

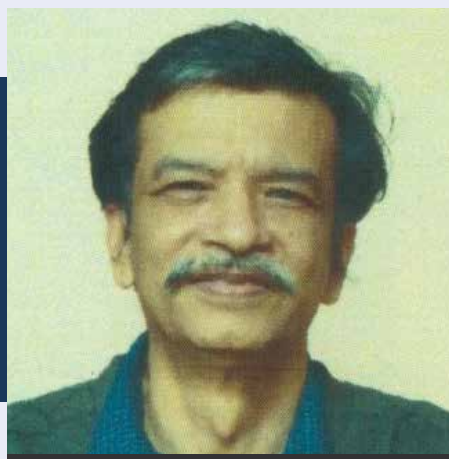


IRD CONNECT

INDUSTRIAL RESEARCH AND
DEVELOPMENT (IRD)

NEWSLETTER
JANUARY – APRIL 2022

IRD Welcomes Professor Rangan Banerjee As Director, IIT Delhi



Professor Rangan Banerjee
Director,
Indian Institute of Technology Delhi

The Industrial Research and Development (IRD) Unit extends a warm welcome to Professor Rangan Banerjee, the new Director of IIT Delhi. Professor Banerjee is a Forbes Marshall Chair Professor at the Department of Energy Science and Engineering at IIT Bombay, a Department that he helped start in 2007. He has been the Dean R&D and received the Excellence in Teaching award from IIT Bombay. He is also a Fellow of the Indian National Academy of Engineering and Public Policy, and Carnegie Mellon University. His areas of interest include energy management, modeling of energy systems, energy planning and policy, and hydrogen energy and fuel cells.

Professor Rangan currently serves on the editorial boards of the *International Journal of Sustainable Energy*, *International Journal of Sustainable Engineering*, *International Journal of Thermodynamics*, *Solar Energy Advances*, and *Global Transitions (Energy Transitions)*. He has been involved in setting up a megawatt scale solar thermal power testing, simulation research facility sponsored by the Ministry of New and Renewable Energy (MNRE), and is the faculty advisor of Team Shunya—India's first student team in the Solar Decathlon Europe finals. He has been involved in advising the city, state regulatory commission, energy agencies, Planning Commission, Niti Aayog, and MNRE on energy issues, and has worked with several Indian and international industries.

With his vast experience in the industry and academia, Professor Banerjee has envisioned priority areas that will drive research at IIT Delhi. These priority areas have been identified, keeping in mind the current needs of society. Thus, **healthcare, environment and climate research, energy and sustainability, smart infrastructure, and smart manufacturing** will be key areas of research besides ongoing cutting-edge research areas, where the technological prowess of our Institute and the research acumen of our students and faculty will be effectively harnessed. The IRD unit has initiated efforts to bring this vision to fruition.



As we emerge from the ravages of the pandemic, which did little to out-spirit our talented researchers, we can already see a decided return to normalcy. This increased impetus in the R&D activities at IIT Delhi is also due to the steady, unflinching support of our academic and industrial partners. A remarkable achievement of the quarter is the establishment of a new **Centre of Excellence (CoE) on New Energy** funded by GMR. Professor P.V. Subba Rao, Head, Centre for Rural Development and Technology (CRDT) will be the co-ordinator of this CoE. The IRD has also partnered with New Zealand Universities, TU Delft in the Netherlands, and the Institute of Liver and Biliary Sciences (ILBS), New Delhi, for joint research projects in cutting-edge areas. The period has already witnessed the addition of 104 new sponsored projects and 88 consultancy jobs worth ₹116.5 crores with thirty-two new high-value projects.

As we embark upon a new chapter in research at IIT Delhi, we will be guided by Professor Banerjee's idea of touching the life of a common man by addressing societal needs in an unprecedented manner.

Professor Sunil Kumar Khare,
Dean R&D,
Indian Institute of Technology Delhi



RESEARCH LANDSCAPE

Department of Mathematics



Professor S. Dharmaraja

Institute Chair Professor
Head, Department of Mathematics
Indian Institute of Technology Delhi

The Department of Mathematics, established in 1961, has more than thirty faculty members who are actively engaged in almost all the branches of mathematical research, with many of them having international research collaborations. Our erudite faculty are recipients of various honours and awards from prestigious national and international agencies. The department's research can be broadly classified under the following areas:



Analysis and PDEs

Research in this area includes operator theory, topology, harmonic analysis, its applications, analysis of partial differential equations, learning

theory, and approximation theory. Harmonic analysis, which was originally devoted to studying the Fourier series or transform, has applications in physics, electrical engineering, and computing and is the backbone of much Research in this area includes operator theory,




topology, harmonic analysis, its applications, analysis of partial differential equations, learning theory, and approximation theory. Harmonic analysis, which was originally devoted to studying the Fourier series or transform, has applications in physics, electrical engineering, and computing and is the backbone of much of modern-day pure mathematics, such as differential equations or number theory, and is also the foundation of pseudo-differential operators essential for studying the elliptic equations, index theory for elliptic operators, and solving boundary integral equations encountered in various physical problems. The team's vision is to study the global calculus of pseudo-differential operators on Lie groups to facilitate the solution of partial differential equations in these spaces. The study of problems in differential geometry, mathematical physics, and extremal functional inequalities naturally leads mostly to PDEs with varying degrees of nonlinearities. The geometric and topological aspects play an important role in understanding these nonlinear equations from the point of view of mathematical understanding. However, in the last few decades, efforts have been directed toward enhancing the understanding of nonlinear equations and the regularity of their solutions.



Topology

Another area of interest is the topology which has applications in quantum mechanics and string theory, where tiny variations in shape, matter, cosmology, computer science, etc., are studied. Combinatorial topology considers the global properties of spaces built up from a network of vertices, edges, and faces. Over the last decade, two interesting new research directions have emerged—one focusing on algorithms for combinatorial topology and the other on applications of combinatorial topology in engineering and science. The research group

seeks to focus on related problems and stimulate interest within the computer vision community to utilise and extend this new field's tools.



Computational and Applied Mathematics

The research group working in the realm of applied and computational mathematics, stochastic processes, and optimisation has exciting projects in the areas of computational fluid dynamics, atmospheric flows, pipeline flows, optimal control problems, the magnetisation of materials, option prices in financial markets, uncertainty quantification, etc. Their research addresses the theoretical and computational issues arising from wide applications, which PDEs model. From a theoretical perspective, their research focuses on analysing the existence, uniqueness, and stability of solutions of PDEs arising as an interface between functional analysis, differential geometry, and algebraic geometry. On the computational aspect, the group is working on developing, analysing, and efficiently implementing a wide variety of computational techniques, e.g., finite element methods, wavelets, finite volume methods, and discontinuous Galerkin methods, etc. The implementation of these algorithms also involves aspects of numerical linear algebra. The group has active collaborations with other prestigious Indian institutions and several ongoing sponsored projects, including international projects with institutions in France and Germany.




Statistics and Operation Research

The operations research (OR) group is working on stochastic game theory, optimisation, financial mathematics, applied probability, queuing theory, and statistical data analysis. The group is planning to explore more complex and exciting research areas in the future, one of them being




the 'stochastic dynamic optimisation and game problems in an uncertain environment.' The new level of uncertainties in reward and transition parameters brings another challenge to an already difficult problem. Methodologies like the Markov decision processes, Markov games, stochastic programming, and distributionally robust optimisation are proposed to be used to study this new area. Many complex real-world problems arise in communication systems that can be analysed by Hawkes processes. The current robust behavior of financial assets can be modeled as jump-diffusion processes and predictive analysis carried out.

Over the last few years, the group has contributed to building research on a spectrum of problems from the financial mathematics domain, including credit risk modeling, portfolio optimisation, insurance modeling, and algorithmic trading, to name a few. Various tools have been used to build a deeper understanding of the models and their solutions methodologies, from deep learning to data analytics and stochastic calculus to optimisation. Exploration of new fields like quantum finance or topological data analysis is in the pipeline.

 **Theoretical Computer Science**

The department has a small group of faculty members working in theoretical computer science areas and applications. Research in this group revolves around the design of robust algorithms for problems arising from real-life applications, which are mostly NP-hard. The practical components include designing and implementing the scheduler, programs involving inter-process communication leading to multi-user programming, thread programming, and parallel programming. Data science is one of the critical areas of current research,

and solutions to many applications are data-driven. The main aim and focus of this group are to promote mathematics in the field of data science, data mining, data analysis, predictive analytics, NLP, text analytics and predictive analytics, reasoning and logic, rough set, and fuzzy set-based data analysis. Statistics, linear algebra, optimisation, and computer science, are the fundamental areas we will excel in the next five years. Another dimension of research is natural language processing, machine translation, and artificial intelligence built-in tools to automate such activities.

 **Algebra and Number Theory**

The research group working on number theory, representation theory, cryptography, coding theory, commutative algebra, and algebraic geometry mainly works on analytical and transcendental aspects, focusing on understanding Schanuel's conjecture and representation theory concerning the Langlands program. Research in commutative algebra and algebraic geometry is on theoretical and computational aspects. Computational commutative algebra is an emerging field, and Grobner basis techniques have vast applications in many areas of mathematics and computer science. The group also studies various kinds of continued fractions and their applications, characters of finite groups and their applications, algebraic coding theory, and quantum computations.

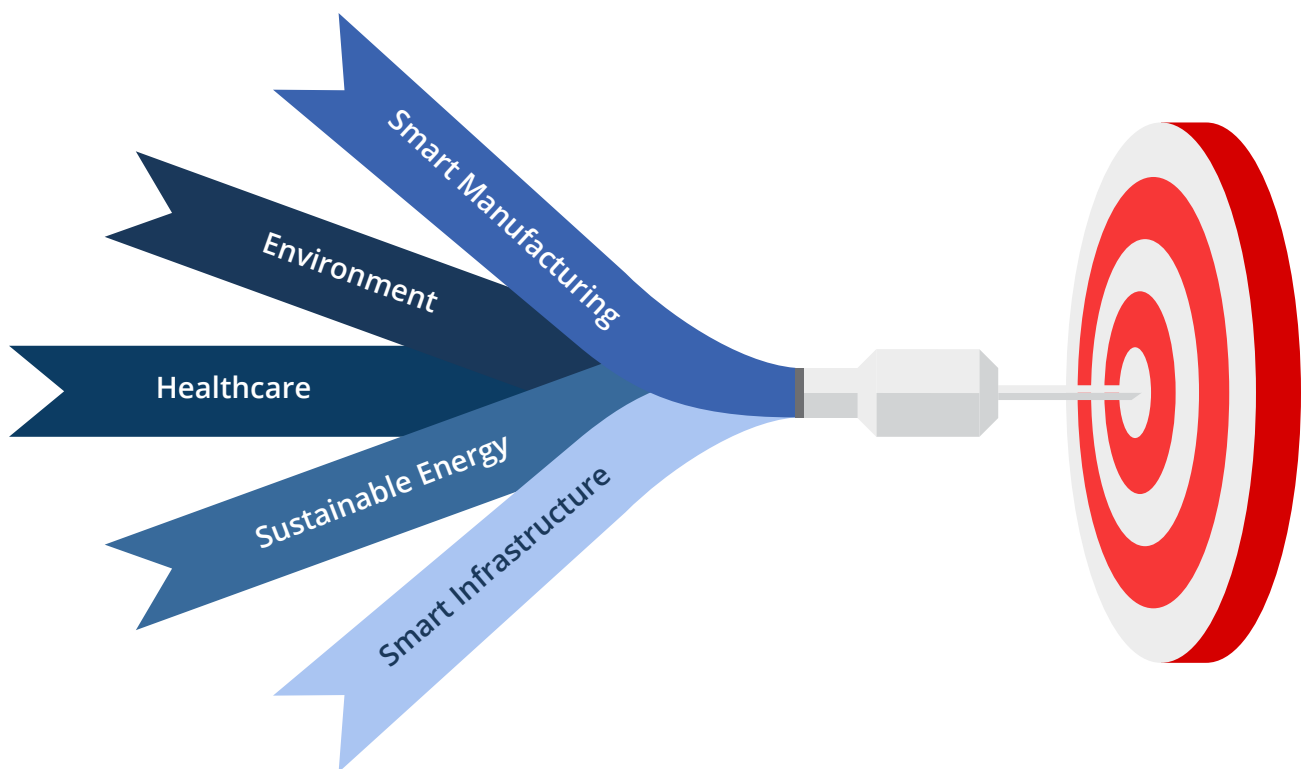
The department has a considerable hold in algebra, number theory, and cryptography applications. It presently holds a chair in Blockchain Technology: the ConsenSys Blockchain Chair. It would like to further strengthen these areas by focusing on modern and futuristic ciphers in the post-quantum era and also set up a state-of-the-art research centre and a laboratory.





New Research Initiatives

In keeping with the institute’s vision of orienting the research at IIT Delhi around five key thrust areas, **healthcare, environment and climate research, energy and sustainability, smart infrastructure, and smart manufacturing**, the IRD Unit invited interest in **healthcare** and **environment and climate research** from the institute faculty members. The responses received through Google forms were collated. The IRD Unit will organise brainstorming sessions with the faculty members, as a follow-up to the expression of interest, to devise strategies for implementing the Institute’s vision.



Centres of Excellence (CoEs)

GMR CoE for New Energy



GMR Power and Urban Infra Ltd., Mumbai, and IIT Delhi signed an MoU on February 17, 2022, for establishing the GMR CoE on New Energy Technologies at IIT Delhi. The CoE will undertake research and academic activities for interdisciplinary research and innovation in the areas of new energy technologies. Professor P.V. Subba Rao will be the coordinator for the centre.



IRD WORKSHOPS

Workshop on Digital Healthcare



Following an online interaction with Mr. Rizwan Koita, Founder and CEO of Koita Foundation, on March 18, 2022, a face-to-face meeting cum workshop with various faculty members of IIT Delhi and Mr. Rizwan Koita, on healthcare projects was organised by the IRD Unit on March 30, 2022.

The faculty members interested in the different thrust areas identified by the Koita Foundation presented their research. It was agreed at the end of the meeting to prepare a white paper on possible academic programmes that can be initiated in the field of digital healthcare at IIT Delhi.

TUD-IITD Webinar



A webinar was organised for the faculty of the Delft University of Technology (TUD) and IIT Delhi on March 28, 2022, where faculty members from both sides met online and shared the key focus areas of their work. This webinar was a step in forging collaborative research between the two institutions. As a prelude to the webinar, a series of surveys were conducted internally by both institutes to invite interested faculty members to research water, materials science, design, biophysics, renewable energy, climate change adaptation, and computational mechanics. The webinar was a step towards matching the areas of research interest of the faculty of TUD and IITD for a call for proposals for collaborative research.

MULTI-INSTITUTIONAL FACULTY INTERDISCIPLINARY RESEARCH PROJECT (MFIRP)

New Zealand Universities – IITD Joint Call



New Zealand (NZ) universities and IIT Delhi announced a joint call for proposals to support collaborative and interdisciplinary education and research initiatives. Both institutions will be contributing matching funds for research leading to sustainable development programmes with impactful outcomes. These projects will be executed through the Multi-Institutional Faculty Interdisciplinary Projects (MFIRP) scheme of the IRD Unit.

It is expected that each funded project will prepare a suitable proposal for further, potentially external, funding post completion of the project tenure of one year.

This is in addition to research output(s) such as publications and is an important measure of success for the project to ensure its viability and sustainability. Proposals were invited from all fields, especially those where synergy was evident between the institutions including cancer genomics, MedTech, robotics and automation (particularly in agriculture), and wastewater treatment.

HUJI–IITD Second Joint Call



The Hebrew University of Jerusalem, Israel (HUJI), and IIT Delhi announced the second joint call for proposals, in continuation of their research collaboration. The project areas could be of mutual interest to the faculty members of both institutes, preferably in inter-disciplinary research areas. Five joint proposals will be funded under the call for a period of two years. An important yardstick of the success of each project will be the submission of a joint project proposal to an external funding agency.

ILBS–IITD Projects



Following an MoU and a joint call for proposals in areas of research such as the use of artificial intelligence in bioscience specific to liver and biliary disease, biosensor, computational biology and bio-informatics, device design and fabrication suitable for diagnostics, and biomedical science and engineering, two projects were selected for seed funding within the ambit of the MFIRP scheme of the IRD. These include (i) 'Oral microbiome as a predictor of eventual progressive liver disease' by Professor Ishaan Gupta, Department of Biochemical Engineering and Biotechnology, and his ILBS collaborators Dr. Shiv Sarin and Dr. Chhagan Bihari, and (ii) '3D Bioprinted liver for drug screening' by Professor Saurav Ghosh from the Department of Textile and Fibre Engineering, and his ILBS collaborator Dr. Savneet Kaur.

Significant achievements of 24 projects of AIIMS-IITD MFIRP CALL OF 2018



12

Publications in reputed peer-reviewed journals



3

Publications in conference proceedings



3

Book chapters



Patents

5

Patents (Total)

4

Filed

1

Granted



Awards

4

Conference poster awards

1

One technology transfer award from DST-SERB on novel robotic exoskeleton developed in-house



Two Technologies Developed/Transferred

- Implant designed for intraocular drug delivery. This has been advertised by FITT for licensing to potential industries.
- Award-winning novel robotic exoskeleton developed in-house that will have a significant positive outcome on hand recovery in stroke patients



Centre of Excellence (CoE)

- Centre for Advanced Research and Excellence in Disability & Assistive Technology (CARE-DAT), sponsored by the Indian Council of Medical Research (ICMR) as an outcome of research leads obtained in the AIIMS-IITD MFIRP Collaborative Project.

MEMORANDUM OF UNDERSTANDING (MoU)

Troop Comforts Ltd.



Troop Comforts Ltd. (TCL) and IIT Delhi signed an MoU on February 21, 2022, for research collaborations in the areas of CBRN (chemical biological radiological nuclear) protection items, extreme cold climate and glacier clothing, ballistic protection gears (vest, jacket and helmet), and terrain battle dress uniforms.

Tata Steel Limited



Tata Steel Limited and IIT Delhi signed an MoU on February 7, 2022, for pursuing collaborative research and other R&D activities in the area of advanced materials.

University of Waterloo



The University of Waterloo, Canada, and IIT Delhi signed an MoU on March 02, 2022, for collaboration in research and academic programs, development of joint research activities, mobility of faculty and students, and development of articulated or shared courses, programs, or degrees.

RITES Limited

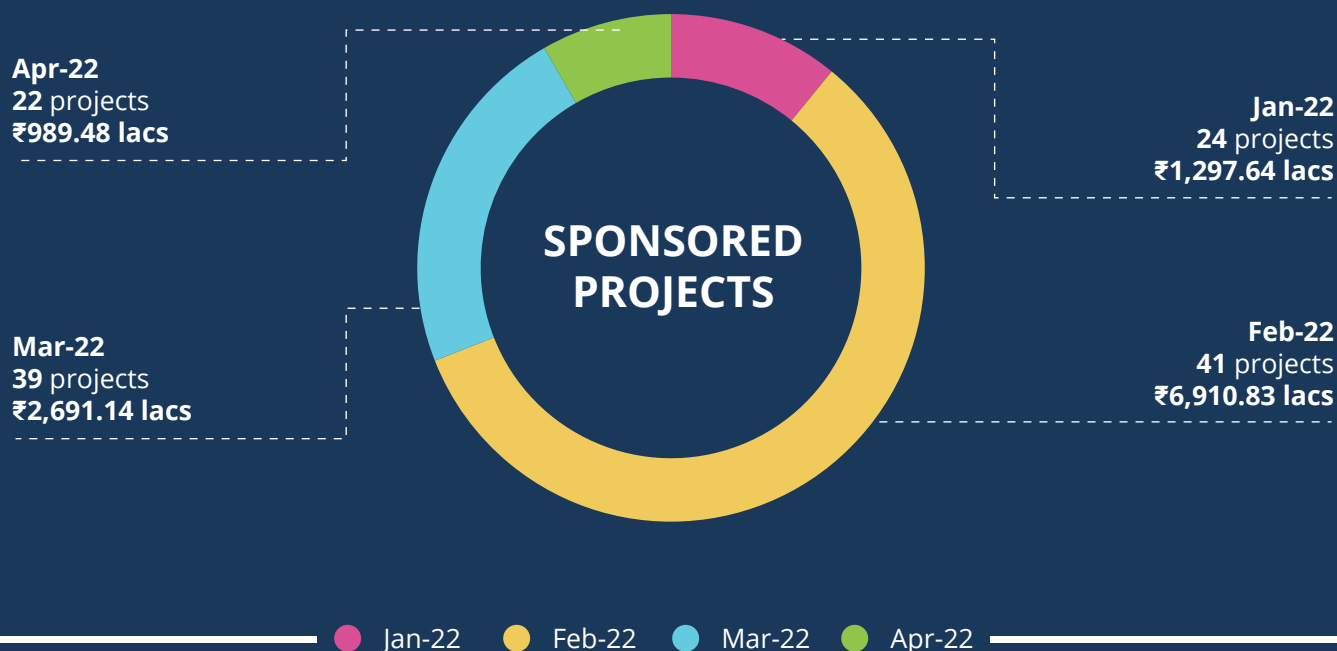


RITES Limited and IIT Delhi signed an MoU on March 28, 2022, for research collaboration in road design and road safety and consultancy projects. Apart from that, both organisations will work on infrastructure projects of mutual interest and develop a working relationship.



SPONSORED RESEARCH AND CONSULTANCIES

During the period January–April 2022, the IRD Unit has operationalised **126** sponsored research projects with a total sanctioned value of **₹118 crores** and **110** consultancy jobs with a sanctioned value of **₹8.6 crores**.



HIGH-VALUE SPONSORED RESEARCH PROJECTS (OVER ₹1 CRORE)

S. No.	Project No.	Title	Sponsoring Agency	Sanctioned Funds (₹ Crore)	PI
1.	RP04255GC	ICMR–IIT Delhi National Centre for Medical Device Manufacturing and Testing Facility	Indian Council of Medical Research, India	50.00	Dinesh Kalyanasundaram, Centre for Biomedical Engineering
2.	RP04267G	ICMR—National Centre for Assistive Health Technology	Indian Council of Medical Research, India	8.78	P V Madhusudhan Rao, Dept. of Design
3.	RP04233F	Fixing the Leak: Advancing STEM Innovation and Inclusion in India, One Woman Scientist at a Time	Co-Impact -New Venture Fund, United States	3.75	Ravinder Kaur, Dept. of Humanities & Social Sciences
4.	RP04283G	Combating Environmental Pollution Through the Internationalisation of Education in Germany and India (COMPOLL)	University Grants Commission, India	3.12	Ashish Kamalakar Darpe, Dept. of Mechanical Engineering
5.	RP04226G	Maintaining the Indigenous 5G Test Bed	Department of Telecommunications, India	2.35	Huzur Saran, Dept. of Computer Science & Engg.
6.	RP04268G	OCRs and Applications in Indian Languages	Ministry of Electronics and Information Technology, India	1.86	Chetan Arora, Dept. of Computer Science & Engg.



S. No.	Project No.	Title	Sponsoring Agency	Sanctioned Funds (₹ Crore)	PI
7.	RP04252G	Development of Suitable Design of Bridge Transition System for 25T & 32.5T Axle Load for Freight (Up to 100 kmph) and Passenger Traffic (Up to 160 kmph) for Indian Railways	Research Designs & Standards Organization (RDSO) Lucknow, Ministry of Railways, India	1.49	Bappaditya Manna, Dept. of Civil Engineering
8.	RP04223G	Design and Development of Lower-Limb Exosuit with Wearable Sensors for Real-Time Estimation of Joint Torque From Physiological Signals	I-Hub Foundation for Cobotics (IHFC), India	1.29	Sitikantha Roy, Dept. of Applied Mechanics
9.	RP04222G	Development of a High-Sensitive Magnetic Field Sensor for Proximity Detection	I-Hub Foundation for Cobotics (IHFC), India	1.29	Pintu Das, Dept. of Physics
10.	RP04218G	Self-Powered Sensor System for Soft Robotics and Human-Machine Interaction (HMI)	I-Hub Foundation for Cobotics (IHFC), India	1.29	Dhiman Mallick, Dept. of Electrical Engineering
11.	RP04215G	Signal Processing and Learning for Efficient Detection, Localization and Tracking by Cognitive Radars	I-Hub Foundation for Cobotics (IHFC), India	1.29	Arpan Chattopadhyay, Dept. of Electrical Engineering
12.	MI02485G	Metalloporphyrin Based Electrocatalytic Reduction of Protons and CO ₂ (Inspire Faculty Award to Dr. Pinky Yadav)	Department of Science & Technology, India	1.12	S Nagendran, Dept. of Chemistry





S. No.	Project No.	Title	Sponsoring Agency	Sanctioned Funds (₹ Crore)	PI
13.	RP04269G	Development of a Rural Bioresources Complex in Tribal Districts of Western Odisha for Primary Processing and Value Addition of Horticultural and Non-Timber Forest Produce	Department of Biotechnology, India	1.11	Jatindra Kumar Sahu, Centre for Rural Development Technology (CRDT)
14.	RP04300G	Carbon Fiber-Based Functional Electrode Materials for Energy Storage Applications	National Technical Textiles Mission, Ministry of Textiles, India	1.10	Bhanu Nandan, Dept. of Textile & Fibre Engineering
15.	RP04295G	Development of Patient-Specific Additively-Manufactured Mandibular Implants with Biotechnology-Inspired Functional Lattice Structures	Indo-German Science & Technology Centre (IGSTC)	1.09	Kaushik Mukherjee, Dept. of Mechanical Engineering
16.	RP04237G	Distributed Adaptive Coverage Control of Network of Drones— Theory to Practice	I-Hub Foundation for Robotics (IHFC), India	1.05	Shubhendu Bhasin, Dept. of Electrical Engineering
17.	RP04299N	Plastic Biodegradation Using Microbial Consortia and Engineered Microorganisms & Enzymes with Focus on Polyethylene (PE) and Polypropylene (PP)	ITC Limited, India	1.00	Preeti Srivastava, Dept. of Biochemical Engineering & Biotechnology



PATENTS

From January 2022 to April 2022, thirty new patents have been filed.

STARTUPS

During the same period, two new startups were incubated at IIT Delhi.

- 1. Intellicon Technologies Pvt. Ltd.** has been set up to accelerate indigenous product development. The core team of the startup comprises technocrats who are passionate about developing engineering products and solutions and looking to collaborate with organisations and individuals with similar interests. The startup was founded by Mr. Vaibhav Agarwal and Mr. Arnab Mitra under the mentorship of Professor Bhim Singh, Department of Electrical Engineering, IIT Delhi.
- 2. Careform Labs Pvt. Ltd.,** a startup established by Mr. Pramod Priya Ranjan and Dr. Nachiket Thakur is a first-of-its-kind design lab committed to undertaking projects aligned with the United Nations (UN) Sustainable Development Goals (SDGs). The company has developed Onperly, an innovative, easy-to-use menstrual cup which is an award-winning product that has won many recognitions.

SIGNIFICANT RESEARCH@IIT DELHI

SWATRIC – Advanced Fabric for the Indian Flag



IIT Delhi startup SWATRIC, founded under the mentorship of Professor Bipin Kumar from Textile and Fibre Engineering, has designed several advanced fabric structures for the National Flag, Tiranga, as per a collaboration with the Flag Foundation of India (FFI) to suit India's diverse climatic and geographical conditions. Using the advanced fabric being developed by the IIT Delhi startup, the FFI has already installed two different prototypes of the monumental National Flag on the field, one in Delhi and another one in Ladakh.

The monumental flag material is durable for extreme weather conditions without being too heavy. Prototypes of the flag were also sent to different locations in the country for installation. IIT Delhi has also installed a monumental National Flag on its campus in March this year. Mr. Naveen Jindal, Founder, FFI, Chairman, Jindal Steel & Power Limited (JSPL), and an IIT Delhi alumnus, has contributed to the project.

Selection of Medical Waste Disposal Firm

Researchers led by the IIT Delhi professor Dr. Surya Prakash Singh from the Department of Management Studies, in a study, have thrown light on how hospitals can select a sustainable medical waste disposal firm. Researchers say that the hospitals, which often encounter difficulty in disposing of their medical wastes hygienically and sustainably, can utilise a decision support framework proposed in their study.

In Covid times, this research becomes even more relevant due to the increasing amount of healthcare wastes and their hazardous and infectious composition, such as syringes, masks, PPE kits, face shields, scalpels, bandages, blooded cotton, heavy metals, chemicals, etc. The World Health Organization has also advocated considering these wastes different from other wastes such as non-hazardous municipal solid waste.

The researchers believe the outcomes of the study will have ramifications for policymakers in the health sector, hospitals, entrepreneurs involved in the medical waste collection and reuse sector, and environment regulating agencies.

Shadow-Less Solar PV Towers

The research team led by Professor Dalip Singh Mehta from the Department of Physics has developed high efficiency, shadow-less, and auto-rotating Solar PV towers for photovoltaic power generation in a given area throughout the day. The 'non-mechanical' and 'mechanical' tracking solar PV towers with reflection concentration are viable for all Indian seasons of the year with high energy density (energy per footprint area, kWh/m²).



Shadow-less solar panels

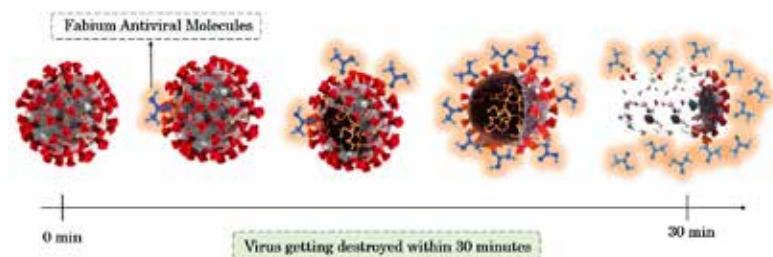
Further, the 'mechanical' tracking solar PV tower is portable, i.e. the entire unit can be mounted on a truck, made functional, and taken anywhere to generate power. Space-saving 'non-mechanical' and 'mechanical' tracking solar PV towers of 3 kW and 5 kW capacity, developed by the group, is scalable to higher capacity with the concept of solar tower array (green energy field). They can be used to power electric vehicle (EV) charging stations, rooftop high-efficiency solar power generation for independent houses, schools, hospitals, etc. A vehicle-mounted solar tower with solar tracking for power generation can also be utilised for agriculture purposes (agri-photovoltaics), such as solar water pumping, charging the battery for tractors, etc.

The team, which also includes Dr. Mayank Gupta and Mr. Virendra Kumar (Department of Physics), and Mr. Masood Ali (SeNSE) and Mr. Sanjay Ambwani (Department of Design) has successfully patented both the systems and has licensed them to the Bengaluru and Mumbai-based company EP Sunsol Private Limited for commercial installation.

FabioSys Antivirus Fabric

The antiviral fabric 'Fabium[®]' developed by an IIT Delhi deep-tech healthcare startup Fabiosys Innovations, under the mentorship of Professor Samrat Mukhopadhyay, destroys 99.9% of microbes within 30 minutes. Ordinary antimicrobial fabric products available in the market inhibit microbes in a span of 24 hours and that too with only limited efficiency. This time span of 24 hours makes those antimicrobial fabric products impractical for daily use because a typical bacterium doubles itself in a span of around 20–30 minutes.

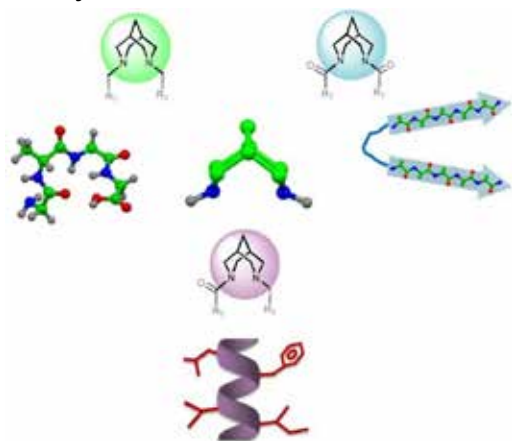
Fabium[®] is developed using a technology called Hi-PAT, which makes it highly effective against bacteria, viruses, and fungi. Fabium[®] starts working within seconds of contact with the pathogens and destroys ~99.9% of them within 30 minutes. Besides, the fabric is also free from formaldehyde and metal nanoparticles, which cause toxicity and irritation to the human body. It is rigorously tested as per the ASTM D737 standard for air permeability, which shows that Fabium[®] is almost as breathable as regular fabrics, which makes it very useful in applications like masks and PPE-overalls, where breathability is almost always an issue.



Representation of a virus getting destroyed within 30 minutes

Design and Demonstration of a New Strategy for Development of Drug Molecules

An interdisciplinary research group led by Professor V. Haridas from the Department of Chemistry, IIT Delhi, has designed and demonstrated a new strategy for developing potential drug molecules for treating Alzheimer's disease and Japanese Encephalitis. Professor Haridas has collaborated with virologist Professor Guruprasad Medigeshi from the Translational Health Science and Technology Institute (THSTI) and biochemist Professor Bishwajit Kundu from the Kusuma School of Biological Sciences, IIT Delhi, for this research work.



Structures of drug molecules

The researchers have come up with a chemical strategy based on macromolecular mimicry. Molecules have shapes just like objects. Designing and synthesising molecules with diverse shapes is an art in itself. Mimicking (copying) the macromolecular interface by uniquely shaped small molecules is an approach adopted by the research group. The researchers utilised the tools of organic chemistry and biophysics to design molecules that target the protein interface. They developed a universal privileged scaffold approach for the design of a variety of inhibitors. The universal scaffold could be converted to a specific inhibitor for a given protein-protein interaction (PPI), which makes the drug design approach relatively easy. The same strategy has been used to design the Japanese encephalitis virus (JEV) inhibitor drug molecule and has been patented by the research group.

Improving Customers' Chatbot Experience



A research team led by Professor Arpan Kumar Kar from the Department of Management Studies, and research scholars Amit Kumar Kushwaha and Prashant Sinha, conducted a study and listed factors that play a key role in improving the experience of customers who use AI-based chatbots in their day-to-day life. These chatbots are used for various purposes like registering complaints/feedback, asking questions related to purchasing, etc. These aspects are, thus, taken into consideration while designing a chatbot.

For their study, the researchers analysed over 2.5 lacs social media users' posts to understand the experience creation process in B2B businesses that use chatbots for marketing automation. Subsequently, the team applied text mining approaches to extract the parameters of a chatbot that may influence customers' experiences. The text mining approach uses natural language processing to identify significant trends, relationships, and group emerging patterns related to customer experience.





IN MEMORY

-  The IRD Unit shares the grief of the bereavement of its employee, Shri Chander Prakash. He breathed his last on February 13, 2022. Shri Chander Prakash Ji had been working with the IRD Unit for more than thirty years.
-  The IRD Unit shares the grief of the bereavement of Shri Harish Mohan Verma. He superannuated in the year 2017 and breathed his last on January 9, 2022. Shri Harish Mohan Verma Ji had been associated with the IRD Unit for more than twenty-one years.



For good ideas and true innovation, you need human interaction, conflict, argument, debate.

- MARGARET HEFFERMAN



R&D, IIT Delhi

IRD IIT Delhi

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