In addition to providing support for over 873 ongoing sponsored projects and consultancies in the Institute, the IRD Unit has been overseeing the operation of twenty-two Centres of Excellence (CoEs). Seventeen of these CoEs have been created in the last five years alone. In the current period of August 2021 to December 2021, four more CoEs have been initiated. These include the CoE on Optics and Photonics, CoE on Quantum Technologies, CoE on Smart Textiles, and Centre for Advanced Research and Excellence in Disability & Assistive Technology (CARE-DAT). Over Rs. 300 crores have been invested in these CoEs through alumni, corporate and government agencies.

The in-house research funding schemes of the IRD Unit have now started to show significant outcomes. The seed fund through the MFIRP scheme resulted in establishing a Centre for Advanced Research and Excellence in Disability & Assistive Technology (CARE-DAT), a joint facility with AIIMS Delhi. Seventy-eight patents have been filed and Technology Transfer projects implemented through the IRD Unit between July 2021 and December 2021.

New collaborations under the MFIRP scheme have commenced with the National Law University Delhi, Ashoka University, Delhi, and South Denmark University, Denmark.

MoUs have been signed with Tata Power, BHEL, National Health Authority, Mirrorsize, USA, and the Indian Air Force to pursue joint research in cutting-edge areas.

The IRD Unit has released a movie, “A Glimpse of IRD Research Activities”, encompassing the institute’s vast gamut of R&D activities. The performance of the R&D Unit has been commendable. My compliments to the Dean (R&D), Prof. Sunil Khare, the Associate Dean (R&D), Prof. Sukumar Mishra, all the previous Deans of R&D and the staff of IRD for their exemplary commitment to the improvement and facilitation of R&D activities at IIT Delhi.
The Department of Physics at IIT Delhi, established in the year 1961, is one of the largest departments in IITD with more than fifty faculty members, many of them having international research collaborations and recipients of prestigious awards and fellowships such as the Bhatnagar & ICO Galileo Galilei awards, MRSI medals, and the APS, Japan Research & Development Corp's STA, INSA, OSA and Humboldt Fellowships. Over the years, the department's faculty members have remained at the forefront of scientific achievements and technological innovations, and the students and researchers have made many noteworthy contributions.


The Condensed Matter Experiment group has many achievements to its credit. In recent times, a device capable of generating electricity from water drops, raindrops, water streams, and even ocean waves that uses the triboelectric effect and electrostatic induction, known as the ‘Liquid-solid Interface Triboelectric Nanogenerator’, has been demonstrated by one of the groups in the department. The device is also capable of storing the generated electricity. The group's work on transparent superhydrophobic surfaces by ZnO nanowire coating and the study of its photo-induced reversible wetting properties has been much acclaimed. The group has fabricated a smart mesh coated by ZnO-nanowires with reversible wettability for an efficient on-demand oil/water separation. The mesh has high demand in oil, shipping and marine industries. Besides, the work on a mechanical strain-induced tunable anisotropic wetting on buckled PDMS silver
narrow rod arrays has paved a new way of controlling the direction of liquid flow in microfluidic devices. This technological achievement has resulted in socially relevant products in the market such as a smartphone-based biosensing application for Anti-Microbial Resistance (AMR) detection, a hand-held Surface-enhanced Raman Spectroscopy (SERS)-based device for dengue diagnosis within one hour, a flexible and robust Surface-enhanced Raman active substrates for the rapid detection of pesticide residues in fruits, a hand-held SERS for Dengue and HIV-1 diagnosis.

Additionally, highly flexible, electrically conducting silver nanorods-embedded PDMS based electrodes has resulted in flexible and wearable electronics. For the group’s work on polymer-embedded silver nanorod-based ECG electrodes, an Indian patent is pending. Demonstration of a selective electrochemical reduction of CO₂ to CO using CuO/In₂O₃ nanocomposites has provided a prospective solution for converting CO₂ into fuel. Further, the group has developed a photomechanical and chemomechanical actuator for the multi-mode soft grippers. It has also developed volatile organic compounds detection for targeted drug delivery, soft robotics, and non-invasive diagnosis of diabetes, breast and lung cancers. Lastly, a sunlight-driven eco-friendly smart curtain based on infrared responsive graphene oxide-polymer photoactuators is also a contribution of the lab. Another group’s research on half-Heusler thin films has provided insights that the strained lattice of RPdBi thin films clearly demonstrate the properties of 2D topologically non-trivial surface states that are suitable for spintronic applications. Research on strongly correlated complex oxides and magnetic materials for spintronic and magnetic refrigeration applications are the other areas of strength in the department. In a breakthrough experiment, researchers in the department established that nanophase oxide ceramics have better radiation resistance as compared to their bulk counterpart. The study was carried out with respect to the environment in the vicinity of a nuclear reactor core, thus solving a long-enduring puzzle for nuclear scientists and engineers. The work led to several student awards like Raman Charpak Fellowship - 2018, EMRS Best Graduate student award - 2019, Best Oral Talk award and the IBMEC- 2018, India. In a combination of experimental- and DFT-based studies, a shape-engineered metal nanoparticle-embedded thin silica matrix has been established as a novel, third-generation, highly stable electron source for electron microscopes. The group’s expertise in nanoscale magnetic elements and arrays has been applied to memory, high-density storage media, logic devices or miniaturised field sensors. The patterned nanomagnets placed in proximity to each other interact via magnetostatic interaction. The team has fabricated high-sensitive magnetic field sensors to investigate the changes in the bistable behaviour of elongated artificially patterned nanomagnets.

Research under the Computational and Statistical Physics group’s research has come up with a new model to reveal the kinetics of protein aggregate formation inside cells of the human body. Such protein aggregates are implicated in neurogenerative diseases such as Alzheimer’s disease, Parkinson’s disease and type II diabetes. In yet another breakthrough, the group has accomplished high precision atomic structure calculations for new frequency and time standards. The first product prototype of a digital holography instrument in diagnostics
and pathology was successfully launched – a contribution of the department’s Computational Imaging research. The work was also granted a US Patent.

**Optics and Photonics**

The Optics and Photonics research group proposed a novel technique for the excitation of Fano resonance in THz deep-subwavelength meta surface cavity in the absence of structural asymmetry. They proposed and experimentally demonstrated a novel cavity sensing technique with superior sensitivity in the range of ~ 1 THz/RIU. An Indian patent has been filed for the method in 2020.

**Plasma Physics**

In collaboration with Japanese physicists, the department’s Plasma Physics research group challenged a six-decade-old notion about giant magnetic fields in high-intensity laser-produced plasma. As against the popular belief that the giant magnetic fields evolve at a small, nanometer-scale in the bulk plasma, the team has shown that the field originates at macroscopic scales. This renewed understanding will have implications for medical imaging and therapies.

**Quantum Matter Physics**

The department is taking up significant work in Quantum Matter Physics. Research on “cold-atom sensing” and “Rydberg atom quantum computing” involving ten atom qubits is in progress. In the last few years, work on Half Heusler Thin films of nanometer-scale has established their use as an experimental platform for exploring topological quantum phenomena and magnetism. A significant breakthrough in quantum transport in low dimensional condensed matter systems has resulted in Quantum Hall Systems, graphene and surface states of Topological Insulators, etc. The first sighting of the mysterious ‘Majorana Fermion on Gold’ has also been accomplished by work carried out in the group. The department established a robust, scalable platform in collaboration with the Massachusetts Institute of Technology and the University of California, USA. The work has been granted a US Patent (2021) USIII00419B2.

**Quantum Technologies**

The Quantum Technologies research group observed the wave-particle duality in the classical optics domain and developed methods for quantum communication leading to photonic quantum technologies. Another quantum research group demonstrated the generation of single/paired photons in the lab, using waveguide-based, fibre-coupled systems, and in free-space systems, using bulk crystals correlated in more than one degree of freedom towards entanglement.
NEW RESEARCH INITIATIVES

Central Research Facility (CRF) Open for Researchers Across the Country

The CRF caters to the needs of researchers within the institute and outside. Both academic and industrial users enjoy the benefits of the sophisticated facilities housed here. Such a facility represents a key commitment to preserving and raising the quality of research to international standards.

The Institute has committed significant funds to establish various high-end facilities at the CRF. The main sources of funding include:

- The IoE grant,
- Special Ministry of Education grant,
- IIT Delhi grant through Industrial Research and Development Unit,
- DST’s Sophisticated Analytical and Technical Help Institutes (SATHI) project and
- HEFA loan.

The CRF has over fifty different facilities available to users. This number is likely to double in the next two years. "The institute would like to thank the Ministry of Education, Government of India, the DST and all other funding agencies who supported the CRF’s establishment", said Prof V. Ramgopal Rao, Director, IIT Delhi, while launching the CRF platform on September 28, 2021.
State-of-the-art Laboratories on Electric Vehicle Technologies Inaugurated

State-of-the-art Battery Research, Charging Infrastructure and Automotive Health Monitoring (AHM) laboratories were inaugurated at the Centre for Automotive Research and Tribology (CART) by Prof. V Ramgopal Rao, Director, IIT Delhi.

CART is a new centre established at IIT Delhi in May 2019 to focus on electric vehicle technologies. The centre is engaged in conducting high-end research and development in battery-operated electric vehicles, hybrid electric vehicles, storage and alternate energy sources, autonomous and connected vehicles.

Department of Energy Science and Engineering (DESE)

Since its inception, the Centre for Energy Studies of the Indian Institute of Technology Delhi has been a nationally acclaimed centre for research and development activities in energy engineering. To further expand the scope and depth of academics and research, the 45-year-old Centre for Energy Studies, IIT Delhi, has been recognised now as the ‘Department of Energy Science and Engineering’ in 2021. Based on JEE Advanced scores, the Department will offer a new UG program, B.Tech in Energy Engineering, from the current academic session.

Over the years, the department has attracted generous funding from various agencies. The major thematic areas are Energy and Environment, Fuel Technology, IC Engine, Solar Energy, Plasma Science, Electrical Power and Renewable Energy Systems (EPRES) and Energy Storage. Prof. K A Subramanian is the Head of the Department.
CENTRES OF EXCELLENCE (CoEs)

Quantum Technologies

IIT Delhi has established a Centre of Excellence (CoE) on Quantum Technologies to bring research activities in various domains of Quantum Technologies under a single umbrella. The centre will focus on selected thrust areas, including Quantum Computing, Quantum Communication, Quantum Sensing and Metrology and Quantum Materials and Devices.

SMITA Research Lab, a CoE in Smart Textiles

National Technical Textile Mission (NTTM), Government of India, has funded a “Smart Materials and Innovative Textile Applications (SMITA) Research Lab” at IIT Delhi recently. The centre is equipped with state-of-the-art research facilities. As a CoE, SMITA Research Lab seeks to bring faculty members, researchers, and students from various disciplines, Chemistry, Electrical Engineering, Chemical Engineering, Physics, Biotechnology and Design, together to innovate and achieve good research outcomes. Prof. Ashwini Agarwal is the Coordinator of the Centre. The centre aims to work in the area of Smart and Functional Textiles using emerging materials and process technologies:

(a) Development of highly functional and high-performance textile materials using nanomaterials, nanofibers and nano-surface engineering,
(b) Development of wearable textiles, also known as E-Textiles and
(c) Development of functional textiles for biomedical applications.
Centre for Advanced Research and Excellence in Disability & Assistive Technology (CARE-DAT) with AIIMS Delhi

In collaboration with the All India Institute of Medical Sciences (AIIMS), New Delhi, a Centre for Advanced Research and Excellence in Disability & Assistive Technology (CARE-DAT) has been set up in the institute, with funding from the Indian Council of Medical Research (ICMR). Prof. Amit Mehndiratta of CBME will coordinate the centre. The CoE is an offshoot of the Multi-Institutional Faculty Inter-Disciplinary Research Programme (MFIRP) scheme with AIIMS, Delhi.

IRD’s MFIRP project, ‘Robotic exoskeleton therapy for Home-based Rehabilitation’, eventually led to the establishment of the CoE. Prof. Amit Mehndiratta, Centre for Biomedical Engineering, IIT Delhi, and Prof. M.V. Padma Srivastava, Department of Neurology, AIIMS, under the MFIRP scheme during 2019-2021 are the Principal Investigators. CARE-DAT is mandated to develop novel technological solutions for rehabilitation in patients with stroke. “The CoE CARE-DAT is a significant outcome of the project”, said Prof. Mehndiratta. He added saying, “The IRD was instrumental in accepting the idea of a CoE in the project and fully supported in embarking upon launching the CoE.”

Centre on Optics & Photonics

A new centre on Optics and Photonics was established at the institute recently. This centre will offer PG and doctoral degree programmes, mission research projects for national needs, industry collaboration, manpower development and training in all areas of Optics and Photonics. Prof. Joby Joseph, Department of Physics, is appointed as the Co-ordinator of the centre.
MULTI-INSTITUTIONAL FACULTY INTERDISCIPLINARY RESEARCH PROJECT (MFIRP)

National Law University Delhi (NLUD)

The Indian Institute of Technology Delhi (IITD) and the National Law University Delhi (NLUD) have signed an agreement under the MFIRP Collaborative Platform.

The collaboration comes within the ambit of the Multi-Institutional Faculty Interdisciplinary Projects (MFIRP) scheme of the Industrial Research and Development (IRD) unit of IIT Delhi. Under the scheme, IITD initiated joint projects on forensic investigations involving human DNA samples and investigations of inherent algorithmic biases and their legal ramifications for India. The outcomes from these collaborative projects are expected to have a profound impact at the national level.

Indraprastha Institute of Information Technology Delhi (IIIT-D)

The joint MFIRP proposals have been invited for collaborative, basic, applied or translational research projects in interdisciplinary areas of Computer Science and Engineering, AI/ML, Electronics and Communication Engineering, Computational Biology, Social Sciences, Humanities, Mathematics and Quantum Computing. The submission deadline was September 30, 2021.

University of Southern Denmark (SDU)

A call for collaborative research proposals between the University of Southern Denmark (SDU) and IIT Delhi was announced during this period. Proposals were invited in Nanotechnology, Advanced Materials, Waste Management, Food Science & Engineering, Imaging, Sustainable Technology, Electronics, Green Energy Technologies, Environmental Research, Biotechnology and Circular Economy, with a submission deadline of December 10, 2021.

University College London

The third call for UCL & IITD, collaborative research project proposals was announced in October 2021, with November 15, 2021, as the last submission date.

Ashoka University

Six joint MFIRP projects have been awarded and initiated between Ashoka University and IIT Delhi in the areas of (i) Air Pollution, (ii) Sustainable Mobility, (iii) AMR/MDR Infectious Bacteria, (iv) Epidemiology/Immunology, (v) AI/ML in Healthcare, (vi) Economic Data and (vii) Socio-economic and Gender Inequality.
FACULTY INTERDISCIPLINARY RESEARCH PROJECTS (FIRP) REVIEW

A review meeting of the FIRP projects of Call-2019 and short-term Faculty Interdisciplinary Research Projects (FIRP) call on COVID research & Locust Control projects was conducted on July 30, 2021, by the team of external experts. According to the reviewers, significant progress has been made in most of the projects. A significant number of joint publications and submissions of extended proposals to external funding agencies have been achieved.

IRD WORKSHOPS

Lecture by DRDO Scientist on Design, Development and Validation of Explosive Storage Structures

A lecture was delivered on September 3, 2021, at IIT Delhi under Azadi Ka Amrit Mahotsav Programme by Mr. Prabhanjan Kumar Thakur, Scientist E, Defence Research and Development Organisation (DRDO), on the topic “Design, Development and Validation of Explosive Storage Structures developed by CFEES (DRDO)”. The programme was chaired by Dr. G Satheesh Reddy, Secretary DDR&D & Chairman, DRDO.
MEMORANDUM OF UNDERSTANDING

SAMRIDH Healthcare Blended Financing Facility, National Health Authority, India

National Health Authority (NHA) and IIT Delhi joined hands to scale high-potential healthcare innovations with more than $100 million raised from the private sector and development funders under the SAMRIDH scheme. Through a blended financing facility, this partnership will support innovators and entrepreneurs in their efforts to improve healthcare delivery in India.

IIT Delhi serves as the hosting entity for SAMRIDH. This initiative is implemented by a technical support unit, IPE Global. The programme aims to catalyse market-based health solutions to improve access to affordable and quality healthcare services for the poor and vulnerable communities, particularly for the Ayushman Bharat Pradhan Mantri Jan Arogya Yojana (AB PM-JAY) beneficiaries.
To connect and leverage industrial R&D activities, IIT Delhi and BHEL have signed an agreement in August 2021 for collaborative research in the priority areas of energy, transportation and transmission.

Recognising their mutual complementarity, both IIT Delhi and Mirrorsize, USA, have executed an umbrella MoU in September 2021 for engaging research co-operation in the area of mutual interest such as analysis of body shape and size data, development of garment size chart, etc., involving AL & ML.

IIT Delhi and TATA Power entered into an MoU in October 2021 for initiating collaborative research in broad areas like clean energy, Smart Grid and S&T Policy, EV infrastructure, artificial intelligence, machine learning, hydrogen technologies, and battery energy storage systems, monitoring and sensing solutions.

IIT Delhi and Maintenance Command Headquarters, Indian Air Force, Nagpur, signed an MoU in December 2021 to foster collaborative research for better maintenance of aircraft, helicopters, missiles, launchers and related radars and other critical life extension studies of the Indian Air Force.
SPONSORED RESEARCH AND CONSULTANCIES

During the period Aug 2021–Dec 2021, the IRD Unit has operationalised 81 sponsored research projects with a total sanctioned value of INR 11930.65 Lacs and 122 consultancies with a sanctioned value of INR 906 Lacs.

A month-wise distribution of sponsored projects and consultancies during the period is shown below.
# HIGH-VALUE SPONSORED RESEARCH PROJECTS (OVER Rs. 50 LACS)

<table>
<thead>
<tr>
<th>Title</th>
<th>PI and Department</th>
<th>Sponsoring Agency</th>
<th>Sanctioned Funds (Rs. Lacs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wearable soft robotics for Upper Limb Muscle Power Augmentation with BMI interface (DRDO JATC Project)</td>
<td>Prof. Sitikantha Roy, AppMech</td>
<td>DRDO, Ministry of Defence, New Delhi -10, India</td>
<td>919.22</td>
</tr>
<tr>
<td>Next Generation Wireless Research and Standardization on 5G and Beyond</td>
<td>Prof. Brejesh Lall, EE</td>
<td>Ministry of Electronics and Information Technology, India</td>
<td>876.85</td>
</tr>
<tr>
<td>Design and Development of photonic technologies for free space quantum key distribution (JATC)</td>
<td>Prof. Bhaskar Kanseri, PH</td>
<td>Department of Defence Research &amp; Development Organisation, Ministry Of Defence, India</td>
<td>740.90</td>
</tr>
<tr>
<td>Demonstration and Deployment of Community Level Integrated Autonomous Solar Energy System for Space Heating, Drying and Cooking Purposes in Ladakh Region (Sunshine Ladakh)</td>
<td>Prof. B Premachandran, ME</td>
<td>Department of Science &amp; Technology, India</td>
<td>730.25</td>
</tr>
<tr>
<td>Indian Nanoelectronics Users Program - Idea to Innovation (INUP-i2i)</td>
<td>Prof. Neeraj Khare, PH</td>
<td>Ministry of Electronics and Information Technology, India</td>
<td>700.00</td>
</tr>
<tr>
<td>Development of a Cognitive Model for an Intelligent Robotic Teammate</td>
<td>Prof. Rohan Paul, CSE</td>
<td>DRDO, Ministry of Defence, India</td>
<td>419.65</td>
</tr>
<tr>
<td>SERB National Science Chair Awarded to Prof. Bhim Singh, Deptt. of Elect. Engg.</td>
<td>Prof. Bhim Singh, EE</td>
<td>Science and Engineering Research Board (SERB), India</td>
<td>132.00</td>
</tr>
<tr>
<td>Secure photonics-enhanced communication systems (IHFC)</td>
<td>Prof. Amol Choudhary, EE</td>
<td>I-Hub Foundation for Cobotics (IHFC), India</td>
<td>129.80</td>
</tr>
<tr>
<td>Electronic sub-system design for RADARs and Lasers (IHFC)</td>
<td>Prof. Rakesh Kumar Palani, EE</td>
<td>I-Hub Foundation for Cobotics (IHFC), India</td>
<td>129.80</td>
</tr>
<tr>
<td>Source Apportionment Study, Emission Inventory and Carrying Capacity Assessment for Alwar City in Rajasthan</td>
<td>Prof. Sri Harsha Kota, CE</td>
<td>Rajasthan State Pollution Control Board, India</td>
<td>118.00</td>
</tr>
<tr>
<td>Title</td>
<td>PI and Department</td>
<td>Sponsoring Agency</td>
<td>Sanctioned Funds (Rs. Lacs)</td>
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<tr>
<td>Diverting plastics from landfill: Catalytic valorization of polyester waste into sustainable monomers and high-value chemicals (Ramalingaswami Fellowship awarded to Dr. Ashish Bohre)</td>
<td>Prof. Kamal Kishore Pant, ChE</td>
<td>Department of Biotechnology, Ministry of Sc. &amp; Tech., India</td>
<td>113.60</td>
</tr>
<tr>
<td>Demonstration of a bamboo processing-waste gasifier system for hydrogen rich syngas to suit thermal and engine application</td>
<td>Prof. Priyanka Kaushal, CRDT</td>
<td>Department of Science and Technology (DST), India</td>
<td>112.80</td>
</tr>
<tr>
<td>Advanced Characterization of Structural and Functional Materials (To strengthen the research facilities of the Department: Under FIST Scheme)</td>
<td>Prof. Bhabani Kumar Satapathy, DMSE</td>
<td>Department of Science &amp; Technology, India</td>
<td>112.00</td>
</tr>
<tr>
<td>Quantum materials: growth of single crystals and physical property characterization</td>
<td>Prof. Kaustuv Manna, PH</td>
<td>MAX Planck Partner Groups, Germany</td>
<td>87.00</td>
</tr>
<tr>
<td>Investigation of charge carrier dynamics and fluctuations of skyrmions in ultrathin film multilayers with interfacial Dzyaloshinskii-Moriya interaction</td>
<td>Prof. Pintu Das, PH</td>
<td>Indo-French Centre for the Promotion of Adv. Res, France</td>
<td>85.47</td>
</tr>
<tr>
<td>Development of Shape Memory Oxide thin-films for Aerospace applications: Understanding the Phase-Switching behavior, related defect formation, and shape recovery process.</td>
<td>Prof. Ratanamala Chatterjee, PH</td>
<td>Aeronautics Research &amp; Development Board, India</td>
<td>84.17</td>
</tr>
<tr>
<td>Investigation into the influence of clinker content on the performance of limestone calcined clay cements (LC3)</td>
<td>Prof. Shashank Bishnoi, CE</td>
<td>Lafarge Centre de Recherche, France</td>
<td>83.71</td>
</tr>
<tr>
<td>Design and development of an advanced 3D woven honeycomb composite structure based high-energy absorbent liner for air crew helmet</td>
<td>Prof. B.K. Behera, TFE</td>
<td>Life Science Research Board, DRDO Hqrs Annex, India</td>
<td>82.45</td>
</tr>
<tr>
<td>Translational Research Consortium for Establishing Platform Technologies to Support Prophylactic and Therapeutic Strategies for Dengue - Discovery to Proof-of-Concept</td>
<td>Prof. Anurag Singh Rathore, ChE</td>
<td>Biotechnology Industry Research Assistance Council (BIRAC), India</td>
<td>81.93</td>
</tr>
<tr>
<td>Title</td>
<td>PI and Department</td>
<td>Sponsoring Agency</td>
<td>Sanctioned Funds (Rs. Lacs)</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Development of THz Modulator based on 2D Transition Metal Chalcogenides</td>
<td>Prof. Samaresh Das, CARE</td>
<td>Science and Engineering Research Board (SERB), India</td>
<td>68.86</td>
</tr>
<tr>
<td>Fabrication of 20% efficient doping free carrier-selective contact silicon heterojunction solar cells</td>
<td>Prof. Vamsi Krishna Komarala, DMSE</td>
<td>Department of Science &amp; Technology, India</td>
<td>68.58</td>
</tr>
<tr>
<td>Solvation and Aggregation within Fluorous Media: Mapping Unchartered Territory</td>
<td>Prof. Siddharth Pandey, CHE</td>
<td>Science and Engineering Research Board (SERB), India</td>
<td>63.36</td>
</tr>
</tbody>
</table>

**PATENTS**

From July 2021 to December 2021, seventy-eight Patent Applications have been filed.

**STARTUPS**

During the same period, five startups have been incubated at IIT Delhi.

1. **Calvem Energy Pvt. Ltd.** - has been set up to work in the area of High-Performance Electric Power train. This startup is founded by Mr. Anurag Sharma under the mentorship of Prof. Amit Kumar Jain.

2. **Recaff Pvt. Ltd.** - A startup working towards industrialising the process of recycling and upcycling coffee industry residues is established by Mr. Nakul Gupta under the mentorship of Prof. S. N. Naik.

3. **Ingo Electric Pvt. Ltd.** - High-Performance drive train and retrofitting electric kit in two-wheelers incubated by Mr. Nikhil Gonsalves under the mentorship of Prof. Amit Gupta.

4. **Incipient Materials Pvt. Ltd.** - This startup is set up by Prof. Ashwini Agrawal to develop technologies and processes in the area of high-performance fibres and smart textile materials.

5. **Medic Tech Pvt. Ltd.** - This startup is set up by Mr. Ishu Singhal under the mentorship of Prof. Vivek Kumar to develop a benchtop instrument for the synthesis of nanoscale structures.
IIT Delhi, AIIMS New Delhi and Addverb Co-develop Telerobotic Ultrasound System During COVID Times

The system allows remote ultrasound access through a robotic arm. In the routine ultrasound setting, the doctor (Radiologist) stands in close contact with the patient for the entire scan duration. However, cross-sectional imaging is preferred instead in the current pandemic scenario with stringent social distancing requirements – a more expensive and less dynamic technique. Ultrasonography is a non-invasive, non-ionising, cost-effective, rapid, bedside, and readily available modality with immense use in point-of-care and follow-up examinations. Prof. Amit Mehndiratta from the Centre for Biomedical Engineering is the Principal Investigator of this project.

R&D collaboration with Indian Railways to Develop Easy to Use Train Simulation Software

Researchers from IIT Delhi and Research Designs and Standards Organisation (RDSO), a unit of the Ministry of Railways, have collaborated and developed a train simulation software named ‘Runtrain#’ that outputs results that can be incorporated into timetabling methods. Runtrain# simulation software is an update of ‘Runtrain’ software being used by the Indian Railways since the 1990s.
Runtrain# was developed to analyze a wide range of Train Running Parameters (TRP) such as running time, fuel consumption, coupler force and so on. These parameters help railway personnel in deciding how many locomotives, stock, etc., are to be used and scheduled. The software’s ease of use and visual graphics representation of output make it useful for analyzing frequently occurring planning issues, such as the impact of temporary changes in speed restrictions, halts, train configuration and so on. Prof. Subir Kumar Saha from the Department of Mechanical Engineering is the Principal Investigator.

Advanced Electrical Characterization Laboratory

Setup with an investment cost of Rs. 17 Cr, the recently inaugurated Advanced Electrical Characterization Laboratory at IIT Delhi will enable measurement of electrical performance of devices and circuits that are used in electronic equipment such as mobile phones, space satellites and quantum computers, to name a few. The facility will be accessible to various researchers of IIT Delhi as well as researchers from other institutions. Prof. Abhishek Dixit from the Department of Electrical Engineering is leading this project.

Catalytic Technology for Sustainable Production of Chiral Active Pharmaceutical Ingredients

India is heavily dependent on importing approximately 85% Active Pharmaceutical Ingredients (APIs), and a significant proportion of those APIs are chiral molecules, which are essential building blocks to produce pharmaceuticals, agrochemicals and biologically active compounds.

An IIT Delhi research group, led by Prof. Kuntal Manna from the Department of Chemistry and his PhD students, Ms Neha Antil and Ms Rajashree Newar, has developed a catalytic technology for sustainable and economical synthesis of chiral molecules. The Science and Engineering Research Board (SERB), a statutory body of the Department of Science and Technology (DST), Government of India, has funded this research work.

“The developed catalytic technology may play a crucial role in decreasing the country’s dependence on the import of Active Pharmaceutical Ingredients, which also means lowering of the input cost for the industry that would encourage it to pass on the benefit to the society,” said Prof. Kuntal Manna, Chemistry Department, IIT Delhi.
IIT Delhi Researchers Develop Device to Generate Electricity from Raindrops, Ocean Waves

IIT Delhi Researchers have developed a device called “Liquid-solid Interface Triboelectric Nanogenerator”. Using this device, electricity can be generated from water drops, raindrops, water streams and even ocean waves.

The Ministry of Electronics and Information Technology (MeitY) and the Department of Science and Technology (DST), Government of India, have supported the research work under the NNetRA project. The project is led by Prof. Neeraj Khare from the Department of Physics.

IIT Delhi Researchers Demonstrate a New Drug Delivery Platform Technology

Technology has been developed for chemotherapy applications using Red Blood Cell (RBC) membrane by an IIT Delhi research group led by Prof. Neetu Singh from the Centre for Biomedical Engineering, working jointly with researchers in AIIMS, Delhi. The developed technology is a significant success in achieving personalised therapy as it can be based on the RBC membrane of patient, thereby minimising the side effects.

IN MEMORY

The IRD Unit shares the grief of the bereavement of Shri. Karamvir Singh. He superannuated in the year 2021. Karamvir Ji had been associated with the IRD for nearly fifteen years.
Innovation distinguishes between a leader and a follower

– STEVE JOBS