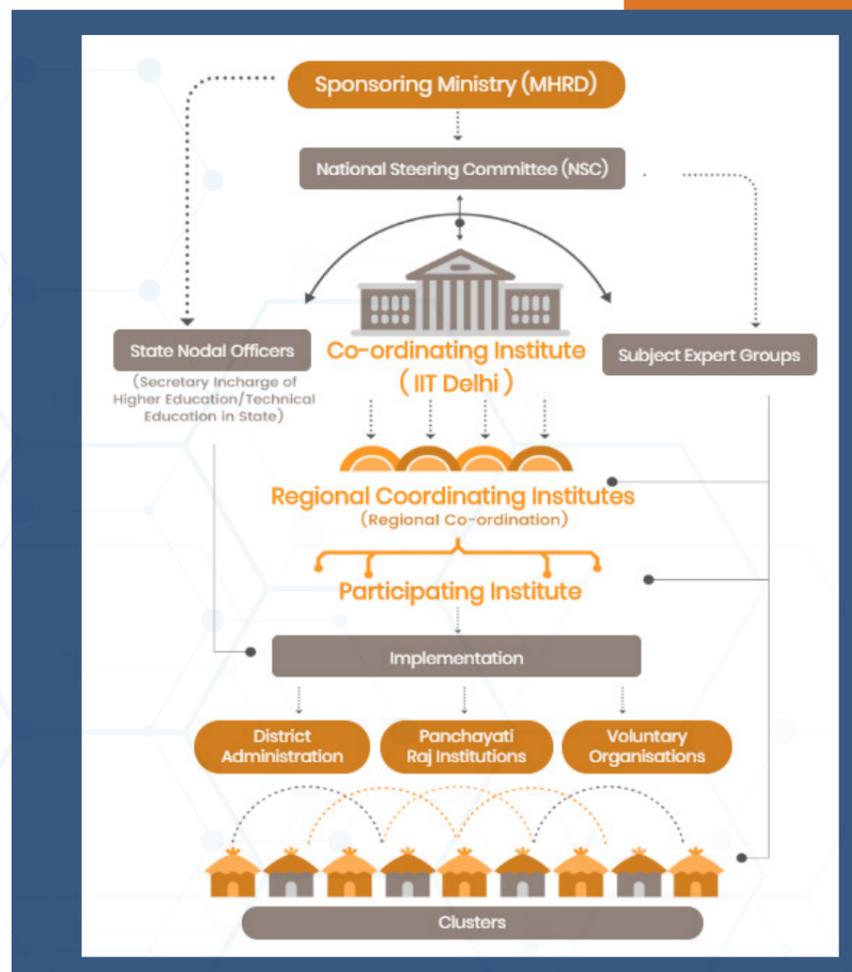
IIT DELHI INDUSTRY DAY

Industry Day is annual flagship event of IIT Delhi held in the 3rd week of September. The event aims to harness and promote the power of Industry-Academia collaborations and showcase cutting-edge technology development being conducted by our research community in the pursuit to deliver impactful techno-social and techno-commercial solutions with a global approach.

KEY OBJECTIVES OF THE EVENT

- Showcase & promote ongoing Industry and IIT Delhi's technology research collaborations.
- Create awareness about technology research projects of industry interest being undertaken by IIT Delhi.
- Harness potential collaboration opportunities.
- Provide Conducive Platform for discussions on Industry's current-day technology needs, potential solutions and channels to create collaborations.
- A platform to bring together our Ph.D Talent & Industry.

WHAT'S IN FOR THE INDUSTRY?

- A glimpse of the eco-system of innovation at IITD.
- Enriching sessions showcasing latest ideas and trends,
- Foster cross-fertilization of ideas.
- Meet your next mentor, partner or hire.
- Insights and feedback from industry and academic experts.
- A relationship in the making: A conduit for future recruitment of top talent.

SUMMARY OF INDUSTRY DAY 2018

▸ **FOOTFALL - 100** FACULTY + STAFF **350** INDUSTRY **260** STUDENTS

▸ **OVER 30 ELITE SPEAKERS**

▸ **MORE THAN 25 HANDS-ON PRODUCTS DEMONSTRATED.**

▸ **OVER 103 INDUSTRIALLY RELEVANT POSTERS SHOWCASED.**

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