



॥ त्वं ज्ञानमयो विद्वानमयोऽसि ॥

# ANNUAL REPORT

## 2021-22



Indian Institute of Technology Jodhpur



# Annual Report

## FY 2021-22



॥ त्वं ज्ञानमयो विज्ञानमयोऽसि ॥

**Indian Institute of Technology Jodhpur**

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# Preface



I am happy to report that IIT Jodhpur is making rapid progress in academics, research and outreach despite disruptions caused by COVID. In this year IIT Jodhpur met the target of built-up area and student strength as specified by the cabinet for setting up of the IIT. Among all second generation IITs, IIT Jodhpur is the first IIT to achieve this target.

IIT Jodhpur focused on implementation of different aspects of the new curriculum and new undergraduate and postgraduate programs through a combination of online teaching and limited in-campus instructions due to challenges posed by COVID. While implementing new curriculum, IIT Jodhpur has aligned its plans along the recommendations of NEP targeted towards Higher Educational Institutions like IITs.

Aligned with the spirit of NEP, the institute offers a B.Tech programme with multiple options and opportunities embedded in it. A B.Tech student has capability and

performance linked opportunity to take up additional credits in an area complimentary or different from his parent discipline (minor area) or take advanced courses in a specific sub-domain of his parent discipline (specialisation). The curriculum has been structured in such a way that there is a core B.tech program of 150 graded credits and if they opt, they can do additional 10 credits for a minor or specialisation add-on to his/her degree. Many students have opted for this option in this year. Students have opted for Entrepreneurship as an option for minor and got engaged in innovative product or process conceptualization as part of his B.Tech programme. They can even continue for one additional year and get a M.Tech degree in the area of his minor or specialization. In the case of Entrepreneurship minor area students can continue their entrepreneurial journey as part of their M.Tech and move to an incubator for a start-up – aligned with NEP recommendation of integrating and promoting entrepreneurship as part of formal academic

structure. As an option, students can also switch to a broader Engineering science B.Tech Programme after the first year. Number of students have opted for it. With Engineering Science they are also pursuing a B.Tech in specific Engineering Disciplines. Some of the students, as per our NEP inspired guidelines, has opted for a personalized programme - any meaningful combination of Engineering disciplines, Sciences and Liberal arts - curated for an individual student based upon his/her choice under the supervision of a faculty as part their B.Tech in Engineering Science on top of a foundation in fundamentals of Engineering.

IIT Jodhpur is starting new 4-year BS programmes (aligning with NEP recommendation) with focus on technology directed basic sciences. The curriculum of these undergraduate BS programs is designed to equip students with a strong scientific background so that they can work in frontier technologies.. These programs require students to opt for any one of the focus areas like, Quantum Technology, Energy materials, Photonics as mandatory requirements. Students interested to embark on an entrepreneurial journey can, alternately, opt for Entrepreneurship.

Institute has brought in different aspects of NEP recommendation in its post-graduate programmes as well. In collaboration with AIIMS Jodhpur, IIT Jodhpur has started an innovation oriented joint Masters and Ph.d programme in Medical Technology aligned with the national objective of achieving self-reliance in medical equipment manufacturing. This first batch of Masters in Medical Technology will graduate.

IIT Jodhpur is involved in a number of advanced research, innovation and development activities. Some recently completed distinguished research projects of IIT Jodhpur include:

- Development of a unique method to detect cataract.
- Development of indigenous metal 3D Printer for aerospace and general engineering applications.
- Development of novel framework to enhance the performance of Internet of Things (IoT) systems.

- Development of early warning signs for neonatal, infant mortality.

We have a major initiative in the area of Artificial Intelligence and Internet of things (IoT)-AI of Things (AIOT). With the 5G coming, the use of IoT will be increasing substantially. IoT devices require integration of AI for what we call edge intelligence – intelligent action at the local site contextualized with global situation via high-speed communication network. IIT Jodhpur is embarking on a major programme in this area in collaboration with the state government, consistent with the Semiconductor Mission of the Government of India. Another mission of the Government of India is Digital health Mission and IIT Jodhpur has taken a specific initiative to work on various aspects of digital healthcare in collaboration with AIIMS Jodhpur.

IIT Jodhpur is actively working in the field of Quantum Technologies. Some of the areas of ongoing research are: Quantum Communications, Quantum Cryptography, and Quantum Machine Learning. We have built strong relations also with industries in this area..

IIT Jodhpur is working on preservation and presentation of our tangible and intangible heritage in digital space. IIT Jodhpur has recently undertaken a project on creating digital twin of five museums of Rajasthan government in collaboration with -HUB Drishti and a start-up associated with iHUB Drishti. IIT Jodhpur is also working on creating a born Digital Museum on Crafts of Jodhpur in collaboration with Jodhpur City Knowledge and Innovation Foundation – a city centric innovation initiative supported by the office of Principal Scientific Advisor to Gol.

**Prof. Santanu Chaudhury**

Director, IIT Jodhpur

# IIT Jodhpur

## Vision, Mission & Goals

### VISION

A future-driven institute for nurturing excellence of thought; creating, preserving, and imparting knowledge; and using transformational technologies/interventions with a multidisciplinary approach for responding to societal challenges and aspirations.

### MISSION

- ◆ Foster humanitarian values, passion for learning, and creativity in faculty and students.
- ◆ Move towards high quality, futuristic educational, and research ecosystem.
- ◆ Develop socially responsible faculty, students, and future leaders, committed to creating a self-reliant India.
- ◆ Catalyze a professional internal culture along with enabling infrastructure and ancillary services.
- ◆ Forge effective national as well as international collaboration and partnership with industry and academia for diverse purposes and activities.

### Goals

#### Curriculum

To assimilate balanced, broad-based as well as specialized education in all curricula with opportunities for different kinds of students and their interests.

#### Pedagogy

To establish systems for dynamic development, implementation, and evaluation of futuristic pedagogy including blended-hybrid teaching and experiential learning.

#### Research

Have a globally engaged research ecosystem with state-of-the-art facilities in place, for attaining leadership in research on academic, social, national, and industrial fronts while capitalizing on emerging and in-demand opportunities.

#### Outreach

To be the Institute of Choice for a lifelong learning journey of working professionals, alumni, and the community.

#### Institutional Collaboration

Have an efficient platform in place for forging impactful partnerships with academia, research institutes, business organizations, civil society, governments, and other agencies across the world for contributing to larger goals for humanity.

#### Industry Connect

Ensure ease of collaboration with industry for joint research/ projects, IPR development, technology transfer, and encouraging entrepreneurship/ startups, along with efficient supporting infrastructure and systems.







### Financial Plan

Set up innovative resource mobilization mechanisms and expenditure management systems, embedded in the internal budgetary processes, to have ample resources/ funds for actualizing the institute's vision and goals.

### Infrastructure

Institute will have secure, evolving futuristic digital and physical infrastructure and ancillary services to meet all its needs, along with knowledge infrastructure for supporting learning and enabling skill development.

### Student Life Cycle

Students will find at IIT Jodhpur (i) a vibrant learning environment, with opportunities for excelling in curricular, co-curricular and extracurricular activities, (ii) an effective career development process for their successful initiation to the professions of their choice and (iii) a strong linkage with alumni through regular interactions, support for their lifelong learning and professional development; and enabling their active participation as a stakeholder in the affairs of the institute.

### Agile Organization

Ensure that IITJ continues to be an agile organization for both stability and dynamism as a network of teams with a people-centric culture that operates through fast but considered decision cycles which are enabled by technology, and guided by a powerful common purpose to co-create value for all stakeholders of the institute.

# Board of Governors

## Dr. R. Chidambaram

Chairman, BOG  
DAE-Homi Bhabha Professor  
Former Principal Scientific Adviser to Government of India  
6th Floor, Central Complex, Trombay, Mumbai 400 085  
Email: rajachid@gov.in, rc@barc.gov.in

## Professor Santanu Chaudhury

Member (Ex-officio)  
Director  
Indian Institute of Technology Jodhpur  
N.H. 62, Nagaur Road, Karwad  
Jodhpur 342 030  
Email: director@iitj.ac.in

## Professor Akhil Ranjan Garg

Council Nominees  
Department of Electrical Engineering  
Faculty of Engineering & Technology  
Jai Narayan Vyas University  
Jodhpur 342 011  
Email: agarg@jnvu.edu.in

## Additional Secretary (Technical Education)

Council Nominees  
Department of Higher Education  
Ministry of Education  
118-C, Shastri Bhawan  
New Delhi 110 001  
Email: ashe-mhrd@gov.in

## Professor Narpat S. Shekhawat

Council Nominees  
B131, Prithviraj Nagar  
Near Maharani Park  
Pali Road  
Jodhpur 342 001  
Email: biotechunit@gmail.com

## Shri Anil Bhavarlal Jain

Council Nominees  
Vice Chairman  
MD & CEO,  
Jain Irrigation Systems,  
Jalgaon 425 002  
Email: jisl@lains.com

## Professor Sampat Raj Vadera

Senate Nominees on the Board of Governors  
Head, Department of Physics  
Indian Institute of Technology Jodhpur  
N.H. 62, Nagaur Road, Karwad, Jodhpur 342 030  
Email: srv@iitj.ac.in  
(Tenure Upto: 31.12.2021)

## Professor Surajit Ghosh

Senate Nominees on the Board of Governors  
Professor, Department of Bioscience & Bioengineering  
Indian Institute of Technology Jodhpur  
N.H. 62, Nagaur Road, Karwad  
Jodhpur 342 030  
Email: sghosh@iitj.ac.in

## Professor Mitali Mukerji

Senate Nominees on the Board of Governors  
Department of Bioscience & Bioengineering  
Indian Institute of Technology Jodhpur  
Karwar 342030  
Phone : 0291- 280 1217  
Email: mitali@iitj.ac.in  
(Tenure From : 01.01.2022)

## Chief Secretary

Member (Nominee of State Government)  
Government of Rajasthan  
Secretariat Jaipur  
Jaipur 302 005  
Email: secretaryhte@gmail.com

**Sh. P.G. Basak**

Secretary to the BoG  
 Offg. Registrar  
 Indian Institute of Technology Jodhpur  
 N.H. 62, Nagaur Road, Karwad  
 Jodhpur 342 030  
 Email: registrar@iitj.ac.in

# Finance Committee

**Dr. R. Chidambaram**

Chairman, FC  
 DAE-Homi Bhabha Professor  
 Former Principal Scientific  
 Adviser to Government of India  
 6th Floor, Central Complex, Trombay, Mumbai 400 085  
 Email: rajachid@gov.in

**Professor Santanu Chaudhury**

Member (Ex-officio)  
 Director  
 Indian Institute of Technology Jodhpur  
 N. H. 62, Nagaur Road, Karwad  
 Jodhpur 342 037  
 Email: director@iitj.ac.in

**Mr. S. S. Bhandari, CA**

Members  
 Non-Executive Director on the  
 Board Bank of Baroda  
 P-7, Tilak Marg, C-Scheme  
 Jaipur 302 005  
 Email: bhandariss@hotmail.com

**Additional Secretary (Technical Education)**

Members  
 Ministry of Education  
 Shastri Bhawan  
 New Delhi 110001  
 Email: ashe-mhrd@gov.in

**Sh. Ashoke Guha**

Members  
 3403 ATS Greens II  
 Plot A-58, Sector 50  
 Gautam Budh Nagar  
 Noida 201307, Uttar Pradesh  
 Email: ashoke\_guha@yahoo.co.in

**Joint Secretary and Financial Advisor (JS&FA)**

Integrated Finance Division (IFD)  
 Department of Higher Education  
 Ministry of Education  
 Shastri Bhawan  
 New Delhi 110115  
 Email: jsfa.edu@gov.in

**Sh. P.G. Basak**

Secretary to the Finance Committee  
 Offg. Registrar  
 Indian Institute of Technology Jodhpur  
 N.H. 65, Nagaur Road, Karwad  
 Jodhpur 342 030  
 Email: registrar@iitj.ac.in

# Senate

## Constitution of Senate

The Director, Ex-officio, who shall be the Chairman of the Senate	<b>Prof. Santanu Chaudhury, Director, IIT Jodhpur and Chairman, Senate</b>
The Deputy Director, Ex-officio	<b>Prof. S.R. Vadera, Deputy Director, IITJ</b>
Three persons, not being employees of the Institute, to be nominated by the Chairman in consultation with the Director, from among educationists of repute, one each from the fields of science, engineering and humanities; and	<b>Dr. Sanjeev Misra, Director, AIIMS Jodhpur</b> <b>Prof. H. P. Kincha, Chairman, Karnataka State Innovation Council, Bangalore</b> <b>Prof. Purnima Singh, Deptt. of Humanities &amp; Social Sciences, IIT Delhi</b>
The professors appointed or recognized as such by the Institute for the purpose of imparting instruction in the Institute.	<ol style="list-style-type: none"> <li><b>1. Prof. S.R. Vadera, Deptt. of Physics</b></li> <li><b>2. Prof. Surajit Ghosh, Deptt. of BB</b></li> <li><b>3. Prof. Mayank Vatsa, Deptt. of CS&amp;E</b></li> <li><b>4. Prof. Richa Singh, Deptt. of CS&amp;E</b></li> <li><b>5. Prof. Joydeep Dutta, AIDE (Upto. 31.12.2021)</b></li> <li><b>6. Prof. Neeraj Jain, Deptt. of BB</b></li> <li><b>7. Prof. Somitra Kumar Sanadhya (w.e.f. 7.12.2021)</b></li> <li><b>8. Prof. Ajay Agarwal (w.e.f. 12.05.2021)</b></li> <li><b>9. Prof. Mitali Mukherjee (w.e.f. 25.05.2021)</b></li> <li><b>10. Prof. Manoj Choudhary (w.e.f. 11.10.2021)</b></li> <li><b>11. Prof. Sangeeta Sahney (w.e.f. 27.12.2021)</b></li> </ol>
Deans	<b>Prof. Surajit Ghosh, Dean (R&amp;D)</b>
Heads of the Departments or Schools as may be established by the Institute.	<p>Department of Bioscience and Bioengineering <b>Dr. Meenu Chhabra (Upto 31.08.2021)</b> <b>Prof. Mitali Mukerji (w.e.f. 01.09.2021)</b></p> <p>Department of Chemical Engineering <b>Prof. P.K. Tewari</b></p> <p>Department of Chemistry <b>Dr. Manikandan Paranjothy</b></p> <p>Department of Computer Science &amp; Engineering <b>Prof. Richa Singh</b></p> <p>Department of Electrical Engineering <b>Dr. Arun Kumar Singh</b></p> <p>Department of Humanities &amp; Social Sciences <b>Dr. Ankita Sharma (Upto 31.08.2021)</b> <b>Dr. K.J. George (w.e.f. 01.09.2021 to 30.01.2022)</b> <b>Prof. Sangeeta Sahney (w.e.f. 31.01.2022)</b></p>

Heads of the Departments or Schools as may be established by the Institute.

Department of Mathematics

**Dr. Puneet Sharma**

Department of Mechanical Engineering

**Dr. Prodyut R. Chakraborty**

Department of Metallurgical & Materials Engineering

**Prof. B.P. Kashyap**

Department of Physics

**Prof. S. R. Vadera (Upto 31.08.2021)**

**Dr. Ashutosh K. Alok (w.e.f. 01.09.2021)**

Department of Civil & Infrastructure Engineering

**Dr. Ranju Mohan**

School of Management & Entrepreneurship

**Dr. Krishna Kumar Balaraman**

School of Artificial Intelligence & Data Science

**Director, IIT Jodhpur (Upto 31.08.2021)**

**Prof. Neeraj Jain (w.e.f. 01.09.2021)**

Centre for Emerging Technologies for Sustainable Development

**Dr. Anand K. Plappally**

Centre for Technology Foresight & Policy

**Dr. Deepak M. Fulwani (Upto 31.08.2021)**

**Dr. Krishna Kumar Balaraman (w.e.f. 01.09.2021)**

IDRP

**Dr. S. C. Bose**

One or more members of academic from each of the Departments and Schools, nominated by the Chairman of the Senate, for a period of one year, subject to a maximum of two persons from any Department or School.

Department of Bioscience and Bioengineering

**Dr. Sushmita Jha, Associate Professor**

Department of Chemical Engineering

**Dr. Deepak Arora, Associate Professor**

Department of Chemistry

**Dr. Rakesh Kumar Sharma, Associate Professor**

Department of Civil & Infrastructure Enggg.

**Dr. Debanjan Guha Roy, Assistant Professor**

Department of Computer Science & Engineering

**Prof. Mayank Vatsa**

Department of Electrical Engineering

**Dr. Mahesh Kumar**

Department of Humanities & Social Sciences

**Dr. V. Hari Narayanan, Associate Professor (Upto: 6.12.2021)**

**Dr. Mayurakshi Chaudhuri (w.e.f. 7.12.2021)**

One or more members of academic from each of the Departments and Schools, nominated by the Chairman of the Senate, for a period of one year, subject to a maximum of two persons from any Department or School.

Department of Mathematics

**Dr. Gaurav Bhatnagar, Associate Professor**

Department of Mechanical Engineering

**Dr. Anand K. Plappally, Associate Professor**

Department of Metallurgical & Materials Engineering

**Dr. Appala Naidu Gandhi, Assistant Professor**

**(Upto: 6.12.2021)**

**Dr. Ravi K.R., Associate Professor (w.e.f. 7.12.2021)**

Department of Physics

**Dr. Ashutosh Kumar Alok, Associate Professor**

**(Upto: 6.12.2021)**

**Dr. Satyajit Sahu, Associate Professor (w.e.f. 7.12.2021)**

IDRP, IRC

**Dr. S.C. Bose**

School of Management & Entrepreneurship

**Dr. Sankalp Pratap**

School of Artificial Intelligence & Data Science (AIDE)

**Dr. Dipanjan Roy (w.e.f. 01.01.2022)**

Two distinguished persons from the industry, Research & Development, Financial Institutions and any other comparable organizations, nominated by the Chairman of the Senate, for a period of two years.

**Dr. Souvik Bhattacharyya, Vice Chancellor, BITS Pilani**

**Dr. Jitendra Balakrishnan, CTO-Products, Sterlite Technologies**

Upto five student representatives nominated by the Chairman of the Senate, as special invitees, for a period of one year whose participation shall be for the non-evaluation items of the Senate.

1. General Secretary, Student Senate
2. General Secretary, Co-curricular Affairs
3. General Secretary, PG Academic Interaction Council
4. General Secretary, UG Academic Interaction Council
5. General Secretary, Hostel Affairs (Upto: 25.10.2021)

1. General Secretary, Student Senate
2. General Secretary, ACAC
3. Vice President, Board of Academic Interaction (w.e.f. 26.10.2021)

Invitees

- 1. Professor-in-charge (Faculty)**
  - 2. Professor-in-charge (Infrastructure)**
  - 3. Associate Dean (Academics –UG Programs)**
  - 4. Associate Dean (Academics –PG Programs)**
  - 5. Associate Dean (Students Affairs)**
  - 6. Associate Dean (Hostel Affairs) (w.e.f. 01.09.2021)**
  - 7. Associate Dean (R&D)**
  - 8. Associate Dean (International Relations & Outreach)**
  - 9. Associate Dean (Planning & Resources Generation)**
- Sh. P.G. Basak Offg. Registrar**

Secretary to the Senate

# Building and Works Committee

## Professor Santanu Chaudhury

Director  
Chairman  
Indian Institute of Technology Jodhpur  
NH 62, Nagaur Road  
Karwad, Jodhpur 342030  
Email: director@iitj.ac.in

## Professor Neeraj Gupta

Members  
Department of Architecture,  
Central University of Rajasthan  
NH-8, Bandar Sindri,  
District Ajmer-305817  
Email: ng@curaj.ac.in, ng2560@yahoo.com

## Professor B. Bhattacharjee

Members  
Emeritus Professor  
Department of Civil Engineering  
Indian Institute of Technology Delhi, Hauz Khas  
New Delhi – 110 016  
Email: bishwa@civil.iitd.ac.in

## Sh. Ramesh Chand Jain

Members  
Additional Chief Engineer (Retd.)  
KA-1, Bhagat Ki Kothi Extension, Pali Road  
Jodhpur 342 003  
Email: rameshjain1953@gmail.com

## Prof. Amitava Mitra

Members  
Professor-in-charge (Infrastructure)  
Indian Institute of Technology Jodhpur  
NH 62, Nagaur Road  
Karwad, Jodhpur 342030  
Email: amitra@iitj.ac.in

## Sh. Anil Kumar Jain

Members  
Flat 9-B, Tower -X, Meghdutam Apartments  
Plot F-21C, Sector 50, NOIDA (UP) 201301  
Mob: 9810826028 P- 0120 4903191  
Email: akjain54@yahoo.com

## Sh. P. G. Basak

Secretary to the B&WC  
Officiating Registrar  
Indian Institute of Technology Jodhpur  
NH 62, Nagaur Road  
Karwad, Jodhpur 342030  
Email: registrar@iitj.ac.in

## Chief Project Manager

Special Invitee  
IIT Jodhpur Project Division  
Central Public Works Department (CPWD)  
Nirman Bhawan, Jodhpur 342011  
eMail: cpmitj pz.cpwd@gov.in  
Mobile: (+91) 98181 80952

# Key Functionaries

Details of various key functionaries of the Institute are as follow:

Director <b>Santanu Chaudhury</b>	
Dean (R&D) Surajit Ghosh Associate Deans	
<b>Rakesh K. Sharma</b> , (Upto 31.08.2021)	Research & Development
<b>Shree Prakash Tiwari</b> , (w.e.f. 01.09.2021)	
<b>Suril V. Shah</b> , (Upto 10.03.2022)	Academics (UG Programs)
<b>Gaurav Harit</b> , (w.e.f. 11.03.2022)	
<b>Somnath Ghosh</b> , (Upto 10.03.2022)	Academics (PG Programs)
<b>Atul Kumar</b> , (w.e.f. 11.03.2022)	
<b>Samanwita Pal</b>	Student Affairs
<b>Indranil Banerjee</b>	Hostel Affairs (w.e.f. 01.09.2021)
<b>Deepak Fulwani</b>	Planning & Resource Generation
<b>Kaushal Kumar A. Desai</b>	International Relations & Outreach

## Head of Departments/School/Centers/Division

Department of Bioscience and Bioengineering <b>Dr. Meenu Chhabra (Upto 31.08.2021)</b> <b>Prof. Mitali Mukerji (w.e.f. 01.09.2021)</b>
Department of Chemical Engineering <b>Prof. P.K. Tewari</b>
Department of Chemistry <b>Dr. Manikandan Paranjothy</b>
Department of Computer Science & Engineering <b>Prof. Richa Singh</b>
Department of Electrical Engineering <b>Dr. Arun Kumar Singh</b>
Department of Humanities & Social Sciences <b>Dr. Ankita Sharma (Upto 31.08.2021)</b> <b>Dr. K.J. George (w.e.f. 01.09.2021 to 30.01.2022)</b> <b>Prof. Sangeeta Sahney (w.e.f. 31.01.2022)</b>
Department of Mathematics <b>Dr. Puneet Sharma</b>



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Department of Mechanical Engineering

**Dr. Prodyut R. Chakraborty**

---

Department of Metallurgical & Materials Engineering

**Prof. B.P. Kashyap**

---

Department of Physics

**Prof. S. R. Vadera (Upto 31.08.2021)**

**Dr. Ashutosh K. Alok (w.e.f. 01.09.2021)**

---

Department of Civil & Infrastructure Engineering

**Dr. Ranju Mohan**

---

School of Management & Entrepreneurship

**Dr. Krishna Kumar Balaraman**

---

School of Artificial Intelligence & Data Science

**Director, IIT Jodhpur (Upto 31.08.2021)**

**Prof. Neeraj Jain (w.e.f. 01.09.2021)**

---

Centre for Emerging Technologies for Sustainable Development

**Dr. Anand K. Plappally**

---

Centre for Technology Foresight & Policy

**Dr. Deepak M. Fulwani (Upto 31.08.2021)**

**Dr. Krishna Kumar Balaraman (w.e.f. 01.09.2021)**

---

IDRP

**Dr. S. C. Bose**

---

## Professors In-Charge

C. Venkatesan

Faculty

S. R. Vadera

Stores & Purchase (Upto 31.08.2021)

Amitava Mitra

Infrastructure Engineering

Mayank Vatsa

Corporate Relations (w.e.f. 01.09.2021)

## Registrar

P. G. Basak

Advisor (Admin) & Offg. Registrar

---

## Chairman

Admissions (UG and PG)

Dr. Sandeep K. Yadav

---

## Faculty-in-charge

Grades and Registration (UG & PG)

Dr. Aashish Mathur

Time Table

Dr. Hardik Kothadia

Evaluations (UG & PG)

Dr. Atul Kumar

---

Academic Research Programs	Dr. Gaurav Bhatnagar (Upto 28.02.2022)
Curriculum Implementation (UG)	Dr. Suril Shah (from 11.03.2022 )
Curriculum Implementation (PG)	Dr. Somnath Ghosh (from 11.03.2022 )
PG Admissions	Dr. Chiranjoy Chattopadhyay
UG Admissions	Dr. Deepak Arora
Continuing Education Programme (CEP)	Dr. Venkatesha Murthy R
Security and Transport	Dr. Satyajit Sahu
TISC	Dr. Sankalp Pratap
Technology Park	Dr. Ram Prakash
Marudhara Foundation	Associate Dean (PRG)
Career Development Cell	Dr. Anuj Pal Kapoor
Alumni Relations	Dr. Shankar Manoharan
Guest House and Visiting Faculty Accommodation	Dr. Abir Bhattacharyya

### Coordinators IDRPs

Coordinator- Robotics and Mobility Systems

Dr. Niladri Sekhar Tripathy, (w.e.f. 01 Sep 2021)

Coordinator- Digital Humanities

Dr. Parichay Patra, (w.e.f. 01 Sep 2021)

Coordinator- IoT & Applications

Dr. Kamaljit Rangra, (w.e.f. 01 Sep 2021)

Coordinator- Quantum Information and Computation

Dr. Subhashish Banerjee, (w.e.f. 01 Sep 2021)

Coordinator- Smart Healthcare

Dr. Meenu Chhabra, (w.e.f. 01 Sep 2021)

Coordinator- Space Technologies

Dr. Arun Kumar R, (w.e.f. 01 Sep 2021)

### Liaison Officers

SC & ST	Dr. Ramesh K. Metre, Associate Professor, Department of Chemistry
OBC, PWD and Minority	Dr. Appala N. Gandhi, Assistant Professor, Department of MME
Economically Weaker Sections (EWSs)	Dr. Shree Prakash Tiwari, Associate Professor, Department of EE

### Statutory Charge

Part-Time, Chief Vigilance Officer (CVO)	Dr. Gaurav Harit, Associate Professor, Deptt. of CS&E
Transparency Officer	Dr. S.C. Bose, Advisor (Academic)

First Appellate Authority (RTI)	Deputy Director
Central Public Information Officer (CPIO), RTI	Sh. Ashok K. Khanduri, Jt. Registrar
Assistant Public Information Officer (APIO), RTI	Sh. Prashant Bhardwaj, Assistant Registrar
Estate Officer	Sh. Amardeep Sharma, Joint Registrar
Public Relations	Director's Office
Hindi Officer	Dr. Puneet Sharma, Associate Professor, Deptt. of Maths.

### Nodal Officers

GIAN Program	Dr. Kaushal K. Desai, Associate Professor, Deptt. of ME
Swachh Bharat Abhiyan	Dr. Meenu Chhabra, Associate Professor, Deptt. of BB
Unnat Bharat Abhiyan	Dr. Ananya Debnath (Upto 31.08.2021)
	Dr. Anand K. Plappaly, Associate Professor Deptt. of ME, (w.e.f. 01.09.2021)
Vigyan Jyoti Program	Dr. Priyanka Singh, Assistant Professor, Deptt. of BB (Upto: 6.08.2021)
	Dr. Ritu Gupta, Associate Professor, Department of Chemistry (w.e.f. 07.08.2021)
DAAD Scholarships Program	Dr. Sandip Murarka, Assistant Professor, Deptt. of Chemistry (Upto 31.08.2021)
	Dr. Kaushal K. Desai, Associate Professor, Deptt. of ME (w.e.f. 01.09.2021)
Study in India Program	Dr. Somnath Ghosh, Associate Professor, Deptt. of Physics (Upto 31.08.2021)
	Dr. Kaushal K. Desai, Associate Professor, Deptt. of ME (w.e.f. 01.09.2021)
National Institutional Ranking Framework (NIRF)	Dr. Gaurav Bhatnagar, Associate Professor, Deptt. of Mathematics (Upto: 31.08.2021)
	Prof. Richa Singh, Professor, Deptt. of CS&E, (w.e.f. 01.09.2021)
All India Survey on Higher Education (AISHE) Portal	Dr. Kshema Prakash, Deputy Librarian
Atal Ranking of Institution on Innovation Achievements (ARIIA) Portal	Faculty-in-charge (TISC)
Ek Bharat Shrestha Bharat (EBSB)	Dr. Rohan Diliprao Erande, Assistant Professor, Deptt. of Chemistry
Corporate Social Responsibility (CSR)	Associate Dean (PRG)
Indian Science, Technology and Engineering facilities Map (I-STEM)	Head, CASE
Fit India Programme	Sh. Gaurav Nigam, Superintendent, Office of Students

# The Institute

The Institute has organized its academic and research activities to be conducted through the following Departments, Interdisciplinary Programs (IDRPs), Schools and Centres, whose details are given in the pages to follow:

## Departments

1. Bioscience & Bioengineering
2. Chemical Engineering
3. Chemistry
4. Civil & Infrastructure Engineering
5. Computer Science & Engineering
6. Electrical Engineering
7. Humanities & Social Sciences
8. Mathematics
9. Mechanical Engineering
10. Metallurgical & Materials Engineering
11. Physics



**Interdisciplinary Research Platforms (IDRPs)**

1. Digital Humanities
2. IoT & Applications
3. Quantum Information and Computation
4. Robotics and Mobility Systems
5. Smart Healthcare
6. Space Technologies

**Schools**

1. School of Management & Entrepreneurship
2. School of Artificial Intelligence & Data Science

**Centres**

1. Center for Emerging Technologies for Sustainable Development
2. Center for Technology Foresight and Policy

In addition, Institute has promoted following section-8 companies to achieve specific objectives of collaborative technology development, enhancing innovation ecosystem and outreach to the local community.

- IITJ Technology Innovation & Start-up Centre
- Jodhpur City Knowledge & Innovation Foundation
- iHuB Drishti Foundation
- IITJ Technology Park
- IITJ Marudhara Foundation



# Departments



# Department of Bioscience & Bioengineering

## Introduction

The Department of Bioscience & Bioengineering (BSBE) @IITJ aspires to build a unique academic and research ecosystem that enables the sustainable development of human resource capacity and technological solutions in healthcare, renewable energy, food, and the environment. We provide state-of-the-art domain knowledge and training to understand biological systems as well as innovative Bio-Tech solutions for applications in medical and environmental engineering domains. These include biofuels, diagnostics, therapeutics, and smart healthcare devices.

The Department currently has 17 Faculty members with expertise ranging from fundamental research to applied sciences. These include the areas of brain science; inflammation and immunity; neuronal protein quality control; microtubule biology; tumor biology; molecular microbiology; environmental biotechnology; genomics;

plant functional genomics; computational, structural, and systems biology; nanomedicine, and biomaterials engineering etc. The Department has organized itself into nine thematic areas including cell and molecular physiology, neuroscience & neuroengineering, biomaterials & tissue engineering, genomics & systems biology, environmental biotechnology, molecular microbiology, biophysics, molecular motors & cell motility, and computational biology & bioinformatics. The Department faculty members are also affiliated with the School of Artificial Intelligence and Data Science (AIDE), Centre for Emerging Technologies for Sustainable Development (CETSD), and interdisciplinary research platforms smart healthcare (IDRPSH) that provide avenues and platforms for extensive trans-disciplinary interactions of the faculties and students from diverse disciplines in academic and research programs.

Following are the Faculty Members associated with the department:

## Faculty Members



**Mitali Mukerji**

Professor & Head of Department

**Specialization/ Research interest:**  
Genomics and Systems Biology



**Shankar Manoharan**

Assistant Professor

**Specialization/ Research interest:**  
Molecular Microbiology, Host-Microbe Interaction, Genomics and Metagenomics


**Amit Kumar Mishra**

Associate Professor

**Specialization/ Research interest:**  
 Cellular and Molecular Neuroscience,  
 Cell Cycle Regulation and Cancer

**Sushmita Jha**

Associate Professor

**Specialization/ Research interest:**  
 Cell and Molecular Physiology,  
 Cellular and Molecular Neuroscience

**Priyanka Singh**

Assistant Professor

**Specialization/ Research interest:**  
 Cellular and Molecular Biology

**Sushmita Paul**

Assistant Professor

**Specialization/ Research interest:**  
 Computational Biology and  
 Bioinformatics

**Indranil Banerjee**

Associate Professor

**Specialization/ Research interest:**  
 Tissue Engineering; Regenerative  
 medicine; Biomaterials Theranostic  
 systems; Biomicrofluidic

**Raviraj Vankayala**

Assistant Professor

**Specialization/ Research interest:**  
 Nanobiotechnology; Biomaterials and  
 Photomedicine

**Neha Jain**

Assistant Professor

**Specialization/ Research interest:**  
 Molecular Biophysics and  
 Microbiology

**Surajit Ghosh**

Professor

**Specialization/ Research interest:**  
 Chemical Neurobiology, Chemical  
 Biology and Cancer Biology

**Pankaj Yadav**

Assistant Professor

**Specialization/ Research interest:**  
 Statistical Genetics and Big Data  
 Analytics

**Sudipta Bhattacharyya**

Assistant Professor

**Specialization/ Research interest:**  
 Structural Biology; Enzyme Chemistry  
 and Protein Engineering

**The following new faculty members joined the department during this financial year.**

**Mitali Mukerji**

Professor

**Specialization/ Research interest:**  
 Genomics and System Biology

**Sucharita Dey**

Assistant Professor

**Specialization/ Research interest:**  
 Computational Structural Biology

**Ayan Sadhukhan**

Assistant Professor

**Specialization/ Research interest:**  
 Plant Functional Genomics

**Dinesh Kumar Ahirwar**

Assistant Professor

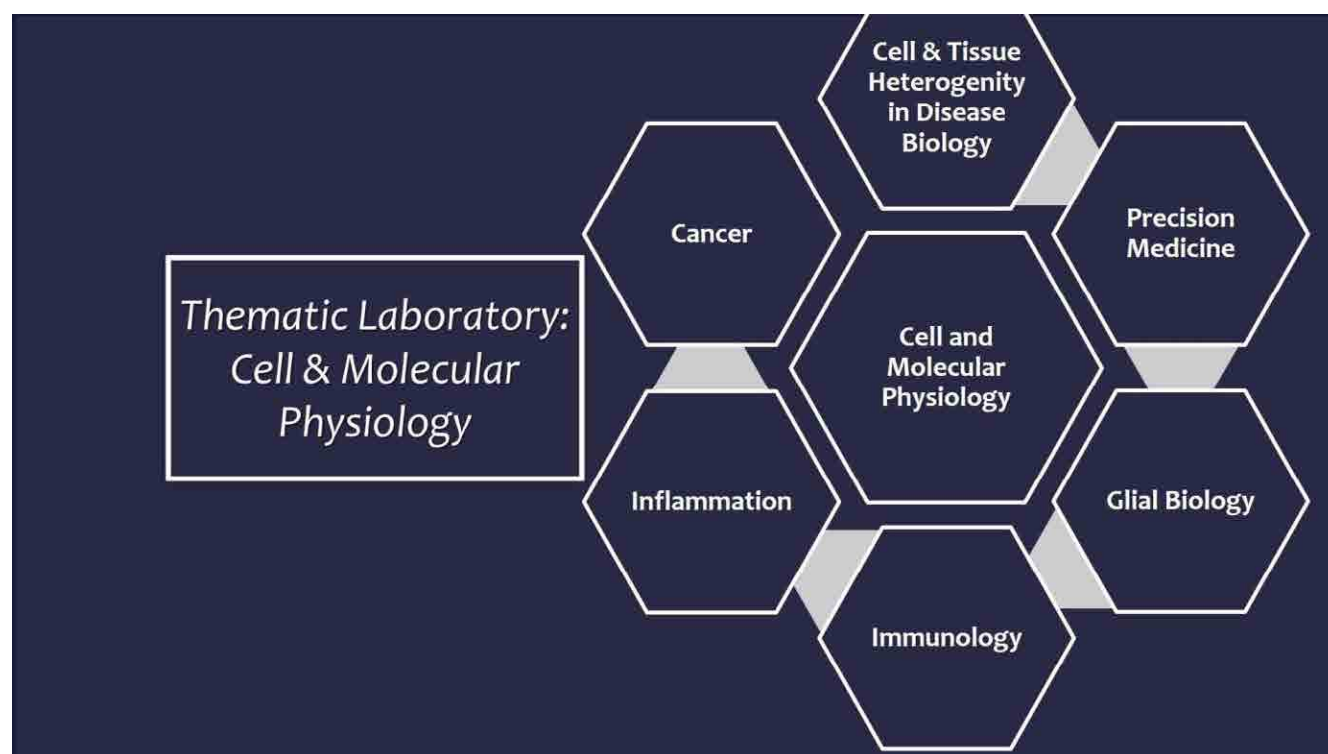
**Specialization/ Research interest:**  
 Tumor Microenvironment



## Description of Research Groups

The following laboratories are functioning in the Department of Bioscience & Bioengineering.

### 1. Cell & Molecular Physiology Laboratory



**Faculty members associated:** Dr. Amit Mishra, Dr Sushmita Jha and Dr. Dinesh Ahirwar

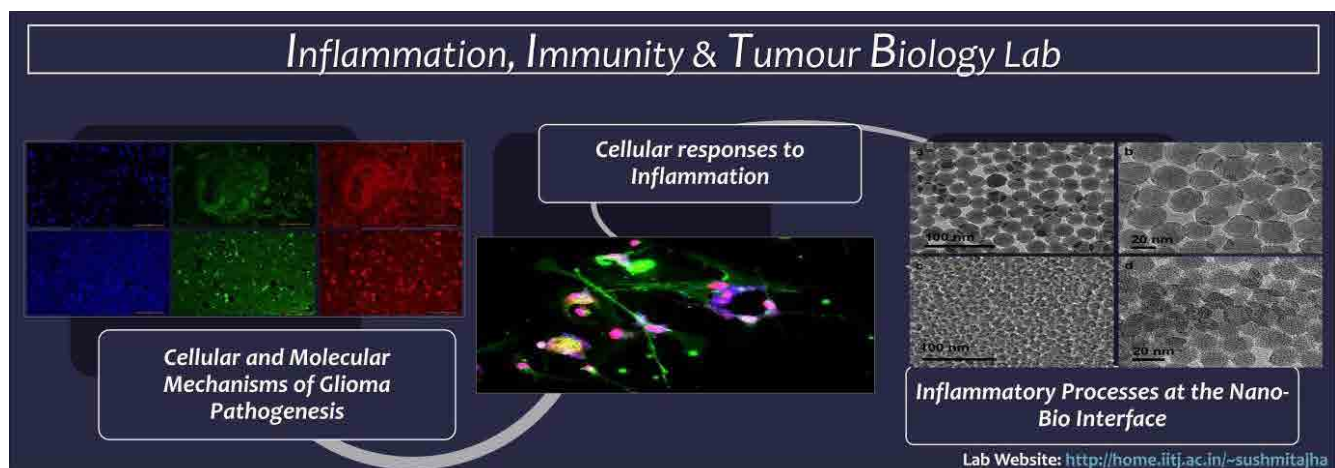
The thematic area in Cellular and Molecular Physiology focuses on understanding how cellular and molecular processes give rise to complex physiologic functions. Our understanding of the normal and diseased states of human physiology allow for development of better technologies and therapeutics to tackle disease, prolong life-span and delay disease progression. Additionally, studies of physiology can allow for development of bioinspired engineering solutions.

#### Groups under this theme

##### 1. Inflammation, Immunity & Tumor Biology Group

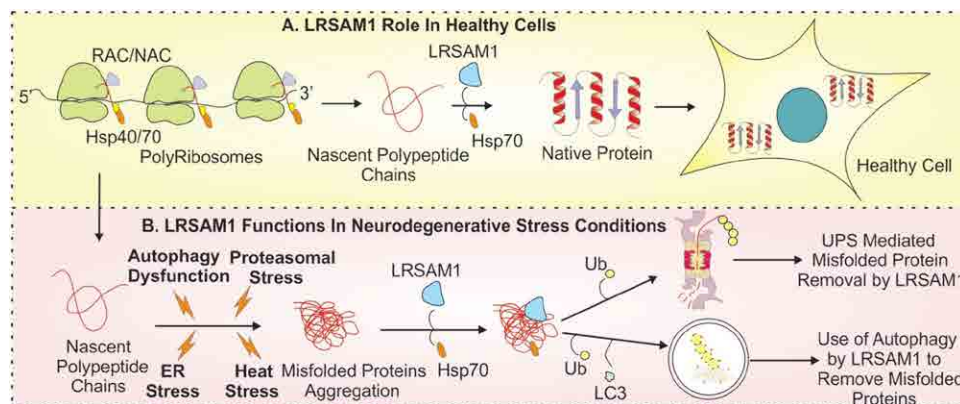
Research within this thematic area focuses on two leading healthcare issues in India; environmental pollution with nanosilica and cancer (specifically brain tumours- gliomas). Malignant gliomas, the most common primary brain tumors that arise from glial cells within the central nervous system (CNS), are among the most fatal human cancers. With a median survival of only 14.6 months even after aggressive therapy with surgery, radiation, and chemotherapy, most patients succumb to their disease within two years of the initial diagnosis. Taking into consideration, the paradigm shifts from traditional surgical resection to precision medicine, we use a multi-pronged approach taking into account the cellular heterogeneity of gliomas, their microenvironment and 3-dimensional cell-cell interactions to identify the role of innate immunity and inflammasome signalling pathways in gliomas. This could potentially provide a novel link between innate immunity and glioma pathophysiology with widespread therapeutic implications for

delaying glioma progression and/or sensitizing gliomas to other treatment modalities. Our aim is to develop three dimensional tumor spheroids as a personalized medicine framework to allow for pre-clinical drug development, biomarker analysis, drug-testing model, as well as basic cancer research. Importantly, our research aims to create a deeper understanding of glioma pathophysiology from the Indian subcontinent and develop technologies for precision medicine. Another focus of our research is to understand the effects of amorphous nanosilica on cellular and molecular physiology. Amorphous nanosilica exposure has widespread applications and with increased human exposure it is critical to understand the interaction of these with the human immune system. We are analyzing size, concentration and exposure time-dependent effects of amorphous nanosilica on human bronchoalveolar epithelial, endothelial and fibroblast cells. In addition, innate immune regulators associated with nanosilica internalization and subsequent inflammatory pathways are being explored.



A patent has been filed for a portable hypoxia chamber that has been developed at IITJ. The process of translating this technology with the help of Industry partners is underway. Assistance has been provided to colleagues from Defense Lab Jodhpur in evaluating wound dressing properties of chitin membranes containing nanosilver and it has been published in Biomedical Physics & Engineering Express, IOP Science, Volume 4, Number 2, 2018, <https://doi.org/10.1088/2057-1976/aaa9ca>. Recently funding has been received from the Ministry of Electronics and Information Technology (MEITY) for development of an interdisciplinary research platform for dissecting the complex cellular interactions using human tumor derived spheroids, computational biology and artificial intelligence-based approaches.

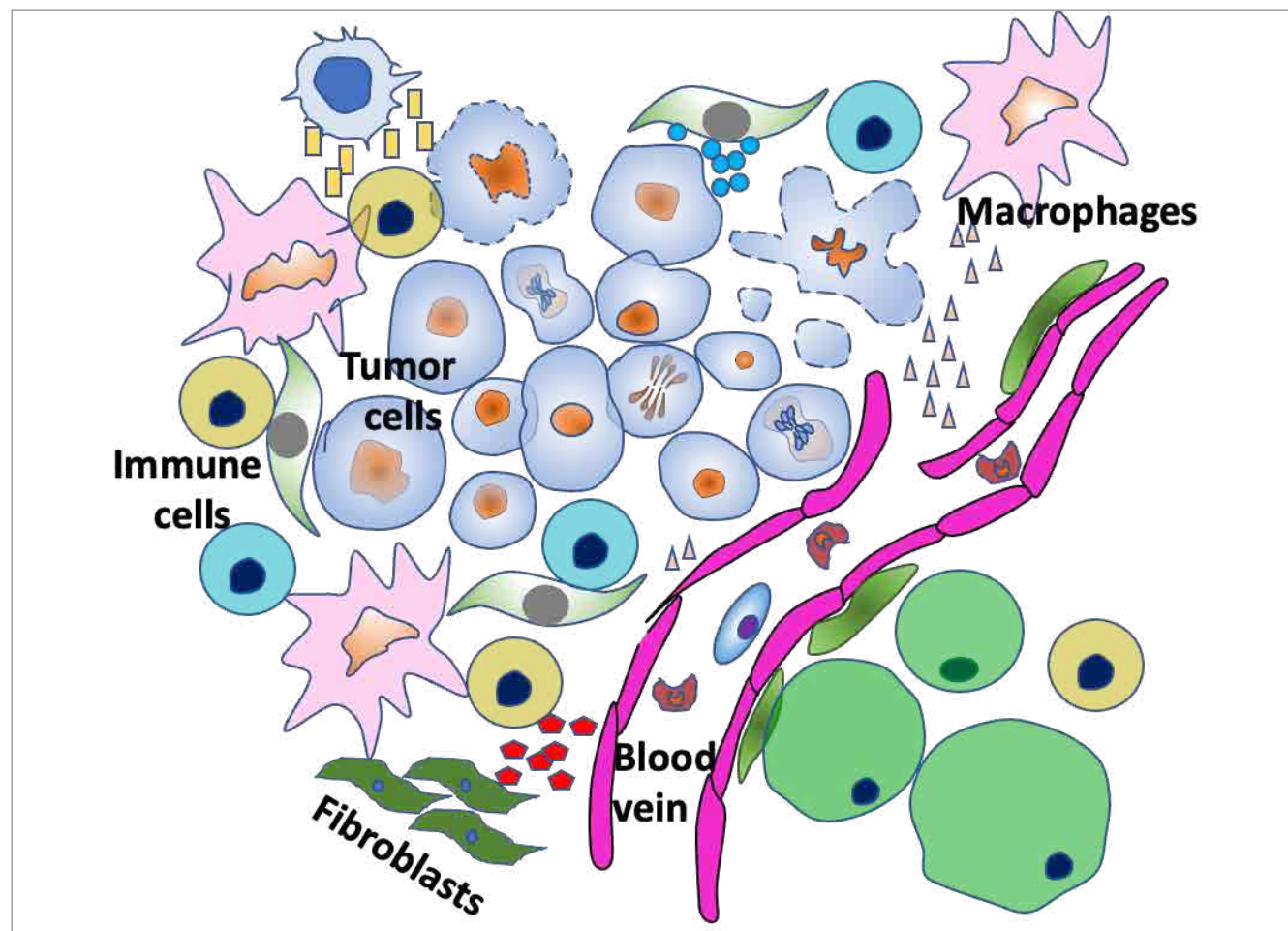
## 2. Cellular Proteome Complexity and Physiology:



Quality Control E3 Ubiquitin Ligase: Regulate Cellular Proteome Complexity

Proteins in their native conformation are essential for maintaining the structure and function of different cellular systems. Multiple cellular physiological processes depend on proteins for their smooth functioning, such as cell growth, division, and metabolism. Any alteration in the native structure of proteins due to stress events can cause their misfolding and disturb cellular homeostasis. Cells retain multiple protein quality control (PQC) pathways, including protein folding and refolding through chaperones, clearance of misfolded proteins through ubiquitin-proteasome system (UPS), and bulk degradation of protein aggregates through autophagy to re-establish homeostasis. Failure of these pathways in multiple proteinopathies, including neurodegenerative diseases can lead to aggregation of misfolded proteins into amyloids and other protein inclusion bodies. Our lab investigates the mechanistic basis of PQC components, including chaperones (Hsp70), E3 ubiquitin ligases (LRSAM1, MGRN1), proteasome, and autophagy-related proteins (p62, LC3, LAMP2). We also study the possible effects of modulation of these components via natural (myricetin, lanosterol) and synthetic compounds (indomethacin, diclofenac, ibuprofen) on pathological conditions. Our work can improve the fundamental understanding of PQC pathway's effects on cellular and molecular physiology. The reported modulators can be further investigated for their clinical translational potential against complex diseases, as many of them have the advantage of being already approved by regulatory bodies.

### 3. Tumor Microenvironment Group

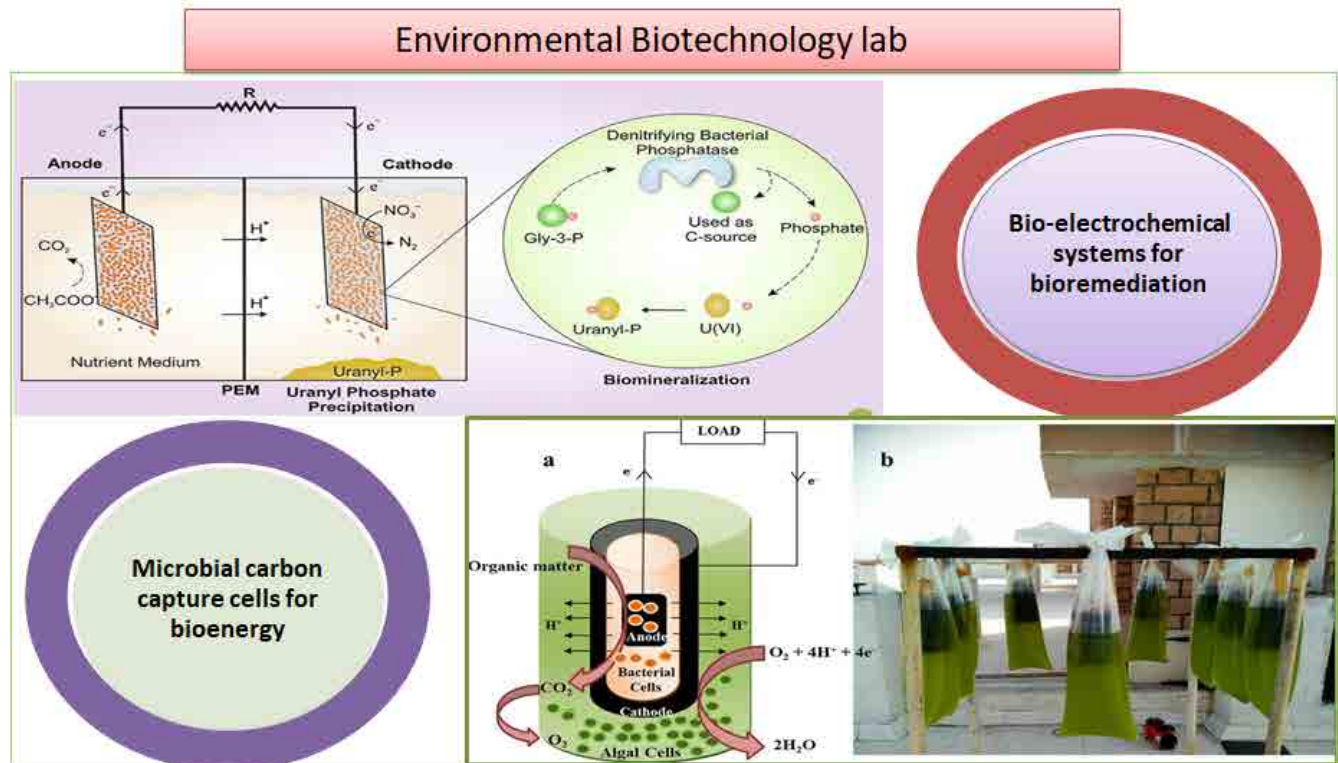


**Tumor microenvironment:** Interaction of tumor cells with different types of host cells

Recent comprehensive and integrated studies using modern technologies, including next-generation sequencing, mass cytometry, and multiplex immunostaining, have established the solid tumors as a complex organ. These studies have shown that, along with malignant cells, the tumor contains various types of host cells and non-cellular components, creating a complex tumor microenvironment (TME). The tumor cells hijack the host cells to acquire aggressive properties. Tumor educated host cells, including tumor-associated macrophages, myeloid-derived suppressor cells, cancer-associated fibroblast, and regulatory T cells have been shown to support the spread of tumor to other organs, known as metastasis, which is the major cause of cancer related death. Therefore, it is imperative to study the tumor and host cells interaction occurring in the TME to better understand the mechanisms of cancer pathogenesis and harness this knowledge to develop novel therapeutic targets against this deadly disease.

The major focus of our lab is to understand the role of immune cells, including macrophages and T cells in tumor progression and metastasis. Using genetically engineered cell lines, transgenic mouse models and modern proteogenomic techniques, we are trying to identify the molecular mechanisms involved in tumor cells and immune cells cross-talk that leads to tumor progression and metastasis. Furthermore, using mouse models which are humanized and harbor patient-derived tumor samples, we are performing high quality pre-clinical studies, which can be quickly transferred into clinics and provide effective therapeutic options to the cancer patients.

## 2. Environmental Biotechnology Laboratory

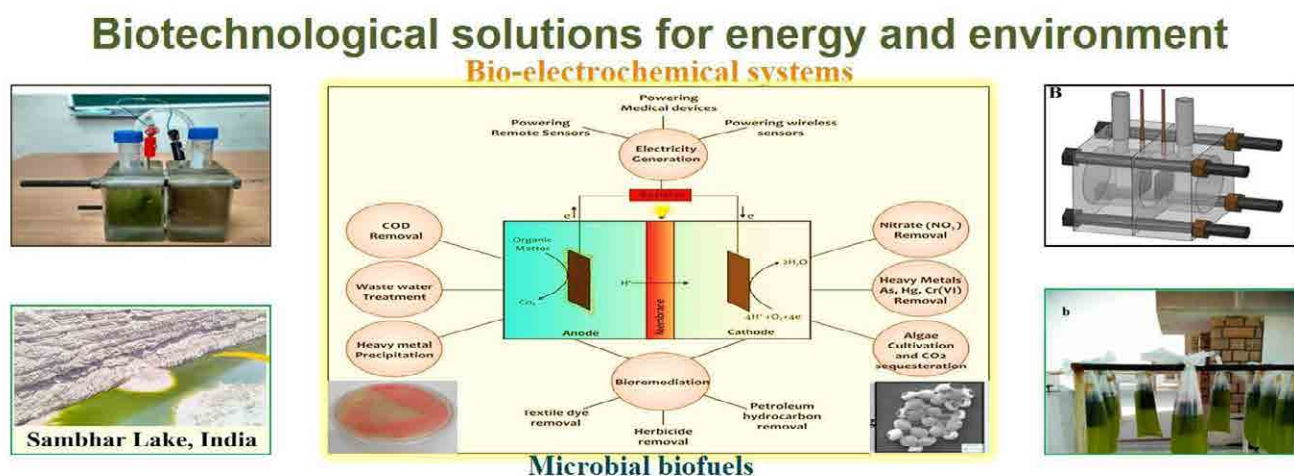


**Faculty members associated with this theme:** Dr. Meenu Chhabra

Environmental biotechnology thematic lab at IITJ focuses on applications of microorganisms to curb environmental pollution, provide clean energy, and remediate toxic or hazardous waste. The versatile microbial metabolism enables their utilization for environmental cleanup. Another critical focus is waste to energy conversion systems, in particular, bioelectrochemical systems which combine the versatility of microbial metabolism with electrochemistry. The bioelectrochemical systems can also serve as biosensors for environmental monitoring and assessment.

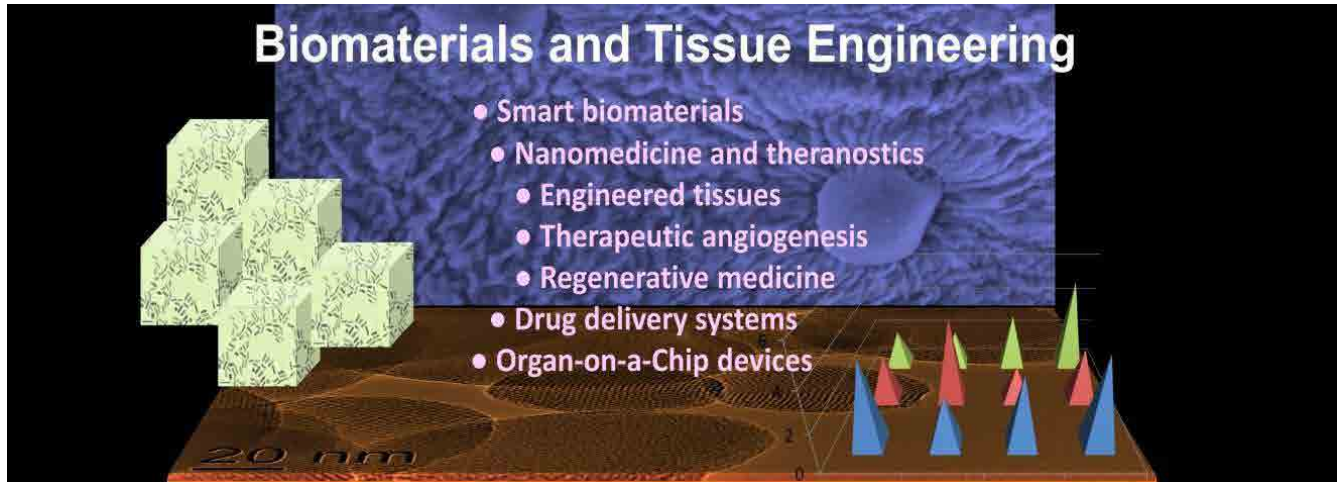
## Groups under this theme

### 1. Bioenergy & Bioremediation Group



To foster the research on technologies associated with renewable bioenergy and environmental mitigation, the environmental Biotechnology lab was established in the department in 2011. The critical problems associated with bioenergy and bioremediation are addressed using Bio-electrochemical systems namely Microbial Fuel Cells. A decade-long research has led to the development of the process for simultaneous removal of U(VI) and Nitrate that was subsequently tested at BARC, Mumbai. Similarly, a low-cost microbial carbon capture cell for algae cultivation and power generation was developed as a part of DBT-funded pan IIT center on Bioenergy. Further, the research group is actively collaborating with other engineering departments to test the process applicability on industrial flue gas carbon capture. The expertise on bio-electrochemical systems has been extended towards the development of sensors for IoT applications. In this regard, an interdisciplinary project on point of use and inline coliform sensors for smart water management was funded recently by the Jal Jeevan mission, ministry of Jal Shakti. The group strives to find sustainable solutions for energy and environment. In this regard, the research on plastic waste bioremediation needs impetus and researchers have been trying to develop microbial consortia from the plastic waste dump sites. Moreover, combinations of treatments are being tested for plastic waste remediation.

### 3. Biomaterials & Tissue Engineering Laboratory



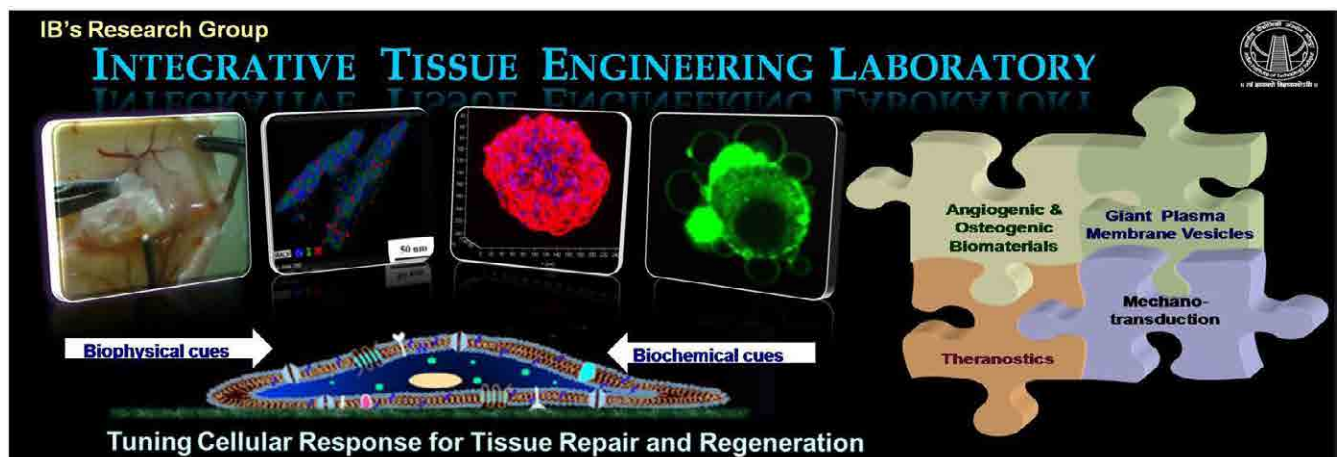
**Faculty members associated:** Dr. Indranil Banerjee and Dr. Raviraj Vankayala

Biomaterials and Tissue Engineering is a transdisciplinary knowledge domain and encompasses sub-domains of material science, chemistry, physics, cell and molecular biology, chemical engineering, mechanical engineering, nanotechnology, and microfluidics. The rapid evolution of biomaterials and tissue engineering is driven by the growing needs of medical devices, implants, drug delivery vehicles, and engineered tissues. Biomaterials and Tissue engineering has now become an integral component of the translational research in bioengineering.

#### Groups under this theme

##### 1. Integrative Tissue Engineering Group

The focus of the Integrative Tissue Engineering Laboratory is to decipher the underlying mechanism of tissue repair and regeneration over a length scale of 'micro to nano', and to translate the understanding into bioengineering strategies for tissue engineering and regenerative medicine. Precisely, the lab aims to address three fundamental questions. Firstly, what are the novel clues (universal or cell specific) that contributes significantly to the physiological processes related to tissue repair and regeneration; secondly, how these different cues/factors co-exist, modulate and cooperate in tissue repair and regeneration and finally, up to what certainty such factors can be manipulated spatio-temporally to engineer the outcome of tissue engineering and regenerative medicine.

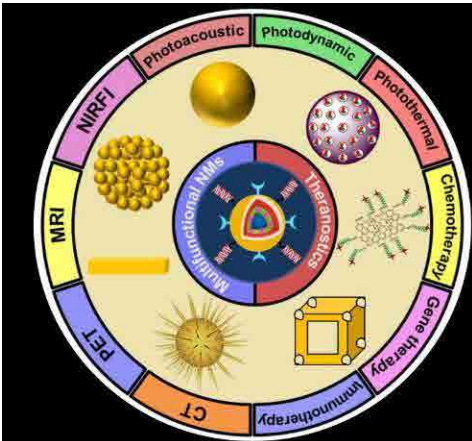


In pursuance of the goal, a trans-disciplinary approach has been adopted that involves strategic amalgamation of the knowledge and techniques of cell biology, regenerative biology, biomaterial science, microfluidics, nanotechnology and tissue engineering. The benefit of such an approach is that it is comprehensive and integrative in nature like any complex physiological process. It is believed that the integrative approach will help us to gain a deep insight and comprehensive understanding of tissue repair and regeneration. Furthermore, such an approach will make tissue engineering an affordable, reproducible and safe health care technology in near future for on-demand production of the so-called spare parts of the human body.

**In line with the goal, the following problems are being deduced:**

- (i) Deciphering the mechanism of angiogenesis and tuning of the biomaterial mediated angiogenic response
- (ii) Mechanistic analysis of osteogenic differentiation and biomaterial induced osteogenesis
- (iii) Reconstruction of cell-friendly 3D microarchitecture with reproducible design parameters for bone tissue engineering.
- (iv) Synthesis and characterization of cell derived membrane vesicles and understanding of its regenerative potential.
- (v) Development of organ-on-chip to probe the cellular cross talk

## 2. Nanomedicine and Biomaterials Group



### Nanomedicine & Biomaterials Lab

We explore the molecular design to engineer new generation multi-functional nanomedicines and biomaterials which have potential to address various challenges in tackling diseases. There are five research directions:

- Inorganic nanomaterials for cancer theranostics
- Polymeric and biomimetic delivery systems
- Biomaterials for modulation of tumor microenvironment
- Nanomaterials for gene therapy
- Biomaterials for immunoengineering

This is highly interdisciplinary, as we are positioned at the intersection of engineering, biology and medicine. We work towards the clinical translation of these technologies.

Research under the thematic area is primarily focused on the synthesis and characterization of smart biomaterials and nanomaterials, nanomedicine and nanotheranostics, drug delivery, engineering of tissue graft, organ-on-a-chip devices, therapeutic angiogenesis, and regenerative medicine. The major focus is to develop new generation multi-functional materials, which have tremendous potential to address challenges in tackling various diseases, such as cancer, ischemic stroke and other neurodegenerative diseases. In particular, we work on inorganic and organic nanomaterials for cancer theranostics, polymeric and biomimetic delivery systems, and nanomaterials for gene therapy.

## 4. Molecular Microbiology Laboratory

**Faculty members associated:** Dr. Shankar Manoharan and Dr. Neha Jain

Microbial cells living in the human gut outnumber the total human cells in our bodies. Also, one is regularly exposed to several microbes from the environment. It is therefore essential to understand the biology of microbes that may be beneficial to us as well as those, which are potentially harmful. Using molecular methods, an attempt is made to understand the basic functioning of individual microbial cells as well as microbial communities. Microbes shift to a community mode of growth, often under stressed conditions, by forming biofilms. Biofilms can be polymicrobial and are difficult to eliminate as they are resistant to stresses that individual bacteria are sensitive to. A small group of researchers working under this theme use molecular methods and genomics approaches to understand the physiology of individual microbes as well as their communities.




### Groups under this theme

#### 1. Molecular Microbial Physiology Group

Hospital-associated infections caused by *Klebsiella pneumoniae* contribute significantly to the disease burden, especially in low- and medium-income countries. Most hospital-associated pathogens are rapidly acquiring virulence factors and becoming resistant to commonly used antibiotics, thereby largely limiting treatment options. Current work is aimed at deciphering how virulence is regulated in the pathogen *K. pneumoniae* using genetic and genomic approaches. Specifically, mechanisms that control virulence at the post-transcriptional level are being explored. This work will contribute to the development of anti-virulence strategies, where the expression of one or more key virulence factors can be affected. This is expected to decrease the overall virulence of the pathogen and easier clearance by the host immune system.

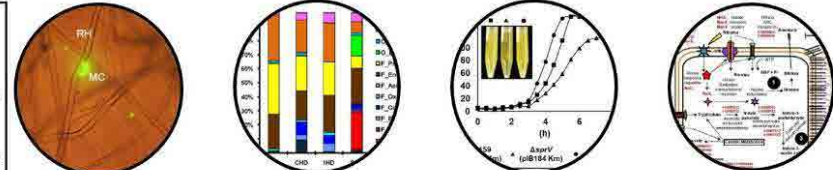


In addition, microbial communities in the human gut have gained focus for their effect on host disease response, drug response, metabolism, behavior and even emotions. Work from the department is under progress to understand the impact of external stimuli on the human gut microbiota and how changes in the microbial community impact the host. Specifically, the effect of the very commonly prescribed, antidiabetic drug on the human gut microbiota is being explored. Future research to probe other environmental stimuli including specific food items, food additives, prebiotics, probiotics and common exposures is also being planned. Four Ph.D. students are currently working in this area. Collaborative work from the Microbial Physiology Lab has shown that modulation of gut microbes in iNOS knock-out mice remediates insulin resistance (Aggarwal et al., *Front. Cell. Infect. Microbiol.* 2021). In collaboration with AIIMS Jodhpur, we have also sequenced and analyzed the genome of a hypermucoviscous clinical isolate of *Klebsiella pneumoniae* with no known genetic determinants of hypermucoviscosity (Dey et al., *Microbiol. Spectr.* 2022).



**Microbial  
Physiology  
Laboratory**

**Bacteria: The Good, Bad and Ugly**



**Virulence in hospital-associated pathogens**


- We study virulence factors of hospital associated pathogens using genetics methods to develop strategies and overcome antibiotic resistant infections

**Microbial Genomics**

- We use genomics and transcriptomics to understand bacterial evolution and behavior during infection

**Metagenomics**

- We study microbial communities associated with medically relevant environments like the human gut



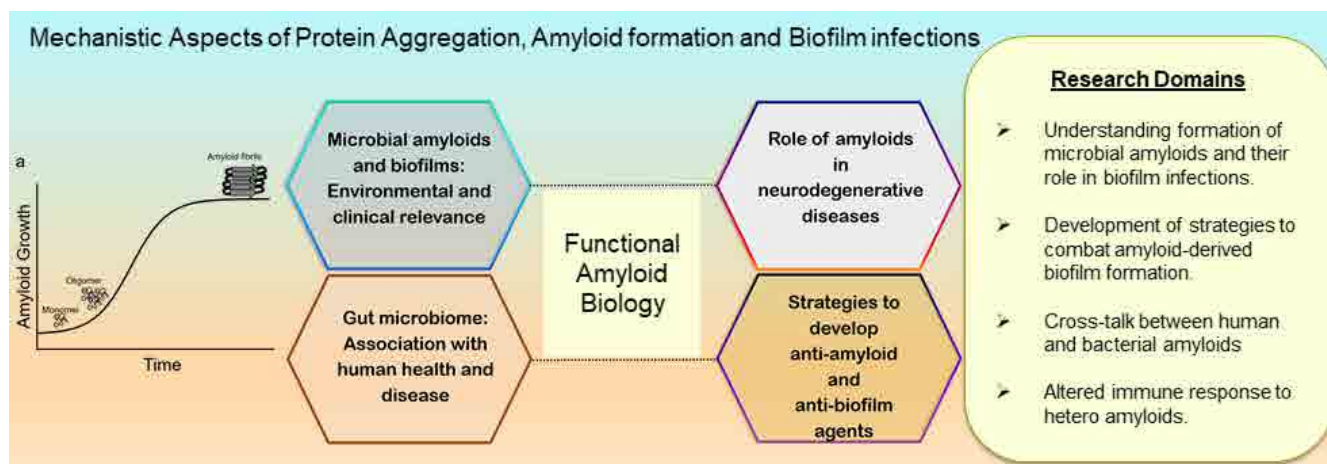
Department of Bioscience  
& Bioengineering

☎ 0291-2801209

🌐 <https://sites.google.com/view/mplaboratory/>

## 2. Functional Amyloid Biology Group

Amyloids are highly stable ordered cross- $\beta$ -sheet aggregates of proteins which are considered as the hallmark of neurodegenerative disorders like Parkinson's and Alzheimer's. Recent years have witnessed the emergence of a new class of amyloids designated as 'functional amyloids' where the amyloid fold is not deleterious to the cell, but is instead harnessed to perform diverse functions. Functional amyloids are produced by all cell types from microbes to human beings. A majority of the microbial amyloids play roles in surface adhesion (biofilm formation) and structural integrity and thus provide a fitness advantage. Often, these microbial amyloids play a key role in the progression of human diseases. Current work focuses on amyloids that have both functional and disease-associated properties. For example, the role of microbial amyloids in the progression of neurodegenerative diseases are being explored. Additionally, strategies to combat persistent bacterial infections, often caused by biofilms by disruption of these biofilms are being explored. The group has one SERB funded project and three Ph.D students working in this area. Two M.Tech students contributed in this area have graduated from the group. Recent work from the lab has demonstrated the different species during amyloid formation and their response to immune system (Nicastro et al *PLoS Pathogens* 2022).



## 5. Biophysics Laboratory

**Faculty members associated:** Dr. Sudipta Bhattacharya and Dr. Neha Jain

“Seeing is believing” ... according to this famous quote, visual inspection paves the most convincing way to divulge naturally occurring phenomena. In the structural biology and protein engineering lab, we aim to elucidate complex biological phenomena by unraveling the molecular snapshots of the concerned pathways through the atomic resolution structures of the macromolecules involved. For this purpose, we principally use the cutting-edge tools of structural biology (X-ray diffraction crystallography and single particle Cryo-Electron microscopy) to define the structure-function behavior of biological macromolecules.

### Groups under this theme

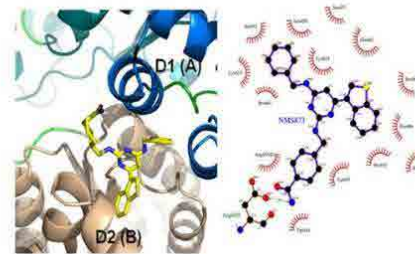
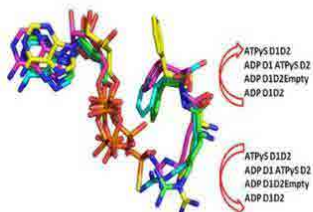
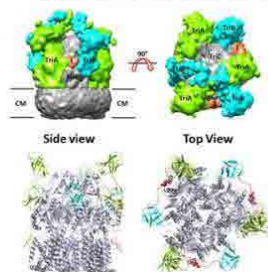
#### 1. Structural Biology & Protein Engineering Group

The main focus is to deduce the molecular mechanism of diseased conditions. Likewise, taking a reductionist’s approach we target proteins or protein complexes involved in disease progression and pathogenesis to reveal their molecular mechanism of action. The detailed three-dimensional structural information gained thereof, not only pinpoint the role of the target proteins/protein complexes but also help design structure-based lead inhibitor libraries against these potential drug target candidates. Further kinetic characterization of these potential inhibitor leads against the drug candidate proteins is performed to validate their antagonistic properties in vitro. The structural biology and protein engineering lab also aims to engineer industrially important enzymes to customize their structure-function to cater industrial needs. The high-resolution structural information of the industrially important protein(s)/enzymes(s) also enable us to gain significant insights into their structure-function relationships which in turn allow us to tailor their function by the state-of-the-art protein engineering and bioinformatic tools. Recently we published the high resolution Cryo-EM structure of *Pseudomonas aeruginosa* drug efflux pump, TriABC. TriABC efflux pump plays the central role in *Pseudomonas aeruginosa* drug resistance (Fabre et al., Structure 2021) In our other recently published works, we used the combined approach of synthetic chemistry and pharmacophore guided drug discovery to design therapeutic leads against drug resistant opportunistic pathogen *Staphylococcus aureus* (Mali et al., ACS Omega 2021) and *Mycobacterium tuberculosis* (Jain et al., Org. Biomol, Chem 2022.; Singh et al., FEBSJ 2022) .



## Structural Biology & Protein Engineering Lab

- ❖ Structure based functional characterization of biological macromolecules
- ❖ Structure guided designing of inhibitor leads against drug target proteins
- ❖ Structural elucidation and catalytic engineering of industrial enzymes



### 2. Functional Amyloid Biology Group (description aforementioned)

## 6. Computational Biology & Bioinformatics Laboratory

**Faculty members associated:** Dr. Sushmita Paul, Dr. Pankaj Yadav and Dr. Sucharita Dey

Computational Biology and Bioinformatics is a rapidly developing multidisciplinary field. There has been a great increase in the amount of biomedical data over the past decade. Along with the expanding application of large-scale genomic sequencing, other modalities such as mobile health (mHealth) data and imaging have added to the rise. At the same time, computing power and storage capacity have continued to increase, allowing us to now mine and model biological data with unprecedented ability. The research activities include computational modeling of biological processes, computational management of large-scale data sets, database development and data-mining, algorithm development and high-performance computing, as well as statistical and mathematical analyses.

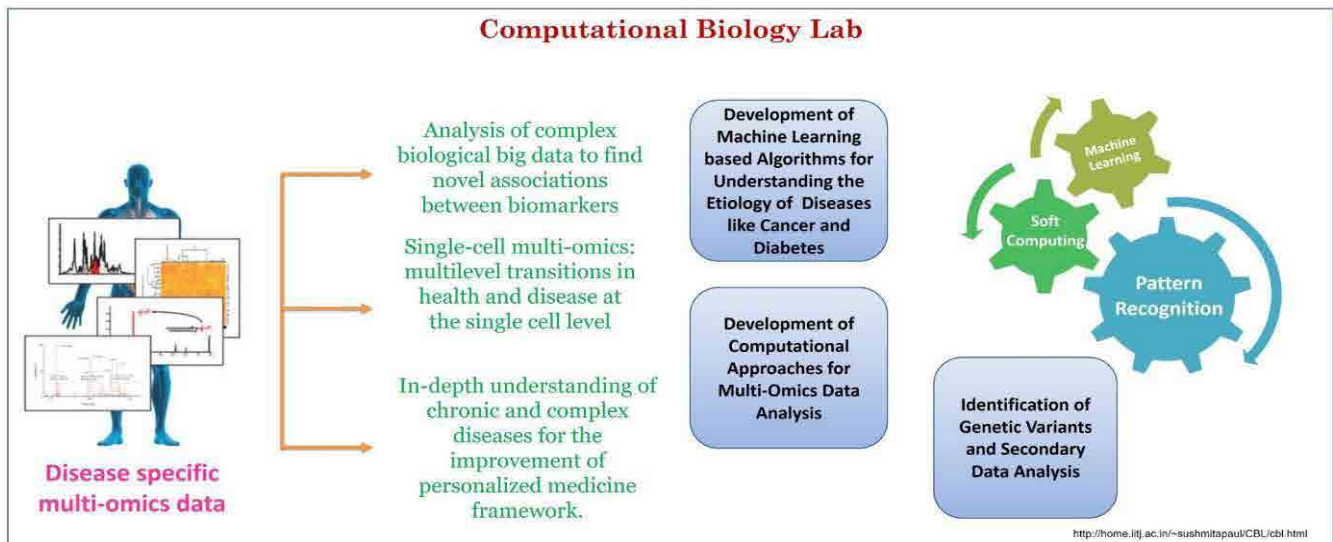


### Groups under this theme

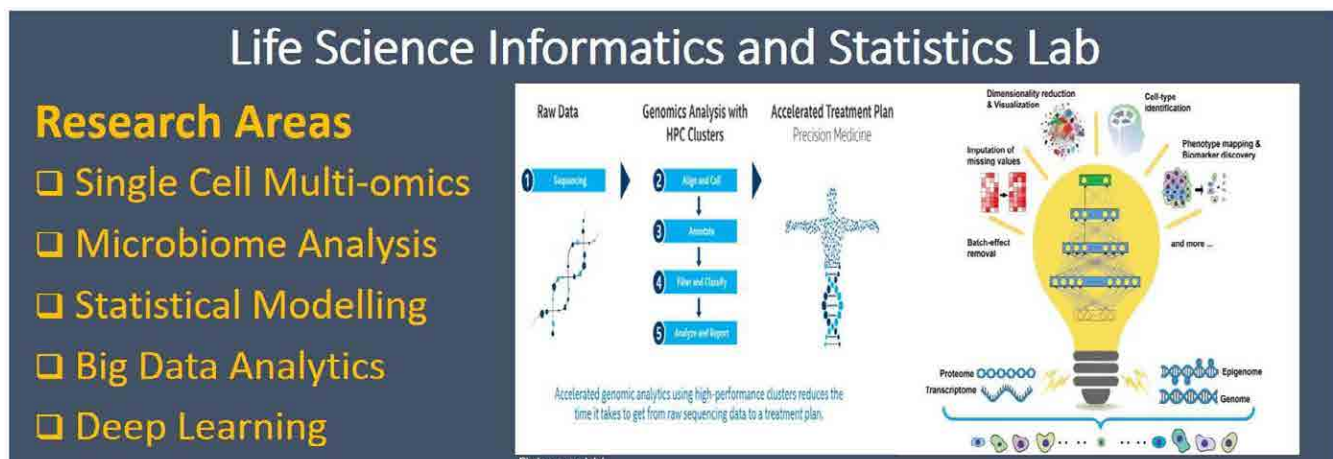
#### 1. Computational Biology Group

Computational Biology Lab (CBL) is established to carry out fundamental and advanced research in the fields of computational biology and bioinformatics. Dr. Sushmita Paul's research group carries out research in multi-omics data analysis, development of pattern recognition algorithms for analysing high dimensional biological data, analysis of genome variation, development and application of bioinformatics tools. The group is actively involved in development of algorithms for identification of miRNA-mRNA modules in various diseases by using multi-omics

data. Another important challenge related to multi-omics data analysis is classification of cancer subtypes. In this regard, the group has developed an algorithm for effectively classifying the cancer samples into their respective sub-types. The group is also involved in functional annotation of genomic variants in the Indian population, sub-grouping of the Indian population based on genetic variants. The group is also focusing on development of an AI based framework to predict patient outcome to treatment based on patient biopsy derived tumour spheroid. The group also developed several algorithms/frameworks to identify Type II diabetes genes by judiciously integrating gene expression data and protein-protein interaction network data. The CB Lab also conducted an international workshop on Recent Advances in Biomedical Data Analysis at Olsztyn, Poland, 2017 ([http://ijcra2017.uwm.edu.pl/?page\\_id=190](http://ijcra2017.uwm.edu.pl/?page_id=190)). In 2019, the lab organized a national level workshop on Computational Biology and Bioinformatics at IIT Jodhpur (<http://home.iitj.ac.in/~sushmitapaul/Workshop2019/>). We have developed several algorithms to analyze multi-omics data where we have addressed several important biological questions (Paul et al., Scientific Reports, 2017, Sharma et al. Scientific Reports, 2019, Paul et al., IEEE TCBB 2019, Pant et al. JBI, 2019, Paul et al., IEEE TCBB, 2020, Pant et al. IS:CLS, 2021, Madhumita et al. JIB, 2022, Madhumita et al. CBM, 2022, Madhumita et al. Scientific Reports, 2022).



## 2. Life Science Informatics & Statistics Group







Centrosomes are molecular machineries which are involved in a plethora of cell functions like spindle organization, cell migration and cell polarization. Their number, position, organization & functioning is precisely regulated in a cell. Any defect in centrosome structure or number could lead to several human diseases like cancer, neurodevelopmental disorders and ciliopathies. The Centrosome Biology group is utilizing a combination of cellular, molecular and biochemical approaches, in order to understand the molecular details of centrosome organization in mammalian cells. The work has provided mechanistic insights in the role of regulatory proteins involved in functioning of mitotic cellular machinery (Jaiswal S. et al, 2021; Singh P. et al, 2021; Gallad E. et al., 2020; Jaiswal S. 2020; Shahid U. et al., 2018). Recent, collaborative work from the group has identified the role of FOX signalling at the core of GDF-15 mediated aggressiveness of breast cancer (Modi A. et al., 2022). Further, the group is involved in the identification of a novel chemical scaffold which target microtubule cytoskeleton proteins in cancer cells (Jaiswal S. et al., 2022; Parida S. K. et al., 2022, Parida S. K. et al., 2021).

## 8. Neuroscience & Neuroengineering Laboratory

**Faculty members associated:** Prof. Neeraj Jain, Prof. Surajit Ghosh, Dr. Sushmita Jha and Dr. Amit Mishra

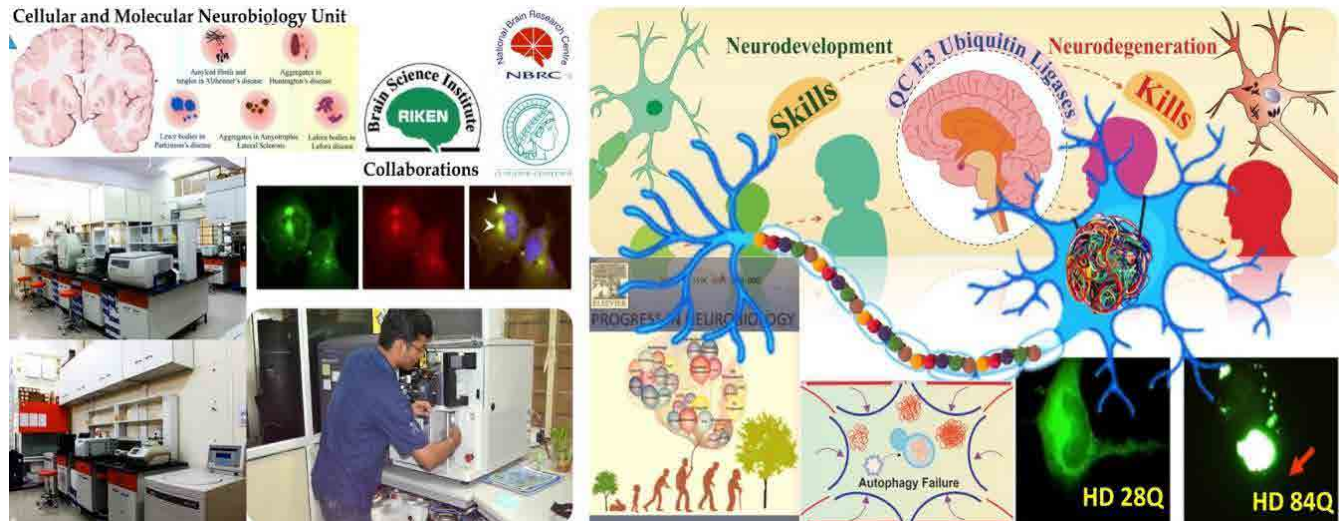
Detailed observation and scientific study of Neuroscience defines the structure and function of the nervous system. Major objective of the current thematic lab is to find the answers of hidden challenges linked with the new reports that can directly contribute and enhance our current understanding of how the nervous system works. It is also critical to understand the molecular defects, repair and restore the neural systems. Neuroengineering research targets those complex interface problems of living neural tissues and engineering techniques of non-living constructs.



## Groups under this theme

### 1. Cellular & Molecular Neurobiology Unit

Our lab has done significant work in neuronal protein quality control mechanisms involved in neurodegenerative diseases. Findings enlighten the precise molecular mechanism of E3 ubiquitin ligases and molecular chaperones, their involvement in neuronal quality control pathways, and affect overall neuronal homeostasis. We design a different mechanism to modulate the proteasomal functions, inducing autophagy pathways and serving as the anti-aggregation program of affected cellular proteostasis. Research from our lab proposes that E3 Ubiquitin Ligases can act as the first line of defense against proteostasis failure under different protein conformation conditions. The group's significant contributions have substantially added knowledge on the progressing neurobiological approaches against multifactorial challenges in neurodegeneration. Shortly, results of our group studies may offer the more suitable substitute proteolytic machinery therapeutic strategies to balance the proteostasis for the defective events specifically linked with late-onset neurodegenerative diseases and aging.



### 2. System Neuroscience:

Sense of touch enriches our experience of the World around us, prompting us to seek close contact and reach out to touch. Although evolutionarily it is a primitive sense, we do not understand how our brain creates a tactile perception from the sensory inputs. Our research work has addressed these questions within two broad themes. One, how neurons are organized in information processing networks in different somatosensory and motor areas of the mammalian brain. Two, how injuries, particularly spinal cord injuries affect these networks leading to brain plasticity. Our lab has used many different technical approaches to address these questions, which include electrophysiology (multi-electrode recordings, multiunit mapping and intracortical microstimulation), imaging (functional Magnetic Resonance Imaging and 2-Photon), neuroanatomy, and behavioral assessment.

### 3. Chemical Neuroscience:

Microtubules are key cytoskeleton filaments and established anticancer targets given their crucial role in many biochemical processes. However, targeting microtubules for the development of neurotherapeutics are relatively unexplored. Our area of research focuses on elucidation of roles of microtubule in neurodegeneration and cancer and possible intervention through carefully chosen routes. The lab has published more than 100 research articles in front-ranking international journals in the area of Chemical Neuroscience and Medicinal Chemistry.



Microtubules perform a large number of functions in neurons such as cargo transport, neuronal migration, maintenance of polarized structures, to name a few. Microtubule stability is not only critical for neuronal polarization process fundamental to their development and plasticity but has a crucial role in neurodegenerative diseases. For example, in Alzheimer's disease (AD), microtubule lattice is disrupted due to microtubule-associated tau hyperphosphorylation, which compromises the neuronal architecture. He has elucidated the importance of microtubule stabilization in neurodegenerative disorders by studying molecular interactions between some novel ligands with microtubule lattice (ACS Chem. Neurosci. 2015, 2018, 2018, 2018, 2018, 2018, 2019, 2019, 2019, 2019, 2020). His group developed a neurosphere-based organoid model generated from primary cortical and hippocampal neurons for drug screening platform. These neurospheres possess a heterogeneous population of glial cells, neurons, neural stem and progenitor cells, bear a closer resemblance to the human brain (ACS Chem. Neurosci. 2018).

Low transfection efficiency and poor reproducibility with existing transfection agents led to the exploration of efficient non-viral transfection agents. Amyloidogenic nature of a peptide transfecting agent, Pep1, led to the discovery of a non-amyloidogenic tetrapeptide sequence from Pep1 truncation, followed by the study of its cellular entry and nuclear localization. Its excellent translocation through the membrane was ascribed to tryptophan, which aided nuclear localization through interaction with DNA in the major groove. This study revealed the role of the spatial position of tryptophan in regulating cell entry and a new route for new transfection agents for gene/drug delivery (J Am Chem Soc. 2018, JACS Young Investigator Virtual Issue by Prof. Peter J Stang).

Repairing of traumatic brain injury (TBI) is an immediate challenge due to the limited regenerative properties of the brain. His group is involved in understanding repair mechanism by exogenous application of a neuroprotective hydrogel to brain injury region in a cryogenic injury mice model. Speedy recovery of the injury was observed through microscopy of brain slices and lower activation of microglia (ACS Appl Mater Interfaces 2017, ACS Chem. Neurosci. 2018). The translational value of this work is under investigation through the study of hydrogels in neuronal transplantation. Mechanism of chemically-induced trans-differentiation of reactive astrocytes into functional neurons and its impact on the global expression of several genes like NeuroD1 and NeuroG2 is in progress (ACS Chem Neuroscience, 2018, ACS Biomaterials Science 2020).

#### 4. Inflammation, Immunity and tumour biology

Within this thematic area our research is at the interface of neuroimmune interactions and neuroinflammation. We recently discovered Dopamine induced microglia extracellular traps. Dopamine plays a central role in our brain's pleasure and reward systems, movement and cognition, but its role in regulating innate immunity is not clear. Our research showed for the first time that dopamine can induce DNA-based extracellular traps in microglia cell lines as well as primary human microglia. These extracellular traps are formed independently of reactive oxygen species, actin polymerization and cell death. The traps are functional and can capture *Escherichia coli* even when reactive oxygen species or actin polymerization is inhibited. Interestingly, we found microglia extracellular traps within Glioblastoma multiforme microenvironment. This is crucial because these tumours are known to secrete dopamine but the mechanistic insights to this were largely undiscovered. Our results demonstrate that dopamine plays a significant role in neuro-inflammation by inducing microglia extracellular traps paving the way for targeting dysregulated neuroinflammation. It would be interesting to explore how these extracellular traps play a role in other neurodegenerative and cognitive diseases where dopamine is central to pathophysiology. We have recently received funding from the Ministry of electronics and information technology (MEITY) for the development of an interdisciplinary research platform for dissecting complex cellular interactions using patient-derived normal and tumour spheroids, computational biology and artificial intelligence-based approaches.

## 9. Genomics and Systems Biology Laboratory



**Faculty members associated:** Dr. Ayan Sadhukan, Dr. Mitali Mukerji, Dr. Shankar Manoharan and Dr. Pankaj Yadav

A major focus of this thematic area is to develop genomic and metagenomic tools /approaches and gain a systems biology perspective at the cellular, organismal, population and ecosystem levels. These are anticipated to provide deeper insights into the functioning of living systems and communities as a whole. This thematic area encompasses diverse areas:

- (i) Metagenomic for profiling response of microbiota to environmental exposures
- (ii) Long-read sequencing for genomic surveillance of hospital-associated pathogens etc.
- (iii) Human genomics for integrative precision medicine
- (iv) Single-cell genomics and spatial transcriptomics: method development and applications
- (v) Functional genomics of plant abiotic stress tolerance

We aim to integrate genomics with knowledge systems from diverse disciplines including engineering, environmental sciences, medicine and local traditional knowledge in a big-data, one health framework. These are being applied in several transdisciplinary initiatives of the Institute including Thar DESIGNs, AyurTech, Smart Healthcare etc. This would provide insights on networks between the environment and their inhabitants. The insights from this area are likely to address different aspects of SDG and ecosystem services in the areas of climate change, conservation, disaster management , sustainable agriculture and education.

### Groups under this theme

#### 1. Human genomics and integrative medicine group

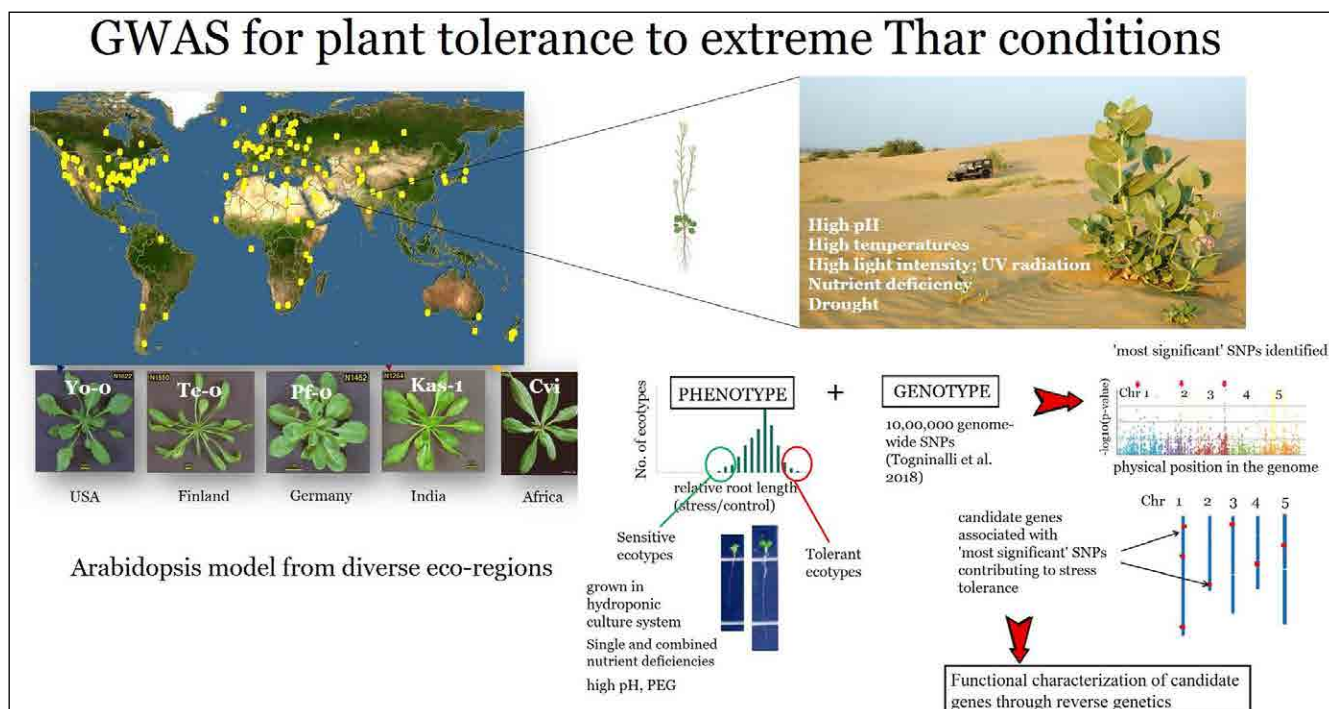
The Thar provides a large natural laboratory for evolving innovative designs that ensure adaptation and survival of its inhabitants, their interdependencies and the conservation of the entire ecosystem. A new initiative of Ecosystem genomics has been undertaken where we are developing methods to integrate massive amount of information from multi-omic resources to understand patterns in genome that links to Biological intelligence. Genomic of human and faunal communities native to the Thar desert have been initiated to gain molecular insights into adaptability/adaptation/diseases in arid desert conditions. This would also be useful in another newly emerging area of phylo-medicine wherein comparative genomics of organisms that are adapted to similar niches through

shared phenotypic adaptations is being used for understanding the molecular basis of human phenotypes and diseases. In addition, Jodhpur provides an ecocline for understanding adaptations in arid environment. We have initiated a citizen science based participatory framework for crowdsourcing ecological knowledge. This initiative aims to capture the designs of native and non-native environments (flora, fauna, human) and their transitions from homeostatic states for early interventions and sustainability. Different technologies and knowledge systems, local ecological information are being aggregated and would be analysed in a big data framework. This would provide insights on networks between environment and their inhabitants. The stable designs could enable AI based recommendation engines for restoration/rewilding. This would address different aspects of ecosystem services in the areas of climate change, conservation, disaster management, sustainable agriculture and education. We are also carrying out bioprospecting on desert species that are routinely used in traditional medicine systems.



## 2. Plant functional genomics group

The extreme conditions in the Thar desert provide an all-round challenge for the survival of plants, which experience a combination of drought, heat, high light intensity, soil salinity, varying pH, UV and nutrient deficiency stresses. Understanding plant tolerance mechanisms to environmental stress is of utmost importance to develop resilient crops to meet future demand. We use Arabidopsis, the high throughput state-of-the-art model system for fundamental research in plant science and Genome-wide association studies (GWAS) as a powerful forward genetic approach to unravel the quantitative trait loci (QTLs) or expression QTLs (eQTLs) associated with multiple abiotic stress tolerance in plants. We are also tapping the genomes of Thar plants for novel tolerance mechanisms.



### 3. Microbial Physiology Lab

The microbial physiology lab employs in-house long-read sequencing to conduct genomic surveillance for hospital-associated pathogens in collaboration with AIIMS Jodhpur to identify new virulence determinants and antibiotic resistance genes in circulation. In addition, we also use metagenomic approaches to understand the impact of environment and exposures on the human gut microbiota. We also study biological soil crusts, ecosystem engineers of the Thar grasslands, which perform key functions in the ecosystem. Formed by a complex community of microbes, these crusts perform key functions for the ecosystem. They could also contain biomolecules and biomaterials with unique properties that can be bioprospected.

### 4. Biological data science group: (Description aforementioned)

#### Academic Programs offered by the department

##### A. Name of the Programme: B.Tech (in Bioengineering)

Year	Number of students
2020-21	33
2021-22	39

##### B. Name of the Programme: M.Tech Bioengineering

Year	Number of students
2020-21	9
2021-22	11

##### B. Name of the Programme: M.Tech-Ph.D dual degree and PhD (in Bioscience and Bioengineering)

Year	M.Tech-Ph.D. (Number of students)	Ph.D. (number of students)
2020-21	4	14
2021-22	1	7

## Research Achievements

### Patents

Faculty Name	Patent Number	Name of patent	Patent Authority	Status
Sushmita Jha	201811017208	Development of a portable, low-cost hypoxia chamber	Indian Patent Authority	Pending
Meenu Chhabra	202211028952	Onsite CO2 capture from industrial gaseous emissions	Indian Patent Authority	Pending
Sushmita Paul	US 2018235487	Method and system for non-invasive, cuffless blood pressure estimation using photo-plethysmogram features and pulse transit time	US Patent Authority	Pending
	EP 3366203 A1 20180829 (EN)		European Patent Authority	
	TEMP/ E1/6660/2017MUM		Indian Patent Authority	
Dinesh K. Ahirwar	US 9885031	A galvanotaxis assay for quantitative assessment of the metastatic potential of cancer cells	US Patent and trademark office	Awarded
		Induced electric field therapy for treatment of solid cancers	US Patent and trademark office	Pending
Raviraj Vankayala	US 20140074009	Method of generating Singlet Oxygen	US Patent and trademark office	Awarded
Surajit Ghosh	PCT Application No. (2021) PCT/IN2021/050432.	RAPID DENGUE VIRUS DETECTION SYSTEM.. Published.	US patent	Granted

## Publications

### Amit Mishra

- Dubey, A. R., Patwa, S. M., Kinger, S., Jagtap, Y. A., Kumar, P., Singh, S., ... & Mishra, A. Improper Proteostasis: Can It Serve as Biomarkers for Neurodegenerative Diseases?. 1-20 2022 Molecular Neurobiology. DOI: 10.1007/s12035-022-02775-w)
- Ojha, R., Gurjar, K., Ratnakar, T. S., Mishra, A., & Prajapati, V. K. Designing of a bispecific antibody against SARS-CoV-2 spike glycoprotein targeting human entry receptors DPP4 and ACE2 83(4), 346-355 2022 Human immunology. DOI: 10.1016/j.humimm.2022.01.004)
- Indari, O., Jakhmola, S., Pathak, D. K., Tanwar, M., Kandpal, M., Mishra, A., ... & Jha, H. C. Comparative Account of Biomolecular Changes Post Epstein Barr Virus Infection of the Neuronal and Glial Cells Using Raman Microspectroscopy 2022 ACS Chemical Neuroscience. DOI: 10.1021/acscemneuro.2c00081
- Singh, A., Gupta, P., Tiwari, S., Mishra, A., & Singh, S. Guanabenz mitigates the neuropathological alterations and cell death in Alzheimer's disease 388(2),239-258. 2022 Cell and Tissue Research. DOI: 10.1007/s00441-021-03570-0
- Jain, N., Sk, M. F., Mishra, A., Kar, P., & Kumar, A. Identification of novel efflux pump inhibitors for Neisseria gonorrhoeae via multiple ligand-based pharmacophores, e-pharmacophore, molecular docking, density functional theory, and molecular dynamics approaches. 98, 107682. 2022

Computational Biology and Chemistry. DOI: 10.1016/j.combiolchem.2022.107682

- Singh, S., Kumar, K., Panda, M., Srivastava, A., Mishra, A., & Prajapati, V. K. High-throughput virtual screening of small-molecule inhibitors targeting immune cell checkpoints to discover new immunotherapeutics for human diseases 1-23 2022 Molecular Diversity DOI: 10.1007/s11030-022-10452-2
- Shubhangini Tiwari, Parul Gupta, Abhishek Singh, Swati Chaturvedi, M. Wahajuddin, Amit Mishra and Sarika Singh (2022) 4-Phenylbutyrate Mitigates the Motor Impairment and Dopaminergic Neuronal Death During Parkinson's Disease Pathology via Targeting VDAC1 Mediated Mitochondrial Function and Astrocytes Activation. Neurochemical Research. DOI: 10.1007/s11064-022-03691-0

### Meenu Chhabra

- A Sharma, **M Chhabra** (2021) Performance evaluation of a photosynthetic microbial fuel cell (PMFC) using *Chlamydomonas reinhardtii* at cathode Bioresource Technology 338, 125499
- A Sharma, S Gajbhiye, S Chauhan, **M Chhabra** (2021) Effect of cathodic culture on wastewater treatment and power generation in a photosynthetic sediment microbial fuel cell (SMFC): *Canna indica* v/s *Chlorella vulgaris* Bioresource Technology 340, 125645
- A Mishra, R Kumar, A Khandelwal, P Lama, **M Chhabra**, RK Metre (2021) Hemi Labile Intramolecular N→ Sn Coordination in a Diorganotin (IV) Sulfide [R<sub>2</sub>Sn (μ-S)]<sub>2</sub> (R= 2-phenylazophenyl) Complex: Synthesis, Structure, DFT-NBO and Antibacterial Studies Polyhedron 205, 115302
- A Khandelwal, K Dhindhoria, A Dixit, **M Chhabra** (2021) Superiority of activated graphite/CuO composite electrode over Platinum based electrodes as cathode in algae assisted microbial fuel cell Environmental Technology & Innovation, 101891
- A Mishra, A Batar, R Kumar, A Khandelwal, P Lama, **M Chhabra**, RK Metre (2021) Assembly of Di-

Tetra-and Hexanuclear Organostannoxanes Using Hemi Labile Intramolecular N→ Sn Coordination: Synthesis, Structure, DFT and Antibacterial Studies. Polyhedron 209, 115487

### Sushmita Jha

- Agrawal I, Sharma N, Saxena S, Arvind S, Chakraborty D, Chakraborty DB, Jha D, Ghatak S, Epari S, Gupta T, Jha S. Protocol for induction and characterization of microglia extracellular traps in murine and human microglia cells Jul 20;2(3):100678. 2021 STAR Protocols
- Agrawal I, Sharma N, Saxena S, Arvind S, Chakraborty D, Chakraborty DB, Jha D, Ghatak S, Epari S, Gupta T, Jha S. Dopamine induces functional extracellular traps in microglia 2021 Jan 6;24(1):101968. 2021 iScience.
- Sushmita Jha, Shalini Singh, Shivanjali Saxena, Nidhi Sharma, Ishan Agrawal, Rukmini Govekar, Pranali Panchal, Epari Sridhar, Tejpal Gupta Understanding NLRs and AIM2 cellular and molecular signalling in glioblastoma pathophysiology 109.10-109.10 2021 The Journal of Immunology
- Shivanjali Saxena, Sushmita Jha ROS at the Intersection of Inflammation and Immunity in Cancer, Handbook of Oxidative Stress in Cancer: Mechanistic Aspects. Springer, Singapore. 1-18 2021 Handbook of Oxidative Stress in Cancer: Mechanistic Aspects Ebook: [https://doi.org/10.1007/978-981-15-4501-6\\_64-1](https://doi.org/10.1007/978-981-15-4501-6_64-1). Online ISBN 978-981-15-4501-6

### Raviraj Vankayala

- Vincy, A., Mazumder, S., Banerjee, I., Hwang, K. C., & Vankayala, R. Recent Progress in Red Blood Cells-Derived Particles as Novel Bioinspired Drug Delivery Systems: Challenges and Strategies for Clinical Translation 2022 Frontiers in Chemistry
- N Hiremath, R Kumar, KC Hwang, I Banerjee, S Thangudu, R Vankayala. Near-infrared light activatable two-dimensional nanomaterials for theranostic applications: A comprehensive review. 2022 ACS Applied Nano Materials 5 (2), 1719-1733

- Tang, J. C., Lee, C. H., Lu, T., Vankayala, R., Hanley, T., Azubuogu, C., ... & Anvari, B. Membrane Cholesterol Enrichment of Red Blood Cell-Derived Microparticles Results in Prolonged Circulation. 5(2), 650-660 2022 ACS Applied Bio Materials

### Ayan Sadhukan

- Kumar S, Das M, Sadhukan A, Sahoo L (2022) Identification of differentially expressed mungbean miRNAs and their targets in response to drought stress by small RNA deep sequencing. Current Plant Biology 30: 100246. <https://doi.org/10.1016/j.cpb.2022.100246>

### Priyanka Singh

- Kasera, H., Kumar, S., & Singh, P. Yeast 2-hybrid assay for investigating the interaction between the centrosome proteins PLK4 and STIL. Methods in Cell Biology, 2022, 169, pp. 97–114.
- Modi, A., Purohit, P., Roy, D., Vishnoi, J. R., Pareek, P., Elhence, P., Singh P., Sharma S., Sharma P. and Misra, S. FOXM1 mediates GDF-15 dependent stemness and intrinsic drug resistance in breast cancer Molecular Biology Reports, 2022, 49, 2877-2888.
- Parida S.,K., Jaiswal S., Singh P\*, Murarka S.\* Multicomponent synthesis of biologically relevant S-aryl dithiocarbamates using diaryliodonium salts. Organic Letters, 2021, 23, 16, 6401–6406.

### Sucharita Dey

- Dey S, Prilusky J, Levy ED. QSaligWeb: A Server to Predict and Analyze Protein Quaternary Structure 8:787510. 2022 Front Mol Biosci
- Dey S, Levy ED\*. PDB-wide identification of physiological hetero-oligomeric assemblies based on conserved quaternary structure geometry 29(11):1303-1311 2021 Structure

### Sudipta Bhattacharyya

- Haider M., Anand V., Enaythullah M. G., Parekh, Y., Ram S., Kumari S., Panda G., Shukla M., Dholakia, D., Ray A., **Bhattacharyya S.**, Sharma U., Bokara K. K., Prasher B., Mukerji M\*. Anti-SARS-CoV-2 potential

of *Cissampelos pareira* L. identified by connectivity map-based analysis and in vitro studies. **BMC complement. med. Ther.** (2022), 22, 114 - 123.

- Jain A., Maji S., Shukla K., Kumari A., Garg S., Metre R. K., **Bhattacharyya S\***, Rana N. K\*. Stereoselective synthesis of tri-substituted tetrahydrothiophenes and their in silico binding against mycobacterial protein tyrosine phosphatase B. **Org Biomol Chem.** (2022), 20, 3124 - 3135.
- Singh B. K., Biswas R., **Bhattacharyya S.**, Basak A., Das A. K. The C-terminal end of mycobacterial HadBC regulates AcpM interaction during the FAS-II pathway: a structural perspective. **FEBS J.** (2022) (Ahead of Print).
- Chavan K. A., Shukla M., Singh Chauhan A. N., Maji S., Mali G., **Bhattacharyya S.**, and **Erande R. D.**, Effective Synthesis and Biological Evaluation of Natural and Designed Bis(indolyl)methanes via Taurine-Catalyzed Green Approach, **ACS. Omega, (2022)**, 7, 10438–10446.
- Mali G., Shaikh B. A., Garg S., Kumar A., **Bhattacharyya S.**, **Erande R. D.**, and Chate A.V., Design, Synthesis, and Biological Evaluation of Densely Substituted Dihydropyrano[2,3-c]pyrazoles via a Taurine-Catalyzed Green Multicomponent Approach, **ACS. Omega, (2021)**, 6, 30734 - 30742.

### Indarnil Banerjee

- K Dixit, S Kulanthaivel, T Agarwal, K Pal, S Giri, TK Maiti, I Banerjee. Gum tragacanth modified nano-hydroxyapatite: An angiogenic-osteogenic biomaterial for bone tissue engineering. Ceramics International. 2022 48 (10), 14672-14683
- N Hiremath, R Kumar, KC Hwang, I Banerjee, S Thangudu, R Vankayala. Near-infrared light activatable two-dimensional nanomaterials for theranostic applications: A comprehensive review. 2022 ACS Applied Nano Materials 5 (2), 1719-1733
- D Bharti, D Kim, MA Cerqueira, B Mohanty, SK Habibullah, I Banerjee, Effect of biodegradable hydrophilic and hydrophobic emulsifiers on the oleogels containing sunflower wax and sunflower oil. Gels 2021 7 (3), 133

4. S Kulanthaivel, T Agarwal, VSS Rathnam, K Pal, I Banerjee. Cobalt doped nano-hydroxyapatite incorporated gum tragacanth-alginate beads as angiogenic-osteogenic cell encapsulation system for mesenchymal stem cell based bone tissue engineering. *International Journal of Biological Macromolecules* 2021 179, 101-115.

### Neha Jain

1. Khambhati K, Patel J, Saxena V, A P, Jain N\* (2021). Gene Regulation of Biofilm-Associated Functional Amyloids. *Pathogens*. 10(4):490. <https://doi.org/10.3390/pathogens10040490>.

### Mitali Mukerji

1. Prakrithi P, Singhal K, Sharma D, Jain A, Bhojar RC, Imran M,..& Mukerji M An Alu insertion map of the Indian population: identification and analysis in 1021 genomes of the IndiGen project 4(1) 2022 NAR Genom Bioinform (Not available on Scopus list)
2. Pathak AK, Mishra GP, Uppili B, Walia S, Fatihi S, Abbas T, Banu S, Ghosh A, Kanampalliwar A, Jha A, Fatma S, Aggarwal S,..& Mukerji M Spatio-temporal dynamics of intra-host variability in SARS-CoV-2 genomes 50(3):1551-1561 2022 *Nucleic Acids Res*
3. Abbas T, Chaturvedi G, Prakrithi P, Pathak AK, ...,Mukerji M & Prasher B. Whole Exome Sequencing in Healthy Individuals of Extreme Constitution Types Reveals Differential Disease Risk: A Novel Approach towards Predictive Medicine 12(3):489. 2022 *J Pers Med*
4. Dholakia D, Kalra A, Misir BR, Kanga U, Mukerji M. HLA-SPREAD: a natural language processing based resource for curating HLA association from PubMed abstracts. *BMC Genomics*. 2022 Jan 7;23(1):10. doi: 10.1186/s12864-021-08239-0.
5. Prakrithi P, Lakra P, Sundar D, Kapoor M, **Mukerji M**, Gupta I, The Indian Genome Variation Consortium.Genetic Risk Prediction of COVID-19 Susceptibility and Severity in the Indian Population. *Front Genet*. 2021 Oct 11;12:714185. doi: 10.3389/fgene.2021.714185. eCollection 2021.

6. Haider M, Dholakia D, Panwar A, Garg P, Gheware A, Singh D, Singhal K, Burse SA, Kumari S, Sharma A, Ray A, Medigeshe GR, Sharma U, Prasher B, **Mukerji M**. Transcriptome analysis and connectivity mapping of *Cissampelos pareira* L. provides molecular links of ESR1 modulation to viral inhibition. *Sci Rep*. 2021 Oct 11;11(1):20095. doi: 10.1038/s41598-021-99444-0.

### Neeraj Jain

1. Leslee Lazar, Prem Chand, Radhika Rajan, Hisham Mohammed and Neeraj Jain (2022). Somatosensory Cortex of Macaque Monkeys is Designed for Opposable Thumb. *Cerebral Cortex*: bhac061

### Sushmita Paul

1. Sojit Tomo, Saikiran Gangam, Mithu Banerjee, and Sushmita Paul, Selenium to Selenoproteins – Role in COVID -19, *EXCLI Journal*, 20, pp. 781–791, 2021.

### Surajit Ghosh

1. Mukherjee, N., Roy, R., Ghosh, S., & Ghosh, S. Self-Assembled Antimitotic Peptide Vesicle Designed from  $\alpha$ ,  $\beta$ -Tubulin Heterodimer Interface for Anticancer Drug Delivery e202200019 2022 . *Israel Journal of Chemistry*
2. Mishra, S., Kachhawa, P., Mondal, P., Ghosh, S., Tripura, C., & Chaturvedi, N AlGaIn/GaN HEMT Based Biosensor for Detection of the HER2 Antigen Spiked in Human Serum 2022 *IEEE Transactions on Electron Devices*
3. Barman, S., Ghosh, S., Roy, R., Gupta, V., Ghosh, S., & Ghosh, S A potent estrogen receptor and microtubule specific purine-benzothiazole-based fluorescent molecular probe induces apoptotic death of breast cancer cells 12(1), 1-17. 2022 *Scientific Reports*
4. Ghosh, S., & Ghosh, S Exosome: The “Off-the-Shelf” Cellular Nanocomponent as a Potential Pathogenic Agent, a Disease Biomarker, and Neurotherapeutics 13 2022 *Frontiers in pharmacology*



5. Pakhira, M., Ghosh, S., Ghosh, S., Chatterjee, D. P., & Nandi, A. K Development of poly (vinylidene fluoride) graft random copolymer membrane for antifouling and antimicrobial applications 112:171-181 2022 Journal of Industrial and Engineering Chemistry
6. Mondal, P., Mohapatra, S., Bhunia, D., Gharai, P. K., Mukherjee, N., Gupta, V., ... & Ghosh, S. Designed hybrid anticancer nuclear-localized peptide inhibits aggressive cancer cell proliferation 13(2), 196-201 2022 RSC Medicinal Chemistry
7. Surajit Ghosh, Nabanita Mukherjee, Satyajit Ghosh, Rajsekhar Roy A potential biocompatible wound healing material 2022
8. Rathnam Mallesh, Juhee Khan, Krishnangsu Pradhan, Rajsekhar Roy, Nihar. R. Jana, Parasuraman Jaisankar, Surajit Ghosh. Design and Development of Benzothiazole-Based Fluorescent Probes for Selective Detection of A $\beta$  Aggregates in Alzheimer's Disease 2022 ACS Chemical Neuroscience.
9. Heera Ram, Chandra kala, Karishma Sen, Anita Sakarwal, Jaykaran Charan, Paras Sharma, Rajsekhar Roy, Surajit Ghosh. In-vitro and in-silico determinations of HMG-CoA reductase inhibition potential of caffeic acid for therapeutics of hypercholesterolemia 12(1); 190-198, 2022 Journal of Applied Pharmaceutical Science.
10. Soumi Sukla, Prasenjit Mondal, Subhajit Biswas, Surajit Ghosh. A Rapid and Easy-to-Perform Method of Nucleic-Acid Based Dengue Virus Diagnosis Using Fluorescence-Based Molecular Beacons 11(12), 479. 2021 Biosensor
11. Batakrishna Jana, Surajit Barman, Rajsekhar Roy, Gaurav Das, Nabanita Mukherjee, Anindyasundar Adak, Surajit Ghosh. Fluorine Substituted Proline Enhances Tubulin Binding Potential of a Tetrapeptide at GTP Binding Pocket Causing Inhibition of Microtubule Motility and Antimitotic Effect 125, 31, 8768–8780. 2021. The Journal of Physical Chemistry B
12. Tanaya Chatterjee, Gaurav Das, Surajit Ghosh and Pinak Chakrabarti. Effect of Gold Nanoparticles on the Structure and Neuroprotective Function of Protein L-isoaspartyl methyltransferase (PIMT) 11, 14296. 2021. Nature Scientific Reports
13. Saswat Mohapatra, Varsha Gupta, Prasenjit Mondal, Shreyam Chatterjee, Debmalya Bhunia, and Surajit Ghosh. Small Molecule with Bridged Carbonyl and Tri-fluoro-aceto-phenone Groups Impedes Microtubule Dynamics and Subsequently Triggers Cancer Cell Apoptosis 16, 2703-2714. 2021. ChemMedChem
14. Saswat Mohapatra, Gaurav Das, Varsha Gupta, Prasenjit Mondal, Masashi Nitani, Yutaka Ie, Shreyam Chatterjee, Yoshio Aso, Surajit Ghosh. Power of organic electron acceptor in modulation of intracellular mitochondrial ROS: Induces JNK and caspase dependent apoptosis of cancer cells. 11, 7815–7828. 2021. ACS

## Projects

### Sponsored Research Projects

S. No	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
1	Development of low cost Microbial Carbon capture (MCC) cells for algae cultivation and powers generation	DBT	Meenu Chhabra	₹77,59,923	24-Dec-14	31-Mar-21
2	Hospital-associated ESKAPE pathogens: Unraveling novel regulatory layers controlling virulence and persistence	The Wellcome Trust/ DBT India Alliance	Shankar Manoharan	₹1,64,88,993	17-Jan-18	31-Aug-22
3	Role of Centriole Protein, CPAP in neurodevelopmental disorder	SERB	Priyanka Singh	₹38,74,312	28-Nov-18	27-Nov-21
4	Modulation of a-Synuclein Amyloid Assemblt by Human Chaperone-like Proteins	SERB	Neha Jain	₹41,00,026	22-May-19	21-May-22
5	GenomeIndia: Cataloguing the genetic Variation in Indians	DBT	Sushmita Paul	₹1,15,00,000	28-Feb-20	27-Feb-23
6	Elucidating the role of centrosome protein CEP152 in primary microcephaly	DBT	Priyanka Singh	₹59,50,240	27-Feb-20	26-Feb-23
7	Multimodal Approach for Repairing of Brain Damage: Small Molecule Mediated Neurogenesis from Stem Cells and Transplantation of Regenerated Neurons through Novel Scaffolds	SERB	Surajit Ghosh	₹2,79,57,120	30-Mar-20	29-Mar-23
8	Systems Biology and Network Analysis for Enabling Research in Personalized Genomics	MHRD	Sushmita Paul	N/A	20-Mar-20	N/A
9	Multimodal Approaches to Develop Potential Therapeutic Leads Targeting Molecular Hot Spots of Duchenne Muscular Dystrophy for Clinical Trial	SERB	Surajit Ghosh	₹3,89,00,910	23-Jun-20	22-Jun-25
10	Understanding The Molecular Specific Scales of Tumor Suppressor Gene 101 (tsg101) enclosed LRSAM1 E3 Ubiquitin Ligase in The Elimination of Polyglutamine Proteins	BRNS	Amit Mishra	₹26,34,000	19-Oct-20	18-Oct-23

S. No	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
11	Deciphering Molecular Mechanism of Action and Electron Acceptor Specificity Through structure based functional characterization of staphylococcal glutathione peroxidase enzymes	SERB-SRG	Sudipta Bhattacharyya	₹30,78,460	07-Dec-20	06-Dec-22
12	Reconstitution of Microenvironment of Brain using Advanced Prototype-based Microfluidic System for Neuro-organoid Culture and Monitoring the Synapse Formation	SERB- STAR	Surajit Ghosh	₹38,50,000	22-Dec-20	21-Dec-23
13	Palladium-catalyzed synthesis of novel heterocycles for the development of potent tubulin polymerization inhibitors.	SERB- NPDF	Surajit Ghosh	₹20,25,600	03-Dec-20	02-Dec-22
14	Role of Centrosome Protein STIL in Cancer	BRNS	Priyanka Singh	₹21,88,900	19-Jun-21	18-Jun-24
15	Dual Targeted Chemical Modulator Inhibits Nmda Receptor and Promotes Ngf Mediated Neuroprotection: Towards Development of Potent Antialzheimers's Therapeutics	CSIR	Surajit Ghosh	₹15,14,000	03-Jun-21	02-Jun-24
16	Seeing The Unseen: The Microbial Community	National Centre for Biological Sciences	Neha Jain	₹70,000	30-Nov-21	31-Dec-22
17	Thar-DESIGNS (Desert EcoSystem Innovations Guided by Nature and Selection)	Jodhpur City Knowledge and Innovation Cluster	Mitali Mukerji	₹30,00,000	Grant not received	Grant not received
18	Biocompatible and water dispersible salinized reduced graphene oxide derivatives: Near infrared responsive bimodal phototherapeutic agents for the disruption of bacterial biofilms	SERB-CRG	Indranil Banerjee	₹54,82,400	10-Dec-21	09-Dec-24
19	Cellulose nanocrystal reinforced pH-responsive PVA-gum tragacanth based proangiogenic smart wound dressings for diabetic foot care	DST-Indo-Thailand	Indranil Banerjee	₹7,30,000	27-Oct-21	26-May-22

S. No	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
20	Siemens-supported Pre-incubation incentive program for Medical Technology Students	Siemens India Pvt Ltd	Sushmita Jha	₹21,00,000	23-Feb-22	22-Jun-24

### Other Projects

S. No	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
1	Workshop on Computational Biology and Bioinformatics	SERB-IITJ	Sushmita Paul	₹2,70,000	26-Jun-19	25-Dec-19
2	Bioengineering Solution for healthcare, food, Energy	Registration Fee from Participants	Meenu Chhabra	₹75,000	04-Mar-21	10-Apr-21
3	Multi-omics Data Science	AICTE-ATAL	Pankaj Yadav	₹93,000	30-Nov-21	28-Feb-22
4	Training Program in current trend in R&D modern scientific advances & technology for scientific understanding & promotion of Ayush Systems for Ayush Doctors/ Scientists	Ministry of Ayush	Mitali Mukerji	₹9,00,000	26-Mar-22	25-Mar-23

### Closed Projects

Sl. No.	Project No.	Project Title	Sponsoring Agency	Category of Project	Principal Investigator	Sanctioned Amount (Rs.)	Start Date	Duration / Expiry Date	Date of Actual Closure
1	S/DBT/SJ/2017 0010	Expression analysis of inflammasome-forming NLRs in gliomas for identification of novel therapeutic interventions	DBT	Sponsored Research Project	Sushmita Jha	₹42,15,000	6-Sep-17	5-Sep-20	

**Outcome:** The research is focused on characterization of mRNA and protein expression of NLRs (Nucleotide-binding domain, leucine-rich repeat containing, proteins) and NLR associated molecules in glioma tissues, and characterization of alteration in NLR associated signaling in glioma cells. Despite the critical role of NLRs in cancers, the physiological and functional significance of NLRs in gliomas remain largely unknown. In this regard, this study provides basic insights into (NLR) and NLR-associated gene regulation in LGG and GBM. This study utilizes bioinformatics and experimental data from human brain tissues of glioma and normal brain tissue to report for the first time, the differential expression of NLRs and NLR-associated genes in different grades of glioma. Importantly this study is the first to report NLRP12 as a prognostic marker of glioblastoma with differential cell specific roles in cell proliferation and migration.

## Faculty / Department Laurels

### Ongoing Grants

Name of Faculty	Title of the Project	Funding Agency	Sanctioned amount in lakhs
Amit Mishra	Understanding the molecular specific scales of tumor suppressor gene 101 (tsg 101) encoded LRSAM1 E3 Ubiquitin Ligase in the elimination of Polyglutamine Proteins.	BRNS/BARC	26.34
Dinesh K. Ahirwar	Casein Kinase-1 epsilon as a novel therapeutic target against small cell lung cancer	Department of Defense, USA	124
	Inhibition of RET proto-oncogene as a novel immune-based strategy against SCLC	Department of Defense, USA	124
Indranil Banerjee	Edible emul-gel based novel cost effective formulation for colon targeted synbiotic drug delivery	DBT/BIG	50
	Cellulose nanocrystals reinforced pH responsive PVA gum tragacanth based proangiogenic smart wound dressings for diabetic foot care.	DST/Indo-Thailand	7.30
Meenu Chhabra	Bioengineering Solutions for Healthcare, Food, energy and environment	BRSI	0.75
	Algae mediated carbon capture from exhaust gases	CETSD, IIT Jodhpur	8
Mitali Mukerji	Joint Co-ordinator and Principal Investigator in Thar-DESIGNS (Desert EcoSystem Innovations Guided by Nature and Selection)	PSA supported Jodhpur City Knowledge Innovation Cluster (JCKIC)	30
	Capacity building and CME in Ayush component of AYurgyan Scheme	AYUSH	10
Neha Jain	Modulation of $\alpha$ -synuclein amyloid assembly by human chaperone-like proteins.	SERB	41
	Seeing the Unseen: The Microbial Community	NCBS	1
Pankaj Yadav	Investigation of genome-wide gene-environment interactions in relation to complex diseases following case-only approach	IIT Jodhpur, Research Initiation Grant	10
Priyanka Singh	Role of Centrosome Protein STIL in Cancer	BRNS, DAE, India	21.90
	Elucidating the Role of Centrosome Protein CEP152 in Primary Microcephaly	DBT, India	59.50
Raviraj Vankayala	Biomimetic nanoscale metal organic frameworks for targeted near infrared fluorescence imaging and phototherapeutic destruction of intraperitoneal tumors	DBT/Ramalingaswami	42.5
Shankar Manoharan	Hospital associated ESKAPE pathogens: Unraveling novel regulatory layers controlling virulence and persistence	DBT/Wellcome Trust India Alliance (Early Career Fellowship)	164.88
	Evaluation of the effect of salicylate on capsule synthesis by virulent <i>Klebsiella pneumoniae</i>	IIT Jodhpur, Research Initiation Grant	25

Name of Faculty	Title of the Project	Funding Agency	Sanctioned amount in lakhs
Sucharita Day	Harnessing protein quaternary structure to unveil new principles of mutational robustness and allostery	DBT/ Ramalingaswami	42.5
Sudipta Bhattacharya	Deciphering Molecular Mechanism of Action and Electron Acceptor Specificity Through structure based functional characterization of staphylococcal glutathione peroxidase enzymes	SERB	30
	Structure based functional characterization of Staphylococcal thiol peroxidase enzymes: A new hunch for anti-Staphylococcal drug discovery	IIT Jodhpur, Research Initiation Grant	25
Surajit Ghosh	Fluorescence Probes for Detection of Amyloid Plaque	IIT Jodhpur, Research Initiation Grant	25
	Muc-1 receptor targeted nano-liposome containing peptide-drug-nanocage for breast cancer and cancer stem cell	DBT, India	17.54
	Multimodal Approaches to Develop Potential Therapeutic Leads Targeting Molecular Hot Spots of Duchenne Muscular Dystrophy for Clinical Trial	SERB	389

## Awards/Recognitions

Name of the Faculty	Achievements	Year of the Achievement
Mitali Mukerji	Fellow of National Academy of Science, India	2021
Amit Mishra	Selected "Executive Board Member" Indian Academy of Neuroscience (IAN) India	2022
	Coveted Honour Malaviya Memorial Award-BIOTECH RESEARCH SOCIETY OF INDIA (BRSI) Fellow of Royal Society of Biology, London, UK	2021
Sushmita Jha	Kusum Sharma Award for a Young Woman Scientist, Indian Academy of Biomedical Sciences	2021
	Indian Society of Neuro-Oncology "President's Award for Outstanding Work in Neuro-Oncology"	2022
Priyanka Singh	"Young Scientist Research Award" from the Board of Research in Nuclear Sciences (BRNS), Department of Atomic Energy, Government of India.	2021
Meenu Chhabra	Prof. Indira Parikh 50 Women in Education Leaders by World Education Congress 2022.	2022
Pankaj Yadav	Invited Editor, Human and Medical Genomics, Frontiers in Genetics	2021
Raviraj Vankayala	Topic Editor for Frontiers in Nanotechnology journal for a special issue entitled "Multifunctional Nanomaterials for Biosensors and Therapeutics".	2021
	Guest Editor in MDPI Nanomaterials journal for a special issue entitled "Advances in Nanomaterials Mediated Photodynamic Therapy".	2021
	Regular member of Royal Society of Chemistry.	2021
	Recipient of Research Excellence Award at IIT Jodhpur.	2021

Name of the Faculty	Achievements	Year of the Achievement
Dinesh Kumar	Special Issue Editor in journal Cancers.	2021
Ahirwar	Guest Associate Editor in Frontiers in Immunology	2021
	Guest Editor in Frontiers in Cell and Developmental Biology	2021
Neha Jain	Early Career Review Board member for Journal of Biological Chemistry	2022

## Student Laurels

The department initiated its current, flagship B. Tech. program in Bioengineering in the year 2019 with a curriculum that was built after extensive consultation with industry, academia, entrepreneurs and foresight experts. The first batch of students following this new curriculum are set to graduate in 2023. The class of 2022 (B.Tech. in Biotechnology), were also given the option to build their own B.Tech. programs by selecting departmental specializations / minors, a key feature of the new curriculum. In alignment with the expected graduate attributes, the B. Tech. students under this programme have taken various internships and industrial training in various capacities. While some of them have interned at start-ups and industries, others have pursued academic research internships in reputed national institutions. It is a matter of pride to the Department that the class of 2022, B.Tech. in Biotechnology has also achieved 100% on campus placement.

Our student Ms. Riddhi Sera (2019-23 batch) was selected for the prestigious Mitacs Globalink research internship program at the University of Toronto, where she worked on machine learning models in computational genomics under the supervision of Prof. Michael Hoffman.



The students actively participate in different institute and department level societies which reflect on their ability to work in a team. Some of our students are contributing in key leadership positions in student councils, boards and societies. Our students have also demonstrated teamwork within and across departments in their final projects as well as design credit projects. Some students have led their teams, while others have worked as a contributing member. Around 30-40 % students have opted for design projects and BTPs from other departments along with their peers from other departments highlighting their interdisciplinary mindset in solving problems.

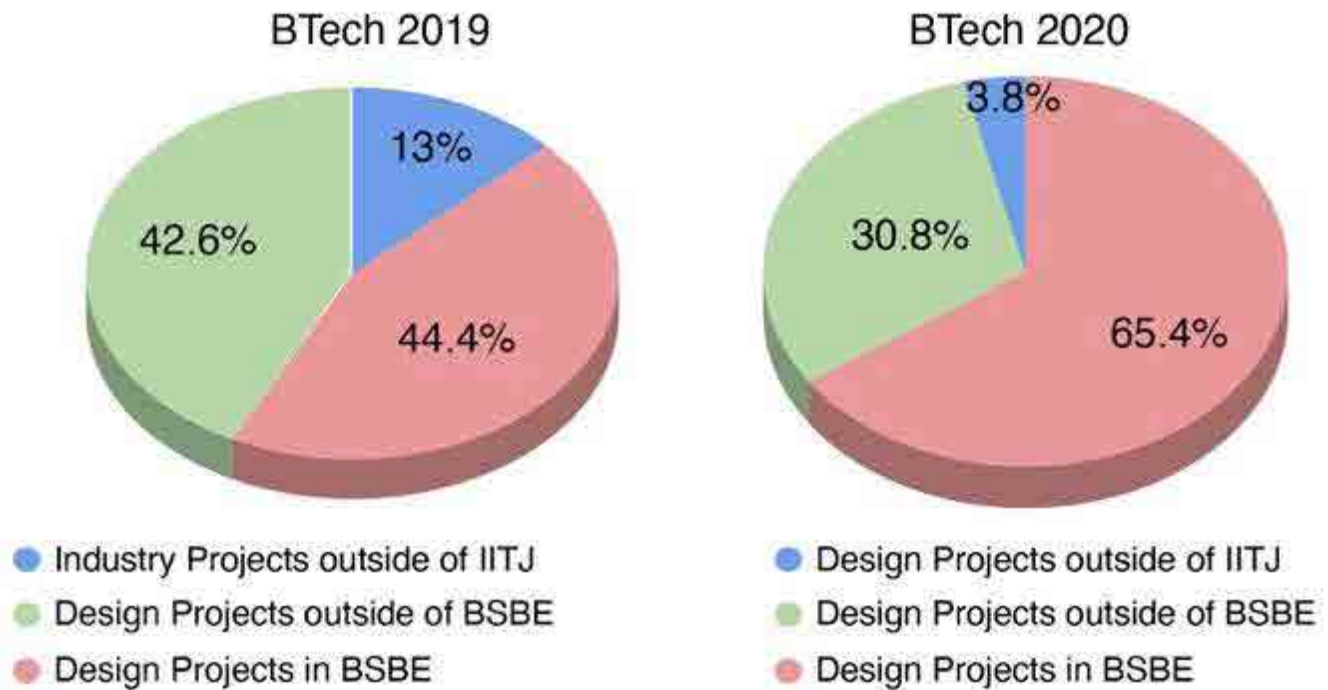


Figure showing different internship opportunities undertaken by undergraduate students of B.Tech Bioengineering in the year 2021-22

Some of our students have participated in meetings and national level competitions, which not only challenges them to think critically and design innovative solutions but also communicate them effectively so that they can be appreciated by a larger audience. The B. Tech students also carried out several design credit projects and B.Tech. projects both at the inter- and intra-department levels which provided them with the opportunities to use trans-disciplinary knowledge and training in designing engineering solutions to solve technical problems in the field of bioscience and bioengineering. Some examples of such projects where problems across various domains addressed innovatively by our students as part of their BTPs and Design projects include:

1. Gloves for suppression of Parkinsons disease tremors using Neuromuscular Electrical Stimulation (Pushpank Katare, Class of 2022, Part of a team that secured 1st place in the 7th Inter IIT Tech meet)
2. Tool for diagnosis of diabetic retinopathy (Arushi Midha & Pradyumn Verma, Class of 2022, BTP)
3. A web tool for personalized portfolio and finance management (Mukul Kumar Babra and team, Class of 2022, BTP)
4. Secure and effective sharing of healthcare information using blockchain technology (Aman Pratap Singh, Class of 2022, BTP)



5. Structure guided therapeutic lead discovery against drug resistant pathogen (Diya Chirag Sankhla and Komalla Vennella, Class of 2022, BTP)
6. Multi-OMICS integrative analysis of Non-Insulin Dependent Diabetes Mellitus (Piyush Mathur and Kshitij Thakur, Class of 2022, BTP)
7. Deep learning in genome-wide association studies (Archit Dwivedi, Class of 2022, BTP)
8. Design and development of an Android App for exploring the local biodiversity through crowdsourced digital archiving (Gaurav Sen and Chinmay Borale, Class of 2023, DP)
9. Digitizing RTI applications (Sarthak Vasani, Class of 2023, DP)
10. Development of a Crowdsourced participatory medicine framework in COVID using BigData science frameworks of NLP and digital humanities (Aman Prakash and Addepalli Bharat Sai, Akshansh Verma, Abir Roy, Class of 2023, DP; along with CSE and EE students)
11. Function annotation of primate specific Alu repeats from large scale genomics and transcriptomic data using computer vision and other AI/ML based approaches for elucidation of primate specific regulatory networks (Divyanshi Jagetiya Class of 2023; Dheemant Jallepalli; Khyati Tiwari; Ronit Kanojiya Class of 2024 along with students of CSE, AI)
12. Digital food experience using AR/VR and Aroma simulations (Vishnu Kumar Class of 2023; Tejas Parmar Haifa Desai, Class of 2024, DP)
13. Quantum machine learning (Bommi Sarath Kumar, Class of 2024, DP)
14. Drug Delivery Through Shock-Wave Apparatus (Kshitij Singh, Class of 2024, DP)
15. Designing a brain-computer interface for a sixth sense (Dheemant Jallepalli and Sharmila Noudu, Class of 2024, DP)
16. Genotype Phenotype association using NLP (Saahil Bhavsar, Ritam sharma, Deepak Majhi, Bhavsar Saahil Pritam, Bodasingi Yaswanth Naidu, Princy Gautam Class of 2024; Nadendla ahammad Hussain Class of 2023)

### DP - Design project, BTP - B.Tech. project

Two students in the Class of 2022, for whom the option to pursue minors were made available had opted and completed minors in entrepreneurship. One student in the Class of 2022 had completed a specialization in Engineering Innovation, where he worked with a start-up (Test at home) conducting research towards development of a safe device for saliva sample collection for diagnostic testing.

In summary, the department has been able to attain most of the graduate attributes as proposed in the curriculum. The department will continue to strive to more effectively implement the curriculum so that a workforce with core-competencies, interdisciplinary training, social awareness, innovation mindset and a strong work ethic continues to be generated.

### Student Graduate Outcomes

1. Ishan Agarwal (2015-2021), student of Sushmita Jha got Post-Doc. offer at Oxford University, UK
2. Madhumita (2017-2022), student of Sushmita Paul got Post-Doc. offer at University of Birmingham, UK

### Notable Achievements of Alumni

Most of our Ph.D. (Bioscience & Bioengineering) Alumni are currently pursuing postdoctoral training in reputed international research institutions (University of Oxford, Karolinska Institute, University of Florida, Northwestern University, University of Twente, University of Alberta etc.), where they are advancing research in their domains and making key contributions to their fields. Some of our Ph.D. Alumni have secured scientist (IIT Bombay, Enveda Biosciences) and faculty positions (Bennett University) as well. Our M.Tech. (Bioscience & Bioengineering) Alumni have predominantly enrolled in prestigious, funded, national (IIT Kharagpur, IIT Jodhpur) and international (Monash University, University of Warwick, National University of Singapore, University of Missouri, University of Lille, University of St. Andrews etc.) Ph.D. programs by securing fellowships. These programs are in core biological research as well as interdisciplinary areas such as biophotonics, nanotechnology, computational biology etc. Our M.Tech. program has also generated a competent and uniquely skilled workforce for industry and government-funded institutes (Center for Development of Advanced

Computing, Prema's life sciences, TCS research, NIBMG, Regrow biosciences). The first batch of our flagship B.Tech. in Bioengineering program is set to graduate in 2023. The graduates of our B.Tech. program in Biotechnology, who were transitioned into the new curriculum have all been placed on campus. While a few B.Tech. graduates have opted for Masters / Ph.D. programs in the core domain (The Hebrew University of Jerusalem, Israel; Institutes of National importance in India), others have preferred to opt for jobs in reputed companies (Microsoft, Accenture, UnDosTres, Housing.com, Reliance Jio, Larsen and Toubro Infotech, ICICI, ZS associates, Pickrr, Cubastion consulting, Neenopal etc.).

## Laboratories & Equipments

All the laboratories/research groups under each thematic area are discussed at the "Description of Research Groups" section

### 1. Cell and Molecular Physiology laboratories

- Cell culture facility
- Fluorescence microscope
- Liquid nitrogen storage system
- -20 °C freezer
- Gel documentation system
- -80°C freezer
- Microplate reader
- Nanodrop spectrophotometer
- Realtime PCR
- Thermal cycler
- Portable hypoxia chamber

### 2. Environmental Biotechnology Laboratory

- Multi-vessel fermenter
- Photobioreactor
- Algal growth chamber
- Electrochemical workstation
- Two-dimensional gel electrophoresis system
- Denaturing gradient gel electrophoresis

### 3. Biomaterials and Tissue Engineering

- Nanomedicine and Biomaterials Group
- Biosafety cabinet (Class II A2)

- BR Biochem Plastic Microprocessor controlled Magnetic Stirrers
- Domestic Microwave oven
- Heating Mantle
- Hydrothermal Autoclave
- Labman pH meter
- LG True Domestic Microwave oven
- Non-refrigerated centrifuge
- Probe sonicator, 650 Watt
- REMI brushless DC motor vortex mixer
- Sonicator System (LMUC-3)
- Tempstar Hot Air Oven 1500W (101-150L)
- Unbranded Frost free double door Refrigerator 300L 3Star
- Unbranded Steel Almirah
- Vertical Laboratory Deep Freezer (Elanpro)
- Weighing scale
- Whirlpool Refrigerator 190L
- Magnetic stirrers with temperature probe
- Microtek 3 kVA UPS
- Neuation Incubator (itherm CH25)
- Neuation Centrifuge (iFuge M15K)

### Integrative Tissue engineering

- Samsung Convertible Fridge-394L
- LG True Domestic Microwave oven
- Neuation Hot plate Magnetic Stirrer( iStir HP320a)
- Neuation Vortexer(iSWIX)
- Labman pH meter(LMPH-10)
- REMI Non-refrigerated Benchtop Centrifuge

### 4. Molecular Microbiology

- AKTA protein purification system
- Probe sonicator
- Multi-mode plate reader
- Microvolume fluorometer
- Electrophoresis systems with blotting apparatus
- Hybridization oven
- Microplate reader
- Laboratory workstation

- Bacteriological incubators
- Incubator shakers
- Refrigerated centrifuge
- Test tube rotator
- Plate reader with a desktop and 1 KVA UPS
- Refrigerated Shaker Incubator with Flask Holder
- pH meter

## 5. Biophysics

### Functional Amyloid biology

- FPLC (Protein purification system)
- Gel apparatus (horizontal and vertical)
- Ika magnetic stirrer
- Magnetic stirrer Hot Plate
- pH meter
- Plate reader, Desktop, 1 KVA UPS
- Refrigerated Shaker Incubator
- Probe Sonicator
- Test-tube Rotator
- Vortex Shaker
- Microcentrifuge

### Structural Biology & Protein Engineering

- Dell Intel core Desktop Computer
- Refrigerator with Bench top Cooler
- Microwave oven cap. 28 Lit
- Refrigerated Centrifuge
- RH-S7-11A, Vertical Laminar Air Flow
- Digital Weighing Balance
- Vertical Electrophoresis System
- Horizontal Electrophoresis System with power pack
- Hot Air Oven
- Analytical weighing Balance
- 4080 Rockymax gel Rocker Tarson
- Refrigerator BOD Incubator
- AKTA start main instruments with accessories
- Vortex shaker
- T 100 Thermal Cycler
- 1 KVA Online UPS, Microtek 30 mins backup

- UV vis spectrophotometer
- Tabletop large Vol. refrigerated centrifuge with accessories
- UV Transilluminator
- Dry Heat Bath
- Magnetic Stirrer with Hot Plate
- Magnetic Stirrer (Small volume)
- pH Meter

## 6. Computational Biology and Bioinformatics

- Servers
- Workstations
- Desktops
- Software Developed
- RFCM3 (<http://home.iitj.ac.in/~sushmitapaul/CBL/softwares.html>)
- ProDFace ([http://structbioinfo.iitj.ac.in/resources/bioinfo/pd\\_interface](http://structbioinfo.iitj.ac.in/resources/bioinfo/pd_interface))

## 7. Molecular Motors and Cell Motility

- Cell culture facility
- Biosafety cabinet
- Inverted light microscope
- -20 °C freezer
- Nanodrop spectrophotometer
- -80 °C freezer
- Gradient thermal cycler
- Bacteriological incubator
- Electrophoresis systems
- Refrigerated centrifuge

## 8. Neuroscience and Neuroengineering

- Cell culture facility
- Fluid cell imaging station
- Inverted microscope
- Gel dryer
- Gel documentation system
- -80 °C freezer
- Single tube multi-mode reader

- Nanodrop spectrophotometer
- Realtime PCR
- Thermal cycler
- Electrophoresis systems
- Automated cell counter
- Sonicator
- Gene pulser system
- Temperature bath
- Portable autoclave
- Microwave oven
- Horizontal gel electrophoresis
- power pack for electrophoresis
- Hot air oven
- (-)20 low-temperature storage
- refrigerated centrifuge

**9. Genomics and systems biology**

**Plant functional genomics group**

- Plant tissue culture rack with photoperiodic timer
- Ultrasonic vapor humidifier
- Desiccator + vacuum pump
- Micropipettes set
- Laminar air-flow cabinet
- Incubator for bacteria
- Refrigerator
- Weighing balance
- pH meter
- Stirrer and hot plate
- Vortex for multiple tubes

**Microbial genomics group**

- Hybridization Oven
- Vertical electrophoresis System with Blotting module
- Microvolume Fluorometer - QUBIT4
- Refrigerated Centrifuge 5430 with 2 x Rotors
- Refrigerated Lab Shaker
- Biosafety Cabinet Class II A2
- Oxford Nanopore sequencer MK1B
- Horizontal electrophoresis system with powerpack
- Laboratory workstation
- Gradient Thermal Cycler
- Automatic Autoclave
- Oxford Nanopore sequencer MK1C

**Outreach**

The following Outreach activities have been undertaken by the Faculty Members at IIT Jodhpur During the FY 2021-22.

**Outreach**

Name of the faculty	Year	Outreach
Neha Jain	2021	Science awareness workshop in Misrilal College, Jaisalmer under SSR
	2022	Conducted five workshops entitled "Seeing the Unseen: The Microbial Community" in rural areas of Jaisalemer, Phagi, Kuchaman city
Sucharita Dey	2021	Invited short talk at the EMBL Conference "Bringing Molecular Structure to Life: 50 Years of the PDB"
Ayan Sadhukhan	2022	Co-organized an online "Workshop on Sustainable Agriculture Using Bharat Agri-Grid Ecosystem" by IIT Jodhpur, IIT Indore, IISR Indore, C-DAC Pune, IISC Bangalore, CEERI-Pilani, NCL Pune 28-29 June 2022 Session coordinator for the keynote talk of Prof Hiroyuki Koyama, Gifu University Japan, on 28 June 2022
	2022	Participated in IITJ-BioBlitz Green Walk program on 06 - 07 Aug 2022 for spreading awareness of IIT Jodhpur campus flora, their ethnomedical uses, and the importance of their conservation

Name of the faculty	Year	Outreach
Priyanka Singh	2022	Invited talk at the First Animal Cell Culture Workshop held at AIIMS Jodhpur
	2021	Invited Speaker, 24th BSCB GenSoc UK Cilia Network e-symposium
	2021	Resource person, Faculty Development Program, AICTE training & Learning Academy, IIT Jodhpur, online
Raviraj Vankayala	2021	Coordinated FB live sessions for the departmental and IDRPSH PG programs
Dinesh K Ahirwar	2021	Served as a departmental representative to coordinate UG and PG orientation session
Sushmita Jha	2021	XXXIX Annual Meeting of Indian Academy of Neurosciences (IAN) 16th to 19th December 2021, Theme: "NeuroGlia in Health and Disease" organized by Indian Institute of Science Education and Research Kolkata, Netaji Subhas Open University & CSIR-Indian Institute of Chemical Biology.
Pankaj Yadav	2022	Invited talk at workshop on Basic Molecular Techniques held at Department of Biochemistry, AIIMS Jodhpur
	2021	Invited talk at workshop on Advances in Bioinformatics sponsored by Ministry of Electronics and Information Technology (MeitY), NIT, Warangal, India
	2021	Invited talk at FDP on Computer Science and Biology sponsored by ATAL academy, MNIT, Jaipur, India
	2021	Invited talk at UGC sponsored two-week online interdisciplinary refresher course on quantitative biology organised by Human Resource Development Centre, Guru Jambheshwar University of Science & Technology, Hisar, India
	2021	Organized ATAL sponsored 1 week workshop on Multi-omics Data Science
Mitali Mukerji	2021	Ayurgenomics: A Step towards Integrative Medicine at AIIMS Jodhpur on Ayurveda day
	2021	Ayurgenomics: Bringing age-old wisdom to healthcare of the future" as a part of the "AzadiKaAmritMahotsav and CSIR in the 80 Years - 80 Success Stories series"
	2021	Thar DESIGNS in the board meeting of the International Consortium on Human Phenomics Nov
	2021	Transdisciplinary initiatives for ecosystem phenomics and precision integrative medicine with focus on THAR region in the Indo-French Knowledge Summit: workshop on AI for Health Care
	2021	Novel, natural and personalised path to health with Ayurgenomics in the seminar series of Chai pe science @ SSIAR Dec
	2022	AyurTech for Precision medicine: Introduction to the basic framework in the Lecture series on Technology based Evidence for Ayurved solution in Precision health @ Dr SR Rajasthan Ayurved University Jan
	2022	Ayurgenomics Framework for Integrative and Precision Medicine: Insights and Application in Covid Times during the occasion of Amrit Mahotsav Science Showcase: Roadmap to 2047 Organized Jointly by NIIRNCD, Jodhpur & Mohanlal Sukhadia University, Udaipur
2022	Presentation on opportunities in BSBE, IITJ at the annual 14th Young investigator meeting : toward's a new horizon on 12th May 2022	

# Department of Chemical Engineering

## Introduction

The inception of the Department of Chemical Engineering at IIT Jodhpur took place in the year 2020 with the admission of the first batch of undergraduate students and postgraduate students in four different academic programs (B.Tech, M.Tech., Ph.D., and M.Tech.-Ph.D. Dual degree). Through the academic programs, the department is making a conscious effort to establish itself as a leading institute in a new genre of chemical engineering education, in line with national education

policy. The program involves traditional courses, emerging areas and specializations such as process engineering intelligence, molecular engineering and sustainability. With Industry 4.0 transforming the chemical industry, AI and IOT for chemical engineering forms an integral part of the curriculum. Chemical Engineering program at IIT Jodhpur has been formulated to produce future ready chemical engineers capable of meeting new industrial challenges. It is full of opportunities and flexibility for the students. Department is also keen on collaboration with industry and academia world-wide.



**Vision:**

“To become a globally recognized department of chemical engineering through its contribution in emerging and demand-driven areas with multidisciplinary approach.”

**Mission:**

- To empower students with fundamentals of chemical engineering and emerging concepts.
- To become a center of excellence in process engineering intelligence, molecular engineering and sustainability
- To engage in research program for translation of molecular information into discovery of sustainable products and processes.

- To create a research ecosystem which encourages students and research scholars to find solutions for diverse environmental and societal issues as a part of the social scientific responsibility.
- To become a net positive department through start-up culture, consultancy, technology transfer, industry-academia interaction.

**Faculty details**

- Total Number of Faculty in Department – 12

Research Profile of each Faculty Member is as following

**Faculty Members****Prof. Pradip K Tewari**

Jal Jeevan Mission Professor Chair and Head, Department of Chemical Engineering

**Specialization/ Research interest:** Water Technologies; Membrane Technology; Desalination; Nanocomposite Membrane Technology; Heat Transfer and Two Phase Flow

**Dr. Abhilasha Maheshwari**

Assistant Professor

**Specialization/ Research interest:** Process Systems Engineering; Water Distribution Networks; Modelling; Optimization; Sustainability; Environmental Chemistry; AI and ML in Chemical and Environmental Systems

**Dr. Angan Sengupta**

Assistant Professor

**Specialization/ Research interest:** Molecular Modelling & Simulation; Theoretical Material Design; Carbon dioxide Capture; Hydrogen Storage; Water Treatment; Fuel Cell; Thermodynamic Studies; Continuum Modelling & Simulation; Fire and Explosion Modelling; Steady and Transient State Modelling; Safety Modelling; Process Modelling; Transport Processes

**Dr. Deepak Arora**

Associate Professor

**Specialization/ Research interest:** Adhesion in electronic packaging and manufacture of high density interconnects; Polymer rheology; Polymer crystallization; Dielectrics for electronic packaging; Structure-process-property relationships for polymers and their composites



**Dr. Prasenjit Sarkar**

Assistant Professor  
**Specialization/ Research interest:**  
 Biomolecular Engineering;  
 Biochemical Engineering



**Dr. Prashant Kumar Gupta**

Assistant Professor  
**Specialization/ Research interest:**  
 Electrochemical Energy Storage  
 Devices (Lithium, Sodium and Zinc  
 Ion Battery), Electrocatalysis (HER,  
 OER, CER, and Electrochemical CO2  
 Reduction), Electrochemical Biosensors



**Dr. Praveen Kumar Sappidi**

Assistant Professor  
**Specialization/ Research interest:**  
 Multiscale modeling, Molecular  
 simulation, Free energy simulations,  
 Contaminant separation materials, Ionic  
 liquid based solvents, Polymeric materials



**Dr. Ramesh Asapu**

Assistant Professor  
**Specialization/ Research interest:**  
 Photocatalysis; Environmental  
 remediation; Modeling & Simulation;  
 Plasmonic nanomaterials; Perovskites



**Dr. Sumit Kamal**

Assistant Professor  
**Specialization/ Research interest:**  
 Fine Chemicals; Catalysis and  
 Reaction Engineering, Process  
 Development; Green Technology;  
 Chemical Reaction Kinetics



**Dr. Tara Chand Kumawat**

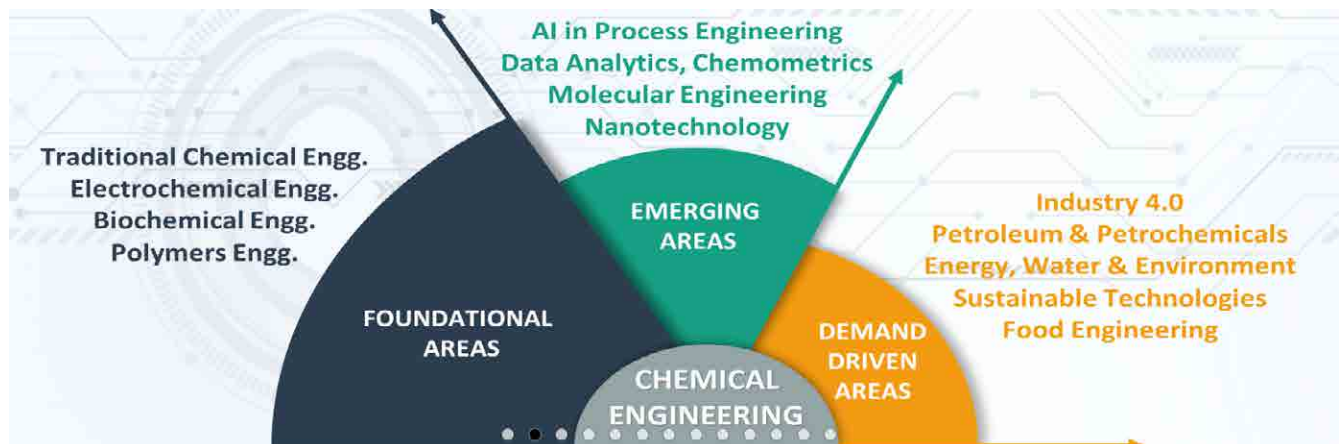
Assistant Professor  
**Specialization/ Research interest:**  
 Hydrodynamic stability; flow through  
 porous media; Computational Fluid  
 Dynamics; Antibubbles



**Dr. Vikky Anand**

Assistant Professor  
**Specialization/ Research interest:**  
 Electrohydrodynamics; Multiphase flow; Electro-desalting; Soft matter; Rheology

**Description of Research Areas and Groups**





Department has research interest in both core chemical engineering and emerging areas. With the advent of Industry 4.0, artificial intelligence (AI), machine learning (ML), data analytics, internet of things (IoT), molecular engineering and nano-composites, the research efforts in the department are focused towards the incorporation of new emerging technologies and demand-driven areas. To this end, following research groups focus on several areas such as:

- **Advanced Water Treatment Technologies:** new energy driven desalination, membrane technologies, nanocomposite membrane, heat transfer and two-phase flow. Future directions include lab to land demonstration of water technologies with particular focus in rural and remote areas.
- **Molecular Engineering:** molecular material design for CO<sub>2</sub> capture, water treatment, geomaterials, molecular designing of membranes for fuel cells, enhanced oil recovery, and molecular development of fabric-based sensors for space applications.
- **Polymers:** for advanced and sustainable manufacturing with applications in Agritech and semiconductors.
- **Electrochemical Engineering:** Energy conversion and storage devices, battery management systems, conversion of CO<sub>2</sub> to fuels, biosensors, electro coalescence of emulsion, electro-desalting in refinery upstream process.
- **Heterogeneous Catalysis & Reaction Engineering:** process development, process intensification, membrane-based separation to work in the domain of fine chemicals, hydrogen economy and biomass valorization.
- **Process Systems Engineering & Sustainability:** Advanced control, AI and machine learning (ML) applications for process modelling and, Decision Support Systems for achieving Sustainable Development Goals, Smart water infrastructure, Water-Food-Energy Nexus, Process Optimization. Future focus of the group also includes setup of digital twin pilot plant for industrial applications and operational excellence studies to name in brief.
- **Fluid & Interfacial Engineering:** Understanding stability of micro-scale free surface flows and

antibubble. use of stable anti-bubbles for various real-life applications such as encapsulation, material transport and delicate mixing

- **Biochemical Engineering & Biomolecular Engineering:** development and large-scale production of new proteins, cells, and tissues of therapeutic and biotechnological value. Future research will also focus on scale-up for large scale production of such tissues in the lab.

### Academic Programmes

Department has students enrolled in following four academic programmes:

- B. Tech. in Chemical Engineering
- M.Tech. in Chemical Engineering
- M.Tech.-Ph.D. Dual Degree in Chemical Engineering
- Ph.D. Chemical Engineering

### Significant Research Achievements

- **Scientific Social Responsibility:** Three water purification units based on membrane assisted sorption process have been designed and installed with local participation in the three rural schools of Sirohi and Jhunjhunu districts providing clean drinking water as a part of technology transfer under Scientific Social responsibility.

Latest Exams School Campus

## IIT Jodhpur Develops Low-Cost Water Purification, Treatment Unit For Schools In Rural Rajasthan

Researchers at the Indian Institute of Technology (IIT), Jodhpur have developed a low-cost water purification and treatment unit for schools in rural areas of Rajasthan.

Press Trust of India | Updated: Aug 8, 2021 3:08 pm IST  
Source: PTI



- **Deployment of First Machine Learning Software** developed by researchers at Department of Chemical Engineering for predictive maintenance of Heat Exchangers at IOCL Mathura Refinery.
- **MOU for Polymer and composites in Agriculture:** Signing of MOU between Eeki Automation Pvt. Ltd and Dr. Deepak Arora, Department of Chemical Engineering for developing the growing chamber based on polymer composites that helps in lowering the temperature near the root zone.
- **Indo-German Research Collaboration:** Signing of the Joint Declaration of Intent between JCKIC, IIT Jodhpur & Fraunhofer IGB, during the Indo-German Summit in Berlin 2022, to initiate and promote a scientific collaboration for future research and development projects in the field of Advanced Wastewater Treatment at the local CETP (Sangaria, Jodhpur).



- **Research Grant funded by SERB(EEQ):** Molecular Exploration of Designer Solvents for the Low Temperature Directional Solvent Extractive Desalination” in the Empowerment and Equity Opportunities for Excellence in Science scheme.
- **Received CSR Fund Sponsored by Canara Bank HEFA:** For the project on Installation of UF -Membrane based Sorption Assisted Water Purification Units in 25 Rural Schools of Jodhpur and nearby villages.

- **Research project for Advanced Electronic Packaging:** Dr. Deepak Arora is running a sponsored project funded by SERB-DST in the area of development of polymer composites for advanced electronic packaging.
- **Total number of Sponsored Research and Consultancy Projects ongoing in department in FY 21-22:** 12

### Faculty/ Department Laurels

- **Jal Jeevan Mission (JJM) Chair Professorship at IIT Jodhpur:** Prof. Pradip K. Tewari has been appointed as JJM Chair professorship with focus on Sustainability of Water Sources.
- **Young Scientist Award** to Dr. Angan Sengupta on International Scientist Awards on Engineering, Science, & Medicine, 2021
- **Research Work Presentation in IFAC International Conference:** Dr. Abhilasha Maheshwari presented her work titled “Stochastic Optimization Model for Short-term Planning of Tanker Water Supply Systems in Urban Areas” at the prestigious International Federation of Automatic Control (IFAC) - DYCOPS 2022 Conference held at Busan, Korea on 17 June 2022.
- **Invited talk in ICTFAB 2021 International Conference for Semiconductor Fabrication and Packaging :** Dr. Deepak Arora was invited for a talk in the area of Advanced Electronic Packaging.

### Student Laurels

- **Best paper presentation Award, InDACon-2022** - Mr. Yogendra Chauhan (guided by Prof. Pradip K Tewari) received the award in the Indian Desalination Association (InDA) Conference, 2022.
- **Participation in Hack of PI: PAN IIT Global Hackathon** – Mr. Vikram Singh Jat, guided by Dr. Deepak Arora clinched their position in the top 1% by registering themselves for the semi-finals in the summit as part of the research on the Growing Chambers for Smart Agriculture.

## Laboratories and equipment

### UG teaching laboratories

Lab Name	Equipment name	Location
Mass Transfer Lab	Natural Draft Dryer Adsorption in Packed Bed Experimental Water Cooling Tower Packed Bed Solid Liquid Extraction Liquid-Liquid Extraction Apparatus Sieve Plate Distillation Column Simple Batch Distillation Column Vapour Liquid Equilibrium Setup Absorption in Sieve Plate Column Absorption in Packed Bed Liquid Diffusion Coefficient Apparatus Solid in Air Diffusion Apparatus Vapour in Air Diffusion Equipment	Berm E-09
Chemical reaction engineering lab	Adiabatic Batch Reactor Isothermal Batch Reactor Isothermal CSTR CSTR with RTD CSTR in series Isothermal PFR PFR with RTD Isothermal semi-batch reactor Packed bed reactor	Berm E-10
Process Control Lab	Single tank system Two tank non-interacting system Two tank interacting system Interacting & non-interacting system Characteristics of PID controller Flow control trainer Level control trainer Temperature control trainer Time constant of thermocouple Time constant of a manometer	Berm E-11
Fluid Mechanics Lab	Discharge Through Venturimeter, Orificemeter & Rotameter Pitot Tube Setup Reynold's apparatus Bernoulli's Theorem Apparatus Fluid friction measurement apparatus Boundary layer apparatus Drag coefficient apparatus Hydrodynamics of packed bed Flow through fluidized bed Cavitation Apparatus	Berm E-12

Lab Name	Equipment name	Location
Heat Transfer lab	Thermal conductivity of metal rod Heat transfer through composite wall Heat transfer in natural convection Heat transfer in forced convection Emissivity measurement apparatus Stefan Boltzmann’s apparatus Heat transfer in agitated vessel Shell and tube heat exchanger Parallel flow/counter flow heat exchanger Dropwise/filmwise condensation apparatus Pool boiling apparatus Unsteady state heat transfer unit	Berm E-13



**Research Laboratories Equipment:**

Equipment name	Lab Location
CO2 Incubator	Lab 205
See-saw shaker	Lab 205
Dry block heater	Lab 205
Battery Testing Equipment 5V 10mA	Berm E11
Battery Testing Equipment 5V 20A	Berm E11
Electrochemical workstation with RRDE	Lab 203
Horizontal arm microscope	Lab 203
Programmable forced convection oven	Lab 206
vacuum oven	Lab 206
programmable spin coater	Lab 206
tube roller	Lab 206
Chemical baths	Lab 206
Computational GPU System + 42 Rack	Rack #18, New Data Center
Computation Work Stations	E8
UV-vis spectrophotometer	Lab 205
Hanna Multiparameter Water Analysis Field Kit	Lab 203
Hermle Centrifuge	Lab 205
Eppendorf Microcentrifuge	Lab 205
Spin Coater (being sent to vendor for repair)	Lab 205
Aspen Server	CC (Rack 18)
Upright Microscope	Lab 203

Equipment name	Lab Location
Trinocular microscope	Lab 203
Camera with cable	Lab 203
High speed homogenizer	Lab 206
Viscometer	Lab 206
Electrochemical analyzer	Lab 203
hydraulic crimping machine and split test cell	Lab 203
electrode punching machine and manual rolling press machine	Lab 203
Autoclave Reactor	Lab 203
Quantum ATK	Lab E8
Function generator	Lab 203
Oscilloscope	Lab 203
Multimeter	Lab 203



#### Outcome:

- **Newsletter publications:** Half yearly publication of newsletter volumes highlighting various department activities
- **Invited Talk:** Prof. Pradip K Tewari gave an invited talk on wastewater management at the 'Environmental Pollution & Wastewater Management of Jodhpur' seminar, jointly organized by the Jodhpur Industries Association (JIA) and Jodhpur City Knowledge and Innovation Cluster (JCKIC) in collaboration with IIT Jodhpur. He briefed about conventional wastewater treatment and outlined innovative wastewater management aspects. He gave plenary lecture on Rural Water Technologies during International Workshop on Water Purification Technologies, Arsenic Removal from Groundwater and Integrated Water Management at CSMCRI and NAM S&T Centre. Keynote address on Water Purification in Rural Areas: IITJ Interventions was delivered by him in the Women Scientist Forum. He delivered Keynote lecture in InDA Conference on Desalination and Water Treatment: Recent Technological advancement, Challenges & Opportunities.
- **Invited Talk & Visit:** Dr. Deepak Arora, and M.Tech (Chemical Engineering) students Yogendra Chouhan and Vikram Singh Jat visited the CIPET Jaipur campus on 8th December 2021.

## Outreach activities

- A talk was given by Dr. Deepak Arora, where he explained the fundamentals of polymers with the help of examples and introduced the Department of Chemical Engineering, IIT Jodhpur.
- **Invited Online Seminar Talk:** Dr. Abhilasha Maheshwari gave an online seminar talk to the Process-Energy-Environmental Systems Engineering (PEESE) lab at Cornell University, New York, entitled "Systems Engineering Perspectives of Smart Water Infrastructure: Modelling and Optimization Approaches for Water Quality Management".
- Opening of Student Chapter of Indian Institute of Chemical Engineers (IIChE) at Department of Chemical Engineering, IIT Jodhpur.
- Dr. Deepak Arora was invited by C4DFED, IIT Mandi for a few lectures on Advanced Electronic Packaging.
- Dr. Deepak Arora was invited to the Thermal Analysis Forum of Delaware Valley for a poster evaluation session.
- Consultancy Projects: At present, the Chemical Engineering Department is sharing its expertise with the Department of Drinking Water and Sanitation (DDWS), Ministry of Jal Shakti; Defence Research and Development Organization (DRDO), Ministry of Defence; Public Health Engineering Department (PHED), Jodhpur Military Cantonment etc. The Department is providing consultancy services to industries and is actively involved in Scientific Social Responsibility (SSR) through Unnat Bharat Abhiyan (UBA) and other societal initiatives.
- **Invited Member & Reviewer:** Dr. Abhilasha Maheshwari has been invited as a National Organizing Committee member for the 10th PSE Asia Conference, IIT Madras, India, 2022.
- **Invited talk:** Dr. Angan Sengupta gave a talk in a Faculty Development Program at Gharda Institute of Technology which is sponsored by AICTE-ISTE.
- Dr. Angan Sengupta is a review committee member for Kerala State Council for Science, Technology & Environment

## Publications

- 1 Sukumar, A., Bachhar, N., Chatterji, A., & Kumaraswamy, G. (2022). Elastic response of polymer-nanoparticle composite sponges: Microscopic model for large deformations. *Physical Review Materials*, 6(2). ISSN: 24759953. <https://doi.org/10.1103/PhysRevMaterials.6.025604>
- 2 Sappidi, P. (2021). Molecular simulation of separation of gadolinium ions from aqueous waste using directional solvent extraction. *Journal of Molecular Liquids*, 341. ISSN: 01677322. <https://doi.org/10.1016/j.molliq.2021.117330>
- 3 Sharma, G. P., Gupta, P. K., Sharma, S. K., Pala, R. G. S., & Sivakumar, S. (2021). Chalcogenide Dopant-Induced Lattice Expansion in Cobalt Vanadium Oxide Nanosheets for Enhanced Supercapacitor Performance. *ACS Applied Energy Materials*, 4(5), 4758–4771. ISSN: 25740962. <https://doi.org/10.1021/acsaem.1c00357>
- 4 Bedar, A., Singh, B., Tewari, P., Bindal, R. & Kar, S. (2021). Kinetics studies on free radical scavenging property of ceria in polysulfone–ceria radiation resistant mixed-matrix membrane. *International Journal of Chemical Reactor Engineering*, 19(8), 779-785. <https://doi.org/10.1515/ijcre-2020-0123>.

## Projects

### Sponsored Research Projects

S. No	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
1	Controlled morphologies via phase-separation in epoxy blends for electronic sensor & device packaging	SERB	Deepak Arora	₹31,39,400	03-Dec-20	02-Dec-22
2	Designing of Potential Adsorbents via Molecular Modelling and Simulations for the High Temperature Carbon Dioxide Capture	SERB	Angansen Gupta	₹21,95,220	04-Dec-20	03-Dec-21
3	Design of Zn Anode and Non-native Structured MnO <sub>2</sub> Cathode for Stationary Grid Energy Storage Devices	DST-Inspire Faculty	Prashant Kumnar Gupta	₹35,00,000	17-Feb-21	16-Feb-26
4	Electrodesalting of water-in-oil emulsion: an experiment, design and scale-up to smart electrocoalescer	SERB-SRG	Vikky Anand	₹32,98,900	23-Dec-21	22-Dec-23
5	Molecular Exploration of Designer Solvents for the Low Temperature Directional Solvent Extractive Desalination	DST-SERB-EMEQ	Praveen Kumar Sappidi	₹36,55,344	05-Mar-22	04-Mar-25
6	Setting up of JJM-Professor Chair on "Sustainability of drinking water sources and releases of funds to IIT, Jodhpur	Ministry of Jal Shakti-National Jal Jeevan Mission	Prof. Pradip Kumar Tewari	₹6,02,37,076	28-Mar-22	27-Mar-27

### Consultancy Projects

S. No	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
1	Separation of fine iron partials from organic powders to less than 10 ppm	Uma Laxmi Organics Pvt. Ltd.	Pradip Kumar Tiwari	₹33,134	01-Feb-20	31-Jan-21
2	Vetting of hydraulic designs related to Rajeev Gandhi Lift Canal (RGLC) System	PHED-Rajasthan	Pradip Kumar Tiwari	₹50,000	01-Jul-20	31-Jul-20
3	Growing chambers used in hydroponic farming	EEKI Automation Private Limited	Deepak Arora	₹1,20,000	31-May-21	30-May-22
4	Random verification of Annual Inventory on Hazardous waste management	Central Pollution control Board	Pradip Kumar Tiwari	₹4,50,000	25-Nov-21	15-Apr-22
5	Data pipeline build-up and ML model deployment for Heat Exchangers	Indian Oil Corpn. Ltd. (Refineries division head quarters)	Pradip Kumar Tiwari	₹1,04,65,000	08-Nov-21	03-Mar-22

# Department of Chemistry

## Introduction

Chemical science meets Technology at the Department of Chemistry, IIT Jodhpur. The department was formally established in the year 2015 at IIT Jodhpur. The Department offers Masters and Doctoral programs in Chemistry. In addition, it offers core and elective courses in chemistry and allied areas for undergraduate B. Tech. Engineering Students of the Institute. The Department of Chemistry at IIT Jodhpur is striving to be acknowledged for excellence in teaching, research and outreach, at a distinctive locus of science and technology. Research is

carried out in all major areas of chemical sciences. It has started its journey of making technology contributions in new materials for energy solutions, environmental remediation, water and healthcare. Also, fundamental research in the areas of Chemical Reaction Dynamics, Computational Biophysics, Nuclear Magnetic Resonance techniques, Organic Synthetic methods, organometallic chemistry, Main Group Chemistry, Nanomaterials, Quantum Chemistry and Quantum Information are being carried out in the department. This document describes the vision and mission of the department.

## Faculty Members



### Manikandan Paranjothy

Head of Department  
**Specialization/ Research interest:**  
Theoretical and Computational Chemistry, Chemical Reaction Dynamics



### Rakesh Kumar Sharma

**Specialization/ Research interest:**  
Catalysis for Energy and Stereocontrol, Feedstock Chemistry, Fuel and Lubricants, Energy Storage and Water Treatment Technology



### Dr. Ananya Debnath

**Specialization/ Research interest:**  
Theoretical and Computational Chemistry



### Ramesh K. Metre

**Specialization/ Research interest:**  
Main-group organometallic chemistry, Coordination polymers, Inorganic-organic hybrid materials and Metal phosphonate and phosphate chemistry



### Atul Kumar

**Specialization/ Research interest:**  
Quantum Information Processing



### Samanwita Pal

**Specialization/ Research interest:**  
Solution and solid-state NMR and NQR spectroscopy



**Ritu Gupta**

**Specialization/ Research interest:**  
Nanomaterials & Nanodevices for Water, Energy and Healthcare

**Sandip Murarka**

**Specialization/ Research interest:**  
Organic Synthesis, Development of Novel Synthetic Methods, Transition Metal Catalyzed Synthetic Transformations, C-H Functionalization Reactions, Asymmetric Catalysis

**Nirmal Kumar Rana**

**Specialization/ Research interest:**  
Asymmetric Catalysis and Continuous Flow Chemistry

**Subrata Chakraborty**

**Specialization/ Research interest:**  
Organometallics, Homogeneous Catalysis

**Dibyendu Kumar Sasmal**

Assistant Professor  
**Specialization/ Research interest:**  
Biophysical chemistry; Single molecule fluorescence imaging; T cell immunology; Ion channel and neurotransmitter; Femtosecond ultrafast fluorescence spectroscopy; Fluorescence correlation spectroscopy; Electrophysiology: Single channel patch-clamp

**Rohan D. Erande**

**Specialization/ Research interest:**  
Synthesis of Natural Products & Medicinally Active Compounds, Method development Lewis Acid Catalysis

## Description of Research Groups

The Department of Chemistry has set up 6 thematic research laboratories for advanced experimental research activities for Ph.D. scholars, project staff and Post-Doctoral Researchers. The details of the research, experimental facilities etc. can be found under the webpages of individual faculty users of the laboratory. Following are the thrust areas in which research activities are going on in the department.

1. Organic Synthesis and Catalysis
2. Natural Products and Drugs
3. Magnetic Resonance Spectroscopy
4. Fluorescence Correlation Spectroscopy
5. Quantum Computing and Information
6. Materials for Energy Harvesting and Storage
7. Computational Physical Chemistry
8. Sensors for Environment and Healthcare
9. Energy Production, Conversion and Storage Devices
10. Bio Fuels and Catalysis
11. Asymmetric Synthesis and Flow Chemistry
12. Main Group Chemistry and Organometallic Catalysis
13. Water Treatment and Environmental Remediation

The department has been actively involved in setting up an advanced research facility that house various sophisticated equipment and characterization tools for carrying out cutting-edge research. Department has access to various spectrometers for molecular characterization (NMR 500 MHz, temperature-dependent fluorescence and PL measurements,

UV-Visible, FT-IR), Microscopy techniques (SEM, AFM, optical microscope) and structural characterization (P-XRD and Single-crystal XRD) and thermal characterization tools (TGA, DTA), Surface techniques (BET, Chemisorption, Contact Angle) and Magnetic Measurements (SQUID and PPMS).

### Academic Programmes

M.Sc. Chemistry (2 year)

Ph. D. in Chemistry

BS in Chemistry with Specialization (4 years)

### Significant Research Achievements

1. Dr. Sandip Murarka has been chosen by the editorial boards of the journals Synthesis, Synlett, and Synfact as one of the "Thieme Chemistry Journal Awardees" for 2022
2. Dr. Sandip Murarka has been invited to join the Early Career Advisory Board of 'Chemistry Select' journal
3. Prof. Rakesh K Sharma elected the Fellow of the Royal Society of Chemistry, London.
4. Sushanta Kumar Parida and Sandip Murarka's latest research article is published in the journal 'Organic Letters' (Impact Factor: 6.005).
5. Research Paper of Abhishek Mishra, Ravi Kumar, Prem Lama and Ramesh K Metre published in Journal of Molecular Structure
6. SERB Women Excellence Award for Young Women Scientists for Outstanding Research for the year 2021 to Dr. Ritu Gupta

### Faculty/ Department Laurels

- Dr. Manikandan Paranjothy, Member of few national level committees; Invited journal publications; Reviewer for journals and SERB; Pooja Sharma (M17CY013) M.Sc student has got PMRF Fellowship. AkashGutal (P20CY201), Ph.D student has got PMRF Fellowship; AnchalGahlaut, PhD student, received a highly prestigious Carl Storm International Diversity (CSID) Award, CSIR Foreign Travel Grant and CCSTDS Travel Fellowship Award
- Dr. Ananya Debnath, Invited journal publications, Review Editor for Frontiers with Biophysics as specialty section, Active referee for journals and Arpita Srivastava & Abhinav Srivastava, Two PhD students doing post doc in reputed Institutes abroad, One PhD student received the best poster award from RSC, One PhD student won travel grant to attend workshop abroad; MSc students doing PhD in reputed Institutes in India and abroad, Purva (M17CY015) received PMRF fellowship and won travel grant to attend workshop abroad,
- Dr. Nirmal Kumar Rana, Received four sponsored research grants including INSPIRE Faculty Award from DST, Core-Research Grant (PI) and IRHPA (Co-PI) from SERB. Mentoring one project under Women Scientist Scheme-A. Serving as Review Editor of the Editorial Board of Catalytic Reactions and Chemistry (specialty section of Frontiers in Chemistry). Life time member of CRSI. Actively working on collaborative research with other research groups within the Institute and outside Institute. Published many original research articles in international journals. and Master students who worked with me during their projects/thesis have been pursuing PhD programs in reputed institutes.
- Dr. Rakesh Kumar Sharma, Three Technology developed in the area of Bio-fuel, Environmental Remediation (water, soil and air) and Catalysis, Editor of Frontiers of Materials. Received 15 research grants including 4 constancy projects, Member of FICCI for roadmap of Bio-Fuel policies, Member of NGT for Environmental monitoring committee, Fellow of Royal Society of Chemistry (FRSC), Member of IUPAC, Executive Member of Royal Australian Chemical Institute, Best Faculty Award for teaching and Research and Outstanding Research Award-2018 and Six Masters students selected for Phd in top universities in USA, One PhD student got SERB-OVDF at University of Alberta, Canada.
- Dr. Ramesh K. Metre, Early Career Research Award from SERB, 2017 and Masters Student selected for Phd in university abroad, Abhishek Mishra received "Best Research Award" for his oral presentation in Students' Research Convention' 21, organized

by the IIT Kanpur; Abhishek Mishra, Ph.D. Student, working under the supervision of Dr. Ramesh K. Metre received “Professor B. C. Halder Memorial Award” for the oral presentation in the 57th Annual Convention of Chemists, 2020 & International Conference on “Recent Trends in Chemical Sciences (RTCS-2020)” organized by the Indian Chemical Society

- Dr. Ritu Gupta, SERB SIRE Fellowship (2022); DST Projects Review Committee Member 2022; Member of Materials Chemistry Team in SERB-VORTEX Conclave 2021; Associate Editor for Frontier in Sensors (2021 onwards); Selected for Indo-German Week of the Young Researcher-2021, NASI Young Scientist Platinum-Jubilee Award (2021); Emerging Young Investigator Recognition by RSC -Journal of Materials Chemistry-A (2021); IIT Jodhpur Young Researcher Award (2021); Associate, Indian Academy of Sciences (2021); SERB Women Scientist Award (2021); Member of Indian National Young Academy of Sciences (2021-25); INSA Young Scientist Medal (2020); RSC Materials Horizon Community Board Member (2020 onwards); SERB ITS Fellowship Travel Grant (2018) , Materials Research Society of India, Member (2018 onwards), Best Reviewer Recognition from Bulletin of Materials Science, India (2018).
- Dr. Rohan D. Erande, developing methodologies in the area of green chemistry to access natural products and drug molecules concisely.
- Dr. Samanwita Pal, Elected as an executive committee member of NMR Society of India in 2021 for two years; active referee for renowned Physical Chemistry Journals; Invited article published in special issue of JMR Open and PhD students are all placed; MSc. students are doing PhDs in reputed national and international institutes; presented papers in NMR conferences; won DST travel grants
- Dr. Sandip Murarka, Thieme Chemistry Journal Award” by the editorial boards of the journals Synthesis, Synlett, and Synfact, 2022.
- Dr. Sandip Murarka, Early Career Advisory Board (ECAB) Member of Wiley-VCH “ChemistrySelect” Journal, 2022.
- Dr. Sandip Murarka, Lifetime Fellow, Indian Chemical Society (ICS), 2020.
- Dr. Sandip Murarka, Lifetime Membership, Indian Chemical Society (ICS), 2020.
- Dr. Sandip Murarka, Lifetime Membership, Chemical Research Society of India (CRSI), 2020.
- Dr. Sandip Murarka, Early Career Research Award (ECRA) from the Science and Engineering Research Board (SERB), 2018.
- Dr. Sandip Murarka, INSPIRE Faculty Award from the Department of Science & Technology (DST), India (2016).
- Dr. Sandip Murarka, Max-Planck fellowship from MPI Dortmund (06/2013-04/2016). and M.Sc. students doing PhD in reputed institutes in India and abroad. Received PMRF fellowship. Published research work in highly reputed international journals of high impact factor.
- Received FIST Project Grant (DST-FIST Program-2019)

## Student Laurels

S. No	Major Achievements of the students	
1.	Samapika Sahu (P20CY011), PhD student has won travel grant for workshop by Cluster of Excellence RESOLV at university of Bochum	7-10 June 2022
2.	Kriti Alam (M21CY011), MSc student has won travel grant for workshop by Cluster of Excellence RESOLV at university of Bochum	7-10 June 2022
3.	Ghanshyam Mali, Ph.D. student, received Best Poster Award in the WOST Conference held at IIT Jodhpur.	19-20 April 2022
4.	Ajay Urgunde (P16CY002) got selected for NSF funded Postdoctoral Position at Auburn University, USA	2 Jan 2022

S. No	Major Achievements of the students	
5.	Snehraj Gaur (P20CY013), PhD student received PMRF fellowship through Lateral Entry to work with Dr.Ritu Gupta on VOC sensors for healthcare applications..	22 Oct 2021
6.	Akash Gural (P20CY201), Ph.D student has got PMRF Fellowship.	31 May 2021
7.	Abhishek Mishra received "Best Research Award" for his oral presentation in Students' Research Convention' 21, organized by the IIT Kanpur	27 March 2021
8.	Gaurav Bahuguna (P16CY001), PhD Student got a fully funded postdoctoral position with Prof.Patolsky at Tel-Aviv University, Israel .	3 March 2021
9.	Abhishek Mishra, Ph.D. Student, working under the supervision of Dr. Ramesh K. Metre received "Professor B. C. Halder Memorial Award" for the oral presentation in the 57th Annual Convention of Chemists, 2020 & International Conference on "Recent Trends in Chemical Sciences (RTCS-2020)" organized by the Indian Chemical Society	06 January 2021

## Laboratories and equipment

### List for Equipment at Basic & Thematic Research laboratories

#### Chemistry

##### Chemistry Inorganic & Organic Laboratory -105

- Shaker (R. T) (Thermo Scientific/MaxQ 3000)-01 No.
- Revco Refrigerators (Thermo Scientific)-02 Nos.
- Centrifuge (Thermo Scientific/Sorval ST40R, Legend Micro STR21 and LegenMicro 21)-02 Nos
- Hot Shaker (Julabo/SW23)-01 No.
- Water purification machine (R O) - 01 No.
- (Thermo Scientific/Barnstead, M. No. 7157)
- Sonicitors (Elm/Elmasonic P)-01 No.
- Soxhlet apparatus (complete Set) Ambassador -01 No.
- Rotary evaporator (IKA/RV10 Basic)-03 Nos.
- Vacuum pumps (I Lmvac GmbH)-o3 No.
- Vacuum Pumps (Oil) (I Lmvac GmbH)-01 Nos.
- Ultra Violet fluorescent analytical cabinet UV-03 Nos.
- Mettler Toledo = 3 Nos.
- Furnace Box (Nabertherm 30-3000°C/LHT 207 GN)-01 No.
- Furnace Tubular (Nabertherm / RT 30/200/15/230 v1/N/PE)-01 No.
- OvenUni Tech Sales/ Mod. No. UTS 1.01 F-1 No.
- Magnetic Hot Plate Stirrers- 18 Nos.
- IKA C – MAG HS 7 = 4 Nos.
- Digital Multimeter (Model :Metravi 451)
- Refrigerator (Elan Pro)-01 No.
- Vacuum pump (Rocker)-01 No.
- Digital Oven (UTS-1.01E)-01 No.
- Vacuum Oven (MAC, MSW-218)



### Chemistry Analytical & Physical laboratory-106

1. Electrochemical work station (CH Instruments, CHI66E)-01 No.
2. UV Visible Spectrometer (LABINDIA, 2000 U)-02 Nos.
3. FTIR Spectrometer (Bruker, Apex-II)-01 No.
4. Fluorescence Spectrometer (JASCO, FP-8300)-01 No.
5. Contact Angle Meter (Kyowa Interference, DME-211 plus)- 01 No.
6. Optical Polarimeter (Rudolph Autopol-II, Automatic Polarimeter) )- 01 No.
7. Electronic weighing balance (Shimadzu, BL-220H) 02 No.
8. Ultrasonic cleaner (Cole parmer08895-19) - 01 No.

9. Water purification system (Milipore) )- 01 No.
10. Refrigerator (Elanpro) )- 02 No
11. Centrifuge (Thermo Scientific)



### Laboratory-201 (Asymmetric Catalysis & Continuous Flow Chemistry Laboratory)

1. Rotary Evaporator
2. (Complete set = rotavap + vacuum pump + chiller) (2 Nos.)
3. Chiller (2 Nos.)
4. Oil Free Vacuum Pump (3 Nos.)
5. Magnetic Stirrers Hot Plate (10 Nos.)
6. Weighing Machines (accuracy 0.001g) (2 Nos.)
7. High Vacuum Pump (with oil) (2 Nos.)
8. Vestfrost Fridge (1 Nos.)
9. Oven (1 Nos.)
10. Ultraviolet Inspection Cabinet (2 Nos.)
11. Chemical Storage (02 Nos.)

12. Ultrasonicator (1 Nos.)
13. Heating Mantle (4 Nos.)



### Laboratory-202 (Spectroscopy & Biophysical Chemistry Laboratory)

1. Benchtop Muffle Furnace (Model: MF-14P) Metrex scientific instruments (P) Ltd.- )- 01 No.
2. Laboratory electric oven universal type (upto 250 °C) UNI-TECH Sales. )- 01 No.
3. pH Meter with micro electrode (3mm), ThermoFisher-)- 01 No.
4. Micro Centrifuge tube rotor, (14000 rpm) Green Genome-)- 01 No.
5. Semi Micro balance (0.01mg-80g) ACZET-)- 01 No.
6. Vortex Shaker Green Genome-)- 01 No.- )- 01 No.
7. Digital Ultrasonic Cleaner (40kHz/2.5 Ltr) Green Genome-)- 01 No.
8. Vacuum Pump (17LPM/hg. 24"/12Psig) Green Genome-
9. Hot Plate with Magnetic Stirrer (Qty-2 Nos.)

10. Normal Refrigerator/ Fridge (Qty-1 No.)
11. Benchtop Muffle Furnace (Model: MF-14P) Metrex scientific instruments (P) Ltd.- )- 01 No.



### Laboratory-207 (Transition Metal & Organometallic Chemistry Laboratory)

1. Oven-2 Nos.
2. Refrigerator-3 Nos.
3. Weighing balance-1 No.
4. Vacuum pump-1 No.
5. Hotplate-4 Nos.
6. Rotary evaporator -1 No.
7. Sonicator-1 No.
8. Melting point apparatus-1 No



### Laboratory-208 (C-H Functionalization & Photoredox Catalysis Laboratory)

1. Rotary evaporator -1 No.
2. Magnetic stirrer-4 Nos.
3. Refrigerator-2 Nos.
4. Chiller-2 Nos.
5. High vacuum pump-1 No.
6. Gas cylinder with regulator-4 Nos.
7. One complete set of Uv Vis kessel system



**Laboratory-215 (Advanced Functional Materials Laboratory)**

1. Electro Chemical station (CHI601e)
2. Laminar Hood
3. Refrigerator-RT EON 231 C
4. Atmospheric Glove Box with Thermal Evaporator
5. Nabertherm TGA furnace (B400/410)
6. Digital Oven
7. Custom Designed Gas/VOC Sensing Set up
8. IVUM Stat Electro Chemical Station
9. Multi-channel Palm Sens Electrochemical Station

10. Probe Sonicator
11. Bath Sonicator

**Laboratory-216 (Energy and Environmental Catalysis Research Laboratory)**

1. Rotary Evaporator (IKA/RV10 Basic)
2. Vacuum pumps (ILmvac GmbH)
3. High preactor (Elfab / Model No. #63393/1/045/2010)
4. Ultra Violet fluorescent analytical cabinet UV
5. Ready Reactor (Complete Set) Radleys
6. Chiller Julabo / Mod. No. FL 1201= 2, FT 902=1, FP 89= 1
7. Colorimeter Fisher Scientific / Mod. 45
8. Titrator Terminator with compact stirrer Mettler Toledo / Mod. T 50
9. Solar simulator (PET photo emission TECH INC& Modal SS50AAA)
10. Glass oven with vacuum pump (Buchi&Buchi glass oven B-585)
11. Melting Point (Buchi& melting point M-565)
12. Autopol II Automatic polarimeter with mini cooling system
13. Rudolph Research Analytical &AP II /2W
14. MCS-R 500 & spectra lab Instruments Pvt. Ltd
15. Electrochemical Workstation (CH instruments & model 680)

16. 8 Channels Battery Analyzer (MTI & BST8-MA (10mA)
17. Toga Clean System (GT Scien)
18. Centrifuge (Thermo Scientific)
19. Julabo Refrigerators (Julabo/KRC 180)
20. Overhead Mechanical Stirrers (Heidolph RZR-2102)



**Centre for Advanced Scientific Equipment-111 and Furnace Lab**

- |   |                   |
|---|-------------------|
| 1. High Resolution Mass Spectrometer System (HR-MS) | 3. Tube Furnace   |
| 2. Nitrogen Generator                               | 4. Muffle Furnace |

**Outreach activities**

- Dr. Ananya Debnath, organized several visits of school children under the scheme of RashtriyaAbhishkarAbhiyaan and Unnat Bharat Abhiyaan, Visited schools in neighboring villages under the scheme of Unnat Bharat Abhiyan, Delivered lectures for the school children under VigyanJyoti program
- Dr. Nirmal Kumar Rana, guided three students from outside institute under Joint Science Academies Summer Research Fellowship Program
- Ritu Gupta organized a conference on “Empowering Science and Technology with Women - WOST 2022” during 19-20th April 2022 at IIT Jodhpur. The event was organized for fostering the involvement of the female fraternity in Science and Technology (S&T). The conference included 184 attendees (young scientists and students) and 23 invited talks on frontier areas of S&T. The program was mandated to construct a roadmap for young women for their involvement in S&T and create an inspirational environment for those interested in pursuing their careers in STEM. This program was laid by the thoughtful initiative of the SERB, RSC and IIT Jodhpur.
- Ritu Gupta delivered a lecture to more than 300 students from local government schools of XI and XII at Indian Air Force Camp on “Nanotechnology: Examples in Everyday Life” at Air Force Auditorium, Air Force Station Jodhpur on 06 May 2022.
- Ritu Gupta delivered an Invited National Webinar on “NanoTechnology : From Lab to Fab” organized for BSc/MSc students and faculty as a part of "Recent Advances in Chemistry" at the IUPAC Global Breakfast Event at Miranda House College, Delhi University on 16 Feb 2022.
- Ritu Gupta, coordinated IIT Jodhpur visit of 80 VigyanJyoti Scholars of Classes 10 & 12 from Navodhya School, Barmer under DST Project VigyanJyoti program on 23 Dec 2021;
- Ritu Gupta, organized Science Exhibition and Lectures on National Science day (28 Feb 2022) at BharatpurPahari district for all govt schools students of Class X and XII.
- Ritu Gupta conducted an online Internship for 4 weeks for research training on “Materials for Energy and Environment” for 1 month (June-July 2021) for selected meritorious MSc/BSc students as INYAS member.
- Ritu Gupta delivered outreach lectures in online mode at VIT Vellore Chennai and Bikaner Engineering College, Rajasthan on 5 and 6 July 2021 as ATAL FDP programme for 200 registered participants.
- Ritu Gupta delivered an invited RSC Desktop Seminar on Smart Sensors organized by Materials Horizon on 3 Dec 2020. Event was attended by more than 100 participants.
- Ritu Gupta delivered a tutorial on X-Ray Diffraction Technique for Materials Analysis at University of Kota, Rajasthan (March 2020).
- Ritu Gupta organized several outreach programs on Nanotechnology that included exhibition, lectures, video shows, quizzes for more than 500 school and college students in 2018, 2019 and 2020 at various locations in Rajasthan (Jaipur Science Centre, Barmer, JNVU and govt schools of Jodhpur). This was supported by NanoMission and DST Rajasthan.



13. Ritu Gupta delivered a lecture and presented a video show on "Discoveries in Chemistry" on 7 July 2016 to students and teachers from Eastern India under Ishan Vikas Program (MHRD).
14. Ritu Gupta delivered a seminar on the topic "Nano: In my Everyday life?" to young students from schools of Jodhpur under RashtriyaAvishkarAbhiyan on 21 November 2015.
15. Dr. SandipMurarka, contributed to the outreach program of DST, KIRAN division, "VigyanJyoti-Pilot", by delivering a lecture on "Organic Chemistry in Today's World". The program was organized at IIT Jodhpur by our Nodal officer of the program, 2018.
16. Dr. SandipMurarka, conducted a session at K.V no.1 Air force Jodhpur as part of an In-Service Training Program for PGT Chemistry (40 in number) for their professional development. The session was conducted by opting a topic "Aromatic Substitution Reactions" to demonstrate innovations in teaching methods, 2018.
17. Dr. SandipMurarka, Served as Jury member for National Children Science Congress (NCSC)-2021 at K.V no.1 Air force Jodhpur, 2021
18. Dr.Dibyendu K sasmal and Dr. SandipMurarka, Served as a department coordinator to conduct institute wide open house-"IIT Jodhpur Padharo", 2022.
19. Dr. Rohan D. Erande, Served as Jury member for National Children Science Congress (NCSC)-2021 at K.V no.1 Air force Jodhpur, 2021
20. Dr. Rohan D. Erande, Served as a Institute Representative (IR) for JEE (Advanced) 2021

## Publications

- 1 Jain, A., Maji, S., Shukla, K., Kumari, A., Garg, S., Metre, R. K., Bhattacharyya, S., Rana, N. K. (2022). Stereoselective synthesis of tri-substituted tetrahydrothiophenes and their in silico binding against mycobacterial protein tyrosine phosphatase B. *Organic and Biomolecular Chemistry*, 20(15), 3124–3135. ISSN: 14770520. <https://doi.org/10.1039/d2ob00052k>
- 2 Kamboj, N., Mali, G., Lama, P., Erande, R. D., & Metre, R. K. (2022). Designing a Redox Noninnocent Phenalenyl-Based Copper(II) Complex: An Autotandem Catalyst for the Selective Oxidation of Polycyclic Aromatic Hydrocarbons (PAHs). *ACS Omega*, 7(10), 8789–8797. ISSN: 24701343. <https://doi.org/10.1021/acsomega.1c07051>
- 3 Andra, S., Balu, S. K., Ponnada, S., Mohan, S., Hossain, M. S., Sivakumar, B., ... Muthalagu, M. (2022). Antimicrobial and Toxicity Studies of Dodonaea angustifolia Extracts-Mediated Green Synthesized Copper Oxide Particles. *ChemistrySelect*, 7(8). ISSN: 23656549. <https://doi.org/10.1002/slct.202104017>
- 4 Kumar, A., Sharma, N., Gutal, A. P., Kumar, D., Kumar, P., Paranjothy, M., & Kumar, M. (2022). Growth and NO<sub>2</sub> gas sensing mechanisms of vertically aligned 2D SnS<sub>2</sub> flakes by CVD: Experimental and DFT studies. *Sensors and Actuators B: Chemical*, 353. ISSN: 09254005. <https://doi.org/10.1016/j.snb.2021.131078>
- 5 Ponnada, S., Gorle, D. B., Kiai, M. S., Raju, C. V., Faraji, M., Sharma, R. K., & Nowduri, A. (2022). Understanding the endocrine disruptor and determination of bisphenol A by functional Cu-BTABB-MOF/rGO composite as facile rapid electrochemical sensor: An experimental and DFT investigation. *Analytical Methods*, 14(5), 560–573. ISSN: 17599660. <https://doi.org/10.1039/d1ay02150h>
- 6 Urgunde, A. B., Dhamija, A., & Gupta, R. (2022). Nickel Cobaltite Nanoplate-Based Electrochemical Sensing Platform from Printable Inks for Simultaneous Detection of Dopamine and Uric Acid. *Chemistry - An Asian Journal*, 17(2). ISSN: 18614728. <https://doi.org/10.1002/asia.202101166>

- 7 Das, S., Azim, A., Hota, S. K., Panda, S. P., Murarka, S., & De Sarkar, S. (2021). An organophotoredox-catalyzed redox-neutral cascade involving: N-(acyloxy)phthalimides and allenamides: Synthesis of indoles. *Chemical Communications*, 57(97), 13130–13133. ISSN: 13597345. <https://doi.org/10.1039/d1cc05397c>
- 8 Kumar, P., Laishram, D., Sharma, R. K., Vinu, A., Hu, J., & Kibria, M. G. (2021). Boosting Photocatalytic Activity Using Carbon Nitride Based 2D/2D van der Waals Heterojunctions. *Chemistry of Materials*, 33(23), 9012–9092. ISSN: 08974756. <https://doi.org/10.1021/acs.chemmater.1c03166>
- 9 Shejale, K. P., Krishnapriya, R., Patil, H., Laishram, D., Rawal, P., & Sharma, R. K. (2021). Recent advances in ultra-low temperature (sub-zero to 100 °C) synthesis, mechanism and applications of titania (TiO<sub>2</sub>) nanoparticles. *Materials Advances*, 2(23), 7502–7529. ISSN: 26335409. <https://doi.org/10.1039/d1ma00942g>
- 10 Naz, E. G., & Paranjothy, M. (2021). Theoretical studies of unimolecular decomposition of thiophene at high temperatures. *Electronic Structure*, 3(4). ISSN: 25161075. <https://doi.org/10.1088/2516-1075/ac391f>
- 11 Sharma, A., Sharma, R. K., Kim, Y.-K., Lee, H.-J., & Tripathi, K. M. (2021). Upgrading of seafood waste as a carbon source: Nano-world outlook. *Journal of Environmental Chemical Engineering*, 9(6). ISSN: 22133437. <https://doi.org/10.1016/j.jece.2021.106656>
- 12 Krishnapriya, R., Nizamudeen, C., Saini, B., Mozumder, M. S., Sharma, R. K., & Mourad, A.-H. I. (2021). MOF-derived Co<sup>2+</sup>-doped TiO<sub>2</sub> nanoparticles as photoanodes for dye-sensitized solar cells. *Scientific Reports*, 11(1). ISSN: 20452322. <https://doi.org/10.1038/s41598-021-95844-4>
- 13 Mali, G., Chauhan, A. N. S., Chavan, K. A., & Erande, R. D. (2021). Development and Applications of Double Diels-Alder Reaction in Organic Synthesis. *Asian Journal of Organic Chemistry*, 10(11), 2848–2868. ISSN: 21935807. <https://doi.org/10.1002/ajoc.202100493>
- 14 Kumar, D., Priyadarshini, C. H., Sudha, V., Sherine, J., Harinipriya, S., & Pal, S. (2021). Investigation of Adsorption Behavior of Anticancer Drug on Zinc Oxide Nanoparticles: A Solid State NMR and Cyclic Voltammetry (CV) Analysis. *Journal of Pharmaceutical Sciences*, 110(11), 3726–3734. ISSN: 00223549. <https://doi.org/10.1016/j.xphs.2021.08.003>
- 15 Jalwal, S., Atreya, V., Singh, T., & Chakraborty, S. (2021). Base metal catalyzed (De)hydrogenative formylation and methylation reactions utilizing carbon dioxide and methanol as C1 sources. *Tetrahedron Letters*, 82. ISSN: 00404039. <https://doi.org/10.1016/j.tetlet.2021.153362>
- 16 Ponnada, S., Kiai, M. S., Gorle, D. B., Nowduri, A., & Sharma, R. K. (2021). Insight into the Role and Strategies of Metal-Organic Frameworks in Direct Methanol Fuel Cells: A Review. *Energy and Fuels*, 35(19), 15265–15284. ISSN: 08870624. <https://doi.org/10.1021/acs.energyfuels.1c02010>
- 17 Urgunde, A. B., Bahuguna, G., Dhamija, A., Kamboj, V., & Gupta, R. (2021). Scalable Production of Nickel Cobaltite Nanoplates using Solution-Processed Inks for OER Electrocatalysis. *Materials Research Bulletin*, 142. ISSN: 00255408. <https://doi.org/10.1016/j.materresbull.2021.111380>
- 18 Dutta, S., Pal, S., Sharma, R. K., Panwar, P., Kant, V., & Khola, O. P. S. (2021). Implication of Wood-Derived Hierarchical Carbon Nanotubes for Micronutrient Delivery and Crop Biofortification. *ACS Omega*, 6(37), 23654–23665. ISSN: 24701343. <https://doi.org/10.1021/acsomega.1c03215>
- 19 Ponnada, S., Gorle, D. B., Kiai, M. S., Rajagopal, S., Sharma, R. K., & Nowduri, A. (2021). A facile, cost-effective, rapid, single-step synthesis of Ag-Cu decorated ZnO nanoflower-like composites (NFLCs) for electrochemical sensing of dopamine. *Materials Advances*, 2(18), 5986–5996. ISSN: 26335409. <https://doi.org/10.1039/d1ma00319d>
- 20 Bahuguna, G., Verma, M., & Gupta, R. (2021). Chemical insights into electrophilic fluorination of SnO<sub>2</sub> for photoelectrochemical applications. *Journal of Materials Chemistry A*, 9(35), 19965–19974. ISSN: 20507488. <https://doi.org/10.1039/d1ta02560k>

- 21 Mishra, A., Kumar, R., Lama, P., & Metre, R. K. (2021). Octanuclear Organotin Copper Sulfide Cage [(RSnCu)<sub>4</sub>(μ<sub>3</sub>-S)<sub>8</sub>].2CHCl<sub>3</sub> (R = 2-phenylazophenyl) Assembled using Intramolecular Coordination Approach: Synthesis, Structure and DFT-NBO-AIM Analysis. *Journal of Molecular Structure*, 1239. ISSN: 00222860. <https://doi.org/10.1016/j.molstruc.2021.130458>
- 22 Laishram, D., Krishnapriya, R., Saini, B., Gupta, U., Soni, V. K., & Sharma, R. K. (2021). Nickel and cobalt transfigured natural clay: A green catalyst for low-temperature catalytic soot oxidation. *New Journal of Chemistry*, 45(32), 14751–14758. ISSN: 11440546. <https://doi.org/10.1039/d1nj01346g>
- 23 Jain, A., & Rana, N. K. (2021). Review on Asymmetric Catalysis Employing 5H-Oxazol-4-Ones as α-Hydroxy Carboxylic Acid Surrogates. *Advanced Synthesis and Catalysis*, 363(16), 3879–3912. ISSN: 16154150. <https://doi.org/10.1002/adsc.202100456>
- 24 Sharma, P. R., Pandey, S., Malik, A., Choudhary, G., Soni, V. K., & Sharma, R. K. (2021). Calix[4]amido crown functionalized visible sensors for cyanide and iodide anions. *RSC Advances*, 11(43), 26644–26654. ISSN: 20462069. <https://doi.org/10.1039/d1ra03608d>
- 25 Chaubey, B., Chandrakumar, N., & Pal, S. (2021). Preferential solvation of carbohydrates in water-trifluoroethanol mixtures: a solvent detected heteronuclear NMR approach. *Physical Chemistry Chemical Physics*, 23(27), 14564–14568. ISSN: 14639076. <https://doi.org/10.1039/d1cp01531a>
- 26 Mukhamatdinov, I. I., Salih, I. S., Rakhmatullin, I. Z., Sviridenko, N. N., Pevneva, G. S., Sharma, R. K., & Vakhin, A. V. (2021). Transformation of resinous components of the ashalcha field oil during catalytic aquathermolysis in the presence of a cobalt-containing catalyst precursor. *Catalysts*, 11(6). ISSN: 20734344. <https://doi.org/10.3390/catal11060745>
- 27 Das, S., Parida, S. K., Mandal, T., Hota, S. K., Roy, L., De Sarkar, S., & Murarka, S. (2021). An organophotoredox-catalyzed redox-neutral cascade involving: N-(acyloxy)phthalimides and maleimides. *Organic Chemistry Frontiers*, 8(10), 2256–2262. ISSN: 20524110. <https://doi.org/10.1039/d1qo00170a>
- 28 Malik, S., & Debnath, A. (2021). Dehydration induced dynamical heterogeneity and ordering mechanism of lipid bilayers. *Journal of Chemical Physics*, 154(17). ISSN: 00219606. <https://doi.org/10.1063/5.0044614>
- 29 Parida, S. K., Hota, S. K., Kumar, R., & Murarka, S. (2021). Late-Stage Alkylation of Heterocycles Using N-(Acyloxy)phthalimides. *Chemistry - An Asian Journal*, 16(8), 879–889. ISSN: 18614728. <https://doi.org/10.1002/asia.202100151>
- 30 Saini, R., Globisch, C., Franke, L., Peter, C., & Debnath, A. (2021). Interactions Determining the Structural Integrity of the Trimer of Plant Light Harvesting Complex in Lipid Membranes. *Journal of Membrane Biology*, 254(2), 157–173. ISSN: 00222631. <https://doi.org/10.1007/s00232-020-00162-x>
- 31 Chaubey, B., Singh, P., & Pal, S. (2021). Solution-state NMR evaluation of molecular interaction between monoaromatic carboxylic acids and dissolved humic acid. *Environmental Science and Pollution Research*, 28(14), 17775–17788. ISSN: 09441344. <https://doi.org/10.1007/s11356-020-12092-1>
- 32 Gupta, U., Krishnapriya, R., & Sharma, R. K. (2021). A Sustainable Palladium-Intercalated Montmorillonite Clay Catalytic System for Imine Hydrogenation under Mild Conditions. *ChemPlusChem*, 86(4), 540–548. ISSN: 21926506. <https://doi.org/10.1002/cplu.202000760>

## Projects

### Sponsored Projects

S. No	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
1	Catalytic Upgrading of Bio-Oil to Transport Fuel	DBT	Rakesh Sharma	₹94,79,277	24-Dec-14	31-Mar-21
2	Unnat Bharat Abhiyan	MHRD	Ananya Debanath	₹3,77,000	06-Mar-17	05-Mar-20
3	Solid state Nuclear Magnetic Resonance (NMR) assessment of zinc oxide (ZnO) nanomaterial based drug delivery systems	SERB (DST)	Samanwita Pal	₹34,45,520	28-Aug-17	27-Aug-20
4	Impact of Rainwater Harvesting on Groundwater Quality in India with Specific Reference to Fluoride and Mircropollutants	DST	Rakesh Sharma	₹75,27,600	10-May-18	16-Feb-22
5	Tandem Annulations Involving Metallocarbenes: Towards Diverse Molecular Architectures	SERB	Sandip Murarka	₹33,00,000	10-Jul-18	09-Jul-21
6	Development of Catalytic Diastereo and Enantiodivergent Tandem Reactions	DST	Nirmal Kumar Rana	₹35,00,000	02-Jul-18	01-Nov-21
7	Multiparticle Entanglement, Nonlocality and Quantum Information processing- Analysing the role and applications of statistical correlations	SERB	Atul Kumar	₹19,50,877	18-Mar-19	18-Mar-22
8	Chiral Calix-crowns for asymmetric phase transfer catalyst	DST	Pragati R Sharma	₹34,68,800	01-Oct-19	30-Sep-22
9	Investigating asymmetric mixed surfactant bilayers using dual-scale simulations to correlate bilayer properties with thermodynamics of asymmetry	SERB	Ananya Debanath	₹44,36,420	07-Feb-20	06-Feb-23
10	Modeling Organic and Biochemical phenomena via direct chemical dynamics simulations	SERB	Manikandan Paranjothy	₹51,88,820	06-Feb-20	05-Feb-23
11	FIST Project	DST-FIST Program-2019	Rohan D Erande	₹2,16,00,000	18-Sep-20	17-Sep-25
12	Capturing and Real-Time Monitoring of Dynamic Instability of TCR-PMHC Bond for Probing Serial Engagement Using Single-Molecule FRET and Biomembrane Force Probe in Live T Cell	SERB	Dibyendu Kumar Sasmal	₹28,05,000	12-Nov-20	11-Nov-22

S. No	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
13	Sustainable Non-Noble Transition Metal Based Pincer Catalytic Design for High-Value Chemical Transformations	SERB-SRG	Subrata Chakraborty	₹29,26,000	17-Dec-20	16-Dec-22
14	Tandem Reactions Utilizing Nitrogen Ylides: Unified Approach for Asymmetric Synthesis of Diverse Heterocycles	SERB-CRG	Nirmal Kumar Rana	₹58,48,832	17-Dec-20	16-Dec-23
15	Main-Group Organometallic complexes Based Molecular Materials For Applications in Molecular Electronics	SERB-EEQ	Ramesh K.Matre	₹36,82,940	05-Dec-20	04-Dec-23
16	Development of Functionalized Metal Oxides and Layered Materials for Environmental Sensors	SERB-CRG	Ritu Gupta	₹73,45,096	22-Dec-20	21-Dec-23
17	Natural clay-plasma catalysed hydrogenation of carbon-dioxide for methanol production under ambient conditions	SERB-CRG	Rakesh Sharma	₹28,73,200	22-Dec-20	21-Dec-23
18	Cascade Annulations Involving Higher-valent Organometallic Compounds: Towards Diverse Molecular Frameworks	CSIR	Sandip Murarka	₹21,94,000	15-Aug-21	02-Jun-24
19	Direct Approaches to $\gamma$ - and $\delta$ -Lactones Under Continuous Flow Conditions Using Packed-bed Immobilized Catalysts	CSIR	Nirmal Kumar Rana	₹19,00,000	24-Sep-21	23-Sep-24
20	Scale up, technological optimization and development of catalysts for Algal Biomass to Biodiesel and Bio-Jet Fuel	DBT PAN IIT Center for Bioenergy: Phase II	Rakesh Sharma	₹1,48,41,360	27-Sep-21	26-Sep-26
21	Preparation of Carbon Foam using a Blowing Agent	DRDO Jodhpur	Ritu Gupta	₹9,90,150	21-Oct-21	20-Oct-22
22	Scalable coating of metal oxides on hybrid transparent electrodes and fabrication of smart window devices	DST-TDT-Advance manufacturing scheme	Ritu Gupta	₹29,86,800	08-Mar-22	07-Mar-25
23	Empowering S&T with Women -A Step towards a New Era	SERB	Ritu Gupta	₹3,50,000	22-Mar-22	21-Mar-25

## Consultancy Projects

S. No	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
1	Towards the development of low-cost water quality sensors	Panasonic R&D Center of India	Rakesh Sharma	₹2,35,563	01-Oct-14	30-Nov-14
2	Towards the development of low-cost water quality sensors	Panasonic R&D Center of India	Rakesh Sharma	₹64,37,502	16-Feb-15	31-Dec-17
3	Utilization of hydrogen as fuel in cement production	Ultratech Cement	Rakesh Sharma	₹10,00,000	01-Oct-19	31-May-20
4	Development of Microelectrode Array for Real-Time Electrochemical Sensing	SERB women Excellence Award	Ritu Gupta	₹18,00,000	23-Mar-21	22-Mar-24

## Closed Projects

### 1) New Single Source Precursors for Potential Nanostructured Bi<sub>2</sub>Te<sub>3</sub>/sb<sub>2</sub>Te<sub>3</sub> System Based Thermoelectric Materials

Science and Engineering Research Board (SERB)

PI: Ramesh K. Metre Rs. 32.12 Lakhs Start Date: 05-Oct-17 End Date: 21-Sep-21

Outcome: This project is about the synthesis and structural characterization of new single source precursors for nanostructured Bi<sub>2</sub>Te<sub>3</sub>/Sb<sub>2</sub>Te<sub>3</sub> system based thermoelectric materials. The main aim of this is to find viable synthetic methods for suitable molecular precursors for Bi<sub>2</sub>Te<sub>3</sub>/Sb<sub>2</sub>Te<sub>3</sub> systems and assemble them into nanostructured material via solution phase decomposition techniques. These nanostructured materials are expected to have enhanced thermoelectric properties. Molecular organometallic complexes are also looked upon as promising single source precursors for advanced materials. Keeping an eye towards envisioned technological applications, molecular organometallic complexes were synthesized and structurally characterized to explore their potential applications as molecular materials in various electronic devices.

### 2) Outreach Workshop-Prime Minister's Fellowship for Doctoral Research

Science and Engineering Research Board (SERB)

PI: Samanwita Pal Rs. 2.37 Lakhs Start Date: 12-Feb-2019 End Date: 17-Jul-2021

Outcome: The institute hosted an Outreach workshop for the Prime Minister's Fellowship Scheme for Doctoral Research on 19th February 2019. The SERB (Science Engineering and Research Board) and CII (Confederation of Indian Industries) have partnered together to provide industry connect to research taking place in academia and facilitate more PhDs coming out of institutions doing industrial R&D. It was conducted in the context to spread awareness regarding the scheme. During this workshop, a number of prominent local, national and international companies also participated. This platform was greatly applauded by the attendees and the sole cause of hosting the program was successfully achieved. PhD students from various Departments presented their research work through posters to initiate discussions with the attendees from the Industries for possible collaboration and funding.

# Department of Civil and Infrastructural Engineering

## Introduction to the department:

The Department of Civil and Infrastructure Engineering, IIT Jodhpur was established in January 2020 and started academic programs in the year 2020-2021. The civil and infrastructure industry has undergone profound changes in recent years due to rapid urbanization and increasing quality of life that demand reliable and intelligent infrastructure systems. The new-age designs and innovations in the civil and infrastructure industry can only be driven by a group of engineering graduates having multidisciplinary training and a sound understanding of emerging technologies. With this viewpoint, the department offers unique programs that incorporate and integrate the elements of conventional civil engineering with advanced transformative technologies such as artificial intelligence (AI), cyber-physical-systems

(CPS), digital twins (DT), and automated management and information systems. Additionally, a major thrust is also planned on the design, implementation, and maintenance of large-scale integrated infrastructure systems across different domains. The focus areas of the department includes Energy and Environment, Building Sciences, Safety, and Services, Applications of AI, IoT, and CPS in Civil and Infrastructure Engineering, Smart and Integrated Infrastructure, Urban Architecture and Planning, Construction Technology and Management, Transportation Engineering, Structural Engineering, Geotechnical Engineering, Water resources Engineering, and Engineering Geology.

An overview of the department and its administrative structure are shown in Fig 1 and Fig. 2.



Figure 1: Department overview

## Vision and Mission

The Department strives to be an internationally renowned center of excellence in education, research, and innovation with a major focus on sustainability and digitalization of infrastructure.

- » Develop unique courses in the field of Civil and Infrastructure Engineering through advanced UG and PG programs with a multidisciplinary perspective.
- » Establish high quality teaching and research facilities in the areas of smart, resilient, and sustainable infrastructure engineering to foster the needs of society.

- » Promote consilient research through application of AI/ML, cyber-physical-systems, digital twin and advanced visualization in the areas of Energy, Environment, Transportation, and Construction.
- » Promote innovative and entrepreneurial activities through intellectual property generation and transfer.
- » Nurture the potential of students to become future leaders in the Civil Engineering industry for leadership achievements, scientific breakthroughs and social welfare.

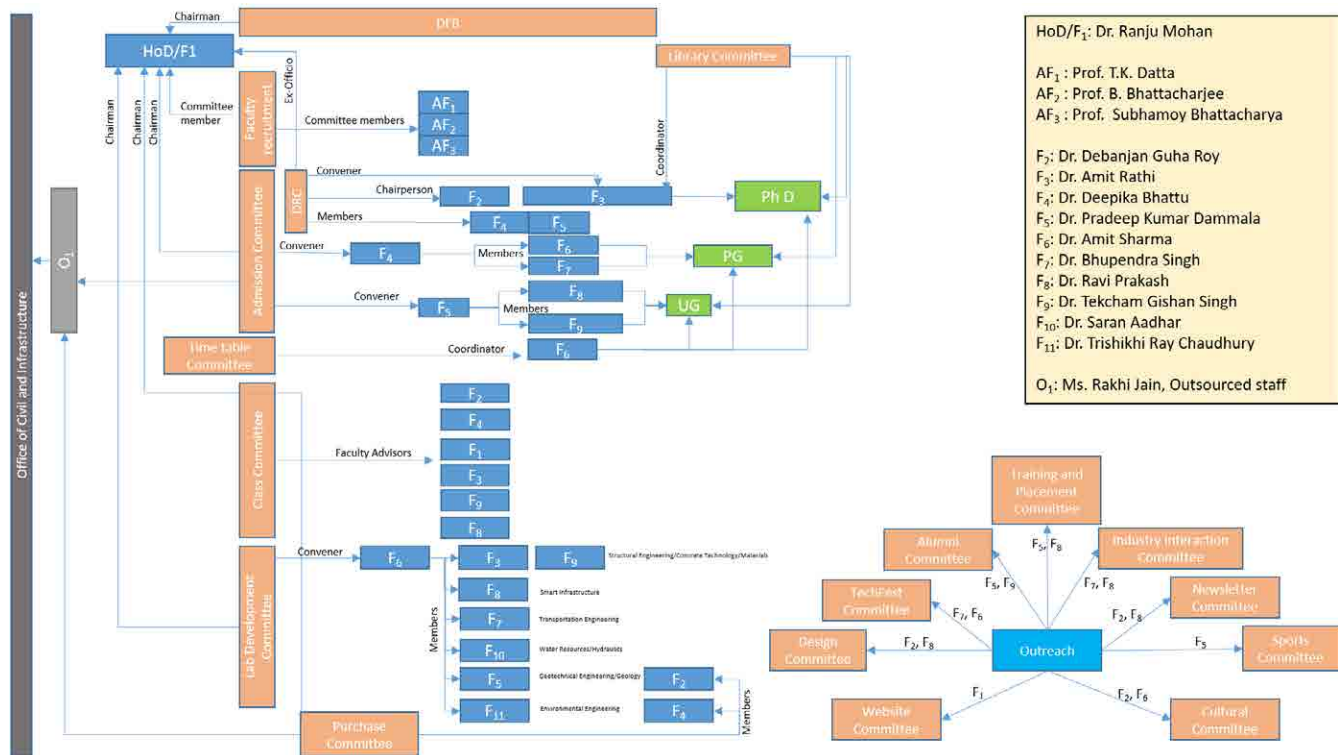


Figure 2: Administrative structure (2021-2022)



## Faculty Members



### Ranju Mohan

Head of the Department  
**Specialization/ Research interest:**  
 Traffic flow theory; Macroscopic and Microscopic modelling of traffic flow; Connected and autonomous vehicles; Dynamic Traffic Assignment



### Tushar Kanti Datta, FNAE

Adjunct Professor  
**Specialization/ Research interest:**  
 Structural Dynamics, Offshore Structures, Seismic Risk and Response Analysis of Structures, Wind induced Vibration of Structures, Disaster Mitigation, Structural Control



### Bishwajit Bhattacharjee

Adjunct Professor  
**Specialization/ Research interest:**  
 Concrete Technology and Building Science



### Subhamoy Bhattacharya

Adjunct Professor  
**Specialization/ Research interest:**  
 Offshore Engineering, Wind Turbine Design



### Aali Pant

Assistant Professor  
**Specialization/ Research interest:**  
 Geoenvironmental Engineering; Reinforced Soil; Sustainable Geotechnics; Machine Learning



### Amit Kumar Rathi

Assistant Professor  
**Specialization/ Research interest:**  
 Structural Engineering; RCC Design; Steel Structures and Pre-Engineered Buildings; Reliability Analysis and Design; Uncertainty Quantification; Stochastic Modelling and Mechanics; Composite Materials; Vibration Control and Structural Health Monitoring



### Amit Sharma

Assistant Professor  
**Specialization/ Research interest:**  
 Atmospheric Chemistry; Air Pollution; Climate change; Impact on crops and human health



### Bhupendra Singh

Assistant Professor  
**Specialization/ Research interest:**  
 Pavement Materials; Pavement Analysis; Pavement Design; Sustainable Pavement Materials



### Debanjan Guha Roy

Assistant Professor  
**Specialization/ Research interest:**  
 Rock mechanics, reservoir geomechanics, engineering geology



### Deepika Bhattu

Assistant Professor  
**Specialization/ Research interest:**  
 Emission sources, characterization and secondary aerosol formation potential; Real-time aerosol measurements using mass spectrometry techniques; Source apportionment techniques; Physical, chemical and hygroscopic properties of atmospheric aerosols and cloud condensation nuclei (CCN) activity



### Mayank Suman

Assistant Professor

**Specialization/ Research interest:** Effect of changing climate on hydrological extremes; Climate change mitigation strategies; Remote sensing application in hydrology



### P. Ravi Prakash

Assistant Professor

**Specialization/ Research interest:** Computational Mechanics; Structural Fire Engineering; Application of AI in Structural Engineering, Building Information Modelling (BIM)



### Pradeep Kumar Dammala

Assistant Professor

**Specialization/ Research interest:** Soil Dynamics; Experimental Geotechnics; Seismic Liquefaction; Seismic Ground Response Analysis; Soil Structure Interaction; Pile Foundations; Seismic Requalification studies; Sustainable Geotechnics; Stability Analysis of Earth Retaining Structures



### Saran Aadhar

Assistant Professor

**Specialization/ Research interest:** Surface Hydrology; Hydroclimatic extremes; Hydrologic modeling in natural and anthropogenic climate; Impact of climate variability and climate change on water resources



### Tekcham Gishan Singh

Assistant Professor

**Specialization/ Research interest:** Civil Engineering, Structural Engineering, Steel Structures



### Trishikhi Raychoudhury

Associate Professor

**Specialization/ Research interest:** Environmental Engineering; colloid filtration; contaminant fate and transport; water treatment; applications and implications of nanotechnology

## Description of Research Groups

**Geotechnical and Geological Engineering:** Reinforced Soil; Sustainable Geotechnics, Soil Dynamics; Experimental Geotechnics; Seismic Liquefaction; Seismic Ground Response Analysis; Soil Structure Interaction; Pile Foundations; Seismic Requalification studies; Sustainable Geotechnics; Stability Analysis of Earth Retaining Structures; Oil and Gas Geomechanics; Slope Stability Analysis  
Number of Research scholars: 4

**Structural Engineering:** Reliability Analysis and Design; Uncertainty Quantification; Stochastic Modelling and Mechanics; Composite Materials; Vibration Control and Structural Health Monitoring; Computational Mechanics; Structural Fire Engineering; Steel Structures; Discrete element modeling  
Number of Research Scholars: 6

**Environmental Engineering:** Air Pollution; Climate change; Impact on crops and human health, characterization and secondary aerosol formation potential; Real-time aerosol measurements using mass spectrometry techniques; Source apportionment techniques; colloid filtration; contaminant fate and transport; water treatment; applications and implications of nanotechnology

Number of Research scholars: 2

**Hydrology and Water resources:** Effect of changing climate on hydrological extremes; Climate change mitigation strategies; Remote sensing application in hydrology, Surface Hydrology; Hydroclimatic extremes; Hydrologic modeling in natural and anthropogenic climate; Impact of climate variability and climate change on water resources;

Number of Research scholars: 0

**Traffic and Transportation:** Macroscopic and Microscopic modelling of traffic flow; Connected and autonomous vehicles; Dynamic Traffic Assignment; Sustainable Pavement Materials

Number of Research scholars: 4

**Smart Infrastructure Engineering:** Intelligent transport systems; Development of Advanced BIM models; BIM based sustainability rating systems

Number of Research scholars: 0

Going forward, the department will focus on expanding interdisciplinary research in smart and sustainable infrastructure engineering.

## Academic Programmes

Sl. No.	Name of the Programme	Level: UG/PG/Research	Number of Students Enrolled
1	B Tech Civil and Infrastructure Engineering	UG	85
2	M Tech Civil and Infrastructure Engineering with Specialization in Energy	PG	17
3	M Tech Civil and Infrastructure Engineering with Specialization in Environment	PG	20
4	M Tech-Ph D Civil and Infrastructure Engineering with Specialization in Energy	Research	2
5	M Tech-Ph D Civil and Infrastructure Engineering with Specialization in Environment	Research	1
6	Ph D	Research	13

## Significant Research Achievements

*Technology Transfers/Product Developed/Technology Licenced/Release of Data*

1. Dr. Saran Aadhar: Real-time drought early warning and forecast system over India with Prof. Vimal Mishra from IIT Gandhinagar.
2. Dr. Mayank Suman: HydroClimatic Conceptual Streamflow model for modeling streamflow under changing climate with Dr. Rajib Maity, IIT Kharagpur.

### Faculty/ Department Laurels if any

1. Dr. Ranju Mohan: DST-SERB Start up Research Grant 2021-2023
2. Dr. Saran Aadhar - Recipient of 2022 Best Discussion Award from Environmental and Water Resources Institute (EWRI), American Society of Civil Engineers.
3. Dr. Saran Aadhar- Recipient of Sivapalan Young Scientists Travel Award (SYSTA) to participate in the IAHS 2022 Scientific Assembly.
4. Dr. P. Ravi Prakash- Absorbed into the editorial board of Frontiers in Built Environment- Fire resistant engineering.
5. Dr. Amit Kumar Rathi - Joined the Board of Directors for Executive Excellence Program, Association of Infrastructure Industry (India) as Special Invitee.

### Student Laurels, if any

1. Tarun Patodia (B20CI043), Ankit Prakash(B20CI012), and Ritika Jain (B20CI037) have received third prize in the UltraTech Shining Star Contest 2022
2. Ashish Kumar (M21CI053), Tej Sushant Kulkarni (M21CI064), and Jai Goyal (B20CI018) were selected in an Internship Program(13Dec 2021-28 Feb2022) organized by the Indian Road Safety campaign in association with the Ministry of Road Transport and Highway.
3. Vishal Tak (M21CI061), MTech student, has been selected for a fully funded 7-Day workshop on “RS and GIS for Agriculture and Water Resources Management” at IIT Hyderabad.
4. Rampunit Kumar (M20CI061) was recently selected for a special award category in a national competition (Climate data hackathon) themed ‘Climate resilient agriculture’ organized by United nations development programme (UNDP) and Government of Telangana. He was also invited and currently working on a startup accelerator program to initiate a startup in the same area. This all is the work of an interdisciplinary team (including one student from AI at IITJ and rest from other institutes)

5. Rampunit Kumar (M20CI061) was placed as an analyst in lumiq.ai, an artificial intelligence based company.
6. Aman Kumar Meena (M20CI051) and Mustafa Ali (M20CI059) were placed as Management Trainees in ICICI Bank.
7. Kandukuri Venkata Subrahmanya Srimukh Babu (M20CI003), Sumaja Kolli (M20CI013), and Kartik Sharma (M20CI058) were placed in ET MEDIA LABS as a Business Analyst.

### Laboratories and equipment

#### 1. Central facilities :

- a. Computer controlled compression testing machine (capacity 3000kN)
- b. Computer controlled universal testing machine (capacity 1000kN) (Figure )
- c. Ultrasonic pulse velocity tester



**Figure 3: Universal Testing Machine**

## 2. Geotechnical Engineering Laboratory :

- a. Basic soil characterization (index and strength properties of soils) equipment along with advanced cyclic triaxial testing apparatus for analyzing dynamic response of soils (Figure 4).



**Figure 4: Selected Basic Equipments in the Geotechnical Engineering Laboratory**

**3. Transportation Engineering Laboratory (Figure 5):**

- a. Basic Bitumen and Aggregate Characterisation Tests
- b. Marshall Mix Design
- c. Rotational Viscometer
- d. Rolling Thin Film Oven
- e. Indirect Tensile Strength
- f. Cannon Manning viscometer
- g. Asphalt Mixer theoretical density meter.



**Figure 5: Transportation Engineering Laboratory Equipments**

#### 4. Structural Engineering Laboratory (Figure 6):

- a. Flexural testing machine (capacity 100 kN)
- b. Covermeter-rebar locator
- c. Half cell potential meter
- d. Basic cement concrete physical and non-destructive test setup
- e. Basic structural analysis/mechanics equipment.



**Figure 6: Structural Engineering Laboratory**

#### 5. Air Quality Monitoring Laboratory (Figure 7):

Gas analyzers such as CO, SO<sub>2</sub>, NO, NO<sub>2</sub> and O<sub>3</sub>, Automatic Weather station, High Volume PM<sub>2.5</sub> Sampler.



**Figure 7: Air Quality Monitoring Laboratory**

## 6. Environmental Engineering laboratory (Figure 8):

Basic water quality testing facility, Wastewater characterization facility, Benchtop multimeter, COD thermoreactor, incubator, UV-Vis spectrophotometer and other basic equipment.



**Figure 8: Water quality testing at Environmental Engineering Laboratory**

## 7. Geological Engineering Laboratory:

- a. Core cutter

## 8. Computational Laboratory Facilities:

- a. Workstation- 4 Nos.- Windows 10 Pro, Tyrone, Intel Xeon silver 4216/Intel Xeon 2.10 GHz, 32 Cores
- b. Softwares: STAAD Pro, ArcGIS, VISSIM, EnViVer Pro, Plaxis 2D, RocScience, SAP, HydroMIKE, Abaqus

A Lab in charge/custodian with 2-years of tenure is assigned common for all laboratories.

### Outreach activities

1. UG and PG openshouse- Yearly prior to admission (2020, 2021, 2022)
2. Departmental newsletters (half-yearly) - Vol 1 (Sep 2021) and Vol 2 (March 2022) published
3. Industry Connect Summit (ICS) with

- a. EDS Technologies and DASSAULT SYSTEMES- 22nd Oct 2021

- b. Renew Power- 19th March 2022

4. Dr. Deepika Bhattu and Dr. Ranju Mohan Institute of Repute (IoR) -IITJ - representative for National Knowledge Network (NKN) under National Clean Air Program (NCAP)
5. Dr. Ranju Mohan serves as Institute Representative, Kota City, Transport4All Challenge by Ministry of Urban Housing and Affairs (MoHUA)

## 6. Seminars/ Workshops/ Conferences organized

- a. Dr. Bhupendra Singh: Conducted 5 day AICTE sponsored ATAL FDP Titled "Recent Advances in Pavement Analysis, Design, and Evaluation"; 20th to 24th September, 2022.
- b. Dr. Amit Kumar Rathi: Coordinated MDP on Structural Health Monitoring under Smart



- Infrastructure and Sustainability from 03-07 January 2022 and delivered 7 lectures.
- c. Dr. Ravi Prakash and Dr. Pradeep Kumar Dammala: Virtual Summer School 2021 - Introduction to Programming in Python 21st May-25th May 2021
  - d. Dr. Ranju Mohan: Technical Committee Member and Co-Chair for the session 'ITS and others', 8th International Conference on Transportation System Engineering and Management (CTSEM), 26-27th Aug 2021, Calicut, Kerala
  - e. Dr. Ranju Mohan: Conference Review Committee Member, 2nd International Conference on Sustainable Construction Technologies and Advancements in Civil Engineering (ScTACE), 14-16th October 2021, Bhimavaram
  - f. Dr. Bhupendra Singh Conducted an ATAL FDP on "Recent Advances in Pavement Analysis, Design, and Evaluation" from 20-24 september 2021
  - g. Dr. Tekcham Gishan Singh served as a Session Chair for three technical parallel sessions at the international conference – "Indian Structural Steel Conference 2020 (ISSC)" held from January 06th to 08th, 2022 organized by Structural Steel Research Group, Indian Institute of Technology Hyderabad (IIT Hyderabad).
  - d. Dr. Bhupendra Singh: Keynote lecture at G H Rasoni College of Engineering and Management Wagholi, Pune on 30th July 2021 during a 5 day short-term course on Recent Practices in Geotechnical and Transportation Engineering.
  - e. Dr. Deepika Bhattu: Empanelment of the Institution as Environmental Auditor and faculty's
  - f. Appointment as Nodal Officer by Rajasthan State Pollution Control Board
  - g. Dr. Ranju Mohan: Invited talk, International Seminar on Advances in Civil Engineering Practices, Jodhpur Institute of Engineering and Technology (JIET), 21st April 2021
  - h. Dr. P. Ravi Prakash: Delivered a keynote lecture on "Applications of Discrete Element Method in Structural Engineering", International Conference on Advances in Civil Engineering (ICACE-2021), K.L University, India on 26th June 2021.
  - i. Dr. Bhupendra Singh delivered a lecture on "Advances in Cold Mix Asphalt" in the workshop "Innovative Solutions for Sustainable Constructions in Civil Engineering" held at Jaypee University of Information Technology Waknaghat on 5th Oct 2021
  - j. Dr. Bhupendra Singh delivered a Keynote speech on "'An Introduction to Cold Mix Asphalt'" in the workshop "Recent Practices in Geotechnical and Transportation Engineering" held at GHRCEM, Pune on 27th July 2021.
  - k. Dr. Bhupendra Singh presented a paper on "Use of Nano-materials to Enhance the Properties of Asphalt Mixtures" at the International Conference on Advances in Construction Materials and Structures (ICCMS 2021) on 14th-19th December 2021.
  - l. Dr. P. Ravi Prakash delivered an expert lecture on "Discrete Element Method: Theoretical background and applications" in the FDP "Advancements in Geotechnical Engineering- AGE 2021", November-2021, organized by the Department of Civil Engineering, as part of the Diamond Jubilee Year Celebrations of NIT Calicut.

## 7. Lecture Series and Student Seminars

- a. The department runs a webinar series on "Infrastructure, Energy, and Environment (IEE)" with distinguished national and international speakers from academic and industrial domains. To date, a total of nineteen webinar series have been conducted.
- b. Mr. Shubham Dhaka (D20CI051), an M Tech-Ph D student delivered a talk on Seasonality of Meteorology and Air quality over Western India, as part of his research curriculum.
- c. Dr. Pradeep Kumar Dammala: Keynote lecture at G H Rasoni College of Engineering and Management Wagholi, Pune on 30th July 2021 during a 5 day short-term course on Recent Practices in Geotechnical and Transportation Engineering

## Publications

- Moschos, V., Dzepina, K., Bhattu, D., Lamkaddam, H., Casotto, R., Daellenbach, K. R., ... El Haddad, I. (2022). Equal abundance of summertime natural and wintertime anthropogenic Arctic organic aerosols. *Nature Geoscience*, 15(3), 196–202. ISSN: 17520894. <https://doi.org/10.1038/s41561-021-00891-1>
- Sharma, A., Valdes, A. C. F., & Lee, Y. (2022). Impact of Wildfires on Meteorology and Air Quality (PM<sub>2.5</sub> and O<sub>3</sub>) over Western United States during September 2017. *Atmosphere*, 13(2). ISSN: 20734433. <https://doi.org/10.3390/atmos13020262>
- S. Raj, S., Krüger, O. O., Sharma, A., Panda, U., Pöhlker, C., Walter, D., Forster, D.J., Singh, R.P., Swetha, S., Klimach, T., Darbyshire, E., Martin, S.T., MaFiggans, G., Coe, H., Allan, J., Ravikrishna, R., Soni, V.K., Su, H., Andeae, M.O., Poschl, U., Pöhlker, M.L., Gunthe, S. S. (2021). Planetary Boundary Layer Height Modulates Aerosol–Water Vapor Interactions During Winter in the Megacity of Delhi. *Journal of Geophysical Research: Atmospheres*, 126(24). ISSN: 2169897X. <https://doi.org/10.1029/2021JD035681>
- Thamban, N. M., Lalchandani, V., Kumar, V., Mishra, S., Bhattu, D., Slowik, J. G., ... Tripathi, S. N. (2021). Evolution of size and composition of fine particulate matter in the Delhi megacity during later winter. *Atmospheric Environment*, 267. ISSN: 13522310. <https://doi.org/10.1016/j.atmosenv.2021.118752>
- Ojha, N., Girach, I., Sharma, K., Sharma, A., Singh, N., & Gunthe, S. S. (2021). Exploring the potential of machine learning for simulations of urban ozone variability. *Scientific Reports*, 11(1). ISSN: 20452322. <https://doi.org/10.1038/s41598-021-01824-z>
- Singh, T. G., & Singh, K. D. (2021). Design of perforated cold-formed steel hollow stub columns using direct strength method. *Thin-Walled Structures*, 168. ISSN: 02638231. <https://doi.org/10.1016/j.tws.2021.108265>
- Singh, B., Prasad, D., & Kant, R. R. (2021). Effect of lime filler on RCA incorporated bituminous mixture. *Cleaner Engineering and Technology*, 4. ISSN: 26667908. <https://doi.org/10.1016/j.clet.2021.100166>
- Shukla, A. K., Lalchandani, V., Bhattu, D., Dave, J. S., Rai, P., Thamban, N. M., ... Tripathi, S. N. (2021). Real-time quantification and source apportionment of fine particulate matter including organics and elements in Delhi during summertime. *Atmospheric Environment*, 261. ISSN: 13522310. <https://doi.org/10.1016/j.atmosenv.2021.118598>
- Pulatsu, B., Gonen, S., Erdogan, E., Lourenço, P. B., Lemos, J. V., & Prakash, R. (2021). In-plane structural performance of dry-joint stone masonry Walls: A spatial and non-spatial stochastic discontinuum analysis. *Engineering Structures*, 242. ISSN: 01410296. <https://doi.org/10.1016/j.engstruct.2021.112620>
- Mohan, R., & Ramadurai, G. (2021). Multi-class traffic flow model based on three dimensional flow–concentration surface. *Physica A: Statistical Mechanics and Its Applications*, 577. ISSN: 03784371. <https://doi.org/10.1016/j.physa.2021.126060>
- Pospisilova, V., Bell, D. M., Lamkaddam, H., Bertrand, A., Wang, L., Bhattu, D., Zhou, X., Dommen, J., Prevot, S.H.P., Baltensperger, U., Haddad, I.E., Slowik, J. G. (2021). Photodegradation of  $\alpha$ -Pinene Secondary Organic Aerosol Dominated by Moderately Oxidized Molecules. *Environmental Science and Technology*, 55(10), 6936–6943. ISSN: 0013936X. <https://doi.org/10.1021/acs.est.0c06752>

## Projects

### Sponsored Research Projects

S. No	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
1	Mechanical response of sedimentary rocks under extreme conditions: implications for cryogenic fracking	DST-Inspire	Debanjan Guha Roy	₹35,00,000	28-Jun-19	27-Jun-24

S. No	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
2	Utilization of the Inferior Quality Aggregate in Hot,Warm and Cold Mix Asphalt	NHAI	Bhupendra Singh	₹20,76,514	04-Nov-20	03-Nov-23
3	Dynamic Traffic Assignment Model for Multi-Class Traffic Lacking Lane Discipline	SERB-SRG	Ranju Mohan	₹29,92,240	27-Dec-21	26-Dec-23
4	Source apportionment study,Emission Inventory and Carrying Capacity for Kota city, Rajasthan	RSPCB, Jaipur	Deepika Bhattu	₹1,15,27,600	10-Feb-22	09-Jul-23
5	Construction of GPS Station in IIT Jodhpur by National Geophysical Research Institute (NGRI), Hyderabad	NGRI	Debanjan Guha Roy	₹89,100	05-Aug-21	04-Aug-23

### Consultancy Projects

S. No	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
1	Analysis of Fiber Glass Mast Tower due to Wind Load	Ercon Composites Jodhpur	Amit Kumar Rathi	₹1,65,000	15-Mar-21	27-Apr-21
2	Sand dune mitigation measures for the proposed Haphasar Solar Park	SBSR Power Cleantech Eleven Pvt. Ltd.	Pradeep Kumar Dammala	₹9,99,999	25-Aug-21	24-Feb-22
3	Structural proof checking, supervision consultancy and regular inspections of warehouse construction at Anoopgarh	Rajasthan State Warehousing Corporation (RSWC)	Amit Kumar Rathi	₹9,42,260	22-Sep-21	21-Sep-23
4	Structural proof checking, supervision consultancy and regular inspections of warehouse construction at Ramgarh	Rajasthan State Warehousing Corporation (RSWC)	Amit Kumar Rathi	₹10,55,009	22-Sep-21	21-Sep-23
5	Structural proof checking, supervision consultancy and regular inspections of warehouse construction at Mohangarh	Rajasthan State Warehousing Corporation (RSWC)	Amit Kumar Rathi	₹9,42,260	22-Sep-21	21-Sep-23
6	Structural proof checking, supervision consultancy and regular inspections of warehouse construction at Dantaur	Rajasthan State Warehousing Corporation (RSWC)	Amit Kumar Rathi	₹8,13,404	22-Sep-21	21-Sep-23
7	Analysis/Verification and Validation of design for road construction works using CTB layers between KM 0.0 to KM 29.0 HANLE-CHUMAR and KM 36.0 to KM 58.0 MAHE-DEBRING roads under Project Himank,BRO	TARU Enterprises Pvt.Ltd	Amit Kumar Rathi	₹1,18,000	17-Feb-22	16-Mar-22
8	Suitability Checking of Cracked Isolated Footing	DEE VEE Project Ltd	Amit Kumar Rathi	₹1,18,000	11-Jan-22	25-Feb-22

### Completed Projects

S. No	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
1	Recent Advances in Pavement Analysis,Design and Evaluation	AICTE-ATAL	Bhupendra Singh	₹93,000	25-Aug-21	25-Nov-21

# Department of Computer Science & Engineering

## Introduction to the department:

Computer Science and Engineering, today, plays a major role in transforming every aspect of human life - in addressing social challenges and catalyzing the ongoing wave of the industrial revolution. The department is driven by its commitment to excel in next generation technology development and research. Our mission is to be among the top 10 departments in terms of research contributions, practical impact, and applications of Computer Science and Engineering in the country in the next 3 years, and internationally well known in some focused areas in the next 5 years.

The faculty members work in different core and allied areas of computer science including theoretical computer science, high performance computing, networking,

software, Artificial Intelligence, Machine Learning, and cyber-physical system security. The research activities of the department are supported by agencies such as the Department of Science and Technology, Ministry of Electronics and Information Technology, and Ministry of Home Affairs. The department works closely with industry leaders like Microsoft, Meta, Accenture, Intel, and TCS, and academic and research collaborators like IIT Delhi, IIT Kanpur, IIT Bombay, and AIIMS Jodhpur. The faculty members have several international collaborations with universities like University of Texas A&M at Kingsville and SUNY at Buffalo. The department is steadily striving towards excellence in both academics, research and service to the community with active participation from faculty, staff and students.

## Faculty details

The following Faculty Members joined the department during the year 2021-22

### Faculty Members



**Kshitij Gajjar**

Assistant Professor  
Ph.D.: Tata Institute of Fundamental Research, Mumbai



**Lawqueen Kanesh**

Assistant Professor  
Ph.D.: Institute of Mathematical Sciences, Chennai

**Following are the Faculty members associated with the department:**



**Richa Singh**

Professor and Head  
Ph.D.: West Virginia University



**Santanu Chaudhury**

Professor  
Ph.D.: Indian Institute of Technology  
Kharagpur



**Anand Mishra**

Assistant Professor  
Ph.D.: International Institute of  
Information Technology Hyderabad



**Angshuman Paul**

Assistant Professor  
Ph.D.: Indian Statistical Institute  
Kolkata



**Chiranjoy Chattopadhyay**

Assistant Professor  
Ph.D.: Indian Institute of Technology  
Madras



**Debasis Das**

Assistant Professor  
Ph.D.: Indian Institute of Technology  
Patna



**Deepak Mishra**

Assistant Professor  
Ph.D.: Indian Institute of Technology  
Delhi



**Dip Sankar Banerjee**

Assistant Professor  
Ph.D.: International Institute of  
Information Technology Hyderabad



**Gaurav Harit**

Associate Professor  
Ph.D.: Indian Institute of Technology  
Delhi



**Mayank Vatsa**

Professor  
Ph.D.: West Virginia University



**Pallavi Jain**

Assistant Professor  
Ph.D.: Dayalbagh Educational Institute  
(Deemed University)



**Romi Banerjee**

Assistant Professor  
Ph.D.: Calcutta University, Indian  
Statistical Institute



**Suchetana Chakraborty**

Assistant Professor  
Ph.D. : Indian Institute of Technology  
Guwahati



**Suman Kundu**

Assistant Professor  
Ph.D.: Indian Statistical Institute,  
Jadavpur University



**Sumit Kalra**

Assistant Professor  
Ph.D.: Indian Institute of Technology Kanpur



**Yashaswi Verma**

Assistant Professor  
Ph.D.: International Institute of Information Technology Hyderabad

**Adjunct Faculty**



**Ajay Kumar**

Professor  
The Hong Kong Polytechnic University  
Ph.D.: The University of Hong Kong



**Nalini Ratha**

Empire Innovation Professor  
State University at Buffalo  
Ph.D.: Michigan State University



**Sajal K. Das**

Professor and Daniel St. Clair  
Endowed Chair  
Missouri University of Science and Technology  
Ph.D.: University of Central Florida



**Hiranmay Ghosh**

Research Advisor & Principal Scientist  
Ph.D. (Multimedia Systems): IIT Delhi



**Aloknath De**

Corporate Vice President  
Samsung Electronics & CTO Samsung R&D Institute India – Bangalore  
Ph.D. (Signal Processing & Communication): McGill University



**Saket Saurabh**

Professor  
Institute of Mathematical Sciences  
Ph.D. (Computer Science): Institute of Mathematical Sciences



**Sameep Mehta**

IBM Distinguished Engineer- AI & Hybrid Data  
IBM Research  
Ph.D. (Computer Science): Ohio State University



**Venkataraman Balaji**

Vice President, COL  
Ph.D. (Energy Studies): University of Madras

## Scholars-in-Residence



### Sankar Kumar Pal

National Science Chair  
Distinguished Scientist and Former Director  
Indian Statistical Institute  
Ph.D. (Radio-Physics): Indian Statistical Institute/Calcutta University;  
Ph.D. & DIC (Electrical Engineering): Imperial College of Science and Technology, London

## Advisors



### Bimal Roy

Professor  
ISI Kolkata



### Chiranjib Bhattacharya

Professor  
IISc Bangalore



### Gargi Banerjee Dasgupta

Director  
IBM Research India & CTO, IBM India  
and South Asia



### Gautam Shroff

Sr. Vice President & Head of Research  
Tata Consultancy Services



### Naveen Garg

Professor  
IIT Delhi



### Sartaj Sahni

Professor  
University of Florida, USA



### Shivkumar Kalyanaraman

CTO  
Energy & Mobility, Microsoft R&D India



### Venu Govindaraju

Vice President  
Office of Research and Economic  
Development, SUNY  
Distinguished Professor  
SUNY, University at Buffalo

## Staff

The Department of Computer Science and Engineering has the following technical and administrative staff members.



### Rimpesh Katiyar

Technical Superintendent



### Vivek Verma

Senior Technical Assistant

## Administrative Staff



**Hanuman Singh**

Junior Superintendent

## Projects

### Sponsored Projects

S. No.	Project Title	Sponsoring Agency	Principal Investigator	Sanctioned Amount (Rs.)
1	Development of Multimodal Search Framework For Architectural Floor Plan	SERB	Chiranjoy Chattopadhyay	24,58,500
2	Information Access from Document Images of Indian Languages	MHRD & Meity	Gaurav Harit (as a Co PI)	80,00,000
3	Indian Heritage in Digital Space of Interdisciplinary cyber physical Systems	DST	Santanu Chaudhury	12,75,55,100
4	Software as a service for OCR system for Odia Documents Images	Meity	Santanu Chaudhury	20,16,000
5	Digital Representation Generation for Efficient Retrieval of Bangla Document Images in Digital Libraries	IIT K, MHRD	Santanu Chaudhury	76,00,000
6	Predictive Maintenance and Quality Control in industries under Industry 4.0	SERB	Sumit Kalra	54,54,065
7	Understanding Semantic Association Between Visual and Textual Data: What lies ahead	DST	Yashashwi Verma	35,00,000
8	Text and Image Semantic Graphic	MHRD	Gaurav Harit	44,67,775
9	DETECTING SPOOFING AND DIGITAL ATTACKS ON FACE IMAGES	Meity	Richa Singh	72,15,000
10	Detection and Prevention of Forged Obscene Images/ Videos in the Social Networks using Machine Learning (A Social Media Engine for Discovering Doctoring in Obscene Multimedia)	MHA	Mayank Vatsa	1,97,28,000
11	Development of Application oriented AI Systems	Meity	Deepak Mishra	39,82,000
12	Smart Health Solutions for Rapid Mass Diagnosis for COVID-19	DST- RAKSHAK	Sumit Kalra	5,00,000
13	Knowledge Discovery from Images containing Text and its application to Audio-Visual Dialogue	Accenture	Anand Mishra	14,64,633
14	Social Distance Alert and Monitoring System Using Smartphone,IOT and AI	DST- RAKSHAK	Suman Kundu	7,50,000
15	AI Driven Estimation of COVID-19 Prognosis using Multimodal Data	DST- RAKSHAK	Deepak Mishra	10,00,000



S. No.	Project Title	Sponsoring Agency	Principal Investigator	Sanctioned Amount (Rs.)
16	Non-Invasive Estimation of Core-Body Temperature, Heart-Rate, SPO2 for Classification of subject AS Healthy or Non-Healthy	DST- RAKSHAK	Romi Banerjee	10,00,000
17	AI-driven diagnosis of COVID-19 using X-ray images	DST- RAKSHAK	Richa Singh	7,00,000
18	Quantum Cryptanalysis	SERB	Somitra Kumar Sanadhya	6,60,000
19	Energy Efficient Communication and Data Flow in Smart City using CRN based IoT Framework	DST-Indo-Uzbek	Debasis Das	17,80,200
20	Lightweight Anonymous Authentication and Communication Protocol for Internet of Vehicles	DST- TWN-MOST	Debasis Das	42,22,000
21	A Wellness Device for Real-time Non-contact Blood Oxygen Saturation Measurements	MSME	Deepak Mishra	15,00,000
22	Algorithms for Facial Recognition System Under Disguise	DRDO	Mayank Vatsa	40,52,576
23	Sentinel-Bias Detection and Mitigation in Face Analysis	Facebook	Richa Singh	1,11,63,804
24	GAMING OF CULTURAL HERITAGE SITES OF ASI	ASI	Santanu Chaudhury	48,50,000
25	Multimodal Query-guided Natural Scene Retrieval	SERB-SRG	Anand Mishra	29,64,110
26	OCR's an Application in Indian Languages	MeitY, Govt. of India	Anand Mishra	1,83,90,000
27	FIST Infrastructure Support	DST-FIST	Richa Singh	1,20,00,000
28	Non-invasive Diagnosis of Coronary Artery Disease using miRNA and Coronary Imaging.	iHub Drishti	Angshuman Paul	47,00,000
29	SensePod: An AIoT based testbed to promote Sensing as a Service for ambient living.	SEED Grant	Suchetana Chakraborty	41,90,000
30	Inventorization of the wildlife towards a sustainable campus.	CETSD Campus Sustainability Program, JCKIC	Suchetana Chakraborty	2,00,000
31	TrustMe: Explainable Adversarial Attack Detection and Mitigation for Object Recognition Algorithms	iHub-Drishti	Richa Singh	36,00,000
32	TrustMe: Explainable Adversarial Attack Detection and Mitigation for Object Recognition Algorithms	iHub-Drishti	Richa Singh	87,00,000
<b>Total Amount</b>				<b>23,19,95,183</b>

### Consultancy Projects

S. No.	Project Title	Sponsoring Agency	Principal Investigator	Sanctioned Amount (Rs.)
1	Strengthening Handwriting Recognition & Smart Annotation	Samsung India Electronics Pvt. Ltd.	Gaurav Harit	13,82,800
2	Online Education	IIT Jodhpur	Anand Mishra	1,44,02,000
3	Management of TBIOM and Newsletter	IEEE Biometrics Council	Mayank Vatsa	45,00,000
4	Online Education	IIT Jodhpur	Deepak Mishra	1,44,02,000

S. No.	Project Title	Sponsoring Agency	Principal Investigator	Sanctioned Amount (Rs.)
5	Inference and Reasoning over Web-Scale Multimodal Knowledge Graph	Microsoft R&D Ltd,Hyderabad	Anand Mishra	14,16,000
6	Design of cuffless BP monitoring device	Johari Digital Healthcare Pvt. Ltd.	Dip Sankar Banerjee	9,20,400
7	TCS-ION Consultancy	Tata Consultancy Limited	Gaurav Harit	10,22,110
8	DigitID Consulting	DigitID Technologies Private Ltd.	Mayank Vatsa	14,16,000
9	Online Education	IIT Jodhpur	Angshuman Paul	70,53,000
10	IHC (TSCHE-Python Prg., FDP)	TCS	Debasis Das	46,020
<b>Total Amount</b>				<b>4,65,60,330</b>

### Fellowship Projects

S. No.	Project Title	Sponsoring Agency	Principal Investigator	Sanctioned Amount (Rs.)
1	Young Faculty Research Fellowship (YFRF) of Visvesvaraya PhD Scheme	MeitY	Gaurav Harit	22,20,000
2	Swarnajayanti Fellowship: Mitigating	DST Swarnajayanti Fellowship	Mayank Vatsa	63,33,337
3	Understanding Semantic Association Between Visual and Textual Data: What lies ahead	DST Inspire Fellowship	Yashaswi Verma	1,06,78,716
4.	Verisk AI Faculty Fellowship	Verisk Research	Mayank Vatsa	10,00,000
5.	Verisk AI Faculty Fellowship	Verisk Research	Richa Singh	10,00,000
<b>Total Amount</b>				<b>1,90,12,053</b>

### Description of Research Groups

#### Cognitive and Social Analytics (CSA)

The CSA Lab at IIT Jodhpur deals with studies on human behavior from a number of perspectives to understand what it is to be 'intelligent' and how individual action-ensembles lead to collective behavior. Currently the lab comprises of the following two groups:

Cognitive Analytics Group (headed by Romi Banerjee) - where we draw inspiration from the origin, evolution and development of fundamental cognitive abilities (e.g. language acquisition, aesthetic-sense, number-sense, time-space continuum, spontaneous thought & imagination, contemplation) across all living species, towards the design an embodied, social (~empathetic) "thinking machine".

SoNAA: Social Network Analysis and Application Group (headed by Suman Kundu) - where we focus on building applications using social networks and collective behaviors, apart from solving fundamental questions on network analysis and mining. We work with data on relationships and relationships within data. The applications currently under consideration are to build support systems for decision making, accountability, control and behaviour, for governance. The group also works on algorithmic questions related to streaming graphs and big data social networks.

IoT and Network Lab	IoT and Network lab aims to support undergraduate and postgraduate courses linked to Internet of Things(IoT), Pervasive and Mobile Computing etc. The students also get hands-on with experiments using IoT devices Like Raspberry Pis, Sensors, Wearable Devices, Arduino, LoRa, Jetson Nano etc which help to design and develop IoT based Framework for real time application.
Theoretical Computer Science (TCS)	The research in Theoretical Computer Science includes understanding the complexity of computational problems, and designing and analysing efficient algorithms. We are largely interested in the following areas: Cryptography, Quantum Computation, Computational Social Choice Theory, Parameterized Complexity.
Systems for Intelligence, Networking, and Communications (SINC) Lab	The SINC Lab at CSE Department of IIT Jodhpur is pursuing research in the general area of computing systems with specific focus on systems for next generation of machine learning, data analytics, and communications. The group comprising of faculty members Dr. Debasis Das, Dr. Suchetana Chakraborty, Dr. Dip Sankar Banerjee, Dr. Sumit Kalra, and Dr. Ravi Bhandari is broadly engaged in some cutting edge problems related to smart cities, assisted living, low power architectures, and parallel computing.
Visual Interaction and Understanding Lab	<p>The focus of this lab is on various problems related to visual understanding. These include recognition (detection, categorisation and retrieval), biometric and behavioural analysis (face, gesture and body pose), low-level vision, image and video synthesis, vision+ language tasks (image captioning, visual question answering and cross-modal retrieval), segmentation, shape analysis, and 3D from multi view and sensors. These problems are addressed in a data-driven manner using various machine learning techniques (both by adapting the existing ones as well as proposing new ones), and are studied in the context of different domains, such as scanned documents, architectural layout plans, natural scenes, activity videos, etc. The focus of this lab is on various problems related to visual understanding. These include recognition (detection, categorisation and retrieval), biometric and behavioral analysis (face, gesture and body pose), low-level vision, image and video synthesis, vision+language tasks (image captioning, visual question answering and cross-modal retrieval), segmentation, shape analysis, medical image analysis, and 3D from multi view and sensors.</p> <p>A major focus of the group working on medical image analysis is data-efficient machine learning for designing decision support systems. The research works include few-shot and zero-shot learning for radiology and histopathology image analysis. Federated learning is another thrust area of the group. The group members are also working on problems related to differential diagnosis of thyroid nodules, chest x-rays, and CT scans. Alongside these, the group is focusing on designing computationally efficient decision support systems for different clinical tasks.</p>
Trusted AI & Biometrics	The research goal of the lab is to become one of the most coveted research groups for pursuing research in trusted AI and trusted biometrics in the country and globally. The group has two primary themes: biometrics and forensics, and designing trusted AI solutions. The research group has been publishing in top-tier venues in Artificial Intelligence and Computer Vision along with domain specific publication venues of biometrics and forensics. The lab has a global footprint with students in top ML and AI research labs across the globe. The faculty members are also actively participating in different national efforts towards Trustworthy AI and designing a diverse workforce for AI in India. The research activities of the lab are supported by multiple government and industry partners including DST, MEITY, DRDO, Meta and Verisk.

Software Innovation Lab	The focus of SIL is on scalable and robust software architectural solutions. Our solutions cater to IoT-based systems in the domain of structural health monitoring and smart healthcare with focus on innovation and IP generation. The lab has successfully deployed various real world systems such as telemedicine portal, hospital bed occupancy tracker, talking gloves independently and as well as in collaboration with various corporate and government organizations. The lab is actively working on various sponsored projects from corporate as well as government agencies with national and international collaborators.
Knowledge Management and Language Technology Lab	This lab focuses on knowledge extraction and representation, multilingual document image understanding, vision and language tasks, and addresses practical as well as core problems in this space. This lab currently has three faculty members and more than 10 research students including PhD, MTech and Research Assistants associated. The lab is equipped with state-of-the-art GPU compute infrastructure.

## Academic Programmes

S. No.	Undergraduate Programs
1.	B.Tech. Computer Science and Engineering (CSE)
2.	B.Tech. AI and Data Science (AI&DS)

S. No.	Postgraduate Programs
1.	M.Tech. Computer Science and Engineering (CSE)
2.	M.Tech. Artificial Intelligence (AI)
3.	Executive M.Tech. AI (for working professionals)

S. No.	Postgraduate Programs
1.	M.Tech. - Ph.D. Dual Degree CSE
2.	M.Tech. - Ph.D. Dual Degree AI
3.	Ph.D. CSE

## Research Snapshots

**Title:** Few-shot Visual Relationship Co-localization

**Team Members:** Revant Teotia, Vaibhav Mishra, Mayank Maheshwari, Anand Mishra

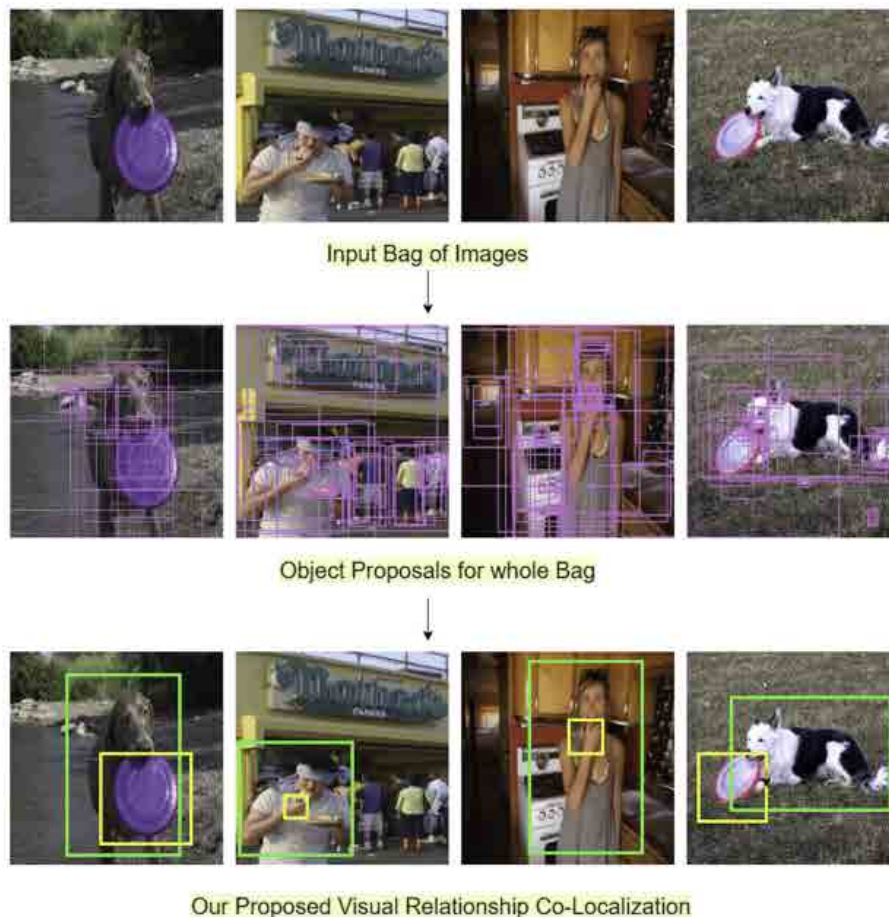
**Brief Description:** In this work, given a bag of a few images, each containing a common but latent predicate, we are interested in localizing visual subject-object pairs connected via the common predicate in each image. We refer to this novel problem as visual relationship co-localization or VRC as an abbreviation. VRC is a challenging task, even more so than the well-studied object co-localization task. This becomes further challenging when using just a few images, the model has to learn to co-localize visual subject-object pairs connected via unseen predicates. To solve VRC, we propose an optimization framework to select a common visual relationship in each image of the bag. The goal of the optimization framework is to find the optimal solution by learning visual relationship similarities across

images in a few-shot setting. To obtain robust visual relationship representation, we utilize a simple yet effective technique that learns relationship embedding as a translation vector from visual subject to visual object in a shared space. Further, to learn visual relationship similarity, we utilize a proven meta-learning technique commonly used for few-shot classification tasks. Finally, to tackle the combinatorial complexity challenge arising from an exponential number of feasible solutions, we use a greedy approximation inference algorithm that selects approximately the best solution. We extensively evaluate our proposed framework on variations of bag sizes obtained from two challenging public datasets, namely VrR-VG and VG-150, and achieve impressive visual co-localization performance. We firmly believe that this work will open up newer space in research in the broad area of video understanding and industry4.0.

**More details (including open source implementation):** <https://vl2g.github.io/projects/vrc/>

**Venue of publication:** International Conference on Computer Vision (ICCV) 2021

Visual illustration



**Figure:** Given a bag of four images as shown in the first row, can you find the visual subjects and objects connected via a common predicate? Our proposed model in this paper automatically does that. In this illustration, the “biting” predicate is present in all four images in the first row. Our proposed model localizes those visual subjects and objects in each image that are connected via “biting” as shown in the third row. Note that the category name “biting” is not provided in our approach. Here, green and yellow bounding boxes indicate the localized visual subject and objects respectively using our approach. **[Best viewed in color].**

**Title:** Context-aware data generation and forwarding for edge-based microservices over shared IoT infrastructure

**Team:** Anirban Das, Sandip Chakraborty, Suchetana Chakraborty

Brief description: The deployment of IoT infrastructure is a determining factor to regulate the quality of services for many intelligent applications in the context of smart city movements. Currently, different service providers independently set up their own infrastructure for sensing and monitoring purposes in order to offer a variety of desired intelligent and adaptive services. However, this is not a cost-effective solution. The recent advent in 5G with its massive machine type communication (mMTC) vertical has contributed to achieve a high ascent in the global market of smart living industry. With more and more connected devices getting deployed, there has been an urgent need to consider the possibilities of sharing the IoT infrastructure among multiple service providers and provision for sensing-as-a-service. For such a shared IoT infrastructure, several microservices corresponding to different smart applications will be running at the edge of the network in order to enable real-time automation and decision-making. The key challenge arises from the method of collection and management of these huge amounts of multimodal data continuous

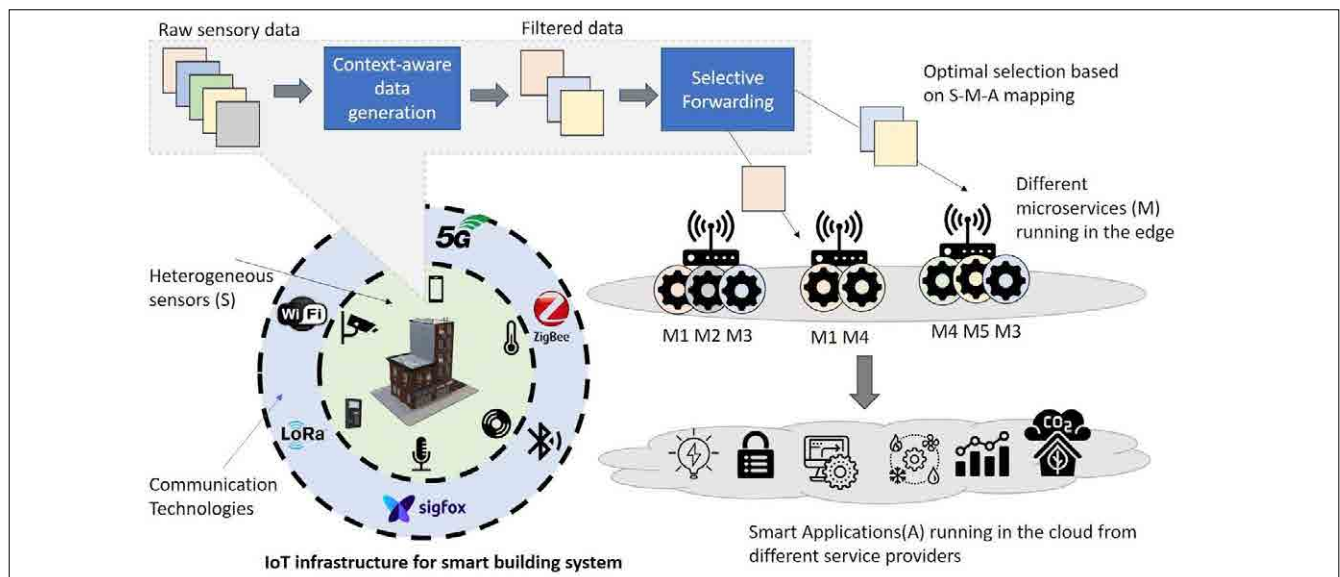
streaming from heterogeneous sensors as such an infrastructure is in general resource-constrained. In this research we ask the following questions:

- (1) How to guarantee the quality of sensing while optimizing the resource-consumption footprint of the shared IoT infrastructure?
- (2) How to feed a diverse set of microservices running at the edge with the needed sensory data generated from the right set of sensors while satisfying the spatio-temporal constraints imposed by the running applications.

We introduced a novel data collection framework, called CaDGen (Context-aware Data Generation), which aims to support hierarchical in-network data fusion through the invocation of microservices. The core idea is to develop a context-aware data filtration mechanism that can reduce the redundancy at the source itself, effectively minimizing the overall resource consumption footprint for the shared infrastructure. The filtration mechanism checks whether a generated piece of data from a sensor is relevant or not by processing a set of contextual parameters relevant for the running applications.

**Venue of publication:** Future Generation of Computer Systems, Elsevier, 2022 (IF: 7.307)

**Visual Illustration**



**Title:** FPPR: Fast Pessimistic (dynamic) PageRank to Update PageRank in Evolving Directed Graphs on Network Changes

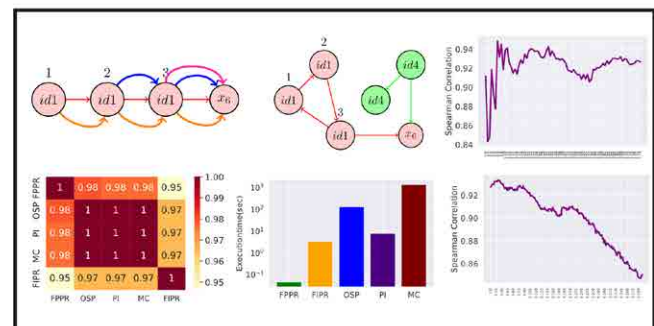
**Team:** Rohith Parjanya Pashikanti and Suman Kundu

Ranking search results of any web search is an important task. Google's PageRank is one of the pioneer algorithms to rank web pages. There were only a few pages in the initial days of the internet. So, static page ranking algorithms were sufficient. However, as the WWW (World Wide Web) started growing, the calculation of PageRank became more and more complex and computationally challenging. In the present era, PageRank is not limited to web search only. With the growth of the internet, many subnetworks appeared and PageRank provides different values to those networks. These subnetworks may have dynamic characteristics. Dynamic networks are those networks where nodes and links get added or deleted with time. Today's internet is full of dynamic networks. For example, the Twitter retweet network, where the addition of nodes (retweets) happen frequently, the following/followers network in Twitter/Instagram, where addition and deletion of nodes, links take place frequently, Twitter mentions network changes with each Tweet post, the citation network, where research papers get added over time etc. Calculating PageRank in such a dynamic network is an important and challenging research problem. The trivial way to find PageRank in dynamic networks is to run the static PageRank methods after every update in the network. This is time-consuming and non-sustainable for rapid updates in the network. In this work we developed a simple algorithm Fast Pessimistic dynamic PageRank (FPPR) to approximate the PageRank on change in network topology. Different topology changes considered are (i) adding a new node/link to the network and (ii) deleting a node/link from the network. The proposed algorithm uses the expected value of random surfers to re-calculate the score for changes in

the topology. Here by the expected value of random surfers we mean the estimated number of visits at a node by the random surfers considering the network is static at that point. For example, when a new node (or link) is added, the score is calculated by adding the estimated scores contributed by inlinks to that new node (or target node) and estimating the visits by random surfers through the link-chain it is being added to. The same method is used to update existing nodes through the outlinks of the newly added node. These are the links which may be used by the random surfer to visit (or going out from) that node if the static PageRank algorithm is used at that point.

## Publications:

- Parjanya, R., Kundu, S. (2022). FPPR: Fast Pessimistic PageRank for Dynamic Directed Graphs. In: Benito, R.M., Cherifi, C., Cherifi, H., Moro, E., Rocha, L.M., Sales-Pardo, M. (eds) Complex Networks & Their Applications X. COMPLEX NETWORKS 2021.
- Parjanya, R., Kundu S. (2022). FPPR: Fast Pessimistic (dynamic) PageRank to Update PageRank in Evolving Directed Graphs on Network Changes, (Under revision from Social Network Analysis and Mining) PREPRINT (Version 1) available at Research Square [https://doi.org/10.21203/rs.3.rs-1512145/v1]



## Faculty/ Department Laurels

### Anand Mishra

- One of the outstanding reviewers at ICCV 2021

### Debasis Das

- International Mobility Research Grant-2021- IIT Jodhpur
- IEEE Vehicular Technology Society (VTS) Senior Member Award-2021
- IEEE Senior Member Award-2021
- International Travel Support (ITS) Award-2022, SERB
- BRICS Young Scientist Award-2022

### Dip Sankar Banerjee

- Excellence in Teaching Award 2021 - IIT Jodhpur

### Mayank Vatsa

- IEEE Fellow
- IAPR Fellow
- AAIA Fellow
- AAAI 2021 Workshop on Meta-Learning for Computer Vision 2021
- IEEE CVPR Workshop on Fair Data Efficient and Trusted Computer Vision 2021

### Richa Singh

- AAIA Fellow
- PC Co-Chair, Computer Vision and Pattern Recognition
- Area Chair IAPR International Conference on Pattern Recognition Italy January 2021
- General Co-Chair IEEE International Conference on Face and Gesture Recognition India 2021
- AAAI 2021 Workshop on Meta-Learning for Computer Vision 2021
- IEEE CVPR Workshop on Fair Data Efficient and Trusted Computer Vision 2021
- Finance Chair International Conference on Multimodal Interaction Montreal Canada 2021
- Verisk AI Faculty Fellowship

### Romi Banerjee

- Diverse Intelligences Summer Institute Fellowship, 2021
- Moonshot Idea Award, 2021

### Suchetana Chakraborty

- Recipient of 'Moonshot Idea Award 2021' - IIT Jodhpur.

### Sumit Kalra

- Moonshot Award 2021
- Google Cloud Education Award (USD \$7500)
- Moonshot Award 2022
- Google Cloud Education Award (USD \$4000)

## National/International Committees

### Debasis Das:

- Subject Expert Student learning Assessment (SLA) Project 2021 AICTE (National level initiative to understand the Level and Gains of students studying in Technical Institutions of India).
- Young Researcher Symposium program committee Member CODS-COMAD 2022
- Poster Chair in the ACM 23rd International Conference on Distributed Computing and Networking (ICDCN 2022)

### Mayank Vatsa:

- Expert Committee Member for DIGIYatra NITI Aayog and AAI 2021

### Richa Singh

- Member, ICCV 2021 Marr Paper Prize Panel
- Member, IAPR Diversity and Equality Committee
- Member, IAPR Education Committee



## Journal Editorship

### Mayank Vatsa:

- Associate Editor, Pattern Recognition
- Area Editor Journal of Information Fusion Elsevier
- Richa Singh:
- Associate Editor Computer Vision and Image Understanding
- Associate Editor-in-Chief Pattern Recognition

### Suchetana Chakraborty:

- Area Editor Journal Ad Hoc Networks Elsevier since June 2021

## Conference Organizing Committee Member

### Anand Mishra:

- Workshop co-chair at International Conference on Frontiers in Handwriting Recognition (ICFHR) 2022
- Co-organizer of DAR workshop at ICVGIP 2022

### Debasis Das

- Poster Chair at 23rd ACM International Conference on Distributed Computing and Networking(ICDCN) 2022
- Organizing Committee Member at The International workshop on Machine Learning and Blockchain for Smart Society(MLBSS-2022) in conjunction with The 23rd International Conference on Distributed Computing & Networking (ICDCN 2022)

### Dip Sankar Banerjee

- Co-Chair Student Research Symposium IEEE HiPC Conference 2021

### Mayank Vatsa:

- Area Chair Conference on Computer Vision and Pattern Recognition 2022
- General Co-Chair CVPR Second Workshop on Fair Data Efficient and Trusted Computer Vision June 2021
- General Co-Chair Meta Learning for Computer Vision Workshop @ AAAI 2021 Virtual February 2021

- Program Co-Chair IEEE International Conference on Face and Gesture Recognition India December 2021
- Program Co-Chair IEEE International Conference on Advanced Video and Signal based Surveillance USA September 2021
- Area Chair IEEE International Conference on Computer Vision 2021
- Senior Program Committee Member AAAI Conference on Artificial Intelligence January 2021

### Pallavi Jain:

- Senior Program Committee Member of 30th International Joint Conference on Artificial Intelligence (IJCAI-21)
- Organizing committee ACM-Grad Cohort 2022

### Somitra Sanadhya:

- Chair 18th IFIP WG 11.9 international conference on digital forensics 2022.

### Suchetana Chakraborty:

- Tutorial Co-chair IEEE ANTS 2021

### Richa Singh

- Organizing committee ACM-Grad Cohort 2022
- General Co-Chair, IEEE International Conference on Face and Gesture Recognition, India, 2021
- Program Co-Chair, Conference on Computer Vision and Pattern Recognition 2022
- Program Co-Chair, International Conference on Multimodal Interaction, Bangalore, India, 2022
- Finance Chair, International Conference on Multimodal Interaction, Montreal, Canada, 2021
- Associate Editor-in-Chief, Pattern Recognition
- Guest Editor, Special Issue on Adversarial Perturbations for Biometrics and Forensics, Computer Vision and Image Understanding, Elsevier
- Vice President Publications, IEEE Biometrics Council

**Romi Banerjee**

- Organizing committee ACM-Grad Cohort 2022

**Program Committee Members****Anand Mishra:**

- International Conference on Computer Vision (ICCV) 2021
- European Conference on Computer Vision (ECCV) 2022
- Conference on Computer Vision and Pattern Recognition (CVPR) 2022
- Association for the Advancement of Artificial Intelligence (AAAI) 2021/2022
- IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)
- International Journal on Computer Vision
- ACM India Joint International Conference on Data Science and Management of Data 2021

**Angshuman Paul:**

- Association for the Advancement of Artificial Intelligence 2023
- Conference on Computer Vision and Pattern Recognition 2022
- International Conference on Medical Image Computing and Computer Assisted Interventions 2022
- British Machine Vision Conference 2022
- European Conference on Computer Vision 2022
- IEEE Transactions on Medical Imaging
- Radiology AI
- Medical Physics
- Pattern Recognition Letters

**Debasis Das:**

- European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECML-PKDD) 2021

- International Conference on Futuristic Trends in Networks and Computing Technologies (FTNCT)-2021
- ACM International Conference on Distributed Computing and Networking (ICDCN)-2022
- IEEE 95th Vehicular Technology Conference: VTC2022-Spring
- The International Wireless Communications & Mobile Computing Conference (IWCMC 2022)

**Deepak Mishra:**

- ACM India Joint International Conference on Data Science and Management of Data 2021

**Dip Sankar Banerjee:**

- IEEE International Conference on High Performance Computing Data and Analytics 2021
- IEEE International Parallel and Distributed Processing Symposium (IPDPS) 2022

**Pallavi Jain:**

- European Conference on Multi-Agent Systems 2021 (EUMAS-21)
- 35th AAAI Conference on Artificial Intelligence (AAAI-21)
- 36th AAAI Conference on Artificial Intelligence (AAAI-22)
- 31th International Joint Conference on Artificial Intelligence (IJCAI-22)
- International Conference on Autonomous Agents and Multi-Agent Systems 2022 (AAMAS-22)
- STOCS 2021
- CSR 2021
- IPEC 2021
- ISAAC 2021
- WG 2021
- FSTTCS 2021
- Theoretical Computer Science
- Algorithmica
- JAAMAS
- Theory of Computing Systems

**Romi Banerjee**

- 6th Annual Meeting of the Society for the Neuroscience of Creativity (SfNC) - 2022
- IEEE Transactions on Fuzzy Systems (Journal)
- IEEE Transactions on Neural Networks and Learning Systems (Journal)
- IEEE Transactions on Cognitive and Developmental Systems (Journal)
- IEEE Transactions on Emerging Topics in Computational Intelligence (Journal)
- Information Systems (Journal)
- Theoretical Computer System (Journal)

**Somitra Sanadhya:**

- International Conference on Security Privacy and Applied Cryptographic Engineering (SPACE) 2021
- International Conference on Cryptology in India (Indocrypt) 2021
- CANS 2022
- IEEE Conference on Local Computer Networks (LCN) 2021
- International Conference on COMmunication Systems & NETworks (COMSNETS) 2022 and IEEE ANTS 2021

**Sumit Kalra:**

- European Conference on Pattern Languages of Programs [2021]
- 3rd International Conference on Rural Technology Development and Delivery (RTDD) :RuTAG

**Suman Kundu**

- IEEE Transactions on Knowledge and Data Engineering
- IEEE Transactions on Cybernetics
- IEEE Transactions on Biometrics, Behavior, and Identity Science
- IEEE Transactions on Computational Social Systems
- Information Sciences
- Engineering and Applied Science Research
- Journal of Experimental and Theoretical Artificial Intelligence

**Yashaswi Verma:**

- Pacific-Asia Conference on Knowledge Discovery and Data Mining (PAKDD - 2021 2022)
- Association for the Advancement of Artificial Intelligence (AAAI - 2021 2022)
- International Conference on Computer Vision (ICCV - 2021)
- ACM India Joint International Conference on Data Science and Management of Data (CODS-COMAD - 2021 2022)
- Indian Conference on Computer Vision Graphics and Image Processing (ICVGIP - 2021)
- IEEE Transactions on Pattern Analysis and Machine Intelligence (Journal)
- IEEE Transactions on Neural Networks and Learning Systems (Journal)
- IEEE Transactions on Multimedia (Journal)
- Pattern Recognition (Journal)

## Student Laurels

**Students Activities & Achievements**

1. Prime Ministers Research Fellowship: Abhiram and Kartik Thakral
2. IBM PhD Fellowship: Surbhi Mittal
3. Ankur Nahar - USENIX Annual Technical Conference(ATC) 2021 Student Grant
4. Lokendra Vishwakarma, Jayant Vyas and Ankur Nahar - ACM SIGMATICRIS 2021 Student Grant
5. Bharat Biradar, Dhruv Patel, Gagandeep Singh - Google Summer of Code, 2021
6. Ankur Nahar - ACM India Travel Award
7. Anggy Eka Pratiwi - INSNA International Travel Award for SUNBELT 2022 Cairns, Australia
8. Ankur Nahar- IEEE INFOCOM 2022 student grant

**Anirudh Srikanth:**

- Secured a rank of 33 in the ACM ICPC Kanpur - Mathura Regionals and was awarded with Certificate of Achievement for the same

- Scored a perfect score in Prometeo Samsung Coding Test and came 2nd, was awarded ₹10,000 for the same

### **Ramandeep:**

- Secured 1st rank in bankruptcy prediction kaggle competition hosted in Pattern recognition and machine learning course.

### **Sumit Kumar Prajapati:**

- Secured Rank 33 in ACM ICPC Kanpur - Mathura Regionals - Certificate of Achievement for the same.
- Secured Global Rank 1 in Code Cery 2022 and ReCode 2022 contests held on Codechef
- Secured National Rank 5 (Rank 1 in IITJ) in Inter IIT CP contest
- SnackDown 2021 - Semifinalist (Among Top 500 out of 75K participants )
- Secured Global Rank 4 (India Rank 1) (5500+ participants) Codechef Long Challenge
- Secured Global Rank 18 (India Rank 7) (3000+ participants) in Codechef Cook-Off
- Shortlisted as mentee for Microsoft Cyber Security Engage Programme

### **Abhay Pratap Singh:**

- Achieved All India Rank 1 on the final leaderboard in Microsoft Cybersecurity Engage'22 program, which was open for all institutions, branches, and also for 2022, 2023 and 2024 batch.

### **Dhruv Viradiya:**

- Achieved All India Rank 1 on the final leaderboard in Microsoft Cybersecurity Engage'22 program, which was open for all institutions, branches, and also for 2022, 2023 and 2024 batch.

### **Atharva Pandey:**

- K. Sanodariya, M. Shekhar, A. Pandey, A. Raj, A. Gupta, P. Suryavanshi and R. Chouhan, "Game-based Learning for Basic Electronics," Proc. International Conference on TESOL and Education (ICTE), 22 January 2022, Vietnam, pp. 61-62

- K. Sanodariya, M. Shekhar, A. Pandey, A. Raj, A. Gupta, P. Suryavanshi and R. Chouhan, "Game-based Learning for Engineering Education: Supplementing Basic Electronics Instruction with Educational Games," Proc. 10th International Conference on Information and Education Technology (ICIET 2022), April 9-11, 2022, Matsue, Japan, pp. 140-144. [Best Presentation Award on Web-based Learning, Game-based Learning and Online Discussion Analysis].

### **Susim Mukul Roy: Secured 8th position among 23 IITs in my PS in inter-IIT Tech Meet**

#### **Akshat Jain:**

- 1st Position in Blockchain Hackathon during Prometeo, technical fest, IITJodhpur
- Secured 9th position among 23 IITs in my PS in inter-IIT Tech Meet

#### **Soumik Roy:**

- Presented design credits research project (deepmood) in the conference of psychological well being 2022 organised by James Cook University, Singapore.

#### **Aman Thakur:**

- 1st Position in Tech Scavenger Hunt during Prometeo, technical fest, IIT Jodhpur

#### **Vikash Yadav:**

- 1st Position in Tech Scavenger Hunt during Prometeo, technical fest, IIT Jodhpur

#### **Rahul Gopathi:**

- Secured 8th position among 23 IITs in my PS in inter-IIT Tech Meet

#### **Ajay Nirmal:**

- Presented design credits research project (deepmood) in the conference of psychological wellbeing 2022 organised by James Cook University, Singapore.

**Nakul Sharma:**

- Secured 2nd position for the institute in Bosch's High-Prep event at Inter-IIT Tech Meet 10.0 among the 22 participating IITs.
- Secured 4th position in Samsung NLP hackathon organized during Prometeo.

**Navlika Singh:**

- Secured 2nd position in Computer Vision Hackathon organized by Prithivi AI (2021)
- Submitted a Journal Paper in Future Generation Computer Systems (FGCS) (2022)

**Patents**

Inventors	Patent Details	Month & Year	Status
Sumit Kalra, Arpit Khandelwal, Abhinav Dixit, Amit Goyal, Nithin	AUTOMATIC SPEECH GENERATION PATENT India Patent Office 201911035856	2021	Granted
Santanu Chaudhury, Shabana K M, Jobin Wilson, Prateek Kapadia	Systems and methods for management of multi- perspective customer segments Patent number-109366220	March, 2021	Granted

**Collaborations**

The faculty members of the department of Computer Science and Engineering have collaborations with several institutions and industries in India and abroad. Following are the details of the collaborations.

Faculty	Research Area	Organization	Country
<b>Industry Collaborations</b>			
Anand Mishra	Natural Language Processing	Accenture	India
Debasis Das	Urban Analytics	Vehant Technologies Private Limited	India
Dip Sankar Banerjee	Digital Devices	Johari Digital	India
Mayank Vatsa	Dependable AI	iHub-Drishti	India
Mayank Vatsa, Richa Singh	Machine Learning	NVIDIA	India
Richa Singh	Dependable AI	iHub-Drishti	India
Richa Singh, Mayank Vatsa	Machine Learning, Trustability	Facebook	USA
Richa Singh, Mayank Vatsa, Santanu Chaudhury	Medical Image Analysis	Tele-Radiology Solutions	India
Richa Singh, Mayank Vatsa, Santanu Chaudhury	Medical Image Analysis	CARING, Mahajan Imaging	India
Sumit Kalra	IoT	Uniconverge Technologies Pvt. Ltd.	India
<b>National Collaborations</b>			
Debasis Das	Software-Defined Networking (SDN)	IIT Kharagpur	India
Debasis Das	5G and Federated Learning	IIT (BHU) Varanasi	India
Debasis Das	Cognitive Radio Networks (CRNs)	IITRAM Ahmedabad	India
Dip Sankar Banerjee	High Performance Computing	IIIT Hyderabad, IIT Tirupati	India
Mayank Vatsa	Medical Image Analysis	PGI Chandigarh	India

Faculty	Research Area	Organization	Country
Richa Singh	Medical Image Analysis	AIIMS Rishikesh	India
Richa Singh	Medical Image Analysis	AIIMS Jodhpur	India
Sumit Kalra	Software Architecture	IIT Dhanbad	India
Suchetana Chakraborty		IIT Guwahati	India
Suchetana Chakraborty		IIT Kharagpur	India
Somitra Sanadhya		IIT Ropar	India
Pallavi Jain		IMSc	India
Pallavi Jain		IIT Hyderabad	India
Anand Mishra	vision-augmented Table-to-Text is under review at EMNLP'22	Microsoft R&D (Bing Team) Hyderabad	India
Deepak Mishra	Jointly working on various medical image analysis problems	AIIMS Jodhpur	India
Deepak Mishra	Evaluation and development of Machine Learning (ML) models for the automated detection, localisation and characterisation of traumatic rib fractures on CT scans	AIIMS Delhi	India
Sumit Kalra	Computers in Biology and Medicine	Queensland University of Technology	Australia
Sumit Kalra	In Health Monitoring of Structural and Biological Systems XVI,		Taiwan
International Collaborations			
Debasis Das	Routing in VANETs and IoVs	Missouri University of Science and Technology	USA
Debasis Das	Vehicular Cloud Computing(VCC) and Edge in AI	University of Melbourne	Australia
Debasis Das	Cryptography and Security	National Sun Yat-sen University	Taiwan
Debasis Das	Blockchain and Edge Intelligence	Centre for Artificial Intelligence Research (CAIR), University of Agder	Norway
Debasis Das	Unmanned Aerial Vehicle (UAV)	University of Perugia	Italy
Mayank Vatsa	Biometrics	SUNY, University at Buffalo	USA
Mayank Vatsa	Biometrics	TAMU, Kingsville	USA
Pallavi Jain		Ben-Gurion University	Israel
Richa Singh	Biometrics	SUNY, University at Buffalo	USA
Richa Singh	Biometrics	TAMU, Kingsville	USA
Sumit Kalra	Telemedicine	Queensland University of Technology	Australia
Sumit Kalra	Software	University of Sannio	Italy
Suchetana Chakraborty		University MaryLand, Baltimore	USA
Suchetana Chakraborty		Missouri University of Science and Technology	USA
Somitra Sanadhya		University of Haifa	Israel
Somitra Sanadhya		NTU	Singapore

## Publications

The faculty members of the department have a rich array of publications in 2021-2022. The details are given below.

### Dr. Angshuman Paul

1. Learning Few-Shot Chest X-Ray Diagnosis Using Images From The Published Scientific Literature, Angshuman Paul, Thomas C Shen, Yifan Peng, Zhiyong Lu, Ronald M Summers 2021 IEEE 18th International Symposium on Biomedical Imaging (ISBI), pp. 344-348

### Dr. Anand Mishra

1. Few-shot Visual Relationship Co-localization, International Conference on Computer Vision (ICCV) 2021: Revant Teotia\*, Vaibhav Mishra\*, Mayank Maheshwari\*, Anand Mishra (\*: Equal contribution)
2. Look, Read and Ask: Learning to Ask Questions by Reading Text in Images, International Conference on Document Analysis and Recognition (ICDAR 2021): S. Jahagirdar, S. Gangisetty, A. Mishra

### Dr. Chiranjoy Chattopadhyay

1. Chiranjoy Chattopadhyay and team (Vaibhavi Gupta, Vinay Detani and Vivek Khokhar) design a framework that converts digital comics to videos.
2. C2VNet: A Deep Learning Framework towards Comic Strip to Audio-Visual Scene Synthesis, ICDAR, 2021: V. Gupta, V. Detani, V. Khokhar, C. Chattopadhyay
3. S2D2NET: An Improved Approach for Robust Steel Surface Defects Diagnosis with Small Sample Learning, IEEE ICIP 2021: V. Nath, C. Chattopadhyay

### Dr. Debasis Das

1. SloVChain: Efficient and Secure Blockchain Based Internet of Vehicles (IoV), Kumar, Amrutesh & Das, Debasis 2022, 23rd International Conference on Distributed Computing and Networking January 2022 (ICDCN 2022).
2. SmartCoin: A novel incentive mechanism for vehicles in intelligent transportation system based on consortium blockchain, Lokendra

Vishwakarma, Debasis Das, 2022 Vehicular Communications(VECOM)-2022.

3. Towards Lightweight Authentication and Batch Verification Scheme in IoV, IEEE Transactions on Dependable and Secure Computing (TDSC), 2021: H. Sikarwar & D. Das
4. SCAB - IoTA: Secure Communication and Authentication for IoT Applications using Blockchain, Journal of Parallel and Distributed Computing(JPDC), Elsevier, 2021: L. Vishwakarma and D. Das
5. P2-SHARP : Privacy Preserving Secure Hash based Authentication and Revelation Protocol in IoVs, Computer Networks, 2021: Harsha V. & D. Das
6. MComIoV: Secure and Energy-Efficient Message Communication Protocols for Internet of Vehicles, IEEE/ACM Transactions on Networking (ToN), 2021: T. Limbasiya, D. Das & S.K. Das
7. DriveBFR: Driver Behavior and Fuel Efficiency-Based Recommendation System, Jayant Vyas, Debasis Das, Santanu Chaudhury, 2021 IEEE Transactions on Computational Social Systems(TCSSS)-2021.
8. EloVChain: Towards Authentication and Secure Communication Based Blockchain for Internet of Vehicles (IoV), Amrutesh Kumar, Debasis Das 2021 IEEE International Conference on Blockchain (Blockchain-2021)
9. BlockTree: a nonlinear structured, scalable and distributed ledger scheme for processing digital transactions, Lokendra Vishwakarma, Debasis Das, 2021, Cluster Computing-2021.
10. EASBVN: efficient approximation scheme for broadcasting in vehicular networks, Debasis Das, Rajiv Misra, 2021 Wireless Networks(WiNet)-2021.
11. Toward Next Generation of Blockchain Using Improved Bitcoin-NG, Debasis Das 2021, IEEE Transactions on Computational Social Systems(TCSSS-2021)

12. An Efficient Algorithm for Fast Handoff in Wireless Mobile Networks, Debasis Das. 2021 Wireless Personal Communication(WPC)-2021.

### Dr. Deepak Mishra

1. BAFL: Federated Learning with Base Ablation for Cost Effective Communication, Maynak Kumar Kundalwal, Anurag Saraswat, Ishan Mishra, Deepak Mishra, 2022, International Conference on Pattern Recognition (ICPR).
2. Data Driven Estimation of Covid-19 Prognosis, Harshit Sharma, Rajendra Nagar, Deepak Mishra, 2022 IEEE 19th International Symposium on Biomedical Imaging (ISBI).
3. MBGRLp: Multiscale Bootstrap Graph Representation Learning on Pointcloud (Student Abstract), Vandan Gorade, Azad Singh, Deepak Mishra, 2022 Proceedings of the AAAI Conference on Artificial Intelligence.
4. Branching Out for Better BYOL, Azad Singh, Deepak Mishra, 2021 NeurIPS workshop: Self-Supervised Learning - Theory and Practice.
5. On-chip Pixel Reconstruction using Simple CNN for Sparsely Read CMOS Image Sensor. Wilfred Kisku, Amandeep Kaur, Deepak Mishra, 2021 IEEE 3rd International Conference on Artificial Intelligence Circuits and Systems (AICAS)
6. Variational inference with latent space quantization for adversarial resilience, Vinay Kyatham, Deepak Mishra, AP Prathosh, 2021 International Conference on Pattern Recognition (ICPR)

### Dr. Dip Sankar Banerjee

1. Chirayu Hariyan, G Ramakrishna, Kishore Kothapalli, and Dip Sankar Banerjee. Shared-Memory Parallel Algorithms for Fully Dynamic Maintenance of 2-Connected Components. in the 36th IEEE International Parallel and Distributed Processing Symposium (IPDPS). 2022
2. Shubhajit Sahu, Kishore Kothapalli, Dip Sankar Banerjee. Dynamic Batch Parallel Algorithms for Updating Pagerank. to appear in, Workshop on Parallel and Distributed Processing for

Computational Social Sciences (ParSocial) held in conjunction with 36th IEEE International Parallel and Distributed Processing Symposium (IPDPS). 2022.

3. Manan Sharma, Shivam Tiwari, Gaurav Ruhela, Suchetana Chakraborty, and Dip Sankar Banerjee. Deep Unsupervised Methods towards Behavior Analysis in Ubiquitous Sensor Data. at Internet of Things (IoT) (Elsevier) (2021).
4. Divy Pandey, Saurabh Singh, Vishesh Mishra, Sagar Satapathy, Babita Jajodia, and Dip Sankar Banerjee. ART-MAC: an Approximate Rounding and Truncation Based Mac Unit for Fault-Tolerant Applications. to appear at the IEEE International Symposium on Circuits and Systems (ISCAS) 2022, Austin, Texas, USA. May 2022.
5. Sagar Satapathy, Vishesh Mishra, Divy Pandey, Saurabh Singh, and Dip Sankar Banerjee. AxLEAP: Enabling Low-Power Approximations Through Unified Power Format. to appear at the IEEE International Symposium on Circuits and Systems (ISCAS) 2022, Austin, Texas, USA. May 2022.
6. Divy Pandey, Vishesh Mishra, Saurabh Singh, Sagar Satapathy, Babita Jajodia and Dip Sankar Banerjee. HPAM: An 8-bit High-Performance Approximate Multiplier Design for Error Resilient Applications. to appear in the proceedings of the 23rd International Symposium on Quality Electronic Design (ISQED), 2022
7. Saurabh Singh, Vishesh Mishra, Sagar Satapathy, Divy Pandey, Kaustav Goswami, Dip Sankar Banerjee, and Babita Jajodia. EFCSA: An Efficient Carry Speculative Approximate Adder with Rectification. to appear in the proceedings of the 23rd International Symposium on Quality Electronic Design (ISQED), 2022
8. Sourish Gunesh Dhekane; Shivam Tiwari; Manan Sharma; and Dip Sankar Banerjee. Enhanced Annotation Framework for Activity Recognition Through Change Point Detection. in the proceedings of 14th IEEE International Conference on COMMunication Systems; NETWORKS (COMSNETS) (2022).



9. Deep Unsupervised Methods towards Behavior Analysis in Ubiquitous Sensor Data, Manan Sharma, Shivam Tiwari, Gaurav Ruhela, Suchetana Chakraborty, Dip Sankar Banerjee, IoT Journal, Elsevier
10. Towards Enhanced System Efficiency While Mitigating Row Hammer, ACM Transactions on Architecture and Code Optimization (TACO), 2021: K. Goswami, D. S. Banerjee, and S. Das
11. Semi-Supervised Subject Recognition in Low Modal Sensor Data, Ad Hoc Networks, 2021: S.G. Dhekane, S. Tiwari, K. Vajra & D.S. Banerjee
12. SAM: A Segmentation Based Approximate Multiplier for Error Tolerant Applications, IEEE International Symposium on Circuits and Systems (ISCAS), 2021: D. Pandey, S. Singh, V. Mishra, S. Satapathy & D.S. Banerjee
13. Towards Row Sensitive DRAM Refresh through Retention Awareness, 22nd International Symposium on Quality Electronic Design (ISQED), 2021: T. Goel, D.S. Maura, K. Goswami, S. Das & D.S. Banerjee
14. ACLA: An Approximate Carry-Lookahead Adder with Intelligent Carry Judgement and Correction, 22nd International Symposium on Quality Electronic Design (ISQED), 2021: S. Belwal, R. Bhattacharya, K. Goswami & D.S. Banerjee

### Dr. Gaurav Harit

1. EKTVQA: Generalized Use of External Knowledge to Empower Scene Text in Text-VQA, Arka Ujjal Dey, Ernest Valveny, Gaurav Harit, 2022 IEEE Access
2. Survey of Mathematical Expression Recognition for Printed and Handwritten Documents, Ridhi Aggarwal, Shilpa Pandey, Anil Kumar Tiwari, Gaurav Harit. 2021, IETE Technical Review
3. Handwritten Annotation Spotting in Printed Documents Using Top-Down Visual Saliency Models, Shilpa Pandey, Gaurav Harit, 2021, Transactions on Asian and Low-Resource Language Information Processing
4. Beyond visual semantics: Exploring the role of scene text in image understanding, Arka Ujjal Dey, Suman K Ghosh, Ernest Valveny, Gaurav Harit, 2021 Pattern Recognition Letters
5. External Knowledge enabled Text Visual Question Answering, Arka Ujjal Dey, Ernest Valveny, Gaurav Harit 2021, arXiv preprint arXiv:2108.09717
6. External Knowledge Augmented Text Visual Question Answering, Arka Ujjal Dey, Ernest Valveny, Gaurav Harit, 2021, arXiv e-prints
7. External Knowledge Augmented Text Visual Question Answering, Arka Ujjal Dey, Ernest Valveny, Gaurav Harit, 2021

### Dr. Kshitij Gajjar

1. Reconfiguring Shortest Paths in Graphs, Kshitij Gajjar, Agastya Vibhuti Jha, Manish Kumar, Abhiruk Lahiri, 2022 Proceedings of the AAAI Conference on Artificial Intelligence
2. Transparency Beyond VNP in the Monotone Setting, Prerona Chatterjee, Kshitij Gajjar, Anamay Tengse, 2022, Journal , arXiv preprint arXiv:2202.13103
3. Generalized Parametric Path Problems, Prerona Chatterjee, Kshitij Gajjar, Jaikumar Radhakrishnan, Girish Varma, 2021, arXiv preprint arXiv:2102.12886

### Dr. Lawqueen Kanesh

1. Elimination Distance to Topological-minor-free Graphs is FPT, Akanksha Agrawal, Lawqueen Kanesh, Daniel Lokshtanov, Fahad Panolan, M. S. Ramanujan, Saket Saurabh, 2021, arXiv preprint arXiv:2104.09950
2. Paths to trees and cacti, Akanksha Agrawal, Lawqueen Kanesh, Saket Saurabh, Prafullkumar Tale, 2021, Theoretical Computer Science, 860: 98-116
3. Parameterized complexity of fair feedback vertex set problem, Lawqueen Kanesh, Soumen Maity, Komal Muluk, Saket Saurabh, 2021, Theoretical Computer Science, 867: 1-12
4. Circumventing Connectivity for Kernelization, Pallavi Jain, Lawqueen Kanesh, Shivesh Kumar Roy, Saket Saurabh, Roohani Sharma, 2021, 12th International Conference on Algorithms and Complexity (CIAC 2021), 300-313

5. A Polynomial Kernel for Bipartite Permutation Vertex Deletion, Lawqueen Kanesh, Jayakrishnan Madathil, Abhishek Sahu, Saket Saurabh, Shaily Verma, 2021, International Symposium on Parameterized and Exact Computation (IPEC 2021), 130-142
6. Odd Cycle Transversal in Mixed Graphs, Avinandan Das, Lawqueen Kanesh, Jayakrishnan Madathil, Saket Saurabh, 2021, International Workshop on Graph-Theoretic Concepts in Computer Science (WG 2021), 130-142
7. A Fixed-Parameter Tractable Algorithm for Elimination Distance to Bounded Degree Graphs, Akanksha Agrawal, Lawqueen Kanesh, Fahad Panolan, M. S. Ramanujan, Saket Saurabh, 2022, SIAM J. Discrete Math, 36(2): 911-921
8. Further Exploiting c-Closure for FPT Algorithms and Kernels for Domination Problems, Lawqueen Kanesh, Jayakrishnan Madathil, Sanjukta Roy, Abhishek Sahu, Saket Saurabh, 2022, 39th International Symposium on Theoretical Aspects of Computer Science (STACS 2022), 39:1-39:20
9. Deleting, Eliminating and Decomposing to Hereditary Classes Are All FPT-Equivalent, Akanksha Agrawal, Lawqueen Kanesh, Daniel Lokshantov, Fahad Panolan, M. S. Ramanujan, Saket Saurabh, Meirav Zehavi, 2022, ACM-SIAM Symposium on Discrete Algorithms (SODA 2022), 1976-2004
4. Intelligence and Adaptive Mixup Technique for Adversarial Robustness, IEEE International Conference on Image Processing, 2021: A. Agarwal, M. Vatsa, R. Singh, and N. Ratha, 824-828
5. Dr. Gaurav Goswami, Dr. Sharath Pankanti, Prof. Nalini Ratha Prof. Richa Singh and Prof. Mayank Vatsa receive approval for US patent on "Identifying Artificial Artifacts in Input Data to Detect Adversarial Attacks"
6. Class Equilibrium using Coulomb's Law, IJCNN, 2021: S. Chhabra, P. Majumdar, R. Singh, M. Vatsa, 1-8
7. Enhancing Fine-Grained Classification for Low Resolution Images, IJCNN, 2021: M. Singh, S. Nagpal, R. Singh, M. Vatsa, 1-8
8. Understanding Neural Responses to Face Verification of Cross-Domain Representations, IJCNN, 2021: M. Singh, S. Nagpal, D. Yadav, N. Kohli, P. Pandey, R. Singh, M. Vatsa, 1-8
9. Discriminative shared transform learning for sketch to image matching, Pattern Recognition, 2021: S. Nagpal, M. Singh, R. Singh & M. Vatsa, 107815
10. Improving face recognition performance using TeCS2 dictionary, Pattern Recognition Letters, 2021: S. Suri, A. Sankaran, M.Vatsa & R. Singh, 88-95
11. Facial retouching and alteration detection, Puspita Majumdar, Akshay Agarwal, Mayank Vatsa, Richa Singh, 2022, Handbook of Digital Face Manipulation and Detection, 2021, pp. 367-387

### Dr. Mayank Vatsa

1. Disguise Resilient Face Verification, IEEE Transactions on Circuits and Systems for Video Technology, 2021: M. Singh, S. Nagpal, R. Singh, M. Vatsa., pp. 3895 - 3905
2. Multi-Task Driven Explainable Diagnosis of COVID-19 using Chest X-ray Images, Pattern Recognition Journal, 2021: A. Malhotra, S. Mittal, P. Majumdar, S. Chhabra, K. Thakral, M. Vatsa, R. Singh, S. Chaudhury, A. Pudrod, and A. Agrawal, 108243.
3. MTCD: Cataract detection via near infrared eye images, Computer Vision and Image Understanding Journal, 2021: P. Tripathi, Y. Akhtar, M. Khurshid, A. Lakra, R. Keshari, M. Vatsa and R. Singh., 103303
12. RGB-D Face Recognition using Reconstruction based Shared Representation, Soumyadeep Ghosh, Richa Singh, Mayank Vatsa, Afzel Noore, 2021/12/15, 2021 16th IEEE International Conference on Automatic Face and Gesture Recognition (FG 2021), 1-8
13. When Sketch Face Recognition Meets Mask Obfuscation: Database and Benchmark, Akshay Agarwal, Nalini Ratha, Mayank Vatsa, Richa Singh, 2021, 16th IEEE International Conference on Automatic Face and Gesture Recognition (FG 2021), 1-8
14. AECNet: Attentive EfficientNet For Crowd Counting, Muskan Dosi, Kartik Thakral, Surbhi Mittal, Mayank Vatsa, Richa Singh, 2021 16th IEEE International

- Conference on Automatic Face and Gesture Recognition (FG 2021), 1-8
15. Dual Sensor Indian Masked Face Dataset, Shiksha Mishra, Puspita Majumdar, Muskan Dosi, Mayank Vatsa, Richa Singh, 2021 16th IEEE International Conference on Automatic Face and Gesture Recognition (FG 2021), 1-8
  16. MD-CSDNetwork: Multi-Domain Cross Stitched Network for Deepfake Detection ,Aayushi Agarwal, Akshay Agarwal, Sayan Sinha, Mayank Vatsa, Richa Singh, 2021 16th IEEE International Conference on Automatic Face and Gesture Recognition (FG 2021), 1-8
  17. Impact of Super-Resolution and Human Identification in Drone Surveillance, Akshay Agarwal, Nalini Ratha, Mayank Vatsa, Richa Singh, 2021 IEEE International Workshop on Information Forensics and Security (WIFS), 1--6
  18. TBIOM Special Issue on “Best Reviewed Papers From IJCB 2020—Editorial”, Nalini Ratha, Richa Singh, Vitomir Štruc, Ioannis A Kakadiaris, Jonathon P Phillips, Mayank Vatsa, 2021 IEEE Transactions on Biometrics, Behavior, and Identity Science, 441 - 442
  19. Intelligent and adaptive mixup technique for adversarial robustness Akshay Agarwal, Mayank Vatsa, Richa Singh, Nalini Ratha, 2021 IEEE International Conference on Image Processing (ICIP), 824--828
  20. Role of optimizer on network fine-tuning for adversarial robustness (student abstract), Akshay Agarwal, Mayank Vatsa, Richa Singh, 2021, Proceedings of the AAAI Conference on Artificial Intelligence, 15745-15746
  21. On Learning Deep Models with Imbalanced Data Distribution, Puspita Majumdar, Richa Singh, Mayank Vatsa, 2021, Proceedings of the AAAI Conference on Artificial Intelligence, 15720-15721
  22. Semi-Supervised Learning via Triplet Network Based Active Learning (Student Abstract), Divyanshu Sundriyal, Soumyadeep Ghosh, Mayank Vatsa, Richa Singh, 2021/5/18, Proceedings of the AAAI Conference on Artificial Intelligence, 15903-15904
  23. Detection of digital manipulation in facial images (student abstract), Aman Mehra, Akshay Agarwal, Mayank Vatsa, Richa Singh, 2021, Proceedings of the AAAI Conference on Artificial Intelligence, 15845-15846
  24. NEAP-F: Network Epoch Accuracy Prediction Framework (Student Abstract), Arushi Chauhan, Mayank Vatsa, Richa Singh, 2021, Proceedings of the AAAI Conference on Artificial Intelligence, 15767-15768
  25. Improving face recognition performance using TeCS2 dictionary, Saksham Suri, Anush Sankaran, Mayank Vatsa, Richa Singh, 2021, Pattern Recognition Letters, Volume 145, Page 88-95
  26. MagNet: Detecting digital presentation attacks on face recognition, Akshay Agarwal, Richa Singh, Mayank Vatsa, Afzel Noore, 2021, Frontiers in Artificial Intelligence, Volume. 4 page 643424
  27. Attention Aware Debiasing for Unbiased Model Prediction, Puspita Majumdar, Richa Singh, Mayank Vatsa, 2021, Conference, Proceedings of the IEEE/ CVF International Conference on Computer Vision, 4116--4124
  28. Indian masked faces in the wild dataset, Shiksha Mishra, Puspita Majumdar, Richa Singh, Mayank Vatsa, 2021 IEEE International Conference on Image Processing (ICIP), 884-888
  29. Evolution of Newborn Face Recognition, Pavani Tripathi, Rohit Keshari, Mayank Vatsa, Richa Singh, 2021, Book Deep Learning-Based Face Analytics, 167-187
  30. Unravelling the Effect of Image Distortions for Biased Prediction of Pre-trained Face Recognition Models, Puspita Majumdar, Surbhi Mittal, Richa Singh, Mayank Vatsa, 2021, Proceedings of the IEEE/CVF International Conference on Computer Vision, pp. 3779--3788
  31. Disguise Resilient Face Verification, IEEE Transactions on Circuits and Systems for Video Technology, 2021: M. Singh, S. Nagpal, R. Singh, M. Vatsa., pp. 3895 - 3905
  32. Multi-Task Driven Explainable Diagnosis of COVID-19 using Chest X-ray Images, Pattern Recognition Journal, 2021: A. Malhotra, S. Mittal, P. Majumdar, S. Chhabra, K. Thakral, M. Vatsa, R. Singh, S. Chaudhury, A. Pudrod, and A. Agrawal., 108243.

33. MTCD: Cataract detection via near infrared eye images, *Computer Vision and Image Understanding Journal*, 2021: P. Tripathi, Y. Akhtar, M. Khurshid, A. Lakra, R. Keshari, M. Vatsa and R. Singh., 103303
34. Intelligence and Adaptive Mixup Technique for Adversarial Robustness, *IEEE International Conference on Image Processing*, 2021: A. Agarwal, M. Vatsa, R. Singh, and N. Ratha, 824-828
35. Dr. Gaurav Goswami, Dr. Sharath Pankanti, Prof. Nalini Ratha Prof. Richa Singh and Prof. Mayank Vatsa receive approval for US patent on "Identifying Artificial Artifacts in Input Data to Detect Adversarial Attacks"
36. Class Equilibrium using Coulomb's Law, *IJCNN*, 2021: S. Chhabra, P. Majumdar, R. Singh, M. Vatsa, 1-8
37. Enhancing Fine-Grained Classification for Low Resolution Images, *IJCNN*, 2021: M. Singh, S. Nagpal, R. Singh, M. Vatsa, 1-8
38. Understanding Neural Responses to Face Verification of Cross-Domain Representations, *IJCNN*, 2021: M. Singh, S. Nagpal, D. Yadav, N. Kohli, P. Pandey, R. Singh, M. Vatsa, 1-8
39. Discriminative shared transform learning for sketch to image matching, *Pattern Recognition*, 2021: S. Nagpal, M. Singh, R. Singh & M. Vatsa, 107815
40. Improving face recognition performance using TeCS2 dictionary, *Pattern Recognition Letters*, 2021: S. Suri, A. Sankaran, M.Vatsa & R. Singh, 88-95
41. Facial retouching and alteration detection, Puspita Majumdar, Akshay Agarwal, Mayank Vatsa, Richa Singh, 2022, *Handbook of Digital Face Manipulation and Detection*, 2021, pp. 367-387
42. RGB-D Face Recognition using Reconstruction based Shared Representation, Soumyadeep Ghosh, Richa Singh, Mayank Vatsa, Afzel Noore, 2021/12/15, 2021 16th IEEE International Conference on Automatic Face and Gesture Recognition (FG 2021), 1-8
43. When Sketch Face Recognition Meets Mask Obfuscation: Database and Benchmark, Akshay Agarwal, Nalini Ratha, Mayank Vatsa, Richa Singh, 2021, 16th IEEE International Conference on Automatic Face and Gesture Recognition (FG 2021), 1-8
44. AECNet: Attentive EfficientNet For Crowd Counting, Muskan Dosi, Kartik Thakral, Surbhi Mittal, Mayank Vatsa, Richa Singh, 2021 16th IEEE International Conference on Automatic Face and Gesture Recognition (FG 2021), 1-8
45. Dual Sensor Indian Masked Face Dataset, Shiksha Mishra, Puspita Majumdar, Muskan Dosi, Mayank Vatsa, Richa Singh, 2021 16th IEEE International Conference on Automatic Face and Gesture Recognition (FG 2021), 1-8
46. MD-CSDNetwork: Multi-Domain Cross Stitched Network for Deepfake Detection ,Aayushi Agarwal, Akshay Agarwal, Sayan Sinha, Mayank Vatsa, Richa Singh, 2021 16th IEEE International Conference on Automatic Face and Gesture Recognition (FG 2021), 1-8
47. Impact of Super-Resolution and Human Identification in Drone Surveillance, Akshay Agarwal, Nalini Ratha, Mayank Vatsa, Richa Singh, 2021 IEEE International Workshop on Information Forensics and Security (WIFS), 1--6
48. TBIOM Special Issue on "Best Reviewed Papers From IJCB 2020—Editorial", Nalini Ratha, Richa Singh, Vitomir Štruc, Ioannis A Kakadiaris, Jonathon P Phillips, Mayank Vatsa, 2021 *IEEE Transactions on Biometrics, Behavior, and Identity Science*, 441 - 442
49. Intelligent and adaptive mixup technique for adversarial robustness Akshay Agarwal, Mayank Vatsa, Richa Singh, Nalini Ratha, 2021 *IEEE International Conference on Image Processing (ICIP)*, 824--828
50. Role of optimizer on network fine-tuning for adversarial robustness (student abstract), Akshay Agarwal, Mayank Vatsa, Richa Singh, 2021, *Proceedings of the AAAI Conference on Artificial Intelligence*, 15745-15746
51. On Learning Deep Models with Imbalanced Data Distribution, Puspita Majumdar, Richa Singh, Mayank Vatsa, 2021, *Proceedings of the AAAI Conference on Artificial Intelligence*, 15720-15721

52. Semi-Supervised Learning via Triplet Network Based Active Learning (Student Abstract), Divyanshu Sundriyal, Soumyadeep Ghosh, Mayank Vatsa, Richa Singh, 2021/5/18, Proceedings of the AAAI Conference on Artificial Intelligence, 15903-15904
53. Detection of digital manipulation in facial images (student abstract), Aman Mehra, Akshay Agarwal, Mayank Vatsa, Richa Singh, 2021, Proceedings of the AAAI Conference on Artificial Intelligence, 15845-15846
54. NEAP-F: Network Epoch Accuracy Prediction Framework (Student Abstract), Arushi Chauhan, Mayank Vatsa, Richa Singh, 2021, Proceedings of the AAAI Conference on Artificial Intelligence, 15767-15768
55. Improving face recognition performance using TeCS2 dictionary, Saksham Suri, Anush Sankaran, Mayank Vatsa, Richa Singh, 2021, Pattern Recognition Letters, Volume 145, Page 88-95
56. MagNet: Detecting digital presentation attacks on face recognition, Akshay Agarwal, Richa Singh, Mayank Vatsa, Afzel Noore, 2021, Frontiers in Artificial Intelligence, Volume. 4 page 643424
57. Attention Aware Debiasing for Unbiased Model Prediction, Puspita Majumdar, Richa Singh, Mayank Vatsa, 2021, Conference, Proceedings of the IEEE/CVF International Conference on Computer Vision, 4116--4124
58. Indian masked faces in the wild dataset, Shiksha Mishra, Puspita Majumdar, Richa Singh, Mayank Vatsa, 2021 IEEE International Conference on Image Processing (ICIP), 884-888
59. Evolution of Newborn Face Recognition, Pavani Tripathi, Rohit Keshari, Mayank Vatsa, Richa Singh, 2021, Book Deep Learning-Based Face Analytics, 167-187
60. Unravelling the Effect of Image Distortions for Biased Prediction of Pre-trained Face Recognition Models, Puspita Majumdar, Surbhi Mittal, Richa Singh, Mayank Vatsa, 2021, Proceedings of the IEEE/CVF International Conference on Computer Vision, pp. 3779--3788
61. Disguise Resilient Face Verification, IEEE Transactions on Circuits and Systems for Video Technology, 2021: M. Singh, S. Nagpal, R. Singh, M. Vatsa., pp. 3895 - 3905
62. Multi-Task Driven Explainable Diagnosis of COVID-19 using Chest X-ray Images, Pattern Recognition Journal, 2021: A. Malhotra, S. Mittal, P. Majumdar, S. Chhabra, K. Thakral, M. Vatsa, R. Singh, S. Chaudhury, A. Pudrod, and A. Agrawal., Volume. 122, 108243.
63. MTCd: Cataract detection via near infrared eye images, Computer Vision and Image Understanding Journal, 2021: P. Tripathi, Y. Akhtar, M. Khurshid, A. Lakra, R. Keshari, M. Vatsa and R. Singh., 103303

### Dr. Pallavi Jain

1. On the Parameterized Approximability of Contraction to Classes of Chordal Graphs, TOCT: S. Gunda, P. Jain, D. Lokshantov, S. Saurabh, P. Tale
2. Gerrymandering on graphs: Computational complexity and parameterized algorithms, SAGT 2021: S. Gupta, P. Jain, F. Panolan, S. Roy, S. Saurabh
3. Even More Effort Towards Improved Bounds and Fixed-Parameter Tractability for Multiwinner Rules, IJCAI, 2021: S. Gupta, P. Jain, S. Saurabh, N. Talmon
4. Participatory Budgeting with Project Groups, IJCAI, 2021: P. Jain, K. Sornat, N. Talmon, M. Zehavi
5. Partition aggregation for participatory budgeting, AAMAS, 2021: L. Bulteau, P. Jain & N. Talmon
6. Parameterized complexity of d-hitting set with quotas, SOFSEM, 2021: S. Gupta, P. Jain, A. Petety & Sagar Singh
7. More Effort Towards Multiagent Knapsack, Sushmita Gupta, Pallavi Jain, Sanjay Seetharaman, 2022, arXiv preprint arXiv:2208.02766
8. Scatter search for the minimum leaf spanning tree problem, Yogita Singh Kardam, Kamal Srivastava, Pallavi Jain, Rafael Martí, 2022, Computers & Operations Research
9. Circumventing Connectivity for Kernelization, Pallavi Jain, Lawqueen Kanesh, Shivesh Kumar Roy, Saket

- Saurabh, Roohani Sharma, 2021, International Conference on Algorithms and Complexity
10. Preserving Consistency for Liquid Knapsack Voting, Pallavi Jain, Krzysztof Sornat, Nimrod Talmon, 2021, Proceedings of the 20th International Conference on Autonomous Agents and MultiAgent Systems
  11. Partition aggregation for participatory budgeting, Pallavi Jain, Nimrod Talmon, Laurent Bultheau, 2021, Proceedings of the 20th International Conference on Autonomous Agents and MultiAgent Systems
  12. Parameterized Complexity of d-Hitting Set with Quotas, Sushmita Gupta, Pallavi Jain, Aditya Petety, Sagar Singh, 2021, International Conference on Current Trends in Theory and Practice of Informatics
  13. Well-structured committees, Sushmita Gupta, Pallavi Jain, Saket Saurabh, 2021, Proceedings of the Twenty-Ninth International Conference on International Joint Conferences on Artificial Intelligence
  6. Class Equilibrium using Coulomb's Law, IJCNN, 2021: S. Chhabra, P. Majumdar, R. Singh, M. Vatsa, 1-8
  7. Enhancing Fine-Grained Classification for Low Resolution Images, IJCNN, 2021: M. Singh, S. Nagpal, R. Singh, M. Vatsa, 1-8
  8. Understanding Neural Responses to Face Verification of Cross-Domain Representations, IJCNN, 2021: M. Singh, S. Nagpal, D. Yadav, N. Kohli, P. Pandey, R. Singh, M. Vatsa, 1-8
  9. Discriminative shared transform learning for sketch to image matching, Pattern Recognition, 2021: S. Nagpal, M. Singh, R. Singh & M. Vatsa, 107815
  10. Improving face recognition performance using TeCS2 dictionary, Pattern Recognition Letters, 2021: S. Suri, A. Sankaran, M.Vatsa & R. Singh, 88-95
  11. Facial retouching and alteration detection, Puspita Majumdar, Akshay Agarwal, Mayank Vatsa, Richa Singh, 2022, Handbook of Digital Face Manipulation and Detection, 2021, pp. 367-387

### Dr. Richa Singh

1. Disguise Resilient Face Verification, IEEE Transactions on Circuits and Systems for Video Technology, 2021: M. Singh, S. Nagpal, R. Singh, M. Vatsa., pp. 3895 - 3905
2. Multi-Task Driven Explainable Diagnosis of COVID-19 using Chest X-ray Images, Pattern Recognition Journal, 2021: A. Malhotra, S. Mittal, P. Majumdar, S. Chhabra, K. Thakral, M. Vatsa, R. Singh, S. Chaudhury, A. Pudrod, and A. Agrawal., 108243.
3. MTCD: Cataract detection via near infrared eye images, Computer Vision and Image Understanding Journal, 2021: P. Tripathi, Y. Akhtar, M. Khurshid, A. Lakra, R. Keshari, M. Vatsa and R. Singh., 103303
4. Intelligence and Adaptive Mixup Technique for Adversarial Robustness, IEEE International Conference on Image Processing, 2021: A. Agarwal, M. Vatsa, R. Singh, and N. Ratha, 824-828
5. Dr. Gaurav Goswami, Dr. Sharath Pankanti, Prof. Nalini Ratha Prof. Richa Singh and Prof. Mayank Vatsa receive approval for US patent on "Identifying Artificial Artifacts in Input Data to Detect Adversarial Attacks"
12. RGB-D Face Recognition using Reconstruction based Shared Representation, Soumyadeep Ghosh, Richa Singh, Mayank Vatsa, Afzel Noore, 2021/12/15, 2021 16th IEEE International Conference on Automatic Face and Gesture Recognition (FG 2021), 1-8
13. When Sketch Face Recognition Meets Mask Obfuscation: Database and Benchmark, Akshay Agarwal, Nalini Ratha, Mayank Vatsa, Richa Singh, 2021, 16th IEEE International Conference on Automatic Face and Gesture Recognition (FG 2021), 1-8
14. AECNet: Attentive EfficientNet For Crowd Counting, Muskan Dosi, Kartik Thakral, Surbhi Mittal, Mayank Vatsa, Richa Singh, 2021 16th IEEE International Conference on Automatic Face and Gesture Recognition (FG 2021), 1-8
15. Dual Sensor Indian Masked Face Dataset, Shiksha Mishra, Puspita Majumdar, Muskan Dosi, Mayank Vatsa, Richa Singh, 2021 16th IEEE International Conference on Automatic Face and Gesture Recognition (FG 2021), 1-8

16. MD-CSDNetwork: Multi-Domain Cross Stitched Network for Deepfake Detection ,Ayushi Agarwal, Akshay Agarwal, Sayan Sinha, Mayank Vatsa, Richa Singh, 2021 16th IEEE International Conference on Automatic Face and Gesture Recognition (FG 2021), 1-8
17. Impact of Super-Resolution and Human Identification in Drone Surveillance, Akshay Agarwal, Nalini Ratha, Mayank Vatsa, Richa Singh, 2021 IEEE International Workshop on Information Forensics and Security (WIFS), 1--6
18. TBIOM Special Issue on "Best Reviewed Papers From IJCB 2020—Editorial", Nalini Ratha, Richa Singh, Vitomir Štruc, Ioannis A Kakadiaris, Jonathon P Phillips, Mayank Vatsa, 2021 IEEE Transactions on Biometrics, Behavior, and Identity Science, 441 - 442
19. Intelligent and adaptive mixup technique for adversarial robustness Akshay Agarwal, Mayank Vatsa, Richa Singh, Nalini Ratha, 2021 IEEE International Conference on Image Processing (ICIP), 824--828
20. Role of optimizer on network fine-tuning for adversarial robustness (student abstract), Akshay Agarwal, Mayank Vatsa, Richa Singh, 2021, Proceedings of the AAAI Conference on Artificial Intelligence, 15745-15746
21. On Learning Deep Models with Imbalanced Data Distribution, Puspita Majumdar, Richa Singh, Mayank Vatsa, 2021, Proceedings of the AAAI Conference on Artificial Intelligence, 15720-15721
22. Semi-Supervised Learning via Triplet Network Based Active Learning (Student Abstract), Divyanshu Sundriyal, Soumyadeep Ghosh, Mayank Vatsa, Richa Singh, 2021/5/18, Proceedings of the AAAI Conference on Artificial Intelligence, 15903-15904
23. Detection of digital manipulation in facial images (student abstract), Aman Mehra, Akshay Agarwal, Mayank Vatsa, Richa Singh, 2021, Proceedings of the AAAI Conference on Artificial Intelligence, 15845-15846
24. NEAP-F: Network Epoch Accuracy Prediction Framework (Student Abstract), Arushi Chauhan, Mayank Vatsa, Richa Singh, 2021, Proceedings of the AAAI Conference on Artificial Intelligence, 15767-15768
25. Improving face recognition performance using TeCS2 dictionary, Saksham Suri, Anush Sankaran, Mayank Vatsa, Richa Singh, 2021, Pattern Recognition Letters, Volume 145, Page 88-95
26. MagNet: Detecting digital presentation attacks on face recognition, Akshay Agarwal, Richa Singh, Mayank Vatsa, Afzel Noore, 2021, Frontiers in Artificial Intelligence, Volume. 4 page 643424
27. Attention Aware Debiasing for Unbiased Model Prediction, Puspita Majumdar, Richa Singh, Mayank Vatsa, 2021, Conference, Proceedings of the IEEE/ CVF International Conference on Computer Vision, 4116--4124
28. Indian masked faces in the wild dataset, Shiksha Mishra, Puspita Majumdar, Richa Singh, Mayank Vatsa, 2021 IEEE International Conference on Image Processing (ICIP), 884-888
29. Evolution of Newborn Face Recognition, Pavani Tripathi, Rohit Keshari, Mayank Vatsa, Richa Singh, 2021, Book Deep Learning-Based Face Analytics, 167-187
30. Unravelling the Effect of Image Distortions for Biased Prediction of Pre-trained Face Recognition Models, Puspita Majumdar, Surbhi Mittal, Richa Singh, Mayank Vatsa, 2021, Proceedings of the IEEE/CVF International Conference on Computer Vision, pp. 3779--3788
31. Disguise Resilient Face Verification, IEEE Transactions on Circuits and Systems for Video Technology, 2021: M. Singh, S. Nagpal, R. Singh, M. Vatsa., pp. 3895 - 3905
32. Multi-Task Driven Explainable Diagnosis of COVID-19 using Chest X-ray Images, Pattern Recognition Journal, 2021: A. Malhotra, S. Mittal, P. Majumdar, S. Chhabra, K. Thakral, M. Vatsa, R. Singh, S. Chaudhury, A. Pudrod, and A. Agrawal., 108243.
33. MTCd: Cataract detection via near infrared eye images, Computer Vision and Image Understanding Journal, 2021: P. Tripathi, Y. Akhtar, M. Khurshid, A. Lakra, R. Keshari, M. Vatsa and R. Singh., 103303

34. Intelligence and Adaptive Mixup Technique for Adversarial Robustness, IEEE International Conference on Image Processing, 2021: A. Agarwal, M. Vatsa, R. Singh, and N. Ratha, 824-828
35. Dr. Gaurav Goswami, Dr. Sharath Pankanti, Prof. Nalini Ratha Prof. Richa Singh and Prof. Mayank Vatsa receive approval for US patent on "Identifying Artificial Artifacts in Input Data to Detect Adversarial Attacks"
36. Class Equilibrium using Coulomb's Law, IJCNN, 2021: S. Chhabra, P. Majumdar, R. Singh, M. Vatsa, 1-8
37. Enhancing Fine-Grained Classification for Low Resolution Images, IJCNN, 2021: M. Singh, S. Nagpal, R. Singh, M. Vatsa, 1-8
38. Understanding Neural Responses to Face Verification of Cross-Domain Representations, IJCNN, 2021: M. Singh, S. Nagpal, D. Yadav, N. Kohli, P. Pandey, R. Singh, M. Vatsa, 1-8
39. Discriminative shared transform learning for sketch to image matching, Pattern Recognition, 2021: S. Nagpal, M. Singh, R. Singh & M. Vatsa, 107815
40. Improving face recognition performance using TeCS2 dictionary, Pattern Recognition Letters, 2021: S. Suri, A. Sankaran, M.Vatsa & R. Singh, 88-95
41. Facial retouching and alteration detection, Puspita Majumdar, Akshay Agarwal, Mayank Vatsa, Richa Singh, 2022, Handbook of Digital Face Manipulation and Detection, 2021, pp. 367-387
42. RGB-D Face Recognition using Reconstruction based Shared Representation, Soumyadeep Ghosh, Richa Singh, Mayank Vatsa, Afzel Noore, 2021/12/15, 2021 16th IEEE International Conference on Automatic Face and Gesture Recognition (FG 2021), 1-8
43. When Sketch Face Recognition Meets Mask Obfuscation: Database and Benchmark, Akshay Agarwal, Nalini Ratha, Mayank Vatsa, Richa Singh, 2021, 16th IEEE International Conference on Automatic Face and Gesture Recognition (FG 2021), 1-8
44. AECNet: Attentive EfficientNet For Crowd Counting, Muskan Dosi, Kartik Thakral, Surbhi Mittal, Mayank Vatsa, Richa Singh, 2021 16th IEEE International Conference on Automatic Face and Gesture Recognition (FG 2021), 1-8
45. Dual Sensor Indian Masked Face Dataset, Shiksha Mishra, Puspita Majumdar, Muskan Dosi, Mayank Vatsa, Richa Singh, 2021 16th IEEE International Conference on Automatic Face and Gesture Recognition (FG 2021), 1-8
46. MD-CSDNetwork: Multi-Domain Cross Stitched Network for Deepfake Detection ,Aayushi Agarwal, Akshay Agarwal, Sayan Sinha, Mayank Vatsa, Richa Singh, 2021 16th IEEE International Conference on Automatic Face and Gesture Recognition (FG 2021), 1-8
47. Impact of Super-Resolution and Human Identification in Drone Surveillance, Akshay Agarwal, Nalini Ratha, Mayank Vatsa, Richa Singh, 2021 IEEE International Workshop on Information Forensics and Security (WIFS), 1-6
48. TBIOM Special Issue on "Best Reviewed Papers From IJCB 2020—Editorial", Nalini Ratha, Richa Singh, Vitomir Štruc, Ioannis A Kakadiaris, Jonathon P Phillips, Mayank Vatsa, 2021 IEEE Transactions on Biometrics, Behavior, and Identity Science, 441 - 442
49. Intelligent and adaptive mixup technique for adversarial robustness Akshay Agarwal, Mayank Vatsa, Richa Singh, Nalini Ratha, 2021 IEEE International Conference on Image Processing (ICIP), 824--828
50. Role of optimizer on network fine-tuning for adversarial robustness (student abstract), Akshay Agarwal, Mayank Vatsa, Richa Singh, 2021, Proceedings of the AAAI Conference on Artificial Intelligence, 15745-15746
51. On Learning Deep Models with Imbalanced Data Distribution, Puspita Majumdar, Richa Singh, Mayank Vatsa, 2021, Proceedings of the AAAI Conference on Artificial Intelligence, 15720-15721
52. Semi-Supervised Learning via Triplet Network Based Active Learning (Student Abstract), Divyanshu Sundriyal, Soumyadeep Ghosh, Mayank Vatsa, Richa Singh, 2021/5/18, Proceedings of the AAAI Conference on Artificial Intelligence, 15903-15904



53. Detection of digital manipulation in facial images (student abstract), Aman Mehra, Akshay Agarwal, Mayank Vatsa, Richa Singh, 2021, Proceedings of the AAAI Conference on Artificial Intelligence, 15845-15846
54. NEAP-F: Network Epoch Accuracy Prediction Framework (Student Abstract), Arushi Chauhan, Mayank Vatsa, Richa Singh, 2021, Proceedings of the AAAI Conference on Artificial Intelligence, 15767-15768
55. Improving face recognition performance using TeCS2 dictionary, Saksham Suri, Anush Sankaran, Mayank Vatsa, Richa Singh, 2021, Pattern Recognition Letters, Volume 145, Page 88-95
56. MagNet: Detecting digital presentation attacks on face recognition, Akshay Agarwal, Richa Singh, Mayank Vatsa, Afzel Noore, 2021, Frontiers in Artificial Intelligence, Volume. 4 page 643424
57. Attention Aware Debiasing for Unbiased Model Prediction, Puspita Majumdar, Richa Singh, Mayank Vatsa, 2021, Conference, Proceedings of the IEEE/CVF International Conference on Computer Vision, 4116--4124
58. Indian masked faces in the wild dataset, Shiksha Mishra, Puspita Majumdar, Richa Singh, Mayank Vatsa, 2021 IEEE International Conference on Image Processing (ICIP), 884-888
59. Evolution of Newborn Face Recognition, Pavani Tripathi, Rohit Keshari, Mayank Vatsa, Richa Singh, 2021, Book Deep Learning-Based Face Analytics, 167-187
60. Unravelling the Effect of Image Distortions for Biased Prediction of Pre-trained Face Recognition Models, Puspita Majumdar, Surbhi Mittal, Richa Singh, Mayank Vatsa, 2021, Proceedings of the IEEE/CVF International Conference on Computer Vision, pp. 3779--3788
61. Disguise Resilient Face Verification, IEEE Transactions on Circuits and Systems for Video Technology, 2021: M. Singh, S. Nagpal, R. Singh, M. Vatsa., pp. 3895 - 3905
62. Multi-Task Driven Explainable Diagnosis of COVID-19 using Chest X-ray Images, Pattern Recognition Journal, 2021: A. Malhotra, S. Mittal, P. Majumdar, S. Chhabra, K. Thakral, M. Vatsa, R. Singh, S. Chaudhury, A. Pudrod, and A. Agrawal., Volume. 122, 108243.
63. MTCN: Cataract detection via near infrared eye images, Computer Vision and Image Understanding Journal, 2021: P. Tripathi, Y. Akhtar, M. Khurshid, A. Lakra, R. Keshari, M. Vatsa and R. Singh., 103303

### Dr. Romi Banerjee

1. Curiosity-driven Intuitive Physics Learning, ICRA (Learning to Learn: Robotics Workshop), 2021: T. Gaikwad, R. Banerjee
2. A Decade of the Z-Numbers, IEEE Transactions on Fuzzy Systems, 2021: R. Banerjee, S.K. Pal, J.K. Pal
3. Associativity between COVID-19 Pandemic and Serious Mental Illness: Rapid Systematic Review within Salutogenesis Model for Public Health Management, Current Psychiatry Research and Reviews, 2022: S. Kaman, A. Sharma, R. Banerjee

### Dr. Santanu Chaudhury

1. Multi-Task Driven Explainable Diagnosis of COVID-19 using Chest X-ray Images, Pattern Recognition Journal, 2022: A. Malhotra, S. Mittal, P. Majumdar, S. Chhabra, K. Thakral, M. Vatsa, R. Singh, S. Chaudhury, A. Pudrod, and A. Agrawal.
2. Multiresolution visual enhancement of hazy underwater scene, Deepak Kumar Rout, Badri Narayan Subudhi, T Veerakumar, Santanu Chaudhury, John Soraghan, 2022 Multimedia Tools and Applications
3. Vision based identification and force control of industrial robots, Abdullah Aamir Hayat, Shraddha Chaudhary, Riby Abraham Bobby, Arun Dayal Udai, Sumantra Dutta Roy, Subir Kumar Saha, Santanu Chaudhury, 2022
4. Pneumonia Classification Using Few-Shot Learning with Visual Explanations, Shipra Madan, Anirudra Diwakar, Santanu Chaudhury, Tapan Gandhi, 2021, International Conference on Intelligent Human Computer Interaction
5. Smart City Umbrella Ontology: Context-Driven Framework For Traffic Planning, Annu Mor, Mukesh

- Kumar, Santanu Chaudhury, 2021, Book Forum for Information Retrieval Evaluation
6. Unsupervised Learning of Affinity for Image Segmentation: An Inpainting based Approach, Swati Bhugra, Vinay Kaushik, Isaac Castro Mateos, Santanu Chaudhury, Brejesh Lall, 2021 36th International Conference on Image and Vision Computing New Zealand (IVCNZ)
  7. Conditional Deep 3D-Convolutional Generative Adversarial Nets for RGB-D Generation, Richa Sharma, Manoj Sharma, Ankit Shukla, Santanu Chaudhury, 2021 Mathematical Problems in Engineering
  8. Handling non-stationarity in E-nose design: a review, Vishakha Pareek, Santanu Chaudhury, Sanjay Singh, 2021 Source Sensor Review Emerald Publishing Limited
  9. Deep learning-based gas identification and quantification with auto-tuning of hyper-parameters, Vishakha Pareek, Santanu Chaudhury, 2021/11 Soft Computing
  10. DriveBFR: Driver Behavior and Fuel Efficiency-Based Recommendation System, Jayant Vyas, Debasis Das, Santanu Chaudhury, 2021 IEEE Transactions on Computational Social Systems
  11. Gas Discrimination & Quantification using Sensor Array with 3D Convolution Regression Dual Network, Vishakha Pareek, Santanu Chaudhury, Sanjay Singh, 2021 11th IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications (IDAACS)
  12. Online Pattern Recognition of Time-series Gas Sensor Data with Adaptive 2D-CNN Ensemble, Vishakha Pareek, Santanu Chaudhury, Sanjay Singh, 2021 11th IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications (IDAACS)
  13. Lighter and Faster Cross-Concatenated Multi-Scale Residual Block Based Network for Visual Saliency Prediction, Sai Phani Kumar Malladi, Jayanta Mukhopadhyay, Chaker Larabi, Santanu Chaudhury, 2021 IEEE International Conference on Image Processing (ICIP)
  14. Deriving Explanation of Deep Visual Saliency Models, Sai Phani Kumar Malladi, Jayanta Mukhopadhyay, Chaker Larabi, Santanu Chaudhury, 2021 Journal, arXiv preprint arXiv:2109.03575
  15. DFTNet: Deep fish tracker with attention mechanism in unconstrained marine environments, Shilpi Gupta, Prerana Mukherjee, Santanu Chaudhury, Brejesh Lall, Hemanth Sanisetty, 2021 IEEE Transactions on Instrumentation and Measurement
  16. Smart Gas Sensing using Single MOS Gas Sensor with Adaptive Gradient Boosting, Vishakha Pareek, Rahul Prajesh, Santanu Chaudhury, Sanjay Singh, 2021 Joint 10th International Conference on Informatics, Electronics & Vision (ICIEV) and 2021 5th International Conference on Imaging, Vision & Pattern Recognition (icIVPR)
  17. Hybrid 3DCNN-RBM Network for Gas Mixture Concentration Estimation With Sensor Array, Vishakha Pareek, Santanu Chaudhury, Sanjay Singh 2021 IEEE Sensors
  18. Understanding Character Recognition using Visual Explanations Derived from the Human Visual System and Deep Networks, Chetan Ralekar, Shubham Choudhary, Tapan Kumar Gandhi, Santanu Chaudhury, 2021 arXiv preprint arXiv:2108.04558
  19. Automated detection of COVID-19 on a small dataset of chest CT images using metric learning, Shipra Madan, Santanu Chaudhury, Tapan Kumar Gandhi, 2021 Conference, International Joint Conference on Neural Networks (IJCNN)
  20. Video Classification using SlowFast Network via Fuzzy rule, Aruna Tiwari, Santanu Chaudhury, Sanjay Singh, Sumeet Saurav, 2021 IEEE International Conference on Fuzzy Systems (FUZZ-IEEE)
  21. Using Scene Graphs for Detecting Visual Relationships, Anurag Tripathi, Siddharth Srivastava, Brejesh Lall, Santanu Chaudhury, 2021 Conference, 25th International Conference on Pattern Recognition (ICPR)
  22. Collaborative Human Machine Attention Module for Character Recognition, Chetan Ralekar, Tapan Kumar Gandhi, Santanu Chaudhury, 2021 Conference 25th International Conference on Pattern Recognition (ICPR)

23. A Hierarchical Framework for Leaf Instance Segmentation: Application to Plant Phenotyping, Swati Bhugra, Kanish Garg, Santanu Chaudhury, Brejesh Lall, 2021
24. Conference 25th International Conference on Pattern Recognition (ICPR)
25. A Variational Training Perspective to GANs for Hyperspectral Image Generation, Harsh Sinha, Subham Kumar, Santanu Chaudhury 2021 Soft Computing for Problem Solving

### Dr. Somitra Kumar Sanadhya

1. Design and Analysis of FPGA-Based PUFs with Enhanced Performance for Hardware-Oriented Security, ACM Journal on Emerging Technologies in Computing Systems (JETC), 2022, ISSN No. 1539-9087: N. Nalla Anandakumar, Mohammad S. Hashmi and Somitra Kumar Sanadhya.
2. Field Programmable Gate Array based Elliptic Curve Menezes-Qu-Vanstone key agreement protocol realization using Physical Unclonable Function and true random number generator primitives, IET Circuits, Devices & Systems, 2022, Pages 1-17, ISSN No. 751-8598: N. Nalla Anandakumar, Mohammad S. Hashmi and Somitra Kumar Sanadhya.
3. Quantum free-start collision attacks on double block length hashing with round-reduced AES-256, IACR Transactions on Symmetric Cryptology, 2021: A.K. Chauhan, A. Kumar & S.K. Sanadhya
4. On the Structure of Format Preserving Sets in the Diffusion Layer of Block Ciphers, Tapas Chatterjee, Ayantika Laha, Somitra Kumar Sanadhya, 2022 IEEE Transactions on Information Theory
5. FbHash-E: A time and memory efficient version of FbHash similarity hashing algorithm, Monika Singh, Anviksha Khunteta, Mohona Ghosh, Donghoon Chang, Somitra Kumar Sanadhya, 2022, Forensic Science International: Digital Investigation
6. Design and Analysis of FPGA Based PUFs with Enhanced Performance for Hardware-Oriented Cryptography, Nalla Anandakumar, Mohammad Hashmi, Somitra Sanadhya, 2022, ACM Journal on Emerging Technologies in Computing Systems, Association for Computing Machinery (ACM)
7. Field Programmable Gate Array based elliptic curve Menezes-Qu-Vanstone key agreement protocol realization using Physical Unclonable Function and true random number generator, N Nalla Anandakumar, Mohammad S Hashmi, Somitra Kumar Sanadhya 2022, IET Circuits, Devices & Systems
8. Quantum Security of FOX Construction based on Lai-Massey Scheme, Amit Kumar Chauhan, Somitra Sanadhya, 2022 Cryptology ePrint Archive
9. Design and analysis of approximate matching algorithms, Monika Singh, Donghoon Chang, Somitra Kumar Sanadhya, 2022 IIIT-Delhi
10. Design and Analysis of FPGA Based PUFs with Enhanced Performance for Hardware-Oriented Security, N Nalla Anandakumar, Mohammad S Hashmi, Somitra Kumar Sanadhya 2022 ACM Journal on Emerging Technologies in Computing Systems (JETC)
11. Release of unverified plaintext: tight unified model and application to ANYDAE, M Nandi, F Sibleyras, B Mennink, D Chang, S Sanadhya, A Dutta, N Datta
12. Cryptanalytic time–memory trade-off for password hashing schemes, A Jati, S Mishra, SK Sanadhya, D Chang 2021
13. Threshold implementations of GIFT: A trade-off analysis, Naina Gupta, Arpan Jati, SK Sanadhya, A Chattopadhyay, Donghoon Chang, 2021
14. FPGA-Based true random number generation using programmable delays in Oscillator-Rings, SK Sanadhya, NN Anandakumar, MS Hashmi, 2021
15. A Configurable crystals-kyber hardware implementation with side-channel protection, Arpan Jati, Naina Gupta, Anupam Chattopadhyay, Somitra Kumar Sanadhya, 2021, Cryptology ePrint Archive

### Dr. Suchetana Chakraborty

1. Anirban Das, Kartik Narayan and Suchetana Chakraborty, "Leveraging ambient sensing for the estimation of curiosity-driven human crowd " to appear in the proceedings of IEEE SysCon 2022
2. Manan Sharma, Shivam Tiwari, Gaurav Ruhela, Suchetana Chakraborty, and Dip Sankar Banerjee. Deep Unsupervised Methods towards Behavior

- Analysis in Ubiquitous Sensor Data. at Internet of Things (IoT) (Elsevier) (2021).
3. Experience: Developing a testbed for ambient sensing and in-network data processing, COMSNETS 2022, Anirban Das and Suchetana Chakraborty ( Regular paper)
  4. Enabling video conferencing in low bandwidth, CCNC 2022, Muzzafer Ali and Suchetana Chakraborty ( Poster paper)
  5. Multi-Access Edge Computing for Urban Informatics, Suchetana Chakraborty and Radhika Sukapuram. ICDCN 2022 ( Tutorial paper)
  6. Deep Unsupervised Methods towards Behavior Analysis in Ubiquitous Sensor Data, Manan Sharma, Shivam Tiwari, Gaurav Ruhela, Suchetana Chakraborty, Dip Sankar Banerjee, IoT Journal, Elsevier
  7. A survey on task offloading in Multi-access Edge Computing, Journal of Systems Architecture, Elsevier, 2021: A. Islam, A. Debnath, Manojit Ghosh, S. Chakraborty
2. Automated and lightweight feature detection and matching towards real-time SHM of large structures, Sneha Prasad, David Kumar, Sumit Kalra, Chih-Hung Chiang, Arpit Khandelwal, 2022, Health Monitoring of Structural and Biological Systems XVI
  3. PalmHashNet: Palmprint Hashing Network for Indexing Large Databases to Boost Identification, Geetika Arora, Sumit Kalra, Ashutosh Bhatia, Kamlesh Tiwari, 2021, IEEE Access
  4. Training Software Engineers for Qualitative Evaluation of Software Architecture, Ritu Kapur, Sumit Kalra, Kamlesh Tiwari, Geetika Arora, 2021, arXiv preprint arXiv:2105.09595
  5. Ajay Nirmal, Sumit Kalra, Ankita Sharma, Soumik, "DeepMood: Identification of mood state with keystrokes on smartphone", PSYCHOLOGICAL SCIENCE AND WELL-BEING CONFERENCE 2022
  6. Krishna Singh Bhandari, Ankita Sharma, Sumit Kalra, Ajay Nirmal, Soumik, Rajat Soni, Bhavneet Kaur, "Feasibility and usability of Experience sampling method and typing characteristics for smartphone-based emotion detection", PSYCHOLOGICAL SCIENCE AND WELL-BEING CONFERENCE 2022
  7. Saxena, Hars; Kalra, Sumit; Telemedicine System Deployment in Rural India - A case study, 3rd International Conference on Rural Technology Development and Delivery (RTDD) :RuTAG 2022

### Dr. Suman Kundu

1. FPPR: Fast Pessimistic PageRank for Dynamic Directed Graphs, In proceedings of 10th International Conference on Complex Networks and their Applications, Madrid, Spain (Hybrid), 2021: Pashikanti Rohith Parjanya and Suman Kundu
2. A Serverless Approach to Federated Learning Infrastructure Oriented for IoT/Edge Data Sources (Student Abstract), Anshul Ahuja, Geetesh Gupta, Suman Kundu, 2021, Proceedings of the AAAI Conference on Artificial Intelligence

### Dr. Sumit Kalra

1. The effect of machine learning explanations on user trust for automated diagnosis of COVID-19, Kanika Goel, Renuka Sindhgatta, Sumit Kalra, Rohan Goel, Preeti Mutreja, 2022, Computers in Biology and Medicine

## Laboratories and equipment

Network Lab	Network lab aims to support undergraduate and postgraduate courses linked to Computer Networks, Wireless Networks, and Network Protocol etc. The students also get hands-on with experiments using Network Hardware (i.e., IoT devices, Raspberry Pi, Routers, Switches, Firewalls, PCs, Servers, Laptops, Sensors, and Arduino) which help to monitor network usage, bandwidth, throughput, delay and security attacks.
Hardware Lab	Hardware lab aims to support undergraduate and postgraduate courses linked to computer organization and facilitate research activities on edge analytics platforms, computing architectures, embedded systems, autonomous systems, and CAD for VLSI.
Samsung AR-VR Innovation Laboratory	<p>The Augmented Reality and Virtual Reality (AR/VR) Innovation lab at IIT Jodhpur was established on November 20, 2020. The lab is a joint initiative between IIT Jodhpur and Samsung R&amp;D Institute India-Delhi (SRI-D).</p> <p>The lab, located at the Department of Computer Science and Engineering, was virtually inaugurated by Shri Ajay Prakash Sawhney, Secretary, Ministry of Electronics &amp; Information Technology, Government of India, in the esteemed presence of Ms. Mugdha Sinha, Secretary, Art, Literature, Culture, Government of Rajasthan. On this occasion, other dignitaries who were also present included Mr. Deokho Kim, Managing Director, Samsung Research &amp; Development Institute, Delhi, Dr. Kaushik Saha, CTO, Samsung R&amp;D Institute, India, and Prof. Santanu Chaudhury, Director, IIT Jodhpur.</p> <p>The lab is equipped with state-of-the-art facilities and high-end equipment, allowing the users to create technology solutions and stimulate skilling and re-skilling educational programs in AR-VR, which can have a transformative impact on society and technology. The lab is a part of Samsung Digital Academy, which is the company's corporate social initiative. It aims to bridge the country's digital divide and proficiency gaps by skilling students in Digital Heritage, Immersive Experience, and Human-Computer Interaction. As AR and VR are finding applications in diverse fields like education, industrial design, robotics, infrastructure management, and medicine, students of different programs in the Institute will take advantage of this facility. Courses at the lab would be run by Samsung engineers in conjunction with the faculty of IIT-Jodhpur and will be offered to students of IIT Jodhpur.</p> <p>The lab is a joint initiative between IIT Jodhpur and Samsung R&amp;D Institute India-Delhi (SRI-D).The lab is equipped with state-of-the-art facilities and high-end equipment, allowing the users to create technology solutions and stimulate skilling and re-skilling educational programs in AR-VR, which can have a transformative impact on society and technology. The lab is a part of Samsung Digital Academy, which is the company's corporate social initiative. It aims to bridge the country's digital divide and proficiency gaps by skilling students in Digital Heritage, Immersive Experience, and Human-Computer Interaction. Some of the ongoing projects relate to medical solutions and game development.</p>

Vehicular Ad-Hoc Networks (VANETs) Lab	<p>This laboratory is equipped with licensed QualNet Network Emulator Software, Duckiebots Setup, Implementation of Real Time Vehicular Networks Testbed (using OBU &amp; RSU) and open source software such as ns2/ns3 and OmNet ++ among many others. The students also get hands-on with experiments using Network.</p> <p>VANET laboratory is equipped with DuckieTowns Setup, licensed QualNet Network Simulator Software, Implementation of Real-Time Vehicular Networks Testbed (using OBU &amp; RSU) and open sources software such as ns2/ns3 and OmNet ++ among many others. DuckieTowns are the urban environments: roads, constructed from exercise mats and tape, and the signage which the robots use to navigate around. DuckieTowns can be transformed into smart cities by adding traffic lights and watchtowers. Duckietown is an integration of advanced technologies using electronics, computers, communication and smart sensors. The designed testbed can increase the scientific value by simulating vehicle autonomy and decrease the cost using real life simulation projects.</p> <p>Hardware (i.e., IoT devices, Raspberry Pi, Routers, Switches, Firewalls, PCs, Servers, Laptops, Sensors, and Arduino) which help to monitor network usage, bandwidth, throughput, delay and security attacks.</p>
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## High end equipment facilities

Various department labs are equipped with high end equipment to support a variety of research and academic facilities. AR-VR labs is well established with Virtual Reality Systems, Gear VR, Smartphones, high end iMac systems, spherical cameras, VR gaming system, and leap motion devices. The lab provides just enough infrastructure for developing various AR/VR solutions and testing them in the lab environment.

The VANET lab has fully established Duckietown that provides bots, city navigation packs, programmed controlled traffic lights tod design, develop, and execute various approaches for testing and validating various solutions for smart city infrastructure, established with support from HEFA loan.

The Hardware lab is also well equipped with Kintex-7 FPGA development boards, Orroid X, Nvidia Jetson Xavier NX development kits to support design and development of various prototype solutions based on edge and fog computing. Our Network lab has a NetFPGA Cube. We also have facilities for EEG, Eye Tracker, Thermal Camera. In terms of computational resources, in addition to the resources available at the institute leve, the department has multiple GPU workstations and servers, DGX stations, and DGX-2 servers with NET App storage to support high end data

collection and processing tasks. We are also in the process of purchasing a Data Processing Unit Server with support from the DST FIST infrastructure support.

## Outreach activities

The department of Computer Science and Engineering is actively engaged in a number of outreach activities showcasing state of the art trends and development across numerous areas. Some of these initiatives are described as follows.

## Seminars/ Workshops/ Conferences organized

### Conferences Organized

- IEEE International Conference on Automatic Face and Gesture Recognition, 2021
- Indian Conference on Vision, Graphics and Image Processing, 2021
- ACM Grad Cohort, 2022

### ACM - Student Chapter

- Student Research Symposium 2022 (SRS'22 )
- iS3: iDeathon on Sustainable Smart Systems
- Tech Talk
- Hour of Code

## Department Webinar

The department of Computer Science and Engineering started a bi-weekly webinar series in 2021 comprising talks on various topics in Computer Science & Engineering. We invite eminent speakers from various institutes as well as industries. These talks are open for everybody across the world, and approximately 100 people from outside IITJ have registered for attending the webinars. We organized the following talks in 2021-2022.

Speaker	Affiliation (with country)	Title of the Talk
Dr. Manish Gupta	Microsoft Bing, India	Compression of Deep Learning Models for NLP
Dr. Karthik Mohan	University of Washington, USA	Deep Learning case-studies: Recommender systems for online shopping and Task-oriented Natural Language Generation system
Swaprava Nath	IIT Bombay	Computational Mechanism Design for Social Decisions
Dr. Lawqueen Kanesh	IIT Jodhpur	Parameterized Algorithms for Model Counting
Dr. Sajal K. Das	Missouri University of Science and Technology, USA	Merely Fun with Algorithms
Mr. Brijesh Pillai	Mercedes Benz RD Pvt. Ltd, India	Intelligent Occupant sensing in Car Interiors
Dr. Sushmita Gupta	IMSc, Chennai	Matching under preferences: Stability to popularity
Dr. Amit Sethi	IIT Bombay	Towards Precision Oncology using Machine Learning on Medical Images
Dr. Angshuman Paul	IIT Jodhpur	Data-efficient Machine Learning for the Diagnosis of Chest Radiographs
Dr. Salil Kanhere	UNSW, Sydney	Transparent, Trustworthy and Privacy-Preserving Supply Chains
Dr. Bharatkumar Sharma	NVIDIA	Powering the Next Era of Analytics and AI with GPU
Dr.Sridhar Chimalakonda	IIT Tirupati	What Is Software Engineering Anyway? Reflections on 50 Years of Software Engineering and the Road Ahead!
Dr. Kalyanmoy Deb	Michigan State University, USA	Explainable AI (XAI) using Nonlinear Decision Trees
Dr. Vinay Kulkarni	TCS	Decision-making in the face of uncertainty
Dr. Heena Rathore	University of Texas, USA	Brain Variable Reward Structure for Cooperative Machine Learning in IoT Network
Dr. Sajal K. Das	Missouri University of Science and Technology, USA	From Smart-Sensing to Smart Living
Dr. Joscha Bach	VP of Research at AI Foundation, San Francisco, USA	What would make an intelligent system generally intelligent?
Dr. Nimrod Talmon	Ben-Gurion University, Israel	Participatory Budgeting - Making Budgeting Great Again
Dr. Nalini K. Ratha	State University at Buffalo, USA	Trustworthy AI Systems
Dr. Ishan Misra	Facebook AI Research, USA	Multi-view invariance and grouping for self-supervised learning
Dr. Saket Saurabh	Institute of Mathematical Sciences	Picking Random Vertices
Dr. Anush Sankaran	IBM Research AI	"Why do we need to Optimize Deep Learning Models?"

## Our Faculty Webinars & Events

The faculty members of the department of Computer Science and Engineering were invited to give talks at the following places and events.

### Anand Mishra

- Pre-conference workshop on multimodal interactions at ICMI 2022
- "Introduction to Neural Networks" at the "International Research Workshop on Advances in Deep Learning and Applications (WADLA 2021)", organized by IIIT Sri City, Chittoor, on February 22, 2021.

### Anghuman Paul

- 'Application of Machine/Deep Learning' on June 16 at the Indian Statistical Institute.
- Tutorial on 'Meta-Learning for Medical Image Analysis' at the tutorial on Meta learning for medical image analysis at MICCAI 2021.
- Data-efficient Machine Learning for the Diagnosis of Chest Radiographs, at the Department Webinar, on August 27, 2021 at 5pm (IST)

### Chiranjoy Chattopadhyay

- "Introduction to Immersive Technology (AR/VR) and its Application" at the Open Innovation Tech Series - VILT Session, organized by Samsung, on August 27, 2021.

### Debasis Das

- Blockchain and Its Applications at NIT Surathkal, SERB Sponsored Workshop on Advanced Topics in Network Security from 30th May –5th June 2022.
- Cyber Crimes and Safety at Cyber Jagurakta Diwas on June 4, 2022 organized by Ministry of Education
- Explainable Artificial Intelligence and the Future at MNIT Jaipur, AICTE-FDP and MNIT Jaipur Sponsored Workshop from 20-24 Dec 2021.
- STTP on Research Methodology at LCIT Bilashpur, AICTE-FDP and LCIT Group Sponsored Workshop from 21-26 March 2022.

- Industrial Internet of Things at KLE university, AICTE-FDP and KLE University Sponsored Workshop from 3-7 January 2022.
- Pedagogy Innovative Methods of Teaching and Learning, at KLE university, AICTE-ISTE and BIET Sponsored Workshop from 7-12 Feb 2022.

### Pallavi Jain

- Invited at Dagstuhl seminar on Matching Under Preferences: Theory and Practice. She also gave a talk on Almost Stable Marriage in the seminar on July 29, 2021.

### Mayank Vatsa

- Trustable Biometrics, Amazon Computer Vision Conference, 2022
- Mayank Vatsa to speak on Human-Machine Interaction on September 17, 2021 in the 'Going Virtual' session (2:30pm-6:00pm) at the Global Virtual Technology Summit 2021, presented by PANIIT.
- Expert panelist on CL Educate Presents Academia Connect (Nvidia Technology Partner) for a talk on "Path to Making India the AI Factory and Resource Pool for the World", on June 23, 2021.
- Talk on "Dependable Computer Vision" on April 13, 2021 at Nvidia GTC 21.
- Invited talk on "Artificial Intelligence and Machine Learning – Opportunities and Challenges" at the National Defense College, Delhi
- Role of Adversarial Perturbations in Deep Learning, BOSCH 2021
- Trusted Face Recognition, IDRBT 2021
- Trustworthy AI, ACM CODS-COMAD 2021

### Richa Singh

- Panel on Facing the Truth: Benefits and Challenges of Facial Recognition, organized by IEEE TechEthics.
- Panel on Mitigating Bias on Face Recognition, organized by IndiaAI. Panelist along with Connor Wright (Montreal AI Ethics Institute), and Jibu Alias as moderator.



## Somitra Sanadhya

- Somitra Sanadhya and Suman Kundu gave talks at the "Cyber Jaagrakta Diwas" on May 4, 2022 - organized by the Ministry of Education and the Ministry of Home Affairs
- Talk on post-quantum crypto in a webinar by CDoT on 12th Oct 2021 Tuesday from 2-4:30pm. Meeting link @ www.cdof.in
- International Webinar session on How to build the fastest track for a Global Career in Cyber Defense on 6th Oct 2021.

## Suchetana Chakraborty

- Invited Talk on "Balancing work-life in Academics" at ACM Grad-Cohort 2022 by Suchetana Chakraborty
- Invited Talk on "MEC and Urban Informatics" at ICDCN Tutorial 2022
- Panelist for discussions on "How to become a successful Cyber Defense Professional" on May 19, 2021, 5-6pm (IST).

## Sumit Kalra

- Invited speaker to talk on Innovations in Healthcare in the India-Sweden Innovation Challenge organized by AIIMS Jodhpur in collaboration with Business Sweden on 24th September, 2021.

- Big Data Analytics - Cloud Centric framework from IoT Perspective - FDP "Artificial Intelligence for IoT services in Cloud: Techniques & Applications
- Contemporary Big Data Processing and Analytical Frameworks - STTP on "BIG DATA ANALYTICS USING SOFT COMPUTING TOOLS", NIT Jalandhar
- Contemporary Data Processing and Analytical tools and frameworks for Deep Learning - FDP on Deep Learning and Its Applications, Rajiv Gandhi University (A central university), Arunachal pradesh & NIT Warangal

## Suman Kundu

- Cyber Crimes and Safety at Cyber Jagurakta Diwas on May 4, 2022 organized by Ministry of Education
- Social Network Analysis Using Rough Set and Fuzzy Sets" at Short Term Training Programme on Big Data Analytics Using Soft Computing Tools (For Data Analytics) on Sep 29, 2021 organized by Rajiv Gandhi University (A central university)
- Network Data Science at Faculty Development Program(FDP) on "Data Science" on Aug 08, 2021 organized by GL Bajaj Institute of Technology and Management Greater Noida
- Social Media Analytics at Five Day National Police Perspective Management Course organized by Bureau Of Police Research And Development

## Placements



## PhD Students

### Ravi Sharma

**Supervisor:** Venkata Ramana Badarla

**Current Position:** Research Associate, SPIN Laboratory, Dept. of Electrical Engineering, Indian Institute of Technology Kanpur, Uttar Pradesh

### Shreya Goyal

**Supervisor:** Chiranjoy Chattopadhyay, Gaurav Bhatnagar

# Department of Electrical Engineering

## Introduction to the department:

The Department of Electrical Engineering primarily focuses on imparting quality education and preparing students to face the future technological challenges. The Vision of the Department is to generate and disseminate knowledge and develop technologies in emerging domains of Electrical Engineering to meet the national and global needs. The Department is committed to engage in high quality research by Faculty Members and Students and in the pursuit of excellence in teaching.

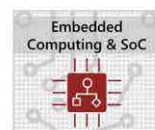
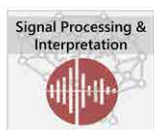
The Mission of the Department is :

- To impart education with emphasis on fundamental knowledge and its applications through pedagogical innovations including experiential learning, synchronous and asynchronous instructional delivery,
- To make significant contributions in fundamental research and advancing technology in different areas of Electrical Engineering with emphasis on Cyber Physical Systems, Artificial Intelligence of Things, 5G and Beyond Systems, and Smart Grid,
- To contribute towards innovation, technology development, IP generation, and entrepreneurship involving the thrust areas of Electrical Engineering,
- To collaborate with various organizations for research, teaching and technology development,

to synchronize and contribute towards the transformational changes in the Electrical Engineering landscape, and

- To enhance the perception of the Department through different avenues and contribute towards continuing education and upskilling programs.

The Department offers B.Tech. in Electrical Engineering and two state-of-the-art M.Tech. programs in Sensors and Internet of Things (SIoT) and Cyber Physical Systems (CPS). The Department also offers M.Tech.- Ph.D. Dual Degree programs in Communication and Signal Processing (CSP), Sensors and Internet of Things (SIoT) and Cyber Physical Systems (CPS). The Ph.D. program of the Department covers a wide range of research areas, such as Microelectronics, VLSI and Computing Systems, Signal Processing, Communication Engineering, RF, Microwave & Photonics, Power Engineering, and Control systems. Technology Tracks currently pursued by the Department include emerging and challenging fields that culminate at the intersection of several traditional research areas. Department faculty members are also engaged in groundbreaking interdisciplinary research in collaboration with faculty members across various departments through the Institute's Interdisciplinary Research Platforms (IDRPs).



Active collaborations are on-going with organizations like UC Berkeley, Carleton University, TIMA laboratory (Grenoble, France), Technion-Israel Institute of Technology, Norwegian University of Science and Technology (Gjovik, Norway), Higher Institute of Applied Sciences and Technology of Sousse (Tunisia), IISc Bangalore, IIT Delhi, IIT Kanpur, IIT Mandi, IIT Bombay, IIITM Kerala, IIT Madras, IIST Thiruvananthapuram, Society for Applied Microwave Electronics Engineering and Research, Indian Space Research Organization, Freescale Semiconductors, Global Foundries, AIIMS

Jodhpur, Defence Research and Development Organization.

The Department won many accolades during 2020-21 at the Institute level including 2020 Teaching Excellence Awards, Research Excellence Award, and the Meritorious Staff Award. During the Covid pandemic, the Department adopted innovative teaching initiatives for prompt and smooth transition into online teaching. The Department also formed its Departmental Society that would organize various webinars, events, and workshops for the students throughout the year.

## Faculty Members



### Arun Kumar Singh

Head of the Department  
**Specialization/ Research interest:**  
Communication Theory, Wireless and Mobile Communications, Satellite based Navigation Systems, Spread Spectrum Systems



### Aashish Mathur

Assistant Professor  
**Specialization/ Research interest:**  
Power Line Communications, Free Space Optical Communications, Visible Light Communications



### Abdul Gafoor Shaik

Associate Professor  
**Specialization/ Research interest:**  
Protection of various components of Power System, Protection of Distribution Network with DG penetration, Power Quality assessment and mitigation in Distribution Networks with Renewable Energy Source penetration



### Ajay Agarwal

Professor  
**Specialization/ Research interest:**  
Microelectronics; Micro- Nano-technologies; Sensors; Micro-fluidics, Point-of-Care devices and Early diagnostics



### Amandeep Kaur

Assistant Professor  
**Specialization/ Research interest:**  
Analog and Mixed-Signal Circuit Design, Data Converters (ADC, DAC), High-speed circuits, CMOS image sensors



### Amit Bhardwaj

Assistant Professor  
**Specialization/ Research interest:**  
Human Haptics, Computer Haptics, Haptics for Teleoperation and Applications of Machine Learning



### Anil Kumar Tiwari

Associate Professor

**Specialization/ Research interest:**  
Electrical Engineering: Image Processing, Video Processing, and Signal Processing application in Bio-Medical



### Anoop Jain

Assistant Professor

**Specialization/ Research interest:**  
Cooperative Control; Multi-Agent Systems; Formation Control; Nonlinear Control; Event-Triggered Control, Cyber-Physical Systems



### Arani Ali Khan

Assistant Professor

**Specialization/ Research interest:**  
RF and Microwave Engineering.



### Arpit Arvind Khandelwal

Assistant Professor

**Specialization/ Research interest:**  
Group III-V Optoelectronic Devices, Fiber Optics and Integrated Optics Sensors, Non-Linear Photonics, Silicon Photonics and Optical Communication



### Bijnan Bandyopadhyay

Visiting Professor, FNAE, FNASc, FASc, IEEE Fellow, Fellow AAIA

**Specialization/ Research interest:**  
Variable structure systems, Discrete-time sliding mode control, Event triggered sliding mode control, Modeling and control of large size nuclear reactor.



### Binod Kumar

Assistant Professor

**Specialization/ Research interest:**  
SoC Design Verification & Testing, Hardware Security & Trust, Hardware Design for AI, VLSI CAD, Computer Architecture



### Deepakkumar M. Fulwani

Associate Professor

**Specialization/ Research interest:**  
Embedded Control, Control of Micro-Grids and Control of Uncertain System



### Harshit Agarwal

Assistant Professor

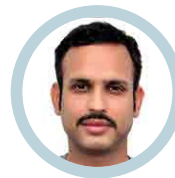
**Specialization/ Research interest:**  
Industry standard compact modeling; Analog and RF modeling, Energy efficient next generation transistors, emerging memories



### Himanshu Kumar

Associate Professor

**Specialization/ Research interest:**  
Image and Video Processing, Computer Vision, Computational Imaging, Deep Learning



### Jai Narayan Tripathi

Assistant Professor

**Specialization/ Research interest:**  
VLSI Circuits and Systems, Signal Integrity, Power Integrity, Design of Experiments, Metaheuristic Optimization Techniques



### **Kamaljit Rangra**

Visiting Professor

**Specialization/ Research interest:**  
Microelectronics, RF, Bio and Inertial-  
MEMS, Transducers and Actuators



### **Kunwar Aditya**

Assistant Professor

**Specialization/ Research interest:**  
Power Electronics; Wireless Power  
Transfer; Transportation Electrification;  
Electrical Energy Storage Systems;  
Automotive Electronics



### **Mahesh Kumar**

Associate Professor

**Specialization/ Research interest:**  
Group III-V quantum structures  
by MBE, Growth of thin films and  
nanostructures, Group III-nitride alloys  
for LEDs, HEMTs and photovoltaic  
applications, Inorganic-Inorganic  
hybrid structures with special  
attention to band gap engineering, Si  
and wide band gap semiconductors  
for MEMS, Micro and Nano device  
fabrications



### **Manish Narwaria**

Assistant Professor

**Specialization/ Research interest:**  
Multimedia signal processing



### **Manoj Choudhary**

Professor

**Specialization/ Research interest:**  
Communication Systems (Wireless  
- 4G/5G/6G, Modem/WLAN/WPAN/  
UWB) and networks; System on Chip;  
Embedded Systems & Software;  
Image Sensors and signal processing;  
Internet of Things and smart homes;  
AI, ML and computer vision



### **Niladri Sekhar Tripathy**

Assistant Professor

**Specialization/ Research interest:**  
Dynamics and Control, Mechatronics  
and Cyber Physical Systems



### **Nishant Kumar**

Assistant Professor

**Specialization/ Research interest:**  
Power System Optimization  
and Control; Renewable Energy  
Generation; Control of Microgrid  
& Smart Grid; Electric Vehicle;  
Cybersecurity for Electric Power  
Infrastructure



### **Nitin Bhatia**

Assistant Professor

**Specialization/ Research interest:**  
Fiber Optics and Photonics



### **Rajendra Nagar**

Assistant Professor

**Specialization/ Research interest:**  
Computer Vision; Image Processing;  
Computer Graphics; 3D Shape  
Analysis; Geometry Processing



### **Rajlaxmi Chouhan**

Assistant Professor

**Specialization/ Research interest:**  
Image processing, image quality  
assessment, noise-aided image  
enhancement, e-learning tools and  
techniques



### **Ravi Yadav**

Assistant Professor

**Specialization/ Research interest:**  
Power system dynamics, Wide  
area monitoring systems, anomaly  
detection and characterization, AI/ML  
applications to power systems, and  
cyber-attack modelling and diagnosis



### **Saakshi Dhanekar**

Assistant Professor

**Specialization/ Research interest:**  
Nano-sensors for societal  
applications, device development,  
gas- and bio-sensors, MEMS, silicon  
based devices



### **Sai Kiran M. P. R.**

Assistant Professor

**Specialization/ Research interest:**  
Millimeter-wave Communications;  
Autonomous Vehicular  
Communications; Internet of Things;  
Cyber-Physical Systems; Wireless  
Network Modeling and Analysis



### **Sandeep Kumar Yadav**

Associate Professor

**Specialization/ Research interest:**  
Signal Processing, Condition  
Monitoring, Image Processing,  
Data Compression, Blind Source  
Separation, Artificial Neural Network



### **Shree Prakash Tiwari**

Associate Professor

**Specialization/ Research interest:**  
Microelectronics & VLSI Technology,  
Microfabrication, Organic Electronics,  
Device Physics and Characterization,  
New Device Structures



### **Soumava Mukherjee**

Assistant Professor

**Specialization/ Research interest:**  
Microwave Communication

## Adjunct Faculty Members



### Hari Mohan Gupta

B.Tech. (Electronics and Communication Engineering): Indian Institute of Technology Roorkee (University of Roorkee)

M.Tech. (Electronics and Electrical Communication Engineering) : Indian Institute of Technology Kharagpur

Ph.D. (Electrical Engineering): Indian Institute of Technology Kanpur

Formerly Professor (HAG), Chair Professor, and Emeritus Professor

Department of Electrical Engineering, Indian Institute of Technology Delhi

Dean Undergraduate Studies, IIT, Delhi (September 2002 – July 2003)

Head, Department of Electrical Engineering, IIT Delhi, (September 2001- August 2002)

Associate Head, Department of Electrical Engineering, IIT Delhi. (September 1999-August 2001)

Founding Coordinator, Bharti School of Telecommunication Technology and Management, IIT, Delhi (September 2000-August 2002)

### R. M. Suresh Babu

M.Sc.(Physics): Indian Institute Technology, Bombay

Distinguished Scientist & Director, Health Safety & Environment Group

Bhabha Atomic Research Center, mumbai 400 085

## Description of Research Groups

### Communication Systems

The research spans several aspects of wireless communications and communication signal processing, with the aim to provide for theoretical breakthroughs as well as practical solutions to problems pertaining to futuristic communication networks. In particular, the focus is on the information theoretic performance analysis of wireless communication systems including multiuser communication networks, cooperative communication networks, MIMO communication systems, and algorithmic solutions to satellite based navigation receiver design.

Our research is highly conducive to multi-disciplinary collaboration; it builds on a diverse set of theoretical breakthroughs in information theory, communication theory, large deviation theory, matrix theory, linear algebra, and coding theory.

Current Research Themes	Associated Technology Tracks
<ul style="list-style-type: none"> <li>Satellite-based navigation receiver design</li> </ul>	<ul style="list-style-type: none"> <li>5G and Beyond Communication</li> </ul>
<ul style="list-style-type: none"> <li>Rate, reliability and complexity limits in MIMO communications</li> </ul>	<ul style="list-style-type: none"> <li>IoT Communications (AIoT)</li> </ul>
<ul style="list-style-type: none"> <li>Performance improvement and security of Optical Wireless Communication</li> </ul>	
<ul style="list-style-type: none"> <li>Communication protocols for RF energy harvesting-based systems</li> </ul>	

## RF, Microwaves and Photonics

With the rapid technological improvements in hand-held devices such as tablets and mobile phones, the requirement of faster access to wireless resources is ever increasing. The group mainly focuses on design of active and passive components for modern transceivers. Along with research in high frequency circuit design, the group aims to improve the quality of understanding in microwave engineering through various practical as well as computer aided simulations.

Optical Techniques would be the fundamental enabler for many future technologies and applications including high-speed data communication systems and Internet of Things. The Photonics group in the department is working on exploring various device applications of multimode optical fibers. The current work is towards generating arbitrary multimode beams and highly pure Laguerre-Gaussian (LG) beams in free-space. The group is also targeting the generation of orbital angular momentum beams using optical fibers, and their use in free-space optical communication systems. In addition, the group also works on security issues in the Physical layer in free-space optical networks.

Current Research Themes	Associated Technology Tracks
<ul style="list-style-type: none"> <li>Millimeter Wave antennas and circuits for 5G application</li> </ul>	<ul style="list-style-type: none"> <li>5G and beyond Communications</li> </ul>
<ul style="list-style-type: none"> <li>Chipless RFID</li> </ul>	<ul style="list-style-type: none"> <li>IoT Communications (AIoT)</li> </ul>
<ul style="list-style-type: none"> <li>Microwave passive components (Filter, coupler, crossover etc.)</li> </ul>	<ul style="list-style-type: none"> <li>IoT Sensors, RFID (AIoT)</li> </ul>
<ul style="list-style-type: none"> <li>Microwave active components (LNA, oscillators, mixer etc.)</li> </ul>	

## Signal Processing

The Signal Processing Research Group of IIT Jodhpur currently focuses on a wide range of applications such as multimedia processing, computer vision, quality assessment, haptics, and computational imaging.

Current Research Themes	Associated Technology Tracks
<ul style="list-style-type: none"> <li>Visual Computing (Computer Vision, Visual Forensics, Machine Learning)</li> </ul>	<ul style="list-style-type: none"> <li>Signal Processing &amp; Interpretation</li> </ul>
<ul style="list-style-type: none"> <li>Socio-digital Reality (AR, VR, Haptics, Speech and Language Analysis)</li> </ul>	
<ul style="list-style-type: none"> <li>Signal Processing for IoT (Predictive Maintenance, Digital Twin, Communication)</li> </ul>	

### Associated Research Laboratories

- Signal Processing Lab (Room 214)
- Image Processing & Computer Vision Lab (Room 218)



## Microelectronics and VLSI

Current Research Themes	Associated Technology Tracks
<ul style="list-style-type: none"> <li>Oxide metal semiconductors by sputtering for sensor applications</li> </ul>	<ul style="list-style-type: none"> <li>Nanoelectronics and Integrated Circuits</li> </ul>
<ul style="list-style-type: none"> <li>2D materials: MoS<sub>2</sub>, AlGa<sub>N</sub>/Ga<sub>N</sub> HEMTs</li> </ul>	<ul style="list-style-type: none"> <li>Embedded Computing and SoC</li> </ul>
<ul style="list-style-type: none"> <li>Bandgap engineering and surface studies of semiconductors</li> </ul>	<ul style="list-style-type: none"> <li>Artificial Intelligence of Things (AIoT)</li> </ul>
<ul style="list-style-type: none"> <li>Micro and Nano device fabrication</li> </ul>	
<ul style="list-style-type: none"> <li>Organic and Flexible Electronics: Field-effect transistors (FETs), Circuits, and Sensors.</li> </ul>	
<ul style="list-style-type: none"> <li>Electrical characterization, Parameter extraction, Interface characterization.</li> </ul>	
<ul style="list-style-type: none"> <li>Device Simulation: New and Unconventional Devices, MEMS and NEMS</li> </ul>	
<ul style="list-style-type: none"> <li>Compact Modeling for Circuit Simulations</li> </ul>	
<ul style="list-style-type: none"> <li>Analog and mixed signal circuit design</li> </ul>	
<ul style="list-style-type: none"> <li>CMOS image sensors</li> </ul>	

## Control Systems

Welcome to the control system research group of the Department of Electrical Engineering at Indian Institute of Technology Jodhpur. It facilitates faculty, students who are conducting research and thesis work along with industry projects in the field of Microgrid and Electric vehicle applications.

Current Research Themes	Associated Technology Tracks
<ul style="list-style-type: none"> <li>Multi-agent system</li> </ul>	<ul style="list-style-type: none"> <li>Cyber-Physical Systems</li> </ul>
<ul style="list-style-type: none"> <li>Mechatronics &amp; cyber-physical system</li> </ul>	<ul style="list-style-type: none"> <li>Embedded Computing and SoC</li> </ul>
<ul style="list-style-type: none"> <li>Control of micro-grid &amp; uncertain system</li> </ul>	
<ul style="list-style-type: none"> <li>Robust &amp; optimal control</li> </ul>	
<ul style="list-style-type: none"> <li>Adaptive control &amp; robotics</li> </ul>	
<ul style="list-style-type: none"> <li>Control of Power Converters</li> </ul>	

## Power Engineering

Welcome to the Power Engineering Group of the Department of Electrical Engineering at IIT Jodhpur.

Current Research Themes	Associated Technology Tracks
<ul style="list-style-type: none"> <li>Protection</li> </ul>	<ul style="list-style-type: none"> <li>Smart Grid</li> </ul>
<ul style="list-style-type: none"> <li>Power Quality</li> </ul>	<ul style="list-style-type: none"> <li>Cyber Physical Systems</li> </ul>
<ul style="list-style-type: none"> <li>Electric vehicles</li> </ul>	
<ul style="list-style-type: none"> <li>Demand-side management</li> </ul>	
<ul style="list-style-type: none"> <li>Microgrid Control and dynamics of distributed generation</li> </ul>	
<ul style="list-style-type: none"> <li>Condition monitoring</li> </ul>	

## Computing Systems

The research theme on Computing Systems focuses on novel approaches to processing and computation for energy- and memory-efficient hardware. With the availability of massive data acquisition and data processing, the research in future computing systems is oriented towards memory-driven computing AI architectures.

### Research Themes

- Advanced processor technologies
- Neuromorphic computing

Real-time scheduling algorithms for multicore processors and heterogeneous platforms

## Academic Programmes

### UG Programs in the Department of Electrical Engineering

The vision of the Department is to develop a world class teaching and research atmosphere by excelling in fundamental knowledge and applications of Electrical Engineering through curricular and co-curricular activities. To accomplish this, the department offers an undergraduate program in the broad discipline of electrical engineering, with embedded capability-linked specializations, for enabling the students to pursue a chosen career path. The 4 year B.Tech program provides the core electrical engineering concepts ranging from circuit analysis and design, computing, control, communication, signal processing, and power engineering. To equip the students with the essential knowledge and problem solving skills, the curriculum provides strong foundations in basic sciences. In addition, the engineering design component is integrated throughout the structure, motivating and familiarizing students with real-world engineering challenges. Additional problem-solving skills and practical experiences are developed through design projects and state-of-the-art laboratory experiments. The structure enables the students to shape their curriculum at various stages. This includes opting for a department specialization, transition to 5-year B.Tech.

and M.Tech. Dual Degree program, an additional minor in relevant areas such as Entrepreneurship.

### Salient Features of the UG Programs

- New broad-based curriculum and flexible program structure
- Balance of theoretical foundation, hands-on, and experiential learning
- Emphasis on design-oriented thinking, creativity, and life-long learning
- Capability-linked Minor, Interdisciplinary, and Department-specific Specializations
- Skillset targeted towards emerging technologies like 5G & Beyond Communication, Industry 4.0, & Smart City Technologies
- Prepares students to compete effectively in a world of rapid technological advancements
- Option to pursue entrepreneurship & industry collaboration through engineering innovation
- Startup ecosystems to translate ideas into business models (Tinkering Lab, Technology Innovation & Startup Center (TISC), & Research Park)

### Expected Graduate Attributes

- Strong understanding of fundamentals of mathematics, science and engineering with emphasis on electrical technologies for Communication, Signal Processing, Devices & Circuits, Computing Systems, Control Engineering, and Power Engineering
- Ability to apply technical skills to identify, formulate, and solve complex problems encountered in modern electrical engineering practices
- Ability to model, analyze, design and experimentally evaluate electrical components or systems that achieve desired technical specifications, subject to certain resource constraints
- Ability to compete effectively in a world of rapid technological advancements and assume leadership roles within academic, industrial, or entrepreneurial environments in the broad context of electrical engineering
- Foundations for critical thinking that are needed to broaden their careers in diverse disciplines through

minor/graduate-level studies and the process of lifelong learning

- Ability to recognize and practice professional ethics in working environment
- Ability to acquire new knowledge and apply it as needed.
- Learning Outcomes
- To acquire knowledge of electrical engineering principles along with the required understanding of computing, engineering fundamentals, mathematics, and science
- To apply the concepts of mathematics, sciences and engineering (including computing science) necessary to analyze and design complex electrical and electronic circuits and systems containing hardware and software modules
- To gain in-depth understanding of concepts of Signals, Devices, Circuits, Systems, Machine Learning, Programming, Control, Communications, Hardware Design and related interdisciplinary topics
- To create, select, and apply appropriate techniques, resources, electrical engineering design and computing tools to solve complex engineering problems with an understanding of the limitations through laboratory exercises and design projects
- To perform literature review and patent landscaping for innovative research
- To adapt to work in multidisciplinary environment
- To understand professional ethics and social responsibilities
- To communicate effectively
- To engage in independent and life-long learning in the context of technological advancements.
- To conduct product design or entrepreneurial activities

### **B.Tech. (4 Years)**

This program is designed to provide students a basic exposure to Engineering with focus on the various domains of Electrical Engineering. These domains have been broadly divided into following areas: Communication, Computing Systems, Control

Engineering, Devices and Circuits, Signal Processing, and Power Engineering. The program aims to connect academics to current emerging technologies and industrial requirements in these domains.

The program also encompasses rigorous experimental components along with global standard courses comparable to top most universities. The program is also flexible enough to provide students options to shape the curriculum according to their interest. Students having inclined interest in any specific area as specified above can opt for relevant specialization.

### **B.Tech. with Specialization (4 Years)**

The curriculum offers flexibility to students for pursuing capability-linked specializations of their choice. The department specializations are designed to enable students to lead technological innovations addressing the emerging industrial and societal challenges in various domains of electrical engineering. The EE students can opt for any one of the departmental specializations as mentioned below. The in-depth understanding and technical skills acquired through these specializations will enable graduates to play a vital role in advancement of technologies such as 5G/6G communications, smart cities, smart healthcare, and Industry 4.0. Students with research inclination also have options for 5-year B.Tech. and M.Tech. Dual Degree program.

Department Specializations (Click on the respective links to know more about these specializations)

- Cyber Physical Systems
- Communication Engineering
- Intelligent Communication and Networking
- Visual Computing
- Socio-digital Reality
- Artificial Intelligence of Things (AIoT)
- VLSI Systems
- Nano and Flexible Electronics
- Smart Grid
- Engineering Innovation

### **B.Tech. with Minor (4 Years)**

The institute also offers a 4-year B.Tech. program with minors in Entrepreneurship or Management or interdisciplinary specializations. Such a flexible curriculum enables students to pursue diverse career goals by choosing the curriculum based on their interests. Students will also have an opportunity to opt for a B. Tech. - Master's dual degree in their chosen specialization or minor area. The curriculum also offers numerous options that enable students to gain industrial experience through collaborative industrial projects at industries and entrepreneurship experience at the Institute's incubation centre.

### **B.Tech. - M.Tech. Dual-degree (5 Years)**

A B.Tech. student having opted for major/minor specialization with CGPA 6 or more at the end of the seventh semester and fulfilling minimum credit requirements may be allowed to switch to B.Tech.- M.Tech. dual degree program in the chosen specialization at the beginning of the eighth semester. The M.Tech degree can be any one of the approved programmes of the institute. All requirements of M.Tech. degree will be applicable to all such students.

### **B.Tech. - MBA (5 Years)**

IIT Jodhpur also provides options to B.Tech students to earn a Tech-MBA degree via a transition program. Students having inclination towards business can opt for this dual-degree program at the start of 5th semester. This program offers a range of specializations such as Business Analytics, Cyber Security, Financial Engineering, Technology Consulting, Technology Product Management.

The Tech-MBA is a reflection of the growing demand for business leaders to have an exposure in various technological fields such as artificial intelligence (AI), fintech and robotics. Tech-MBA is a new wholesome program totally focussing on the tech sector such as digital finance, data analytics and AI, as well as digital transformation. The aim of such a program is to enable students to apply their tech expertise within a business context. The program focuses on covering important aspects of corporate strategy analysis of top tech companies, like Amazon, Google, and tech-centric

companies, such as start-ups in addition to business strategy. The economics and operations are going to be introduced with strong emphasis on the digital economy and supply chain in e-commerce companies respectively.

The Department of Electrical Engineering offers following Post Graduate Programs:

#### **Master of Technology Programs:**

1. M.Tech. (Intelligent Communication Systems)
2. M.Tech. (Cyber Physical Systems)
3. M.Tech. (Sensors and Internet of Things)
4. Executive M.Tech Program in Intelligent VLSI Systems

#### **Master of Technology - Doctor of Philosophy (M.Tech.-Ph.D.) Dual Degree Programs**

1. M.Tech.-Ph.D. Dual Degree (Intelligent Communication Systems)
2. M.Tech.-Ph.D. Dual Degree (Cyber Physical Systems)
3. M.Tech.-Ph.D. Dual Degree (Sensors and Internet of Things)

PhD Program at Department of Electrical Engineering

The Department of Electrical Engineering offers PhD in a wide range of emerging and challenging research areas of electrical engineering and allied interdisciplinary areas of communication engineering, RF, microwaves & photonics, control engineering, power engineering, signal processing and computing systems, and microelectronics & VLSI. The areas can also be mapped with the current technology tracks of the Department that include 5G and Beyond Communication, Signal Processing & Interpretation, Cyber-Physical Systems, Nano-electronics & Integrated Circuits, Smart Grid, Embedded systems & SoC, and Artificial Intelligence & Internet-of-Things (IoT). Please visit Research Overview to know the associated research areas, laboratories, and faculty members associated with each technology track and research area.

Our PhD students are trained to conduct high-quality cutting-edge research demonstrated through tangible deliverables, and to publish in top ranking journals and

conferences. Specially-designed courses on technical communication and Intellectual Property Rights enable students in quality expression as well as patent landscaping for potential IP and business translation of their work. Weekly colloquium enables the students to keep open avenues of sharing ideas and learning from peers. Students have round-the-clock access to high-end research and computational facilities,

and also have the opportunity of one additional year of fellowship after thesis submission to engage in translational and entrepreneurial initiatives arising out of their PhD work. On graduation, our doctoral students are trained in critical thinking, research, development, operations and management of emerging technological challenges for both industry and academia.

## Significant Research Achievements

1.	Mr. IdurySatya Krishna, Ph.D. student of Dr. Soumava Mukherjee, has received prestigious European Microwave Conference Student Grant Award in EuMC 2022	13 July 2022
2.	Best Presentation Award at IEEE ICIET 2022	10 June 2022
3.	Dr. AashishMathur have been selected as Exemplary Reviewer for IEEE TCOM for 2021	20 April 2022
4.	Mr. NamanBaghel, PhD student has been selected as recipients of the prestigious TICRA - EurAAP Travel Grant	24 February 2022
5.	Mr. NamanBaghel, PhD student has been selected as recipients of the prestigious 2021 IEEE AP-S Doctoral Fellowship Award	24 February 2022
6.	Mr. NamanBaghel, PhD student received MrsRanjana Pal Award for practical applications and design in InCAP' 2021	13 January 2022
7.	Best Paper Awards at IEEE Indicon 2021	19 December 2021
8.	Idury Satya Krishna, Ph.D. Student, received prestigious European Microwave Association (EuMA) internship award.	10 November 2021
9.	Mr. NamanBaghel, PhD student has been selected as recipients of the prestigious IEEE AP-S C.J. Reddy Travel Grant	08 November 2021
10.	Dr. M. Kumar received the PIFI visiting scientist fellowship by the Chinese Academy of Sciences (CAS)	27 September 2021
11.	Dr. Mahesh Kumar, Associate Professor, Department of EE, has been appointed as Associate Editor of IEEE Sensors Journal and as the Executive Editorial Board Member of Nano Express	15 June 2021
12.	The Department of EE congratulates Dr. Mahesh Kumar, Associate Professor, Department of EE for the prestigious Fulbright-Nehru Academic and Professional Excellence Fellowship to conduct research at MIT, USA.	15 June 2021

## Faculty/ Department Laurels

### Dr. Aashish Mathur

1. Awarded Exemplary Reviewer 2021 for IEEE Transactions on Communications by IEEE Communications Society.
2. Co-authored paper with PhD Student, Gyan Deep Verma, titled "Secrecy Performance of FSO

communication systems with nonzero boresight pointing errors" recognized as top cited paper 2020-21 in IET Communications.

3. Adjunct faculty (Part-Time), BSTTM, IIT Delhi (April 2022- March 2025).

4. Delivered an expert talk in a short term course “Statistical Modelling and Analysis of Advanced Wireless Communication Systems” under AICTE-QIP Scheme organized by IIT Indore in March 2022.
5. Delivered an expert talk in TEQIP III sponsored 1 Week online short term course on “Modern Wireless Communication Systems and Antenna Engineering with Experimental Learning” on 18th March, 2021 held in NIT Sikkim.
6. Co-authored paper titled “Reconfigurable Intelligent Surface for Mixed FSO-RF Systems with Co-Channel Interference” appeared in the list of Popular Articles of IEEE Communications Letters for Feb, 2021.

### Dr. Kunwar Aditya

1. Delivered an Expert talk in a Workshop organized by IIT Mandi on Wireless Power Technologies for E-Transportation Applications. Date 5th of May 2022.

### Dr. Soumava Mukherjee

- Our paper is listed in Popular Documents - April 2021 of IEEE Transactions on Circuits and Systems II: Express Briefs (Includes the 50 most frequently accessed documents for this publication.) <https://ieeexplore.ieee.org/xpl/topAccessedArticles.jsp?punumber=8920>
- Our paper Design of dual band and dual-polarised dual band SIW cavity backed bow-tie slot antennas has been identified as most cited paper in IET Microwaves, Antennas & Propagation in March, 2020.
- Our EL paper “Dual-mode SICL bandpass filter with via based perturbation technique for Ku-band” listed in 50 most frequently accessed documents in September 2020. [Link]
- Our paper Air filled substrate integrated waveguide cavity backed slot antenna has been one of the top downloaded in between January 2018 and December 2019 in Microw Opt Technol Lett.
- Recipient of URSI Young Scientist Award, APRASC 2019
- Best paper award in IEEE-INAE workshop on Electromagnetics 2018 for the paper “Design of

Elliptical SIW cavity backed High Gain slot antenna” authored by S. Mukherjee, A. Biswas.

- One transaction paper is selected for top cover page of the journal issue (IEEE Transactions on Antennas and Propagation, vol. 66, no. 8, Aug. 2018)
- Recipient of DST-INSPIRE Faculty Award, Govt. of India (July, 2016 session)
- Ph.D. Student, Idury Satya Krishna received prestigious European Microwave Association (EuMA) internship award.
- Alumni of our research group, Mr. Anchal Singh, B. Tech (EE), joined Ansys Inc.
- Mr. Idury Satya Krishna, Ph.D. student of Dr. Soumava Mukherjee, has received prestigious European Microwave Conference Student Grant Award in EuMC 2019 to be held in Paris, France during 28 September - 4 October 2019

### Dr. Ajay Agarwal

- Nominated as Director, Governing Board, Electronics Sector Skills Council of India (ESSCI), New Delhi
- Guest interviewee, IEEE NTC WIN/DEI Leadership interview series, August 19, 2022
- Guest Editor, for the journal Micromachines (ISSN 2072-666X), MDPI
- Plenary talk, Research, Development and Innovations in Water Quality Monitoring: Sensors, System, Software & Networks (iCEN-64), 29th July 2022
- Resource faculty, ATAL - Short Term Course on Nano-Sensors, 9th July 2021, IIT Jodhpur
- Invited speaker, Talk Series on Nano Sensing for Healthcare, Tata Consultancy Services, 02nd August 2021
- Invited speaker, Recent Trends in Bio-MEMS and Medical Micro devices: From Devices to Applications, 22nd August 2021, NIT Silchar
- Invited speaker, 05th IETE Innovators-Industry Meet– 2021, 26th - 27th August 2021, The Institution of Electronics and Telecommunication Engineers (IETE), New Delhi

- Resource faculty, AICTE- ATAL FDP on Sensor Technology, UIET, Kurukshetra, 09th Sept. 2021
- Invited speaker, Engineer's Day Celebration at Central University of Haryana, 15th Sept. 2021
- Invited speaker, IEEE Day Celebration at IEEE Student Branch SPSU Udaipur, 05th Oct. 2021
- Invited speaker, Smart Miniaturized Sensors for Industry 4.0 & 5.0, Intl. Sym. on Industry - Academia Smart Transformation for Industry 4.0 & 5.0 (VIBES), IEEE BKBIET Student Branch, 24 October 2021
- Panellist at Capital Talk - Semiconductor Policy of India, Patrika TV Rajasthan, 17th Dec. 2021
- Resource faculty, Emerging Tools and Techniques in VLSI, MEMS & MOEMS (ETTVM-2022), SKIT Jaipur, 26th January 2022
- Eminent Speaker, Research Conclave 22' - IIT Indore, 10 - 12 Feb, 2022
- Invited speaker, Workshop on Recent Trends on Nanostructured Thin Films & Application, 19th February 2022, BITS Pilani
- Distinguished Subject Expert, Lecture Series on Technology Based Evidences for Ayurved Solutions in Precision Health organized by Centre for Human Resource Development (CHRD), Dr. SR Rajasthan Ayurved University, Jodhpur, 7th April 2022
- Invited speaker, PRAGYATA-2022 - Innovative & Sustainable Developments in Electrical & Electronics Engineering, 27th May 2022 at Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
- Mr. Naman Baghel, PhD student has been selected as recipients of the prestigious IEEE AP-S C.J. Reddy Travel Grant for attending the 2021 IEEE AP-S Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting, Singapore.
- Mr. Naman Baghel, PhD student has been selected as recipients of the Mrs Ranjana Pal Award for practical applications and design (Male) for his paper in INCAP 2021.
- K. Srivastava and N. Bhatia, "Practical Considerations For 1x4 All-Fiber MMI Based Power Splitter Using Square Core Fiber," in Frontiers in Optics + Laser Science 2021, Technical Digest Series (Optica Publishing Group, 2021), <https://doi.org/10.1364/FIO.2021.JTu1A.7>
- K. Srivastava and N. Bhatia, "A Multimode Interference method for power combining and coupling tunable optical power in a single mode fiber," 2022 Conference on Lasers and Electro-Optics Pacific Rim (CLEO-PR), 2022 (Presented at CLEO-PR in Sapporo, Japan between 31st
- K. Srivastava and N. Bhatia, "Field propagation method in a square core optical waveguide for designing multimode interference devices," in Frontiers in Optics + Laser Science 2022 (Accepted)
- Best paper award for Seventh Indian Control Conference 2021 (ICC, 21), organized by IIT Bombay to a Ph.D student Shubham under supervision of Dr. Anoop Jain.

## Student Laurels

- Mr. Idury Satya Krishna, Ph.D. student of Dr. Soumava Mukherjee, has received prestigious European Microwave Conference Student Grant Award in EuMC 2022 to be held in Milan, Italy
- Mr. Naman Baghel, PhD student has been selected as recipients of the prestigious 2021 IEEE AP-S Doctoral Fellowship Award
- Mr. Naman Baghel, PhD student has been selected as recipients of the prestigious TICRA - EurAAP travel grant Travel Grant

## Laboratories and equipment

### Cyber Physical System Modelling Laboratory

CPS modeling laboratory is a teaching laboratory for M.Tech. students. The seamless integration of cyber systems with physical systems poses challenges to analyse such systems. It is necessary to model physical and cyber components in a unified way. The cyber component includes hardware and associated software. The design of cyber components also requires software level abstraction to have a system level model of cyber component. This also allows designing a very high reliability system as the model allows a predictable behaviour. Conventionally software is developed

without formal models and largely depends on programmers' experience and knowledge; however, requirements of safety, reliability in CPS demand higher levels of abstractions at software level as well. This allows the system to remain correct by design.

The CPS laboratory studies interaction of physical and cyber components to understand holistic systems. The tools used for this laboratory are State flow Matlab. The laboratory also has a helicopter emulatory system which is used to emulate different control aspects of the helicopter system. The lab also has COMSOL multiphysics modeling software.

### Facilities and Equipment

The tools used for this laboratory are Matlab-Stateflow and COMSOL multiphysics modeling software.

### Control and Computing Laboratory

This lab facilitates students with hand-on experiments on the real physical systems that apply fundamentals of control system theory. The lab contains a variety of equipment used in the design and experimentation of digital and analog electromechanical feedback control systems. The topics studied in this lab include system modeling, digital and analog data acquisition systems, electro-mechanical interfacing, controller design, and implementation using MATLAB.

The lab also includes equipment and simulation kits useful for realizing the various DSP techniques into hardware. The lab aims to provide the experience of developing various DSP algorithms and then porting them to the hardware for real time applications. Thus, this bridges the necessary gap of DSP Theory and development of hardware aware DSP algorithms. The experiments in the DSP lab range from basic implementation of sampling, filtering, fourier transform to complex real life applications such as noise cancellation, audio processing etc.

In addition, the laboratory imparts knowledge of processor architecture, real time scheduling algorithms and use of different embedded processors in different applications. The embedded processors come with peripherals like GPIOs, Timers, Analog inputs, I2C Bus, USART, RTC etc. The students learn programming of

these peripherals using programming languages like C. The students also use assembly language programming to understand low level drivers. Students are exposed to Hardware Abstraction Layer (HAL) for accessing different peripherals through high level languages like C.

This lab is used for research as well as conducting lab experiments in following areas:

- Control systems
- Microprocessors and Microcontrollers
- Embedded systems
- Digital signal Processing

This lab is also used for conducting experiments associated with embedded systems for the M.Tech. students enrolled in Cyber Physical Systems and Sensors &IoT branches.

### Facilities

- Magnetic Levitation System
- Ball and Beam
- Active Suspension System
- Industrial Emulator
- Rotary Inverted Pendulum
- Q-Aero USB (Helicopter)
- Coupled Tank System
- Real Time Digital Simulator (RTDS)
- Data Acquisition System
- Software MATLAB
- 8085 Based Microprocessor Kits
- Dual DAC Interface Module
- Logic Controller Interface Module
- 16 Channel 8-Bit ADC Interface Module
- LCD(16\*2) Interface Module
- Musical Tone Generator Interface Module
- Real Time Clock Interface Module
- Traffic Light Interface Module
- Elevator Interface Module
- DM 164134 HPC Curisoity Board
- Digital Storage Oscilloscope



- Software MP LAB IDE
- TMS320C5515 DSP Kit
- DM6437 Digital Video Development Platform
- DSP F28335 Board
- Code composer studio
- Evaluation Modules TMS320LF2407 EVM board
- DM642 Digital Media Developer Kit
- DM6437 Davinci with Camera
- Video and Image Kit SMT8039
- KeilµVision Software
- ST32CubeMX software
- Cortex-M4 STM32F407VET6 Development Board
- ST LINK V2 - ST-LINK Programmer

The Electronics Lab is based on hands-on experimentation, and exposes students to the basic building blocks of electronic circuitry and measurement procedures. The lab includes experiments on PN diodes, zener regulators, transistor switches and amplifiers, digital logic design using gate level ICs, and microcontroller-based design. The lab allows the students to engage in creative design thinking and implement small projects such as rectifiers, audio amplifiers, automatic light controller, digital counters and finite state machines. In the process, the students also learn the use of Function Generator, Power Supply and Digital Storage Oscilloscope available in the lab.

The Electronics Lab is used for academic activities for the following courses along with B.Tech. Projects across the Institute:

- Introduction to Electrical Engineering
- Digital Logic & Design

### Facilities

- Arbitrary Function Generator (Tektronics (AFG3021B - 25MHz)
- Digital storage oscilloscope (Agilent & DSO1022A - 200MHz)
- Digital Multimeter 6 1/2 Digit (Agilent 34410A)
- Programmable DC Power Supply (Scientific PSD9005 -30V/1A, 5V/5A)
- Universal IC Tester (VPL-UICT)

- Soldering Iron Station (Xytronics LF-2000)
- Arduino Uno Microcontroller and Sensors

### Energy Conversion & Systems Lab

The Energy Conversion & Systems Lab is dedicated for research and academic activities in the areas of power engineering and electrical machines.

#### Facilities

- DC machines
- Induction machines
- Synchronous machines
- Transformers
- Synchronization panel
- Directional overcurrent relay
- Differential relays
- Continuous Variable Auto Transformer
- Transformers Rheostat, Ammeters, Voltmeters, Wattmeters, Multimeters, resistive and inductive loads inductive loads

### Electronic Circuit Simulation and VLSI Systems Lab

This lab was developed to support the fabless design activities. It hosts various design and simulation tools related to VLSI design and TCAD simulations with the aim of designing low power systems for future IoT applications. Following are the summary of resources. Many of the the VLSI Design tools are supported through SMDP-C2SD project from Ministry of Information Technology, Govt. of India, in addition to the tools supported by Institute.

- VLSI Design and Circuit Simulation: Various VLSI Design Tools and FPGA kits (with 5 Workstations) obtained under SMDP-C2SD project. 11 Workstations are hosted as a part of Electronic Circuits Simulations and Systems Laboratory
- Device Simulation: Synopsys ISE-TCAD tools for simulation of conventional as well as novel device

### Image Processing and Computer Vision Lab

The Image Processing and Computer Vision Lab of the Department of Electrical Engineering currently focusses on research in the areas of compute vision, image

processing, machine learning and multimedia signal analysis.

### Research Facilities

- RGB-D Motion Sensor
- Dell Precision Tower
- GPU GTX1080ti
- Dell Precision 5820 Tower XCTO
- Nikon Camera D5600 with 18-55 mm lens and accessories
- HP 280 G4 MT
- Acer 4K Display
- Netgear Network Attached Storage

### Internet of Things (IoT) Laboratory

Internet of Things (IoT) uses physical objects embedded with sensors, readout electronics, networking, and communication, enabling intelligent data exchange or storage between these devices. Within the last decade, various commercial IoT products are available in the market. These are widely used in applications like smart health care and monitoring, autonomous vehicles, smart home, smart city applications and others. IoT lab encourages interdisciplinary research where different departments share the common platform.

### Academic activities

This lab is used for research as well as conducting lab experiments related to Sensors & IoT lab. For M.Tech. Students in Sensors and IoT.

### Microelectronics Laboratory

This lab was developed to support the fabrication of discrete devices. It is mainly a research laboratory focusing on low cost devices and sensors for various applications. Currently, various devices such as Organic Field-Effect Transistors and Gas Sensors are routinely fabricated and characterized. Following is the summary of facilities of this laboratory

### Facilities

- Device Fabrication: Mask Aligner, Thermal Evaporation System, E-beam Evaporation System, Chemical Vapor Deposition System, RF Sputtering,

Atomic layer deposition, Mask Aligner, Fume hoods

- Characterization: Keithely 4200 SCS, Probe station, Gas Sensing Characterization Setup, Hall Effect Measurement, Profilometer
- Sensor and Transducer Design and Simulation Tools
  - (1) CoventorWare® Integrated software suite for designing and simulating MEMS sensors and actuators. A versatile FEM and BEM based tool set, has material properties database, creates or imports a 2-D layout and can build 3D models in conjunction with process flow information. Important modules consist of (i) Designer - Material Properties Editor, Process Editor, Layout Editor, Foundry Design Kits (ii) Analyzer Meshing, MemElectro, MemMech, CoSolve, Parametric Simulations, Visualization (iii) Advanced Solvers and Reduced Order Modelling
  - (2) Mentor Graphics HEP Software : Tanner MEMS design (layout editor) and IC Design suite consist of Tanner L-Edit, S-Edit, T-spice , Eldo and Nitro SoC etc.

### Microgrid and Real-time Simulator Laboratory

The laboratory carries out research in DC Microgrid, Control Issues in Power Converters, and Electric Vehicles. The lab is also hosting many projects in the fields of Power Electronics, Electric Vehicle and Control. The laboratory has a Real Time simulator and also has a test bench for Microgrid Research. The Microgrid test bench is created in the lab and has capability to test complex control algorithms and power sharing schemes. Electric Vehicle is another domain of interest and the laboratory has resources to research on controllers for Electric Two wheelers and Three Wheelers.

### Facilities

- Yokogawa WT3000 power analyzer (01)
- Semikron power boost converters (02)
- Hameg programmable LCR bridge (01)
- Xytronic LF2000 High-power soldering station
- Chroma DC Electronic load (01)

- DC Programmable power supply (02)
- TMS320F38335 experiment kit boards (02)
- Opal-RT Real-time Simulator
- High power rectifier unit
- dSpace1104
- DSO 1022A oscilloscope 200MHz
- Tektronix afg3021b Function generator
- Tektronix DPO4104b 1GHz four-channel oscilloscope
- Two voltage source inverters
- Two low voltage high current induction motors
- One motor generator set
- Battery bank

### Power Electronics & Drives Laboratory

This lab is dedicated to the study of power electronics and electrical drives. Research and teaching activities are carried out in the following areas:

- Study the performance of various power electronic converter
- Triggering circuit for SCR firing
- Study the operation of single-phase and three-phase converters
- Study of AC voltage regulators
- Study of zero voltage switching
- Study of zero current switching
- Performance of DSP based 3-ph Induction Motor drive using SCR
- Performance of DSP based 3-ph Induction Motor drive using IGBT

### Facilities

- High Precision power analyzer –YOKOGAWA WT3000
- DSO- Tektronix 200MHz (DPO 2024)
- 1GHz (DPO 4104B), Function Generator-Tektronix AFG 3021B
- Power Supply: 0-32V, 3A; 0-32, 10A
- Three-phase inverter drive
- Three-phase inverter stacks
- DC-DC converters

- Differential currents probes
- Isolation Transformers
- FPGA training kits

### Signal Processing Lab

Research at the Signal Processing Lab are centered around Signal Processing, Condition Monitoring, Image Processing, Data Compression, Blind Source Separation, Artificial Neural Network.

### Current Research Themes

1. Automatic Modulation Classification
2. Modelling of Complex Networks
3. Automatic Fault Diagnosis in distribution Networks

### Research Facilities

- NI PXI-5652 Signal generator
- NI PXI-5611 RF Up-converter
- NI PXIe-5450 Arbitrary waveform generator
- NI PXIe-5601 RF Down-converter
- NI PXIe-5622 Digitizer
- NI PXIe-5791 Adapter module
- NI PXIe-7975 FPGA
- NI 8880 Controller
- USRP 2920

### Smart Grid Laboratory

This lab is dedicated to the study of distributed generations and their integration to the electrical grid. Research work is carried out in the following areas:

- Integration of solar PV and Wind energy systems into the electrical grid
- Control of distributed generation
- Integration of distributed FACTS devices
- Power quality issues in the integration of distributed generation

### Facilities

- Solar power generating Experimental Equipment Model: KTE 7000SG
- Wind power plant Model no. EWG 1

## Wireless and Microwave Laboratory

This lab is dedicated to the study of all aspects of testing and characterization of wireless communication signal. In addition, the lab also consists of facilities dedicated to microwave active and passive devices. The research activities conducted in the lab are as follows:

- Design and characterization of Microwave antenna and passive circuits (filters, couplers, crossover etc.)
- Design and characterization of Microwave active circuits (LNA, PA etc.)

The lab is also conducted for teaching activities which are as follows:

- Contemporary Communication System Laboratory
- Communications Engineering Lab.

### Facilities:

- ENA Series Network Analyzer (300KHz-20GHz).
- ENA Series Network Analyzer (100KHz-4.5GHz).
- Power Meter.
- Triple Output DC Power Supply.
- Function Waveform Generator (300MHz).
- EXA Signal Analyzer (9KHz-3.6GHz).
- EXA Signal Analyzer (9KHz-26.5GHz).
- MXG Analog Signal Generator (100KHz-3GHz).
- MXG Analog Signal Generator (100KHz-20GHz).
- ME1000 RF Training Kit(Tx-Rx).
- ME1300 Antenna Training Kit(Tx-Rx).
- ME1100 Digital RF Communication Kit.
- VSA89600 Software(1 set for 15 users).
- Digital Phosphor Oscilloscope (200MHz).
- Oscilloscope(200MHz).
- Single Channel Arbitrary/Function Generator (25MHz).
- NI PXIe-1075 Chassis: NI PXIe-8108 Controller, NI PXIe-5652, NI PXIe-5601, NI PXIe-5622, NI PXIe-5450, NI PXIe-5611, NI PXI-5600, NI PXI-5610, NI PXI-5441, NI PXIe-5641R, NI PXI-5691, NI PXI-5652, NI Developer suit for Lab-view DS1 2011, NI Modulation Tool kit 4.3, NI Modulation Tool kit 4.1, NI

Modulation Tool kit 4.2.1, NI Spectral Measurement 2.5.1.

- Logic Analyzer TLA6404.

## Wireless Communications and Navigation Lab

The Wireless Communications and Navigation Lab's research spans several aspects of wireless communications and communication signal processing, with the aim to provide for theoretical breakthroughs as well as practical solutions to problems pertaining to futuristic communication networks. In particular, the focus is on the information theoretic performance analysis of wireless communication systems including multiuser communication networks, cooperative communication networks, MIMO communication systems, and algorithmic solutions to satellite based navigation receiver design.

Our research is highly conducive to multi-disciplinary collaboration; it builds on a diverse set of theoretical breakthroughs in information theory, communication theory, large deviation theory, matrix theory, linear algebra, and coding theory.

### Facilities

- Computing Facility- In addition to the high performance computation facility of the institute the lab has several workstations for system simulation studies.
- Testbed Facility -2x2 Multiple Input Multiple Output Transceiver Setup, NI USRP units, GNSS Satellite Signal Acquisition Setup, NavIC Software Signal Simulator and Receiver, IoT Network Setup
- Equipment -Data Acquisition Unit, Logic Analyzer

## Lightwave Technology Laboratory

The Lightwave Technology Lab (LTL) is focussed on experiments involving optical wireless communication and guided wave optical communication. The current research work includes novel optical communication paradigms targeting 5G and beyond communications such as passive optical networks links, radio over fiber

(RoF), radio over free space optics (RoFSO) with orbital angular momentum (OAM) generation, modulation, transmission and detection. Moreover, the lab is also being used for modelling waveguide based passive structures for their applications in passive optical networks. The research work in the lab will also be expanded to include experiments to study nonlinear effects in optical fibers, particularly targeting the issues in high-speed optical communications.

### List of equipments/facilities

- Optical Table with Vibration isolation
- Laser Sources
  - 655 nm LD
  - 1550 nm DFB source
  - 1064 nm DPSS
- Optical Detector
- Optical Power Meter
- CCD Camera
- Fusion Splicing Machine
- EDFA

- Bit error rate tester (BERT)
- Power Attenuator
- Digital Microscope
- Precision Optics such as mirrors, objective lens, filters, etc.
- Single and Multimode Optical Fiber Spool
- Precision Optomechanics

### Microwave Circuits and Systems (MCS) Lab

The group mainly focuses on design of active and passive components for modern transceivers. Along with research in high frequency circuit design, the group aims to improve the quality of understanding in microwave engineering through various practical as well as computer aided simulations.

- Anechoic Chamber Box
- Horn Antenna
- Microwave Circuits
- Soldering Station
- Microwave Bench
- Soldering oven

### Outreach activities

1.	EE UG Orientation	03 December 2021
2.	IEEE Nanotechnology Council SBC IITJ Inaugural Talk	29 November 2021
3.	Invited Talk by Prof Chandra Shekhar (EE Society and EEN2010 Introduction to Profession)	08 September 2021
4.	Departmental PG Orientation	22 July 2021
5.	AICTE Training and Learning (ATAL) Short-term Course on Nano Sensors (05 - 09 July 2021)	05 July 2021
6.	Departmental Farewell for Class of 2021!	12 June 2021

## Publications

- 1 Kumar, A., Khan, M. A., & Kumar, M. (2022). Recent advances in UV photodetectors based on 2D materials: A review. *Journal of Physics D: Applied Physics*, 55(13). ISSN: 00223727. <https://doi.org/10.1088/1361-6463/ac33d7>
- 2 Kumar, D., Kumar, R., Kumar, M., & Kumar, P. (2022). Coupled excitonic quasiparticle-electron-phonon and interlayer coupling in vertically and horizontally aligned MoS<sub>2</sub>. *Journal of Materials Chemistry C*, 10(14), 5684–5692. ISSN: 20507534. <https://doi.org/10.1039/d2tc00266c>
- 3 Bhati, V. S., Takhar, V., Raliya, R., Kumar, M., & Banerjee, R. (2022). Recent advances in g-C<sub>3</sub>N<sub>4</sub> based gas sensors for the detection of toxic and flammable gases: A review. *Nano Express*, 3(1). ISSN: 2632959X. <https://doi.org/10.1088/2632-959X/ac477b>
- 4 Kumar, D., Kumar, V., Kumar, R., Kumar, M., & Kumar, P. (2022). Electron-phonon coupling, thermal expansion coefficient, resonance effect, and phonon dynamics in high-quality CVD-grown monolayer and bilayer MoSe<sub>2</sub>. *Physical Review B*, 105(8). ISSN: 24699950. <https://doi.org/10.1103/PhysRevB.105.085419>
- 5 Seesaard, T., Goel, N., Kumar, M., & Wongchoosuk, C. (2022). Advances in gas sensors and electronic nose technologies for agricultural cycle applications. *Computers and Electronics in Agriculture*, 193. ISSN: 01681699. <https://doi.org/10.1016/j.compag.2021.106673>
- 6 Narwaria, M. (2022). Does explainable machine learning uncover the black box in vision applications? *Image and Vision Computing*, 118. ISSN: 02628856. <https://doi.org/10.1016/j.imavis.2021.104353>
- 7 Verma, G. D., Mathur, A., Ai, Y., & Cheffena, M. (2022). Mixed Dual-Hop IRS-Assisted FSO-RF Communication System With H-ARQ Protocols. *IEEE Communications Letters*, 26(2), 384–388. ISSN: 10897798. <https://doi.org/10.1109/LCOMM.2021.3129594>
- 8 Khan, A. A., Kahar, M., & Mandal, M. K. (2022). A modified microstrip to empty substrate integrated waveguide transition. *International Journal of RF and Microwave Computer-Aided Engineering*, 32(2). ISSN: 10964290. <https://doi.org/10.1002/mmce.22990>
- 9 Lou, C., Lei, G., Liu, X., Xie, J., Li, Z., Zheng, W., Goel, N., Kumar, M., Zhang, J. (2022). Design and optimization strategies of metal oxide semiconductor nanostructures for advanced formaldehyde sensors. *Coordination Chemistry Reviews*, 452. ISSN: 00108545. <https://doi.org/10.1016/j.ccr.2021.214280>
- 10 Chaturvedi, S., Fulwani, D., & Patel, D. (2022). Dynamic Virtual Impedance-Based Second-Order Ripple Regulation in DC Microgrids. *IEEE Journal of Emerging and Selected Topics in Power Electronics*, 10(1), 1075–1083. ISSN: 21686777. <https://doi.org/10.1109/JESTPE.2021.3076474>
- 11 Raj, A., Shah, N. A., & Tiwari, A. K. (2022). A novel approach for fundus image enhancement. *Biomedical Signal Processing and Control*, 71. ISSN: 17468094. <https://doi.org/10.1016/j.bspc.2021.103208>
- 12 Chawda, G. S., & Shaik, A. G. (2022). Enhancement of Wind Energy Penetration Levels in Rural Grid Using ADALINE-LMS Controlled Distribution Static Compensator. *IEEE Transactions on Sustainable Energy*, 13(1), 135–145. ISSN: 19493029. <https://doi.org/10.1109/TSTE.2021.3105423>
- 13 Nikolskaya, A. A., Korolev, D. S., Mikhaylov, A. N., Mullagaliev, T. D., Chigirinsky, Yu. I., Belov, A. I., ... Tetelbaum, D. I. (2021). Non-equilibrium methods for synthesis and modification of gallium oxide. In Averkiev N.S., Poniaev S.A., & Sokolovskii G.S. (Eds.), *J. Phys. Conf. Ser. (Vol. 2103)*. IOP Publishing Ltd. ISBN: 17426588. <https://doi.org/10.1088/1742-6596/2103/1/012062>
- 14 Chaturvedi, S., Makineni, R. R., Fulwani, D. M., & Yadav, S. K. (2021). Regulation of Electric Vehicle Speed Oscillations Due to Uneven Drive Surfaces Using ISMDTC. *IEEE Transactions on Vehicular*

- Technology, 70(12), 12506–12516. ISSN: 00189545. <https://doi.org/10.1109/TVT.2021.3120282>
- 15 Bajpai, A., Rangra, K., & Bansal, D. (2021). Optimization of Thick Photoresist for Uniform Thickness in RF MEMS Applications. *Journal of Electronic Materials*, 50(12), 7143–7149. ISSN: 03615235. <https://doi.org/10.1007/s11664-021-09225-8>
  - 16 Sharf, M., Jain, A., & Zelazo, D. (2021). Geometric Method for Passivation and Cooperative Control of Equilibrium-Independent Passive-Short Systems. *IEEE Transactions on Automatic Control*, 66(12), 5877–5892. ISSN: 00189286. <https://doi.org/10.1109/TAC.2020.3043390>
  - 17 Kumar, A., Kumar, P., Bajpai, A., Rangra, K., & Bansal, D. (2021). Analytical Modeling, Design, and Performance Analysis of a Micromirror for Space-Based Multiobject Spectroscopy. *IEEE Transactions on Electron Devices*, 68(11), 5773–5778. ISSN: 00189383. <https://doi.org/10.1109/TED.2021.3113261>
  - 18 Narwaria, M., & Tatu, A. (2021). Interval-Based Least Squares for Uncertainty-Aware Learning in Human-Centric Multimedia Systems. *IEEE Transactions on Neural Networks and Learning Systems*, 32(11), 5241–5246. ISSN: 2162237X. <https://doi.org/10.1109/TNNLS.2020.3025834>
  - 19 Nigam, A., Sharma, N., Tripathy, S., & Kumar, M. (2021). Development of semiconductor based heavy metal ion sensors for water analysis: A review. *Sensors and Actuators, A: Physical*, 330. ISSN: 09244247. <https://doi.org/10.1016/j.sna.2021.112879>
  - 20 Kanani, A., Vaidya, S., & Agarwal, H. (2021). LightFPGA: Scalable and Automated FPGA Acceleration of LightGBM for Machine Learning Applications. *Int. Symp. VLSI Des. Test, VDAT*. Institute of Electrical and Electronics Engineers Inc. ISBN: 9781665419925. <https://doi.org/10.1109/VDAT53777.2021.9600900>
  - 21 Goel, N., Kumar, R., & Kumar, M. (2021). Visualization of band offsets at few-layer MoS<sub>2</sub>/Ge heterojunction. *Nanotechnology*, 32(37). ISSN: 09574484. <https://doi.org/10.1088/1361-6528/ac0932>
  - 22 Goel, N., & Kumar, M. (2021). 2D Materials for Terahertz Application. *Nano Express*, 2(3). ISSN: 2632959X. <https://doi.org/10.1088/2632-959X/ac0d56>
  - 23 Rajamani, S., & Kumar, M. (2021). Spectrum Selective Narrowband Optical Detectors. *Resonance*, 26(9), 1211–1220. ISSN: 09718044. <https://doi.org/10.1007/s12045-021-1223-z>
  - 24 Souilem, M., Tripathi, J. N., Melicio, R., Dghais, W., Belgacem, H., & Rodrigues, E. M. G. (2021). Neural-network based modeling of I/O buffer predriver under power/ground supply voltage variations. *Sensors*, 21(18). ISSN: 14248220. <https://doi.org/10.3390/s21186074>
  - 25 Sharma, V. K., Tripathi, J. N., & Shrimali, H. (2021). Analysis of power supply noise in AMS circuits including the effects of interconnects using estimation by inspection method. *AEU - International Journal of Electronics and Communications*, 139. ISSN: 14348411. <https://doi.org/10.1016/j.aeue.2021.153913>
  - 26 Johar, A. K., Sharma, G. K., Kumar, T. B., Varma, T., Periasamy, C., Agarwal, A., & Boolchandani, D. (2021). Optimization of a Flexible Film Bulk Acoustic Resonator-Based Toluene Gas Sensor. *Journal of Electronic Materials*, 50(9), 5387–5395. ISSN: 03615235. <https://doi.org/10.1007/s11664-021-09059-4>
  - 27 Bhargav, H., Vs, V., Kumar, B., & Singh, V. (2021). Enhancing Testbench Quality via Genetic Algorithm. *Midwest Symp Circuits Syst, 2021-August*, 652–656. Institute of Electrical and Electronics Engineers Inc. ISBN: 15483746; 9781665424615 (ISBN). <https://doi.org/10.1109/MWSCAS47672.2021.9531876>
  - 28 Kumar, V., Satapathy, B., Kisku, W., Kaur, A., & Mishra, D. (2021). CMOS image sensor with adaptive readout scheme for low power applications. *Midwest Symp Circuits Syst, 2021-August*, 766–769. Institute of Electrical and Electronics Engineers Inc. ISBN: 15483746; 9781665424615 (ISBN). <https://doi.org/10.1109/MWSCAS47672.2021.9531910>
  - 29 Satapathy, B., & Kaur, A. (2021). A low kickback noise and low power dynamic comparator. *Midwest*

- Symp Circuits Syst, 2021-August, 146–149. Institute of Electrical and Electronics Engineers Inc. ISBN: 15483746; 9781665424615 (ISBN). <https://doi.org/10.1109/MWSCAS47672.2021.9531668>
- 30 Bhati, V. S., Kumar, M., & Banerjee, R. (2021). Gas sensing performance of 2D nanomaterials/metal oxide nanocomposites: a review. *Journal of Materials Chemistry C*, 9(28), 8776–8808. ISSN: 20507534. <https://doi.org/10.1039/d1tc01857d>
- 31 Chordia, A., & Tripathi, J. N. (2021). Uncertainty Quantification of a CMOS Oscillator using Stochastic Collocation Techniques. *Jt. IEEE Int. Symp. Electromagn. Compat. Signal Power Integr., EMC Europe, EMC/SI/PI/EMC Europe*, 391–394. Institute of Electrical and Electronics Engineers Inc. ISBN: 9781665448888. <https://doi.org/10.1109/EMC/SI/PI/EMCEurope52599.2021.9559318>
- 32 Hemaram, S., & Tripathi, J. N. (2021). Metaheuristic Optimization of Decoupling Capacitors in a Power Delivery Network. *Jt. IEEE Int. Symp. Electromagn. Compat. Signal Power Integr., EMC Europe, EMC/SI/PI/EMC Europe*, 554–558. Institute of Electrical and Electronics Engineers Inc. ISBN: 9781665448888. <https://doi.org/10.1109/EMC/SI/PI/EMCEurope52599.2021.9559179>
- 33 Khan, M. A., Kumar, A., Zhang, J., & Kumar, M. (2021). Recent advances and prospects in reduced graphene oxide-based photodetectors. *Journal of Materials Chemistry C*, 9(26), 8129–8157. ISSN: 20507534. <https://doi.org/10.1039/d1tc01306h>
- 34 Rituraj, Tiwari, A., Chaudhury, S., Singh, S., & Saurav, S. (2021). Video Classification using SlowFast Network via Fuzzy rule. *IEEE Int Conf Fuzzy Syst, 2021-July*. Institute of Electrical and Electronics Engineers Inc. ISBN: 10987584; 9781665444071 (ISBN). <https://doi.org/10.1109/FUZZ45933.2021.9494542>
- 35 Kumar, D., Singh, B., Kumar, R., Kumar, M., & Kumar, P. (2021). Davydov splitting, resonance effect and phonon dynamics in chemical vapor deposition grown layered MoS<sub>2</sub>. *Nanotechnology*, 32(28). ISSN: 09574484. <https://doi.org/10.1088/1361-6528/abf37b>
- 36 Choi, H., Bhardwaj, A., Yoon, G., & Choi, S. (2021). Perceived Hardness of Virtual Surface: A Function of Stiffness, Damping, and Contact Transient. *IEEE World Haptics Conf., WHC*, 613–618. Institute of Electrical and Electronics Engineers Inc. ISBN: 9781665418713. <https://doi.org/10.1109/WHC49131.2021.9517263>
- 37 Verma, G. D., & Mathur, A. (2021). Performance improvement of FSO communication systems using hybrid-ARQ protocols. *Applied Optics*, 60(19), 5553–5563. ISSN: 1559128X. <https://doi.org/10.1364/AO.424687>
- 38 Wang, H., Ma, J., Zhang, J., Feng, Y., Vijjapu, M. T., Yuvaraja, S., ... Huang, J. (2021). Gas sensing materials roadmap. *Journal of Physics Condensed Matter*, 33(30). ISSN: 09538984. <https://doi.org/10.1088/1361-648X/abf477>
- 39 Arora, P., Tripathi, J. N., & Shrimali, H. (2021). Device Parameter-Based Analytical Modeling of Power Supply Induced Jitter in CMOS Inverters. *IEEE Transactions on Electron Devices*, 68(7), 3268–3275. ISSN: 00189383. <https://doi.org/10.1109/TED.2021.3082106>
- 40 Mahato, A. K., Bharti, D., Varun, I., Saxena, P., Raghuvanshi, V., & Tiwari, S. P. (2021). UV assisted non-volatile memory behaviour using Copper (II) phthalocyanine based organic field-effect transistors. *Organic Electronics*, 94. ISSN: 15661199. <https://doi.org/10.1016/j.orgel.2021.106174>
- 41 Saoji, S., Krishna, D., Sanap, V., Nagar, R., & Shah, S. V. (2021). Learning-based Approach for Estimation of Axis of Rotation for Markerless Visual Servoing to Tumbling Object. *ACM Int. Conf. Proc. Ser. Association for Computing Machinery*. ISBN: 9781450389716. <https://doi.org/10.1145/3478586.3478639>
- 42 Chaudhary, S., Patel, S. M., Dal, P. N., Joshi, S. K., Tripathy, N. S., & Shah, S. V. (2021). Robust Control Strategy for Reactionless Manoeuvring of a Dual-Arm Space Manipulator. *ACM Int. Conf. Proc. Ser. Association for Computing Machinery*. ISBN: 9781450389716. <https://doi.org/10.1145/3478586.3478621>



- 43 Raghuwanshi, V., Mahato, A. K., Saxena, P., Rahi, S., Konwar, G., & Tiwari, S. P. (2021). Low Voltage Organic Field-Effect Transistors with Room Temperature Deposited Dielectric Layer. *FLEPS - IEEE Int. Conf. Flex. Printable Sensors Syst.* Institute of Electrical and Electronics Engineers Inc. ISBN: 9781728191737. <https://doi.org/10.1109/FLEPS51544.2021.9469826>
- 44 Rahi, S., Raghuwanshi, V., Saxena, P., Konwar, G., & Tiwari, S. P. (2021). Effect of Annealing on Low-Voltage Organic Field-Effect Transistors with P(VDF-TrFE) Gate Dielectric. *FLEPS - IEEE Int. Conf. Flex. Printable Sensors Syst.* Institute of Electrical and Electronics Engineers Inc. ISBN: 9781728191737. <https://doi.org/10.1109/FLEPS51544.2021.9469854>
- 45 Kisku, W., Kaur, A., & Mishra, D. (2021). On-chip Pixel Reconstruction using Simple CNN for Sparsely Read CMOS Image Sensor. *IEEE Int. Conf. Artif. Intell. Circuits Syst., AICAS.* Institute of Electrical and Electronics Engineers Inc. ISBN: 9781665419130. <https://doi.org/10.1109/AICAS51828.2021.9458532>
- 46 Aswani, A. R., Kumar, R., Tripathi, J. N., & James, A. (2021). Performance of Crossbar based Long Short Term Memory with Aging Memristors. *IEEE Int. Conf. Artif. Intell. Circuits Syst., AICAS.* Institute of Electrical and Electronics Engineers Inc. ISBN: 9781665419130. <https://doi.org/10.1109/AICAS51828.2021.9458402>
- 47 Mythili, K., & Narwaria, M. (2021). Assessment of Machine Learning-Based Audiovisual Quality Predictors: Why Uncertainty Matters. *ACM Transactions on Multimedia Computing, Communications and Applications*, 17(2). ISSN: 15516857. <https://doi.org/10.1145/3430376>
- 48 Das, S., Kumar, A., Kumar, A., Singh, J., Jha, R., & Kumar, M. (2021). UV Light Detection Using Resonance Frequency of Piezoelectric Quartz Crystal. *IEEE Transactions on Electron Devices*, 68(6), 2791–2795. ISSN: 00189383. <https://doi.org/10.1109/TED.2021.3072351>
- 49 Sahu, A., Kumar, A., & Tiwari, S. P. (2021). Exploration of logic gates and multiplexer using doping-free bipolar junction transistor. *Solid-State Electronics*, 180. ISSN: 00381101. <https://doi.org/10.1016/j.sse.2021.107994>
- 50 Mahato, A. K., Bharti, D., Saxena, P., Raghuwanshi, V., Varun, I., & Tiwari, S. P. (2021). Influence of molecular weight of polymer dielectric on the photo-response of solution-processed OFETs. *Polymer*, 224. ISSN: 00323861. <https://doi.org/10.1016/j.polymer.2021.123724>
- 51 Chordia, A., Hemaram, S., & Tripathi, J. N. (2021). An Automated Framework for Variability Analysis using Simulated Annealing. *SPI - IEEE Workshop Signal Power Integr.* Institute of Electrical and Electronics Engineers Inc. ISBN: 9781665423885. <https://doi.org/10.1109/SPI52361.2021.9505204>
- 52 Kumar, R., Chordia, A., Aswani, A. R., James, A., & Tripathi, J. N. (2021). Uncertainty Quantification of Memristor Crossbar Array for Vector Matrix Multiplication. *SPI - IEEE Workshop Signal Power Integr.* Institute of Electrical and Electronics Engineers Inc. ISBN: 9781665423885. <https://doi.org/10.1109/SPI52361.2021.9505193>
- 53 Narwaria, M. (2021). The Transition from White Box to Black Box: Challenges and Opportunities in Signal Processing Education. *IEEE Signal Processing Magazine*, 38(3), 163–173. ISSN: 10535888. <https://doi.org/10.1109/MSP.2021.3050996>
- 54 Nikolskaya, A., Okulich, E., Korolev, D., Stepanov, A., Nikolichev, D., Mikhaylov, A., ... Gogova, D. (2021). Ion implantation in  $\text{-Ga}_2\text{O}_3$ : Physics and technology. *Journal of Vacuum Science and Technology A: Vacuum, Surfaces and Films*, 39(3). ISSN: 07342101. <https://doi.org/10.1116/6.0000928>
- 55 Mangal, N. K., & Tiwari, A. K. (2021). A review of the evolution of scientific literature on technology-assisted approaches using RGB-D sensors for musculoskeletal health monitoring. *Computers in Biology and Medicine*, 132. ISSN: 00104825. <https://doi.org/10.1016/j.compbimed.2021.104316>
- 56 Dhanekar, S., & Rangra, K. (2021). Wearable Dosimeters for Medical and Defence Applications: A State of the Art Review. *Advanced Materials Technologies*, 6(5). ISSN: 2365709X. <https://doi.org/10.1002/admt.202000895>

- 57 Shaik, M., Yadav, S. K., & Shaik, A. G. (2021). An EMD and Decision Tree-Based Protection Algorithm for the Solar PV Integrated Radial Distribution System. *IEEE Transactions on Industry Applications*, 57(3), 2168–2177. ISSN: 00939994. <https://doi.org/10.1109/TIA.2021.3058618>
- 58 Sikri, A., Mathur, A., Saxena, P., Bhatnagar, M. R., & Kaddoum, G. (2021). Reconfigurable Intelligent Surface for Mixed FSO-RF Systems with Co-Channel Interference. *IEEE Communications Letters*, 25(5), 1605–1609. ISSN: 10897798. <https://doi.org/10.1109/LCOMM.2021.3057116>
- 59 Kumar, P., Bansal, D., Kumar, A., Bajpai, A., Mehta, K., Ashudeep, Rangra, K., Boolchandani, D. (2021). Sacrificial layer optimization for RF MEMS switches. *Microsystem Technologies*, 27(5), 2147–2152. ISSN: 09467076. <https://doi.org/10.1007/s00542-020-05000-7>
- 60 Krishna, I. S., & Mukherjee, S. (2021). Triple-Mode Substrate Integrated Coaxial Resonator Based Bandpass Filter Featuring Flexible Transmission Zeros and Adjustable Bandwidth. *IEEE Transactions on Circuits and Systems II: Express Briefs*, 68(4), 1223–1227. ISSN: 15497747. <https://doi.org/10.1109/TCSII.2020.3035717>
- 61 Zheng, S., Zhou, J., Agarwal, H., Tang, J., Zhang, H., Liu, N., ... Hao, Y. (2021). Proposal of Ferroelectric Based Electrostatic Doping for Nanoscale Devices. *IEEE Electron Device Letters*, 42(4), 605–608. ISSN: 07413106. <https://doi.org/10.1109/LED.2021.3063126>
- 62 Das, S., Singh, J., & Kumar, M. (2021). Fabrication of Fast and Reliable Pulse Laser-Ablated ZnO Nanoparticles-Based Formaldehyde Sensor. *IEEE Transactions on Electron Devices*, 68(4), 1872–1877. ISSN: 00189383. <https://doi.org/10.1109/TED.2021.3058085>
- 63 Sikri, A., Mathur, A., Bhatnagar, M., Kaddoum, G., Saxena, P., & Nebhen, J. (2021). Artificial Noise Injection-Based Secrecy Improvement for FSO Systems. *IEEE Photonics Journal*, 13(2). ISSN: 19430655. <https://doi.org/10.1109/JPHOT.2021.3060974>

## Projects

### Sponsored Projects

Sl. No.	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
1	Visvesvaraya PhD Scholarship scheme for Electronics & IT (Part-1)	Media lab Asia	Anil Kumar Tiwari	₹2,16,34,188	01-Jan-14	31-Mar-20
2	Special Manpower development Program for Chips to System Design (SMDP-C2SD)/ Design of a Sensor Signal Conditioning System (I) & Multiprocessor Scheduling Algorithms using Control Theoretic Approach (II)	DeitY	Shree Prakash Tiwari	₹10,43,000	11-Aug-15	30-Nov-21
3	Visvesvaraya PhD Scholarship scheme for Electronics & IT (Part-2)	Media lab Asia	Anil Kumar Tiwari	₹1,51,70,876	21-Oct-14	31-Mar-21
4	Design and development of NavIC Receiver	MeitY	Arun Kumar Singh	₹64,55,000	18-Oct-17	25-Jun-22
5	Substrate Integrated Coaxial Line (SICL) based Circuits and Systems for millimeter wave application	DST	Soumava Mukherjee	₹35,00,000	20-Sep-17	19-Sep-22

Sl. No.	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
6	Design and Fabrication of Germanium on Silicon near infrared photodetectors	DST	Saravanan Rajamani	₹19,20,000	09-Aug-17	08-Aug-19
7	Young Faculty Research Fellowship (YFRF) of Visvesvaraya PhD Scheme	MeitY	Shree Prakash Tiwari	₹37,00,000	24-Jan-18	22-Jul-23
8	Young Faculty Research Fellowship (YFRF) of Visvesvaraya PhD Scheme	MeitY	Deepak Fulwani	₹37,00,000	01-Feb-18	23-Jul-21
9	High Performance Low Voltage Flexible Organic Field-Effect Transistors for Circuit and Sensing Applications	SERB	Shree Prakash Tiwari	₹51,70,000	15-Sep-18	14-Sep-21
10	Hub and Spoke Consortia for e2W and e3W Electric Drives-Design Development of Prototyping of Advanced IM and Synchronous Reluctance Drives and Vehicle Integration for e2W and e3W Applications	DHI(NFTDC)	Deepak Fulwani	₹24,40,000	31-Aug-18	31-Dec-20
11	Experimental Investigation and Performance Evaluation of HARQ Technique for Free-Space Optical Communication Systems	SERB	Aashish Mathur	₹42,84,100	24-May-19	23-May-22
12	Development of low cost sensors for monitoring of odours in ambient air	SERB	Mahesh Kumar	₹1,07,75,664	14-Nov-19	13-Nov-22
13	Development of low cost sensors for monitoring of odours in ambient air	Envirotech Instruments Pvt. Ltd.	Mahesh Kumar	₹13,00,000	14-Nov-19	31-Mar-23
14	Large area synthesis of 2DMoS <sub>2</sub> structures for low power and fast NO <sub>2</sub> Gas Sensor	SERB	Mahesh Kumar	₹40,81,000	30-Dec-19	29-Dec-22
15	Design And analysis of multi-channel incoherent beam combination system	DRDO	Arpit Khandelwal	₹9,60,000	21-Jan-20	20-Jan-21
16	Design and Development of Substrate Integrated Waveguide (SIW) and Empty SIW (ESIW) Based RF-Microwave Components	SERB	Arani Ali Khan	₹25,43,210	26-Dec-19	25-Jun-22
17	Development of System to Mitigate Second Order Harmonic Ripple in AC/DC Microgrid using Advanced Control Techniques	SERB	Deepak Fulwani	₹41,47,121	11-Feb-20	10-Feb-23

Sl. No.	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
18	Fundamentals of Photovoltaics	MHRD	Mahesh Kumar	₹5,68,000	23-May-20	28-Jun-20
19	Functional Materials	MHRD	Mahesh Kumar	₹5,68,000	02-Nov-20	11-Dec-20
20	Angle-resolved photoelectron (ARPES) studies of doped 2DMoS <sub>2</sub>	UGC-DAE	Mahesh Kumar	₹1,35,000	05-Mar-20	04-Mar-23
21	Establishment of AI-Based Platform to Monitor and Identify Smell, Taste and Key COVID 19 Therapeutic Hotspots	DST-RAKSHAK	Amandeep Kaur	₹10,00,000	17-Sep-20	16-Mar-22
22	A Programmable CMOS image sensor for high speed, low power and low noise applications	SERB-SRG	Amandeep Kaur	₹27,22,060	19-Dec-20	18-Dec-22
23	Nanostructured Metal Oxides for Efficient Detection of Breast Cancer	SERB-SRS	Saakshi Dhanekar	₹10,60,007	15-Sep-20	10-Aug-21
24	Secure and Robust Coordination and Control of Autonomous Multi-Vehicle Systems with Desired Constraints	SERB	Anoop Jain	₹29,84,870	25-Dec-20	24-Dec-22
25	Object Based Spatial 3D Audio Rendering for Augmented and Virtual Reality Applications	SERB	Manish Narwaria	₹25,84,280	22-Dec-20	21-Dec-22
26	Design, fabrication and characterization of all-fiber Multimode Interference (MMI) device for generating highly pure Laguerre-Gaussian (LG) mode in free-space	SERB	Nitin Bhatia	₹28,72,820	25-Dec-20	24-Dec-22
27	Data-driven Haptic Modeling and Rendering of Normal Interaction on Inhomogeneous Viscoelastic Deformable Objects	SERB-SRG	Amit Bhardwaj	₹33,00,000	23-Dec-20	22-Dec-22
28	Perception-Theoretic Approach for Quantifying Robustness of Machine Learning Models	SERB-Mathematical Research Impact Centric Support (MATRICS)	Manish Narwaria	₹6,60,000	11-Jan-20	10-Jan-24
29	A Robust Visual Positioning System	SERB-SRG	Himanshu Kumar	₹25,80,670	27-Jan-21	26-Jan-23

Sl. No.	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
30	Ga <sub>2</sub> O <sub>3</sub> -based nanomaterials with controlled defect and impurity composition for advanced electronic devices	DST-BRICS	Mahesh Kumar	₹41,98,528	14-Oct-20	13-Oct-23
31	Human perception driven on-chip compression for power efficient CMOS image sensors	MSME	Amandeep Kaur	₹15,00,000	31-Mar-21	30-Mar-22
32	Development of AlGa <sub>N</sub> /Ga <sub>N</sub> high electron mobility transistor based robust air pollution sensors	SERB	Mahesh Kumar	₹24,92,192	13-Aug-21	12-Aug-23
33	Telepresence and Teleaction System for Robot Assisted Dentistry	IHFC, IIT Delhi	Amit Bhardwaj	₹1,00,00,000	03-Nov-21	02-Nov-24
34	Development of Cognitive Cyber-Physical System(C2PS) testbed	IHUB NTIHAC Foundation, IIT Kanpur	Sandeep Kumar Yadav	₹26,50,240	07-Dec-21	06-Dec-24
35	Reflection Symmetry Based 3D Surface Reconstruction and Restoration from Partial Point Cloud	SERB-SRG	Rajendra Nagar	₹29,71,190	28-Dec-21	27-Dec-23
36	Unified Compact Modeling and Design of High Voltage MOS Transistors	SERB-SRG	Harshit Agarwal	₹32,01,000	23-Dec-21	22-Dec-23
37	Design and Development of the Virtual Museums of Rajasthan (Alwar, Bundi, Baran, Chittorgarh and Bharatpur)	Department of Archaeology and Museum, Jaipur, Govt. of Rajasthan	Rajendra Nagar	₹81,12,000	20-Jan-22	31-Mar-22
38	Design of power delivery networks using efficient selection and placement of decoupling capacitors based on a large scale component database	SERB-SRG	Jai Narayan Tripathi	₹22,91,760	29-Jan-22	28-Jan-24
39	Reconfigurable Intelligent Surface based mixed FSO-RF Systems for beyond 5G/6G Networks	SERB-NPDF	Aashish Mathur	₹19,20,000	01-Feb-22	31-Jan-24
40	Gate All Around Nanosheet Steep-Slope Transistors for Sub-2nm Technology Nodes: Physical Investigation, Compact Modeling and Device-Circuit Co-Optimization	DST-Nanomission	Harshit Agarwal	₹45,09,633	09-Mar-22	08-Mar-25

### Consultancy Projects

S. No	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
1	Voice and Video Analytics	Phimetrics Telecom VAS Pvt. Ltd.	Himanshu Kumar	₹2,00,000	30-Jan-20	30-Aug-20
2	Research Advisory	Spanidea Systems Private Limited	Sandeep Kumar Yadav	₹11,04,480	01-Feb-21	31-Jan-22
3	Photometry based Biomedical Analyzers	Johari Digital Healthcare Pvt. Ltd.	Arpit Khandelwal	₹9,20,000	02-Sep-21	01-Sep-23
4	DoT 5G Hackathon	Department of Telecommunication (DoT)	Arun Kumar Singh	₹1,00,000	02-Feb-21	02-Feb-22

### Other Projects

S. No	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
1	64th DAE Solid State Physics Symposium	DAE	Mahesh Kumar	₹20,00,000	16-Jul-19	22-Dec-19
2	Nano-Sensors	AICTE-ATAL	Mahesh Kumar	₹93,000	01-Jul-21	30-Sep-21

### Closed Projects

Sl. No.	Project No.	Project Title	Sponsoring Agency	Category of Project	Principal Investigator	Sanctioned Amount (Rs.)	Start Date	Duration / Expiry Date	Date of Actual Closure
10	S/UBA/MK/20200105	Development of low-cost portable vent	MHRD	Sponsored Research Project	Mahesh Kumar	₹1,00,000	31-Mar-21	14-Oct-21	21-Sep-21

#### Outcome:

The project is about to make a simple, portable, and low-cost ventilator that can be built rapidly and with no supply chain disruption. This single-mode continuous, mandatory, closed loop, pressure-controlled, time-terminated emergency ventilator adds a layer of safety and flexibility to ventilator shortage situations. The COVID-19 ventilator was designed with the following goals in mind: minimizing part count, cost, and complexity; reducing or eliminating reliance on scarce parts and resources; ensuring viability in various healthcare system around the world; and seeking simple assembly, testing, and use procedures by healthcare professionals.

# Department of Humanities and Social Sciences

## Introduction to the department:

The Department of Humanities and Social Sciences (HSS) had its inception in the year 2015 with an aim to play a significant role in the academic curriculum of young engineers. The Department plays a unique role in an Institute where the ethos of Science and Technology is predominant. Within the coordinates of the IIT system, the Department offers a unique scope to study and comprehend the critical role of technology within a socio-cultural context. With faculty members who specialize in diverse disciplines and students from a spectrum of backgrounds, the Department provides an enriching platform where technical education can be complemented with human and social understanding. Furthermore, the Department, with its faculty from a wide spectrum of diverse disciplines, paves the way for learning and discussions on multiple issues ranging from the rigor of analysis to engagement with multiple cultures, individual struggles, political trends, dialogue

and reasoning. Thus, the Department of HSS facilitates a well-rounded and expansive point of view amongst the student community. These young minds that come in contact with varied knowledge systems are likely to evolve into reflective and thinking individuals with refined sensibilities. Such a process is expected to enable them to appreciate life more creatively, effectively, and holistically and contribute in a positive way to the nation at large.

The HSS will evolve into the School of Liberal Arts (SoLA) in the year 2022 and will shortly launch its own flagship programme M.Sc. in Computational Social Sciences from the academic year 2022-23.

## Faculty details

At present, the HSS has 16 faculty members, 1 staff member, and 1 intern. The following are the research areas of the department faculty.

## Faculty Members



### Prof. Sangeeta Sahney

Head of Department & Professor  
School of Management &  
Entrepreneurship  
**Specialization/ Research interest:**  
Marketing, Organizational Behaviour,  
Studies in Service Quality



### Dr. Alok Ranjan

Assistant Professor  
**Specialization/ Research interest:**  
Public Health, Universal Health  
Coverage, Health System


**Dr. Ankita Sharma**

Assistant Professor

**Specialization/ Research interest:**  
Research Interests: Psychology;  
Gerontology, Clinical and Positive  
Psychology


**Prof. Chhanda Chakraborti**

Visiting Professor

**Specialization/ Research interest:**  
Bioethics, Public Health Ethics, CSR  
and Business Ethics; Philosophy of  
Mind, Philosophy of Logic


**Dr. Dibyadyuti Roy**

Assistant Professor

**Specialization/ Research interest:**  
Digital Humanities; Media,  
Communication and Cultural Studies;  
Postcolonial Masculinities; Health  
Communication; Science and  
Technology Studies


**Dr. Farhat Naz**

Assistant Professor

**Specialization/ Research interest:**  
Natural Resource Management;  
Water Governance; Climate Change,  
Disaster Risk Reduction, Gender


**Dr. K. J. George**

Associate Professor

**Specialization/ Research interest:**  
Philosophy: Applied Ethics, Ethics of  
Technology, Bioethics


**Dr. Malavika Tyagi**

Assistant Professor

**Specialization/ Research interest:**  
Development Economics; Political  
Economy; Law and Economics;  
Economics of Crime; Empirical  
Economics


**Dr. Mayurakshi Chaudhuri**

Assistant Professor

**Specialization/ Research interest:**  
Sociology/Sociocultural Anthropology:  
Gender Studies; Postcolonial South  
Asia; International and Transnational  
Migrations, Qualitative Research


**Dr. Natasa Thoudam**

Assistant Professor

**Specialization/ Research interest:**  
Literary Studies, Gender Studies,  
Religious Studies, Comic Studies,  
Digital Humanities (focused on India's  
Northeast (Manipur))


**Dr. Parichay Patra**

Assistant Professor

**Specialization/ Research interest:**  
Film Studies: Transnational Cinema,  
Indian New Wave, The Global 1968,  
Film Aesthetics


**Dr. Prasanjeet Tribhuvan**

Assistant Professor

**Specialization/ Research interest:**  
Anthropology of Material Objects, STS  
studies in Sociology, Political Ecology,  
Tourism and Youth Subcultures





### Dr. Ruhi Sonal

Assistant Professor

**Specialization/ Research interest:**  
Decision theory, social networks,  
bounded rationality.



### Dr. Suman Dhaka

Assistant Professor

**Specialization/ Research interest:**  
Cognitive Neuroscience, Cognitive  
Psychology; Sleep and Cognition



### Dr. V Hari Narayan

Associate Professor

**Specialization/ Research interest:**  
Philosophy: Cognitive Studies,  
Evolutionary Theory, Analytic  
Philosophy and Mindfulness



### Dr. Vidya Sarveswaran

Associate Professor

**Specialization/ Research interest:**  
Literature and Environment  
(Ecocriticism), Film and Literature,  
Literatures of the Global South,  
Regional Literatures in Translation,  
American Literature.

## Description of Research Groups

The major research groups in the department are focused along the following disciplinary/interdisciplinary tracks:

1. Literary and cultural studies
2. Philosophy
3. Psychology
4. Sociology
5. Economics

## Academic Programmes

The HSS offers core and elective courses at the Bachelors, Masters and Doctoral levels. The Department offers Bouquet courses in

- Literary and cultural studies
- Philosophy
- Psychology
- Sociology
- Economics

## Significant Research Achievements

The faculty of the Department have produced 33 articles in top journals, presented papers in 29

conferences, 2 books, 4 book chapters and 1 technical report. Students of the Department have presented papers at several international conferences. Faculty have also been part of 32 outreach programmes with reputed academic institutions as invited speakers, resource persons, chairs in conferences and special experts. At present, there are 4 ongoing research projects worth a total of 83.7 lakhs.

## Faculty/ Department Laurels

- Prof. Sangeeta Sahney, was inducted as a Member of the Editorial Advisory Board Research, Journal of Textile and Apparel, Emerald.
- Dr. Alok Ranjan was awarded the Fulbright- Nehru Postdoctoral Fellowship at Harvard T. H. Chan School of Public Health, 2021-22. Dr Ranjan was also the recipient of the Emerging Voices for Global Health Fellowship, 2021-2022. Dr. Alok Ranjan also joined the editorial board of PLOS ONE as an academic editor from November 2021 onwards.
- Dr. Ankita Sharma was awarded the Moonshot project Award 2021, IIT Jodhpur on the idea, 'ExPoPsych: Experiencing Positivity at the face of Psychological Vulnerability'. (2021). She also received the Early Career Scholar award in International Wisdom Summit (Jointly supported

by Wisdom and Culture Lab-University of Toronto, Center for Practical Wisdom-University of Chicago, and Social Sciences and Humanities Research Council of Canada). (2021)

- Dr. Farhat Naz obtained a DAAD (German Academic Exchange Service) Visiting grant at Georg-August-University Göttingen, Germany, for the work on India's Forest Policy and Climate Change (2022). She was also awarded IIT Jodhpur Institute Award for Research Excellence - Young Researcher Award for Outstanding Contribution in Sociological Aspects of Water Management (2021)
- Dr. Natasa Thoudam was presented with an honorarium for her art practice paper titled "On Pandemic Art Poetry: A Graphic Narrative in the Form of a Poem"— at Resilience, Resistance, Renovation, and Rebirth Conference 2021 hosted by Northern Arizona University (NAU) College of Arts and Letters held on 22 to 23 Apr 2021.
- Dr. Vidya Sarveswaran was awarded the Senior Research Award for Research Excellence and outstanding contribution to Literature, Environment and Film from IIT Jodhpur, August, 2021
- Dr. Mayurakshi Chaudhari was offered a Research fellowship from EUROLAB, GESIS - Leibniz Institute for the Social Sciences, Cologne (Germany), for her proposed project titled "The 'Women's' Question: A Comparative Study of Family and Gendered Mobility in Contemporary Germany and India" in December 2021.

## Student Laurels

Sana Maidullah (supervised by Dr. Ankita Sharma), the first PhD student of the Department, who graduated in 2019, has joined IIM Sirmaur as a faculty member. Abhra Paul student of Dr. Vidya Sarveswaran was selected for her Post Doctoral Studies at NISER, Bhubaneswar. Her work was also published in a journal: Abhra Paul and Sarveswaran.V. "Knowing our place: Reading Barbara Kingsolver's work from a bioregional perspective". Canadian Journal of American Studies, University of Toronto Press (In print).

The Department's students have also presented their work in prestigious international conferences and other academic venues. Ishani Vajpayee won a Best Paper

Award for her paper presented at the International Conference on Post Covid Challenges on Life and Livelihood' (ICPCC). The details of the conferences are given below:

1. Sanskriti K and Samyukthah A.: 'Covering Trauma, Memory and the Body'. Suspirias Symposium: organised by Queen Mary, University of London, 11 June 2022.
2. Sanskriti K. "Laptops and Mobile Phones in the Kitchen: Food-Media Ecology and its confluence with the Digital Public Sphere" at the 19 th Annual EGSS Conference organized by the McGill University April 8-10, 2022
3. Sanskriti K.: "Digital Fandom and Streaming platforms with special reference to Hallyu" at Reconfiguring Digital Spaces: GLO Conference 2022 organized by Graduate Literature Organization at Florida State (April 8-9, 2022)
4. Prarthana Saikia, Saikia, P., and Sharma, A. (2021). Wise negotiation through exposure to diversity and perspective-taking capability. International Wisdom Summit 2021 (11-12 October 2021). University of Illinois Chicago (Online).
5. Prarthana Saikia, Saikia, P., and Sharma, A. (2022). Awareness training of common wisdom model and its effect on wise negotiation. Psychological Science and Wellbeing Conference (4-5 March 2022). James Cook University Singapore.
6. Krishna Singh Bhandari, Bhandari, K.S., Sharma, A., Kalra, S., Nirmal, A., Soumik, Soni, R., and Kaur, B. (2022). Feasibility and Usability of Experience sampling method and typing characteristics for smartphone-based emotion detection. Psychological Science and Wellbeing Conference (4-5 March 2022). James Cook University Singapore.
7. Krishna Singh Bhandari, Nirmal, A., Kalra, S., Sharma, A., Soumik, Soni, R., Kaur, B., Pandey S., and Bhandari, K.S., (2022). DeepMood: Identification of mood state with keystrokes on smartphone. Psychological Science and Wellbeing Conference (4-5 March 2022). James Cook University Singapore.

8. Pooja Rawat, Rawat, P., Kalra, S., Sriram, Dutta, J., Singh, P., Kumar, P., and Sharma, A., (2022). Understanding Typing error, delayed error identification, and fatigue in online interaction. Psychological Science and Wellbeing Conference (4-5 March 2022). James Cook University Singapore.
9. Ishani V, Publication Vajpai, I & Tribhuvan, P. Employee Engagement Based Framework for Internal Marketing and InTCRM in the IT sector. International Conference for Markets and Development (ICMD), 16th Biennial Conference of ISMD with IIM Trichy. P. 106-113, 16-18, Dec, 2021

## Laboratories and equipment

The Department of Humanities and Social Sciences has two specialized research facilities, which are described below.

- a. Multimedia language lab: The Language Lab located within the Central Library at IIT-Jodhpur is designed to provide students with an interactive learning environment for practical training in English. The lab actively engages students in exercises through its collaboration with SANAKO, a company that produces specialized software to enhance language learning for non-native English speakers. ELT instructors in the lab assist students in developing effective communication skills based on the LSRW model (Listening, Speaking, Reading and Writing) through specific activities such as speed reading, in-depth reading, declamation, practice for better grammar, listening comprehension, round table discussion, speech practice with phonetics, intonation, voice modulation, pronunciation, and exercises to improve writing emails, official letters, reports, and essays. The lab also supplements classroom learning by enabling students to practice independently and in groups with the use of state-of-the-art, multimedia equipment. The spatial layout and software facilities of the lab are designed to maximize immersive language learning. Through the lab, the institute's students and staff from disciplines ranging across the engineering, sciences, humanities and social sciences have access to the best digital tools and hands-on
- training towards developing fluency and mastery of English.
- b. Psychology lab: The Psychology laboratory of the Department of Humanities and Social Sciences is a research facility that works in the domain of Positive-Cognitive Psychology focusing on 'OPTIMAL HUMAN FUNCTIONING'. The lab's work is oriented towards understanding, intervening and promoting the well-being and excellence of human beings. At present, research is being conducted on Decision-making, Social Cognition, and Wisdom. The work revolves around three themes: 1) Cognitive Functioning and Psychological Tendencies, 2) Skills, ability and well-being management in personal, educational and organization context, 3) Performance assessment, management and enhancement. The Psychology Lab provides an understanding of the functioning of the brain and the mind and their interrelationship with behavior. Some concepts which are of specific relevance to engineering students include perception (biases and illusions involved), decision making (algorithmic and heuristic thinking, associated cognitive errors and biases. Other topics include student learning (style and strategies), memory (mnemonic strategies and distortions), identifying strength, emotional intelligence, social cognition, etc. The laboratory is equipped with tools and software like EEG Neurofeedback System, E-prime, Speech recognition software, Wisconsin Card Sorting Test, IOWA Gambling Task, Stroop Test, SPM, NEOPI-R, Emotional Intelligence Questionnaire, and Social Responsiveness Scale etc.

## Outreach activities

- Prof. Sangeeta Sahney played the role of Chair in several prestigious academic conferences and seminars including: (a) the National seminar, "Impact of Covid-19 on Indian Industry and Economy", Rajiv Gandhi University, Rono Hills, Doimukh, Arunachal Pradesh: on 18 th Nov, 2022 (Online), (b) "International Society for Data Sciences & Innovation – Global (ISDSI-G)", IIM Nagpur, 27-12-2021 to 30-12-2021 (Online), (c) "Indian Academy

of Management (INDAM) Conference”, IIM Rohtak, 07-01-2022 to 09-01-2022 (Online)(d) “Management Doctoral Colloquium and VGSOM research scholars’ day”, VGSOM, IIT Kharagpur, 02-02-2022 to 03-02-2022 (Online). She was invited as a Resource Person for the following: (a) “Research Methodology and Data Analysis” - AICTE STTP at the Centre for Management Studies, 16-08-2021 to 21-08-2021, NERIST, Nirjuli NERIST, Arunachal Pradesh (Online); (b) “Sustainable Change Management in Technical Institutes for NEP – 2020 Implementation”, ATAL FDP at Government Engineering College, 23-08-2021 to 27-08-2021, Bilaspur, Government Engineering College, Bilaspur

- Dr. Alok Ranjan gave an Invited talk on “India’s diseases burden and the importance of a healthy lifestyle” at Workshop held on Development of Strategic Interventions through Communication and Science Media for Enforcing Sustainable and Healthy Lifestyles Among School Children, Teachers, and Women, by IIT-Dhanbad; 15-19 July 2021. He also gave an invited talk on “Progress towards universal health coverage (UHC): a district health perspective”, at the Department of Global Health and Population, Harvard T. H. Chan School of Public Health, 19th August, 2022, Boston, US.
- Dr. Ankita Sharma delivered a number of lectures at prominent academic institutions and also served as a resource person. These are as follows: (a) ‘Monitoring mental health of students. Atal FDP organized by MBM Engineering College, Jodhpur (7/9/2021) (b) ‘Digital Wellbeing of Elderly’ organized by Senior Citizens Division, National Institute of Social Defence, Ministry of Social Justice and Empowerment (20 August, 2021) (c) ‘Monitoring mental health and physical health for all. AICTE Atal FDP organized by PDPM IIIT Design and Manufacturing, Jabalpur (24 August, 2021) (d) Qualitative and Quantitative Research Methodology, AMPGC, BHU (10 March, 2022) and (e) “Autodidactic or Vicarious learning about Mental Health”. “Jai Narain Vyas University, Jodhpur under the Flagship of Rajiv Gandhi National Institute Of Youth Development” (13 March, 2022)
- Dr. Natasa Thoudam delivered the invited Plenary lecture “Gendered Spaces and Gendered Violence:

Towards an Interrogation of the Concept of Caste in Devala Mutum’s ‘Thaningla’ and Hoihnu Hauzel’s Essential North-East Cookbook”—at the International Conference on “Cartographies of Gender Based Violence: Literary Reflections from South Asia and Beyond” organized by IIT Patna held on 12 and 13 March 2022 .

- Dr. Ruhi Sonal was an invited speaker at the Department of Economics Seminar Series at Shiv Nadar university, September 24, 2021. She also gave an invited seminar, “Sequential entry and perfect equilibrium” at CDE Seminar series, Delhi School of Economics on January 13, 2022. She gave an Invited lecture on Decision Theory at Research Cell, Delhi School of Economics on February 26, 2022.
- Dr. Suman Dhaka gave an Invited talk on “ Brain Imaging Techniques and Their Applications” workshop on scientific sophisticated instruments through the Synergistic Training program Utilizing the Scientific and Technological Infrastructure (STUTI) supported by DST (9 August 2022).
- Dr. V. Harinarayan gave an Invited talk on “Sensory Motor approach to consciousness” on World Philosophy Day on 2 June 2021 organized by Panjab University. He also gave an invited talk on “Epistemic Justice and Episodic Self” as part of ICPR study circle on 4 February 2022 at SMVDU University, Jammu.
- Dr. Parichay Patra gave an invited talk ‘Death, an Imposter, and the Maiden: Pyaasa beyond the Borders’ delivered at the webinar ‘A Response to Crises: Literature, Film and Culture of the 21st Century’, organized by Deshbandhu Mahavidyalay, Kazi Nazrul University, West Bengal, on June 24, 2021. He delivered the Plenary Address entitled ‘Crisis and Beyond: India’s Latin America in the Long 1960s’ in International Graduate Conference on Art & Literature in Conflict Zones, Centre of Spanish, Portuguese, Italian and Latin American Studies, Jawaharlal Nehru University, India, October 2021. He also spoke on “Solanas and India-Latin America Cinematic Links” in a panel on Fernando Solanas at XII Jornadas de Historia, Arte y Política, Universidad Nacional del Centro de la Provincia de Buenos Aires (UNICEN), Argentina, June 2021

- Dr. Farhat Naz was an invited speaker at the ISTR PANEL DISCUSSION on 'Responding to Crises: Civil Society Experiences in Different Asia-Pacific Regimes'. She was also an invited speaker on the topic of 'Academic Integrity' at the 6th Faculty Development Program, at UGC-HRDC (University Grant Commission-Human Resource Development Center). She delivered a talk at the CIPSH International Academy on Chinese Cultures and Global Humanities Seminar on 'Global Challenges and Global Ethics in a time of Pandemic and Climate Change' 2021.
- Dr. Prasanjeet Tribhuvan gave a talk 'Knowing the Unknown: Curious Case of Cannabis' at Research Majlis, the Research Colloquium of Jindal Global University, Sonapat on 30 September, 2021. He also gave a talk 'Looking at Cannabis Policy through Assemblages' at the Research Colloquium, Delhi School of Economics, University of Delhi, March 25, 2022.
- He also served as a consultant on an audit project of Environmental Resource Management (ERM) for the study of local communities and their interaction with The Great Indian Bustards.
- Dr. Malvika Tyagi was an invited seminar talk "Economic Approach to Crime, Law and Deterrence, at GSL University, Ahmedabad, 1 February 2022

## Reporting Year's Publication Records

The following are the details of faculty publications.

### i. Prof. Sangeeta Sahney

#### Journal Publications

1. Dutta, V. and Sahney, S. (2022), "Relation of Principal Instructional Leadership, School Climate, Teacher Job Performance, and Student Achievement", *Journal of Educational Administration*, Vol. 60, No. 2, pp. 148-166, Emerald (ABDC: B) DOI 10.1108/JEA-01-2021-0010
2. Arora, S., Sahney, S. and Pradhan, D. (2022), "Potential Benefits and Descriptive Norms on Webrooming: Applying an Extended Model of Goal-Directed Behaviour", *International Journal of Retail and Distribution Management* Vol. 50, No.

3, pp. 377-397, Emerald (ABDC: A) . DOI 10.1108/IJRDM-10-2020-0417

3. Ray, S.K. and Sahney, S. (2021), "Personal Cultural Orientation and Green Purchase Intention: A Case of Electric Two-wheelers in India", *Earlycite, Journal of Asia Business Studies*, Emerald (ABDC: C) .DOI 10.1108/JABS-06-2020-0220
4. Saha, M.D. and Sahney, S. (2022), Exploring the relationships between Socialization Agents, Social Media Communication, Online Shopping Experience, and Pre-Purchase Search: A Moderated Model, *Internet Research*, Vol. 32, No. 2, pp. 536-567, Emerald (ABDC: A) .DOI 10.1108/INTR-08-2020-0472

#### Conferences

5. Aparna, S.M. and Sahney, S., "Organizational Learning and Resilience: The Role of Creative Problem-Solving Capacity and Knowledge Leakage", *IDSIGlobal International Conference on Leading Business in a FLUID World*, IIM, Nagpur, December 27-30, 2021.
6. Aparna, S.M. and Sahney, S., "A Three-Way Interaction Model of Research Output: Investigating the Role of Age, Technological Aids and Knowledge Sharing", 11th edition of Conference on Excellence in Research and Education (CERE), at the Indian Institute of Management Indore, during 18th-20th June 2021.

### ii. Dr. Alok Ranjan

#### Journal Publications

1. Ranjan, A. COVID-1. (2021): A wake-up call for health system strengthening in India. *TechScape: The Science, Technology and Education Journal of IIT Jodhpur*.
2. Garg, S., Tripathi, N., Ranjan, A., & Bebart, K. K. (2021). Comparing the average cost of outpatient care of public and for-profit private providers in India. *BMC health services research*, 21(1), 1-9. <https://doi.org/10.1186/s12913-021-06777-7>
3. Meher SR, Ranjan A, Shukla P, Atram Y. Effect of COVID-19 lockdown on the livelihood of street vendors in Maharashtra, India. *Int J Community*

- Med Public Health 2021;8:5297-303. <https://dx.doi.org/10.18203/2394-6040.ijcmph20214263>
4. Vaidyanathan, G., VR, M., Dash, U., Ranjan, A., Iyer, H., Chokshi, M., ... & Nair, A. (2022). Innovations in Primary Healthcare: A Review of Initiatives to Promote Maternal Health in Tamil Nadu. *Journal of Health Management*, 24(1), 22-30. <https://doi.org/10.1177%2F09720634221078697>
  5. Ansari S., Ranjan A. (2022). Towards an equitable and universal health coverage amidst COVID-19 pandemic: learnings from 75th Round National Sample Survey, 2017-18. *Social Action*. No 1, Vol:72. ([http://isidelhi.org.in/ckfinder/userfiles/files/File%2011/SA%20JAN-MAR%202022%20\(for%20web\).pdf](http://isidelhi.org.in/ckfinder/userfiles/files/File%2011/SA%20JAN-MAR%202022%20(for%20web).pdf))
  6. Ranjan, A., Crasta, J. Healthcare utilization and financial protection among those with mental disorders in India: Insights from the 75th round of the National Sample Survey, 10 March 2022, PREPRINT (Version 1) available at Research Square [<https://doi.org/10.21203/rs.3.rs-1409762/v1>]
  7. V R Muraleedharan, Umakant Dash, Alok Ranjan, Rajasulochana S R. "Innovations in maternal and child health services in Tamil Nadu" IHSC. no:5 (2021): 1 (Technical Report)
  8. Sundararaman, T., Ranjan, A., Rajendran, P., & Ahuja, S. (2022). Chapter 4: India and the World: Response to the COVID-19 Pandemic (pp. 77–106). (Book Chapter)
  2. Kaman, S., Sharma, A., & Banerjee, R. (2021). Associativity between COVID-19 Pandemic and Serious Mental Illness: Rapid Systematic Review within Salutogenesis Model for Public Health Management. Published on psycharxiv.com. DOI: 10.31234/osf.io/mgj45 (Pre print)
  3. Sharma, A. & Sharma, A. (2021). Efficacy of role and perceived organizational support as contributory factors of organizational commitments. *Pacific Business Review International*, 13(11), 88-96. (WoS)
  4. Sharma, A. & Sharma, A. (2021). What doesn't break you makes you stronger: An experimental validation of personal wisdom development through regret handling and personality dispositions. *Journal of Higher Education Theory and Practice*, 21(8), 99-114. DOI: <https://doi.org/10.33423/jhetp.v21i8.4508>
  5. Sharma, A., & Sharma, A. (2021). Turnover Intention and Procrastination: Causal Contribution of Work-Life (Im) Balance. *Journal of Contemporary Issues in Business and Government*, 27(2), 1891-1901. (ABDC, WoS) DOI: <https://doi.org/10.47750/cibg.2021.27.02.199>
  6. Kaman, S., Sharma, A., & Banerjee, R. (2022). Associativity between COVID-19 Pandemic and Serious Mental Illness: Rapid Systematic Review within Salutogenesis Model for Public Health Management. *Current Psychiatric Research and Review*. 10.31234/osf.io/mgj45.

### Conferences

9. Ranjan, A. 'Informal Health Care Provider in India' Emerging Voices for Global Health Fellowship at Mohammed bin Rashid School of Government, UAE, November 202

### iii. Dr. Ankita Sharma

#### Journal Publications

1. Sharma, A. & Sharma, A. (2021). Beyond Exchange Relationship: Exploring the Link Between Distributive Justice, Job Involvement, And Citizenship Behavior. *The Journal of Behavioral Science*, 16(3), 123-135.

### Conferences

7. Sharma, A. and Sharma, A. (2021). Translational relation of wisdom and transformational leadership: Exploring conceptualization and predictions. International Wisdom Summit 2021 (11-12 October 2021). University of Illinois Chicago (Online).
8. Saikia, P., and Sharma, A. (2021). Wise negotiation through exposure to diversity and perspective-taking capability. International Wisdom Summit 2021 (11-12 October 2021). University of Illinois Chicago (Online).
9. Bhandari, K.S., Sharma, A., Kalra, S., Nirmal, A., Soumik, Soni, R., and Kaur, B. (2022). Feasibility and Usability of Experience sampling method and typing characteristics for smartphone-based emotion

- detection. Psychological Science and Wellbeing Conference (4-5 March 2022). James Cook University Singapore.
10. Kaman, S., and Sharma, A., (2022). Neural Correlates of Non-Verbal Response and Wisdom. Psychological Science and Wellbeing Conference (4-5 March 2022). James Cook University Singapore.
  11. Nirmal, A., Kalra, S., Sharma, A., Soumik, Soni, R., Kaur, B., Pandey S., and Bhandari, K.S., (2022). DeepMood: Identification of mood state with keystrokes on smartphone. Psychological Science and Wellbeing Conference (4-5 March 2022). James Cook University Singapore.
  12. Rawat, P., Kalra, S., Sriram, Dutta, J., Singh, P., Kumar, P., and Sharma, A., (2022). Understanding Typing error, delayed error identification, and fatigue in online interaction. Psychological Science and Wellbeing Conference (4-5 March 2022). James Cook University Singapore.
  13. Saikia, P., and Sharma, A. (2022). Awareness training of common wisdom model and its effect on wise negotiation. Psychological Science and Wellbeing Conference (4-5 March 2022). James Cook University Singapore.
3. Naz, F. & George, K. J. 2021. Ethics, Professional Life, and the New Curriculum of IITJ (co-author: K.J George); Science and Education Magazine TechSpace: IITJ, Vol.1, Issue 3. <https://iitj.ac.in/techscape/>
  4. Naz, F. & George, K. J.. 2021. Climate Change, Gender Vulnerability, and Disaster: Viewpoint on the Himalayan Region, Eastern Anthropologist 74(4): 485-501.
  5. George, K. J. & Naz. F. 2021. 'Water, Sanitation, and the Cry of the Excluded,' Special Issue: Landscape of Sanitation in India: Reflections on Swachhta, Indian Anthropologist, (co-author: Dr. Farhat Naz), Vol.51 No.2, 7- 21 (<http://indiananthro.in/IA2021->)

#### Conferences

1. Naz, F. 'Cross-road of Development: Climate Change, Water-Induced Disasters and the Urgency of Foresighted Policies' at the International Virtual Conference 'Un/Predictable Environments: Politics, Ecology, Agency' , 20- 21 May, 2021 University of British Columbia (Canada)
2. Naz, F. 'Hype and Hope of Sustainable Forest Management: A Story from Post-Colonial Forest Policy in India' at IUAES-WAU World Anthropology Pre-Congress 26 February, 2022; IITJ& Guelph University, Ontario

#### iv. Prof. Chhanda Chakraborti

##### Journal Publications

1. Dutta, D., Chakraborti, C.. (2021). Does India's Menstrual Hygiene Management Scheme exclude the disabled? Indian Journal of Medical Ethics. 2021 Oct;-):1-4. DOI: 10.20529/ijme.2021.081.

#### v. Dr. Farhat Naz

##### Journal Publications

1. Kurnio, H., Fekete, A., Naz, F., Jüpner, R. & Norf, C. 2021. 'Resilience Learning and Indigenous Knowledge of Earthquake Risk in Indonesia,' International Journal of Disaster Risk Reduction, Vol. 62, pp.1-11 (10.1016/j.ijdr.2021.102423)
2. Naz, F. 2021. 'Editorial: 'Landscape of Sanitation in India: Reflections on Swachhta', Special Issue: Indian Anthropologist, Vol.51 No.2, 1-6 <http://indiananthro.in/IA2021->

#### vi. Dr. K. George

##### Journal Publications

1. George K.J. 2021. 'Kerala Model Development: A Philosophical Analysis. Mathavum Chinthayum 101(3): 40-55
2. George, K. J. & Naz. F. 2021. 'Water, Sanitation, and the Cry of the Excluded,' Special Issue: Landscape of Sanitation in India: Reflections on Swachhta, Indian Anthropologist, (co-author: Dr. Farhat Naz), Vol.51 No.2, 7- 21
3. Naz, F. & George, K. J. 2021. Ethics, Professional Life, and the New Curriculum of IITJ (co-author: K.J George); Science and Education Magazine TechSpace: IITJ, Vol.1, Issue 3.

- Naz, F. & George, K. J.. 2021. Climate Change, Gender Vulnerability, and Disaster: Viewpoint on the Himalayan Region, *Eastern Anthropologist* 74(4): 485-501.

### Conferences

- George, K. J. 'Climate Justice: Lessons from Recent Disasters and Covid-19 Pandemic,' Paper presented in the international conference organized by the Canadian Association for the Study of International Development (CASID); 17-19 May 2022.
- George, K. J. 'Responding to Crises: Civil Society Experiences in Different Asia-Pacific Regimes: The case of the state Kerala in India' Paper presented in the webinar organized by the International Society for Third Sector Research (ISTR); 23 February 2022.
- George, K. J. "Climate Change, Vanishing Himalayan Glaciers, and Global Ethical Concerns", paper presented in the second CIPSH international seminar on Global Challenges in a Time of Pandemic and Climate Change, organized by the Union Academique Internationale (UAI) in collaboration with the Stockholm China Centre, Institute for Security and Development Policy, Stockholm; 6 December 2021.

### vii. Dr. Hari Narayanan

#### Journal Publications

- Akhil Singh, Hari Narayanan V "Embodied Education: A Pathway towards more integrated Learning" *Contemporary Education Dialogue*, Vol 18, Issue 2, 2021 pp 202-225, <https://doi.org/10.5840/bjp20211314>
- Hari Narayanan V "Conceptualising the Self: The Role of Narratives" *Balkan Journal of Philosophy* Vol 13, Issue 1, 2021 pp 21-32, <https://doi.org/10.5840/bjp20211314>

#### Conferences

- Hari Narayanan, V., "Dialogue and Counselling" in the First International Conference on Philosophical Counselling held at University of Delhi from 14-16 January 2022

- Hari Narayanan, V. "Attention and Meaning" in the Fourth International Conference on Philosophy and Meaning of Life held at University of Pretoria from 17-19 January 2022

### viii. Dr. Natasa Thoudam

#### Journal Publications

- Thoudam, N. 2021. "Divisive Politics of the Inner Line Permit (ILP) in Three Stories from Manipur in India's Northeast." *South Asia: Journal of South Asian Studies*, vol. 44, no. 4, 2021, pp- 790–806. <https://doi.org/10.1080/00856401.2021.1940479>
- Thoudam, N. 2022 "Book review: L. Somi Roy, Maharaj Kumari Binodini, The Princess and the Political Agent." *Indian Journal of Gender Studies*, vol. 29, no. 1, 2022, pp. 146–50. <https://doi.org/10.1177/2F09715215211057941>

#### Conferences

- Thoudam, N. "From Mahasveta's "Dopti" to Kanhailal's Draupadi: Translating Draupadi/Dopti"—IACLALS ANNUAL INTERNATIONAL CONFERENCE 2022 titled "Circulations, Mediations, Negotiations: New Perspectives on Translation from South Asia" organized by IACLALS held on 2 to 5 Mar 2022 (online).
- Thoudam, N. "Archival Pedagogy: Teaching a Course on India's Northeast in an Online Classroom". *International Archives Week - Milli Sessions 2021* organized by Milli Consortium held on 7 to 13 Jun 2021.
- Thoudam, N. "Gendered Spaces and Gendered Violence: Towards an Interrogation of the Concept of Caste in Devala Mutum's 'Thaningla' and Hoihnu Hauzel's Essential North-East Cookbook" (Plenary Lecture), the International Conference on "Cartographies of Gender Based Violence: Literary Reflections from South Asia and Beyond" organized by IIT Patna, 12 and 13 Mar 2022.
- Thoudam, N. "In Search of a Form while Inventing a Language of Subversion through Stereotypes". *Transitions 9 Symposium: New Directions in Comics Studies* organized by Kingston University; University of the Arts London; and Birkbeck, University of London, held on 8 to 10 Apr 2021.



7. Thoudam, N. "On Pandemic Art Poetry: A Graphic Narrative in the Form of a Poem". Resilience, Resistance, Renovation, and Rebirth Conference 2021 hosted by Northern Arizona University (NAU) College of Arts and Letters held on 22 to 23 Apr 2021
8. Thoudam, N. "Remapping the Indian Novel in English" organized by Kirori Mal College, DU, and Mizoram University (online), Faculty Development Programme (FDP), FDP: 21–25 Jun 2021

### ix. Dr. Parichay Patra

#### Journal Publications

1. Patra, P. 2022. "Beyond the Metanarratives of Indian Cinema." *Discourse: Journal for Theoretical Studies in Media and Culture* 44.1, 101-08. (ISSN1522-5321)

#### Books

2. Patra P. & Kho Lim, Michael (Eds.). 2021 *Sine ni Lav Diaz: A Long Take on the Filipino Auteur*, Bristol/Chicago: Intellect/University of Chicago Press (Book)
3. Patra, P. 2021. "Jesus, Magdalene and the Filipino Judas: Lav Diaz and his 'Artless' Epics" In *Sine ni Lav Diaz: A Long Take on the Filipino Auteur*, eds. Parichay Patra and Michael Kho Lim, Bristol/Chicago: Intellect/University of Chicago Press, 2021, pp. 130-45

#### Conferences

4. Patra, P. "When the History Fails: Global South Re-narrated through the Anecdotal", American Comparative Literature Association (ACLA) 2020 Annual Meeting, Online, USA, April 8-11, 2021
5. Patra, P. "The Prominence of History and the Lack of the Global", at I World Cinema International Conference, Universidad de Complutense de Madrid, Spain, June 202

### x. Dr. Prasenjeet Tribhuvan

#### Conferences

1. Vajpai, I & Tribhuvan, P. Employee Engagement Based Framework for Internal Marketing and

InTCRM in the IT sector. International Conference for Markets and Development (ICMD), 16th Biennial Conference of ISMD with IIM Trichy. P. 106-113, 16-18 Dec, 2021

### xi. Dr. Ruhi Sonal

1. Bhattacharya M., Mukherjee S. and Sonal R. "Frame-based stochastic choice rule", *Journal of Mathematical Economics*, Vol. 97, 102553, 2021. DOI:10.1016/j.jmateco.2021.102553

### xii. Dr. Suman Dhaka

#### Journal Publications

1. Mishra, Bijeta, Niswas Sahu, and Suman Dhaka. "Association Between Pittsburgh Sleep Quality Index Factors, Academic Performance and Health." *Sleep and Vigilance* (2022): 1-10. <https://doi.org/10.1007/s41782-022-00212-5>.

#### Conferences

2. Mishra, Bijeta; Dhaka, Suman, "Psychological Well-Being of the Elderly: Impact of Loneliness and Social Isolation", 31st annual convention of NAOP, 4-6 March 2022. Online.
3. S. Dhaka " Effect of total sleep deprivation on risk-taking behaviour: an ERP study, 26th Congress of the European Sleep Research Society. 27 – 30 September 2021, Athens, Greece.

### xiii. Dr. Vidya Sarveswaran

#### Journal Publications

1. Abhra Paul and Sarveswaran.V. "Knowing our place: Reading Barbara Kingsolver's work from a bioregional perspective". *Canadian Journal of American Studies*, University of Toronto Press (In print)
2. Sarveswaran,.V. "From Dust to Dust". *International Journal of Fear Studies*. University of Calgary. Vol (3). Issue 1. 2021. Transdisciplinary and Interdisciplinary Approaches. Pp 118-120. <http://prism.ucalgary.ca/handle/https1880/113237>

## Books

1. Slovic, S., Rangarajan, S. & Sarveswaran, V. (Eds.) (2022). The Bloomsbury Handbook to Medical Environmental Humanities. Bloomsbury, London. Bloomsbury, London.  
  
<https://www.bloomsbury.com/us/bloomsbury-handbook-to-the-medicalenvironmental-humanities-9781350197305/>
2. Sarveswaran, V. (2022) Dying to Breathe. The epilogue in the Bloomsbury Handbook to Medical Environmental Humanities. Pp 395-397. Bloomsbury, London (Book Chapter).  
  
<https://www.bloomsbury.com/us/bloomsbury-handbook-to-the-medicalenvironmental-humanities-9781350197305/>

## Conferences

1. Sarveswaran, Vidya. Dying to Live: Solastalgia and Soliphilia as Diptychs in Charlotte 's Migrations at the ASLE – Biennial Conference on August 5th 2021

## Projects

### Sponsored/Consultancy Projects

#### On-going Projects

Sr. No	Project title	PI/Co-PI	Sponsoring agency	Amount in Lakhs	Start date	End date
1	An Interdisciplinary Study of Technologically Manipulated Information : Its Ecosystem And Its Psycho-Social Impact	Dr. Chhanda Chakraborti (PI), Dr. Ankita Sharma (Co-PI), Dr. Prasanjeet Tribhuvan (Co-PI)	ICSSR Project	18 Lakhs	10 March 2022	March 2024
2	"Offering Provocations, Surfacing Evidence": The Archiving of Cine-Politics under the Indian National Emergency through Digital Humanities 2.0	Dr. Parichay Patra (Co-PI)	SPARC, Ministry of Education	54 Lakhs	April 2019	September 2022

## xiv. Dr. Mayurakshi Chaudhuri

### Journal Publications

1. 2021. Sakshi Shukla and Mayurakshi Chaudhuri, "Intersectional Im/Mobilities: Gender, Family and Information Technology Professionals in Digital India", Applied Mobilities, Taylor and Francis. DOI: <https://doi.org/10.1080/>
2. 2022. Mattius Rischard, Patricia Goodman Hayward, Mayurakshi Chaudhuri, Claudine Brunnuell, Chiranjoy Chattopadhyay, Alice C. Mello. "Authentic Leadership being Shared as a Collective," in Viktor Wang's (Ed) Handbook of Research on Educational Leadership and Research Methodology, IGI Global. <https://www.igi-global.com/>

Sr. No	Project title	PI/Co-PI	Sponsoring agency	Amount in Lakhs	Start date	End date
3	Mapping the Waqf Property in Rajasthan	Dr. Farhat Naz (Co-PI)	Ministry of Minority Affairs, Government of India	1 Crore	1 Jan 2022	31 Dec 2022
4	The Life and the After-Life of Political Crime: A Sociological Study of Law, Society and Human	Dr. Prasanjeet Tribhuvan (PI)	Seed Grant, IIT Jodhpur	6.7 Lakhs	20 February, 2022	February 2025
4	India Forest Policy	Dr. Farhat Naz	The German Government	5 Lakhs	1 Oct 2021	28 Feb 2023
5	India Forest Policy	Dr. Farhat Naz	The German Government	5 Lakhs	1 Oct 2021	28 Feb 2023

### Completed Projects

	Project title	PI/Co-PI	Sponsoring agency	Amount in Lakhs	Start date	End date
1	Elderly Health in the Context of Universal Health Coverage: A Cross-country Comparison between India and the United States.(2021-2022)	Dr. Alok Ranjan	United States India Educational Foundation (USIEF)	25.5 Lakhs	31 July 2021	30 March, 2022
<b>Outcome of the Project:</b> Report submitted; other publications are in the pipeline.						
2	Progress towards UHC and costing of healthcare facilities at Korba, Chhatisgarh.(2018-22)	Dr. Alok Ranjan (PI)	State Health Resource Centre, Chhatisgarh. Role	5 Lakhs	July 2018	December 2021
<b>Outcome of the Project:</b> Publications and Technical Report						
3	Social Isolation and Cognition: Interventions to reduce social isolation and loneliness amongst the Elderly (2019-2021). Funded by IMPRESS, ICSSR.	Dr. Suman Dhaka	IMPRESS, ICSSR	8 Lakhs	August 2019	October 2021
<b>Outcome of the Project:</b> 2 Publications, others are in the pipeline						
4	Pilot Project for Preparation of a Structural Conservation Proposal for Arulmigu Abathsakayeswarar Temple in Thukkatchi, Kumbakonam	Dr. Vidya Sarweswaran	HR&CE Department, Government of Tamil Nadu, National Centre for Safety of Heritage Structures (NCSHS), IIT Madras.	1 Crore	February 2020	April 2021
<b>Outcome of the Project:</b> Consultancy, Report submitted 'The significance of socio-cultural conversations in the context of conservation and restoration of temples: The Abathsahyeshwarar Temple'						



# Department of Mathematics

Mathematics, being the basis of many disciplines, is a subject that evolves with time and creates new theories to solve real-world challenging problems. The department has been taking a leading role in developing new methods to model such situations that can be used in diverse areas of computer science, engineering, and basic sciences. We are excited to offer high-quality programs at postgraduate level for students who wish to apply math to science or engineering such as a two-year M.Sc. program in Mathematics, a four-year M.Sc-M. Tech. program in Mathematics-Data and Computational Sciences, a two year M.Tech program in Data and Computational Sciences. We also offer an M.Tech-Ph.D. dual degree program in Data and Computational

Sciences and a Ph.D. Program with specialization in different areas of Mathematics to those who wish to earn a deeper understanding of pure and applied Mathematics. The department has faculty with research interests in the areas of Algebra, Lie Groups and its Applications, Cryptography and Network Security, Mathematical Physics, Fluid Dynamics, Scientific Computations, Optimization, Frame Theory, Numerical Analysis, Partial Differential Equations, Topological Dynamics, Low Dimensional Chaos, Dynamical Systems, Renormalization in Low-dimensional dynamics, Wavelet Analysis, Fractional Transform Theory, Image Processing, Financial Risk Analysis, Categorical Data Analysis, Reliability Theory and Applied Probability.

## Faculty Members

The following faculty members are associated with the department.



### Puneet Sharma

Associate Professor  
Head of Department

**Specialization/ Research interest:**  
Topological Dynamics, Low  
Dimensional Chaos



### Abhishek Sarkar

Assistant Professor

**Specialization/ Research interest:**  
Elliptic partial differential equations



### Dilpreet Kaur

Assistant Professor

**Specialization/ Research interest:**  
Algebra, Group Theory



### Gaurav Bhatnagar

Associate Professor

**Specialization/ Research interest:**  
Wavelet Analysis, Fractional Transform  
Theory, Multimedia Security, Image  
Processing, Information Fusion



### **Kirankumar R. Hiremath**

Associate Professor

**Specialization/ Research interest:**  
Theoretical, mathematical and computational aspects of wave-matter interactions



### **Md Abu Talhamainuddin Ansary**

Assistant Professor

**Specialization/ Research interest:**  
Numerical Optimization; Multi-objective Optimization; Interval Analysis



### **Moumita Mandal**

Assistant Professor

**Specialization/ Research interest:**  
Numerical Functional Analysis



### **Nil Kamal Hazra**

Assistant Professor

**Specialization/ Research interest:**  
Reliability Theory, Applied Probability



### **Sukhendu Ghosh**

Assistant Professor

**Specialization/ Research interest:**  
Hydrodynamic Instability; Differential Equations; Lie Groups Applications; Dynamical Systems



### **Tuhina Mukherjee**

Assistant Professor

**Specialization/ Research interest:**  
Analysis of Partial Differential Equations



### **Vivek Vijay**

Assistant Professor

**Specialization/ Research interest:**  
Financial Risk Analysis, Categorical Data Analysis, Regression



### **V. V. M. S. Chandramouli**

Assistant Professor

**Specialization/ Research interest:**  
Dynamical Systems, Renormalization in Low-Dim Dynamics



### **Vandana Sharma**

Assistant Professor

(till May 16, 2021)

**Specialization/ Research interest:**  
Reaction-Diffusion Systems, Parabolic Partial Differential Equations, and Mathematical Biology  
(The Department lost one of its promising faculty members due to sad demise of Dr. Vandana Sharma on May 16, 2021)

## Description of Research Groups

The department facilitates research groups in a variety of areas from pure and applied mathematics. A brief description of the same is given below:

- **Pure Mathematics:** Algebra, Analysis, Topological dynamics, Low dimensional chaos, Renormalization in low dimensional dynamics and analysis of partial differential equations, Numerical Functional Analysis, Approximation Methods, Operator Theory, Projection Methods for solving integral equations and Integro-Differential Equations, Frame theory
- **Applied Mathematics:** Hydrodynamic Stability Analysis, Lie Groups Applications, Mathematical Modelling, Finite frames for sparse representation, Pilot design for cellular and cell-free wireless communication systems, Run-time power management for embedded systems, Group testing, Cryptographic Boolean Functions, Cryptology, Quantum Encryption with Classical Communication, Multivariate Public-Key Cryptosystems, Broadcast encryption, Traitor tracing and revocation, Attribute-based encryption, Cloud computing, Internet of Things (IoT), Mathematical optics,
- **Probability-Statistics & Optimization:** Reliability, Applied Probability, Information Theory, Numerical Optimization, Sparse vector Optimization
- **Data Science:** Time Series Modeling, Reinforcement learning, Lightweight Neural Network
- **Computational Science:** Computational optics

## Academic Programmes

The department of Mathematics offers an undergraduate program in Artificial Engineering and Data Science jointly with the Department of Computer Science and Engineering. We also offer exciting high-quality programs at the postgraduate level such as a two-year M.Sc. program in Mathematics, a four-year M.Sc-M.Tech program in Mathematics-Data and Computational Sciences, and a two-year M.Tech

program in Data and Computational Sciences. We also offer an M.Tech-Ph.D. dual degree program in Data and Computational Sciences and a Ph.D. program specializing in different areas of Mathematics to those who wish to earn a deeper understanding of fundamentals of pure and applied Mathematics. The Department of Mathematics also offers a Minor Program in Data Science (DS) at the undergraduate level (for all the B.Tech. students of the institute except the students enrolled in B.Tech.(CSE), B.Tech.(AI&DE), and B.Tech. (EE) programs). The program facilitates the study of a multidisciplinary field that extensively uses statistics, predictive modeling, and machine learning without changing its application, irrespective of the domain. Moreover, the faculty members of the department actively participate in fulfilling the teaching and executional requirements of Executive M.Tech. program in Data and Computational Sciences (with the School of Artificial Intelligence and Data Science (AIDE)) and Executive M.Tech. program in Artificial Intelligence (with the Department of Computer Science and Engineering).

## Significant Research Achievements

The faculty members of the department have been making significant progress towards developing new methods to model and solve various problems that can be used in diverse areas of sciences, engineering and emerging technologies. Consequently, the faculty members have published research papers in some of the leading journals in their respective domains and have been awarded research projects by external agencies to continue research in different areas of fundamental and applied mathematics. A brief summary of the same is given below.

**Research Projects Awarded**

PI	Project title	Funding Agency	Total fund amount	Start Date	End Date	Fund received in FY 21-22
Nil Kamal Hazra	Some Important Problems on Information Measures	SERB	Rs. 660000	Feb.-2022	Feb.-2025	Rs. 220000
Nil Kamal Hazra	Towards More Realistic $\Delta$ -Shock Models and Their Applications	SERB	Rs. 1389344	Jan.-2022	Jan.-2024	Rs. 774672
Moumita Mandal	Spectral Methods for derivative dependent integral equations and integro-differential equations.	NBHM	15,14800/-	Jul.-2021	Jul.-2024	Rs 5,30,000
Moumita Mandal	Superconvergence Results for Integro-Differential Initial and Boundary Value Problems by Spectral Projection Methods	IITJ	1000000/-	Aug.-2021	Aug.-2024	Rs. 600000
Sukhendu Ghosh	Mathematical framework of secondary and nonlinear instabilities for complex flow systems	SERB	Rs. 15,26,844	Feb.-2022	Feb.-2024	Rs. 900922
Sukhendu Ghosh	Mathematical modelling of infectious diseases using surfactant dynamics	SERB	6,60,000/-	Mar.-2022	Mar.-2025	Rs. 220000
Abhishek Sarkar	Eigenvalue type problems related to linear and quasi-linear operators	DST	Rs. 35,00,000	Apr.-2019	Apr.-2024	Rs. 7,00,000
Puneet Sharma	On Graph Induced Symbolic Dynamics	SERB	Rs. 6,60,000	Feb.-2020	Feb.-2023	Rs. 2,20,000
Vivek Vijay	Virtually connecting village to nearby doctors including PHC through Videoconferencing	IIT Delhi	Rs. 80,000	Feb.-2022	Mar.-2023	Rs. 80,000



## Publications

- 1 Gupta, D., & Chandramouli, V. V. M. S. (2022b). Topological entropy of one-dimensional deformed maps. In Nandkeolyar R. & Sharma R.K. (Eds.), AIP Conf. Proc. (Vol. 2435). American Institute of Physics Inc. ISBN: 0094243X; 9780735441774 (ISBN). <https://doi.org/10.1063/5.0083735>
- 2 Kumar, R., Goyal, A., & Chandramouli, V. V. M. S. (2022). Repelling hyperbolic Cantor set of a bimodal map. In Nandkeolyar R. & Sharma R.K. (Eds.), AIP Conf. Proc. (Vol. 2435). American Institute of Physics Inc. ISBN: 0094243X; 9780735441774 (ISBN). <https://doi.org/10.1063/5.0083567>
- 3 Gupta, D., & Chandramouli, V. V. M. S. (2022a). Dynamics of deformed Hénon-like map. *Chaos, Solitons and Fractals*, 155. ISSN: 09600779. <https://doi.org/10.1016/j.chaos.2021.111760>
- 4 Hazra, N. K., Finkelstein, M., & Cha, J. H. (2022). On a hazard (failure) rate process with delays after shocks. *Statistics and Probability Letters*, 181. ISSN: 01677152. <https://doi.org/10.1016/j.spl.2021.109276>
- 5 Sharma, V., Prajapat, J. V., & Prajapat, J. V. (2022). Global existence of solutions to reaction diffusion systems with mass transport type boundary conditions on an evolving domain. *Discrete and Continuous Dynamical Systems- Series A*, 42(1), 109–135. ISSN: 10780947. <https://doi.org/10.3934/dcds.2021109>
- 6 Mukherjee, T., Pucci, P., & Xiang, M. (2022). Combined effects of singular and exponential nonlinearities in fractional kirchhoff problems. *Discrete and Continuous Dynamical Systems-Series A*, 42(1), 163–187. ISSN: 10780947. <https://doi.org/10.3934/dcds.2021111>
- 7 Gupta, D., & Chandramouli, V. V. M. S. (2021). An improved q-deformed logistic map and its implications. *Pramana - Journal of Physics*, 95(4). ISSN: 03044289. <https://doi.org/10.1007/s12043-021-02209-7>
- 8 Kumar, R., & Chandramouli, V. V. M. S. (2021a). Period tripling and quintupling renormalizations below C2SPACE. *Discrete and Continuous Dynamical Systems- Series A*, 41(12), 5633–5658. ISSN: 10780947. <https://doi.org/10.3934/dcds.2021091>
- 9 Maiti, S., Kumar, A., Jain, S., & Bhatnagar, G. (2021). A Novel Image Inpainting Framework Using Regression. *ACM Transactions on Internet Technology*, 21(3). ISSN: 15335399. <https://doi.org/10.1145/3402177>
- 10 Selvan, S. A., Ghosh, S., Behera, H., & Meylan, M. H. (2021). Hydroelastic response of a floating plate on the falling film: A stability analysis. *Wave Motion*, 104. ISSN: 01652125. <https://doi.org/10.1016/j.wavemoti.2021.102749>
- 11 Finkelstein, M., & Hazra, N. K. (2021). Generalization of the pairwise stochastic precedence order to the sequence of random variables. *Probability in the Engineering and Informational Sciences*, 35(3), 699–707. ISSN: 02699648. <https://doi.org/10.1017/S0269964820000145>
- 12 Hazra, N. K., & Misra, N. (2021). On relative aging comparisons of coherent systems with identically distributed components. *Probability in the Engineering and Informational Sciences*, 35(3), 481–495. ISSN: 02699648. <https://doi.org/10.1017/S0269964820000066>
- 13 Khan, M. B. M., Sani, M., Ghosh, S., & Behera, H. (2021). Poiseuille-Rayleigh-Bénard instability of a channel flow with uniform cross-flow and thermal slip. *Physics of Fluids*, 33(5). ISSN: 10706631. <https://doi.org/10.1063/5.0050006>
- 14 Kumar, R., & Chandramouli, V. V. M. S. (2021b). Renormalization of Symmetric Bimodal Maps with Low Smoothness. *Journal of Statistical Physics*, 183(2). ISSN: 00224715. <https://doi.org/10.1007/s10955-021-02764-8>
- 15 Goyal, S., & Mukherjee, T. (2021). Kirchhoff Equations with Choquard Exponential Type Nonlinearity Involving the Fractional Laplacian. *Acta Applicandae Mathematicae*, 172(1). ISSN: 01678019. <https://doi.org/10.1007/s10440-021-00402-9>

## Projects

### Sponsored Projects

S. No	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
1	Validation of Jodhpur Instrumented Kursi Against Dual Energy X-Ray Absorptiometry to Diagnose Sarcopenia in Older Indians	ICMR	Vivek Vijay	₹11,01,710	01-Oct-19	30-Sep-20
2	Eigenvalue type problems related to linear and quasi-linear operators	DST	Abhishek Sarkar	₹35,00,000	01-Apr-19	31-Mar-24
3	On Graph Induced Symbolic Dynamics	DST SERB	Puneet Sharma	₹6,60,000	21-Feb-20	20-Feb-23
4	A Study on Fractional Laplacian Operator with Hardy Type Potentials	DST-Inspire Faculty	PhD Student-Deepak Kumar Mahanta Mentor-Dr. Abhishek Sarkar & Dr. Tuhina Mukherjee	₹4,51,520	11-Jan-21	10-Jan-26
5	Spectral Methods for derivative dependent integral equations and integro-differential equations	NBHM	Moumita Mandal	₹15,14,800	23-Jul-21	22-Jul-24
6	Towards more realistic delta-shock models and their applications	SERB-SRG	Nil Kamal Hazra	₹13,89,344	24-Jan-22	23-Jan-24
7	Mathematical Framework of secondary and nonlinear instabilities for complex flow systems	SERB-SRG	Sukhendu Ghosh	₹15,26,844	04-Feb-22	03-Feb-24
8	Study of Some Important Problems on Information Measures	SERB-Mathematical Research Impact Centric Support (MATRICS)	Nil Kamal Hazra	₹6,60,000	18-Feb-22	17-Feb-25
9	Mathematical Modelling of infectious diseases using surfactant dynamics	SERB-Mathematical Research Impact Centric Support (MATRICS)	Sukhendu Ghosh	₹6,60,000	02-Mar-22	01-Mar-25
10	Virtually connecting village to nearby doctors including PHC through Videoconferencing	IIT Delhi	Vivek Vijay	₹80,000	03-Feb-22	31-Mar-23

## Consultancy Projects

S. No	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
1	M. Tech Executive DCS Program	IIT Jodhpur	Gaurav Bhatnagar	₹2,48,40,000	02-Oct-21	01-Oct-22

## Other Projects

S.No	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
1	TEW on Linear Algebra & Its Application	NCM	Dilpreet Kaur	₹1,45,800	19-Nov-20	13-Dec-20
2	Popular Talk on Bernstein Polynomials, Computer-Aided Geomet Design and Real Algebraic Applications	NCM	Dilpreet Kaur	₹9,937	12-Feb-20	12-Feb-20

## Closed Projects

### 1) Multimedia security based on biometrics for copyright protection and authentication

Science and Engineering Research Board (SERB)

PI: Gaurav Bhatnagar Rs.13.44 Lakhs Start Date: 13-Nov-2014 End Date: 01-Jul-2021

**Outcome:** The emphasis of the project is on development of new concepts, algorithm and techniques in multimedia security for copyright protection and authentication. The efforts have been made to extend the idea of multimedia security which can help to use biometrics as a proof for ownership, to examine the conditions for biometrics to be utilized for copyright protection and authentication of multimedia, and to investigate the properties of biometrics for multimedia security by forming a biometrically encoded bitstream from biometrics. The study also include integration of different biometric information and designing of guidelines for a more efficient, novel and economical watermarking system, which embeds biometrics bitstream invisibly in the host multimedia as a notice of legitimate ownership.

## Faculty/ Department Laurels

- Dr. Gaurav Bhatnagar is listed in the list of "WORLD RANKING OF TOP 2% SCIENTISTS" in the area of "Artificial Intelligence & Image Processing" (for both Career-long and Year 2020) according to the report published by Stanford University in August 2021.

## Student Laurels

- Mr. Tapesh Yadav has been offered a Ph.D. position (fully funded) at Department of Mathematics, University of Memphis, Tennessee in August 2021.

## Laboratories and equipment

The Department of Mathematics has set up a computational lab with 20 PCs to cater to the requirements of Masters students enrolled with the department.

## Outreach activities

- (1) Dr. Gaurav Bhatnagar served as Guest Editor for the Special Issue on "Computational Intelligence Techniques for Information Security and Forensics in IoT Environments" in the journal *Wireless Communications and Mobile Computing*, May 2021.
- (2) Dr Vivek Vijay delivered an Invited Talk on National Mathematics Day at Lachoo Memorial College, Jodhpur, 22 December 2021.
- (3) Dr Vivek Vijay delivered a talk in Symposium on Advancement of Research on Yagya at Dev Sanskriti University, Haridwar, 4 December 2021.
- (4) Dr. Sukhendu Ghosh delivered an invited talk in the IQAC-Sponsored Webinar MATHEMATICS FOR COMPUTING: RECENT TRENDS" at the Indas Mahavidyalaya, W.B., India during 7-8 October, 2021.
- (5) Dr. Sukhendu Ghosh delivered an invited talk on "Applications of Linear Algebra and Numerical Analysis on Hydrodynamics" at the Pandit Deendayal Energy University, Gandhinagar, India on 28th November, 2021.
- (6) Dr. Sukhendu Ghosh delivered an invited talk on "Use of Linear Algebra and Numerical Analysis in Hydrodynamics" at the KPR Institute of Engineering and Technology, Coimbatore, India on 2nd February, 2022.
- (7) Dr. Sukhendu Ghosh delivered a lecture in the Mathematics Webinar organized by Department of Mathematics, Ramnagar College, W.B, India on 27th March 2022.
- (8) Dr. Tuhina Mukherjee delivered an invited talk in IITG Mathematics Seminar Series (Webinar) on January 18, 2022.
- (9) Dr. Moumita Mandal was the member of the Technical Program Committee of the International Conference on Mathematics and Computing (ICMC) conference held on Mar 02, 2021 - Mar 05, 2021 at IEST, Shibpur, Kolkata , India.
- (10) Dr. Moumita Mandal was the member of the Technical Program Committee and session chair of the International Conference on Mathematics and Computing (ICMC) conference held on Jan 6, 2022- Jan 8, 2022 at VIT Vellore, Tamil Nadu, India.
- (11) Dr. Moumita Mandal becomes the Member of Allahabad Mathematical Society (A.I.M.S.), Affiliate Member of American Mathematical Society, Life Member of INDIAN MATHEMATICAL SOCIETY, and Ramanujan Mathematical Society since 2021.
- (12) Dr. V.V.M.S. Chandramouli served as Mathematical Reviewer, American Mathematical Society, Jan' 2021-till date.
- (13) K. R. Hiremath, Expert talk on 'Computational methods for electromagnetics and photonics devices', AICTE QIP Sponsored Short Term Course Microwave and Photonic Devices and Modeling at IIT Bhubaneswar, June 22, 2021
- (14) K. R. Hiremath, Invited talk on 'Coupled Mode Theory, 5th workshop on Optics and Photonics: Theory and computational techniques IIT Delhi, December 26-27, 2021

# Department of Mechanical Engineering

The Department of Mechanical Engineering at IIT Jodhpur is devoted to impart quality engineering education and pursue the excellence in research. It is dedicated to prepare students to face the emerging challenges of forthcoming decades. The vision of the Department is to attain synchronous evolution of pedagogical pursuit and research initiatives to nurture young minds finding technological solutions for emerging engineering challenges. The department offers B. Tech. M. Tech. and Ph.D. in Mechanical Engineering within three broader domains of Thermofluids, Design and Smart Manufacturing. Looking at the diaspora of current and futuristic technology demand, the following four specializations are envisioned to be nurtured and expanded by the Department, namely (i) Micro-Nano Engineering (ii) Energy Engineering, (iii) Design Engineering, and (iv) Smart Manufacturing. The students also have the opportunity to work with interdisciplinary specializations in emerging areas like Artificial Intelligence (AI), Internet of things (IoT), Smart Healthcare, and Cyber-Physical Systems (CPS). The flexible curriculum structure of the Department also allows and encourages undergraduate students to pursue a management or entrepreneurial career.

At IIT Jodhpur, mechanical engineers are educated in a way not only to adapt but to define direct change. This is reflected in the portfolio of the current activities of the department. Faculty members are involved in a wide range of projects in the areas of energy conversion and power systems, heat transfer and fluid mechanics, mechanics of solid, mechanical vibrations, robotics, autonomous unmanned vehicles, design optimization, acoustics and noise control, control systems, rotor dynamics, nano-materials, biomechanics, bio-inspired thermofluids, fluid-structure interaction, conventional/nonconventional manufacturing, and multi-scale manufacturing to name a few. Additionally, efforts are being made to introduce advanced concepts like smart manufacturing, Industry 4.0, smart scientific computing techniques, high-performance computing, applications of artificial intelligence, machine learning algorithms, sensors, and IoT as a part of solving interdisciplinary problems requiring mechanical engineering knowhow. Keeping a balance between theory and hands-on experience, the department intends to provide its students with a solid foundation in core as well as emerging areas of mechanical engineering by inspiring critical thinking and nurturing problem-solving skills.

## Technology Tracks include the following:

1. Smart Manufacturing and Industry 4.0	7. Energy and Sustainability
2. Multi-scale Manufacturing	8. Solid Mechanics and Design
3. Processing of Novel Materials	9. Vibration and Acoustics
4. Fluid Thermal System Design	10. Robotics and Mobility Systems
5. Multiphase Flows	11. Aerodynamics
6. Microfluidics	12. MEMS

The following Faculty Members are associated with the department:

## Faculty Members



### Prodyut R. Chakraborty

Head of the Department  
**Specialization/ Research interest:**  
 Heat and mass transfer, Latent heat-based storage device for high temperature applications, Alloy solidification process, Active and passive solar cooling systems, Electronic cooling



### Hardik B. Kothadia

**Specialization/ Research interest:**  
 Multiphase Flow, Boiling and Condensation, Heat Transfer, Fluid Mechanics, Gasification



### Anand Krishnan Plappally

**Specialization/ Research interest:**  
 Water, Water Management and Characterization of Engineered Materials



### Kaushalkumar A. Desai

**Specialization/ Research interest:**  
 Modeling of Manufacturing Processes, CAD/CAM, CNC Machining, Error compensation



### Barun Pratiher

**Specialization/ Research interest:**  
 Dynamics of Machines and Structures, Flexible Robots, MEMS, Rotor Dynamics, Nonlinear Oscillations



### Rahul Chibber

**Specialization/ Research interest:**  
 Welding and joining, Manufacturing and materials processing, Mechanical behaviour of materials



### B. Ravindra

**Specialization/ Research interest:**  
 Design, Dynamics, Vibration and Control



### Suril V. Shah

**Specialization/ Research interest:**  
 Robotics, Multibody Dynamics and Control



### Amrita Puri

**Specialization/ Research interest:**  
 Active noise control; Active vibration control; Experimental modal analysis; Acoustics



### Sudipto Mukhopadhyay

**Specialization/ Research interest:**  
 Energy Technology, Combustion Technology, Computational Fluid Dynamics, Turbulent flows, Sprays



### Atul Kumar Sharma

**Specialization/ Research interest:**  
 Solid Mechanics; Continuum Mechanics; Computational Solid Mechanics; Mechanics of Soft Active Materials; Wave Propagation in Soft Active Composite Materials; Topology Optimization



### Nipun Arora

**Specialization/ Research interest:**  
 Flapping wing aerodynamics; Fluid-structure interaction; CFD with Lattice Boltzmann method; Turbulence and moving boundary simulations; High performance computing; Electrorheological Fluids



### Chandan Pandey

**Specialization/ Research interest:** Welding, Heat treatment, Nuclear grade material, Mechanical behavior of materials, Material processing



### Shobhana Singh

**Specialization/ Research interest:** Thermal energy systems: Thermal energy storage, Solar dryers, Heat pumps, Heat exchangers; Heat and mass transfer analysis; Dynamic and multiphysics modeling; Computational fluid dynamic modeling; System and design optimization; Renewable energy integration; Electrochemical carbon capture



### Arun Kumar, R.

**Specialization/ Research interest:** Experimental Aerodynamics - Confined Jets, Shock Wave Reflection and Transitions, Ejector Flows



### Shrutidhara Sarma

**Specialization/ Research interest:** Thin film nanocomposite temperature sensors, nanocomposite materials, flexible sensors



### Ankur Gupta

**Specialization/ Research interest:** Microsystems Fabrication



### Ashish Pathak

**Specialization/ Research interest:** Fluid-Structure Interaction; Ocean Energy; Phase-Change Problems; Multiphase flows; High Performance Computing



### Jayant Kumar Mohanta

**Specialization/ Research interest:** Planar Parallel manipulators; Lower limb rehabilitation robots; Medical robotics; Robot manipulator kinematic and dynamic control, Mechanism design and Analysis



### Prof. C. S. Upadhyay

Department of Aerospace Engineering, IIT Kanpur is spending his sabbatical at the Department of Mechanical Engineering, IIT Jodhpur

**Specialization/ Research interest:** Solid Mechanics, Adaptive Finite Element Methods, Structural Optimization

The following Faculty Members joined the department during this year.



**Harshal Akolekar**

**Specialization/ Research interest:**  
 Aerodynamics; Computational Fluid Dynamics; Machine Learning; Submarine Hydrodynamics; Turbomachinery



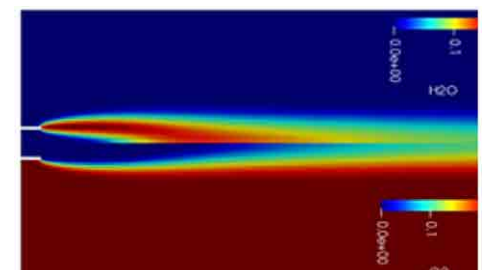
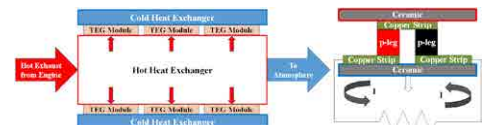
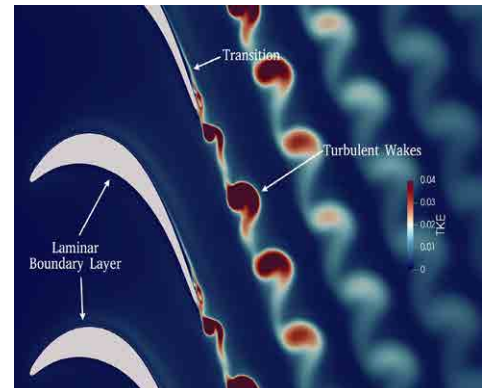
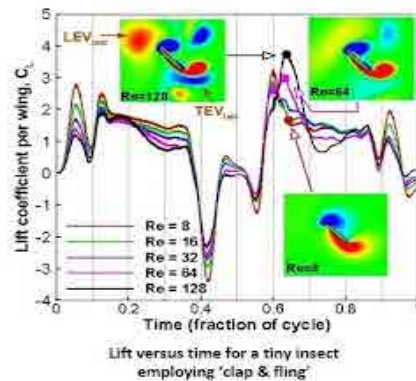
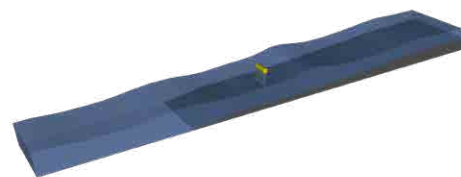
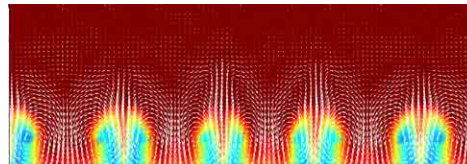
**Ashok Joshi**

**Specialization/ Research interest:**  
 Dynamics & Control of Flexible Vehicles; Navigation & Guidance; Space Mechanics; Unmanned Systems and Swarms

## Description of Research Groups

### Computational fluid dynamics (CFD) group

Computational Fluid Dynamics (CFD) solvers allow us to investigate flow fields, structures and field distributions which may be difficult to access experimentally. This gives researchers a unique insight into a physical phenomena or how different phenomena are interacting with one another. The Mechanical Engineering department now consists of a dynamic CFD group. The faculty members in the group include Dr. Prodyut Ranjan Chakaborty , Dr. Sudipto Mukhopadhyay, Dr. Nipun Arora, Dr. Shobana Singh, Dr. Harshal Akolekar and Dr. Ashish Pathak. The faculty members are currently supervising projects on a diverse range of topics that includes thermal energy storage, water management, waste heat recovery, fluid-



structure interaction problems such as flapping wings and ocean wave energy converters, combustion & propulsion, turbomachinery and machine learning based turbulence modeling.



### Welding Research Group

In advanced ultra-supercritical (AUSC) power plants, the dissimilar joint between ferritic/martensitic grade steel and Ni-based superalloy (Inconel 617) suffers from several issues like mismatch in coefficient of thermal expansion (CTE), mismatch in microstructure, chemical composition, and mechanical properties, and migration of elements across the weld interface during welding and service condition. The problems are mainly mitigated by using the Ni-based superalloy filler like IN617, IN625, and IN82. The faculty members in the group include Dr. Chandan Pandey and Dr. Rahul Chhibber. The welding research group of IIT Jodhpur is currently working on welding problems associated with dissimilar joints for power plants, chemical, nuclear and aerospace industries. The research interest includes the evaluation of residual stresses in dissimilar weldments, structural integrity assessment of the welded joint and development of the various type of fluxes and consumables for the shielded metal arc welding (SMAW) process.

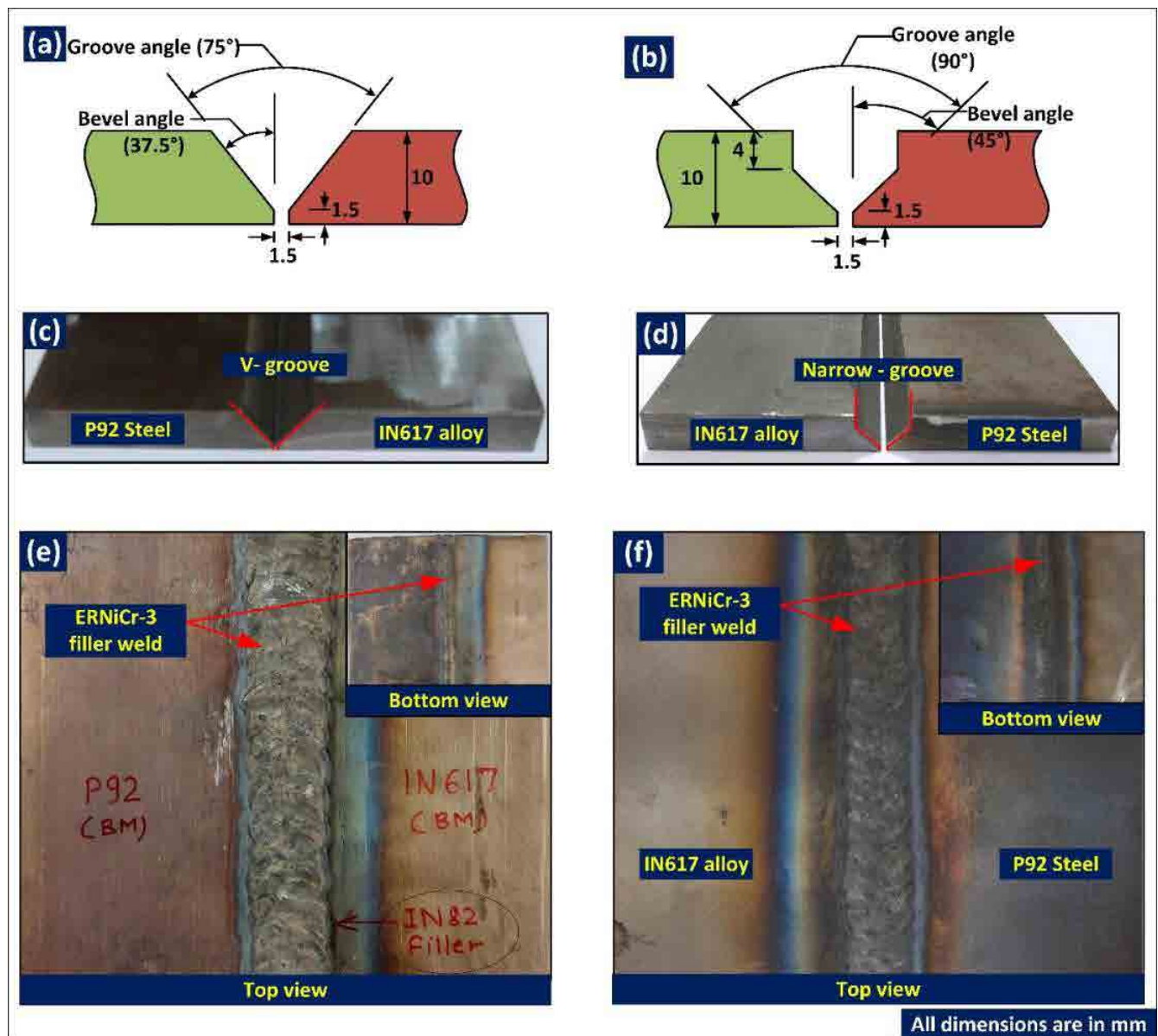


Fig. Groove details: (a) conventional V groove (b) narrow V groove; (c, and d); (e and f) welded plate front and back view.

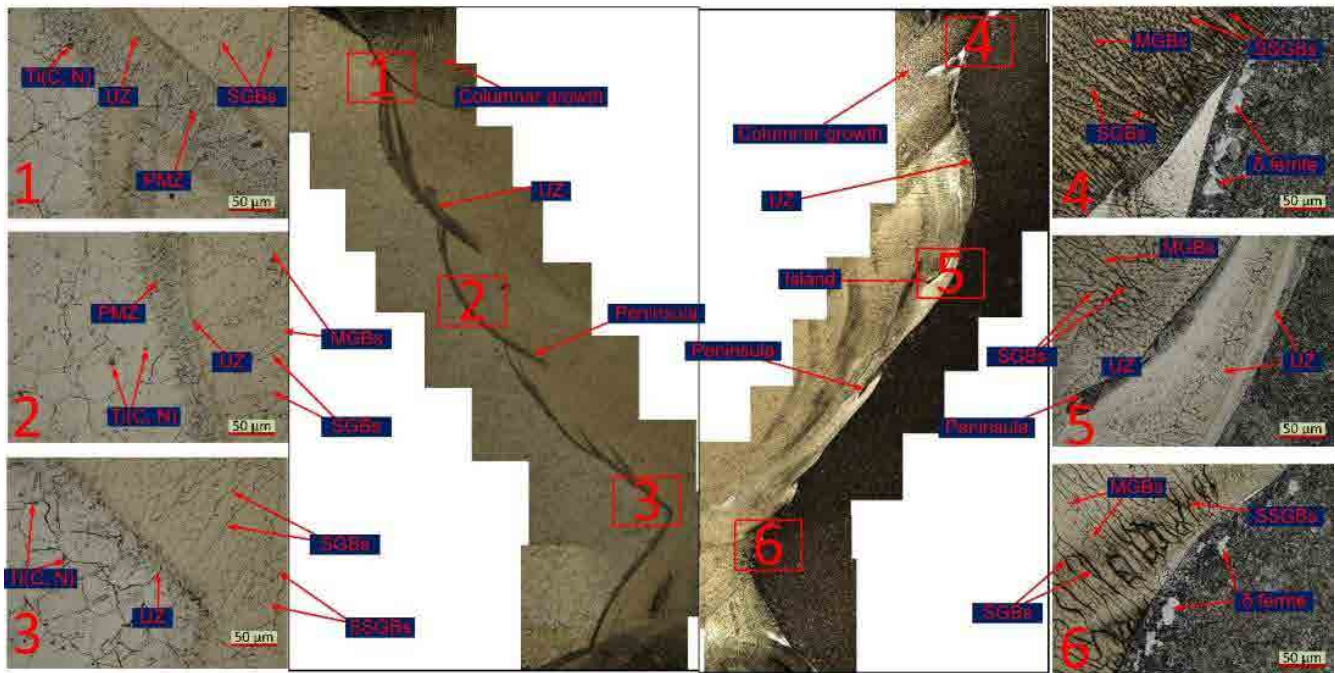


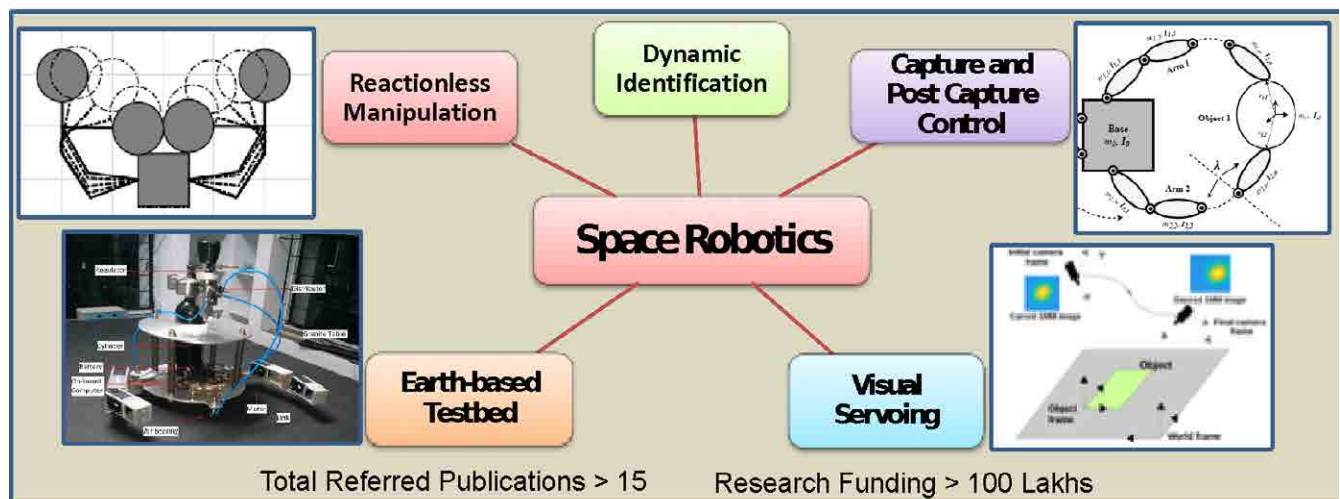
Fig. Metallographic microstructures on both the side of the interface for narrow groove.

### Robotics group

At IIT jodhpur, research activities have been undertaken in space and mobile robotics. The Faculty Members in this group are Dr. Suril Shah and Dr. Jayant Mohanta. A brief overview of key contributions in these areas is highlighted next.

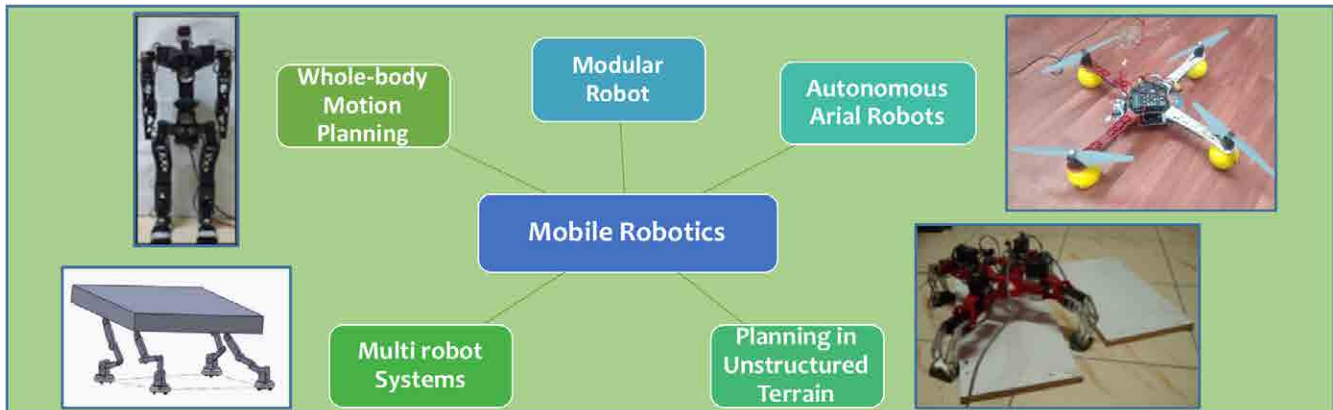
### Research on Space Robotics

Research activities have been undertaken in reactionless manipulation, capture and post-capture control, vision-based control, dynamic identification and earth-based prototype development



## Research on Mobile Robotics

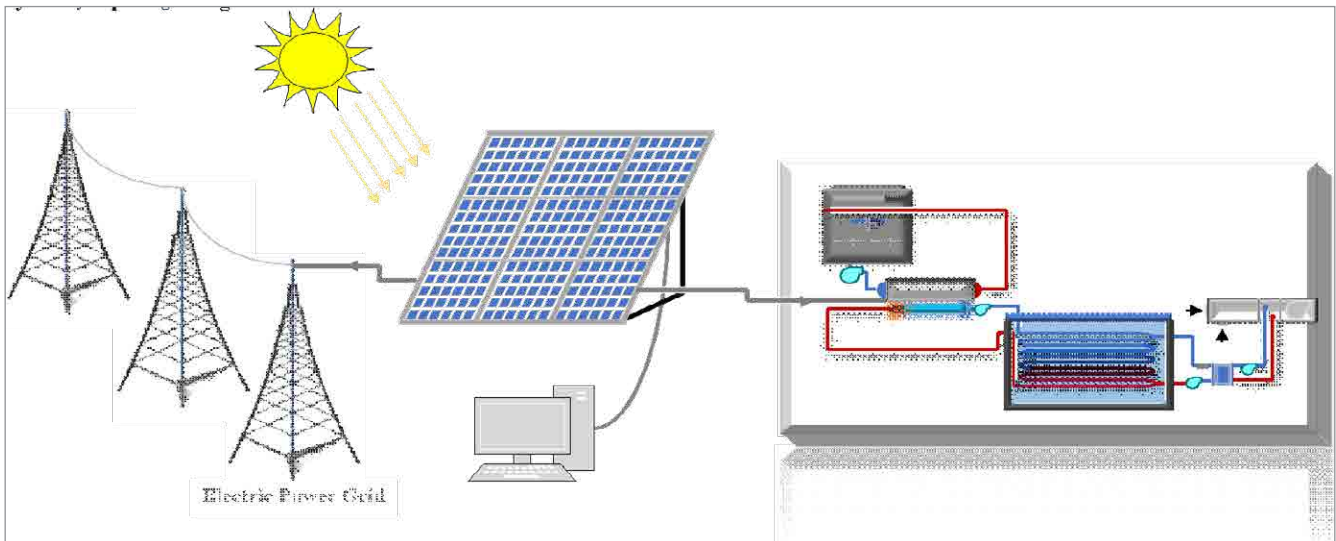
Research activities have been undertaken in the control of multi-robot systems, design of modular robots, autonomous aerial robots, and motion planning and control of legged robots.



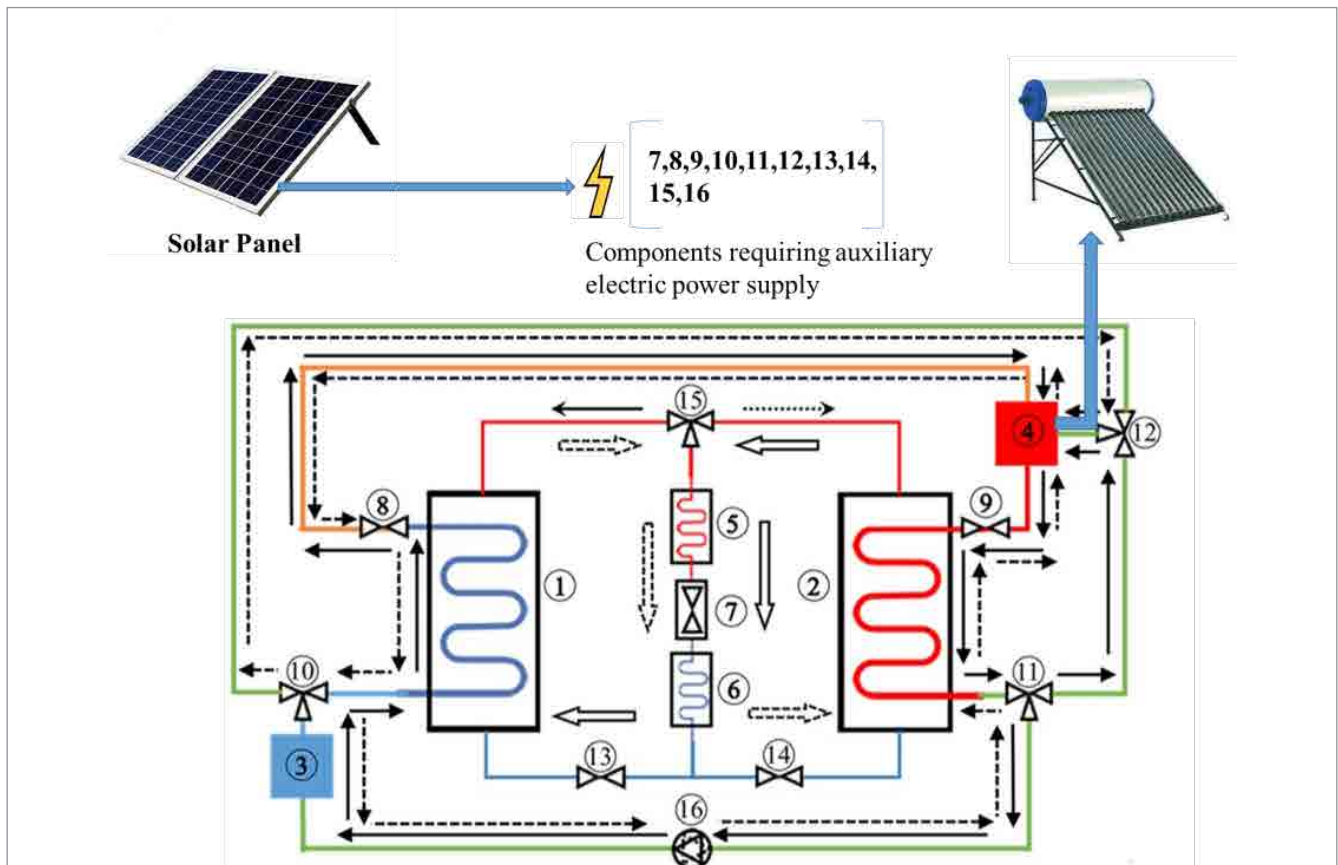
## Solar Thermal Energy Group

Solar energy plays a key role in future advancement and transition of the global energy system. With the rapid integration of solar energy, applied science and engineering research and development in the areas of solar energy are required. The Solar Thermal Energy Group in the Department of Mechanical Engineering, IIT Jodhpur carries out research and development targeted at improving thermal science and engineering applied to solar renewable energy technologies. The primary research focus is on high-temperature heat and mass transfer phenomena and multi-phase flows with applications in solar thermal power, energy storage, and energy conversion processes. The group has a strong team of faculty members and research scholars working on diverse solar thermal systems, such as thermal energy storage, parabolic dish concentrator, central receiver, solar dryer, solar cooker, etc.

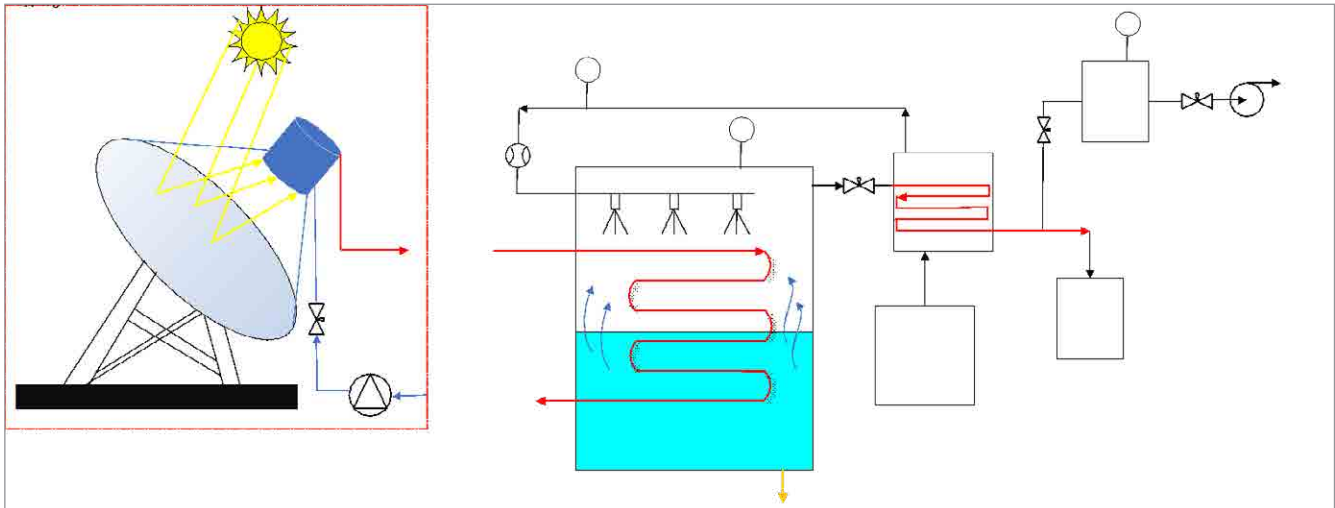
The unique laboratory facilities in the department enable the group to pursue highly innovative projects on technology advancements and train young engineers in the field of sustainable solar energy technologies. Energy Conversion and Storage Research (ECSR) Lab combines the multiphysics approach with CFD to study thermal energy systems and conversion technologies. The lab develops objective-oriented CFD models to investigate the thermal-hydraulic behavior of energy systems. The current research focuses on the design and development of thermal energy storage (TES) for high-temperature solar energy applications using solid storage media such as concrete, rocks, and ceramic that have a minimal environmental impact. The lab is also engaged in developing thermoelectric devices to tap the solar thermal energy, including waste heat for direct conversion into electricity. Additionally, the lab has developed passive solar dryer systems using low-cost materials for solar heat collection and efficient drying of food products for long-term storage. The Faculty Members in this group are Dr. Prodyut Ranjan Chakraborty, Dr. Hardik Kothadia and Dr. Shobhana Singh.



Schematic of the proposed system involving Solar PV, Ammonia based VCERS, CEG-Water/Ice Composite Cold Energy Storage, Building Cooling and Power Grid.



Schematic of the solar adsorption cooling/heating demonstration unit.



Solar based flash evaporation desalination system for saline water / industry wastewater treatment.

### Microsystems Research Group

Microsystems research group in the department of mechanical engineering at IIT Jodhpur explores innovative and inexpensive fabrication methods for microsystems for wide range of applications. Through various research problems-in-hand, faculty members have found out the cost effective methodology to realize embedded high aspect nanostructures, nano-porous films for various applications viz., sensors, water treatment etc. as well as worked on various microsystems design and development. Working in the interdisciplinary area, the group is focussing on microsystems design and development in collaboration with the researchers of other department and institutes. The Faculty Members in this group are Dr. Ankur Gupta and Dr. Shrutidhara Sarma.



## Flapping wing MAV group

Micro air vehicles (MAVs) or drones have carved a niche as a new class of aerial robots, with immediate interests in military and civilian applications such as reconnaissance, surveillance, rescue operations, field surveys, food and package delivery, pesticide spray, etc. The major portion of the market share is dominated by the rotary wing drones. Flapping wing drones are the emerging popular ones, though a segment of these inspired by natural flyers have seen a renewed interest among aerodynamicists and researchers for their better manoeuvrability and flight control. The majority of species in this research involve insects, which operate in unfavourable aerodynamic conditions such as low Reynolds numbers generating low lift to drag ratios. Despite their low lift to drag ratios, insects sustain their flight by adhering to high flapping frequencies and employing diverse flapping trajectories. The MAVs share similar dimensions and operating conditions as natural flyers, and their fabrication thus requires understanding the various complex aerodynamic phenomena associated with flapping flight. Our group is envisaged in developing the next generation bio-inspired flapping wing MAVs. The Faculty Members in this group are Dr. Nipun Arora and Dr. C Venkatesan.

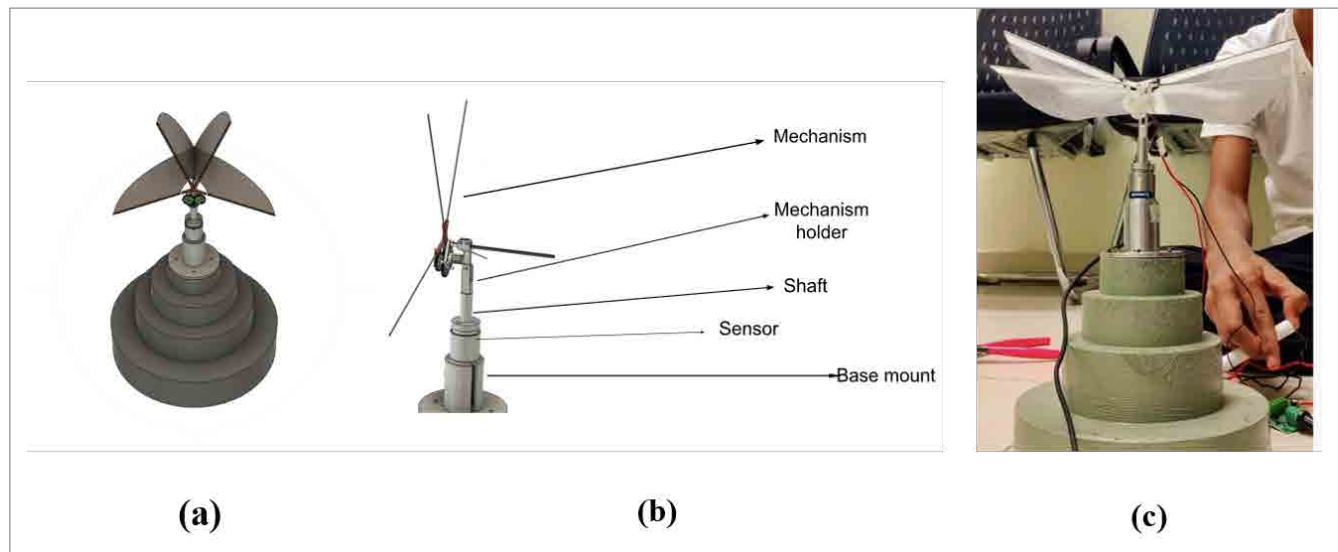


Figure 1. The experimental setup for aerodynamic lift and moment measurement of an indigenously developed flapping wing MAV.

## Mechanical Design, Vibration and Control Group

Design and analysis of vibrating mechanical systems is important in a number of engineering problems. Both numerical and experimental analysis of acoustics and vibrations in mechanical systems help in ensuring safety and compliance with national and international standards. The Mechanical Engineering department now consists of group of faculty members in the group that include Dr. Barun Pratiher, Dr. Amrita Puri, Dr. Atul Sharma, Dr. B. Ravindra, Dr. C. Venkatesan, Dr. Ashok Joshi. The faculty members with their graduate students are currently supervising projects on a diverse range of topics that includes rotor dynamics, modal analysis, helicopter dynamics, and vehicle dynamics.



**Academic Programmes**

Course	Number of Students
Btech	76
Mtech TFE	20
Mtech AMD	20
Mtech_PhD	0
PhD	8

**Significant Research Achievements**

S. No.	Technology	Faculty Member
1	G filter Developed	Anand Plappally
2	SSPV Developed	Anand Plappally

## Publications

- 1 Singh, S. K., & Arun, K. R. (2022). A Parametric Study on the Fluid Dynamics and Performance Characteristic of Micronozzle Flows. *Journal of Fluids Engineering, Transactions of the ASME*, 144(3). ISSN: 00982202. <https://doi.org/10.1115/1.4052546>
- 2 Shinde, S., Mukhopadhyay, S., & Mukhopadhyay, S. (2022). INVESTIGATION OF FLOW IN AN IDEALIZED CURVED ARTERY: COMPARATIVE STUDY USING CFD AND FSI WITH NEWTONIAN AND NON-NEWTONIAN FLUIDS. *Journal of Mechanics in Medicine and Biology*, 22(2). ISSN: 02195194. <https://doi.org/10.1142/S0219519422500105>
- 3 Biswal, H. J., Srivastava, T., Vundavilli, P. R., & Gupta, A. (2022). Facile fabrication of hydrophobic ZnO nanostructured nickel microtubes through pulse electrodeposition as promising photocatalyst for wastewater remediation. *Journal of Manufacturing Processes*, 75, 538–551. ISSN: 15266125. <https://doi.org/10.1016/j.jmapro.2022.01.001>
- 4 Kumar, A., & Pandey, C. (2022). Autogenous laser-welded dissimilar joint of ferritic/martensitic P92 steel and Inconel 617 alloy: mechanism, microstructure, and mechanical properties. *Archives of Civil and Mechanical Engineering*, 22(1). ISSN: 16449665. <https://doi.org/10.1007/s43452-021-00365-6>
- 5 Khurana, A., Kumar, D., Sharma, A. K., & Joglekar, M. M. (2022). Static and dynamic instability modeling of electro-magneto-active polymers with various entanglements and crosslinks. *International Journal of Non-Linear Mechanics*, 139. ISSN: 00207462. <https://doi.org/10.1016/j.ijnonlinmec.2021.103865>
- 6 Kishnani, V., Park, S., Nakate, U. T., Mondal, K., & Gupta, A. (2022). Nano-functionalized paper-based IoT enabled devices for point-of-care testing: a review. *Biomedical Microdevices*, 24(1). ISSN: 13872176. <https://doi.org/10.1007/s10544-021-00588-7>
- 7 Sirohi, S., Gupta, A., Pandey, C., Vidyarthi, R. S., Guguloth, K., & Natsu, H. (2022). Investigation of the microstructure and mechanical properties of the laser welded joint of P22 and P91 steel. *Optics and Laser Technology*, 147. ISSN: 00303992. <https://doi.org/10.1016/j.optlastec.2021.107610>
- 8 Sirohi, S., Kumar, S., Bhanu, V., Pandey, C., & Gupta, A. (2022). Study on the Variation in Mechanical Properties along the Dissimilar Weldments of P22 and P91 Steel. *Journal of Materials Engineering and Performance*, 31(3), 2281–2296. ISSN: 10599495. <https://doi.org/10.1007/s11665-021-06306-x>
- 9 Kumar, K., & Singh, S. (2022). Investigating Thermal Stratification in a Hot Water Storage Tank during Charging Mode. In Sikarwar B.S., Tyagi R.K., Phanden R.K., Shukla A.K., & Chouhan M.K. (Eds.), *J. Phys. Conf. Ser.* (Vol. 2178). IOP Publishing Ltd. ISBN: 17426588. <https://doi.org/10.1088/1742-6596/2178/1/012001>
- 10 Rai, S., & Singh, S. (2022). Performance Enhancement of Finned Tube Heat Exchanger using New Vortex Generator. In Sikarwar B.S., Tyagi R.K., Phanden R.K., Shukla A.K., & Chouhan M.K. (Eds.), *J. Phys. Conf. Ser.* (Vol. 2178). IOP Publishing Ltd. ISBN: 17426588. <https://doi.org/10.1088/1742-6596/2178/1/012002>
- 11 Sunilkumar, P., Mohan, S., Mohanta, J. K., Wenger, P., & Rybak, L. (2022). Design and motion control scheme of a new stationary trainer to perform lower limb rehabilitation therapies on hip and knee joints. *International Journal of Advanced Robotic Systems*, 19(1). ISSN: 17298806. <https://doi.org/10.1177/17298814221075184>
- 12 Agarwal, A., & Desai, K. A. (2022). Effect of component configuration on geometric tolerances during end milling of thin-walled parts. *International Journal of Advanced Manufacturing Technology*, 118(11–12), 3617–3630. ISSN: 02683768. <https://doi.org/10.1007/s00170-021-08185-x>



- 13 Biswal, H. J., Vundavilli, P. R., & Gupta, A. (2022). Fabrication and Characterization of Nickel Microtubes through Electroforming: Deposition Optimization Using Evolutionary Algorithms. *Journal of Materials Engineering and Performance*, 31(2), 1140–1154. ISSN: 10599495. <https://doi.org/10.1007/s11665-021-06223-z>
- 14 Kumar, A., & Hardik, B. K. (2022). Heat transfer distribution and pressure fluctuations during flow boiling in a pipe with different orientations. *Applied Thermal Engineering*, 201. ISSN: 13594311. <https://doi.org/10.1016/j.applthermaleng.2021.117822>
- 15 Sharma, A. K., Kosta, M., Shmuel, G., & Amir, O. (2022). Gradient-based topology optimization of soft dielectrics as tunable phononic crystals. *Composite Structures*, 280. ISSN: 02638223. <https://doi.org/10.1016/j.compstruct.2021.114846>
- 16 Sharma, A., Parth, P., Shobhana, S., Bobin, M., & Hardik, B. K. (2022). Numerical study of ice freezing process on fin aided thermal energy storage system. *International Communications in Heat and Mass Transfer*, 130. ISSN: 07351933. <https://doi.org/10.1016/j.icheatmasstransfer.2021.105792>
- 17 Kumar, S., Sharma, A., Pandey, C., Basu, B., & Nath, S. K. (2022). Impact of Subsequent Pass Weld Thermal Cycles on First-Pass Coarse Grain Heat-Affected Zone's Microstructure and Mechanical Properties of Naval Bainitic Steel. *Journal of Materials Engineering and Performance*, 31(1), 390–399. ISSN: 10599495. <https://doi.org/10.1007/s11665-021-06177-2>
- 18 Kumar, V. D., Upadhyay, V. K., Singh, G., Mukhopadhyay, S., & Chandra, L. (2022). Open volumetric air receiver: An innovative application and a major challenge. *Wiley Interdisciplinary Reviews: Energy and Environment*, 11(1). ISSN: 20418396. <https://doi.org/10.1002/wene.404>
- 19 Sirohi, S., Taraphdar, P. K., Dak, G., Pandey, C., Sharma, S. K., & Goyal, A. (2021). Study on evaluation of through-thickness residual stresses and microstructure-mechanical property relation for dissimilar welded joint of modified 9Cr–1Mo and SS304H steel. *International Journal of Pressure Vessels and Piping*, 194. ISSN: 03080161. <https://doi.org/10.1016/j.ijpvp.2021.104557>
- 20 Dayam, S., Desai, K. A., & Kuttolamadom, M. (2021). In-process dimension monitoring system for integration of legacy machine tools into the industry 4.0 framework. *Smart and Sustainable Manufacturing Systems*, 5(1), 242–263. ISSN: 25206478. <https://doi.org/10.1520/SSMS20210021>
- 21 Yadav, A., Mondal, K., & Gupta, A. (2021). Biomedical application of ZnO nanoscale materials. In *Met. Oxides for Biomed. and Biosens. Appl.* (pp. 407–435). Elsevier. ISBN: 9780128230589. <https://doi.org/10.1016/B978-0-12-823033-6.00014-4>
- 22 Kishnani, V., Mondal, K., & Gupta, A. (2021). Introduction to metal oxide-based biosensing. In *Met. Oxides for Biomed. and Biosens. Appl.* (pp. 169–182). Elsevier. ISBN: 9780128230589. <https://doi.org/10.1016/B978-0-12-823033-6.00005-3>
- 23 Mangla, B., Dwivedi, N. K., Sharma, D. K., Bardhan, A., Rajput, A., & Singh, S. (2021). Low latitude, topside ionosphere composition and its variation with changeable solar activity. *Indian Journal of Radio and Space Physics*, 50(4), 190–197. ISSN: 03678393.
- 24 Verma, G., Mondal, K., & Gupta, A. (2021). Si-based MEMS resonant sensor: A review from microfabrication perspective. *Microelectronics Journal*, 118. ISSN: 00262692. <https://doi.org/10.1016/j.mejo.2021.105210>
- 25 Sirohi, S., Pandey, C., & Goyal, A. (2021a). Corrigendum to “Role of the Ni-based filler (IN625) and heat-treatment on the mechanical performance of the GTA welded dissimilar joint of P91 and SS304H steel” [*J Manuf Process* 65 (2021) 2717] (*Journal of Manufacturing Processes* (2021) 65 (174–189), (S152661252100195X), (10.1016/j.jmapro.2021.03.029)). *Journal of Manufacturing*

- Processes, 72, 594–595. ISSN: 15266125. <https://doi.org/10.1016/j.jmapro.2021.10.004>
- 26 Phadatare, H. P., & Pratiher, B. (2021b). Nonlinear dynamics and chaos of a multi-disk rotating shaft undergoing large deflection mounted on a moving support. *International Journal of Non-Linear Mechanics*, 137. ISSN: 00207462. <https://doi.org/10.1016/j.ijnonlinmec.2021.103819>
- 27 Kishnani, V., Verma, G., Pippara, R. K., Yadav, A., Chauhan, P. S., & Gupta, A. (2021). Highly sensitive, ambient temperature CO sensor using tin oxide based composites. *Sensors and Actuators A: Physical*, 332. ISSN: 09244247. <https://doi.org/10.1016/j.sna.2021.113111>
- 28 Kumar, R., Sharma, L., Chhibber, R., Dixit, A., & Singhal, R. (2021). Environmental Degradation of Glass Fiber-Reinforced Nanocomposites with Self-Healing Reinforcement in Polymer Matrix for Wind Turbine Blade Application. *Transactions of the Indian Institute of Metals*, 74(12), 3119–3133. ISSN: 09722815. <https://doi.org/10.1007/s12666-021-02361-z>
- 29 Khurana, A., Kumar, D., Sharma, A. K., & Joglekar, M. M. (2021b). Nonlinear oscillations of particle-reinforced electro-magneto-viscoelastomer actuators. *Journal of Applied Mechanics, Transactions ASME*, 88(12). ISSN: 00218936. <https://doi.org/10.1115/1.4051911>
- 30 Kumar R, A., & Pathak, V. (2021). Shock wave mitigation using zig-zag structures and cylindrical obstructions. *Defence Technology*, 17(6), 1840–1851. ISSN: 22149147. <https://doi.org/10.1016/j.dt.2020.10.001>
- 31 Sharma, L., & Chhibber, R. (2021b). Investigations of Surface Properties of SAW Fluxes Using CaO-SiO<sub>2</sub>-TiO<sub>2</sub> & Al<sub>2</sub>O<sub>3</sub>-CaO-SiO<sub>2</sub> Ternary Phase Systems. *Silicon*, 13(12), 4623–4631. ISSN: 1876990X. <https://doi.org/10.1007/s12633-020-00787-6>
- 32 Agarwal, A., & Desai, K. A. (2021). Rigidity Regulation Approach for Geometric Tolerance Optimization in End Milling of Thin-Walled Components. *Journal of Manufacturing Science and Engineering, Transactions of the ASME*, 143(11). ISSN: 10871357. <https://doi.org/10.1115/1.4051008>
- 33 Kumar, K., & Singh, S. (2021). Investigating thermal stratification in a vertical hot water storage tank under multiple transient operations. *Energy Reports*, 7, 7186–7199. ISSN: 23524847. <https://doi.org/10.1016/j.egy.2021.10.088>
- 34 Sauraw, A., Sharma, A. K., Fydrych, D., Sirohi, S., Gupta, A., Świerczyńska, A., ... Rogalski, G. (2021). Study on microstructural characterization, mechanical properties and residual stress of gtaw dissimilar joints of p91 and p22 steels. *Materials*, 14(21). ISSN: 19961944. <https://doi.org/10.3390/ma14216591>
- 35 Sheshkar, N., Verma, G., Pandey, C., Sharma, A. K., & Gupta, A. (2021). Enhanced thermal and mechanical properties of hydrophobic graphite-embedded polydimethylsiloxane composite. *Journal of Polymer Research*, 28(11). ISSN: 10229760. <https://doi.org/10.1007/s10965-021-02774-w>
- 36 Kumar, S., Kasyap, P., Pandey, C., Basu, B., & Nath, S. K. (2021). Role of heat inputs on microstructure and mechanical properties in coarse-grained heat-affected zone of bainitic steel. *CIRP Journal of Manufacturing Science and Technology*, 35, 724–734. ISSN: 17555817. <https://doi.org/10.1016/j.cirpj.2021.09.002>
- 37 Bhanu, V., Fydrych, D., Gupta, A., & Pandey, C. (2021). Study on microstructure and mechanical properties of laser welded dissimilar joint of p91 steel and incoloy 800ht nickel alloy. *Materials*, 14(19). ISSN: 19961944. <https://doi.org/10.3390/ma14195876>
- 38 Kumar, S., Sirohi, S., Vidyarthi, R. S., Gupta, A., & Pandey, C. (2021). Role of the Ni-based filler composition on microstructure and mechanical behavior of the dissimilar welded joint of P22 and P91 steel. *International Journal of Pressure Vessels and Piping*, 193. ISSN: 03080161. <https://doi.org/10.1016/j.ijpvp.2021.104473>

- 39 Khan, F., Mahajan, S., Khan, W. N., & Chhibber, R. (2021). Mechanical, microstructure, and hot corrosion investigations on P22/P91 dissimilar tungsten inert gas weld. Proceedings of the Institution of Mechanical Engineers, Part L: Journal of Materials: Design and Applications, 235(9), 2128–2141. ISSN: 14644207. <https://doi.org/10.1177/14644207211021941>
- 40 Kumar, S., Yadav, V., Sharma, S., Pandey, C., Goyal, A., & Kumar, P. (2021). Role of dissimilar Ni-based ERNiCrMo-3 filler on the microstructure, mechanical properties and weld induced residual stresses of the ferritic/martensitic P91 steel welds joint. International Journal of Pressure Vessels and Piping, 193. ISSN: 03080161. <https://doi.org/10.1016/j.ijpvp.2021.104443>
- 41 Kishnani, V., Yadav, A., Mondal, K., & Gupta, A. (2021). Palladium-functionalized graphene for hydrogen sensing performance: theoretical studies. Energies, 14(18). ISSN: 19961073. <https://doi.org/10.3390/en14185738>
- 42 Taraphdar, P. K., Kumar, R., Pandey, C., & Mahapatra, M. M. (2021). Significance of Finite Element Models and Solid-State Phase Transformation on the Evaluation of Weld Induced Residual Stresses. Metals and Materials International, 27(9), 3478–3492. ISSN: 15989623. <https://doi.org/10.1007/s12540-020-00921-4>
- 43 Jena, S., & Gupta, A. (2021). Sensitivity analysis of MEMS gyroscope for radar-based true north finding application. Int. Conf. Range Technol., ICORT. Institute of Electrical and Electronics Engineers Inc. ISBN: 9781665449564. <https://doi.org/10.1109/ICORT52730.2021.9581416>
- 44 Taraphdar, P. K., Kumar, R., Giri, A., Pandey, C., Mahapatra, M. M., & Sridhar, K. (2021). Residual stress distribution in thick double-V butt welds with varying groove configuration, restraints and mechanical tensioning. Journal of Manufacturing Processes, 68, 1405–1417. ISSN: 15266125. <https://doi.org/10.1016/j.jmapro.2021.06.046>
- 45 Pippara, R. K., Chauhan, P. S., Yadav, A., Kishnani, V., & Gupta, A. (2021). Room temperature hydrogen sensing with polyaniline/SnO<sub>2</sub>/Pd nanocomposites. Micro and Nano Engineering, 12. ISSN: 25900072. <https://doi.org/10.1016/j.mne.2021.100086>
- 46 Maurya, A. K., Pandey, C., & Chhibber, R. (2021). Dissimilar welding of duplex stainless steel with Ni alloys: A review. International Journal of Pressure Vessels and Piping, 192. ISSN: 03080161. <https://doi.org/10.1016/j.ijpvp.2021.104439>
- 47 Khan, W. N., & Chhibber, R. (2021b). Experimental investigation on dissimilar weld between super duplex stainless steel 2507 and API X70 pipeline steel. Proceedings of the Institution of Mechanical Engineers, Part L: Journal of Materials: Design and Applications, 235(8), 1827–1840. ISSN: 14644207. <https://doi.org/10.1177/14644207211013056>
- 48 Adhithan, B., & Pandey, C. (2021). Study on effect of grain refinement of P92 steel base plate on mechanical and microstructural features of the welded joint. International Journal of Pressure Vessels and Piping, 192. ISSN: 03080161. <https://doi.org/10.1016/j.ijpvp.2021.104426>
- 49 Sharma, L., Chhibber, R., & Bhandari, D. (2021). Effect of SAW fluxes on electrochemical corrosion & microstructural behavior of API X70 weldments. Proceedings of the Institution of Mechanical Engineers, Part E: Journal of Process Mechanical Engineering, 235(4), 1140–1149. ISSN: 09544089. <https://doi.org/10.1177/0954408921995699>
- 50 Kumar, M., Sharma, S., Verma, N., Jain, A., & Sharma, A. K. (2021). Design of a GPS Enabled Maximum Power Point Solar Tracker for Mobile Platform. Proc. Int. Conf. Commun. Electron. Syst., ICCES, 834–839. Institute of Electrical and Electronics Engineers Inc. ISBN: 9781665435871. <https://doi.org/10.1109/ICCES51350.2021.9488997>

- 51 Thakare, J. G., Pandey, C., Gupta, A., Taraphdar, P. K., & Mahapatra, M. M. (2021). Role of the heterogeneity in microstructure on the mechanical performance of the Autogenous Gas Tungsten Arc (GTA) welded dissimilar joint of F/M P91 and SS304L steel. *Fusion Engineering and Design*, 168. ISSN: 09203796. <https://doi.org/10.1016/j.fusengdes.2021.112616>
- 52 Thakare, J. G., Pandey, C., Mahapatra, M. M., & Mulik, R. S. (2021). Thermal Barrier Coatings—A State of the Art Review. *Metals and Materials International*, 27(7), 1947–1968. ISSN: 15989623. <https://doi.org/10.1007/s12540-020-00705-w>
- 53 Saoji, S., Krishna, D., Sanap, V., Nagar, R., & Shah, S. V. (2021). Learning-based Approach for Estimation of Axis of Rotation for Markerless Visual Servoing to Tumbling Object. *ACM Int. Conf. Proc. Ser. Association for Computing Machinery*. ISBN: 9781450389716. <https://doi.org/10.1145/3478586.3478639>
- 54 Chaudhary, S., Patel, S. M., Dal, P. N., Joshi, S. K., Tripathy, N. S., & Shah, S. V. (2021). Robust Control Strategy for Reactionless Manoeuvring of a Dual-Arm Space Manipulator. *ACM Int. Conf. Proc. Ser. Association for Computing Machinery*. ISBN: 9781450389716. <https://doi.org/10.1145/3478586.3478621>
- 55 Patel, S. M., Gupta, S., & Shah, S. V. (2021). Motion Planning of Half-Humanoid in the Presence of Obstacle. *ACM Int. Conf. Proc. Ser. Association for Computing Machinery*. ISBN: 9781450389716. <https://doi.org/10.1145/3478586.3478634>
- 56 Mahajan, S., Nawaz Khan, W., & Chhibber, R. (2021). CaO–CaF<sub>2</sub>–SiO<sub>2</sub>–Al<sub>2</sub>O<sub>3</sub> system for development of SMAW electrodes with Ni alloy core wire. *Ceramics International*, 47(12), 17307–17315. ISSN: 02728842. <https://doi.org/10.1016/j.ceramint.2021.03.042>
- 57 Nighojkar, A., Plappally, A., & Soboyejo, W. O. (2021). Animated concept-in-context maps as a materials science learning resource in an online flipped classroom. *MRS Advances*, 6(13), 351–354. ISSN: 20598521. <https://doi.org/10.1557/s43580-021-00069-2>
- 58 Kumar, S., Pandey, C., & Goyal, A. (2021). Effect of post-weld heat treatment and dissimilar filler metal composition on the microstructural developments, and mechanical properties of gas tungsten arc welded joint of P91 steel. *International Journal of Pressure Vessels and Piping*, 191. ISSN: 03080161. <https://doi.org/10.1016/j.ijpvp.2021.104373>
- 59 Rao, S. S., Arora, K. S., Sharma, L., & Chhibber, R. (2021). Investigations on Mechanical Behaviour and Failure Mechanism of Resistance Spot-Welded DP590 Steel Using Artificial Neural Network. *Transactions of the Indian Institute of Metals*, 74(6), 1419–1438. ISSN: 09722815. <https://doi.org/10.1007/s12666-021-02237-2>
- 60 Phadatare, H. P., & Pratiher, B. (2021a). Large deflection model for rub-impact analysis in high-speed rotor-bearing system with mass unbalance. *International Journal of Non-Linear Mechanics*, 132. ISSN: 00207462. <https://doi.org/10.1016/j.ijnonlinmec.2021.103702>
- 61 Bhandari, D., Chhibber, R., Sharma, L., Arora, N., & Mehta, R. (2021). Combining CaO–SiO<sub>2</sub>–TiO<sub>2</sub> and CaO–SiO<sub>2</sub>–Al<sub>2</sub>O<sub>3</sub> ternary phase systems for design of bimetallic welds. *Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture*, 235(8), 1271–1283. ISSN: 09544054. <https://doi.org/10.1177/0954405421995919>

- 62 Khurana, A., Sharma, A. K., & Joglekar, M. M. (2021). Nonlinear oscillations of electrically driven aniso-visco-hyperelastic dielectric elastomer minimum energy structures. *Nonlinear Dynamics*, 104(3), 1991–2013. ISSN: 0924090X. <https://doi.org/10.1007/s11071-021-06392-5>
- 63 Sirohi, S., Pandey, C., & Goyal, A. (2021b). Role of the Ni-based filler (IN625) and heat-treatment on the mechanical performance of the GTA welded dissimilar joint of P91 and SS304H steel. *Journal of Manufacturing Processes*, 65, 174–189. ISSN: 15266125. <https://doi.org/10.1016/j.jmapro.2021.03.029>
- 64 Raina, D., Gora, S., Maheshwari, D., & Shah, S. V. (2021). Impact modeling and reactionless control for post-capturing and maneuvering of orbiting objects using a multi-arm space robot. *Acta Astronautica*, 182, 21–36. ISSN: 00945765. <https://doi.org/10.1016/j.actaastro.2021.01.034>
- 65 Khan, W. N., & Chhibber, R. (2021c). Investigations on effect of CaO-CaF<sub>2</sub>-TiO<sub>2</sub>-SiO<sub>2</sub> based electrode coating constituents and their interactions on weld chemistry. *Ceramics International*, 47(9), 12483–12493. ISSN: 02728842. <https://doi.org/10.1016/j.ceramint.2021.01.106>
- 66 Khan, W. N., & Chhibber, R. (2021a). Characterization of CaO-CaF<sub>2</sub>-TiO<sub>2</sub>-SiO<sub>2</sub> Based Welding Slags for Physicochemical and Thermophysical Properties. *Silicon*, 13(5), 1575–1589. ISSN: 1876990X. <https://doi.org/10.1007/s12633-020-00537-8>
- 67 Khurana, A., Kumar, A., Sharma, A. K., & Joglekar, M. M. (2021a). Effect of polymer chains entanglements, crosslinks and finite extensibility on the nonlinear dynamic oscillations of dielectric viscoelastomer actuators. *Nonlinear Dynamics*, 104(2), 1227–1251. ISSN: 0924090X. <https://doi.org/10.1007/s11071-021-06328-z>
- 68 Verma, R., Arora, K. S., Sharma, L., & Chhibber, R. (2021). Experimental investigation on resistance spot welding of dissimilar weld joints. *Proceedings of the Institution of Mechanical Engineers, Part E: Journal of Process Mechanical Engineering*, 235(2), 505–513. ISSN: 09544089. <https://doi.org/10.1177/0954408920968351>
- 69 Mahajan, S., & Chhibber, R. (2021). High temperature molten salt corrosion investigations on P22/P91 power plant dissimilar welds. *Proceedings of the Institution of Mechanical Engineers, Part E: Journal of Process Mechanical Engineering*, 235(2), 440–451. ISSN: 09544089. <https://doi.org/10.1177/0954408920966304>
- 70 Sharma, L., & Chhibber, R. (2021a). Experimental investigation of structural integrity behavior of High strength low alloy steel – Study of mechanical, microstructural and corrosion behavior of Submerged arc welding weldments. *Proceedings of the Institution of Mechanical Engineers, Part E: Journal of Process Mechanical Engineering*, 235(2), 266–273. ISSN: 09544089. <https://doi.org/10.1177/0954408920958104>

## Faculty/ Department Laurels

Name of the Faculty member	Notable Achievements of Faculty Members and Students
Atul Kumar Sharma	1: Best Paper Award, European Journal of Computational Mechanics (2021) 2: Start-up Research Grant (SRG), Science and Engineering Research Board (SERB), Government of India (2021)
Chandan Pandey	7. Selected in list of World Ranking of Top 2% Scientists” in 2021 database (Published: 19 October 2021), Stanford University, US, 2021;
Hardik Kothadia	1. "2022 Teaching Excellence Award – IIT Jodhpur 2. 2022 Alumni Award – Nirma Institute of Technology Alumni Association (NITAA)

## Student Laurels

Name of Student(s)	Achievement
Meraj Ahmad, Ritwik Kulkarni, Saurabh Yadav, S. M. S. M. Quadri	Best Product Award, international e-conference on water source sustainability, ICWSS 2021, IIT Roorkee
Meraj Ahmad	Winner of the National Level Essay Competition - NSD2021BLR - Engineering Education, Bangaluru
Arpit Sanwal	Best Paper Award 2021, ICRM 2020, MG University, Kerala.
Pankaj Jakhar	Starts Unnada Pvt Ltd, visit Horticulture   Unnada.com   जोधपुर
Chander Veer	Best Poster Award in WOST-2022 organized by IIT Jodhpur

The following laboratories are functioning in the Department of mechanical Engineering:

## 1. Advanced Manufacturing

The advanced manufacturing laboratory houses CNC Machine Tools, 3-D Printers and manufacturing simulation software to support academic and research activities in the domain of CNC Machine Tools, CAD/CAM, New product development and Smart Manufacturing. The laboratory supports the academic activities of the department in the above-mentioned areas. The research groups associated with the laboratory has developed physics-based process models for machining operations using computational tools and validated the same using experimental facilities available in-house. The laboratory also facilitates the development of prototypes for various applications ranging from mechanical, automotive, aerospace and healthcare industries using 3-D printing technology. Considering recent impetus to Industry 4.0, the laboratory is expanding to develop indigenous technological solutions to implement smart manufacturing for various processes.

The Advanced Manufacturing Laboratory is equipped with the following facilities:

1. CNC Machine Tools and Smart Manufacturing
2. 3-axis CNC Vertical Machining Center
3. On-Machine Probing System
4. Table mounted Dynamometer
5. 3-D Printer
6. Polyjet 3-D Printer
7. Fused Deposition Modeling 3-D Printer (2 Nos.)
8. Computer-Aided Designing and Analysis
9. ANSYS
10. DEFORM - 3D
11. SolidWorks
12. Creo
13. AutoCAST



## 2. Central Workshop

The central workshop is the central facility of Institute, consisting of various workshops such as Welding shop, Carpentry shop, Fitting shop, Sheet metal shop, Foundry and Heat treatment shop and Machine shop. Undergraduate Students get hands-on experience in the above sections by doing the job work and carrying out projects as part of their coursework and also students utilize the facilities for fabrication purpose of their academic projects. It also supports the R&D projects of the institute handled by various faculty members and PhD and M.Tech. thesis work of research scholars by providing them assistance in the fabrication of their research set-ups. The following machines and equipment are available in the Central Workshop:

1. Welding Fume Extraction Down Draft Table,
2. Multi-process Welding Equipment,
3. Portable Single Phase MIG/MAG,
4. AC/DC Welding Equipment,
5. MIG/MAG Welding Equipment,
6. Treadle-operated Shearing Machine,
7. Hand-operated Folding Machine,
8. Kaizen Muffle Furnace,
9. Hand-operated Jeeny or Burying Machine
10. Motorized Circle Cutting Machine
11. Hand-operated Circle Cutting Machine,
12. Hydraulic Shearing Machine,
13. Portable Heating Plant,
14. Portable Hardening plant,
15. Forging Heating Plant,
16. Aluminum Melting Plant,
17. Fitting Table,
18. Mould Making Facility, and
19. Portable Tool Grinder.





### 3. Industrial Engineering Laboratory

The industrial engineering lab in the department of mechanical engineering consists of several experimental set up covering different domains of the subject. Experiments in the curriculum are designed for better understanding of Value engineering and value analysis. Students are given real-time exposure of quality control with experimental data used to prepare control charts, such as X, R,  $\sigma$ , C, P and nP. The laboratory has the following experiment kits to perform several laboratory activities:

- Finger dexterity test.
- Tweezer dexterity test.
- Grooved keyhole pegboard
- Purdue pegboard.

The experiments and activities of Industrial engineering lab are closely aligned with the theoretical teaching, so as to give necessary hands-on exposure to students.



### 4. Metrology Laboratory

The Metrology Laboratory facilitates the academic and research activities associated with the understanding of various measuring and inspection activities for manufactured components. The laboratory encompasses a set of classical measuring and gauging instruments, computer-controlled measuring machines and associated software to determine appropriate dimensional and geometric tolerances for the components. The laboratory facilitates the conduct of well-designed experiments to familiarize students with working of measuring tools, equipment and quality control procedures.

The Metrology Laboratory is equipped with the following facilities:

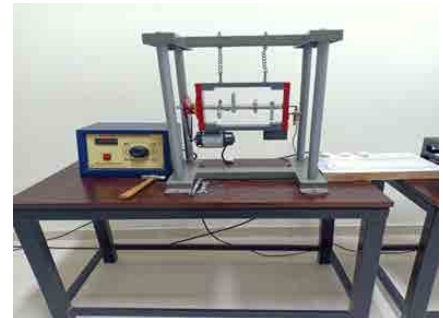
- Tool Maker Microscope
- Profile Projector
- Autocollimator
- Optical Interferometer



- CNC Form and Roughness Measuring Machine
- Coordinate Measuring Machine
- MCOSMOS

## 5. Dynamics of Machine Laboratory

Kinematics and Dynamics Laboratory has been designed to primarily focus on mechanism and dynamic analysis of the mechanical system in helping the students to understand the behaviour of the various mechanisms and forces acting on them. This lab is well equipped with various mechanisms and machines such as Motorised Gyroscope Apparatus, Static and Dynamic, Balancing Apparatus, Universal Governor Apparatus, Coriolis Component of Acceleration Apparatus, Epicyclic Gear Train Apparatus, Cam Analysis Machine Apparatus, Universal Vibration Apparatus, Stroboscope, and Tachometer.



## 6. Helicopter Laboratory

Helicopter Laboratory mainly focuses on the development of hover capable aerial vehicles with autonomous capabilities. At present, hover capable configurations of vehicles available are quadrotors and conventional mini-helicopters. The major area of research focus is on the development of indigenous autopilot system consisting of microcontrollers, sensors, actuators and wireless communication, data processing, control, navigation algorithms. In addition, several test rigs have been developed for the characterization of brushless motors, and for testing the control algorithm for stabilization of quadrotors. Development of mathematical formulation for various maneuvers in auto mode, and implementation and flight testing of the vehicle in an outdoor environment are other key areas of research undertaken in this laboratory. The software architecture and source code for all tasks are fully developed in this lab. Further, the lab also aims at the design and development of mechanical hardware of multi-rotors and helicopters.

At present the equipment available in the Helicopter Lab of the institute are:

- Quadrotor Platforms
- Conventional Mini-helicopters
- Control Rigs for Multirotors
- Setup for Motor Characteristic Estimation
- Oscilloscope
- Variable Voltage and Current DC Supply Unit

- Soldering Station
- NI PXI System
- Atmel and Arm microcontroller development boards
- Lord MicroStrain IMU
- MEMS sensors such as accelerometer, gyroscope, magnetometer, barometer
- GPS receivers and sonar



## 7. Mechatronics laboratory

Mechatronics and IoT lab at IIT Jodhpur is established to impart state of the Art interfacing of mechanical systems with sensors, actuators and microcontrollers. The projects include microcontroller and internet of things (IoT) based design of consumer appliances, healthcare and transportation and automotive domain.

The UG laboratory equipment and projects include:

- Dissection and assembly of consumer appliances
- Creating the Internet of things-based applications using microcontrollers
- Prototype solar tracker using microcontrollers
- Programmable logic controller (PLC) and Pneumatic circuits
- Programmable logic controller for material handling system (conveyor belt)
- Quanser CUBE servo control design with QUARC real-time interface
- Hardware in the loop (HIL) simulations and rapid prototyping with dSPACE
- Applications of computer vision and deep learning in mechatronics
- Sensors and Internet of things
- Software packages such as MATLAB, OpenCV, ADAMS, ANSYS, SOLIDWORKS, Pro-E



## 8. Robotics Laboratory

- The Robotics Laboratory is a part of Mechanical Engineering Department at Indian Institute of Technology at Jodhpur.
- Robotics laboratory is integral part of M.Tech. in Advanced Manufacturing and Design offered by the department where students get exposed to kinematic, dynamics, motion planning, programming, and control of robots.
- The laboratory focuses on research problems and innovative projects that extend the state of the art in robotics. The laboratory's research work is in the areas of Space Robots, Motion Planning, Vision based Control, Robot Mechanism Design and Computational Dynamics. The laboratory is equipped with diverse robot platforms and advanced sensors.

## 9. Vibration Laboratory

Vibration and Control laboratory has been established with the objective of measuring the vibration characteristics and subsequent control for vibrating the machine or structures. This lab offers various experimental techniques and principles to study vibration analysis and control strategies. This lab is well equipped with various testing, measuring, and monitoring equipment for conducting the experiments and demonstrations for teaching and research purposes.



## 10. Fluid Mechanics and Turbomachinery Laboratory

Fluid mechanics lab aims to provide hands-on exposure to students on various experimental flow measurement techniques. Students are introduced with the experimental flow prediction of a wide range of practical problems such as frictional flow through pipes, prediction of various aerodynamic coefficients over subsonic airfoils, wake flows, jet flows, turbulent flows in pipe etc. The laboratory also aims to provide a practical feel on the different fluid dynamic concepts involved in the measurement of various flow field parameters like velocity, pressure, flow rate etc.

The various facilities available at the institute Fluid Mechanics lab are as follows:

- Subsonic Wind Tunnel
- Pipe Friction Apparatus
- Reynolds Apparatus
- PIV simulator
- Various Flow Measurement devices

The turbomachines lab introduces students with various hydraulic turbomachines and their operational characteristics. The lab consists of test rigs for various hydraulic turbines and centrifugal pump. The miniature turbomachine units are mounted on a test bench with closed water circuit. A transparent cover provides a direct view of the turbomachine in operation and thus clearly illustrates the interaction of guide apparatus, water flow and runner. The test rigs are equipped with a volume flow meter, pressure sensors at the inlet and outlet pipes, tachometer and brake drum dynamometer which can be used to measure the input power, runner speed and torque and are shown using electronic display boards. Characteristics curves and performance curves for various hydraulic machines at various speeds can thus be evaluated. The various facilities available at the institute Turbomachines lab are as follows:

- Pelton Turbine (Impulse hydraulic turbine)
- Francis Turbine (Reaction hydraulic turbine)
- Centrifugal Pump





**Francis Turbine**



**Pelton Turbine**



**Centrifugal Pump**

## 11. Heat Transfer Laboratory

The objectives of Heat Transfer Lab is to provide the practical knowledge with regard to the determination of the rate of heat exchange in various modes of heat transfer and to provide practical exposure to various temperature measurement instruments and its working principle. In the Heat Transfer Lab, students can expect to measure the temperature of objects using different temperature measurement instruments, measure the heat transfer properties of various metals, understand basic laws of radiation heat transfer, compare the performance of different convection processes. Students can expect to gain knowledge of heat transfer in solar thermal applications.



## 12. Energy Conversion Laboratory

Energy Conversion Lab aimed to improve the thermal performance of energy transfer processes. Knowledge of thermal performance of equipment helps to enhance efficiency from power-producing devices like thermal power plants, nuclear power plant, automobile engines as well as refrigeration devices. Knowledge of heat transfer is the key to this goal.

In recent times, research in this field has become more toward industrial applications and includes fields that are at the borderline of Physics. As manufacturing has become miniaturized, the study of heat transfer at the micro and nanoscale has become extremely important. The miniaturization of components provides enormous increment in the heat dissipation capacity of devices in engineering applications. The quest for enhanced heat removal leads researchers to two-phase flow and specialized surface modifications to enhance the heat transfer without leading to a pressure penalty. The intimate relation of the field with energy production has led to significant research in solar while also exploring the use of waste heat for industrial process implementation.

In the Energy Conversion Lab, students can expect to work on the industrial and most contemporary problems in each of these fields.





## 13. Automotive Propulsion

The increasing demand for vehicles worldwide is driving research for efficient and low emission automotive propulsion solutions. This lab aims to train today's engineers to basic and emerging technologies in automobiles. The lab is equipped with:

- Fuel quality measurement: Flashpoint apparatus, Bomb calorimeter,
- IC Engine rigs: Multicylinder petrol engine, Multicylinder diesel engine
- Emission analyzer: AVL CDS 450
- In-cylinder diagnostics: Kistler box
- Cut section models: 2-S Engine, 4-S engine
- Combustion physics: Cantera, ANSYS FORTE, FLUENT
- IC Engine simulation: Lotus Engine Simulation
- EV simulation: AmeSIM



## 14. Refrigeration and Air Conditioning Laboratory

In the refrigeration and air conditioning lab, students assess various kinds of refrigeration systems such as vapour compression, vapour absorption, vortex tube, etc and evaluate their performance. They study the characteristics of heating and ventilation and analyze psychrometric processes. The cut section models of hermetically sealed rotary and reciprocating compressors are available to provide a thorough knowledge of various components, their purpose and maintenance. The disassembled window air-conditioner and a domestic refrigerator are also present to impart a practical understanding of their working principles. The lab is equipped with the following facilities:

1. Vapour compression test rig
2. Vapour absorption test rig
3. Vortex tube cooling apparatus
4. Ventilation and air distribution setup
5. Cut sections of rotary and reciprocating compressors
6. Disassembled window air conditioner and domestic refrigerator
7. Psychrometer
8. Steam jet injection test rig



## 15. Gas Dynamics Laboratory

The Gas Dynamics Laboratory introduce students with various high-speed flow scenarios and experimental measurement techniques. This lab intends to provide students with the fundamental knowledge of supersonic flows through various devices like, nozzles, diffusers, compression and expansion corners etc. The students are also exposed to the fundamentals of aerodynamic shock waves and its reflection characteristics. The fluid dynamics at high-speed flows are particularly important in aerospace propulsion and defense sector and this lab this lab aims to give a flavor of various high speed flow applications in these sectors. The various teaching lab experiments conducted at this lab are as follows:

1. Nozzle flow experiments using blow-down open jet tunnel.
2. Mowing shock wave experiment using Shock Tube
3. Shock Wave reflection studies using supersonic wind tunnel.
4. Underexpanded and Overexpanded jets in supersonic nozzles

5. Schlieren and Shadowgraph Visualization for High-Speed Flows
6. Computational Gas Dynamics

### Blowdown Open Jet Tunnel



## Outreach

### Department of Mechanical Engineering

1. A field workshop for Potters of Bhim, Rajsamand District, in June 2021 was conducted by ME PhD students Pankaj Jakhar, Sunil Duhan . The news of the same can be observed here [https://www.youtube.com/watch?v=N7wcMQ\\_hD5I](https://www.youtube.com/watch?v=N7wcMQ_hD5I)
2. The NGO Arpan Seva Sansthan has an MOU with IIT Jodhpur. Technology transfer of G filter and Sub-surface porous vessels was performed.
3. ME Industry Day: Speakers invited from various segments of industry. The event concluded with a panel discussion
4. First tile drainage pilot installation for a spice farmer with more than 2 Acre farmland in Paravoor Panchayat, Alappuzha District, Kerala to prevent flooding based erosion by Sunil Duhan and Pankaj Jakhar. This is a technology from lab-to-land demonstration site.
5. Open House ME dept.: School students in Jodhpur were invited to visit various laboratories in the dept. Games, quizzes etc were organized.

## Projects

### Sponsored Projects

S. No	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
1	Development of Highly Efficient Low Cost Insulation for power plants	MHRD	Sudipto Mukhopadhyay	₹93,47,000	27-Mar-19	26-Mar-23
2	Unnat Bhart Abhiyan (RCI)	IIT Delhi	Anand K. Plapally	₹5,00,000	31-Mar-19	31-Mar-26
3	Development of lead free piezoelectric based Nano-generator: Modeling, Simulator and Experimental Realization	SERB	Barun Pratiher	₹53,53,832	23-May-19	22-May-22
4	Development of Paired Neck Chamber Device for Assessment of Baroreflex Sensitivity	DST	Kaushal A. Desai	₹26,32,344	01-Aug-19	31-Jul-21
5	Design and Analysis of Indigenous Autopilot System for Quadrotor	DRDO	C Venkatesan	₹9,96,000	01-Dec-19	26-Feb-21
6	Development of Light-weight and Flexible Multi-link Robotic Manipulator Mounted on Mobile Platform: Modelling, Simulation and Physical Realization	SERB	Barun Pratiher	₹39,64,240	21-Nov-19	20-Nov-22
7	Mitigation of weldability issues and residual stresses in dissimilar welded joints of ultra-supercritical power plants	SERB	Chandan Pandey	₹25,26,980	01-Jan-20	30-Apr-22
8	Shock Wave Interaction with Various Interfaces	DST	Arun Kumar R	₹35,00,000	03-Oct-18	02-Oct-23
9	Reactionless Manoeuvring and Visual Servoing for Space Flying Robot and Half Humanoid	ISRO	Suril V. Shah	₹43,86,000	01-Jun-20	31-May-22
10	Dynamic Studies for Half-humanoid and Spaceflying Robot	ISRO	Suril V. Shah	₹16,84,000	01-Jun-20	31-May-22
11	Multiphysics Modeling & Analysis of Energy Technologies & Systems	MHRD	Shobhana Singh	₹5,68,000	14-Mar-20	14-Aug-20
12	Design and Development of Indigenous On-board Autopilot and Vision-based Navigation Systems for Autonomous Flight of Hover Capable Rotary-wing Vehicles	SERB	Suril V. Shah	₹46,22,200	20-Mar-20	19-Mar-23

S. No	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
13	Personal Use facial fit trails of reusable ceramic respirators being manufactured at Bhopalgarh for use towards preventing spread of air borne diseases.	MHRD	Anand K. Plapally	₹89,500	03-Jul-20	02-Jan-21
14	Design of ice freezing type heat exchanger and optimization of size, weight and power of heat exchanger	DRDO	Hardik Kothadia	₹9,88,800	01-Aug-20	23-Oct-21
15	Understanding The Deformation Mechanisms Under In-Plane Shear and Role of Pre-Twining on Formability Behavior of AZ31-Xca Mg Alloy Sheets	SERB	Jaiveer Singh	₹32,98,570	24-Nov-20	23-Nov-22
16	Owl-inspired aerodynamic noise reduction of a flapping wing unmanned aerial vehicle	SERB	Nipun Arora	₹29,48,000	03-Dec-20	02-Dec-22
17	Input Shaping Control Strategies for Mitigating Residual Vibrations and Viscoelastic Creep in Electrically Driven Dielectric Elastomer Actuators	DST-Inspire	Atul Kumar Sharma	₹35,00,000	01-Dec-20	30-Nov-25
18	Highly conductive nanocomposite fibers for flexible temperature sensors (Flextem)	SERB-SRG	Shrutidhara Sarma	₹27,60,340	03-Dec-20	02-Dec-22
19	Lab-On-Paper for inexpensive point of care diagnostics	SERB-SRG	Ankur Gupta	₹32,37,810	19-Dec-20	18-Dec-22
20	Design and development of a micro turbine combustor working on biogas	Petroleum Conservation Research Association (PCRA)	Sudipto Mukhopadhyay	₹24,98,000	23-Aug-21	22-Aug-23
21	Multiphysics simulations to design efficient heat exchangers for automotive thermoelectric generators	DRDO Jodhpur	Shobhana Singh	₹15,18,000	23-Nov-21	22-Nov-22
22	Numerical Modeling and Experimental Characterization of Dynamic Behavior of Soft Dielectric Elastomer Minimum Energy Structures	SERB-SRG	Atul Kumar Sharma	₹32,98,900	23-Dec-21	22-Dec-23

## Consultancy Projects

S. No	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
1	Short term course on Helicopter dynamics and handling qualities	DRDO	Suril V. Shah	₹3,72,125	15-Feb-17	14-Feb-20
2	Visual Servoing of Mobile Manipulator with application to smart warehouse and smart factory	Tata Consultancy Limited	Suril V. Shah	₹10,12,440	01-Jul-17	30-Jun-18
3	Helicopter Dynamics and Handling Quality	ASTE Bangalore	C. Venkatesan	₹3,42,495	10-Dec-18	14-Dec-18
4	01 mw Micro grid based solar power plant at Military Station Brichgunj (Portblair) under Military engineering services Portblair	RAMA Refelection Pvt. Ltd.	Barun Pratiher	₹70,880	10-Sep-19	NA
5	Modeling of Laser Ignition of Coal	GE India Industrial Pvt. Ltd	Sudipto Mukhopadhyay	₹1,53,400	02-Jul-20	01-Jan-21
6	External Advisor to Pearson UK	Pearson UK	B. Ravindra	₹0		

## Other Projects

S. No	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
1	Ishaan Vikas Program 2016	IIT Guwahati/ MHRD	Barun Pratiher	₹2,57,000	04-Jul-16	16-Jul-16
2	ICSSP Conference	ICSSP	Ravi K R	₹3,19,916	06-Aug-19	31-Dec-21

## Closed Projects

Sl. No.	Project No.	Project Title	Sponsoring Agency	Category of Project	Principal Investigator	Sanctioned Amount (Rs.)	Start Date	Duration / Expiry Date	Date of Actual Closure
1	S/DST/ SVS/ 20150026	Hybrid reactionless manipulation and visual serving of a satellite mounted robot for autonomous on orbit services	DST	Sponsored Research Project	Suril V. Shah	₹35,00,000	27-Jan-16	28-Nov-18	30-Sep-21

**Outcome:** The research work was undertaken to develop a novel and generic reactionless visual servo controller for a satellite-based multi-arm space robot. The problem of algorithmic singularity was also mitigated by proposing path planning for reactionless visual servoing of a redundant dual-arm space robot through exploration in the image space. A lightweight and modular test-bed for a planar space robot was successfully built. The research work also emphasized on performing experiments to model the robot more accurately and further validation of the numerical results, obtained on planar reactionless visual servoing using the in-house experimental setup. In order to validate the path planning framework, a 14-DOF dual arm space robot was considered with each robot having 7 Degrees-of-freedom.

# Department of Metallurgical and Materials Engineering

## 1. Introduction

The Department of Metallurgical and Materials Engineering at IIT Jodhpur was established in 2017 with a vision of imparting high-quality education in the areas of Materials Engineering to address continuously evolving demands of new materials in the fast-evolving sectors such as, energy, aerospace, defence, healthcare, transport, etc. The department is committed to high-quality education and research in the broad area of Materials Engineering. The department continuously strives for excellence in teaching and research through innovative pedagogy

and curriculum, by undertaking interdisciplinary projects, and through active collaborations with industries, R&D labs, and academia. By enabling the students to think independently and equipping them with relevant skill sets, our goal is to encourage the graduates to innovate and address present-day materials challenges to meet the needs of the country. The department is currently offering degree programs namely, B.Tech., M.Tech., Ph.D. and M.Tech.-Ph.D. in Materials Engineering which are designed through a unique combination of foundational courses, core courses and electives from the following four thematic areas or streams:

S. No.	Theme area	Focus
1.	Structural Materials	Materials Processing, Additive Manufacturing, Phase Transformations, Deformation Behavior and Microstructure evolution, Failure of Materials, High Temperature Materials, Materials Degradation.
2.	Functional Materials	Electronic Materials, Energy Materials, Smart Materials, Battery Materials, Electrochemistry, Biomaterials.
3.	Computational Materials Engineering	Computational Thermodynamics, Alloy Design, First-Principles Calculation, Molecular Dynamics, Energy Materials Modelling, Scientific Computation, Data Structure and Algorithms, Machine learning in Materials Design, Material Informatics.
4.	Process Metallurgy	Iron and Steel making, Non-ferrous Metal Extraction techniques, Principles of Process Metallurgy, Kinetics of Metallurgical Processes.

## 2. Faculty Details

The Faculty Members in the department have expertise in diverse areas of Materials Engineering. They are actively involved in conducting translational research in the fundamental and applied areas of Materials Engineering. The department frequently organizes invited lectures and workshops to share research findings, train students

on the state of the art experimental and computational techniques to promote the development of skill sets. The Department welcomes bright people who aspire to utilize the power of ambitious research and teaching to shape a better future.

**Following are the details of the faculty members associated with the Department:**

## Faculty Members



### **Bhagwati P. Kashyap**

Head of Department

***Specialization/ Research interest:***

Thermo-mechanical treatment and Super-plasticity, Creep and low temperature deformation, Light metals and alloy development



### **Ravi K. R.**

***Specialization/ Research interest:***

Additive Manufacturing, Self-cleaning coating, Computational Approach in Alloy Design, Biomaterials



### **Abir Bhattacharyya**

***Specialization/ Research interest:***

Mechanical Behavior of Materials, Fatigue of Bearing Steels, High-strain rate Deformation of Materials, Indentation Response of Materials



### **Appala Naidu Gandhi**

***Specialization/ Research interest:***

First Principles Calculations: Thermoelectric Transport, Lattice Dynamics, Mechanical Behaviour, Battery Materials; Phase Field Modelling



### **Saurabh Nene**

***Specialization/ Research interest:***

Alloy Design, High Entropy Alloys, Mechanical behaviour of Materials, Severe Plastic Deformation



### **Jaiveer Singh**

***Specialization/ Research interest:***

Microstructure/texture evolutions, Plastic deformations in HCP materials, Structure-property-processing correlations; Thermo-mechanical processing, Mg alloys, Biomaterials.



### **Srijan Sengupta**

***Specialization/ Research interest:***

Lithium ion batteries, Corrosion, Electrochemistry, Hydrogen production



The following faculty members joined the department during FY 2021-22:



**Nitin Kumar Sharma**

***Specialization/ Research interest:***

Phase Transformations, Grain Boundary Engineering, Thermo-mechanical Processing, Electron Microscopy, Atom Probe Tomography, Computational thermodynamics



**Devendra Singh Negi**

***Specialization/ Research interest:***

Experimental and computational electron microscopy, Thermoelectric materials, quantum materials, Density functional theory calculations, EMCD



**Pranay Ranjan**

***Specialization/ Research interest:***

2D materials, their hybrids and hetero-structures, Semiconductor Devices, Gas Sensors, Environmental Remediation, Water Desalination/ Filtration



**Sk Md Hasan**

***Specialization/ Research interest:***

Phase transformations, High strength bainitic/martensitic steels, Thermomechanical processing, Microstructure-property correlation



**Amitava Banerjee**

***Specialization/ Research interest:***

DFT, Molecular Dynamics, Crystal structures prediction, Hydrogen, and oxygen evolution reaction (HER, OER), 2D catalysts, Solar cell, 2D anodes, Battery Thermodynamics and Kinetics modeling, Defect engineering, Oxide growth

### 3. Academic Programmes

The department is currently offering the following degree programs:

- B.Tech in Materials Engineering
- M.Tech. in Materials Engineering
- B.Tech - M.Tech Dual Degree
- M.Sc - M.Tech Dual Degree
- M.Tech.- Ph.D. Dual Degree
- Ph.D.

### 4. Faculty / Department Laurels

- Dr. Saurabh Nene is conferred with INDO-ASIAN Distinguished Research Excellence Award 2022 conferred by RED TALKS International on February 28th, 2022.

## 5. Laboratories and equipment

The following laboratories are functioning in the Department of Metallurgical & Materials Engineering:

### Materials and Mechanics Laboratory

Materials and Mechanics Laboratory is a teaching and research facility in the department of Metallurgical and

Materials Engineering consisting of various facilities for material testing, heat treatment, melting, mechanics and metallography etc. This lab provides facilities to test samples of different types of materials to find out their mechanical properties like modulus of elasticity, tensile and compressive strengths, stress-strain curve, bending properties, hardness etc. It also supports the R&D projects of the institute handled by various Faculty Members, Ph.D. thesis work and M.Tech. thesis work of research scholars.

#### The laboratory has following testing equipment:

1. Universal Testing Machine (Up to 100 kN)	13. Polishing Machines
2. Micro-hardness Tester	14. Spin Coater
3. Metallurgical Microscopes with Software	15. Jominy End-Quench Test
4. Stereo-zoom Microscope	16. Notch-Broaching Machine
5. Density balance	17. Charpy Impact Test for Plastics
6. Muffle furnaces	18. Beam deflection unit
7. Vacuum Oven with pump	19. Polarimeter
8. Induction Melting Furnace	20. FDM 3D printer
9. Hot Mounting Press	21. Stereolithography – 3D printer
10. Precision Diamond Cutting Machine	22. Magnetic Stirrer with hot plate
11. Bend-saw Cutting Machine	23. Ultrasonic Cleaner
12. High Speed Grinder	24. Oven (Microwave)



Mounting and Precision Cutting Machine



Polishing Machine



Metallographic Sample Preparation



Microstructural Observation



Additive Manufacturing



Lathe Machine



Drilling and Cutting Machine

## Heat Treatment Laboratory

The heat treatment Laboratory has state of the art research facilities to carry out heat treatments of a variety of materials like steel, aluminium alloys, Ti alloys and high entropy alloys (HEAs). There are different types of furnaces installed in the lab starting from conventional muffle furnaces, vacuum tubular furnaces and low temperature vacuum ovens. There are fumehood and microscopy facilities also set up for performing complete heat treatment experiments.

**Following are the equipment details of the lab:**

1. High temperature tubular furnace (1600°C)
2. Muffle furnace
3. Horizontal tubular furnace (1400°C)
4. Vertical tubular furnace (1200°C)
5. Vacuum oven with pump (250°C)
6. Jominy end quench test apparatus with hardness tester
7. Fume hood



## Mechanical Testing Laboratory

The Mechanical Testing Laboratory has state of the art research facilities to carry out studies on quasi-static deformation of materials at macro and micro length scales. The facilities consist of Electromechanical Universal Testing Machine (100 kN load capacity) capable of carrying mechanical testing in cryogenic (up to -70°C) and elevated temperatures (up to 1100°C). The Universal Testing Machine is also equipped with customized fixtures to carry out experiments under compression, and three point bending. The laboratory also has a Universal Hardness Testing Machine, and a Vickers Microhardness Testing machine. While the Universal hardness testing machine can be used to carry out hardness measurements beyond 0.5 kg load, the microhardness testing machine can be used to carry out indentations as low as 1 g load. This lab is used for teaching and research.



Universal Hardness Tester



100 kN Universal Testing Machine

## Computational Materials Engineering Laboratory

The Computational Materials Engineering laboratory supports teaching and research activities in the domain of computational materials engineering. It is equipped with a server, fourteen workstations, and ten desktop computers. The softwares required for studying materials at different length scales are installed in these facilities. These include first-principles calculations-based codes Quantum Espresso and VASP, Molecular dynamics codes LAMMPS and xmd, Engineering and Multiphysics packages ANSYS, COMSOL Multiphysics, Materials selection software CES Selector and CES Edupack, and thermodynamic property calculator ThermoCalc with Steel, Mg, High Entropy alloy databases. Tutorials and laboratories based on computer exercises are conducted in this facility. Our research focuses on understanding mechanical behavior, thermoelectric transport, lattice dynamics in materials, and energy materials design such as catalysts for solar fuel, organic green battery electrodes, etc. We also characterized the materials by calculating the Infra-Red and Raman spectra, and simulated scanning tunneling microscopic images.



Computational Materials Engineering Laboratory

## Structural Materials Research Laboratory

With an emphasis on structure-property correlations in novel and established metallic alloy systems, structural materials research lab primarily works in the broader fields of physical and mechanical metallurgy. The lab has competence in creating and processing ultralight Mg and Ti based alloys for automotive, aerospace, and biomedical applications, among other standard metallic alloy systems. A bigger portion of the group is primarily focused on the design and processing of multifunctional, microstructurally flexible high entropy alloys (HEAs), which is a dynamic yet challenging area of metallurgy in recent times. The majority of this activity entails modelling and experimenting tasks. Thermodynamic predictions for phase stability, the impact of slight changes in the

concentrations of constituent elements in the alloy compositions on thermodynamic factors are carried out by modelling. The experimentation on these newly designed HEAs entails fabrication, thermo-mechanical processing followed by mechanical and microstructural characterization.

The structural materials research laboratory is equipped with the following facilities:

1. Thermo-Calc v2022a software (TCFE9, TCHEA4, TCTI3 databases)
2. Vacuum arc melting furnace with suction casting facility (0.5 kg capacity, 10-5, 1440 C)
3. Universal Testing Machine (UTM) (25 kN capacity and a unique facility of performing tensile tests on 2mm gauge length tensile specimen)
4. Muffle furnace (maximum attainable temperature of 1400°C)
5. Hot mounting setup
6. Grinding and polishing machine
7. Lab scale rolling mill (under procurement)
8. Leica optical microscope (50X, 100X, 200X, 500X and 1000X magnification)
9. TSL-OIM v8 software



## Outreach Activities

The following Outreach activities have been undertaken by the faculty members of the department During the FY 2021-2022:

1. Dr. Pranay Ranjan did outreach activities at Government School, Pahari, Bharatpur, Rajasthan on the eve of National Science Day from 28th Feb to 3rd March 2022.
2. Dr. Saurabh Nene is continuing the official collaboration with Prof. M.H. Tsai, Associate Professor, Department of Materials Science and Engineering, National Chung Hsing University (NCHU) Taichung, Taiwan to work in the field of High Entropy Alloy(HEA) Design.
3. Dr. Saurabh Nene is continuing the official collaboration with Prof. Sheng Guo, Chalmers University of Technology, Sweden to work in the area of defect induced plasticity in HEAs.
4. Dr. Saurabh Nene is continuing the official collaboration with Prof. Satyam Suwas, IISc Bangalore to work in the area of alloy design and texture modification.
5. Dr. Abir Bhattacharyya is continuing the official collaboration with CSIR-National Metallurgical Laboratory in the area of multiaxial fatigue, and residual stress measurement.
6. Dr. Abir Bhattacharyya is continuing the official collaboration with Indira Gandhi Centre for Atomic Research (IGCAR), DAE in the area of low cycle fatigue of nuclear steels.
7. Dr. Jaiveer Singh is mentoring the Churu district, Rajasthan under Unnat Bharat Abhiyan (UBA) RCI IIT Jodhpur.
8. Dr. Jaiveer Singh is continuing the official collaboration with Prof. Shi-Hoon Choi, Suncheon National University, Suncheon, Korea in the area of formability behavior of Mg alloys.
9. Dr. Jaiveer Singh is continuing the official collaboration with Hindustan Zinc Limited (HZL) subsidiary of Vedanta Limited in the area of design and development of Mg alloys.
10. Dr. Amitava Banerjee, along with the departmental colleagues organized the virtual PG open house 2022 at MME department.

## Conference/Seminar/Workshop Presentations

Dr. Pranay Ranjan

Sl. No.	Title	Sponsoring Authority	Type	Organizers	Dates
1.	4th International Multiconferences in Advances in Science and Engineering Technology (ASET)	IEEE	IC	Higher College of Technology	21-24 Feb 2022
2.	Workshop on Sensors based Innovations and Start-ups- Opportunities and Challenges	IEEE	NW	IITJ	3-4 Dec. 2021

	Title	Organization	Type	Dates	Chaired/co-chaired
3.	Characterization of Functional Electronics Materials through FTIR and UV-Vis Spectroscopy	KL University	Guest Lecture	2nd March 2022	Invited Speaker

**Dr. Saurabh Nene**

	Title	Organization	Type	Dates	Chaired/co-chaired
1.	Short Term Course on "ADDITIVE MANUFACTURING AND CHARACTERISATION"	Chennai Institute of Technology, Chennai	Short Term Course	21st-25th Feb. 2022	Invited Talk
2.	HEA 2021	TMS, USA	ICP	4-8th Dec. 2021	Oral Presentation
3.	International conference on Powder Metallurgy 2022 (PMAI-PM 22)	PMAI, India	ICP	18-21st April 2022	Invited Talk
4.	Advanced Technologies in Dissimilar Metal Welding (DMW-2022)	DAE-BRNS theme meeting, BARC Mumbai	ICP	15-16th July 2022	Invited Talk

**Dr. Jaiveer Singh**

Sl. No.	Title	Organization	Type	Dates	Chaired/co-chaired
1.	Virtual International Conference on Product Design, Development, and Deployment (PD3 - 2021)	VIT Vellore	IC	September 11-12, 2021	Chaired

Sl. No.	Title	Sponsoring Authority	Type	Organizers	Dates
1.	In-Situ Nanomechanical Testing & Property Correlation	Industron Nanotechnology Pvt Ltd	Mini-Symposium	Virtual Symposium, India	June 1-2, 2021

**Dr. Nitin Kumar Sharma**

S. No.	Title	Organization	Type	Dates	Role
1	FABTECH Professional Program 2021	American Welding Society (AWS)	International Conference	September 20, 2021	Oral Presentation
2	Short term course on Materials Engineering from Synthesis to Applications	Indian Institute of Technology (IIT) Indore	QIP & AICTE Sponsored Short-Term Course	February 21-26, 2022	Invited Lecture

**Dr. Srijan Sengupta**

S. No.	Title	Organization	Type	Dates	Role
1	Corrosion and Battery	Veer Surendra Sai University of Technology, Burla	Invited talk	6 February 2022	Keynote address delivered



## Publications

### Journal Articles

- Lee, S.-E., Kim, M.-S., Chae, Y.-W., Guim, H., Singh, J., & Choi, S.-H. (2022). Effect of intermediate heat treatment during hot rolling on the texture and formability of annealed AZ31 Mg alloy sheets. *Journal of Alloys and Compounds*, 897. ISSN: 09258388. <https://doi.org/10.1016/j.jallcom.2021.163238>
- Agrawal, P., Gupta, S., Shukla, S., Nene, S. S., Thapliyal, S., Toll, M. P., & Mishra, R. S. (2022). Role of Cu addition in enhancing strength-ductility synergy in transforming high entropy alloy. *Materials and Design*, 215. ISSN: 02641275. <https://doi.org/10.1016/j.matdes.2022.110487>
- Singh, A. K., Kaushik, L., Singh, J., Das, H., Mondal, M., Hong, S.-T., & Choi, S.-H. (2022). Evolution of microstructure and texture in the stir zone of commercially pure titanium during friction stir processing. *International Journal of Plasticity*, 150. ISSN: 07496419. <https://doi.org/10.1016/j.ijplas.2021.103184>
- Betal, A., Bera, J., Alam, M., Gandhi, A. N., & Sahu, S. (2022). Strain and electric field-modulated indirect-to-direct band transition of monolayer GaInS<sub>2</sub>. *Journal of Computational Electronics*, 21(1), 227–234. ISSN: 15698025. <https://doi.org/10.1007/s10825-021-01833-1>
- Bhowmik, S., Zhang, J., Vogel, S. C., Nene, S. S., Mishra, R. S., McWilliams, B. A., & Knezevic, M. (2022). Effects of plasticity-induced martensitic transformation and grain refinement on the evolution of microstructure and mechanical properties of a metastable high entropy alloy. *Journal of Alloys and Compounds*, 891. ISSN: 09258388. <https://doi.org/10.1016/j.jallcom.2021.161871>
- Ramya, M., & Ravi, K. R. (2022). Biodegradable nanocrystalline Mg-Zn-Ca-Ag alloys as suitable materials for orthopedic implants. *Materials Today: Proceedings*, 58, 721–725. ISSN: 22147853. <https://doi.org/10.1016/j.matpr.2022.02.290>
- Bera, J., Betal, A., Singh, Z., Gandhi, A. N., & Sahu, S. (2022). Low lattice thermal conductivity and its role in the remarkable thermoelectric performance of newly predicted SiS<sub>2</sub> and SiSe<sub>2</sub> monolayers. *Computational Materials Science*, 201. ISSN: 09270256. <https://doi.org/10.1016/j.commatsci.2021.110931>
- Arivazhagan, A., Venugopal, P. R., Mohammad, A., & Ravi, K. R. (2022). Influence of magnesium infiltration on compressive behavior of additively manufactured porous Ti6Al4V structure. *Journal of Testing and Evaluation*, 50(1). ISSN: 00903973. <https://doi.org/10.1520/JTE20200558>
- Dandekar, T. R., Kumar, A., Khatirkar, R. K., Singh, J., & Kumar, D. (2021). Effect of isothermal aging at 750 °C on microstructure and mechanical properties of UNS S32101 lean duplex stainless steel. *Materials Today Communications*, 29. ISSN: 23524928. <https://doi.org/10.1016/j.mtcomm.2021.102753>
- Kaushik, L., Singh, J., Kang, J.-H., Ko, Y. S., Kim, D.-I., Suh, J.-Y., & Choi, S.-H. (2021). Deciphering the role of multiple generations of annealing twins on texture evolution in cold-rolled high entropy alloys during annealing. *Scripta Materialia*, 205. ISSN: 13596462. <https://doi.org/10.1016/j.scriptamat.2021.114221>
- Gupta, S., Agrawal, P., Nene, S. S., & Mishra, R. S. (2021). Friction stir welding of  $\gamma$ -fcc dominated metastable high entropy alloy: Microstructural evolution and strength. *Scripta Materialia*, 204. ISSN: 13596462. <https://doi.org/10.1016/j.scriptamat.2021.114161>
- Saradesh, K. M., Ravi, K. R., & Vinodkumar, G. S. (2021). The age hardenability of 22 karat gold (Au-5.8wt.%Cu-2.5wt.%Ag) alloyed with titanium. *Gold Bulletin*, 54(2), 105–113. ISSN: 00171557. <https://doi.org/10.1007/s13404-021-00301-9>
- Nene, S. S., Agrawal, P., Frank, M., Watts, A., Shukla, S., Morphew, C., ... Mishra, R. S. (2021). Transformative high entropy alloy conquers the strength-ductility paradigm by massive interface strengthening. *Scripta Materialia*, 203. ISSN: 13596462. <https://doi.org/10.1016/j.scriptamat.2021.114070>
- Das, S., Banthia, S., Manna, J. S., Palai, D., & Sengupta, S. (2021). Electrodeposited Nickel Coating Reinforced with Chlorophyll-Reduced

- Graphene Oxide. *Advanced Engineering Materials*, 23(9). ISSN: 14381656. <https://doi.org/10.1002/adem.202100254>
- 15 Sittiho, A., Bhattacharyya, M., Graves, J., Nene, S. S., Mishra, R. S., & Charit, I. (2021). Friction stir processing of a high entropy alloy Fe<sub>42</sub>Co<sub>10</sub>Cr<sub>15</sub>Mn<sub>28</sub>Si<sub>5</sub> with transformative characteristics: Microstructure and mechanical properties. *Materials Today Communications*, 28. ISSN: 23524928. <https://doi.org/10.1016/j.mtcomm.2021.102635>
  - 16 Ramani, S., Wins, K. L. D., Nampoothiri, J., Ravi, K. R., & Dhas, D. S. E. J. (2021). Effect of post-reaction ultrasonic treatment on synthesis, microstructural evolution and mechanical behaviour of Al 4043/TiB<sub>2</sub> in situ nanocomposites. *Arabian Journal for Science and Engineering*, 46(8), 7521–7531. ISSN: 2193567X. <https://doi.org/10.1007/s13369-021-05468-z>
  - 17 Sarwat, S. G., & Ravi, K. R. (2021). Liquid phase as an indicator of glass-forming ability. *Intermetallics*, 133. ISSN: 09669795. <https://doi.org/10.1016/j.intermet.2021.107174>
  - 18 Kaushik, L., Kim, M.-S., Singh, J., Kang, J.-H., Heo, Y.-U., Suh, J.-Y., & Choi, S.-H. (2021). Deformation mechanisms and texture evolution in high entropy alloy during cold rolling. *International Journal of Plasticity*, 141. ISSN: 07496419. <https://doi.org/10.1016/j.ijplas.2021.102989>
  - 2) S.S. Nene, Transformative High Entropy Alloys: a potential solution for metal 3D printing using LPBF technique, (Invited abstract) presented in PM 22 to be held online during 18th-20th April 2022
  - 3) A. Dutta, S.K. Gupta, M.H. Tsai, S.S. Nene, Extremely high compressive strength in as-cast dual phase high entropy alloy for emerging applications, presented in PM 22 (online mode) conducted during 18th-20th April 2022.
  - 4) D. Mishra, S. Agrawal, J. Singh, S.S. Nene, Towards high engineering strength of newly designed brass like high entropy alloy for structural applications, presented in PM 22 (online mode) conducted during 18th-20th April 2022.
  - 5) S.S. Nene and R.S. Mishra, Designing new corrosion resistant materials with exceptional strength-ductility synergy and good weldability using high entropy approach, presented in HEA 2021, USA (online mode) during Dec. 5-8th, 2021.
  - 6) Narender Kumar, Na'il Saleh, Arun Kumar, Mohan Lal Verma, Pranay Ranjan, Investigation of Atomic Layer Futuristic Memory Devices of Binary Chalcogenides WX<sub>2</sub> (X = S and Se): First-Principles Study, *IEEE XPLORE*, 2022, 1-4, doi: 10.1109/ASET53988.2022.9735000
  - 7) Atul Kumar, Narender Kumar, Pranay Ranjan, Ajay D Thakur, Electrical and Optical Characterisation of CZTS Thin-Film for Sensing Applications, *IEEE XPLORE*, 2022, 1-4, doi: 10.1109/ASET53988.2022.9734877.

### Book Chapters

1. Shashank Shekhar, Nitin Kumar Sharma, Sandeep Sahu, and Santanu Misra (2022), "Electron backscatter diffraction technique: Fundamentals to Applications, In: Krishanu Biswas, Sri Sivakumar, Nilesh Prakash Gurao (editors) *Electron Microscopy in Science and Engineering*", IITK Directions, Vol. 6, Springer
2. S Senthil, KR Ravi, A Brief Review on Self-cleaning Coatings for Photovoltaic Systems, *New Research Directions in Solar Energy Technologies*, 197-234, 2021
- 8) Durgesh Kumar Pandey, Aritra Sarkar, Abir Bhattacharyya, A. Nagesha, Modelling of Low Cycle Fatigue Behaviour of type 316LN Austenitic Stainless Steel at Different Temperatures, 8th International Conference on CREEP, FATIGUE AND CREEP-FATIGUE INTERACTION, Aug 24-27, 2021
- 9) Juhi Srivastava, Aman Bansal, Bryan D. Allison, Abir Bhattacharyya, Investigation on the Formation of White Etching Region Due to Rolling Contact Fatigue in M50 Bearing Steel, 8th International Conference on CREEP, FATIGUE AND CREEP-FATIGUE INTERACTION, Aug 24-27, 2021

### Conference Abstracts/Proceedings

- 1) S.S. Nene, High Entropy Alloys: a potential material for efficient dissimilar welding, presented in DMW 2022 (invited talk) held during 15th-16th July 2022 at BARC Mumbai.
- 10) Nitin Kumar Sharma, James Hogan, Gary Fisher, and Leijun Li, Finite element simulation of generation of residual stress during brazing of cemented carbide and steel, presented in FABTECH professional program 2021 at Chicago, IL, USA (virtual mode) during September 20, 2021.

## Projects

### Ongoing Sponsored Projects

S. No	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
1	Thermoelectric Performance Study Using First-Principles Calculations Based Methods	SERB	Appala Naidu Gandhi	₹22,59,420	02-Apr-19	01-Apr-22
2	Design and Fabrication of Indigenous Powder Fed Metal Additive Manufacturing Machine	DST	Ravi K R	₹2,15,50,720	01-Aug-19	31-Jul-22
3	Quantitative assessment of Hot tearing characteristics of Aerospace Magnesium Alloys	Aeronautical Research & Development Board	Ravi K R	₹5,77,500	05-Aug-19	31-Dec-20
4	Chemical Reactions and Energy Transfer in Atmospheric N <sub>2</sub> /O <sub>2</sub> /Ar-Boron Nitride Surface Collisions: Applications in Modelling Spacecraft Materials	DST	Moumita Majundar	₹33,63,984	30-Nov-19	29-Nov-22
5	Study of the Effects of Stress-State and Strain-Rate on Constitutive Response of Polymer Gels via Experiments and Continuum Mechanics Modeling	SERB	Abir Bhattacharyya	₹30,60,480	21-Dec-19	20-Mar-22
6	Novel in-situ volume contractible metal halide negative electrodes for high performance lithium-ion batteries	SERB-CRG	Srijan Sengupta	₹31,07,150	17-Oct-20	04-Mar-23
7	Development of Transparent, Durable superhydrophobic-coating for self-cleaning of Endoscope	MSME	Ravi K R	₹15,00,000	31-Mar-21	30-Mar-22
8	Design of Cost-effective, Ultralight High Entropy Alloys with Transformation Induced Plasticity	SERB-SRG	Saurabh Nene	₹32,99,750	23-Dec-21	22-Dec-21
9	Development of optical based in-situ monitoring techniques for porosity detection during laser cladding and additive manufacturing of stainless steel	SERB	Ravi K R	₹50,42,400	16-Mar-22	15-Mar-25

# Department of Physics

A visible research in fundamental Physics along with its applications is the major theme of the Physics department at IIT Jodhpur. The faculty members carry out research in the field of Astrophysics, Condensed Matter Physics & Material Science, Particle Physics, Experimental and Theoretical Quantum Optics, Quantum Information and

Foundations of Quantum Mechanics. The research facilities available in the department include SQUID magnetometer, Physics Property Measurement Systems (PPMS), Raman Spectrometer and Scanning Tunneling Microscope (STM).

## Faculty Members



**Ashutosh Kumar Alok**

Head of Department

**Specialization/ Research interest:**  
Particle Physics and Cosmology



**Satyajit Sahu**

**Specialization/ Research interest:**

Molecular electronics, single molecular electronic devices, semiconductor devices, 2D materials and their applications, density functional theory, Information Processing in Biological Systems



**Ambesh Dixit**

**Specialization/ Research interest:**

Semiconductors, multifunctional ferroics & materials for energy-fabrication & characterization, Photovoltaic materials & devices ab initio DFT study and device simulations



**Subhashish Banerjee**

**Specialization/ Research interest:**

Open Quantum Systems; Quantum Information; Non-Equilibrium Statistical Mechanics; Quantum Optics


**Sampat Raj Vadera**

**Specialization/ Research interest:**  
Solid State Physics, Materials Science, Nanoscience and Nanotechnology, Stealth Materials, Stealth Technology


**Somnath Ghosh**

**Specialization/ Research interest:**  
Light in disordered and complex systems, Mid-IR photonics and unconventional devices


**Durgamadhab Mishra**

**Specialization/ Research interest:**  
Magnetic thin films and nanoparticles, Permanent Magnets, Synchrotron and Neutron Scattering and X-ray imaging


**V. Narayanan**

**Specialization/ Research interest:**  
Optics and Solar Field Design, Plasmonics, Laser Produced Plasmas (LPP), Pulsed Laser Deposition (PLD), Plasma Diagnostics (Interferometry & Optical Emission Spectroscopy (OES)), Laser Matter Interaction and Laser Cluster Interaction


**Monika Sinha**

**Specialization/ Research interest:**  
Astrophysics, Astroparticle physics


**Amitava Mitra**

**Specialization/ Research interest:**  
Magnetism & Application of Magnetic Materials, Electromagnetic Techniques for Non-destructive Evaluation of Damage for Engineering Components, Research Planning & Project Management


**Reetanjali Moharana**

**Specialization/ Research interest:**  
Astroparticle Physics, High energy Cosmic rays, Gamma rays and Neutrinos


**B.M. Krishna Mariserla**

**Specialization/ Research interest:**  
Light-Matter interactions, Ultrafast Spectroscopy, Terahertz Spectroscopy, and Higher harmonic generation


**Santosh Mogurampelly**

**Specialization/ Research interest:**  
Transport in Polymer Electrolytes and Materials, Multiscale Modeling of Soft Matter Physics and Materials Science


**Prabhat Kumar Jaiswal**

**Specialization/ Research interest:**  
Nonequilibrium Statistical Physics, Soft Condensed Matter Physics, Computational Physics

**Ram Prakash**

**Specialization/ Research interest:**  
Plasma Science & Technology: Low temperature plasma applications

**Shahab Ahmad**

**Specialization/ Research interest:**  
Condensed Matter Physics, Nanomaterials, Optoelectronics, Energy Storage Devices, Solar Cells, Photo-detectors, Light Emitting Diodes

The following DST Inspire faculty members joined the department during the year 2020-21.

**Lakshay Daukiya**

**Specialization/ Research interest:**  
Condensed Matter Physics, 2-D Materials, Surface Science

**Vijay Kumar Singh**

**Specialization/ Research interest:**  
Condensed Matter Physics; Nanotechnology; Low dimensional materials; Photo-detector; Biosensor; Electrochemical water splitting

The following Ramanujan faculty members joined the department during the year 2022-23.

**S. Appalakondaiah**

**Specialization/ Research interest:**  
Computational Condensed Matter Physics, Density Functional Theory, Phase transitions, Strongly Correlated Phenomena, Metal-Semiconductor interfaces, Lattice Dynamics

## Staff

The Department of Physics has the following technical and administrative staff members.

### Technical Staff

**Narendra Kumar Singh**

Technical Superintendent

### Administrative Staff

**Dhani Ram**

Senior Assistant

**Sunil Kumar Chouhan**

Office Assistant

## Department Research Groups

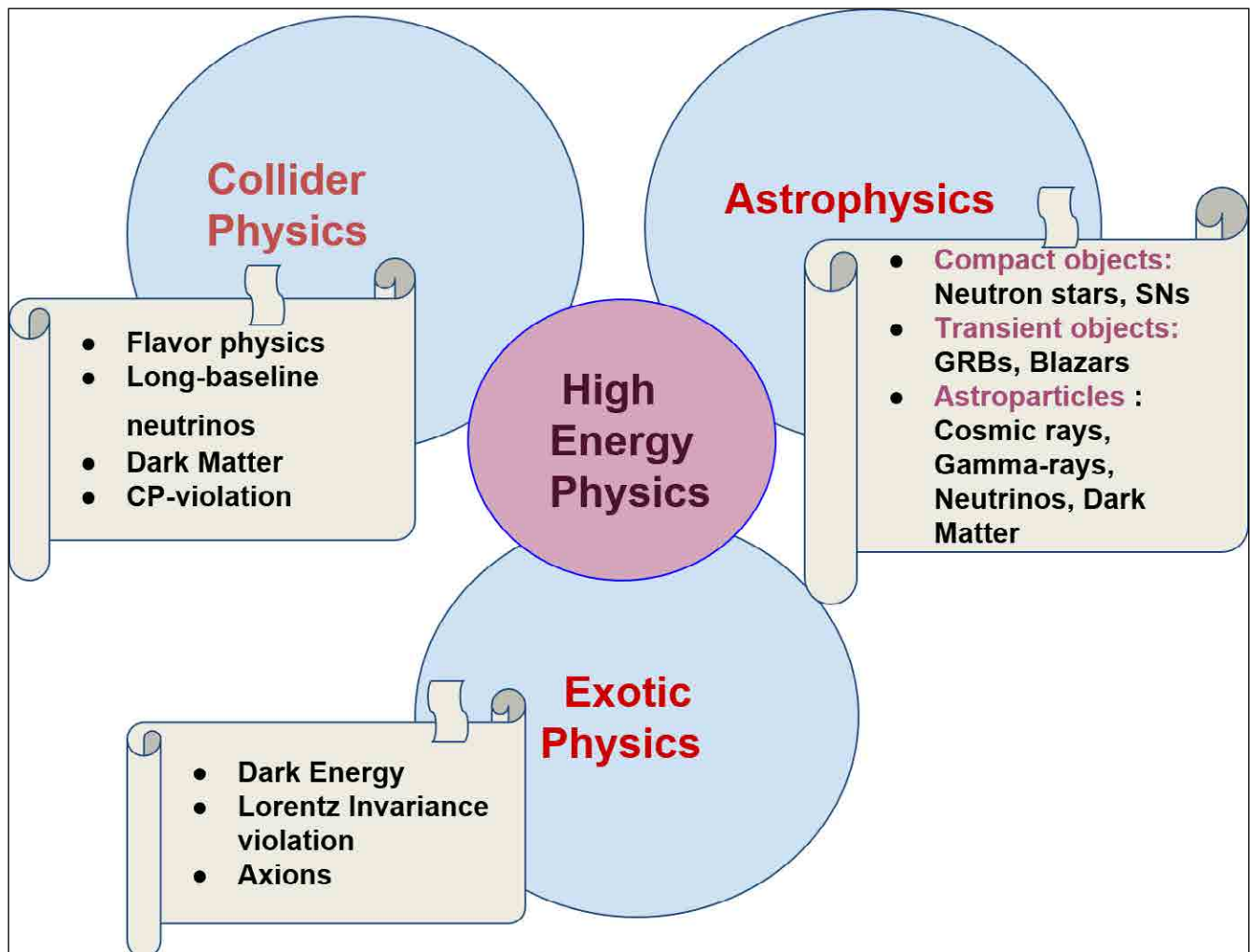
### Condensed Matter and Plasma Physics Group

The group at IIT Jodhpur is pursuing research in Experimental and Computational aspects of Condensed Matter and Plasma Physics. The blend of young and experienced faculty members in the group have a strong R&D focus to address the cutting edge challenges faced by the nation in the field of energy, climate change and sustainable growth, etc. The major field of research being pursued are Functional materials for strategic application, Materials for energy storage and harvesting, photovoltaics and solar thermal applications, Multiscale modeling of soft matter, Molecular devices for electronics, Magnetic and Multiferroic nanostructures and nanomaterials, Kinetics of phase transitions, Mechanical properties of amorphous solids, Wetting-Dewetting behavior on surfaces, and Development of cold plasma technologies for health applications and surface engineering. The endeavor is to create an ecosystem to carry out interdisciplinary research by taking advantage of all the expertise and resources available at IIT Jodhpur. In order to encourage that, the group has established Thematic Research labs viz, Functional Materials Lab, Thinfilm and Plasma Devices Lab, Multiscale Characterization Lab and Computational Lab, where various applied and fundamental research activities are carried out. The faculty members have established strong collaboration with national and international institutes and thus remain at the forefront of research via exchange of ideas and research scholars. The group envisions to grow further and embrace new members into the family and continue to strive to carve a unique path in the future for the department and the nation.



## High Energy Physics and Astrophysics Group

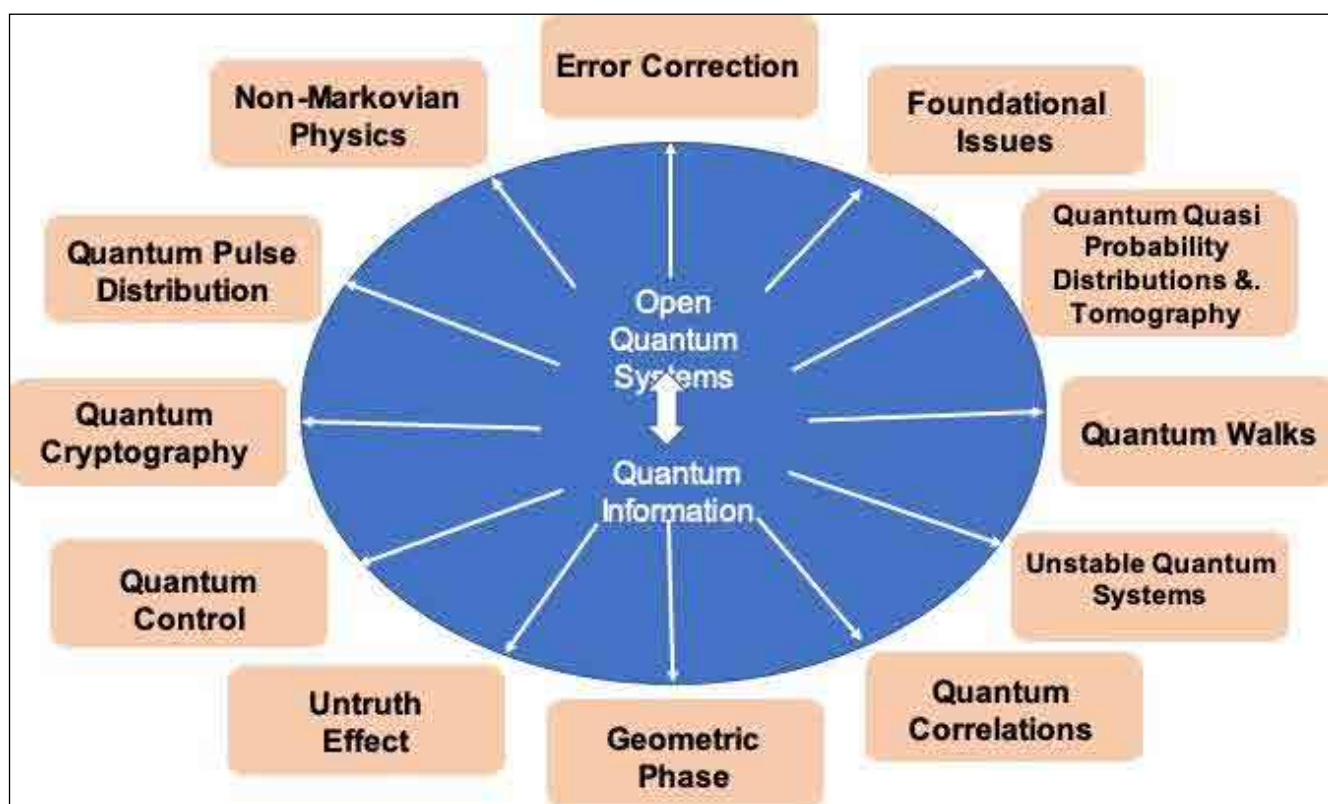
The group is involved in the research works comprising of astrophysics and particle physics as a part of understanding the origin and evolution of Universe. It aims at the participation in the exciting theoretical and phenomenological developments in the field of fundamental interactions of nature in cohesion with the rapid growth of new observational and experimental data in the field. The group addresses the forefront problems on both scales: using the universe and astrophysical objects to learn fundamental underlying features of particle physics and employing what is learned from particle physics to provide a better understanding of the universe at large scale by exploring nature and properties of the objects in it. The group is robustly active in several sub-domains of High Energy Physics.



## Quantum Physics group

The Quantum Physics Group aims at the intersection of various facets of quantum physics, from foundational issues to technological applications.

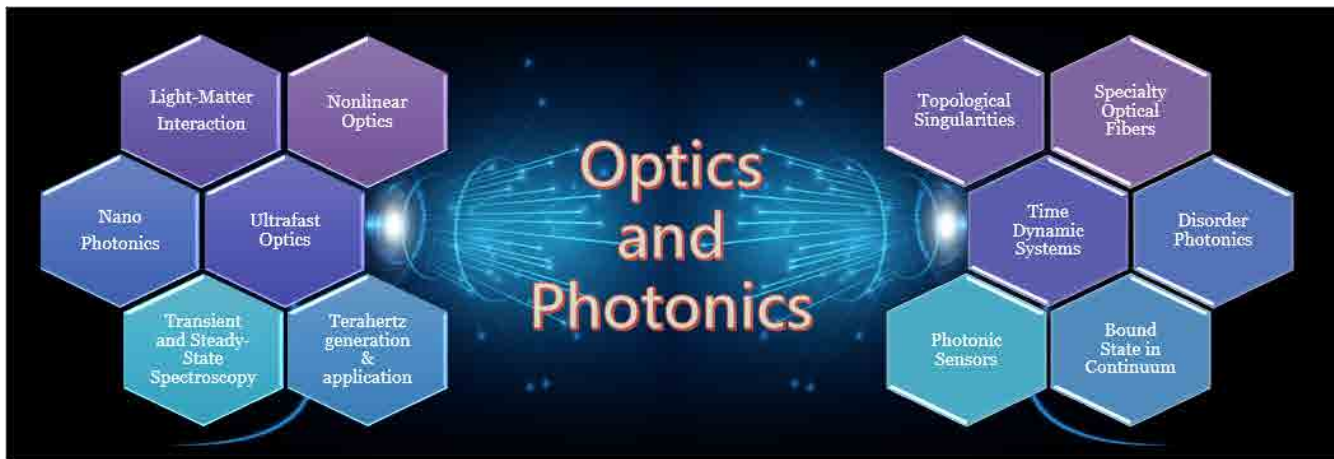




**Open Quantum Systems:** Open Quantum Systems: Dynamics of Nonclassical Evolution This provides an overall umbrella which allows for a global as well as a local viewpoint to be developed into various branches of quantum physics. In particular, efforts are made into: (i) Parity-Time (PT) Symmetric Quantum Physics: A non-Hermitian Hamiltonian with the parity (P) - time (T) symmetry; (ii) Quantum Thermodynamics: The major aim of these endeavors is to amalgamate quantum physics with thermodynamics. understanding of working efficiencies of quantum information processing devices.; (iii) Quantum Optics & Quantum State Engineering: With the advent of quantum state engineering the study of nonclassical properties of engineered quantum states has become important. nonclassical features in a quantum state can only provide quantum supremacy and are directly related to technology development; and (iv) Generation of multi-qubit states using short pulsed Lasers. Development of Homodyne detection: Wigner distribution of Coherent and Vacuum states .

### Optics and Photonics group

The group has been exploring fundamental as well as application specific research activities in optics and photonics. The present investigations include development of emerging technologies like Terahertz technology, Ultrafast Optical techniques, Time-resolved and Steady state spectroscopy, Fluorescence quantum efficiency, Optical Imaging and Mapping, Specialty Optical Fibers, Sensing and Quantum Confinement inspired optical phenomena. The research activities and opportunities equally involve experimental as well as theoretical aspects. The group has globally competitive skill sets in the domains of optics and photonics and progressively contributing towards fundamental explorations as well as making a paradigm shift in technology development and proof-of-concept devices.



## Laboratories and Equipments

The following laboratories are functional in the Department of Physics.

Experiential learning is an integral part of the various programs offered by the physics department at IIT Jodhpur. The students grasp the theoretical concepts much better and quickly through hands-on experience. Therefore, the department of Physics has established following laboratories for UG and PG students to enhance their comprehension of concepts taught in lectures as well as impart skills for their future professional growth.

In order to facilitate globally competitive cutting edge research and breakthrough technologies it is imperative to develop an atmosphere wherein the students and faculty members have free access to research facilities not only within the department but across all the departments of the institute. Therefore, the department has set up four focussed research groups which carry out fundamental and applied research in the areas of (i) Quantum Physics, (ii) High Energy and Astrophysics, (iii) Optics and Photonics and (iv) Condensed Matter and Plasma Physics. These research groups are supported by the Thematic Research Laboratories catering to the needs of the Faculty members, PhD students and Research staff. The details of Laboratories (Teaching / Research lab, Thematic Research lab) and Research Groups of the Department are given below.

## A. Teaching Labs

### 1. Basic Physics Lab

Typical experiments in the lab covers Electromagnetism (Hall effect, B-H curve tracing), Optics (Newton's Rings, Refractive index of prism, Diffraction of light, Faraday effect), Mechanics (Stationary waves in strings, Flywheels) and Electrodynamics (e/m-ratio with Helmholtz's coil, Basic current balance).

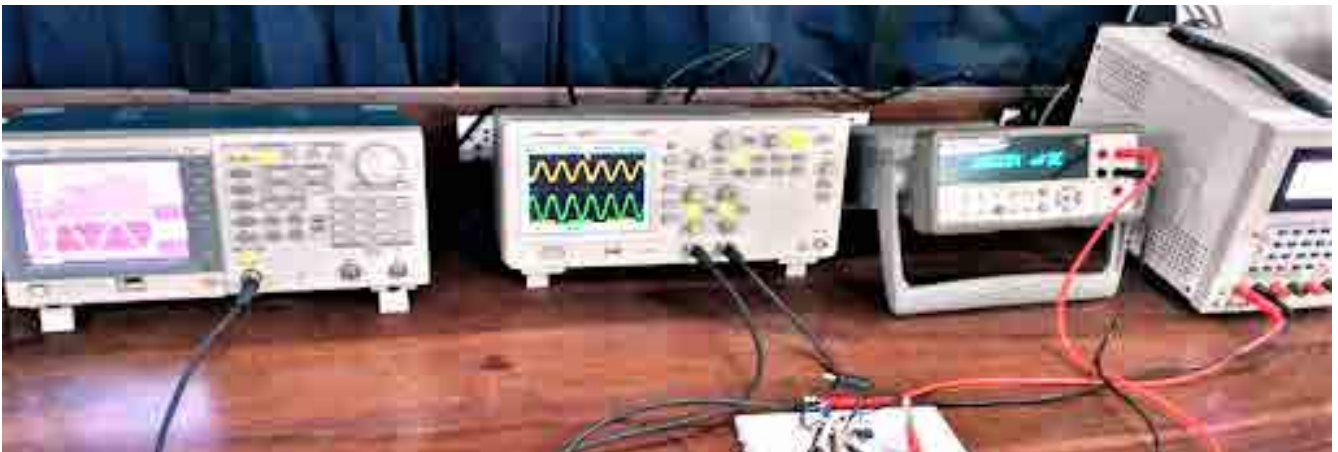


Basic Physics Lab

## 2. Electronics Lab

It is equipped with instruments that can be used to perform experiments related to transistors, Op-AMP, Digital circuits, etc. The following new equipment have been acquired in the Electronics Laboratory:

1. New source meter, oscilloscopes, function generators were added.
2. To perform Arduino based experiments new microcontrollers were added.



Electronics Lab

### 3. Condensed Matter Physics Lab

The lab is equipped with a four-probe set up for temperature dependent conductivity measurement, band gap measurement of semiconductors, Hall apparatus etc. to measure the functional properties viz. electronic, magnetic, optical and thermal properties of materials. The following new experiments have been added to Condensed Matter Physics Laboratory:

1. Vibrational spectrometer for Raman analysis
2. Temperature dependent resistivity and Hall measurements



Four-probe set up



Hysteresis loop tracer

### 4. Atomic and Nuclear Physics Lab

This lab has various experiments such as Compton Scattering, Frank-Hertz Experiment, Photoelectric effect, Alpha particle spectrometer, Radiation counters etc. covering fundamental aspects of nuclear and atomic physics.



Millikan Oil drop



Photoelectric effect apparatus

The following new experiments have been installed in Atomic and Nuclear Physics laboratory

1. Gamma Ray Spectrometer (Energy resolved)
2. Alpha spectrometer (Energy resolved)
3. Radiation Counter for Alpha and Beta Particle
4. Radiation Counter for Gamma and Beta Particle
5. Millikan Oil-drop experiment

### 5. Optics and Laser Lab

The experiments in the lab provide the conceptual understanding of geometrical & wave optics, and Lasers. It has several Interferometers (Michelson, Fabry Perot, Mach Zehnder), optical fibers, laser diodes, Goniometers, prisms, polarizers to cater to the experiments. New experiments such as refractor meter, characteristic study of diode laser and Polarization studies by wave plates are introduced in this academic year of 20-21.



### 6. Computational Physics Lab

The laboratory is equipped with several state-of-the-art workstations with multiple operating system environments. A number of computational and simulation programs including MATLAB® and Mathematica® are pre-installed. The standard flow of activities in this laboratory is to formulate/model the real-world and multi-Physics phenomena; develop algorithms; write code; execute the job on a computer; visualize and analyse obtained data; and finally, correlate/verify the results with the observed phenomena.

## B. Research Laboratories

### 1. Thin Films and Device Lab

The lab is equipped with various thin film fabrication instruments including in-house developed low-cost solution processing techniques such as spin coater, dip coater, and hydrothermal cells together with more advanced and sophisticated DC and RF magnetron sputtering system for single and multilayer thin film depositions, and thermal chemical vapor deposition system to fabricate thin-film nanostructures in different geometries. The synthesis laboratory provides the opportunity to develop materials ranging from bulk thin films to 2D and 1D nanostructured thin-film structures on various substrates for different applications such as energy, water, health, and environment.

### 2. Multiscale Characterization Lab

This lab houses several state-of-the-art characterization facilities viz. Scanning Tunneling Microscope, Physical Property Measurement System, SQUID Magnetometer, Multiferroic measurement systems, etc. The department also has access to a wide range of other analytical equipment available at the Centre for Advanced Scientific Equipment (CASE) being managed at the institute level.



(1) Low temperature Scanning Tunneling Microscope



(2) Electrical Transport Measurement system



Characterization of electronic properties of fabricated devices

### 3. Functional Materials Processing Lab

The lab is equipped with several advanced equipment such as High Energy Ball Milling, Pressure Machine, Plasma Etcher, a wide range of Furnaces, Glove Box, etc. The facilities will be further augmented with a number of state-of-the-art high-end process equipment for device fabrication.



Furnaces and Material Processing Units

#### 4. Functional Materials Design Lab

This lab is developing into a state-of-the-art facility with dedicated instrumentation for the synthesis of new functional materials for high efficiency photovoltaic devices and batteries, single-molecule electronics devices. Moreover, novel ferromagnetic and ferroelectric materials, high-performance thermoelectric materials, and stealth materials for enhanced military capability are also being synthesized in this lab.



Synthesis and Functionalization of Quantum Dots

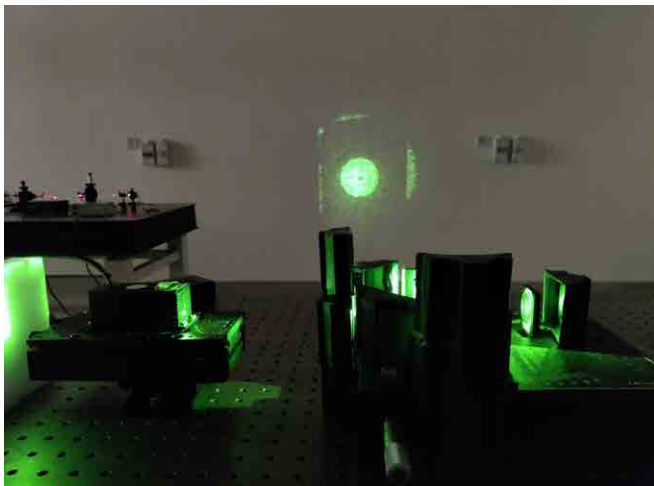
An inert atmosphere filled Glove box system is procured from DST funded research grant to facilitate the fabrication of Li-ion batteries and other types of energy storage devices at the Department of Physics.



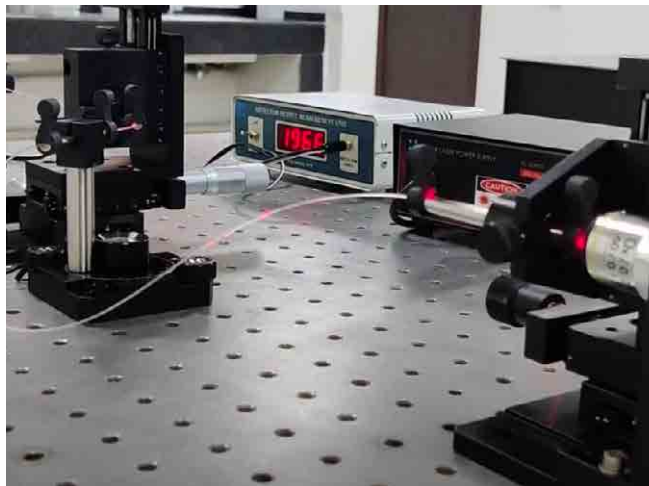
Three-port Glove Box system for the fabrication of Li-ion batteries

### 5. Nonlinear Photonics and Laser Lab

Nonlinear optical effects in the materials due to high-intensity laser pulses drive the research towards a deep understanding of light-matter interactions and development of novel photonic and nano electronics devices. In this lab fast dynamics using high intense and ultrafast lasers with broad spectral range, including UV-VIS, IR and THz will be carried out. Moreover, control and propagation of electromagnetic wave in disordered optical media, photonic devices and optical fibers are explored by computational and experimental techniques.



a) Experimental Design of Interferometry



b) Optical guiding through visible fibers

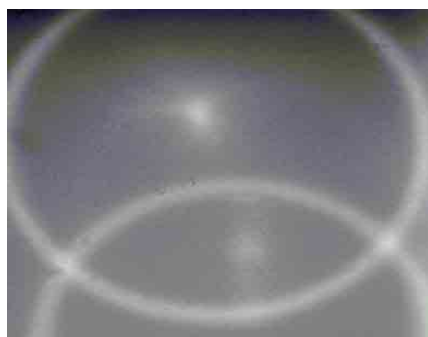


## 6. Quantum Optics and Quantum Information Lab

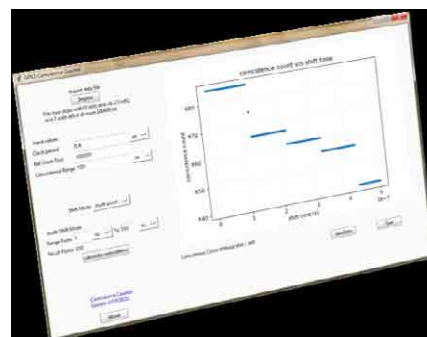
Along with various aspects of Quantum Physics efficient generation of entangled photons using short-pulsed laser and its characterization will be realized in this lab. Development of Single Photon Source and its characterization shall be performed. Optically generation of non-classical states shall be applied for carrying out challenging modern-day experiments in Quantum Physics.



(a) Entangled Photon Generation



(b) Entangled photons using Femto-Laser



(iii) GUI for Time-stamping

## 7. Computational Physics Lab

The Computational Physics laboratory is being developed with several state-of-the-art HPC workstations. A number of computational and simulation programs including LAMMPS, GROMACS, QUANTUM-ESPRESSO, VMD, MATLAB®, and Mathematica® will be made available to the users of Computational Physics Laboratory. The recommended workflow of research activities in this laboratory includes: ideate the research problem, develop model/algorithm, write a code/script, execute the job on a workstation, analyse and visualize computer generated data; and finally, test/produce/analyse the computational results. New High End Workstations have been acquired in the Computational Physics Laboratory.

## 8. Thematic Laboratory: Cold Plasma Lab

A cold plasma applications lab is being developed to create a niche of high science and high technology by retaining the leadership achieved and aiming at global leadership in the area of non-thermal and non-equilibrium cold plasmas for a range of food, health, energy, medicine, and agricultural applications. The following new equipment have been added to the Cold Plasma Lab.



High Resolution UV-Visible Monochromator (Focal Length 500 mm, Aperture Ratio  $f/6.5$ , Wavelength coverage 190 nm- 900 nm, Spectral Resolution 0.05 nm with 10 mm wide slits)



Vacuum Sealing System for Quartz/Glass Pinching (Four Tubes at a time)

A test and characterization set up for Dielectric Barrier Discharge Based Cold Plasma Systems is also being developed.



Cold Plasma Lab Set-up is being built

## Publications

### Journal Publications

- Betal, A., Bera, J., Sharma, A., Rath, A. K., & Sahu, S. (2022). Composition and Surface Morphology Invariant High On-Off Ratio from an Organic Memristor. *ACS Applied Electronic Materials*, 4(3), 1109–1116. ISSN: 26376113. <https://doi.org/10.1021/acsaelm.1c01234>
- Rai, S., Singh, V. K., Pendurthi, R., Nasr, J. R., Das, S., & Srivastava, A. (2022). Unveiling the electrical and photo-physical properties of intrinsic n-type 2D WSe<sub>2</sub> for high performance field-effect transistors. *Journal of Applied Physics*, 131(9). ISSN: 00218979. <https://doi.org/10.1063/5.0082707>
- Alok, A. K., Kumbhakar, S., & Sankar, S. U. (2022). A unique discrimination between new physics scenarios in  $b \rightarrow s\mu^+\mu^-$  anomalies. *European Physical Journal Plus*, 137(3). ISSN: 21905444. <https://doi.org/10.1140/epjp/s13360-022-02576-z>
- Chetia, A., Bera, J., Betal, A., & Sahu, S. (2022). A brief review on photodetector performance based on zero dimensional and two dimensional materials and their hybrid structures. *Materials Today Communications*, 30. ISSN: 23524928. <https://doi.org/10.1016/j.mtcomm.2022.103224>
- Laha, S. S., Thorat, N. D., Singh, G., Sathish, C. I., Yi, J., Dixit, A., & Vinu, A. (2022). Rare-Earth Doped Iron Oxide Nanostructures for Cancer Theranostics: Magnetic Hyperthermia and Magnetic Resonance

- Imaging. *Small*, 18(11). ISSN: 16136810. <https://doi.org/10.1002/smll.202104855>
- 6 Dey, S., Das, N. R., & Ghosh, S. (2022). Exploring unconventional features of light dynamics in Aubrey–André–Harper model based quasi-periodic optical lattices. *Optics Communications*, 506. ISSN: 00304018. <https://doi.org/10.1016/j.optcom.2021.127593>
  - 7 Singha, C., & Banerjee, S. (2022). Thermal radiation in curved spacetime using influence functional formalism. *Physical Review D*, 105(4). ISSN: 24700010. <https://doi.org/10.1103/PhysRevD.105.045020>
  - 8 Khan, B., Singh, M. K., Kumar, A., Pandey, A., Dwivedi, S., Kumar, U., Ramawat, S., Kukreti, S., Dixit, A., Roy, S. C. (2022). Multiferroic, optical and magneto-dielectric properties with enhanced magneto-impedance characteristic of  $\text{KBiFe}_2\text{O}_5$ . *Journal of Alloys and Compounds*, 893. ISSN: 09258388. <https://doi.org/10.1016/j.jallcom.2021.162225>
  - 9 Laha, A., Dey, S., & Ghosh, S. (2022). Reverse-chiral response of two T -symmetric optical systems hosting conjugate exceptional points. *Physical Review A*, 105(2). ISSN: 24699926. <https://doi.org/10.1103/PhysRevA.105.022203>
  - 10 Kumar, K., Bharti, A., & Mogurampelly, S. (2022). Insights on choline chloride–based deep eutectic solvent (reline) + primary alcohol mixtures: a molecular dynamics simulation study. *Journal of Molecular Modeling*, 28(2). ISSN: 16102940. <https://doi.org/10.1007/s00894-021-05017-3>
  - 11 Jani, R. K., Saini, L., & Vadera, S. R. (2022). Size dependent percolation threshold and microwave absorption properties in nano carbon black/silicon rubber composites. *Journal of Applied Physics*, 131(4). ISSN: 00218979. <https://doi.org/10.1063/5.0071517>
  - 12 Kumar, N., Chaurasiya, R., & Dixit, A. (2022). Strain tailored thermodynamic stability, electronic transitions, and optoelectronic properties of III (In, Ga and Al)-nitride monolayers. *Nanotechnology*, 33(4). ISSN: 09574484. <https://doi.org/10.1088/1361-6528/ac31ea>
  - 13 Thapa, V. B., & Sinha, M. (2022). Influence of the nuclear symmetry energy slope on observables of compact stars with. *Physical Review C*, 105(1). ISSN: 24699985. <https://doi.org/10.1103/PhysRevC.105.015802>
  - 14 Alok, A. K., Chundawat, N. R. S., & Kumar, D. (2022). Impact of  $b \rightarrow s\ell\ell$  anomalies on rare charm decays in non-universal  $Z'$  models. *European Physical Journal C*, 82(1). ISSN: 14346044. <https://doi.org/10.1140/epjc/s10052-021-09975-z>
  - 15 Saikia, D., Bera, J., Betal, A., & Sahu, S. (2022). Performance evaluation of an all inorganic CsGel3 based perovskite solar cell by numerical simulation. *Optical Materials*, 123. ISSN: 09253467. <https://doi.org/10.1016/j.optmat.2021.111839>
  - 16 Paul, A., Laha, A., Dey, S., & Ghosh, S. (2021). Asymmetric guidance of multiple hybrid modes through a gain-loss-assisted planar coupled-waveguide system hosting higher-order exceptional points. *Physical Review A*, 104(6). ISSN: 24699926. <https://doi.org/10.1103/PhysRevA.104.063503>
  - 17 Tripathi, B., Katiyar, R. K., Morell, G., Dixit, A., & Katiyar, R. S. (2021). BiFeO3 coupled polysulfide trapping in C/S composite cathode material for Li-S batteries as large efficiency and high rate performance. *Energies*, 14(24). ISSN: 19961073. <https://doi.org/10.3390/en14248362>
  - 18 Utagi, S., Banerjee, S., & Srikanth, R. (2021). On the non-Markovianity of quantum semi-Markov processes. *Quantum Information Processing*, 20(12). ISSN: 15700755. <https://doi.org/10.1007/s11128-021-03302-x>
  - 19 Verma, H., kale, A. J., Prakash, C., Harb, M., & Dixit, A. (2021). Enhanced Photocatalytic Activity in Strain Engineered Janus WSe Monolayers. *Journal of Electronic Materials*, 50(12), 7230–7239. ISSN: 03615235. <https://doi.org/10.1007/s11664-021-09215-w>
  - 20 Dixit, A., Bhatia, B., & Tripathi, R. P. (2021). Evolution of hematite and/or magnetite iron phases with thermal heating in ordinary chondrites: A generic characteristic. *Journal of Earth System Science*, 130(4). ISSN: 23474327. <https://doi.org/10.1007/s12040-021-01699-8>

- 21 Vavilapalli, D. S., Melvin, A. A., Bellarmine, F., Mannam, R., Velaga, S., Poswal, H. K., ... Singh, S. (2021). Author Correction: Growth of sillenite  $\text{Bi}_{12}\text{FeO}_{20}$  single crystals: structural, thermal, optical, photocatalytic features and first principle calculations (Scientific Reports, (2020), 10, 1, (22052), 10.1038/s41598-020-78598-3). Scientific Reports, 11(1). ISSN: 20452322. <https://doi.org/10.1038/s41598-021-85663-y>
- 22 Stingaciu, M., Mishra, D., de Julián Fernández, C., Cabassi, R., Eikeland, A. Z., Christensen, M., & Deledda, S. (2021). High magnetic coercive field in Ca-Al-Cr substituted strontium hexaferrite. Journal of Alloys and Compounds, 883. ISSN: 09258388. <https://doi.org/10.1016/j.jallcom.2021.160768>
- 23 Karak, S., Bera, J., Paul, S., Sahu, S., & Saha, S. (2021). Low thermal conductivity and interface thermal conductance in Sn S<sub>2</sub>. Physical Review B, 104(19). ISSN: 24699950. <https://doi.org/10.1103/PhysRevB.104.195304>
- 24 Beniwal, R., Gawas, P., Prabha Charan, C., Nutalapati, V., & Mariserla, B. M. K. (2021). Core modified freebase porphyrins in glass matrix for nonlinear optical properties. Materials Letters, 303. ISSN: 0167577X. <https://doi.org/10.1016/j.matlet.2021.130453>
- 25 Khandelwal, A., Dhindhoria, K., Dixit, A., & Chhabra, M. (2021). Superiority of activated graphite/CuO composite electrode over Platinum based electrodes as cathode in algae assisted microbial fuel cell. Environmental Technology and Innovation, 24. ISSN: 23521864. <https://doi.org/10.1016/j.eti.2021.101891>
- 26 Lahiri, S., Banerjee, S., & Jayannavar, A. M. (2021). Exploring the extent of validity of quantum work fluctuation theorems in the presence of weak measurements. Quantum Information Processing, 20(11). ISSN: 15700755. <https://doi.org/10.1007/s11128-021-03260-4>
- 27 Tiwari, C., & Dixit, A. (2021). Highly textured (100)-oriented AlN thin films using thermal atomic layer deposition and their electrical properties. Applied Physics A: Materials Science and Processing, 127(11). ISSN: 09478396. <https://doi.org/10.1007/s00339-021-04961-4>
- 28 Prasad, D., Praveen, A., Mahapatra, S., Mogurampelly, S., & Chaudhari, S. R. (2021). Existence of  $\beta$ -diketone form of curcuminoids revealed by NMR spectroscopy. Food Chemistry, 360. ISSN: 03088146. <https://doi.org/10.1016/j.foodchem.2021.130000>
- 29 Naikoo, J., Banerjee, S., Pan, A. K., & Ghosh, S. (2021). Projective measurements under qubit quantum channels. Physical Review A, 104(4). ISSN: 24699926. <https://doi.org/10.1103/PhysRevA.104.042608>
- 30 Mandal, S., & Banerjee, S. (2021). Local description of S-matrix in quantum field theory in curved spacetime using Riemann-normal coordinate. European Physical Journal Plus, 136(10). ISSN: 21905444. <https://doi.org/10.1140/epjp/s13360-021-02037-z>
- 31 Yadav, D. K., Yadav, A., Meena, K., Devat, K., Mishra, J. K., Sahu, R., Jain, S. K., Dixit, A., Srivastava, N., Patodia, T., Jakhar, N., & Tripathi, B. (2021). Study of CNT Intercalated  $\text{Bi}_2\text{O}_3/\text{PVDF}$  Composite for Super Capacitors Applications. Macromolecular Symposia, 399(1). ISSN: 10221360. <https://doi.org/10.1002/masy.202100022>
- 32 Biswas, P., Dey, S., & Ghosh, S. (2021). Specialty topological fiber using periodic lattice geometries. Physical Review A, 104(4). ISSN: 24699926. <https://doi.org/10.1103/PhysRevA.104.043513>
- 33 Thapa, V. B., Kumar, A., & Sinha, M. (2021). Baryonic dense matter in view of gravitational-wave observations. Monthly Notices of the Royal Astronomical Society, 507(2), 2991–3004. ISSN: 00358711. <https://doi.org/10.1093/mnras/stab2327>
- 34 Alok, A. K., Dighe, A., Gangal, S., & Kumar, J. (2021). The role of non-universal Z couplings in explaining the Vus anomaly. Nuclear Physics B, 971. ISSN: 05503213. <https://doi.org/10.1016/j.nuclphysb.2021.115538>
- 35 Pandey, S., Ramavtar, K., Pareek, P., & Prakash, R. (2021). Surface Dielectric Barrier Discharge Based Large Volume Plasma Activated Water. IEEE Int Conf

- Plasma Sci, 2021-September. Institute of Electrical and Electronics Engineers Inc. ISBN: 07309244; 9781665432276 (ISBN). <https://doi.org/10.1109/ICOPS36761.2021.9588505>
- 36 Dixit, S., Patodia, T., Sharma, K. B., Katyayan, S., Dixit, A., Jain, S. K., Agarwal, G., Tripathi, B. (2021). Adsorption characteristics of MWNTs via intercalation of nickel. *Mater. Today Proc.*, 38, 1233–1236. ISSN: 22147853. <https://doi.org/10.1016/j.matpr.2020.07.534>
- 37 Bhattacharjee, S., Biswas, P., & Ghosh, S. (2021). Identifying topological signature of 1D photonic lattice by Zak phase analysis and towards robust amplification of edge state. *Journal of Optics (United Kingdom)*, 23(9). ISSN: 20408978. <https://doi.org/10.1088/2040-8986/ac11ab>
- 38 Kukreti, S., Gupta, G. K., & Dixit, A. (2021). Theoretical DFT studies of Cu<sub>2</sub>HgSnS<sub>4</sub> absorber material and Al:ZnO/ZnO/CdS/Cu<sub>2</sub>HgSnS<sub>4</sub>/Back contact heterojunction solar cell. *Solar Energy*, 225, 802–813. ISSN: 0038092X. <https://doi.org/10.1016/j.solener.2021.07.071>
- 39 Balakrishnan, R., Dixit, A., Rao, M. S. R., & Naik, R. (2021). Influence of Ca doping on X-ray photoelectron core-level spectra of magnetoelectric bulk BiFeO<sub>3</sub>. *Surface and Interface Analysis*, 53(9), 798–807. ISSN: 01422421. <https://doi.org/10.1002/sia.6981>
- 40 Saini, L., Jani, R. K., Janu, Y., Kumar, M., Patra, M. K., & Dixit, A. (2021). Gamma radiation induced microwave absorption properties of Ultra-thin barium titanate (BaTiO<sub>3</sub>) ceramic tiles over X-Band (8.2–12.4GHz). *Ceramics International*, 47(16), 22397–22403. ISSN: 02728842. <https://doi.org/10.1016/j.ceramint.2021.04.249>
- 41 Bera, J., Betal, A., & Sahu, S. (2021). Spin orbit coupling induced enhancement of thermoelectric performance of HfX<sub>2</sub> (X = S, Se) and its Janus monolayer. *Journal of Alloys and Compounds*, 872. ISSN: 09258388. <https://doi.org/10.1016/j.jallcom.2021.159704>
- 42 Abe, K., Adrich, P., Aihara, H., Akutsu, R., Alekseev, I., Ali, A., Mishra, A. K.... Zsoldos, S. (2021). Supernova Model Discrimination with Hyper-Kamiokande. *Astrophysical Journal*, 916(1). ISSN: 0004637X. <https://doi.org/10.3847/1538-4357/abf7c4>
- 43 Murugaiyan, P., Mitra, A., Jena, P. S. M., Mahato, B., Ghosh, M., Roy, R. K., & Panda, A. K. (2021). Grain refinement in Fe-rich FeSiB(P)NbCu nanocomposite alloys through P compositional modulation. *Materials Letters*, 295. ISSN: 0167577X. <https://doi.org/10.1016/j.matlet.2021.129852>
- 44 Saini, L., Gupta, V., Patra, M. K., Jani, R. K., Shukla, A., Kumar, N., & Dixit, A. (2021). Impedance engineered microwave absorption properties of Fe-Ni/C core-shell enabled rubber composites for X-band stealth applications. *Journal of Alloys and Compounds*, 869. ISSN: 09258388. <https://doi.org/10.1016/j.jallcom.2021.159360>
- 45 Sarkar, R., Dutta, S., Banerjee, S., & Panigrahi, P. K. (2021). Phase squeezing of quantum hypergraph states. *Journal of Physics B: Atomic, Molecular and Optical Physics*, 54(13). ISSN: 09534075. <https://doi.org/10.1088/1361-6455/ac02d2>
- 46 Naikoo, J., Kumari, S., Banerjee, S., & Pan, A. K. (2021). PT symmetric evolution, coherence and violation of Leggett-Garg inequalities. *Journal of Physics A: Mathematical and Theoretical*, 54(27). ISSN: 17518113. <https://doi.org/10.1088/1751-8121/ac0546>
- 47 Paul, A., Laha, A., & Ghosh, S. (2021). Hosting of exceptional points in an atom-field interaction Hamiltonian and manipulation of light states. *Physica Scripta*, 96(7). ISSN: 00318949. <https://doi.org/10.1088/1402-4896/abf7ff>
- 48 Sahani, R. M., Singhal, R., Jinger, N., Kulhar, M., Pandya, A., & Dixit, A. (2021). Gamma Radiation Dosimetry Characteristics of Hydrothermally Synthesized TiO<sub>2</sub> Nanorods. *Journal of Electronic Materials*, 50(7), 4090–4095. ISSN: 03615235. <https://doi.org/10.1007/s11664-021-08939-z>
- 49 Bhalla, B., & Sinha, M. (2021). Ambipolar decay of magnetic field in magnetars and the observed magnetar activities. *Modern Physics Letters A*, 36(20). ISSN: 02177323. <https://doi.org/10.1142/S0217732321501443>
- 50 Shringi, A. K., Betal, A., Sahu, S., & Kumar, M. (2021). Write-once-read-many-times resistive switching

- behavior of amorphous barium titanate based device with very high on-off ratio and stability. *Applied Physics Letters*, 118(26). ISSN: 00036951. <https://doi.org/10.1063/5.0050448>
- 51 Alok, A. K., Kumbhakar, S., Saini, J., & Sankar, S. U. (2021). New physics in  $b \rightarrow se+e^-$ : A model independent analysis. *Nuclear Physics B*, 967. ISSN: 05503213. <https://doi.org/10.1016/j.nuclphysb.2021.115419>
- 52 Shekhawat, S. S., Gupta, A. B., Kulshreshtha, N. M., & Prakash, R. (2021). UV disinfection studies on chlorine tolerant bacteria recovered from treated sewage. *Journal of Environmental Chemical Engineering*, 9(3). ISSN: 22133437. <https://doi.org/10.1016/j.jece.2021.105253>
- 53 Sahani, R. M., Pandya, A., & Dixit, A. (2021). Zinc oxide/polystyrene composite based scintillator for alpha particle monitoring. *Materials Science in Semiconductor Processing*, 127. ISSN: 13698001. <https://doi.org/10.1016/j.mssp.2021.105692>
- 54 Mathieson, A., Rahil, M., Zhang, Y., Dose, W. M., Lee, J. T., Deschler, F., Ahmad, S., De Volder, M. (2021). Ruddlesden Popper 2D perovskites as Li-ion battery electrodes. *Materials Advances*, 2(10), 3370–3377. ISSN: 26335409. <https://doi.org/10.1039/d1ma00020a>
- 55 Madeo, J., Man, M. K. L., Sahoo, C., Campbell, M., Pareek, V., Wong, E. L., ... Dani, K. M. (2021). Time-resolved ARPES of excitons in a 2D semiconductor. *Conf. Lasers Electro-Opt., CLEO - Proc. Institute of Electrical and Electronics Engineers Inc.* ISBN: 9781943580910.
- 56 Ghosal, A., Das, D., & Banerjee, S. (2021). Characterizing qubit channels in the context of quantum teleportation. *Physical Review A*, 103(5). ISSN: 24699926. <https://doi.org/10.1103/PhysRevA.103.052422>
- 57 Chandrasekhar, S., Deepa, H. R., Melavanki, R., Basanagouda, M. M., Mogurampelly, S., & Thipperudrappa, J. (2021). Computational and spectroscopic studies of biologically active coumarin-based fluorophores. *Luminescence*, 36(3), 769–787. ISSN: 15227235. <https://doi.org/10.1002/bio.4002>
- 58 Sharma, A., Dambhare, N. V., Bera, J., Sahu, S., & Rath, A. K. (2021). Crack-Free Conjugated PbS Quantum Dot-Hole Transport Layers for Solar Cells. *ACS Applied Nano Materials*, 4(4), 4016–4025. ISSN: 25740970. <https://doi.org/10.1021/acsnanm.1c00373>
- 59 Alok, A. K., Kumbhakar, S., & Sankar, S. U. (2021). Discriminating new physics in  $b \rightarrow s\mu+\mu^-$  via transverse polarization asymmetry of  $K^*$  meson. *Proc. Sci.*, 390. Sissa Medialab Srl. ISBN: 18248039.
- 60 Utagi, S., Rao, V. N., Srikanth, R., & Banerjee, S. (2021). Singularities, mixing, and non-Markovianity of Pauli dynamical maps. *Physical Review A*, 103(4). ISSN: 24699926. <https://doi.org/10.1103/PhysRevA.103.042610>
- 61 Athira, B. S., Mandal, S., & Banerjee, S. (2021). Characteristics of interaction between gravitons and photons. *European Physical Journal Plus*, 136(4). ISSN: 21905444. <https://doi.org/10.1140/epjp/s13360-021-01361-8>
- 62 Dey, S., Laha, A., & Ghosh, S. (2021). Exotic light dynamics around an exceptional point of order four associated with three connecting second-order exceptional points. *Journal of the Optical Society of America B: Optical Physics*, 38(4), 1297–1306. ISSN: 07403224. <https://doi.org/10.1364/JOSAB.416232>
- 63 Paulson, K. G., Panwar, E., Banerjee, S., & Srikanth, R. (2021). Hierarchy of quantum correlations under non-Markovian dynamics. *Quantum Information Processing*, 20(4). ISSN: 15700755. <https://doi.org/10.1007/s11128-021-03061-9>
- 64 Goel, N., Bera, J., Kumar, R., Sahu, S., & Kumar, M. (2021). MoS<sub>2</sub>-PVP Nanocomposites Decorated ZnO Microsheets for Efficient Hydrogen Detection. *IEEE Sensors Journal*, 21(7), 8878–8885. ISSN: 1530437X. <https://doi.org/10.1109/JSEN.2021.3054038>

### International Conference Papers

1. Kiran Ahlawat, Ramavtar, Shivam Chaturvedi, Rajneesh Chaurasiya, Ankur Gupta, Shankar Manoharan, Deepak Fulwani, Ambesh Dixit and Ram Prakash "A Portable Photocatalytic Oxidation System for Reuse of N95 Filtering Face-Mask Respirators" Proceedings of the 48th IEEE International Conference on Plasma Sciences

- (ICOPS-2021) held at Lake Tahoe, Maxico, USA during 12-16 September 2021 (Poster Presentation).
2. Shikha Pandey, Kiran, Ramavtar, Pankaj Pareek and Ram Prakash "Surface Dielectric Barrier Discharge Based Large Volume Plasma Activated Water" Proceedings of the 48th IEEE International Conference on Plasma Sciences (ICOPS-2021) held at Lake Tahoe, Maxico, USA during 12-16 September 2021 (Poster Presentation).
  3. Amitava Mitra, "Rapidly Solidified Magnetic Materials and Their Applications", 2nd International Conference on "Metallurgy & Materials Technology-Emerging Trends, Development & Applications" (On-line) organized by MetCorr, 30th June, 2021
  4. Ravina Beniwal, Pratiksha Gawas, Chandra Prabha charan, Venkatramaiah Nutalapati\*, Bala Murali Krishna Mariserla, "Nonlinear optical study of hydroxyl phenyl porphyrins embedded in borate glass matrix for power limiting applications", ICAMMC 2021, SRM University, Chennai, Tamil Nadu, India, Dec 02-04 (2021).
  5. Ravina Beniwal, Pratiksha Gawas, Chandra Prabha charan, Venkatramaiah Nutalapati\*, Bala Murali Krishna Mariserla, "Core modified free based porphyrin in solution/glass matrix for optical limiting application", ICON 2021, SRM University, Chennai, Tamil Nadu, India, Feb 01-03 (2021).
  6. Ravina, Pratiksha Gawas, Aswathy Sundaresan, K. Shadak Alee, Venkatramaiah Nutalapati, Bala Murali Krishna Mariserla\*, "Functionalization of graphene with metal nanoparticles by pulsed laser-induced synthesis", APS March Meetings 2021, USA, Mar 15th -19th (2021).
  7. Julien Madéo, Michael KL Man, Chakradhar Sahoo, Marshall Campbell, Vivek Pareek, E Laine Wong, Abdullah Al-Mahboob, Nicholas S Chan, Arka Karmakar, Bala Murali Krishna Mariserla, Xiaoqin Li, Tony F Heinz, Ting Cao, Keshav M Dani, "Time-resolved ARPES of excitons in a 2D semiconductor", CLEO-2021, San Jose, California, USA, 9-14 May 2021.
  8. Chakradhar Sahoo, Julien Madéo, Michael Man, Marshall Campbell, Vivek Pareek, E Laine Wong, Abdullah Al-Mahboob, Nicholas S Chan, Arka Karmakar, Bala Murali Krishna Mariserla, Xiaoqin Elaine Li, Tony Heinz, Ting Cao, Keshav Dani, "Dynamics of momentum-resolved excitons in a 2D semiconductor using TR- $\mu$ ARPES", APS March meetings, USA Mar 15-19 (2021).
  9. S. Dey and S. Ghosh, "Hosting exceptional points in 1D photonic bandgap waveguide for mode engineering" 26th Optoelectronics and Communications Conference, P. Alexander Wai, H. Tam, and C. Yu, eds., OSA Technical Digest (Optical Society of America, 2021), paper W4C.5.
  10. A. Paul, A. Laha, S.dey and S. Ghosh " Exceptional points and non-chiral mode conversion of hybrid-modes in a manifold coupled planar waveguide" 26th Optoelectronics and Communications Conference, P. Alexander Wai, H. Tam, and C. Yu, eds., OSA Technical Digest (Optical Society of America, 2021), paper JS3E.9.
  11. S. Dey, M. Mishra, P. Biswas, N. Ranjan Das and S. Ghosh, "A Specialty Multicore Optical Fiber Using Aubry-AndreHarper Model Based Localization Phase Transition Frontiers in Optics and Laser Sciences (FiO+LS-2021), Technical Digest Series (Optica Publishing Group, 2021), paper JTU1A.85, Washington DC, United States, November 2021.
  12. A. Roy, S. Dey, A. Laha, A. Biswas, and S. Ghosh, "Hosting an exceptional point in a gain-loss assisted dual-core optical fiber segment", Frontiers in Optics and Laser Sciences (FiO+LS-2021), Technical Digest Series (Optica Publishing Group, 2021), paper JW7A.50, Washington DC, United States, November 2021.
  13. A. Laha, D. Beniwal, and S. Ghosh, "Third-order exceptional point and state-switching in an all-lossy microcavity," The JSAP-OSA Joint Symposia (82th Autumn Meeting of the Japan Society of Applied Physics), September 2021, paper 10a-N405-4, Virtual Web Conference, Japan.
  14. B. Pant et.al., GRAPES-3 Collaboration, "Characterizing the isotropic diffuse gamma-ray flux (10-300 TeV) by the GRAPES-3 experiment", ICRC Proceedings

15. D. Pattnaik, GRAPES-3 Collaboration "Measurement of the improved angular resolution of GRAPES-3 EAS array by the observation of the Moon shadow", ICRC Proceedings
16. GRAPES-3 Collaboration, "Zenith angle dependence of pressure effect in GRAPES-3 muon telescope", ICRC proceedings
17. GRAPES-3 Collaboration, "An Advanced Triggerless Data Acquisition System for GRAPES-3 Muon Detector", ICRC Proceedings
18. GRAPES-3 Collaboration, "Cosmic ray energy spectrum and composition measurements from the GRAPES-3 experiment: Latest results", ICRC proceedings
19. GRAPES-3 Collaboration, "Search for gamma rays above 30 TeV from the Crab Nebula with the GRAPES-3 experiment", ICRC proceedings
20. GRAPES-3 Collaboration "Measurement of large angle muon flux in GRAPES-3 experiment using triggerless DAQ system", ICRC Proceedings
21. GRAPES-3 Collaboration "A study of the Moon shadow by using GRAPES-3 muon telescope", ICRC Proceedings
22. GRAPES-3 Collaboration "An extensive study for correcting the nonlinear particle density measured by GRAPES-3 scintillator detectors", ICRC proceedings
23. GRAPES-3 Collaboration, "The azimuthal distribution of thunderstorm events recorded by the GRAPES-3 experiment", ICRC Proceedings
24. GRAPES-3 Collaboration "An extensive study for correcting the nonlinear particle density measured by GRAPES-3 scintillator detectors", ICRC Proceedings
25. Invited guest speaker in "Scholars International Conference on Physics and Quantum Physics". Physics Conference 2022 hosted with the theme "Frontiers in Physics and Quantum Physics", held on June 22-23, 2022 at Berlin, Germany and Online.

## National Conference Papers

1. Ramavtar, Kiran, and Ram Prakash "A BBD Plasma Based Packed Bed Discharge System Useful for Effective VOCs Reduction" Proceedings of the 36th National Symposium on Plasma Science and Technology (Plasma-2021) held at Birla Institute of Technology, Jaipur during 13-15 December, 2021 (Poster Presentation).
2. Kiran, Ramavtar, Vigyan Gadodia, Shikha Panday, Ritesh Mishra and Ram Prakash "Cold Plasma Treatment of Raw Milk and Its Physical Properties Analysis" Proceedings of the 36th National Symposium on Plasma Science and Technology (Plasma-2021) held at Birla Institute of Technology, Jaipur during 13-15 December, 2021 (Oral Presentation).
3. Rashid Malik Ansari\*, Mohammad Rahil and Shahab Ahmad, "Investigation of 2D Ruddlesden-Popper Perovskites for Optoelectronic Devices", Energy Storage and Conversion , AIP Publishing Horizons , 4-6 Aug 2021 (Poster Presentation).
4. Shubham Chamola\* and Shahab Ahmad, "Nanoporous Fe<sub>2</sub>O<sub>3</sub> Electrodes for Photo-Rechargeable Li-ion Battery Applications", Advanced Energy Materials & Devices (AEMD) - 2022, Central Glass & Ceramic Research Institute, Kolkata, 3rd March 2022 (Oral Presentation).
5. Shubham Chamola\* and Shahab Ahmad, "Nanoporous Fe<sub>2</sub>O<sub>3</sub> Electrodes for Li-ion Battery Applications", ACMS-2022 International conference on Advances in Chemical and Material Sciences, Indian Institute of Chemical Engineers HIT Kolkata, 14-16 April 2022 (Poster Presentation).
6. Abhishek Yadav\*, Mohammad Rahil and Shahab Ahmad, "Rb<sup>+</sup> doped Ruddlesden-Popper Perovskite for Improved Optoelectronics Properties" , International conference on Advanced Two-Dimensional Materials (ICAM – 2022), Amrita Vishwa Vidyapeetham Chennai, 9-11 June 2022 (Oral Presentation).
7. Invited guest speaker in "National Assembly of Researchers In Physics" to be held on August 25-26, 2022 at IISER Bhopal, India.



## Projects

### New projects in the Department of Physics

1. Scanning tunneling microscopic study of single organic molecule for memristive application in neuromorphic devices, SERB, CRG, 49 Lakhs, 2021-2024.
2. Silicon Phthalocyanine Based Low Power Memristive Device for Neuromorphic Application, SERB, SIRE, 2022

S. No	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
1	Investigation of magnetoelectric coupling in $Cil-xTMxO$ Multiferroic System	BRNS, Mumbai	Ambesh Dixit	₹23,42,500	27-Mar-14	26-Mar-17
2	Probing Magnetic Structures and Spin Flop transition in bulk and nanostructured $FeVo_4$ Multiferroic System	DST	Ambesh Dixit	₹6,60,573	13-Jan-16	31-Dec-19
3	Magnetars with superfluid core	SERB	Monika Sinha	₹20,60,082	21-Mar-18	20-Mar-21
4	Synthesis and study of properties of electrochemically active composites based on lithium intercalated silicates of iron, manganese, cobalt and having high electron conductivity carbosilicates of transition metal	DST	Ambesh Dixit	₹23,31,200	22-Nov-18	07-May-21
5	Generation of Entangled Photons and its application to Quantum Computation and Information Processing	DST	V Narayanan	₹2,08,92,000	24-Apr-19	23-Apr-22
6	Design and Development of Metal Oxide Hole Transporting Material (HTM) based Inverted Perovskite Solar Cell (iPSC) Under Ambient Conditions	DST	Ambesh Dixit	₹21,18,400	26-Sep-18	25-Sep-23
7	Sulphur nanoparticles Reinforced Hierarchical Assemblies of Carbon nanotubes for Efficient Lithium-Sulphur Batteries	DST	Shahab Ahmad	₹86,86,828	09-Oct-19	08-Oct-22
8	Photo-Rechargeable Organo-Halide Perovskite-Transition Metal Dichalcogenide Batteries	SERB	Shahab Ahmad	₹48,98,476	22-Mar-19	21-Mar-22
9	Electronic and thermoelectric properties of $Bi_2Te_3$ -XSX and $Sb_2Te_3$ -xSX: A density functional theory approach and scanning tunneling microscopy study of surface states for enhancement of thermoelectric efficiency	DRDO	Satyajit Sahu	₹9,80,000	09-Jul-20	04-Oct-22

S. No	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
10	Cold Plasma Detergent in the environment to fight COVID-19	Porte Automations Pvt Ltd	Ram Prakash	₹23,60,000	04-Jun-20	20-Jun-21
11	Uniquely Identifying Lorentz Structure of New Physics in Semi-Leptonic B-Decays	SERB-CRG	Ashutosh K Alok	₹22,18,612	28-Dec-20	27-Dec-23
12	Study of Very High Energy Gamma-Rays from Galactic sources by Grapes-3 observatory	SERB-SRG	Reetanjali Mohrana	₹26,07,044	26-Nov-20	25-Nov-22
13	Design and Development of Dielectric Barrier Discharge Based Flat VUV/UV Excimer Light Sources for Advanced Applications in Health and Medicine	SERB-CRG	Ram Prakash	₹62,13,399	30-Dec-20	29-Dec-23
14	High voltage (~5V) ultrafast charging/ discharging cathode materials in bulk and nano geometries for high power Li ion rechargeable batteries	SERB-CRG	Ambesh Dixit	₹40,26,000	28-Dec-20	27-Dec-23
15	Engineering the interface of perovskites and 2D materials	DST-Inspire Faculty	Lakshya Daukiya	₹1,10,00,000	02-Nov-20	01-Nov-25
16	Fabrication of Atomically Thin, Ultrafast and Ultrasensitive Photodetectors Based on 2D-2D van der Waals (vdW) Heterostructures of Graphene with W Based TMDs	DST-Inspire Faculty	Vijay Kumar Singh	₹1,10,00,000	01-Jan-21	31-Dec-26
17	Design and Development of Multiferroic Materials for Photovoltaic and Energy Harvesting Application	DST-Inspire Faculty	PhD Student- Priyambada Sahoo Mentor- Dr. Ambesh Dixit	₹4,51,520	06-Nov-20	05-Nov-25
18	Lead free perovskite based semiconducting materials and devices for photovoltaic and photodetector applications	DST-Inspire Faculty	PhD Student- Surbhi Ramawat Mentor-Dr. Ambesh Dixit	₹4,51,520	07-Nov-20	06-Nov-25
19	Two-dimensional TMDC and QD based hybrid phototransistor with high sensitivity and mobility	DST-Inspire Faculty	PhD Student- Chayan Das Mentor-Dr. Satyajit Sahu	₹4,51,520	21-Oct-20	20-Oct-25
20	Design and development of small scale milk disinfection system using mercury-free plasma (MFP) UV Lamp technology	MSME	Ram Prakash	₹10,50,000	31-Mar-21	30-Mar-22
21	Quantum heat engines	DST-QITPD- ICPS	Subhashish Banerjee	₹15,59,000	22-Apr-21	21-Apr-24
22	Measurement of particle Size: A Laser-based forward scattering approach	BMW Steels Pvt. Ltd	V Narayanan	₹6,00,000	17-May-21	16-May-22

S. No	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
23	FIST Project	DST-FIST Program-2020	Sampat Raj Vadera	₹1,05,00,000	29-Sep-21	29-Sep-26
24	Scanning tunneling microscopic study of single organic molecule for memristive devices in neuromorphic application	SERB-CRG	Satyajit Sahu	₹49,14,525	29-Jan-22	28-Jan-25
25	Center for Rechargeable Energy storage systems for Augmenting Transportation and Electrification (CREATE)	SERB (DST)	Ambesh Dixit	₹65,21,200	11-Mar-22	10-Mar-27
26	Functional Quantum Heterostructures: Multiscale Modelling	SERB-Ramanujan Faculty Scheme	Appalakondaiah Samudrala	₹1,19,00,000	09-Mar-22	08-Mar-27
27	High Dimensional Quantum Information Processing	DST-Inspire Fellowship	Subhashish Banerjee	₹24,64,720	22-Sep-21	21-Sep-26
28	Development of 2D Transition Metal Dichalcogenides (TMDs) and Metal Oxide Thin Film based Perovskite Solar Cells (PSCs) and Photodetectors	DST-Inspire Fellowship	Ambesh Dixit	₹24,64,720	14-Jan-22	13-Jan-27

## Consultancy Projects

S. No	Project Title	Sponsoring Agency	PI	Sanctioned Amount (Rs.)	Start Date	End Date
1	Faculty Development Program on Quantum Science and Technology	DST	Subhashish Banerjee	₹1,80,000	18-Aug-19	30-Aug-19
2	Quantum Information and Computation 2019	Multiple Agencies (DRDO and other Pvt Agency)	Subhashish Banerjee	₹1,45,000	08-Dec-19	11-Dec-19

## Closed Projects

### 1. Possibilities and Device Applications of Degenerate Optical Microcavities

Department of Science and Technology (DST)

PI: Somnath Ghosh Rs. 34.89308 Lakhs Start Date: 09-May-2018 End Date: 08-Sep-2021

Outcome: The project is intended to design prototypes to meet few challenges of the photonic industry towards innovative and efficient light controlling devices. This has been done by encounter of multiple second order EPs (exceptional points), encounter of second order EPs via coupling between two states with deliberate phase difference and encounter of third order EPs. This will broadly improve the quality of future optical sensing, optical communication and defense applications. The investigations has been restricted on specific designs of cavities for unconventional applications, however the findings would open up a new platform for such device applications. This

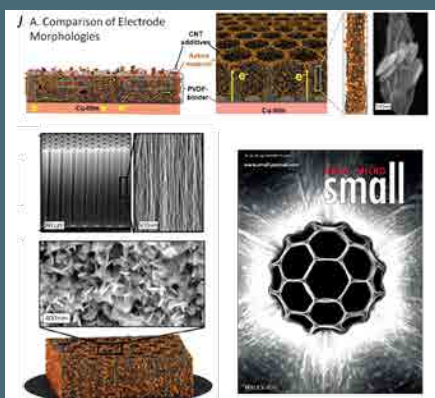
is an emerging area and there are lot of possibilities for technological applications in next generation all-optical chips/integrated circuits/on-chip chirality. Moreover, the outcome is helpful in initiating future collaborative long-term project.

## 2. Photo-Rechargeable Perovskite Batteries for Future Mobility

Department of Science and Technology (DST)

PI: Shahab Ahmad Rs. 27.6514 Lakhs Start Date: 03-Oct-2018 End Date: 02-Oct-2020

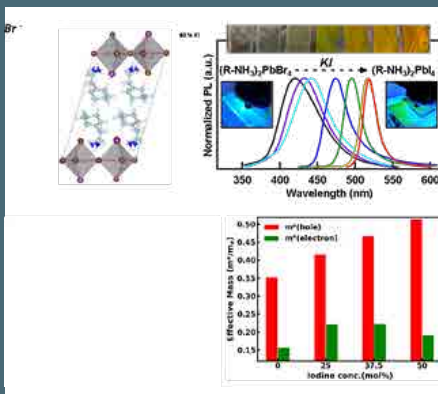
### Outcome:



#### Hydrothermal Coating of Patterned Carbon Nanotube Forest for Structured Lithium-Ion Battery Electrodes

We have demonstrated a process to coat vertically aligned carbon nanotube (CNT) forests with metal oxide nanoparticles using microwave-assisted hydrothermal synthesis. Hydrothermal processes normally damage delicate CNT forests, which is addressed here by a combination of lithographic patterning, transfer printing, and reduction of the synthesis time. This process is applied for the fabrication of structured Li-ion battery (LIB) electrodes where the aligned CNTs provide a straight electron transport path through the electrode and the hydrothermal coating process is used to coat the CNTs with conversion anode materials for LIBs. These nanoparticles are anchored on the surface of the CNTs and batteries fabricated following this process show a fourfold longer cyclability. Finally, this process is used to create thick electrodes (350 μm) with a gravimetric capacity of over 900 mAh/g.

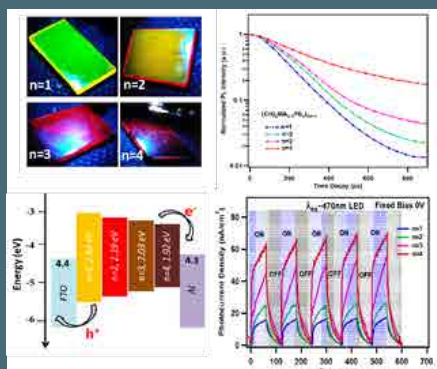
S. Jessl, D. Copic, S. Engelke, Shahab Ahmad and Michael De Volder, *Small* (2019) 1901201, 1-6.



#### Highly Tunable Single-Phase Excitons in Mixed Halide Layered Perovskites

The fabrication of highly controlled single-phase mixed halide two-dimensional (2D) perovskites is demonstrated by successive doping of inorganic dopant, potassium iodide (KI), in 2D perovskite CHPB. Our computational investigations further confirm the thermodynamic stability of mixed anion lattices. A stoichiometric increase of KI in CHPB beyond critical passivation levels results in a uniform bandgap tunability of thin films from the UV (~3.21 eV) to green (~2.50 eV) region of spectra. Distinctly linear, tunable, and single-phase strong room-temperature exciton absorbance (~401–508 nm) and emission peaks (~416–518 nm) in the blue-green spectral region are observed with the increase of KI concentration levels in thin-film samples. Doped two-dimensional (2D) perovskite films exhibit a minimum stokes shift parameter of 40 meV, which is very small compared to the conventional route of mixing two perovskite precursor solutions.

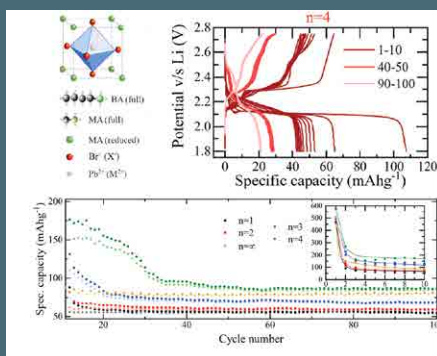
Mohammad Rahil, Pramod Rajput, Dibyajyoti Ghosh and Shahab Ahmad, *ACS Applied Electronic Materials* (2020) 2, 10, 3199-3210.



### Ruddlesden-Popper 2D perovskites of type $(C_6H_9C_2H_4NH_3)_2(CH_3NH_3)_{n-1}PbI_3n_{-1}$ ( $n = 1-4$ ) for Optoelectronic Applications

A new series of quasi 2D perovskites with a ring type cyclic carbon group as organic spacer forming RP perovskite is reported for photobattery applications. The demonstrated RP perovskite of type for  $n = 1-4$  have shown formation of highly crystalline thin films with alternate stacking of organic and inorganic layers, where the order of  $PbI_6$  octahedron layering are controlled by  $n$ -value, and shown uniform direct bandgap tunable from 2.51 eV ( $n = 1$ ) to 1.92 eV ( $n = 4$ ). The PL lifetime measurements supported the fact that lifetime of charge carriers increase with  $n$ -value of RP perovskites. In addition, the photodetectors shown sharp photocurrent response from 17 nA/cm<sup>2</sup> for  $n = 1$  to 70 nA/cm<sup>2</sup> for  $n = 4$ , under zero bias and low power illumination conditions (470 nm LED, 1.5 mW/cm<sup>2</sup>). Furthermore, for lowest bandgap RP perovskite  $n = 4$ , the photodetector showed maximum photocurrent density of  $\sim 508$  nA/cm<sup>2</sup> at 3 V under similar illumination condition, thus giving fairly large responsivity (46.65 mA/W). Our investigations show that 2-(1-cyclohexenyl)ethylamine based RP perovskites can be potential solution processed semiconducting materials for optoelectronic applications such as photo-detectors, solar cells, LEDs, photobatteries etc.

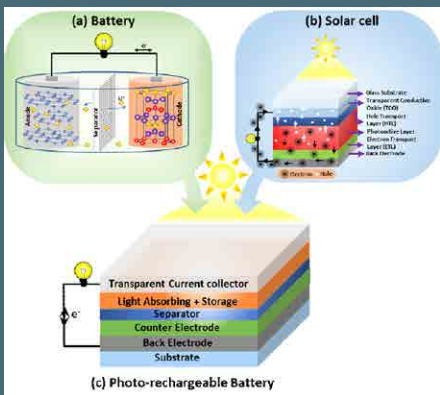
Mohammad Rahil, Rashid Malik Ansari, Chandra Prakash, S. S. Islam, Ambesh Dixit and Shahab Ahmad, *Scientific Reports* (2022) 12, 2176.



### Ruddlesden Popper 2D perovskites as Li-ion battery electrodes

The effect of tuning the layering properties of the quasi two-dimensional Ruddlesden Popper (RP) layered perovskite series  $(BA)_2(MA)_{n-1}PbX_3n+1$  from  $n = 1$  to  $n = 4$  and the equivalent bulk crystal structure  $MAPbX_3$  is investigated. The interaction between the insertion of lithium ions and the layering arrangement of the perovskite structure are studied electrochemically. The layering structure that optimises both capacity and stability is determined to be  $n = 4$ , providing a compromise between the number of active layers and the lithium ion access between them provided by the BA organic chain, thus demonstrating initial and stabilised gravimetric capacities of 575.5 mAh/g and 89.9 mAh/g respectively. The effect of changing the halide within the perovskite structure is investigated and demonstrates a greater gravimetric capacity for the lighter bromide species compared to the commonly used iodide. Finally, high molarity electrolytes and tailored cut-off potentials are used to improve the stability of the RP layered perovskite electrodes.

A. Mathieson, Mohammad Rahil, Y. Zhang, W. M. Dose, J.T. Lee, Felix Deschler, Shahab Ahmad and Michael De Volder, *Materials Advances* (2021) 2, 3370-3377. (link) (Features in a new Editor's choice web collection on luminescent metal halides by Journal of Materials Chemistry C).



### Photo-Rechargeable Li-ion Batteries: Device Configurations, Mechanisms and Materials

We have jointly published a detailed review article on the photo-rechargeable Li-ion batteries. Photo-Rechargeable batteries (PRBs) are emerging dual functionality devices, able to both harvest solar energy and store it in the form of electrochemical energy. Recently, efforts have been made in the search for advanced functional materials and integrated device configurations to improve the performance of photo-enhanced batteries. A photo-rechargeable battery will provide a unique, standalone energy solution for self-powered remote electronic devices, independent of power grids. However, these devices currently suffer from several technical shortcomings in terms of efficiency, lifetime, and operating voltage. In this review, a comprehensive report is presented on the significant research developments in the field of photo-rechargeable Li-ion batteries (Li-PRBs), including device configurations, working mechanisms, material selection, and future directions.

Akshaykumar D. Salunke, Shubham Chamola, Angus Mathieson, Buddha Deka Boruah, Michael de Volder and Shahab Ahmad, *ACS Applied Energy Materials* (2022) 5, 7891–7912.

### Patents

1. Ramavtar Jangra, Kiran Ahlawal, Ambesh Dixit, and Ram Prakash "Indoor Air Purifying Device" Indian Patent Application No., 202211042187 Dated 22/07/2022
2. R M. Sahani, A. Pandya, C. Kumari, A. Dixit, A doped zinc oxide nanorod scintillator and alpha radiation detector prepared thereof, (Indian Patent Granted; Patent No. 379542)

### Outreach activities from the Department of Physics

1. Ram Prakash demonstrated Novel Cold-plasma Detergent in Environment (CODE) Device in the Exhibition organized during the visit of Hon'ble Vice President of India Shri M. Venkaiah Naidu at Jodhpur City Knowledge and Innovation Cluster on 28th September 2021.
2. Ram Prakash delivered an Invited-talk on "Plasma Technologies for Sustainable Development: Successful attempts for FEAR (Food/Health, Energy & Agriculture Retrievals)" in the 8th Rajasthan Science Congress on "Science and Technology for Sustainable Development" held at APJ Abdul Kalam

Auditorium, IIS, Kshipra Path, Mansarovar, Jaipur during 20-22 October 2021.

3. Ram Prakash demonstrated Novel CODE Device and Small-scale Milk Disinfection System in the Exhibition organized on the eve of the 7th Convocation of IIT Jodhpur at the Innovation Complex on 18th December 2021.
4. Ram Prakash organized a one-day Meet on 28th January 2022 in association with Rajasthan Solation Association's CSR Stakeholders during the MoU signing between IIT Jodhpur Technology Park and the Rajasthan Solar Association (RSA) to set-up RSA Centre of Excellence for Renewable Energy.
5. Ram Prakash demonstrated the Novel CODE Device and Small-scale Milk Disinfection System to Prof. Samir K. Brahmachari, Ex-DG, CSIR during the product showcasing on the 10th March 2022.
6. Ram Prakash demonstrated four products developed in the Cold Plasma Lab during the open-house day organized at the institute on 20th April 2022.
7. Ram Prakash organized an agreement signing event for physical space allocation for M/s

- WhizHack Technologies Pvt. Ltd. in IIT Jodhpur Technology Park for a Centre of Excellence (CoE) in Cyber-Physical Systems Security on 31st May 2022.
- Ram Prakash organized an agreement signing event for physical space allocation for the Rajasthan Solar Association at IIT Jodhpur Technology Park for RSA Centre of Excellence
8. Shahab Ahmad delivered an invited talk on "Structured Electrodes for Advanced Energy Storage Devices" at the ADVANCED ENERGY MATERIALS & DEVICES (AEMD)-2022 Workshop, CSIR-Central Glass & Ceramic Research Institute Kolkata (03 Mar 2022, Invited Talk).
  9. Shahab Ahmad chaired session on "Nitride Electronics" at the MRSI-AGM Conclave 2021, Indian Institute of Technology Madras (23 December 2021, Session Chair).
  10. Shahab Ahmad delivered a lecture on "Nanomaterials for Energy Harvesting and Storage" in 9th 2-Week Online Refresher Course in Basic Science (Interdisciplinary), Human Resource Development Centre, Jamia Millia Islamia, New Delhi (12 October 2021, Resource Person).
  11. Shahab Ahmad participated in CUTS Roundtable Conference-I on "Accelerating Electric Vehicle Adoption in Rajasthan" as a Panel Expert (01 Oct 2021 and Panel Discussion).
  12. Shahab Ahmad has supervised an e-intern, Mr. Janmesh Kumar Samariya, under the Knowledge Augmentation through Research in Young Aspirants (KARYA) Programme, Department of Science & Technology-Rajasthan on project entitled "Niobium Tungsten Oxide for Fast Charging Li-ion Batteries" for duration of 3 months (Completed in Feb 2022).
  13. M. Bala Murali Krishna delivered invited talk on "Dreamland of two dimensional (2D) materials for optoelectronics and Photonics, Faculty Development Program on Nanomaterials: Experimental design & Theoretical Modeling, IIITDM Kurnool, India, 13-20 Feb (2021).
  14. Amitava Mitra delivered a lecture on "Nanostructured Magnetic Materials and their Applications" at ATAL- Faculty Development Programme on Novel Materials and their Applications (on-line), Maharaja Ranjit Singh Punjab Technical University, Bathinda, 23rd July, 2021
  15. Amitava Mitra delivered lecture on "Technology Management" at CSIR INTEGRATED SKILL INITIATIVE, Industrial, R&D Training on Materials & Metallurgical Engineering (On-line) organized by CSIR-National Metallurgical Laboratory, Jamshedpur, 21st June, 2021
  16. Amitava Mitra delivered a lecture on "Non-destructive Evaluation of Materials: A tool for Structural Health Monitoring" at a Short-term Course on Structural Health Monitoring, Indian Institute of Technology Jodhpur, 3rd -7th January, 2022
  17. Amitava Mitra delivered a lecture on "Magnetic Barkhausen Emissions: A tool for Quality Control and Damage Assessment of Engineering Components" at Kalyani Center for Technology and Innovations (R&D of Bharat Forge), Pune, 16th March, 2022
  18. Sampat Raj Vadera delivered a lecture on "Nanoscience and Nanotechnology" at Gyan Ganga State Level Subject Specific Short Term Online Training Programme at Government Dungar College, Bikaner, 01-06 February 2021.
  19. Sampat Raj Vadera delivered a lecture on "Sustainable Development" AICTE sponsored ATAL-FDP Scheme on Green Technology and Sustainability Engineering organized by Engineering College, Bikaner, 03 July 2021.
  20. Prabhat K. Jaiswal delivered an Invited Talk on "Domain growth and wetting in binary mixtures: Fast-mode kinetics" in an International Symposium on "Current Trends in Non-equilibrium Physics", School of Physical Sciences, JNU, New Delhi during 22-26 November 2021.
  21. Dr Satyajit Sahu was invited by the French embassy to visit UTT, France for a research collaboration between UTT and IIT Jodhpur.

## Award & Recognitions

### Faculty

1. Dr. Ram Prakash was Elected as Vice-President of the Plasma Science Society of India (PSSI) for the term 2022-2024.
2. Dr. Shahab Ahmad's research work was highlighted on the Cover page of Annual Compendium on 'Materials for Energy Storage-2021' published by Department of Science & Technology (DST), India. The Compendium was released by Prof. Ashutosh Sharma, Former Secretary, DST.
3. Best paper award on research paper "Indigenous High Power Pseudospark Switches for Fast Pulse Power Applications" authored by R. P. Lamba, U. N. Pal, and Ram Prakash for the best oral presentation by Mr. R. P. Lamba (Ph.D. work) in the 36th National Symposium on Plasma Science and Technology (Plasma-2021) held at Birla Institute of Technology, Jaipur during 13-15 December, 2021.

### Students

1. "Best-Oral presentation" award won by PhD student Mr. Shubham Chamola at "Advanced Energy Materials & Devices-2022" workshop conducted by CGCRI-Kolkata.
2. "Best-Poster presentation" award won by PhD student Mr. Shubham Chamola at the "International Conference on Advances in Chemical and Material Sciences (ACMS-2022)", organized on Platinum Jubilee celebration of 'Indian Institute of Chemical Engineers', held during April 14-16, 2022.

### New Technologies developed in the Department of Physics

A Novel Cold-plasma Detergent in Environment 'CODE' device for indoor air quality technology is developed by faculties and students of department, namely, Dr. Ram Prakash, Associate Professor, Dr. Ambesh Dixit, Associate Professor, along with PhD scholars Mr. Ramavtar Jangra, Ms. Kiran Ahlawat under an industry sponsored project. Air pollution is basically one of the top 5 risks causing chronic diseases according to WHO. We consume nearly 8 times as much air by volume as

food and 4 times as much air as water. Indoor air often contains around 2-5 times more pollution as compared to outdoor air. Sick building syndrome is also a challenging issue nowadays. Besides these, airborne transmitted pathogen infection is a huge challenge in the current era. Almost every year we are seeing a new bacteria or virus of influenza nature appearing and creating epidemic or pandemic of diseases. Long living pathogens and small size aerosols are not effectively dealt by the currently available indoor air purifiers. To reduce the risks of infection from airborne pathogens in the indoor environment, the IITJ's Novel CODE device was designed, developed, tested and successfully transferred to M/s Divya Plasma Solutions Pvt. Ltd. -A start-up company, September, 2021.

Accordingly, M/s Divya Plasma Solutions Pvt. Ltd. -a Deep Tech Start-up incubated at IIT Jodhpur-Technology Innovation and Start-up Center announced their Novel CODE Indoor Air Purifiers recently. The CODE101 Air Purifier System was launched on the 2nd August 2022 on the Foundation Day of IIT Jodhpur and is developed for home and offices which deactivates more than 99.99% of harmful pathogens and provides quality indoor air. Right now, different indoor air purifying products are being developed on a patented technology of IIT Jodhpur by this start-up. The company is promoted by Dr. Ram Prakash, Associate Professor IIT Jodhpur, the key inventor of the technology, and Shri Anil Sapra, Smt. Bina Sapra, Shri Pradeep Jain and a few others.

The concept is based on non-equilibrium cold plasma in combination with nano-technology. This Novel CODE device is producing optimum concentrations of negative ions having cold-plasma detergent ions as well as positive ions in the environment similar to mother nature. Nobel Prize winner Paul Crutzen coined the phrase "Detergent of the Atmosphere" that is exactly what the Novel Code device is capable of. In this development, the existence of cold-plasma detergent ions for more than 25 seconds on an average is the key advantage for better indoor air quality.



### There are four-fold benefits of this invention:

1. Cold-plasma detergent ions can instantaneously bond on the surface of substances such as bacteria, fungi, viruses, and allergens which can break down the proteins on the surface of such pathogens.
2. Concentrations of active ions are such that they can produce local fields similar to the bond energy of the chemical bonds of the harmful pathogens in the environment for faster deactivation. Further, negative and positive ion concentrations are neutralized in the air itself, which otherwise can deposit on to the surfaces.
3. The enhanced electric field produced in the micro-discharges from the developed novel configuration provides additional opportunity for disfigurement of cells of harmful bacteria and viruses via shear stresses once passed through the device.
4. Cold-plasma detergent ions can degrade Volatile Organic Compounds 'VOCs' very fast and can capture dust and pollen.

The key features of the technology are: Rapid Disinfection, Faster Control of VOCs, Deodorization, Dust and pollen reduction even without use of any filter, No vacuum sealing, No UV, No or Nil Ozone, Easily Scalable, Longer sustenance of plasma detergent ions, Consumes less power in discharge and Environment friendly. The working performance of a 4 inches Novel CODE device has been tested for disinfection of total microbial counts, E. Coli Bacteria, MS-2 Phage virus, reduction of total fungal counts, dust, pollens and VOCs in indoor environments (sizes up to 1000 cubic feet) and the obtained results showed the quality indoor air. The CODE device is tested at CEG Test House Jaipur, AIIMS Jodhpur, BISR Jaipur, Bio-care Research Lab Ahmedabad and IRCLASS, Jaipur.

The developed technology is attractive for individuals in offices and houses. Systems based on this technology can eventually be deployed at all public and health care facilities as standalone systems or can be integrated with the ducts, AC, Coolers, etc. The first product is a CODE101 Indoor Air Purifier for home and offices deactivating more than 99.99% of harmful pathogens and purifying indoor air and is shown below.



IITJ's Novel CODE device based indoor air purifier (CODE101)

**New high end research instrumentation through project in the Department of Physics:**

1. A 50 kV (peak to peak) variable bi-polar pulse power supply with frequency range 5kHz-50kHz
2. Tektronix High-Voltage Passive Probe 40 kV
3. Rogowski-type Pearson current monitor Output resistance 50 Ohms, Maximum peak current ~5000 A Maximum rms current 65 A.
4. Air Ion Counter Range: 2 million and 200 million
5. Computational workstations
6. Glove-Box for energy storage applications
7. High-energy Ball-Mill for energy storage applications
8. Multichannel Potentiostat Workstation for electrochemical characterization of energy storage devices.
9. Thermal Chemical Vapor Deposition System for the growth of CNTs and other nanomaterials.
10. Xe-Lamp based Light Source for Photocurrent measurements.

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# **Inter- Disciplinary Research Platforms**

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# Inter-Disciplinary Research Division

## Introduction

Engaging students and helping them to develop knowledge, insights, problem solving skills, self-confidence, self-efficacy, and a passion for learning are common goals that educators bring to the classroom, and interdisciplinary instruction and exploration promotes realization of these objectives. An interdisciplinary programme emerges when multidisciplinary initiative for a problem requires an integrated approach through fusion of knowledge from multiple fields. The boundaries among disciplines get diffused. With the passage of time the interdisciplinary platforms may lead to the establishment of transdisciplinary academic schools/centres. In the institute a division of interdisciplinary research has been established since 2019.

## Objectives/Purpose

- To create an environment to support interdisciplinary research platforms in the contemporary areas of research and innovation
- To develop an ecosystem for competitive and cutting edge research
- To encourage innovation and technology development in interdisciplinary fields
- To have a structured process for conducting Ph.D and Post-Doctoral Research Programmes in interdisciplinary areas of IDRPs
- To establish partnership with relevant industries and research organisations in the areas of mutual interest

## Platforms

There are six following Inter-Disciplinary Research Platforms (IDRP) under the division:

1. Digital Humanities (DH),
2. IoT and Applications (IoT),
3. Quantum Information and Computation (QIC),
4. Robotics and Mobility (RM),
5. Smart Health Care (SHC) and
6. Space Science Technology (SST).

Each platform is headed by one Coordinator.

## Faculty Members

Faculties of different departments, depending upon their research interests, join any one or two of above platforms to carry out the interdisciplinary activities. In addition to the affiliation to the parent department, 103 faculties are associated with IDRPs through their secondary affiliation.

### Office of IDRP Division



**Dr. S. C. Bose**

Head of the Division

# Digital Humanities (DH)

## Introduction

Digital Humanities at IIT Jodhpur is a unique interdisciplinary platform that offers a master's degree in DH, the latter being the first of its kind in India. It also runs a PhD program with a number of scholars working on various issues ranging from digital healthcare, human-computer interaction and digital social reading to archiving, digital heritage, documentation of traditional art and algorithmic accountability. The MSc program involves student projects on several topics such as e-governance, ICT, app design, AI-based design, digital banking, VR-based e-learning and so on.

The first MSc batch students have been placed across companies with high packages. Some of them have received research positions in IITs and IIMs.

The group has contributed to existing and under consideration MoUs with other institutions and is currently expanding nationally and internationally.

## Faculty details

At present, the following faculty members are associated with the IDR-IP:

### School of Liberal Arts

1. Dr. Parichay Patra (Assistant Professor, Area: Film Studies)
2. Dr. Prasenjeet Tribhuvan (Assistant Professor, Area: Sociology)
3. Dr. Natasa Thoudam (Assistant Professor, Area: Performance Studies, Indian Northeast Studies)

4. Dr. Vidya Sarveswaran (Associate Professor, Area: Ecocriticism)
5. Dr. Tonisha Guin (Assistant Professor, Area: Cultural Studies)
6. Dr. Rachel Philip (Assistant Professor, Area: Sociology of Education)
7. Dr. Gurujegan Murugesan (Assistant Professor, Area: Linguistics)
8. Dr. Akanksha Choudhary (Assistant Professor, Area: Economics)

### School of Management and Entrepreneurship

1. Dr. Manish Aggarwal (Associate Professor, Area: Business Analytics)
2. Dr. Sankalp Pratap (Associate Professor, Area: Innovation & Entrepreneurship)
3. Dr. G. Venkat Ram Reddy (Assistant Professor, Area: Human Capital & Organizational Dynamics)

### Dept. of Electrical Engineering

1. Dr. Rajlaxmi Chouhan (Assistant Professor, Area: Education Technology, Digital Learning Tools)

### Dept. of Mechanical Engineering

1. Dr. Amrita Puri (Assistant Professor, Area: Acoustics)

### Dept. of Computer Science and Engineering

1. Dr. Romi Banerjee (Assistant Professor, Area: Embodied Cognitive Architectures)
2. Dr. Suman Kundu (Assistant Professor, Area: Social Network Analysis)
3. Prof. Santanu Chaudhury (Professor, Area: Digital Multimedia)

**Dept. of Mathematics**

1. Dr. Gaurav Bhatnagar (Associate Professor, Area: Wavelet Analysis)

**Dept. of Metallurgical & Materials Engineering**

1. Dr. Srijan Sengupta (Assistant Professor, Area: Lithium ion Batteries)

**Professor of Practice**

1. Prof. Nimish Vohra (IDRP & SME, Area: Design)

**Adjunct Professors**

1. Prof. Arjun Ghosh (HSS, IIT Delhi)
2. Prof. Sarah Kenderdine (EPFL, Switzerland)

**Academic Programs**

There are two academic programs. They are as follows.

1. 2-year MSc program in Digital Humanities
2. PhD program in Digital Humanities

## Significant Research Achievements

A number of research scholars have participated and got their papers/posters accepted in top international conferences including the Alliance of Digital Humanities Organizations (ADHO) Annual Conference 2022. One PhD scholar has been offered a membership of Johannes Gutenberg University (JGU) of Mainz, Germany.

## Student Laurels

1. The following students of the DH-IDRP got their presentations accepted in the Alliance of Digital Humanities Organizations (ADHO) Annual Conference, 2022.
  - a. Ms. Sharanya Ghosh & Mr. Rajarshi Das (PhD scholars)
  - b. Ms. Vasundhra Dahiya (PhD scholar) & Ms. Lavanya Dahiya (MSc student)
2. Ms. Sharanya Ghosh, PhD scholar, has been accepted as a junior member of the Graduate

School of Humanities and Social Sciences, Johannes Gutenberg University (JGU), Mainz, Germany. It will enable her to complete a research visit at the university with access to the resources offered by them, she can also be a member/associate member in their collaborative projects. She is currently being externally supervised by Prof. Gerhard Lauer, who used to be the Digital Humanities Chair at the University of Basel, Germany, and is currently the Gutenberg Chair Professor of Book Studies at JGU.

3. Ms. Sharanya Ghosh successfully completed the European Summer University in Digital Humanities in 2021, which was hosted by the University of Leipzig, Germany.
4. DH research group comprising of Dr. Mayank Kumar, Mayank Kapoor and Ishita Vyas got their paper 'Theorising Sociomateriality in the adoption and use of smart health wearables' accepted at the 2021 Health Information Technology Symposium (formerly SIG-Health Pre-ICIS Workshop) held at Austin TX, USA, in December 2021.
5. Ms. Lavanya Dahiya (MSc student in DH) and Mr. Samya Brata Roy (PhD scholar in SoLA) have been accepted into the 2021-2023 HASTAC Scholars Program (Humanities, Arts, Science, and Technology Alliance and Collaboratory) located at the Graduate Center at the City University of New York (CUNY) and Dartmouth College.
6. Ms. Vasundhra Dahiya, PhD student in DH, has been selected as one of the 15 global panelists in the Data & Society Research Institute's Parables of AI in/from the Global South Storytelling Workshop, 2021.
7. Aparna Shaji, an M.Sc. student in DH, completed an international internship with the United Nations Framework Convention on Climate Change.
8. Tushar Kant, an M.Sc. student in DH, has been accepted as an international participant in the 2022 Plant Humanities Summer Program, Dumbarton Oaks, USA.

## Laboratories and equipment

- Space for a DH laboratory has been assigned and it is in the process of getting transformed into a creative artspace.

## Outreach activities

- The Digital Humanities group facilitated an MoU with the Scottish Church College, University of Calcutta, and soon the two institutions will organize a national-level Faculty Development Program (FDP) in DH. Two more MoU proposals with Jadavpur University and Indira Gandhi National Centre for the Arts (IGNCA), respectively, are under consideration.
- The DH group helped the Office of International Relations and Outreach, IITJ, in achieving the membership of Erasmus program of the European Union, as one of the DH PhD scholars, Ms. Sharanya Ghosh, has received a membership of Johannes Gutenberg University (JGU) of Mainz, Germany.

## Publications

- Aggarwal, Manish. (2021). Attitude-based entropy function and applications in decision-making. Engineering Applications of Artificial Intelligence. 104, 104290, 0952-1976, <https://doi.org/10.1016/j.engappai.2021.104290>

## Ongoing Sponsored Research Project

Project Title: "Offering Provocations: Surfacing Evidence": The Archiving of Cine-Politics under the Indian National Emergency through Digital Humanities 2.0

Co-PI: Dr. Parichay Patra (PIs from IIT Ropar and Royal Holloway, University of London)

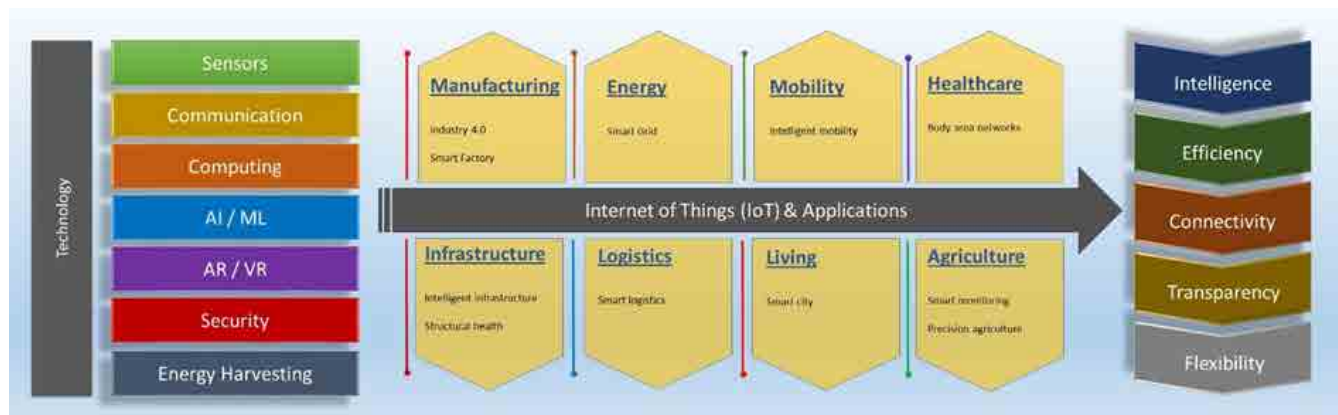
Amount: 55 lakhs (approx.) | Start Date: April 2019 | End Date: September 2022

# IoT and Applications (IoT)

## Introduction

Internet of Things (IoT) has gained immense interest for applications in smart agriculture, transportation, environment monitoring, healthcare, and smart wearable, Industrial IoT, and many other applications. Sensors are the key components to communicate with surroundings, which have to be both highly sensitive and selective as well. On the other hand, the data collected from sensors

have to be analyzed and used for making Processes and Systems smarter. IoT and applications area is a highly multidisciplinary area involving various areas of Materials, Devices, Sensors, Circuits, Communication, and Data Analytics, and their applications in IoT system development. Inter-Disciplinary Research Platform (IDRP) on the Internet of Things (IoT) & Applications is created to work with a holistic approach for seamless integration of technologies.

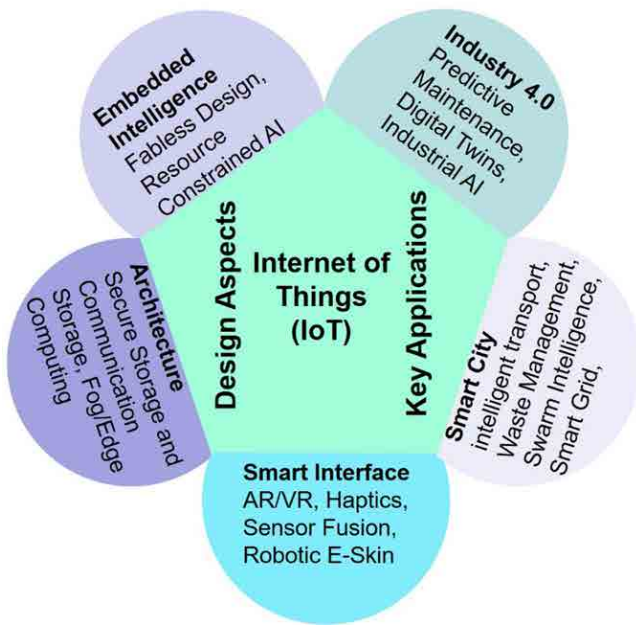


The IDRP on IoT & Applications will facilitate the research and development in multiple areas including Industry 4.0, Health, Agriculture, Infrastructure, Transportation, Environmental Monitoring, and Infrastructure Safety encompassing a complete ecosystem for simulation, design, development, characterization, and testing. R&D ecosystem of Jodhpur which includes IITJ, AIIMS, NLU, and Police University, can be an ideal combination

for innovation in various areas of AIoT, such as in environment, healthcare, and cybersecurity.

The IDRP on IoT & Applications offers Ph.D. in a wide range of emerging and challenging interdisciplinary research areas such as AIoT, Industry 4.0, Smart City, Smart Infrastructure, Smart Grid, Environment Monitoring, Intelligent Transportation, etc. This unique interdisciplinary Ph.D. program addresses the gap





between real-life challenges and Technology by using a holistic approach. Please visit Research Areas to know

the associated research areas, facilities, and associated faculty members.

The Ph.D. students are trained to conduct high-quality cutting-edge research demonstrated through tangible deliverables and to publish in top-ranking journals and conferences. Specially-designed courses on technical communication and Intellectual Property Rights enable students in quality expression as well as patent landscaping for potential IP and business translation of their work. Weekly colloquium enables the students to keep open avenues of sharing ideas and learning from peers. Students have round-the-clock access to high-end research and computational facilities, and also have the opportunity of one additional year of fellowship after thesis submission to engage in translational and entrepreneurial initiatives arising out of their Ph.D. work. On graduation, the doctoral students are trained in critical thinking, research, development, operations, and management of emerging technological challenges for both industry and academia.

## Faculty details

At present, the following faculty members are associated with the IDR- IoT:

### Department of Electrical Engineering

1. Aashish Mathur (Convener )
2. Abdul Gafoor Shaik
3. Ajay Agarwal
4. Amandeep Kaur
5. Arpit Khandelwal
6. Arun Kumar Singh
7. Harshit Agarwal
8. Kamaljit Rangra (Coordinator)
9. Kunwar Aditya
10. Jai Narayan Tripathi
11. Mahesh Kumar
12. Manoj Chaudhury
13. Malyala Pavana Ravi Sai Kiran
14. Nitin Bhatia
15. Ravi Yadav

16. Saakshi Dhanekar
17. Sandeep Kumar Yadav
18. Shree Prakash Tiwari
19. Soumava Mukherjee
20. SC Bose

### Department of Computer Science & Engineering

21. Sumit Kalra
22. Debasis Das
23. Deepak Mishra
24. Dip Sankar Banerjee
25. Suchetana Chakraborty

### Department of Civil & Infrastructure Engineering

26. Ranju Mohan
27. Debanjan Guha Roy (CIE)

**Department of Mechanical Engineering**

- 28. Anand Krishnan Plappally
- 29. Hardik Kothadia
- 30. Ankur Gupta
- 31. Barun Pratiher
- 32. Amrita Puri
- 33. Shrutidhara Sarma

**Department of Bioscience & Bioengineering**

- 34. Meenu Chhabra
- 35. Mitali Mukeerji

**Department of Metallurgical and Materials Engineering**

- 36. Pranay Ranjan

**Department of Physics**

- 37. Ambesh Dixit

**Department of Chemistry**

- 38. Ritu Gupta

**School of Management and Entrepreneurship**

- 39. Yerasani Sinjana

## Academic Programs

- IoT IDR P PhD Program

**Details of the Students:**

S. No.	Name of the Student	Supervisors
1	Sneha Prasad	Dr. Sumit Kalra and Dr. Arpit Khandelwal
2	Preeti Jain	Dr. Debasis Das and Dr. Arpit Khandelwal
3	Manpreet Singh	Dr. Saakshi Dhanekar and Dr. Sinjana Yerasani
4	Amritesh Kumar	Dr. Debasis Das and Dr. Nitin Bhatia
5	Chetali Yadav	Dr. Dip Sankar Banerjee and Dr. Kamaljit Rangra
6	Koustav Mondal	Dr. Debasis Das
7	Shubham Sharma	Dr. Sai Kiran, Prof. Manoj Dr. R Bhandari

\*2 students admitted in July 2022; Supervisor allocation pending

## Faculty Laurels

1. Team of Sneha Prasad, **Dr. Sumit Kalra and Dr. Arpit Khandelwal** was the Winner of iS3: iDeathon on Sustainable Smart Systems (1 Lac)
2. **Saakshi Dhanekar** was awarded 'Best Woman Professional' by Shri Pralhad P. Chhabria Awards and IEEE India Council
3. Team of Sneha Prasad, **Dr. Sumit Kalra, Dr. Arpit Khandelwal**, Dr. Amit Goyal, Dr. Abhinav Dixit, and Dr. Nithin Prakasan Nair won the 1st prize from Tech4Seva competition organized by Unnat Bharat Abhiyan, RCI IIT Jodhpur

## Student Laurels

1. Team of Sneha Prasad, Dr. Sumit Kalra and Dr. Arpit Khandelwal was the Winner of iS3: iDeathon on Sustainable Smart Systems (1 Lac)
2. Team of Sneha Prasad, Dr. Sumit Kalra, Dr. Arpit Khandelwal, Dr. Amit Goyal, Dr. Abhinav Dixit, and Dr. Nithin Prakasan Nair won the 1st prize from Tech4Seva competition organized by Unnat Bharat Abhiyan, RCI IIT Jodhpur

## Outreach activities

S. No.	Title	Speaker	Date
1	Netradyne - AI and IoT	Mr. Teja Gudena, Senior Vice President, Netradyne	28.5.2021
2	Cellular Internet of Things	Dr. Abhinav Kumar, IIT Hyderabad	3.7.2021
<b>Allied</b>			
3	5G Wireless Communication & Technologies	Prof. Manav Bhatnagar, IIT Delhi	25.3.2021
4	VLSI Webinar on SoC Design & Verification by Maven Silicon	Mr. Sivakumar P R, Founder and CEO, Marvel Silicon	25.4.2021
5	Industry Webinar on Semiconductor Technologies – Enabling the Connected World	Dr. Usha Gogineni, Director for EDA (Electronic Design Automation) in AMS Semiconductors, Hyderabad	6.5.2021

## Publications

1. P. Shrivastava, M. Singh, N. Vadera, V. Chalka, S. Dhanekar\*, K. Rangra, "A Photodetector-Based Automated Light Intensity Controlling System Using IoT", Accepted in IEEE Sensors 2022, 29 Oct-2 Nov 2022, Dallas, USA.
2. Ranjan, P., Gaur, S., Yadav, H. et al. (2022), 2D Materials: Increscent Quantum Flatland with Immense Potential for Applications. Nano Convergence (Springer) 9, 26 <https://doi.org/10.1186/s40580-022-00317-7>

## Projects

### On-going Projects

S. No.	Project title	PI/Co-PI	Sponsoring agency	Amount in Lakhs	Start date	End date
1.	Point-of-use and in-line water quality sensors for smart water management: Detection of coliforms, fluoride and Biochemical Oxygen Demand (BOD)	Meenu Chhabra, Raviraj Vankayala, Arpit Khandelwal, Ravi Bhandari, Saakshi Dhanekar, Kamaljit Rangra	Jal Jeevan Mission	72 Lakhs	June 2022	June 2023
2.	Inventorization of the wildlife towards a sustainable campus	Suchetana, Arun Kumar Singh, Aashish Mathur, Malyala Pavana Ravi Sai Kiran, Debasis Das, Rajendra Nagar, Pradeep K. Tewari, Preeti Tiwari, Anand K Plappally	CETSD, IIT Jodhpur	2 Lakhs		
3.	An endoscopic camera system	Amandeep, Deepak	BIRAC – BIG	49.7 Lakhs	22nd November 2021	
4.	A Wellness Device for Real-time Non-contact Blood Oxygen Saturation Measurements	Dr. Deepak Mishra (PI), Dr. Amandeep Kaur (Co-PI)	MSME	20 Lakhs	31st March 2020	
5.	Human Perception driven on-chip compression for power efficient CMOS image sensors	Dr. Amandeep Kaur (PI), Dr. Deepak Mishra (Co-PI)	MSME	20 Lakhs	31st March 2020	

# Quantum Information & Computation (QIC)

## Introduction

Over the last century, Quantum Mechanics has emerged as a fundamental ingredient for understanding various facets of nature such as atomic and sub-atomic physics, quantum optics and a plethora of phenomena in condensed matter physics. Modern developments in computing could be said to have started from the work of Alan Turing, while information theory was put on the pedestal of modern science by the efforts of Claude Shannon. The amalgamation of quantum physics with computing and information theory could be historically traced from the works of EPR (Einstein, Podolsky and Rosen), followed by that of John Bell and culminating in efforts made by Charles Bennett. This was further cemented by the efforts of William Wootters. In the last three decades, the world has witnessed enormous progress on the theoretical front to investigate the foundations of quantum information, and to analyse the potentials offered by entanglement and nonlocal correlations towards computing. The ongoing debates, studies and creative intellect paved the way for a new computing paradigm with a promise of speed-up, efficiency, and enhanced security. In fact, the experimental developments over the last few decades have brought the subject of quantum information and computation to the threshold of technology development.

Handling, manipulating, and processing quantum information require control and protection of nonlocal correlations over quantum channels. The fragile nature of these correlations coupled with uncontrollable interactions with surroundings make the problem of scalability exponentially challenging. The increase in technological difficulties with the increase in number of

qubits should not be surprising considering that complexity is the characteristic trait of the theory in place. In fact, it is the complexity and potentials therein that motivate the academicians, industries and entrepreneurs to invest in the intellect and generate funding to resolve theoretical and technological challenges. Apart from academia across the globe, tech giants such as IBM, Google, Microsoft, D-Wave, Intel, Regetti, Quintessence Labs, Hewlett Packard, Ion Q, Cambridge quantum computing Quantum Biosystems, and many more are addressing the issues related to control, gate fidelity and scalability-quantum error correction. Moreover, the Government of India has taken the cognizance of the area and initiated a new research program on Quantum Enabled Science & Technology (QuEST) and in the similar way the Ministry of Electronics and Information Technology (MeitY) has taken various initiatives.

## Faculty details

At present, the following faculty members are associated with the IDRQ-QIC:

1. Dr. Subhashish Banerjee, Department of Physics
2. Dr. V. Narayanan, Department of Physics
3. Dr. Debasish Das, Department of Computer Science and Engineering
4. Dr. Atul Kumar, Department of Chemistry
5. Dr. B Ravindra, Department of Mechanical Engineering
6. Dr. K J George, Department of Humanities and Social Science
7. Dr. Harshit Agarwal, Department of Electrical Engineering

8. Dr. Somitra Sanadhya, Department of Computer Science and Engineering
9. Dr. Kiran Kumar Hiramath, Department of Mathematics
10. Dr. Vivek Vijay, Department of Mathematics
11. Dr. Suman Kundu, Department of Computer Science and Engineering

## Description of Research Groups

The Quantum Information and Computation (QIC) group at IIT Jodhpur is working towards analysing classical and quantum correlations from the perspective of a practical interface between quantum optics and quantum information processing. Such correlations occupy a central position in the quest for understanding and harvesting the power of quantum mechanics and fundamentals of quantum information processing. As a group, we are addressing some of the key issues in characterizing multiqubit entanglement. From the applications perspective, the spectrum includes, but is not limited to, quantum key distribution, quantum dense coding, quantum teleportation, quantum cryptography, quantum game theory and quantum secure communication. For a practical implementation of any quantum information task, it is important to consider the role of noise on the chosen task. The group is interested in the systematic study of quantum information and computation in realistic scenarios, including the effect of ambient noise, using ideas and techniques of Open Quantum Systems.

## Academic Programmes

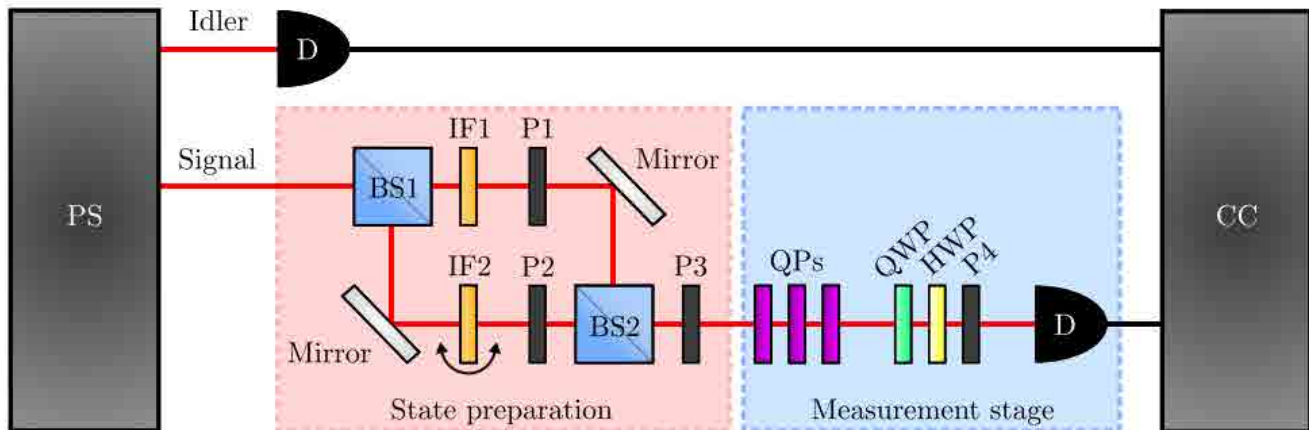
- BS program with a specialization in Quantum Technology (slated to start from AY 2022-23)
- M.Tech. in Quantum Technology (to be introduced)
- B.Tech. minor in Quantum Information and Computation (QIC)
- PhD in IDRP-QIC
- A Science-linked elective titled “Fundamental of Quantum Information” offered to 2nd year undergraduate students

## Significant Research Achievements

1. Open Quantum Systems: Dynamics of Nonclassical Evolutions: Book on Open Quantum Systems by Dr. Subhashish Banerjee published by Springer
2. non-Markovian Physics:
  - (a) A new method developed to classify and quantify quantum non-Markovian (with memory) behaviour.
  - (b) An experimental method to verify quantum non-Markovianity with Unknown System-Probe Couplings developed and implemented.
3. Interface of Particle Physics with Quantum Information, Theories developed for:
  - (a) Neutrino oscillations imply quantum correlations and vice versa.
  - (b) Leggett-Garg inequalities in mesons and neutrinos probed.
4. Quantum Thermodynamics:
  - (a) Impact of non-Markovian effects on a quantum heat engine probed.
  - (b) The dynamics of a simplified version of a quantum thermal diode studied.
5. Quantum Optics:
  - (a) Properties of engineered quantum states studied.
  - (b) Dynamics of Tavis-Cummings model in the context of cavity quantum electrodynamics probed.
6. Entanglement and Nonlocality in Multiqubit systems:
 

An efficient generic approach based on cluster coefficients to classify and quantify entanglement and nonlocal correlations in multiqubit states is developed

Experimental Setup for Snapshot Verification of non-Markovianity



## Laboratories and equipment

- i) Femtosecond Laser
- ii) Single Photon Detector
- iii) Periodically Poled Non-linear Crystal (PPKTP)

## Outreach activities

- An Online Conference on Quantum Information and Computation: From Foundations to Applications – 2021 (QFA-2021), 18 Oct 2021 to 23 Oct 2021
- Faculty Members gave several lectures through Atal-FDP in Quantum Computing for knowledge sharing and discussions

## Publications

1. Singha, C., & Banerjee, S. (2022). Thermal radiation in curved spacetime using influence functional formalism. *Physical Review D*, 105(4). ISSN: 24700010. <https://doi.org/10.1103/PhysRevD.105.045020>
2. Utagi, S., Banerjee, S., & Srikanth, R. (2021). On the non-Markovianity of quantum semi-Markov processes. *Quantum Information Processing*, 20(12). ISSN: 15700755. <https://doi.org/10.1007/s11128-021-03302-x>
3. Lahiri, S., Banerjee, S., & Jayannavar, A. M. (2021). Exploring the extent of validity of quantum work fluctuation theorems in the presence of weak measurements. *Quantum Information Processing*, 20(11). ISSN: 15700755. <https://doi.org/10.1007/s11128-021-03260-4>
4. Naikoo, J., Banerjee, S., Pan, A. K., & Ghosh, S. (2021). Projective measurements under qubit quantum channels. *Physical Review A*, 104(4). ISSN: 24699926. <https://doi.org/10.1103/PhysRevA.104.042608>
5. Mandal, S., & Banerjee, S. (2021). Local description of S-matrix in quantum field theory in curved spacetime using Riemann-normal coordinate. *European Physical Journal Plus*, 136(10). ISSN: 21905444. <https://doi.org/10.1140/epjp/s13360-021-02037-z>
6. Sarkar, R., Dutta, S., Banerjee, S., & Panigrahi, P. K. (2021). Phase squeezing of quantum hypergraph states. *Journal of Physics B: Atomic, Molecular and Optical Physics*, 54(13). ISSN: 09534075. <https://doi.org/10.1088/1361-6455/ac02d2>
7. Naikoo, J., Kumari, S., Banerjee, S., & Pan, A. K. (2021). PT symmetric evolution, coherence and violation of Leggett-Garg inequalities. *Journal of Physics A: Mathematical and Theoretical*, 54(27). ISSN: 17518113. <https://doi.org/10.1088/1751-8121/ac0546>

8. Ghosal, A., Das, D., & Banerjee, S. (2021). Characterizing qubit channels in the context of quantum teleportation. *Physical Review A*, 103(5). ISSN: 24699926. <https://doi.org/10.1103/PhysRevA.103.052422>
9. Utagi, S., Rao, V. N., Srikanth, R., & Banerjee, S. (2021). Singularities, mixing, and non-Markovianity of Pauli dynamical maps. *Physical Review A*, 103(4). ISSN: 24699926. <https://doi.org/10.1103/PhysRevA.103.042610>
10. Athira, B. S., Mandal, S., & Banerjee, S. (2021). Characteristics of interaction between gravitons and photons. *European Physical Journal Plus*, 136(4). ISSN: 21905444. <https://doi.org/10.1140/epjp/s13360-021-01361-8>
11. Paulson, K. G., Panwar, E., Banerjee, S., & Srikanth, R. (2021). Hierarchy of quantum correlations under non-Markovian dynamics. *Quantum Information Processing*, 20(4). ISSN: 15700755. <https://doi.org/10.1007/s11128-021-03061-9>

### Outreach activities

1.	Quantum Heat Engines	2019-2023	ICPS, New Delhi
2.	Generation of Entangled Photons and its application to Quantum Computation and Information Processing	2019-2023	ICPS, New Delhi
3.	Multiparticle Entanglement, Nonlocality and Quantum Information processing	2019-2022	SERB, New Delhi
4.	Modelling and comparative analysis of approaches, protocols, atmospheric effects and components of LEO satellite based Quantum Key Distribution	2022-2023	DRDO, Pune
5.	Quantum cryptanalysis of symmetric cryptosystems.	2022-2023	DRDO

# Robotics & Mobility Systems (RMS)

## Introduction

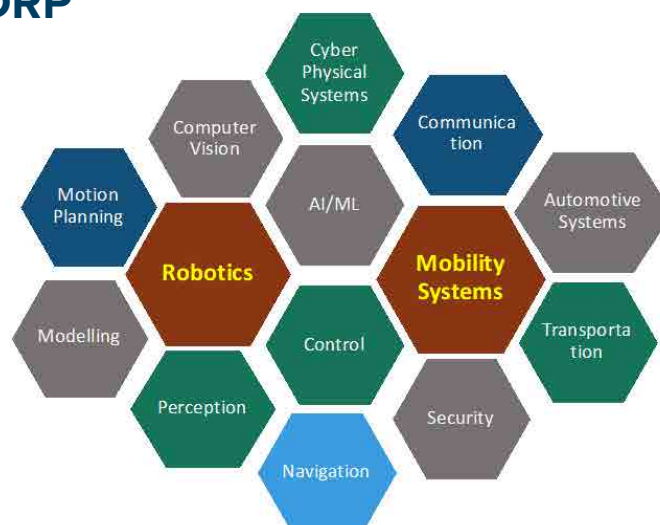
The Inter-Disciplinary Research Platforms (IDRPs) on Robotics and Mobility Systems (RMS) is a multi-disciplinary initiative with focus on solving open research problems requiring an integrated approach through the fusion of knowledge from multiple fields.

The vision of IDRPs on RMS is to advance the interdisciplinary fields of robotics and mobility systems through development in modelling, control, multimodal perception, communication, AI/ML, and energy management systems to solve technological challenges in civil and military sectors to develop state-of-the-art applications.

### The missions of IDRPs on RMS are:

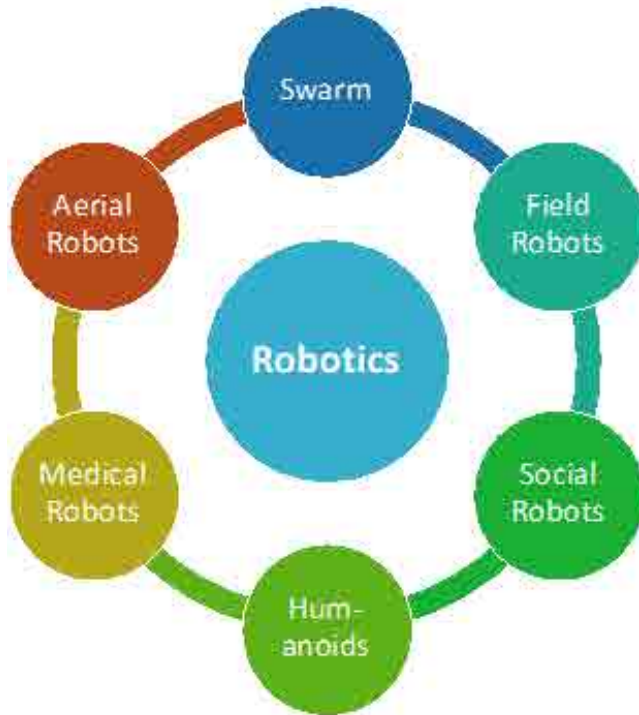
- Develop an ecosystem to promote research and technology development in ground-, air- and water-based mobile robots, and collaborative robots for defence and civilian applications.
- To pursue indigenous research to cultivate technological solutions addressing growing demands in electric vehicles, autonomous vehicles, and drones.
- To produce professionals with in-depth knowledge and analytical and experimental research skills to handle Robotics and Mobility Systems problems.
- To generate adequate financial resources by establishing collaboration with industries, R & D organisations, and the government.

## Scope of RMS-IDRP





## Application Area



## Faculty Details

The following Faculty Members from different Departments in the Institute are associated with this IDRP, in different areas:

### Computer Vision and Haptics

1. Amit Bhardwaj, Department of Electrical Engineering
2. Anand Mishra, Department of Computer Science & Engineering
3. Himanshu Kumar, Department of Electrical Engineering
4. Manish Narwaria, Department of Electrical Engineering
5. Rajendra Nagar, Department of Electrical Engineering
6. Santanu Chaudhury, Department of Computer Engineering

### Robotics and Control

1. Ashok Joshi, Mechanical Engineering
2. Anoop Jain, Department of Electrical Engineering
3. Deepakkumar M. Fulwani, Department of Electrical Engineering
4. Jayant Kumar Mohanta, Department of Mechanical Engineering
5. Niladri Sekhar Tripathy (Co-ordinator), Department of Electrical Engineering
6. Suril V. Shah, Department of Mechanical Engineering

### Dynamics, Design and Manufacturing

1. Atul Kumar Sharma, Department of Mechanical Engineering
2. C. Venkatesan, Department of Mechanical Engineering
3. Kaushal A. Desai, Department of Mechanical Engineering
4. Nipun Arora, Department of Mechanical Engineering

### Communication

1. Aashish Mathur, Department of Electrical Engineering
2. Arpit Khandelwal, Department of Electrical Engineering
3. Sai Kiran M. P. R., Department of Electrical Engineering

### Drives and Battery Technology for Electric Vehicle, Traffic Management Systems

1. Nishant Kumar, Department of Electrical Engineering
2. Ranju Mohan, Civil Engineering
3. Srijan Sengupta, Metallurgical & Materials Engineering

## Research Groups

The Thematic Areas of Research in this IDRP are:

- **Robotics:** Research in Robotics aimed at overcoming challenges in perception, manipulation, navigation in unstructured and unknown dynamic environments with focus on application to defense, medical, manufacturing and social domains.
- **Mobility Systems:** Research in Mobility Systems aimed at addressing challenges of future mobility in e-drive, autonomous driving, communication and control from the perspective of cyber-physical systems.

## Academic Programmes

**Phd Program:** The Ph.D. program offered by the IDRP on RMS is one of the few nationwide programs where students can earn a doctorate in Robotics/Mobility Systems. The program is inherently interdisciplinary, bringing together areas of research that would otherwise be spread across different departments or separate universities.

**M.Tech. Program:** To meet the increasing demand for engineers with diverse backgrounds in the field of robotic and mobility systems, and to support relevant

research and development, an M.Tech. Programme in Robotics and Mobility System is designed. The M.Tech. programme provides interdisciplinary learning opportunities to participate in one of the most challenging advanced technology areas. It is also envisaged that the programme serves as a platform to test innovative ideas in the design, development, and testing of the Robotics and Mobility systems. Currently, we are offering the M.Tech. program in Robotics and Mobility Systems with micro specialisations in

1. Autonomous Mobile Robots [AMRs]
2. Unmanned Aerial Vehicles [UAVs]
3. Electric Vehicles (EVs)

**B.Tech. Specialization:** To provide an understanding of the interdisciplinary field of robotics to undergraduate students interested in pursuing careers or post graduate degrees in this field of interdisciplinary specialization in robotics for B.Tech. Students.

## Laboratories and equipment

The IDRP RMS is in the process of developing a Lab for Unmanned Vehicles. The primary focus of this Lab will be to pursue research on Unmanned Vehicles. The Lab facility will also be used for the M.Tech. Students.

## Outreach activities

IDRP RMS offered a one credit winter course on Deterministic Swarming Strategies for Unmanned Systems. The course covers topics as basic concept of swarming and its application to unmanned systems, Role of path planning in swarm generation and motion, Deterministic swarming strategies – Features & Benefits, Graph theory based swarm generation and path planning, Vector field based swarming methodology and path generation, Cyclic pursuit based swarms and their mobility.

# Smart Healthcare (SH)

## Introduction

The interdisciplinary platform in Smart Healthcare was established in 2019 with a vision to Emerge as an Interdisciplinary platform achieving excellence in devising smart healthcare solutions for diagnostics, therapeutics, and remote healthcare through multidisciplinary research and teaching, bringing disruption in the conventional health care regime.

The Smart Health Care IDRP aspires to create significant scientific and technological advancements in the area of Healthcare by bringing together a multidisciplinary team of scientists working in the interface of Biology, Chemistry, Healthcare & Engineering. The research is intended to focus on designing and developing sustainable solutions for point-of-care health devices, drug discovery, affordable diagnostics, bio-compatible implants, and remote health care, including telemedicine. The IDRP platform is expected to support the development of various eHealth and mHealth based solutions for improving the quality of healthcare and making it available to large segments of the society.

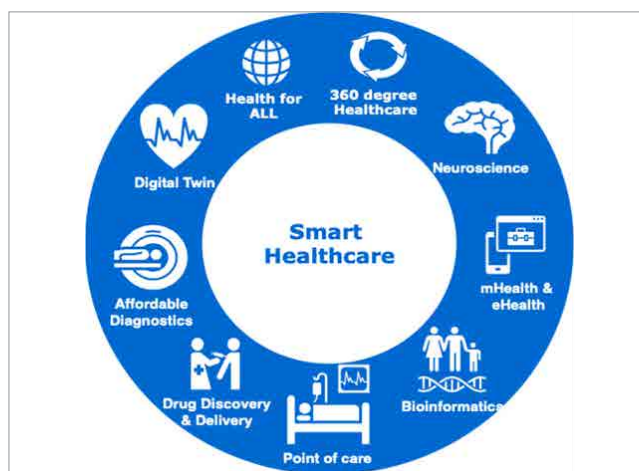
### The major objectives of this IDRP are:

- Augmenting existing methods for medical research using machine learning and artificial intelligence based approaches.
- Designing new and optimizing existing point-of-care health devices.
- Identifying novel methods for early diagnosis and personalized therapeutics.
- Creating a platform to use various electronic,

mechanical, and biosensors for improving the remote health care facilities.

- Implementing translational outcome oriented various academic and research programs such as Biodesign, Medical Technology (Masters, PhD, and Master-PhD Jointly with AIIMS), AI and Ayush, PhD in Smart healthcare, and UG minor in Smart Healthcare.
- Establishing start-ups and supporting entrepreneurs in the domain of smart healthcare through Bionest, Biodesign, Med Tech Park, Jodhpur City Knowledge and Innovation cluster (JCKIC), and several similar platforms..
- Initiating a comprehensive research program to harvest the true potential of desert ecosystems.

The following schematic represents the key focus areas of research in the IDRP on Smart Health Care.

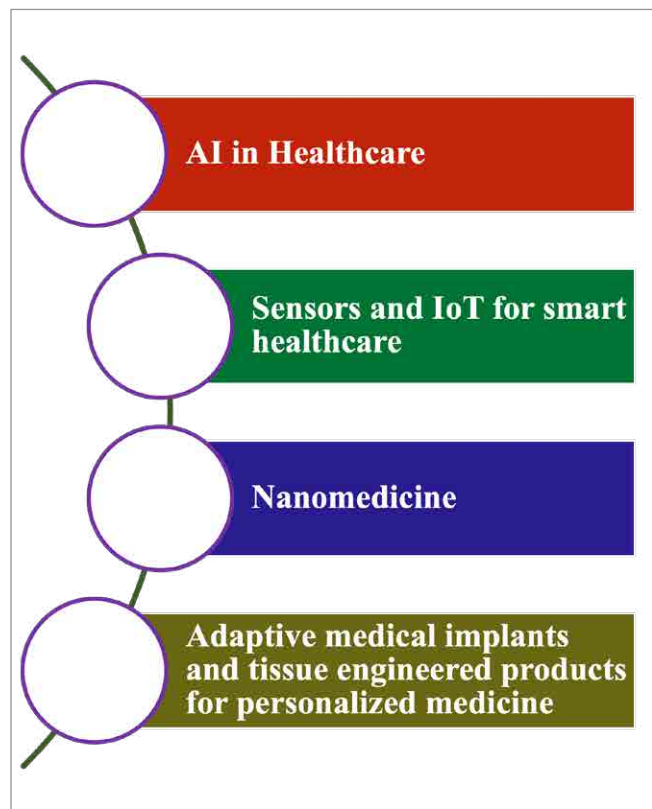


## Faculty details

1. Raviraj Vankayala, Department of Bioscience and Bioengineering
2. Indranil Banerjee, Department of Bioscience and Bioengineering
3. Jaiveer Singh, , Department of Metallurgical and Materials Engineering
4. Ram Prakash, Department of Physics
5. Sushmita Jha, Department of Bioscience and Bioengineering
6. Meenu Chhabra, Department of Bioscience and Bioengineering
7. Samanwita Pal, Department of Chemistry
8. Sudipta Bhattacharya, Department of Bioscience and Bioengineering
9. Pankaj Yadav, Department of Bioscience and Bioengineering
10. Suchetna Chakraborty, Department of Computer Science and Engineering
11. Dip Sankar Banerji, Department of Computer Science and Engineering
12. Sumit Kalra, Department of Computer Science and Engineering
13. Anil K Tiwari, Department of Electrical Engineering
14. Saakshi Dhanekar, Department of Electrical Engineering
15. Ajay Agarwal, Department of Electrical Engineering
16. Mitali Mukerji, Department of Bioscience & Bioengineering
17. Manoj Chaudhary, Department of Electrical Engineering
18. Ravi KR, Department of Metallurgical and Materials Engineering
19. Hardik Kothadia, Department of Mechanical Engineering
20. Surajit Ghosh, Department of Bioscience and Bioengineering
21. Pranay Ranjan, Department of Metallurgical and Materials Engineering
22. Prasenjit Sarkar, Department of Chemical Engineering
23. Dinesh Kumar Ahirwar, Department of Bioscience & Bioengineering
24. Siddharth Srivastava, Department of Bioscience & Bioengineering
25. Bala Pesala, Department of Bioscience & Bioengineering

## Description of Research Groups

The platform currently has four prominent research groups even though the research activities of the platform revolves around several allied areas of smart healthcare including cancer informatics, digital healthcare, precision medicine, smart biodevices and so on.



## Academic Program

IIT Jodhpur-AIIMS Jodhpur Joint Programs (Masters, Masters-PhD Dual Degree and PhD) in Medical Technologies

### Mission

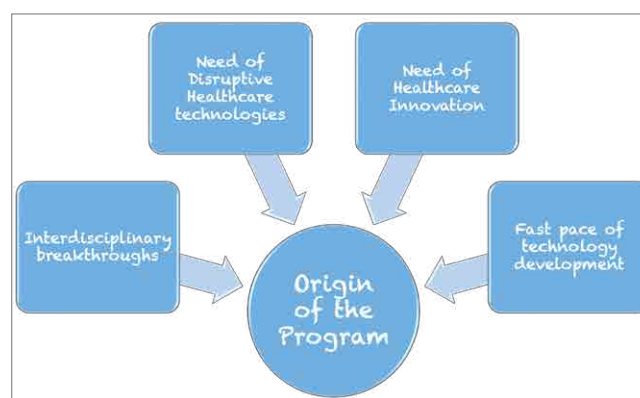
A Multi-disciplinary program to produce deep-tech innovators in the field of Medical Technologies

Why a Multi-disciplinary Program on Innovation in Healthcare?

- A. Technology's nonlinear pace of progress will almost certainly create substantial market disruption in healthcare, spawning wave after wave of opportunities for traditional healthcare organizations, and new start-up companies alike.
- B. There is a need for professionals with a multi-disciplinary background with training in entrepreneurship and business dynamics for meeting the challenges of future transformations of

healthcare technology. This cannot be done by only medical practitioners or engineers or management professionals.

- C. The programme targets to generate manpower with multi-dimensional capability of creative thinking, deep knowledge and strong sense of business.



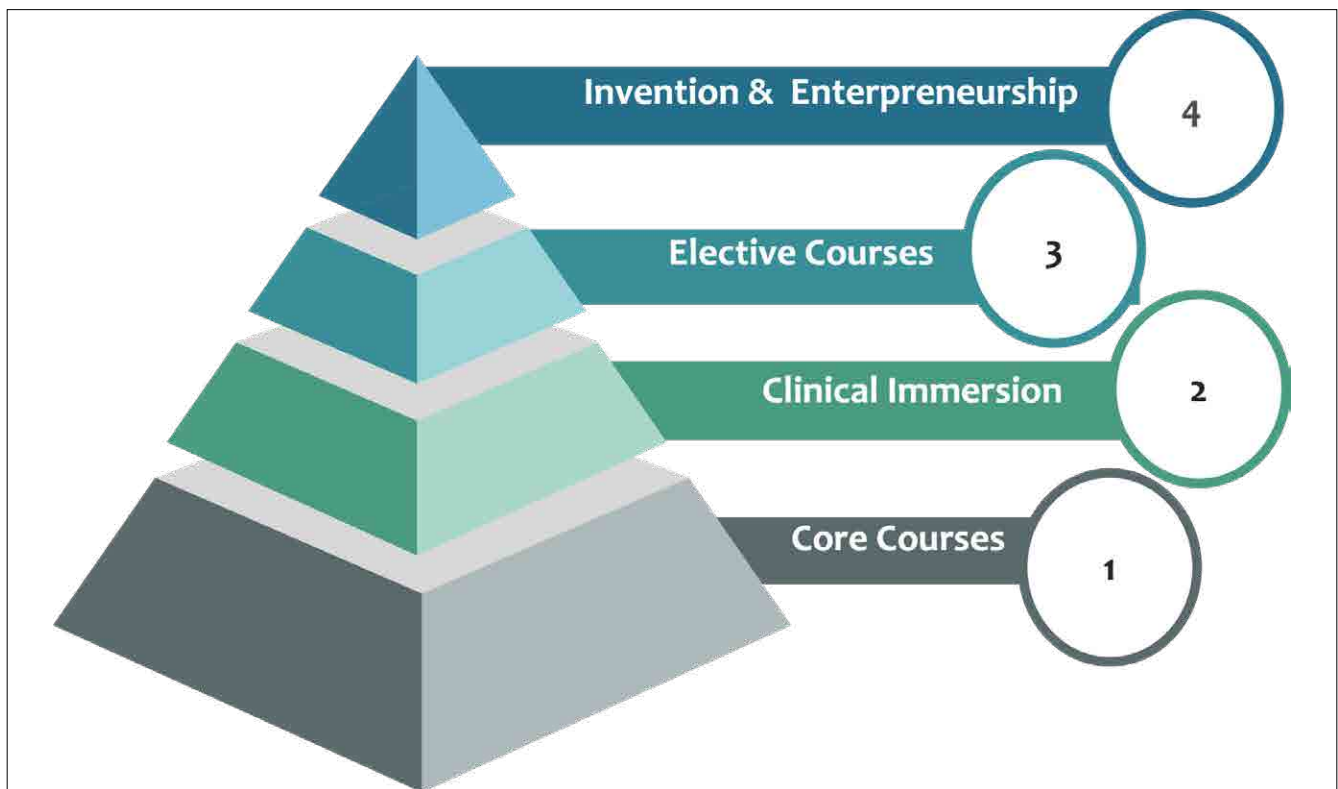
### Scope

1. The program will provide opportunities to assimilate the cutting-edge knowledge in the domain of medical and technological science to address the current and future challenges in the global problems of healthcare sectors
2. The program will also encourage the health-techno innovators to initiate a start-up and venture into entrepreneurship.
3. The program will encompass broad areas related to but not limited to: bio-device development, imaging-based diagnostics, deep-tech solutions, and telemedicine
4. The program plans to utilize the individual interests of students and tailor the course work to enable the doctors and engineers to work jointly to meet the challenges of healthcare.

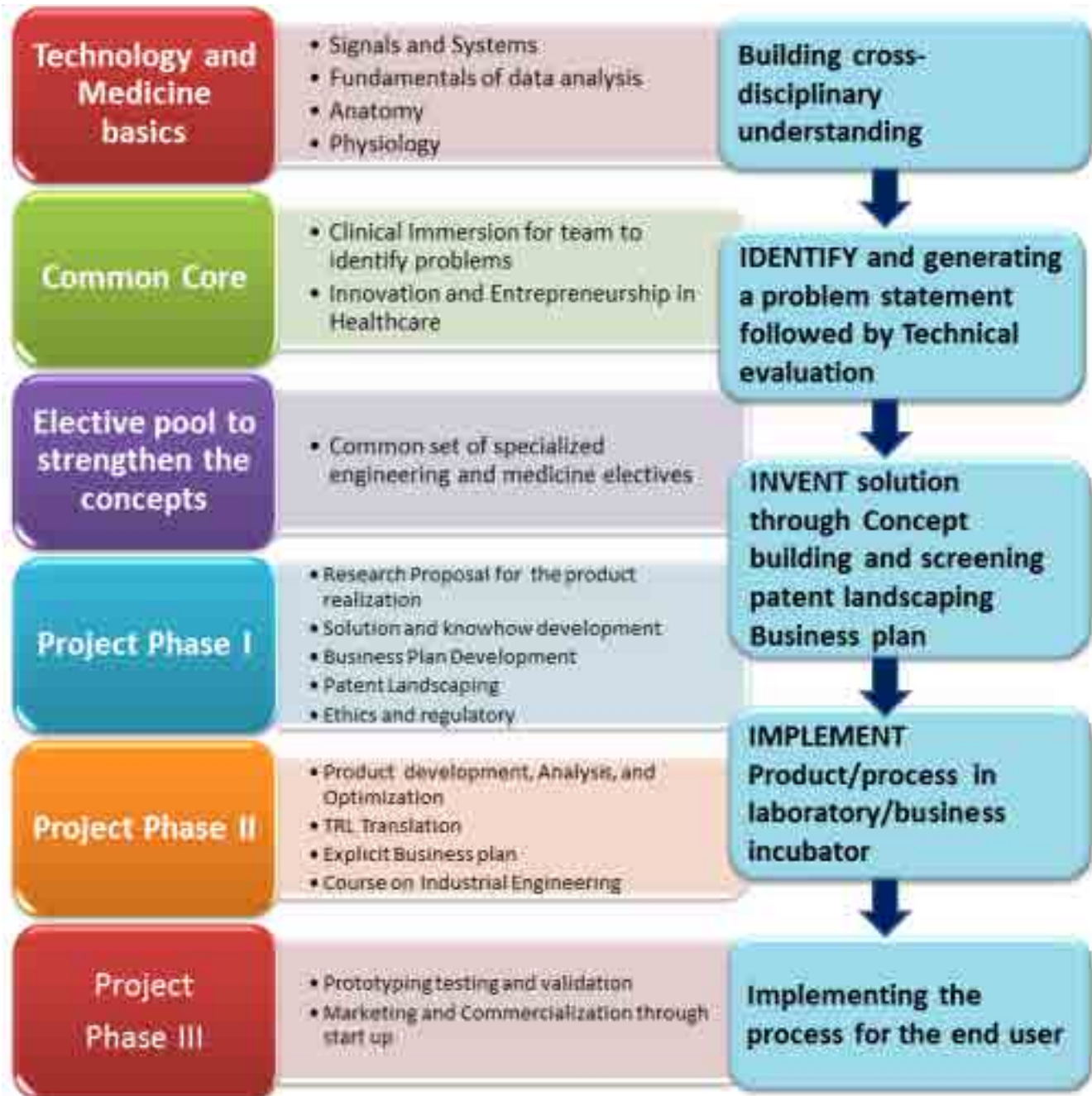
### Salient Features

1. First program in India that provides an opportunity to the medical professionals and engineers to learn and share knowledge under a trans-disciplinary academic umbrella.
2. The program is designed to cater to the emerging needs of innovation and improvisation in the field of healthcare technologies.
3. Unique opportunity for the students to work under the joint guidance of a faculty member of AIIMS, Jodhpur and IIT Jodhpur in the emerging areas of healthcare technologies.
4. State of the art research infrastructure of AIIMS, Jodhpur and IIT Jodhpur for research and innovation.

- 5. The program offers unique combinations of core subjects, flexible electives and a year and half long innovation and entrepreneurship oriented research project. Students will have the flexibility to pursue academic and research interests.
- 6. The students will be encouraged to compete for different fellowships and grants offered by the institute and other extramural funding agencies.
- 7. The program aims to nurture entrepreneurship skills leading to the acquisition/generation of Intellectual Property by providing business incubation facilities along with seed-finance to students on a competitive basis.



### The Teaching-Learning Process



**Core courses**

**Objective:**

**Building basic Cross disciplinary Understanding**

Courses for Candidates with Engineering Background

To be exposed to fundamentals of human biology

- Fundamentals of Physiology
- Fundamentals of Anatomy

**Courses for Candidates with Medical Background**

To be exposed to fundamentals of technology components which are significantly impacting the domain of the healthcare

- Introduction to Machine Learning
- Biomedical Signals and Systems

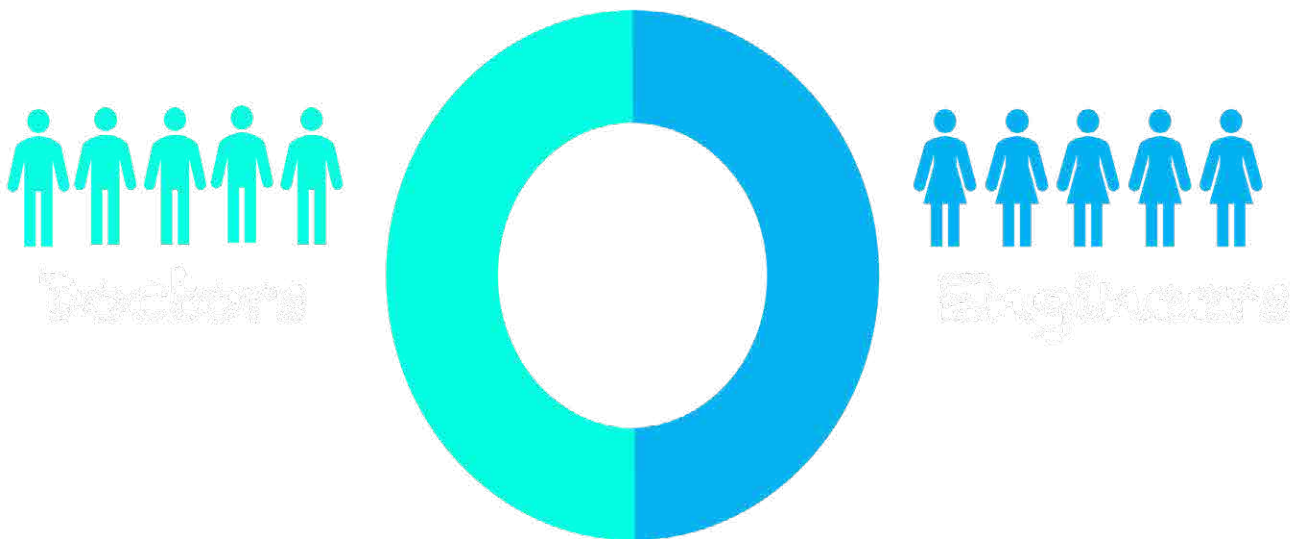
**Innovation and Entrepreneurship in Health Care**

- Introduction to the theory and practice of innovation and entrepreneurship in health care settings.

- The first half of the sessions focus on aspects of starting & growing a new health care business (for-profit or non-profit).
- The second half of the sessions focus on fostering innovation and entrepreneurship in established organizations (non-profit, for-profit or governmental organizations) engaged in health care or related.

**By the end of the course, students are able to:**

- Analyze the idea, value proposition, team, business model, financing and execution of any early stage healthcare company and make recommendations for improvement.
- Assess the innovation environment, challenges and barriers for any established health care company and make recommendations for improvement.
- Generate new, innovative solutions to optimize resources and improve outcomes in health care.



**Immersion**

- Each team (typically an Engineer and a Doctor) delves deeply into one or more (maximum three) specific clinical area by direct immersion in relevant inpatient and outpatient settings.
- Over the course of several weeks, the students document their clinical observations with the goal of creating a list of needs.

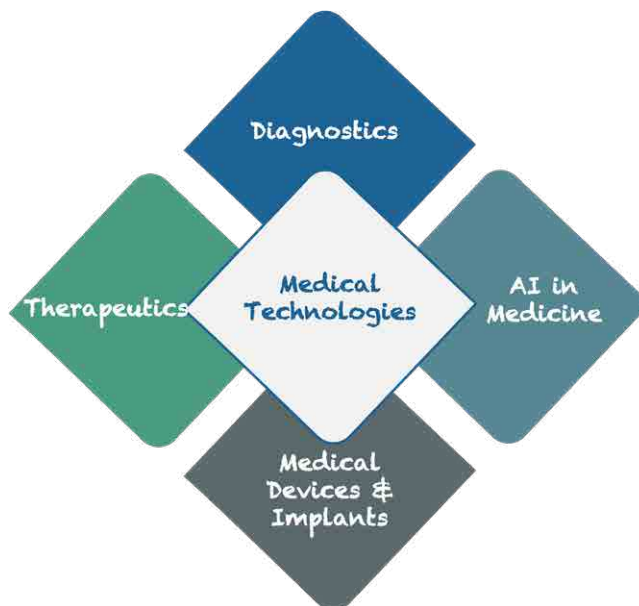
- The next step in the process is the development of a need statement carefully crafted to capture the essence of the need.
- In effect, it is a mission statement, serving as the driving force behind the team’s efforts to solve the identified need.



## Elective courses

- Electronic Nose for health monitoring
- Molecular Techniques for Precision medicine
- Biomaterials
- Imaging Applications in Healthcare
- MEMS Technology for Biomedical Applications
- Drug Designing and Development
- Introduction to Medical Robotics
- AI Applications in Healthcare
- BioMEMS
- Plasma Medicine
- Tissue Engineering: From bench to clinics
- Telemedicine: Technology and Frameworks
- Microfluidics based Point-of-Care diagnostics
- Overview of Drug Designing and Development
- Medical 3D Printing
- Wearable Devices
- Genomic medicine
- 3D Bioprinting
- Point of care diagnostics
- Enzymes and Enzyme Kinetics
- Biomedical Nanomaterials

- Modern tools and Techniques used in Drug designing and Development
- Experimental Techniques in Tissue Engineering



### The platform also offers:

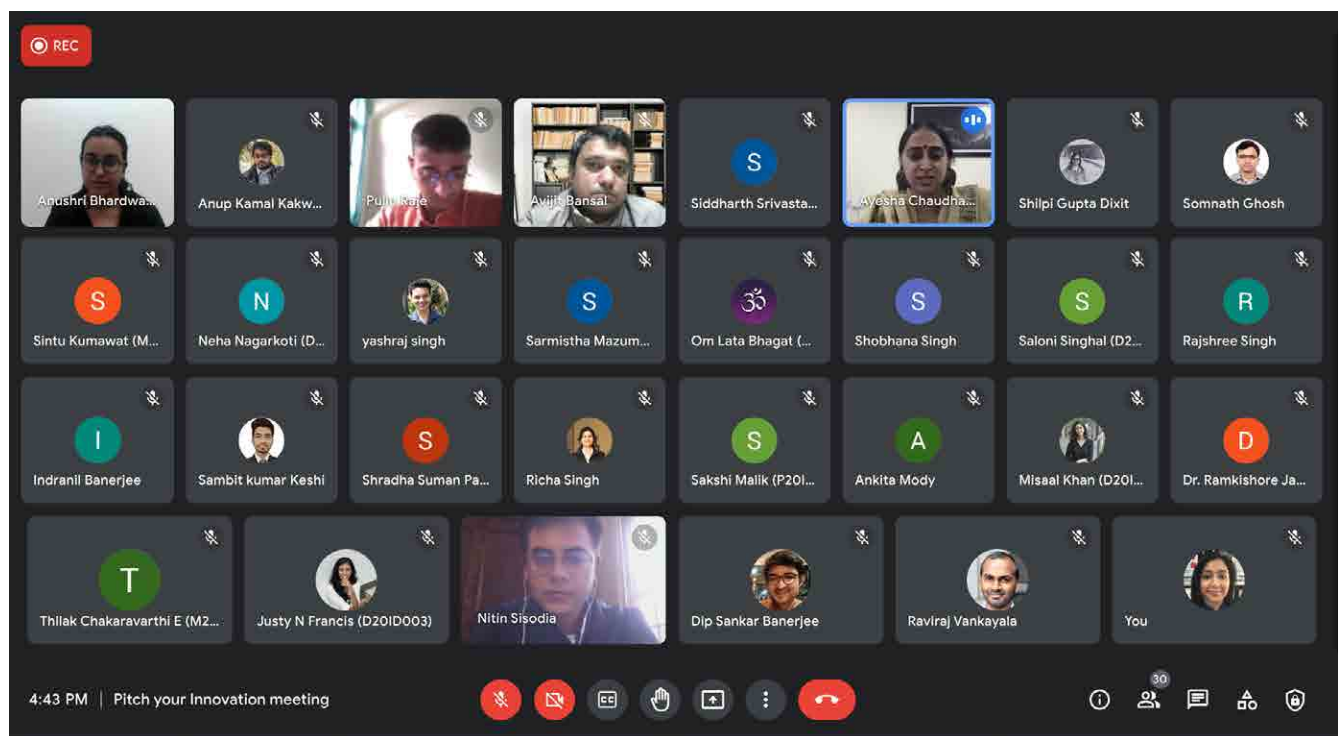
- Interdisciplinary Specialization in Smart healthcare to final year UG students.
- Regular Ph.D. in Smart healthcare

S. No.	Name of the students	Enrolment year	Topic	Supervisors
1.	Nikhil Vadera	2020	Breath based diagnosis	Saakshi Dhanekar Meenu Chhabra
2.	Ritesh Mishra	2020	Plasma based food sterilization	Ram Prakash Meenu Chhabra
3.	Nabanita Mukerji	2019	Smart-Engineered Soft Biomaterials as Therapeutics.	Prof. Surajit Ghosh
4.	Surojit Ghosh	2019	Engineered Utrrophin Agonist Chemical Tool-box Developed for Discovery of Potential Duchenne Muscular Dystrophy Therapeutic Lead.	Prof. Surajit Ghosh
5.	Ramkamal Samat	2019	Peptide Based Therapeutics to combat antimicrobial resistance and infection	Prof. Surajit Ghosh
6.	Aniket Jana	2019	Next Generation Chemical Regulator for Neural Regeneration: Development of Potential Neuroregenerative Medicine	Prof. Surajit Ghosh Dr. Prasunpriya Nayak, AIIMS, Jodhpur
7.	Netra Hiremath	2020	Nanotheranostic platform to combat Ischemic stroke	Raviraj Vankayala, Ravi KR

S. No.	Name of the students	Enrolment year	Topic	Supervisors
8.	Arpita Ghosal	2020	3-D Bioprinting of vascular tissue	Indranil Banerji Ravi KR
9.	Supriya Suman	2019	Fundus Image analysis for diagnosis of ocular diseases	Anil Tiwari Kuldeep Singh (AIIMS Jodhpur)
10.	Midhuna K	2021	Structural elucidation of therapeutic targets and molecules	Samanwita Pal Sudipta Bhattacharya
11.	Ranjan K Mishra	2021	Design of implants	Jaiveer Singh Indranil banerji
12.	Dinesh Chaudhary	2021	-	Supervisor to be allocated
13.	Vipul Srivastava	2022	-	Supervisor to be allocated
14.	Om Lata Bhagat	2020	Estimation of Cardiovascular system	Anil K Tiwari Abhinav Dixit (AIIMS Jodhpur)
15.	Sudesh Pachar	2020	LFA for tuberculosis	Anil K Tiwari Pradeep Dwivedi (AIIMS Jodhpur)

**Significant Research Achievements**

**Pitch your innovation Meeting- 17th Nov 2021**



Biodesign expert panel of Dr Ayesha Chaudhury, Dr Avijit Bansal, Dr Nitin Sisodia, and Dr Pulin Raje. The criteria for evaluation was:

- 1) Need Statement Clarity
- 2) How innovative and novel is the solution.
- 3) Stage of innovation in terms of TRL
- 4) Quality of the presentation and Teamwork
- 5) Overall stakeholder engagement- Real-world connect

## Faculty Laurels

1. Dr. Ram Prakash was Elected as Vice-President of the Plasma Science Society of India (PSSI) for the term 2022-2024.
2. Dr Sushmita Jha was awarded ISNO President's award for Outstanding work in Neuro-Oncology 2022.
3. Dr Sushmita Jha presented Medical Technologies Innovations to the Honourable Vice President to IIT Jodhpur on 28th Sep 2021, during his visit to IIT Jodhpur.
4. Dr Sushmita Jha coordinated the Medtech showcase at the Technology Innovation and Startup Center (TISC) IIT Jodhpur 7th convocation of IIT Jodhpur, and the visit of Dr. Rajesh S Gokhale (Secretary, Department of Biotechnology, Govt of India) and Dr. R Chidambaram (Chairman Board of Governors, IITJ), 18th December 2021.
5. Dr Sushmita Jha Invited lectures:
  - International Symposium on "Proteins and Biology", Department of Biochemistry, Faculty of Science, The M. S. University of Baroda, Vadodara, 28th February 2022-1st March 2022
  - XXXIX Annual Meeting of Indian Academy of Neurosciences (IAN) Theme: "NeuroGlia in Health and Disease" organized by Indian Institute of Science Education and Research Kolkata, Netaji Subhas Open University & CSIR-Indian Institute of Chemical Biology, 16th to 19th December 2021
- Invited talk by the Board of Governors, IIT Jodhpur, 8th October 2021
- Invited talk on MedTech, BSBE Industry Day 2022, "Building a Medtech Ecosystem at IIT Jodhpur: Biodesign and Beyond" 15th April 2022
- 6. Dr. Siddharth Srivastava, Invited talks/ Case discussions:
  - Indian Cooperative Oncology Network (ICON) conference, Pune. Molecular Oncology workshop: Oct 2nd 2021
  - Association of Maharashtra Medical Oncologists (AMMO) conference at Shirdi: 15th July 2022
  - Optimal Management of NSCLC meeting, Vedanta Hospitals, Ahmedabad: 6 Aug 2022
  - Sanjay Gandhi Post Graduate Institute of Medical Sciences (SGPGI Lucknow), Diagnostic Update & Molecular Advances in Endocrine Organ Lesions, Sept 2022

## Student Laurels

1. Misaal Khan, 2020, Masters- PhD (MedTech)
  - "Travel grant for in person attendance at Wicv, CVPR at New Orleans, Louisiana, USA
  - Paper accepted at Wicv, CVPR 2022 New Orleans, Louisiana, USA
  - Poster presentation at CVPR 2022 New Orleans, Louisiana, USA
  - Review paper on "Role of AI in maternal and neonatal health" accepted at Frontiers in Public health journal
  - Second position in iS3: iDeathon on Sustainable Smart Systems"
2. Thilak Chakravarthy, 2020, Masters (MedTech):
  - Selected for the PadUp ventures Acceleration Program cohort of 2022.
  - Selected for seed grant fund through MSME Innovation contest "Idea Hackathon 2022".
3. Varun Khandelwal (MedTech)
  - Best innovator Award in Bioinnovate Competition at National Bioengineering Conference-2022, NIT-Rourkela

- Participated in Oral Presentation Competition at National Bioengineering Conference-2022, NIT-Rourkela
  - Winner of MEDHA-2022, BETiC, IIT-Bombay
  - Marathwada Medtech Lab, Aurangabad offered the RPT (Rapid Prototyping) service coupons worth Rs. 20000/-
4. Rajshree 2020, Masters (MedTech)
    - Project collaboration with Johari Digital, entrepreneurial mentoring by Pad Up Ventures
  5. Umme Abiha, 2021, PhD (MedTech)
    - Best Poster presentation for excellence in research in Pharmaceutical Sciences Category along with a cash prize during 3rd National Biomedical Research Competition NBRCOM 2021 under the aegis of SYBS, India.
  6. Varun Khandelwal and Sayak Sarkar (MedTech) were awarded, Best Innovator Award at Bioinnovate competition at the National Bioengineering Conference 2022 held at NIT Rourkela
  7. Manik Sejwal(MedTech): 3rd position in Tech4Seva Summit 2022 Regional level 3rd National Biomedical Research Competition (NBRCOM 2021), Date: 6-10th December 2021, Organized By: AIIMS Rishikesh, JNU Delhi, PGIMER Chandigarh, NIPER Mohali, CSIR-CDRI Lucknow, CSIR-IITR Lucknow, AIIMS Jodhpur
  8. Ajmal Jaleel (MedTech) was Awarded Young Researcher Award (First), Category: Health Science, Title of Study: Automated vulva and anus cleaning machine for mentally and physically challenged people (Rehabilitation Robotics)
  9. Umme Abiha (MedTech) was Awarded Award of Appreciation, Category: Life Science, Title of Study: To study the impact of a rare crocus sativus on breast carcinogenesis
  10. 6 students have applied for different funding schemes including (BIG, MSME, PMRF)

## Laboratories and equipment

Facilities established under Bionest

1. Cell culture facility
  - a. CO2 Incubator
  - b. Laminar Air Flow
  - c. Centrifuge for cell culture
  - d. 4 Degree Celsius Refrigerator
  - e. Automated Cell counter
  - h. Ice Maker
  - f. Inverted Microscope
  - g. Upright Microscope
2. Biosafety cabinet, refrigerators
  - a. Refrigerators
    - i. 4 degree celsius
    - ii. -20 degree celsius
    - iii. -80 degree celsius
3. Food quality testing equipments
  - a. Decagon Aqualab water activity meter (Decagon water activity meter)

## Outreach activities

1. Ram Prakash demonstrated Novel Cold-plasma Detergent in Environment (CODE) Device in the Exhibition organized during the visit of Hon'ble Vice President of India Shri M. Venkaiah Naidu at Jodhpur City Knowledge and Innovation Cluster on 28th September 2021.
2. Ram Prakash demonstrated the Novel CODE Device and Small-scale Milk Disinfection System in the Exhibition organized on the eve of the 7th Convocation of IIT Jodhpur at the Innovation Complex on 18th December 2021.
3. Ram Prakash demonstrated the Novel CODE Device and Small-scale Milk Disinfection System to Prof. Samir K. Brahmachari, Ex-DG, CSIR during the product showcasing on the 10th March 2022.
4. Dr Sushmita Jha is a Co-organizer of EMBO India Investigator Network seminar series

5. Dr Sushmita Jha Initiated and organized Biodesign Workshop, 10th -12 May 2022. Hosted Dr Ayesha Chaudhury, Adjunct Professor of Practice at IIT Jodhpur and officer on special duty at the office of the principal scientific advisor, Govt of India. Dr Chaudhury is an alumnus of Stanford Biodesign fellow and IIT-Bombay. She was part of the founding team of Atal Innovation Mission and is also a founder and director of windmill healthcare technologies. The program was open to all faculty colleagues (from IITJ and AIIMSJ), MTech and PhD students.
6. Dr Sushmita Jha organized a Biodesign Workshop 10th -12th May 2022
7. Dr Sushmita Jha was an Invited speaker at 'Career Convention' event held at Sri Aurobindo Centre of New Education, Jodhpur, 24th July 2021,
8. Dr Sushmita Jha was the Moderator on "National Technology Day" panel discussion on "MedTech for the Future", 11th May 2022.

## Publications & Patents

1. Kiran, Ramavtar, Shivam Chaturvedi, Chandra Prakash, Ambesh Dixit, Deepak Fulwani, Ankur Gupta, Neha Jain, Vibhor Tak and Ram Prakash "Photocatalytic Oxidation Conveyor 'PCOC' System for Large Scale Surface Disinfection" Rev. Sci. Instrum. 93, 074101 (2022). DOI <https://doi.org/10.1063/5.0082222>
2. Antony Vincy, Sarmistha Mazumder, Indranil Banerjee, Kuo Chu Hwang, "Recent Progress in Red Blood Cells-Derived Particles as Novel Bioinspired Drug Delivery Systems: Challenges and Strategies for Clinical Translation", *Frontiers in Chemistry* 2022, 10, 905256. DOI: 10.3389/fchem.2022.905256.
3. Netra Hiremath†, Rahul Kumar†, Kuo Chu Hwang, Indranil Banerjee, Suresh Thangudu, Raviraj Vankayala\*, "Near-Infrared Light Activatable Two-Dimensional Nanomaterials for Theranostic Applications: A Comprehensive Review", *ACS Applied Nanomaterials*, 2022, 5, 2, 1719. DOI: 10.1021/acsanm.2c00170.
4. Justy N. Francis, Indranil Banerjee, Ankita Chugh, Jaiveer Singh, "Additive manufacturing of polyetheretherketone and its composites: A review", *Polymer Composites*, 2022, In press. DOI: [doi.org/10.1002/pc.26961](https://doi.org/10.1002/pc.26961).
5. Pranay Ranjan, Snehranj Gau, Himanshu Yadav, Ajay B. Urgunde, Vikas Singh, Avit Patel, Kusum Vishwakarma, Deepak Kalirawana, Ritu Gupta, Prashant Kumar, "2D materials: increscent quantum fatland with immense potential for applications", *Nano Convergence* 9, 26 (2022). <https://doi.org/10.1186/s40580-022-00317-7>
6. S. Ghosh, S. Garg, N. Mukherjee, S. Ghosh, (2022). Facile Method of Tubulin Purification from Goat Brain for Reconstitution of Microtubule-Associated Intracellular Function. In: Inaba, H. (eds) *Microtubules. Methods in Molecular Biology*, vol 2430. Humana, New York, NY. DOI: [https://doi.org/10.1007/978-1-0716-1983-4\\_2](https://doi.org/10.1007/978-1-0716-1983-4_2)
7. N Mukherjee, R Roy, S Ghosh, S Ghosh. "Self-Assembled Antimitotic Peptide Vesicle Designed from  $\alpha$ ,  $\beta$ -Tubulin Heterodimer Interface for Anticancer Drug Delivery", *Israel Journal of Chemistry* (2022). DOI: <https://doi.org/10.1002/ijch.202200019>
8. P. Mondal, S. Mohapatra, D. Bhunia, P. Kumar Gharai, N. Mukherjee, V. Gupta, S. Ghosh, S. Ghosh "Designed hybrid anticancer nuclear-localized peptide inhibits aggressive cancer cell proliferation" *RSC Med. Chem.*, 2022,13, 196-201, DOI: 10.1039/D1MD00324K
9. Surajit Ghosh, Nabanita Mukherjee, Satyajit Ghosh, Rajsekhar Roy. Amyloid-Inspired Antibacterial hydrogel –A potential biocompatible wound healing material. Provisional Patent Application No. 202211032081 Dated 04-06-2022 in India

## Projects

1. Development of an AI platform for human health. Funding Agency : MEITY 386.54 Lakhs 2020 – 2023; Team: Professor Santanu Chaudhury, Dr. Sushmita Jha, Dr. Sumit Kalra, Dr. Sushmita Paul, and several other consortium investigators.
2. BioNEST: For providing incubations to Start ups and entrepreneurs DBT-BIRAC 445.47 Lakhs, 2021-2024; Team: Professor Surajit Ghosh and several participants, Med Tech students
3. Biodesign: Establishing Biodesign labs for medtech. DBT, 300 lakhs Team: Dr. Ravi KR, Dr. Sushmita Jha, Dr. Saakshi Dhanekar MedTech and SH students
4. CSR Funds received through Siemens (2022). Team Dr, Sushmita Jha Med Tech students. 20 Lakhs
5. Center for rare disease Duchenne muscular dystrophy Prof Surajit Ghosh, Dr. Sudipta Bhattacharya, Dr. Nirmal Rana and Dr. Dibyendu Sasmal, faculty members from AIIMS Jodhpur DST (2022 onwards)
6. Development of Transparent, Durable superhydrophobic-coating for self-cleaning of Endoscope. MSME 15 Lakhs Dr. Ravi K R & Mr. Subburayalu.

7. Developing Endoscope Socket to provide an uninterrupted endoscopic visual field. MSME 15 lakhs Mr. Thilak Chakravarthy, Dr. Ravi K R and Dr. Amit Goyal (approved).
8. Forecasting COVID-19 spatio-temporal disease spread patterns and establishing predictive factors through the analysis of large data inconclusive/ repeat tests and associated testing data. Budget : 21.2 lakhs. (Submitted to ICMR Extramural Call). Team Members: Dr. Dip Sankar Banerjee (IITJ), Dr. Saptarshi Mandal (AIIMS J), Dr. Asmita Hazra (Govt. Medical College Pali) (Approved)

## CSR funding

Siemens-supported Pre-incubation incentive program for Medical Technology Students; Funds: 21 Lakhs; Transferred to TISC for incubation support Projects offered incubation support after evaluation of pitch:

1. Thilak Chakravarthy: Developing Socket-Based Anti-Fogging Lens for ENT Endoscopes
2. Anup Kakwani : Manual mechanical device for root canal irrigation through Apical Negative Pressure
3. Rajshree : Continuous BP monitoring using a convenient non-invasive cuffless device.

# Space Science & Technology (SST)

## Introduction

The space science and technology (SST) inter disciplinary research platform (IDRP) at IIT Jodhpur has been formed in 2019 to cater to the growing demands on space sector research in the country. The proposed research programme on Space Science and Technology will be a collective multi-disciplinary effort to address key scientific and engineering issues in understanding and exploiting space. The space being so vast and varied with an almost infinite number of stellar objects and perhaps a greater number of unknowns than known, offers huge opportunities to carry out fundamental research to develop better understanding of the Universe. Further, space also offers a wide range of opportunities for its exploitation for a number of technological applications such as space vehicles, satellite technologies, remote sensing using sensors operating over a range of wavelength regions including visible, infrared, microwave, etc. It comprises both the science as well as engineering/technology components. These can be thought as the following:

1. Develop scientific and technological tools including certain specialized payloads for the furtherance of research in basic or fundamental science, particularly in the exploration of the Universe.
2. Technology advancement can be achieved with
  - a. Pure technological development
  - b. Translation of basic research into technology.

The program will be based on system approach involving multidisciplinary subjects wherein a set of complex problems pertaining to the

Space Science and Technology will be taken up involving several sub-activities such as design and development of sub-components including materials modelling, experimental realization, component modelling and fabrication, integration, and its validation as a complete system/sub-system.

## Faculty Details

1. Dr. Arun Kumar R, Department of Mechanical Engineering
2. Dr. Arun Kumar Singh, Department of Electrical Engineering
3. Dr. Anand Krishnan Plappally, Department of Mechanical Engineering
4. Dr. Mahesh Kumar, Department of Electrical Engineering
5. Dr. Ankur Gupta, Department of Mechanical Engineering
6. Dr. Reetanjali Moharana, Department of Physics
7. Dr. Angan Sengupta, Department of Chemical Engineering
8. Dr. Barun Pratiher, Department of Mechanical Engineering
9. Dr. Prashant Kumar Gupta, Department of Materials & Metallurgical Engineering
10. Dr. Jayant Kumar Mohanta, Department of Mechanical Engineering
11. Dr. Nirmalya Bachhar, Department of Materials & Metallurgical Engineering

12. Dr. Rahul Chhibber, Department of Mechanical Engineering
13. Dr. Ashok Joshi, Department of Mechanical Engineering
14. Dr. Chandan Pandey, Department of Mechanical Engineering

## Publications

### Journal Publications in IDRPs-SST

1. Singh, S. K., & R, Arun. K. (2021). A parametric study on the fluid dynamics and performance characteristic of Micronozzle flows. *Journal of Fluids Engineering, ASME*, 144(3). <https://doi.org/10.1115/1.4052546>
2. Nipun Sharma, Adarsh Nigam, Dmitry Lobanov, Ankur Gupta, Alexey Novikov, and Mahesh Kumar. "Mercury (II) Ion Detection using AgNWs MoS<sub>2</sub> Nanocomposite on GaN HEMT for IoT Enabled Smart Water Quality Analysis". *IEEE Internet of Things* <https://doi.org/10.1109/JIOT.2021.3071382>
3. Nipun Sharma, Adarsh Nigam, Ankur Gupta, Sudhiranjan Tripathy, and Mahesh Kumar. "1T and 2H Heterophase MoS<sub>2</sub> for Enhanced Sensitivity of GaN transistor-based Mercury ions Sensor". *IOP Nanotechnology* <https://doi.org/10.1088/1361-6528/ac5cff>
4. Nipun Sharma, Sumit Kumar, Ankur Gupta, Surani Bin Dolmanan, Dharmraj Subhash Kotekar Patil, Swee Tiam Tan, Sudhiranjan Tripathy, and Mahesh Kumar "Influence of gas molecules on 2D electron gas of AlGaIn/GaN transistor: Room temperature NO<sub>2</sub> gas sensor". *Sensors and Actuators: A* <https://doi.org/10.1016/j.sna.2022.113647>
5. Nipun Sharma, Vikas Pandey, Ankur Gupta, Swee Tiam Tan, Sudhiranjan Tripathy, and Mahesh Kumar. "Recent progress on Group III-nitride based Gas Sensors: A Review" <https://doi.org/10.1039/D2TC02103J>
6. Nigam Adarsh, Nipun Sharma, Dmitry Lobanov, Alexey Novikov, and Mahesh Kumar. "Ultrasensitive Detection of Mercury Ions Under UV Illumination of MoS<sub>2</sub> Functionalized AlGaIn/GaN Transistor." *67, no. 12 (2020): 5693- 5700. IEEE Transactions on Electron Devices* <https://doi.org/10.1109/TED.2020.3030000>
7. Adarsh Nigam, Nipun Sharma, Sudhiranjan Tripathy and Mahesh Kumar "Development of Semiconductor Based Heavy Metal Ion Sensors for Water Analysis: A Review" *Sensors and Actuators: A* <https://doi.org/10.1016/j.sna.2021.112879>

## Conferences Attended/Paper present in IDRPs-SST:

1. Himanchal Aman Meena, Sunil Duhan, Meraj Ahmad, Pankaj Jakhar, Aswathy Puthukkulam, Vinayak Shedekar, Asmita Murumkar, Anand Plappally, Plappally, "Modelling of Jojari river in semi-arid western Rajasthan, India using the geospatial techniques and 1 D flow model Analysis" BRICS NUs Water Resource and Pollution Treatment [WRPT21] 6 th 8 th July, 2021, NIT Jodhpur, IIT Kanpur.
2. Attendee at IEEE-ICEE 2020 (5th International Conference on Emerging Electronics) scheduled on 26th to 28th November 2020 hosted by IIT Delhi.
3. Attendee at International Winter School-2020 on "Frontiers in Materials Science", hosted at the Jawaharlal Nehru Centre for Advanced Scientific Research, scheduled on December 07-11, 2020.
4. Oral Presentation in MRSI AGM, IIT Madras (20th December-23rd December 2021).
5. Poster Presentation in IEEE IWPSD, IIT Delhi 2021(14th December-17th December 2021).
6. Participated in Online Elementary FDP on "Nano-Sensors" at IIT Jodhpur conducted by AICTE Training And Learning (ATAL) Academy from 5th July- 9th July 2021.

## Academic Programmes

The SST IDRPs is currently offering only PhD program and there are currently 6 students pursuing PhD under this program

## Faculty Laurels

Ankur Gupta received "SERB International Research Experience fellowship" for the year 2022-2023 by the Science and Engineering Research Board (SERB), Department of Science and Technology, Government of India. The fellowship has been approved for research



visit at the Institute of Microstructure Technology, Karlsruhe Institute of Technology, (Germany)

## Student Laurels

- The student Mr. Nipun Sharma (IDRPSST003) received the prestigious PMRF fellowship
- The student Mr. Vikas Pandey (P20SS201) received the prestigious PMRF fellowship

## Laboratories and equipment

Shock Waves and High-Speed Flow (SWAHS) Lab:

The SWAHS lab tries to advance the frontiers of

research activities and technology development in the field of Aerospace and Defence sector. We also focus on extending the high-speed flows and shock waves research to other applications such as refrigeration systems, Bio-Medical engineering, Industrial processing, Water processing etc. Some of the existing research activities undertaken in these directions are, Supersonic Intakes, Supersonic Air-Fuel Mixing in Scramjet Combustors, Flow control and Actuators, Gas Turbine Cooling, Electric Propulsion Systems, Shock & Blast Wave Attenuation, Shock waves applications in Bio-Medical Engineering, Solar Ejector Refrigeration, Steam Ejector based Water Purification etc.



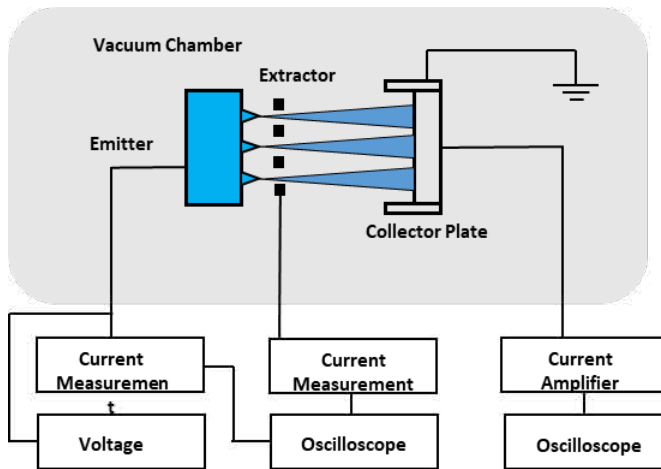
High Speed Imaging



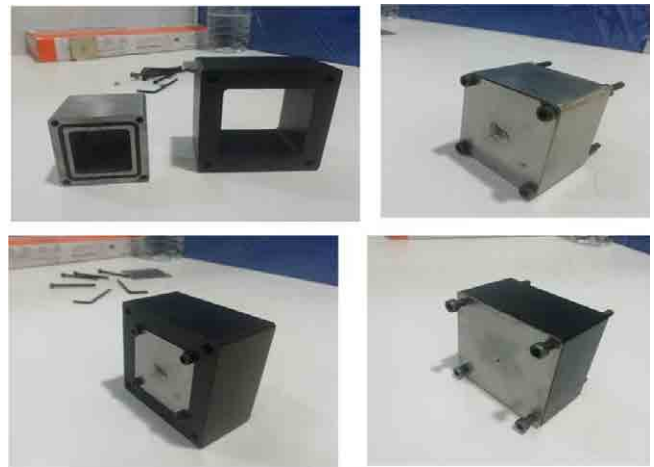
High-Pressure Storage Facility



Open Jet Facility



Electrospray Thruster System



Electrospray Thruster

## Outreach activities

- Organized a three day talk series (7th-9th October 2021) as part of International Space Week
- Organized a talk session by Professor Lazar Chitilappilly (Prof. of Practice IIT Madras, former Projector Director Scramjet Engines, ISRO) on ScramJet Engines for Hypersonic Vehicles

## Projects

### On-going Projects

Project title	PI/Co-PI	Sponsoring agency	Amount in Lakhs	Start date	End date
Cross Flows Flapping Jets for Supersonic Mixing Enhancement	PI: Dr. Arun Kumar R Co-PI: Dr. Hardik.B. Kothadia	Aeronautics Research Development Board – DRDO	24.89 Lakh	30th Sep 2020	30th Sep 2023
Film Cooling for Ejector Diffuser System in High Altitude Testing Facility	PI: Dr. Arun Kumar R Co-PI: Dr. Hardik.B. Kothadia	ISRO Respond	27.9 lakh	24th March 2021	24th March 2023
Radiation hard Gallium Nitride transistor for IoT enabled dosimeter	PI: Dr. Mahesh Kumar	DRDO	92.08 Lakh	7th Feb 2022	7th Feb 2025

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# Schools

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# School of Artificial Intelligence and Data Science (SAIDE)

## Introduction

Breakthroughs in AI and Data Science are key to shaping the future technological landscape. AI and Data Science is impacting progress of diverse disciplines of natural sciences, different fields of engineering and medicine, social sciences, and economics. In order to be at the forefront of this emerging technological frontier, School of Artificial Intelligence and Data Science (AIDE) was established at IIT Jodhpur in July 2020 with the vision to advance the field of AI and Data Sciences for the good of humanity.

The School aims to play a leading role in research, teaching and training in AI and its applications. The School also focuses on developing AI based technologies aligned to the locally and nationally relevant problems and challenges.

AIDE School brings together faculty from diverse disciplines with shared interests in fundamental challenges in AI and Data Science to make significant

contributions in this field. Currently there are 50 faculty in the School which includes 42 affiliated faculty from 10 different departments and schools.

The School of AI and Data Science envisions the following transdisciplinary Centers of Excellence in its initial phase. Out of these the first four are already in place.

1. Brain Science and Applications
2. Mathematical and Computational Economics
3. Intelligent Infrastructure
4. AI based Integrative Precision Health
5. Language Technology
6. Human Centered AI
7. Guarantees for Machine Learning
8. AI and Ethical Challenges
9. Quantum AI

## Faculty details

## School of AIDE

**Prof. Neeraj Jain**

Head of School  
 Department: Biosciences &  
 Bioengineering  
 Affiliation: Center for Brain Sciences &  
 Applications  
 Neuroscience/Mammalian Sensory  
 and Motor Systems; Tactile  
 Information Processing; Brain  
 Plasticity; Spinal Cord Injuries; Brain-  
 Computer Interface; Brain Networks

**Abhinaba Lahiri**

Assistant Professor  
 Affiliation: Center for Mathematical  
 and Computational Economics  
 Social Choice Theory, Mechanism  
 Design, Game Theory

**Dipanjan Roy**

Associate Professor  
 Affiliation: Center for Brain Science  
 and Applications  
 Coordinator: Center for Brain Science  
 and Applications  
 Network Neuroscience, Multimodal  
 data fusion and EEG-MEG, fMRI brain  
 signal decoding, Eye tracking and  
 Human behavior, Cognitive aging and  
 brain flexibility

**Dweepobotee Brahma**

Assistant Professor  
 Affiliation: Center for Mathematical  
 and Computational Economics  
 Econometrics, Causal Inference and  
 Machine Learning, Health Economics

**Ganesh Manjhi**

Assistant Professor  
 Affiliation: Center for Mathematical  
 and Computational Economics  
 Macroeconomics, Political Economy,  
 Growth Economics, Applied  
 Econometrics and Forecasting

**Shilpa Dang**

Assistant Professor  
 Affiliation: Center for Brain Science  
 and Applications  
 Computational Cognitive  
 Neuroscience; Connectomics; fMRI;  
 Pupillometry

**Somitra Sanadhya**

Associate Professor  
 Cryptography; Quantum Computation

**S. Srivatsa Srinivas**

Assistant Professor  
 Affiliation: Center for Mathematical  
 and Computational Economics  
 Queueing Game Theory, Service  
 Operations, Game Theory  
 Applications, Public Policy Modeling

## Affiliated Faculty

### Department of Bioscience & Bioengineering



#### Mitali Mukerji

Professor  
Affiliation: Center for Excellence in Integrative Precision Health  
Coordinator: Center for Excellence in Integrative Precision Health  
Genomics, Human molecular genetics, functional genomics of Alu repeats, Ayurgenomics, genetics of rare diseases



#### Neeraj Jain

Professor  
Affiliation: Center for Brain Sciences & Applications  
Neuroscience/Mammalian Sensory and Motor Systems; Tactile Information Processing; Brain Plasticity; Spinal Cord Injuries; Brain-Computer Interface; Brain Networks



#### Pankaj Yadav

Assistant Professor  
Statistical Genetics, Deep Learning and Big Data Analytics



#### Sushmita Paul

Assistant Professor  
Computational Biology and Bioinformatics

### Department of Chemical Engineering



#### Pradip Kumar Tewari

Visiting Professor  
AI/ ML based Performance Analysis of Process Equipment and Chemical Industries, Smart Water Grid.



#### Angan Sengupta

Assistant Professor  
Multiscale Modeling and Simulations, Computational Material Design, Fire and Explosion Dynamics and Safety Modeling, Transport Processes Modeling and Simulations

### Department of Civil and Infrastructure Engineering



#### P. Ravi Prakash

Assistant Professor  
Affiliation: Center for Intelligent Infrastructure  
Coordinator: Center for Intelligent Infrastructure  
Computational Mechanics, Structural Fire Engineering, Discrete Element Method



#### Ranju Mohan

Assistant Professor  
Affiliation: Center for Intelligent Infrastructure  
Traffic flow modelling and simulation, Driver behavior analysis, connected and autonomous vehicles



### Saran Aadhar

Assistant Professor

Affiliation: Center for Intelligent Infrastructure  
Surface Hydrology; Hydroclimatic extremes; Hydrologic modeling in natural and anthropogenic climate; Climate change and resilience

## Department of Chemical Engineering



### Anand Mishra

Assistant Professor  
Computer Vision; Deep Learning;  
Knowledge Graph; Multimodal  
Machine Learning



### Debasis Das

Assistant Professor  
Affiliation: Center for Intelligent  
Infrastructure  
Networking, IoT and Machine  
Learning



### Deepak Mishra

Assistant Professor  
Medical Image Analysis, Machine  
Learning, Resource Constrained AI



### Dip Sankar Banerjee

Associate Professor  
High Performance Computing,  
Computer Architecture



### Mayank Vatsa

Professor  
Computer Vision, Machine Learning  
(deep learning)



### Richa Singh

Professor  
Machine Learning and Trustable AI



### Romi Banerjee

Assistant Professor  
Affiliation: Center for Brain Sciences &  
Applications  
Natural Language Understanding,  
Creativity in Children, Embodied  
Systems



### Santanu Chaudhury

Professor  
Affiliation: Center for Brain Sciences &  
Applications



### Sumit Kalra

Assistant Professor  
Software Architecture and Cloud  
Computing

## Department of Electrical Engineering



### Ajay Agarwal

Professor  
Microelectronics; Micro- Nano-  
technologies; Sensors; Micro-fluidics,  
Point-of-Care devices and Early  
diagnostics



### Amit Bhardwaj

Assistant Professor  
Affiliation: Center for Brain Sciences &  
Applications  
Haptics, Perception, Teleoperation,  
Applications of Machine Learning and  
Augmented and Virtual Reality



### Anil Kumar Tiwari

Associate Professor  
Affiliation: Center for Brain Sciences &  
Applications  
Neuroscience, Image and video  
processing, Healthcare devices



### Arun Kumar Singh

Associate Professor  
Wireless Communications,  
Spread Spectrum Systems, ML for  
communications



### Manish Narwaria

Assistant Professor  
Multimedia signal processing



### Manoj Choudhary

Professor  
Communication Systems (Wireless  
- 4G/5G/6G, Modem/WLAN/WPAN/  
UWB) and networks; System on Chip;  
Embedded Systems & Software;  
Image Sensors and signal processing;  
Internet of Things and smart homes;  
AI, ML and computer vision



### Rajendra Nagar

Assistant Professor  
Computer Vision, Computer Graphics,  
Digital Geometry Processing



### Sandeep Kumar Yadav

Associate Professor  
Signal Processing, Condition  
Monitoring, Image Processing,  
Data Compression, Blind Source  
Separation, Artificial Neural Network



## Department of Mathematics



**Dilpreet Kaur**

Assistant Professor  
Group Theory



**Gaurav Bhatnagar**

Associate Professor  
Multimedia Security, Image  
Fusion, Floor Plan Analysis, Image  
Segmentation, Image Completion



**Nil Kamal Hazra**

Assistant Professor  
Reliability, Time series Analysis



**Puneet Sharma**

Associate Professor  
Computational Neuroscience



**Vivek Vijay**

Assistant Professor  
Financial Risk Analysis, Categorical  
Data Analysis, Regression



**V.V.M.S. Chandramouli**

Assistant Professor  
Smooth Dynamical Systems,  
Renormalization of Unimodal maps  
and Henon-like maps

## Department of Mechanical Engineering



**Anand Krishnan Plappally**

Assistant Professor  
Wetlands, geospatial applications,  
agriculture



**Harshal Akolekar**

Assistant Professor  
Aerodynamics; Computational  
fluid dynamics; Machine learning;  
Submarine hydrodynamics;  
Turbulence Modeling

## Department of Physics



**Reetanjali Moharana**

Assistant Professor  
Astroparticle Physics, High energy  
Cosmic rays, Gamma rays and  
Neutrinos



**V. Narayanan**

Assistant Professor  
Experimental Quantum Optics, Optical  
Coherence Tomography (OCT) and  
Quantum Imaging

## Department of Humanities & Social Sciences



**Ankita Sharma**

Associate Professor  
 Affiliation: Center for Brain Science and Applications  
 Advance form of human behavior as an integration for cognition, emotional, social, moral and self aspects



**Ruhi Sonal**

Assistant Professor  
 Affiliation: Center for Mathematical and Computational Economics  
 Coordinator: Center for Mathematical and Computational Economics  
 Decision Theory, Game Theory, Economics of Networks



**Suman Dhaka**

Assistant Professor  
 Affiliation: Center for Brain Science and Applications  
 Cognitive Neuroscience

## School of Management and Entrepreneurship



**Sankalp Pratap**

Associate Professor  
 Practices that aid entrepreneurs and their contexts



**Krishna Kumar Balaraman**

Associate Professor  
 Foresight, Microfoundations of Strategic Capability Building

## School of Management and Entrepreneurship



**Chhanda Chakraborti**

Adjunct Professor  
 Bioethics, Public Health Ethics, Logic, Philosophy of Mind.



**Saptarshi Mukherjee**

Adjunct Professor  
 Affiliation: Center for Mathematical and Computational Economics  
 Mechanism Design, Social Choice, Game Theory, Bounded Rationality



### Vinay Kulkarni

Adjunct Professor of Practice  
Distinguished Chief Scientist,  
Software Systems & Services, CS  
Research

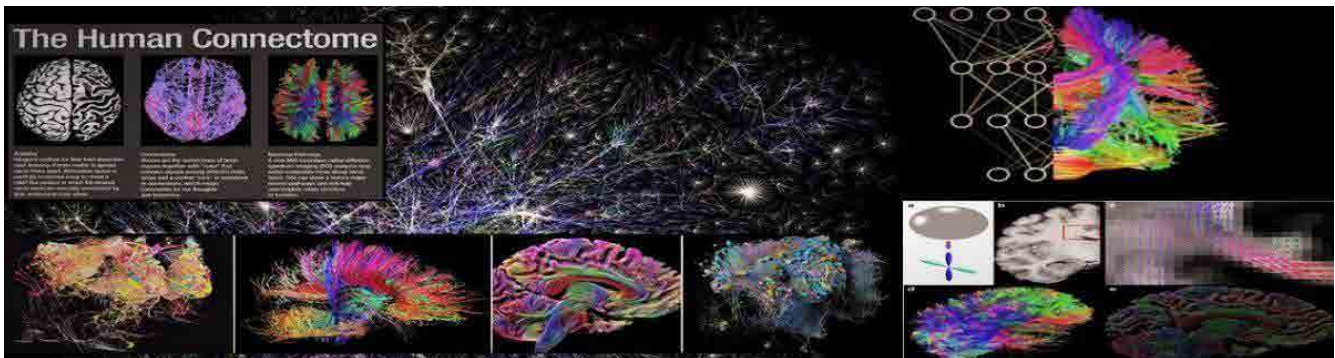


### Tapan K. Gandhi

Adjunct Professor  
Department: Electrical Engineering,  
IIT Delhi  
Affiliation: Center for Brain Science  
and Applications  
Computational Neuroscience, Human-  
Machine Interaction, Medical Signal/  
Image Processing, ML/AI, AR/VR/MR,  
Assistive Technology

## Description of Centers of Excellence

### 1. Center for Brain Sciences & Applications



**Faculty:** Dr. Amit Bhardwaj, Dr. Anil Kumar Tiwari, Dr. Ankita Sharma, Dr. Dipanjan Roy, Prof. Neeraj Jain (Coordinator), Dr. Romi Banerjee, Prof Santanu Chaudhury, Dr. Shilpa Dang, Dr. Suman Dhaka, Adjunct faculty: Prof Tapan Gandhi

Center for Brain Science and Applications (CBSA) envisages bringing together practitioners of diverse disciplines to work on understanding the brain, developing technologies to study the brain, developing brain inspired AI and other technologies. This interdisciplinary center brings together biologists, physicists, engineers, mathematicians, psychologists and all those interested in the brain. The neurobiologists interrogate the brain at the microscale (determining connectivity and functioning of individual neurons), mesoscale (studying network of groups of neurons such as a single sensory system or multiple sensory systems) and mega scale (studying the entire brain and interactions of brain in the context of inter-individual interactions). Other groups develop tools

for data analysis and visualization, and AI and hardware inspired from the knowledge of the brain function. Use of knowledge from research on sensation, perception, intelligence, cognition and consciousness would lead to development of brain inspired machines, intelligent technology for prediction and diagnosis of diseases, brain-computer interface devices, intelligent prosthetics to name a few. One of the major goals of this Center is to work at the interface of neuroscience and AI dedicated to the study of human cognition and develop brain inspired algorithms to design cognitive machines. An important component of the Center's activities is teaching and training at the graduate and undergraduate levels.

## 2 Center for Mathematical and Computational Economics



**Faculty:** Dr. Ruhi Sonal (Coordinator), Dr. Abhinaba Lahiri, Dr. Dweepobotee Brahma, Dr. Ganesh Manjhi, Dr. Srivatsa Srinivas; Adjunct faculty: Dr. Saptarshi Mukherjee

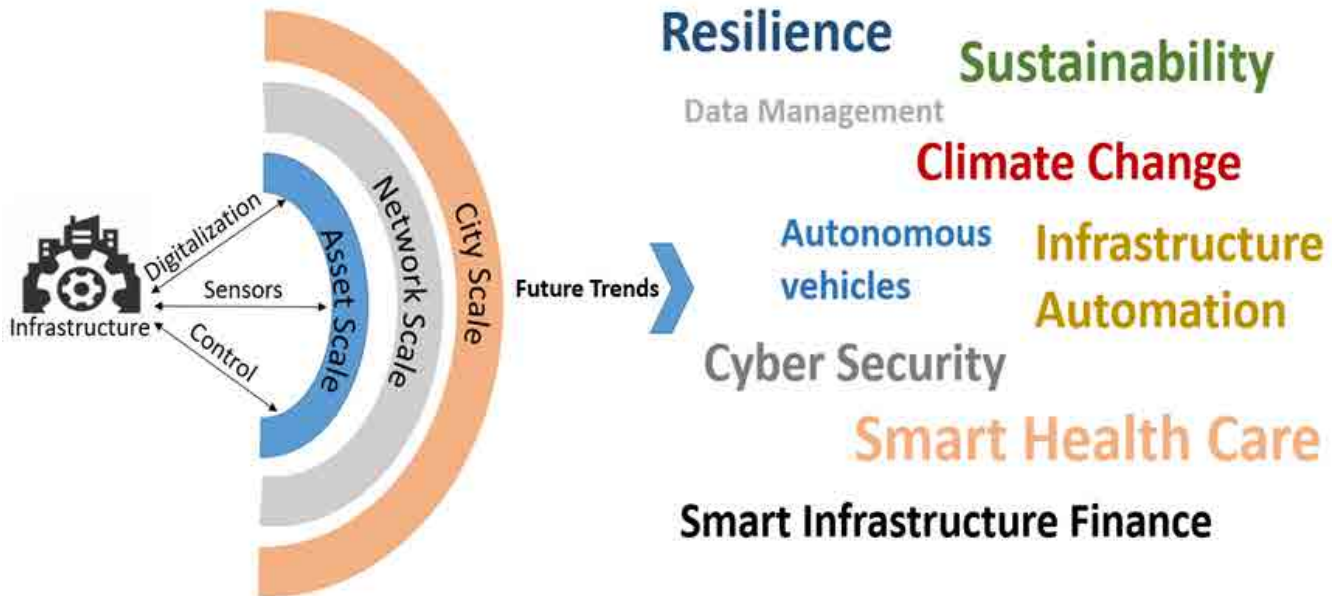
The internet revolution has seen a massive change in the way commerce is done. The very nature of a marketplace has undergone massive changes with the advent of online markets for almost every good and service we need. Online marketplaces are powered by massive computer algorithms which govern what we see and choose and are designed to help consumers make better choices and help sellers generate higher revenue. Economics is at the heart of all this.

The Center for Mathematical and Computational Economics (CMCE) was established in 2020 as a specialized center dedicated to improving our understanding of the evolving nature of economics in the internet era. CMCE is an interdisciplinary unit that combines knowledge across the disciplines of computer science, engineering, mathematics, and statistics. It is a specialized unit for the research and teaching of economic theory combined with the use of modern tools of artificial intelligence and specializes in

the following areas:

- Decision theory;
- Experimental economics;
- Social and Economic Networks;
- Mechanism design;
- Social choice;
- Auction theory;
- Optimization theory;
- AI, reinforcement learning and mechanism design;
- Computational social choice;
- Algorithmic game theory;
- Big data and consumer choice

### 3 Center for Intelligent Infrastructure



**Faculty:** Dr. Ranju Mohan, Dr. Ravi Prakash (Coordinator), Dr. Saran Aadhar, Dr Debasis Das

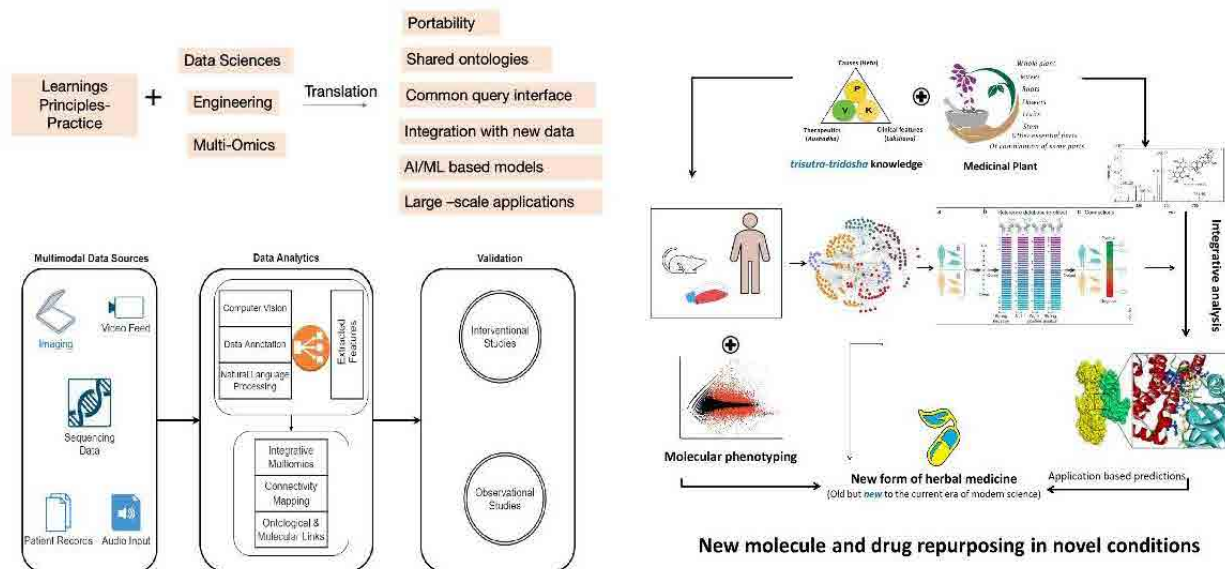
The Center for Intelligent Infrastructure (CII) is a transdisciplinary research center to foster research in smart, sustainable, and resilient infrastructure. CII is one of the lofty visions of IITJ to nurture a vibrant ecosystem equipped with a highly qualified workforce, novel ideas, and innovative research. The prime focus of the center is to integrate artificial intelligence and machine learning (AI & ML), big data analytics, automation, and finance into the life-cycle assessment, performance prediction, risk analysis, and resilience of infrastructure systems. In particular, the following is a list of some of

the research areas, with major thrust on AI & ML based research.

- Climate Change Sustainability and Resilience
- Cyber-physical systems
- Cyber-Security
- Digital Twins
- Intelligent Transport Systems
- Smart Cities
- Smart Infrastructure Finance

## 4 Center of Excellence in Integrative Precision Health

### Centre of Excellence in “AYURTECH and Precision Health and Medicine



Creation of database architecture for multimodal data analysis, validation and recommendation engines

**Faculty:** Dr. Mitali Mukerji (Coordinator)

Precision health cohorts have been set up globally with an aim to capture a populations’ and an individual’s baseline phenotype as well as response trajectory in spatial-temporal dimensions for evolving precise health interventions. These basically address predictive, preventive, personalized and participatory aspects called P4 medicine. We have recently established a transdisciplinary Center of excellence for integrative precision health wherein we aim to establish a Data Science driven framework for population and individual risk stratification and early actionable precision health interventions. The broad objectives include the following

- Phenomics based non-invasive risk stratification
- Development of an objective framework for Integrative medicine
- Management of rare disease and common disease

- Integration of principles and practice of Ayurveda with other knowledge systems
- Precision health in arid regions

Under this program we also have established an AYURTECH CoE supported by the Ministry of AYUSH. This would be the first of it’s kind unique initiative combining Electronics, Digital health and AI for realizing “Evidence based Ayurveda” solutions

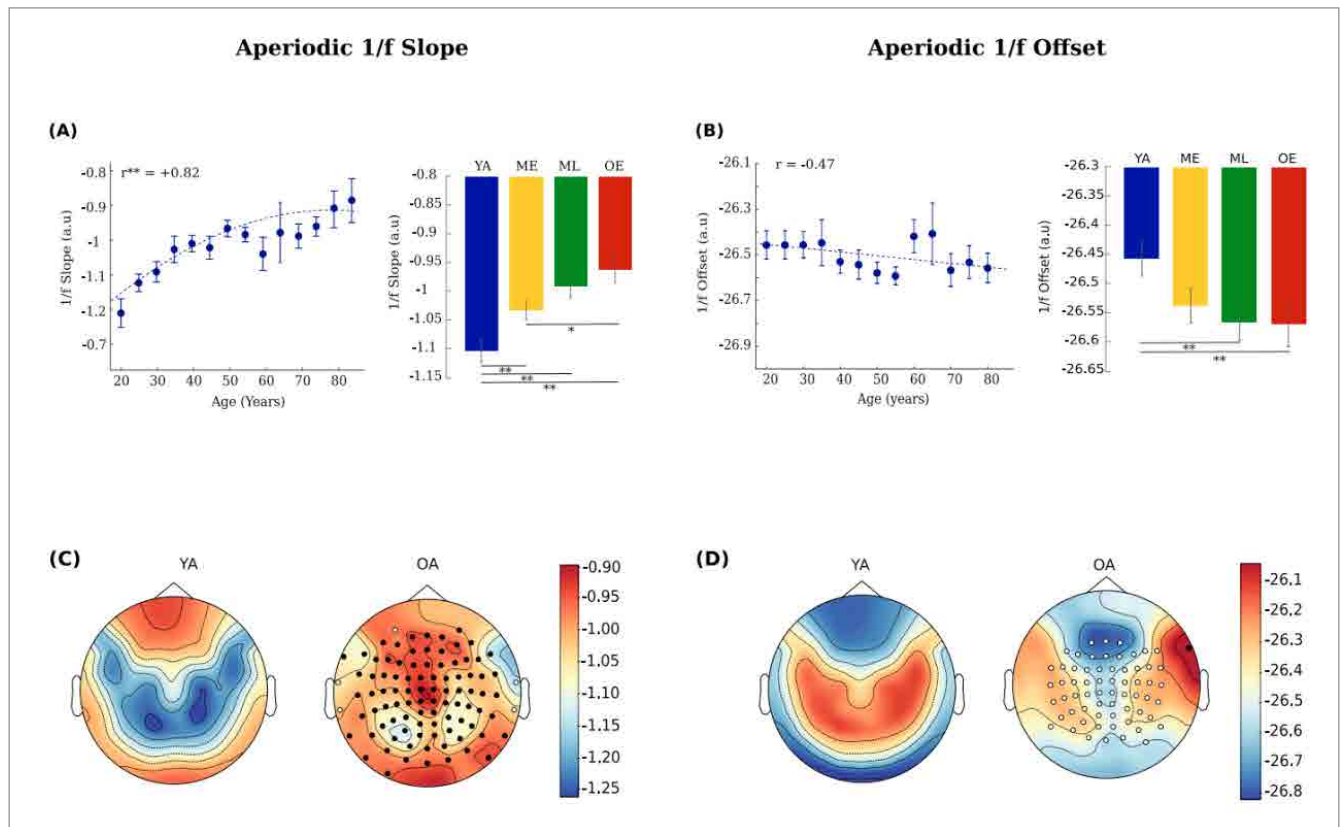
### Academic Programs

- Ph.D. program in AI & Data Sciences
- M.Tech. Executive in Data Computational Sciences for Working Professionals
- M.Tech. Executive in AR-VR for Working Professionals
- Minor/Specialization program for B.Tech. students in Science of Intelligence (offered by CBSA)

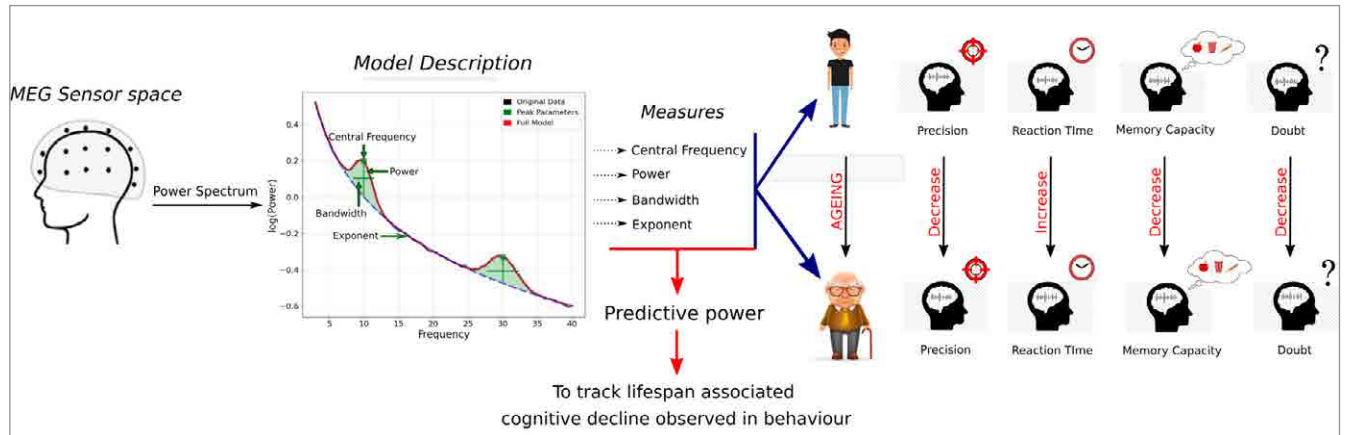
- Minor/Specialization program for B.Tech. students in Mathematical and Computational Economics (offered by CMCE)
- Specialization track in Mathematical and Computational Economics for M.Sc. Computational Social Science (offered by School of Liberal Arts)
- Summer Internship Program

### Significant Research Achievements

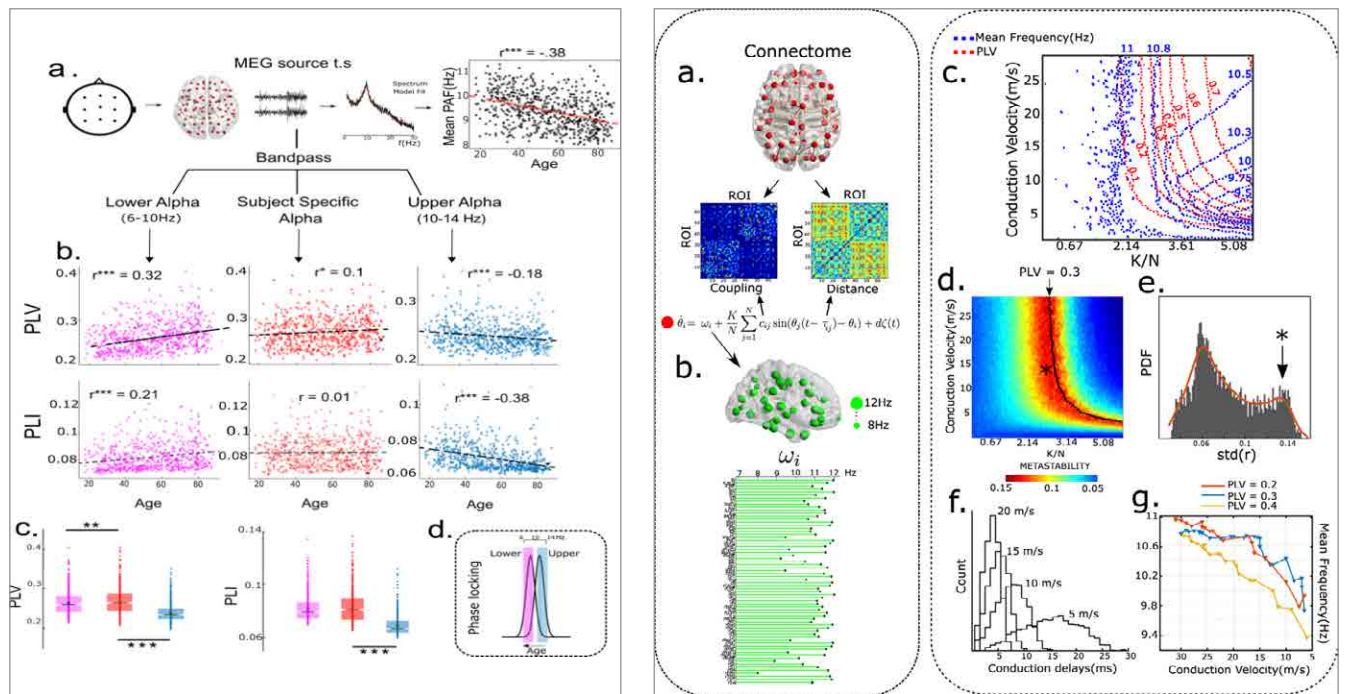
#### 1. Brain oscillations during Brain Aging as predictive marker of behavior and their impact on short-term working memory processing (Developing signal processing methods to decode periodic and aperiodic components of brain signals)



## 2. Ongoing Oscillatory Large-scale Brain Network Dynamics links Distinct Functional Aspects of Cognition across adult lifespan

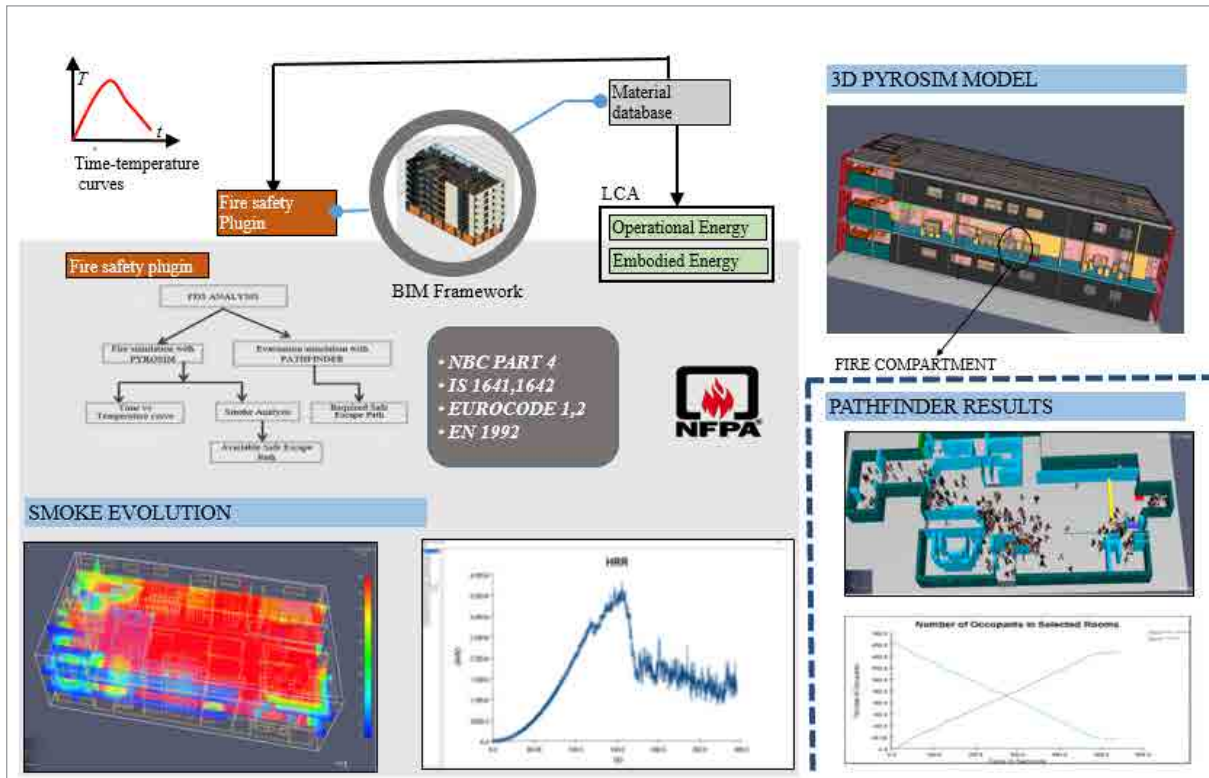


## 3. Biophysical mechanism underlying compensatory preservation of neural synchrony over the adult lifespan

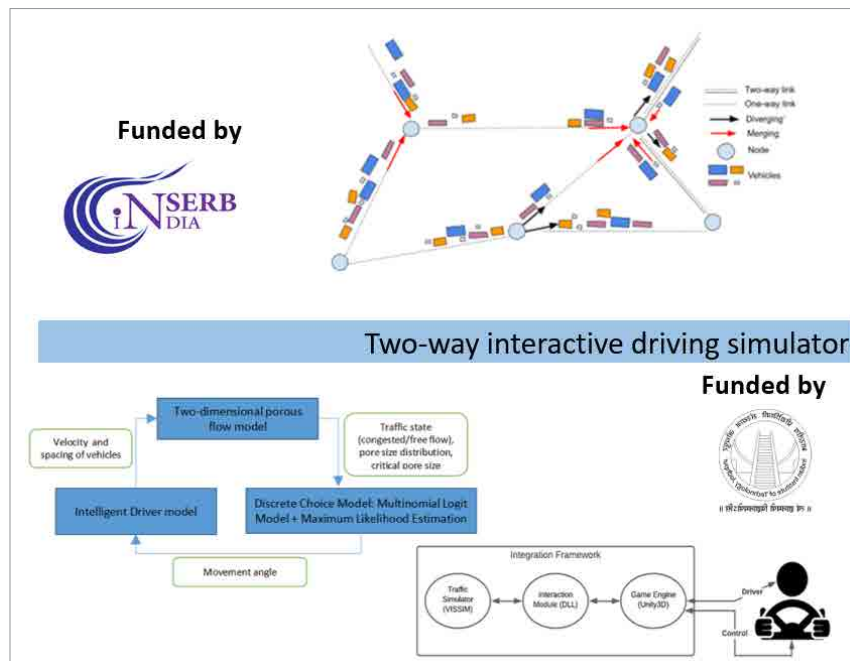




### 4 Advance BIM models (BIM-Fire safety integration); Automation in BIM; LCA



### 5 Dynamic Traffic Assignment (DTA) Framework for Indian transportation network



## Faculty Laurels

Ankita Sharma	<ol style="list-style-type: none"> <li>1. Early career scholar award in International Wisdom Summit (Jointly supported by Wisdom and Culture Lab-University of Toronto, Center for Practical Wisdom-University of Chicago, and Social Sciences and Humanities Research Council of Canada). (2021)</li> <li>2. Moonshot project Award 2021, IIT Jodhpur on the idea, 'ExPoPsych: Experiencing Positivity at the face of Psychological Vulnerability.' (2021)</li> <li>3. Invited to the podcast by Prof. Michel Ferrari, Director of Wisdom and Identity Lab, Ontario Institute for Studies in Education, University of Toronto. The podcast "Essence of Wisdom" is out with the interview with Ankita Sharma on Leadership and Virtue <a href="https://open.spotify.com/episode/0kXo56qfaPC7DWQ1Z5NHUF">https://open.spotify.com/episode/0kXo56qfaPC7DWQ1Z5NHUF</a>, <a href="https://linktr.ee/EssenceOfWisdom">https://linktr.ee/EssenceOfWisdom</a></li> </ol>
Debasis Das	<ol style="list-style-type: none"> <li>1. IEEE Senior Member Award-2021</li> <li>2. IEEE Vehicular Technology Society (VTS) Senior Member Award-2021</li> <li>3. BRICS Young Scientist Award-2022</li> <li>4. International Travel Support (ITS) Award, 2022</li> <li>5. International Mobility Research Grant Award-2021</li> </ol>
Dipanjan Roy	<ol style="list-style-type: none"> <li>1. Journal Editorship, joined the editorial board of Frontiers in Cognition: learning and Cognitive development and presently serving as Associate Editor.</li> <li>2. Review Editor: Frontiers in Brain Imaging methods and Frontiers in Psychology</li> <li>3. Associate Editor: Frontiers in Neurology: Stroke and Frontiers in Computational Neuroscience</li> </ol>
Dweepobotee Brahma	<ol style="list-style-type: none"> <li>1. Received the Google India Research Award 2021 to study child health inequities in India using Machine Learning</li> </ol>
Ganesh Manjhi	<ol style="list-style-type: none"> <li>1. Invited lecture for undergrad students on "Fiscal Policy, Budget, and Political Budget cycles", Hansraj College, University of Delhi.</li> <li>2. Invited lecture and seminar at Dr. Ram Dayal Munda Tribal Welfare Research institute on 'Tribal Philosophy (Epistemology and Metaphysics)', Jharkhand.</li> </ol>
Neeraj Jain	Haryana Vigyan Ratna Award
P Ravi Prakash	Joined the editorial board of Frontiers of Built Environment- Fire resistant engineering
Ranju Mohan	Start-up Research Grant (SRG) from Science and Engineering Research Board (SERB), 2021
Romi Banerjee	<ol style="list-style-type: none"> <li>1. Diverse Intelligence Summer Institute (A Templeton World Charity Foundation initiative in Diverse Intelligences) Fellowship - 2021</li> <li>2. Moonshot Idea Award, IIT Jodhpur 2021 on the idea, 'BRBL: Conversations, Intelligence, Empowerment.' (2021)</li> </ol>
Suman Dhaka	<ol style="list-style-type: none"> <li>1. Moonshot project Award 2022, IIT Jodhpur on the idea "Sleep Switch: Personalized Optimization of Sleep"</li> <li>2. Moonshot project Award 2022, IIT Jodhpur on the idea "CogTree or WiseTree: Tree that knows you"</li> </ol>

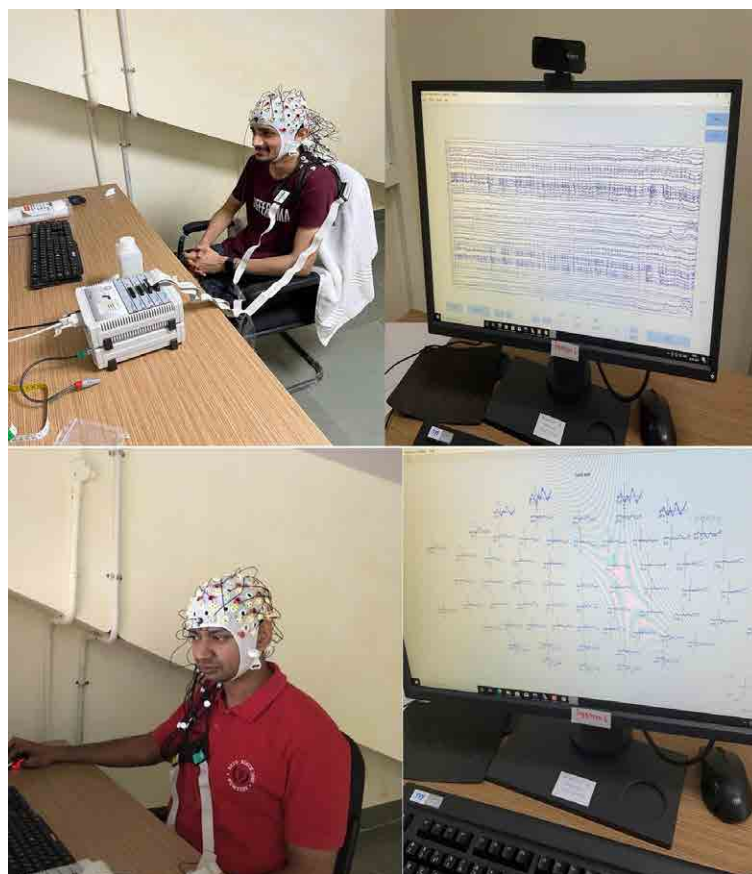
## Student Laurels

Sweta Kaman      Diverse Intelligence Summer Institute (A Templeton World Charity Foundation initiative in (IDRP19CG202)      Diverse Intelligences) Fellowship - 2021

## Laboratories and Equipment

### 1. Cognitive Engineering Research Lab (managed by CBSA)

This lab is equipped with 128 channel high density EEG recording system, Tobii pro fusion Eye-tracker system with high sampling frequency, Neurostimulation devices including neurostym tES system with various low intensity electrical stimulation protocols tDCS, tACS & tRNS and a variety of stimulus presentation software for stimulus design for behavioral recordings and assessment. The facility is currently being used to study naturalistic image and audio-visual stimulus processing, Visual and Auditory perception and steady state processing, working and episodic memory processing and developmental changes associated with speech, language, perceptual processing in children, adolescents, adults of different age groups to record and analyze brain signals and study systematically behavior coupling and developmental alterations in cognitive processes.



### 2. Ayurtech Center

A ~ 3760 sqft space has been built for housing the Ayurtech facility. This facility has provisions for molecular biology, cell biology and cell culture, phenotyping and consultation areas, sensor fabrication and characterization labs and meeting/ training and office spaces.

## Outreach Activities

### Conferences/Seminars/Workshops/STTP/FDP Organized/Participated

S. No.	Title	Sponsoring Authority	Type	Organizers	Dates
1.	Dr. Dipanjan Roy Lifespan associated change in coherent communication and cognitive processing	Ashoka University	Invited talk and seminar	Ashoka University	03/12/2021
2.	Dr. Dipanjan Roy Lifespan associated changes in brain rhythms and cognitive flexibility	IIT Delhi	Invited talk and seminar in Cognitive Science Colloquium series	IIT Delhi	29/10/2021
3.	Dr. Romi Banerjee Digital Curator (2020 - present)	SFNC Digital curation committee	Society membership	Society for Neuroscience of Creativity	NA
4.	Dr. Romi Banerjee 6th annual meeting of SFNC	Program committee member	Society Annual Meeting	Society for Neuroscience of Creativity	March 12-13th 2022
5.	Dr. Ankita Sharma Delivered lecture on 'Monitoring mental health of students.'	Atal FDP organized by MBM Engineering College, Jodhpur	Resource person	MBM Engineering College, Jodhpur	09/07/2021
6.	Dr. Ankita Sharma Delivered outreach lecture on 'Digital Wellbeing of Elderly'.	Organized by Senior Citizens Division	Resource person	Senior Citizens Division, National Institute of Social Defence Ministry of Social Justice and Empowerment	20/08/2021
7.	Dr. Ankita Sharma Delivered lecture on 'Monitoring mental health and physical health for all.'	AICTE Atal FDP	Resource person	PDPM IIIT Design and Manufacturing, Jabalpur	20/08/2021
8.	Dr. Ankita Sharma Lecture on Qualitative and Quantitative Research Methodology	AMPGC	Resource person	Banaras Hindu University	10/03/2022
9.	Dr. Ankita Sharma Lecture on Autodidactic or Vicarious learning about Mental Health	RAJIV GANDHI NATIONAL INSTITUTE OF YOUTH DEVELOPMENT	Resource person	Jai Narain Vyas University under the Flagship of RAJIV GANDHI NATIONAL INSTITUTE OF YOUTH DEVELOPMENT	13/03/2022

S. No.	Title	Sponsoring Authority	Type	Organizers	Dates
10.	Expert talk on “Digitalized Fire Safety Assessment in Structural Systems” during 10 days FDP on Facilitating Digital Transformation in Design, Construction and Management Processes of Civil Engineering” at NIT Warangal	NIT Warangal	Invited talk and seminar	NIT Warangal	25/2/2022
11.	Lecture delivered by Dr Prof Mitali Mukerji, BSBE IIT Jodhpur on Ayurtech for precision medicine: introduction to basic framework	SRA University	Invited talk	lecture series on Technology based evidence for Ayurveda solutions in precision health <a href="https://www.youtube.com/watch?v=Imnj62tS5Fo">https:// www. youtube. com/ watch?v=Imnj62tS5Fo</a>	15th January 2022
12.	Lecture delivered by Prof Mitali Mukerji “Ayurgenomics Framework for Integrative and Precision Medicine: Insights and Application in Covid Times”	Jointly by NIIRNCD, Jodhpur & Mohanlal Sukhadia University, Udaipur		Amrit Mahotsav Science Showcase: Roadmap to 2047	Feb 24th 2022
13.	Dr. Pankaj Yadav coordinated ATAL sponsored one week workshop on multi-omics Data Science	AICTE	FDP	IITJ	Dec 20 – 24, 2021
14.	Dr. Ruhi Sonal Invited seminar: Sequential entry and perfect equilibrium	Delhi School of Economics	Invited seminar	Delhi School of Economics	January 13, 2022
15.	Dr. Ruhi Sonal Invited seminar: Sequential entry and perfect equilibrium	Shiv Nadar University	Invited seminar	Shiv Nadar University	September 24, 2021
16.	Dr. Ruhi Sonal Decision theory	Research Cell, Delhi School of Economics	Invited seminar	Research Cell, Delhi School of Economics	February 26, 2022



Dr. Dipanjan Roy explaining to students about the human brain on IITJ Open House Day.

Thar Talk Series: AI and Beyond, in collaboration with Jodhpur City Knowledge and Innovation Foundation

Objectives and Scope: This webinar series aims to organize webinars on the role of Artificial Intelligence and Data Science techniques in solving the current problems and shaping the future technological landscape of various fields of science, engineering, and public health. The Thar Talk Series focuses on multidisciplinary emerging themes and fundamental issues and explores pathbreaking possibilities in various disciplines of Engineering and Sciences.

Under the Thar Talk series, we invite distinguished speakers around the world working in the areas of but not limited to: Brain Science, Intelligent Infrastructure,

Mathematical and Computational Economics, Smart Business Analytics, Autonomous Robot Systems, Computer Vision, AI Hardware, Chemical Process Modeling, Computational Material Science, AI for Social Good, AI and Emotion, etc.

We have organized the below twelve talks under the Thar talk series which were open to the national and international audiences. These talks available publicly at the YouTube channel of the AIDE School:

[https://www.youtube.com/watch?v=gu\\_XUZ9ZBco&list=PLHASPzwmCK-ELDjbqJu91\\_uf2K4zUKI6R](https://www.youtube.com/watch?v=gu_XUZ9ZBco&list=PLHASPzwmCK-ELDjbqJu91_uf2K4zUKI6R)

#	Theme	Date	Title	Speaker
1	Brain Science	12/05/21	Recent Progress Toward a High-Performance Neural Prosthetic	Prof. Andrew B. Schwartz Distinguished Professor & Endowed Chair in Systems Neuroscience, University of Pittsburgh
2	Brain Science	26/05/21	A View of the Future for BMI Basic Research and Clinical Applications	Prof. Miguel Nicolelis, Duke School of Medicine Professor in Neuroscience Depts. of Neurobiology, Neurology, Biomedical Engineering, and Psychology and Neuroscience
3	Brain Science	09/06/21	From Brain to Robot: Enabling Our Brain to Adopt a Robotic Body	Prof. Gordon Cheng, Chair Professor of Cognitive Systems, Institute for Cognitive Systems, Dept. of Electrical and Computer Engineering, Technical University of Munich, <a href="https://www.ei.tum.de/ics/people/cheng/">https://www.ei.tum.de/ics/people/cheng/</a>
4	Intelligent Infrastructure	16/06/21	Physiological and Cognitive Aspects of Real-Time Information Systems and Their Impacts on Driver Performance and Decision-Making	Prof. Srinivas Peeta, Frederick R. Dickerson Chair and Professor, School of Civil and Environmental Engineering, H. Milton Stewart School of Industrial and Systems Engineering, Georgia Institute of Technology, Principal Research Faculty, Georgia Tech Research Institute, <a href="https://sites.gatech.edu/peeta/">https://sites.gatech.edu/peeta/</a>
5	Intelligent Infrastructure	23/06/21	AI Innovations in Smart Transportation for Sustainable and Inclusive Cities	Prof. Satish Ukkusuri, Professor, Transportation and Infrastructure Systems Engineering Group Lyles School of Civil Engineering Purdue University, <a href="http://www.satishukkusuri.com/">http://www.satishukkusuri.com/</a>
6	Mathematical and Computational Economics	14/07/21	Implementation in Undominated Strategies with Applications to Auction Design, Public Good Provision and Matching	Prof. Nozomu Muto, Professor, Department of Economics, Yokohama National University, Japan, <a href="https://sites.google.com/site/nozomumuto/">https://sites.google.com/site/nozomumuto/</a>
7	Digital Heritage	21/07/21	Computational Museology	Prof. Sarah Kenderdine, Lead: Laboratory for Experimental Museology (eM+), Director & lead curator: EPFL Pavilions (formerly ArtLab), EPFL, Switzerland <a href="https://sarahkenderdine.info/">https://sarahkenderdine.info/</a>
8	Chemical Process Modeling	11/08/21	Performance-oriented Model Learning via Constrained Bayesian Optimization	Prof. Ali Mesbah, Department of Chemical and Biomolecular Engineering, University of California Berkeley
9	DNA Modeling	25/08/21	DNA Data Storage	Dr. Emily Leproust, CEO AND CO-FOUNDER OF TWIST
10	Intelligent Infrastructure	08/09/21	Hiding in Plain Sight: The Role of Machine Learning in Modernizing Civil Engineering	Dr. M. Z. Naser, Assistant Professor, Glenn Department of Civil Engineering and AI Research Institute for Science and Engineering (AIRISE), Clemson University, Clemson, SC, USA

#	Theme	Date	Title	Speaker
11	Smart Health	10/11/2021	Soft Electronic and Microfluidic Systems for the Skin	Prof. John A. Rogers Simpson/Querrey Professor, Northwestern University <a href="http://rogersgroup.northwestern.edu/">http://rogersgroup.northwestern.edu/</a>
12	Brain Science	08/12/2021	Carving Data at its Joint-ness: Multimodal Data-Driven Fusion of Neuroimaging Data	Prof. Vince D. Calhoun Founding Director & Distinguished University Professor, Center for Translational Research in Neuroimaging and Data Science

### CMCE Seminar Series:

S. No.	Title	Type	Organizers	Dates
1.	CMCE Seminar by Dr. Souvik Banerjee, IIT Bombay - “Latent Factor Models for Causal Inference with and without Instrumental Variable”	Seminar	CMCE	25-03-2022
2.	CMCE Online workshop “Techniques for Strategy, Analysis and Decision Making”	Workshop	CMCE	25-09-2021 to 26-09-2021
3.	CMCE online seminar series Dr. Pawan Gopalakrishnan, RBI - “Covid-19 Induced Lockdown and Economic Activity: Evidence from Zoning Restrictions in India”	Seminar	CMCE	06-01-2022
4.	CMCE online seminar series Dr. Noirit Kiran Chandra, The University of Texas at Austin - “Bayesian Scalable Precision Factor Analysis for Massive Sparse Gaussian Graphical Models”	Seminar	CMCE	13-01-2022
5.	CMCE online seminar series Dr. Aditya Aradhye, Czech Technical University - “Computing Stackelberg Strategies with Memory in Sequential Games”	Seminar	CMCE	03-02-2022
6.	CMCE online seminar series Dr. Nandana Sengupta, IIT Delhi - “Simple Surveys: Response Retrieval Inspired by Recommendation Systems”	Seminar	CMCE	24-03-2022

## Publications

### Journal Publications

1. Kaman, S., Sharma, A., & Banerjee, R. (2022). Associativity between COVID-19 Pandemic and Serious Mental Illness: Rapid Systematic Review within Salutogenesis Model for Public Health Management. *Current Psychiatric Research and Review*, vol. 18, 2022. <https://dx.doi.org/10.2174/2666082218666220823153739>
2. Sharma, A. & Sharma, A. (2021). What doesn't break you makes you stronger: An experimental validation of personal wisdom development through regret handling and personality dispositions. *Journal of Higher Education Theory and Practice*, 21(8), 99-114. (Scopus) DOI: <https://doi.org/10.33423/jhetp.v21i8.4508>



3. Dweepobotee Brahma - "Early Warning Signs: Targeting Neonatal and Infant Mortality using Machine Learning" with Debasri Mukherjee, *Applied Economics*, 2022, Vol 54 (1). doi: <https://doi.org/10.1080/00036846.2021.1958141>
4. Ruhi Sonal - "Frame-based stochastic Choice rule" with Bhattacharya M. and Mukherjee S, *Journal of Mathematical Economics* 2021, Vol. 97, 102553. doi: <https://doi.org/10.1016/j.jmateco.2021.102553>
5. Vyas, J., Das, D., & Chaudhury, S., DriveBFR: Driver Behavior and Fuel Efficiency-Based Recommendation System, *IEEE Transactions on Computational Social Systems*, 1-10, 2021. doi:10.1109/TCSS.2021.3112076
6. Aggarwal, M., Attitude-based entropy function and applications in decision-making, *Engineering Applications of Artificial Intelligence*, Vol.104, 2021. <https://doi.org/10.1016/j.engappai.2021.104290>
7. Madhumita and Sushmita Paul, Autoencoder Assisted Cancer Subtyping by Integrating Multi-omics Data, 9th International Conference on Pattern Recognition and Machine Intelligence (PReMI2021), Kolkata, (Virtual Mode) India, December 2021.
8. Madhumita, Archit Dwivedi, and Sushmita Paul, Recursive Multi-view Integration for Subtypes Identification of Cervical Cancer, 15th IEEE International Conference on Bioinformatics and Biomedicine (BIBM2021), USA (Virtual Mode), December 2021, pp. 706-709. <https://doi.org/10.1109/BIBM52615.2021.9669481>
9. Leslee Lazar, Prem Chand, Radhika Rajan, Hisham Mohammed and Neeraj Jain, Somatosensory Cortex of Macaque Monkeys is Designed for Opposable Thumb. *Cerebral Cortex: bhac061*, 2022 <https://doi.org/10.1093/cercor/bhac061>

### Books/Monographs Authored/Edited

1. Roy, Dipanjan. "Computational modelling of individualized EI balance post lesion using noninvasive Brain-State-Dependent electrical (BSDE) stimulation therapy." *Brain Stimulation: Basic, Translational, and Clinical Research in Neuromodulation* 14, no. 6 (2021): 1714. Elsevier. 2021

2. Kumari, M., & Sharma, A., *Neurofeedback Training for Social Cognition Deficit: A neuroimaging approach. Neurofeedback and Neuromodulation techniques and applications (Second Edition)*, R., Coben (Ed.). Elsevier. 2022

### Conference attended/presented by Ph.D. student: Sweta Kaman

1. Kaman, S., and Sharma, A., (2022). Neural Correlates of Non-Verbal Response and Wisdom. *Psychological Science and Wellbeing Conference (4-5 March 2022)*. James Cook University Singapore. (On-site)
2. BIRAX UK-Israel Healthy Ageing Conference (Nov 3-4, 2022). Attended a two-day cross-disciplinary brainstorming conference held at the Museum of Natural History at Tel Aviv University (Online)
3. Kaman, S. (2021). Food categorization learning strategies of babies in a social context at the 'Food, memory and machines workshop,' organized by Indian Network for Memory Studies in association with the Center for Memory Studies and Office of Global Engagement IIT Madras. (Online).

### Conference presentation by B.Tech student from Design proposal

1. Bhandari, K.S., Sharma, A., Kalra, S., Nirmal, A., Soumik, Soni, R., and Kaur, B. (2022). Feasibility and Usability of Experience sampling method and typing characteristics for smartphone-based emotion detection. *Psychological Science and Wellbeing Conference (4-5 March 2022)*. James Cook University Singapore.
2. Rawat, P., Kalra, S., Sriram, Dutta, J., Singh, P., Kumar, P., and Sharma, A., (2022). Understanding Typing error, delayed error identification, and fatigue in online interaction. *Psychological Science and Wellbeing Conference (4-5 March 2022)*. James Cook University Singapore.
3. Nirmal, A., Kalra, S., Sharma, A., Soumik, Soni, R., Kaur, B., Pandey S., and Bhandari, K.S., (2022). Deep Mood: Identification of mood state with keystrokes on the smartphone. *Psychological Science and Wellbeing Conference (4-5 March 2022)*. James Cook University Singapore.

**CMCE Seminar Series:**

S. No.	Title	Cost in Lakh	Start Date	End Date	Role as PI/Co-PI	Agency
1.	Comparative Mapping of Common Mental Disorders (CMD) over lifespan	470 Lakhs	22/12/2019	23/12/2024	Co-PI: Dipanjan Roy	Department of Biotechnology (DBT) Government of India
2.	Identification and classification of Hub genes downstream to let-7 using network approach in C-elegans neuron regeneration	350 Lakhs	01/08/2022	01/08/2027	Co-PI: Dipanjan Roy	Department of Biotechnology Senior Wellcome Trust Fellowship
3	Center of Excellence in "AYURTECH" for integrative precision health and medicine	10 Crore	25th Feb 2022	24th Feb 2025	PI- Mitali Mukerji, Ajay Aggarwal	Ministry of AYUSH
4	Center for Advanced Security Technology Development on Cyber Physical Systems	5.91 Crore	March 2022	March 2025	PI Somitra Sanadhya	MEITY
5	Quantum Cryptanalysis	6.6 Lakhs	March 2020	March 2023	PI Somitra Sanadhya	SERB
6	Quantum security of Symmetric Cryptographic constructions	26.40 Lakhs	March 2022	Sept 2023	PI Somitra Sanadhya	DRDO

**2 Completed Projects**

S. No.	Title	Cost in Lakh	Start Date	End Date	Role as PI/Co-PI	Agency
1.	Social Isolation and Cognition: Interventions to reduce social isolation and loneliness amongst the Elderly	8 Lakhs	August 2019	October 2021	PI: Suman Dhaka	IMPRESS, ICSSRP
2.	EEG Neurofeedback Training for optimal functioning	10 Lakhs	2017	2021	PI: Ankita Sharma	IITJ Seed Grant
3.	Wisdom as Cognitive and Motivational – Emotional Heuristic in Ecologically Rational Decision Making	22 Lakhs	2016	2021	PI: Ankita Sharma	DST-CSRI

# School of Management & Entrepreneurship (SME)

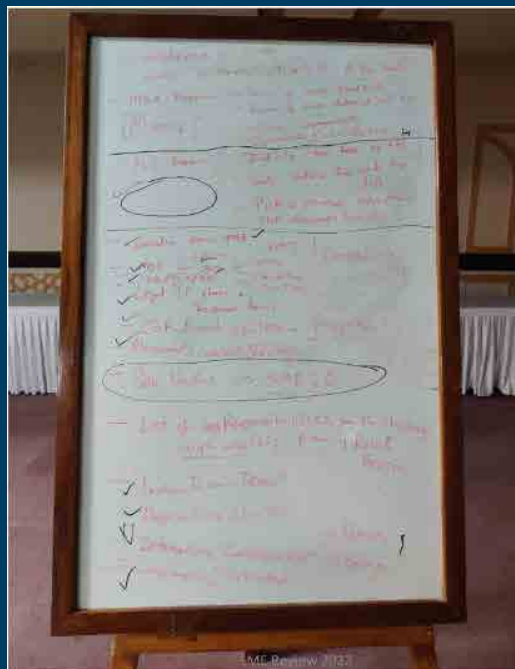
The School of Management & Entrepreneurship (SME) is a forward-looking bold experiment to create and deliver a novel value proposition in the management and entrepreneurship education sector in India. Underlying this experiment is the stark realization that on account of fast-paced technological changes, the era of stable paradigms in the industry which could be exploited through traditional business models, has come to an end. The future will belong to those who are comfortable with

technologically-dynamic business models, derived from continual expression of entrepreneurial energy exhibited by organizational members. To this end, SME has created a program which integrates technology, management and entrepreneurship through an institutional framework which leverages various engineering disciplines, interdisciplinary programs, its own innovation and incubation centre, humanities department apart from management faculties.

## Values at SME

An Academic Retreat of SME was held On 6th May, 2022 (Friday) from 10:00 AM to 6:00 PM through physical mode:

1. To discuss the value system for the growth of SME,
2. To discuss the action pointers for various programs and activities, and
3. To decide the point persons for the smooth functioning of various programs and activities.



**The following values were identified by the team:**

- In SME we are humble and considerate in our own actions and communication.
- SME lives by actions guided by Honesty, Openness, Transparency, Concern, Interaction and Approachability.
- SME is Reliable and Respectful as a team with Rebounding capability.
- SME practices the change we wish to see in the world.
- All of us at SME are responsible towards the institute, student, family, and self.
- SME is a thought leader with its research focus valuing creativity and rigor in order to produce excellent researchers.
- At SME, we love our Jobs, contribute and add value to one another, and empower each other, and learn from our failures.
- At SME, we are respectful and mindful in our communication.
- SME practices collective responsibility and everyone-is-a-leader spirit in making SME great.
- Key Highlights
- With concentrated effort from the Admissions team, 1425 MBA applications were received, around 1.7 times compared to the previous year (820). Finally, class of 2022-24 started with 81 students.



Director's Address as part of MBA induction

- For the PhD admissions for July 2022, 148 applications were received, of which 89 were shortlisted, and finally 14 were given offers.
- The placement season spearheaded by the Corporate Relations and Placements team, resulted in SME achieving a 100% placement record, with 21.32 LPA as highest CTC and 1.5 Lacs as the highest stipend with an average CTC of 12.64 LPA.



Farewell to the first batch (2020-22) of MBA

- The first year MBA students (2021-23) received the highest stipend of 1.4 Lakhs, an average stipend of 58.7 Lakhs for their summer internship.
- Ten students from the MBA 2021-23 batch opted for the dual degree program at partner universities abroad - 6 at SUNY Albany, 2 at George Washington University, and 2 at Brandeis University.

## Faculty Members

Following are the faculty members associated with the School



### Krishna Kumar Balaraman

PhD (IIT Madras)  
Associate Professor  
Strategy & Public Policy



### Sinjana Yerasani

PhD (IIT Kharagpur)  
Assistant Professor  
Decision Sciences & Operation



### Devi Prasad Dash

PhD (IIT Ropar)  
Assistant Professor  
Economics



### Venkat Ram Reddy Ganuthula

PhD (IIT Madras)  
Assistant Professor  
Human Capital & Organizational  
Dynamics



### Anuj Pal Kapoor

PhD (FMS, University of Delhi)  
Assistant Professor  
Marketing



### Mithu Rani Kuiti

PhD (IIM Calcutta)  
Assistant Professor  
Decision Sciences & Operations



**Monika Tanwar**

PhD (IIT Delhi)  
Assistant Professor  
Industry 4.0, Cyber Physical Systems



**Jitesh Mohnot**

PhD - IIM Trichy  
Assistant Professor  
Strategy



**Venkatesha Murthy**

PhD (TISS Mumbai)  
Assistant Professor  
Innovation & Entrepreneurship



**Sankalp Pratap**

PhD (IIM Calcutta)  
Associate Professor  
Innovation & Entrepreneurship



**Sangeeta Sahney**

PhD (IIT Delhi)  
Professor  
Marketing, OB & HR



**Deepak Kumar Saxena**

PhD (Trinity College Dublin)  
Assistant Professor  
Management Information Systems

**Research Groups**

Research Group	Members	Primary Research Topics
Digital Transformation and Business Intelligence	Amit Singh Bhargab Chattopadhyaya, Deepak Saxena, Monika Tanwar Tanmoy Kundu	AI Ethics, Cyber Physical Systems, Coreset construction, Digital Transformation, Enterprise Systems (on-premise and cloud-based), Industry 4.0, Sentiment Analysis, Sequential analysis, Text Analytics, Digital twin / Control tower for e-commerce logistics, Blockchain for International Coldchain Transportation
Economics	Devi Prasad Dash	Urban Economics, Economics of Crime, Climate Change Economics
Entrepreneurship	Jitesh Mohnot Nimish Vohra Sankalp Pratap Venkatesa Murthy	Art entrepreneurship, Corporate Entrepreneurship, Design thinking, Entrepreneurship ecosystems, Entrepreneurial failure, Healthcare Entrepreneurship, Indigenous entrepreneurship, Micro-Small-Medium Scale Enterprises, New venture creation and associated practices/issues, Practices in incubation centers, Start-up team dynamic, The art of Pitching and fundraising
Human Capital Management	Sangeeta Sahney Venkat Ram Reddy	Science and practice of Behavior Change, Managerial Judgment and Decision Making, human Resource Management
Marketing	Anuj Kapoor Sangeeta Sahney	Multi Sensory Experiences, Design Aesthetics, Neuro-marketing and Collaborative consumption. Consumer Behavior, Services Marketing, Internet Marketing, Cross-cultural Marketing and Rural Marketing, Educational Leadership, Socio-Technical Design systems and Organizational Culture.

Research Group	Members	Primary Research Topics
Operations	Amit Singh Mithu Rani Kuiti Monika Tanwar Tanmoy Kundu Yerasini Sinjana	Green supply chain management, Humanitarian Logistics, Intelligent Logistics, Last-mile Logistics, Multi-modal (Air/ Maritime/Surface) Transportation, Sustainable Supply Chain Management, Diagnostics, Prognostics and Health Management, Failure and Reliability Analysis,
Strategy and Public Policy	Jitesh Mohnot Krishna Kumar Balaraman	Business Models, Strategic Alliances, Strategic Decision Making, Strategic Foresight, Strategizing practices of indigenous business communities

## Academic Programs

### PhD Program

The PhD program at SME is rigorous and demanding. It has been designed to produce candidates with skills and achievements, enabling them to meaningfully stake their candidature for full-time faculty positions in premier management institutes across the country.

The PhD program currently provides an opportunity for focused research in all areas of specialization that the school offers. The program emphasizes pursuing research work that connects with the world of practice, with any of the national or global programs that speak to contemporary issues in our society and their management, particularly those that have an overlay of technology and entrepreneurship.

### Minor in Management

The undergraduate students at IITJ are offered minor programs to complement their Majors. The minor program must be completed simultaneously with a major degree program.

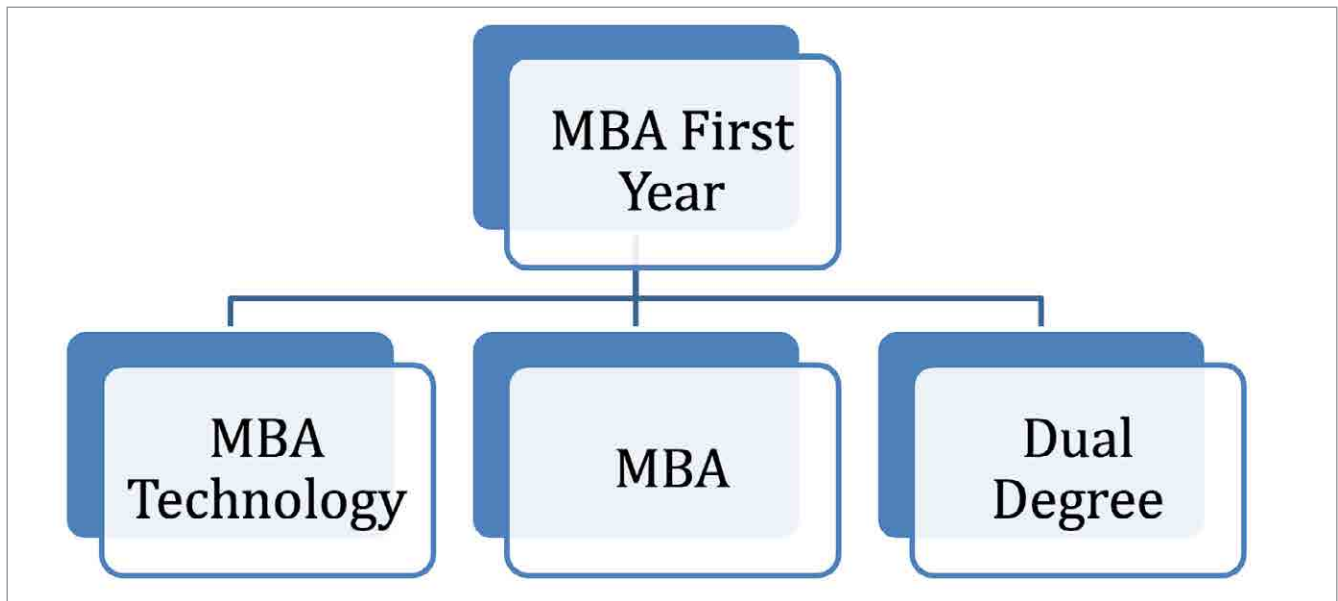
#### Students can opt for:

- (i) Minor in Management
- (ii) Minor in Entrepreneurship

### MBA

Flagship two year MBA program leading to:

- Track I – Leading to MBA-Technology Degree
- Track II – Leading to MBA Degree
- Track III – Dual Degree (SME, IIT Jodhpur has tie-ups with some of the leading business schools in the world and jointly offers dual degree programs. The students would successfully complete their foundational courses in the 1st year at SME, IIT Jodhpur, and thereon would study specialized Master's degree offerings in the 2nd Year at one of the partner B-School abroad. The students would go to earn an MBA/MBA-Technology degree from IIT Jodhpur and a specialized Master's degree from the partner B-School.)



MBA Pathways

## Significant Research Achievements

Prof. Sangeeta Sahney became a member of the Editorial Advisory Board Research, Journal of Textile and Apparel, Emerald.

Dr. Krishna Kumar Balaraman was invited to be on the Editorial Board of The IUP Journal of Entrepreneurship Development.

Dr. Krishna Kumar Balaraman was invited to be part of the editorial review board of IEEE Transactions on Engineering Management from 2022 for three years.

Dr. Bhargab Chattopadhyay is the Associate Editor of the Sequential Analysis Journal.

Dr. Anuj Pal Kapoor's research work featured in the reputed Neuromarketing Science and Business Association (NSBA), Venlo, the Netherlands: Neuromarketing Science and Business Association.

Dr. Monika Tanwar acted as a Program Committee Member of IEEE International Conference on Industrial Engineering and Engineering Management (IEEM).

## Faculty Laurels

Dr. Krishna Kumar Balaraman was nominated for the SMS 2022 Annual Conference Responsible Research Paper Prize -Strategic Management Society (SMS) 2022 Conference Paper "Microfoundational Framework of Institutions: Knowledge Transfer in Traditional Crafts Industry"

Ideas submissions by Dr. Venkat Ram Reddy (2021), Dr. Deepak Saxena, and Dr. Mithu Rani Kuiti (2022) were shortlisted for the next round in the Moonshot competition conducted by IIT Jodhpur.



## Student Laurels

Anisha Mehta	Secured 3rd position in a product management competition 'Productivitea' organized by LBSIM, New Delhi through d2c
Adarsh Totla	Case Study Competition 'Creazione' by Entrepreneurship Cell of SDA Bocconi Asia Center - First Runner Up (2021), <a href="https://dare2compete.com/competition/creazione-la-conquista-sda-bocconi-asia-center-mumbai-187704">https://dare2compete.com/competition/creazione-la-conquista-sda-bocconi-asia-center-mumbai-187704</a> 'Productivitea', Product Management Competition by LBSIM - Runner Up (2021), <a href="https://dare2compete.com/creative-cultural-event/productivitea-product-management-competition-lal-bahadur-shastri-institute-of-management-lbsim-d-199049">https://dare2compete.com/creative-cultural-event/productivitea-product-management-competition-lal-bahadur-shastri-institute-of-management-lbsim-d-199049</a> 'Mahayodha' held during Avenues '21 - The Annual Business Festival of SJMSOM, IIT Bombay - National Finalists (2021), <a href="https://dare2compete.com/competition/mahayodha-avenues-21-the-annual-business-festival-of-sjmsom-iit-bombay-shailesh-j-mehta-school-of-management-215918">https://dare2compete.com/competition/mahayodha-avenues-21-the-annual-business-festival-of-sjmsom-iit-bombay-shailesh-j-mehta-school-of-management-215918</a> Please find Certificate and Submission at - <a href="https://drive.google.com/drive/folders/1Z_bMBHPxdSzD8spkodKDXM_XENKhx4Z7">https://drive.google.com/drive/folders/1Z_bMBHPxdSzD8spkodKDXM_XENKhx4Z7</a>
Anagha S Ajith	HeuRistics 2020 by HR club of BIM Trichy- Team including me reached final round Trishna 2020(Solo singing competition) by IBS Hyderabad - Finalist
Anupreet Dube	CEO,000,000 for a day Lal Bahadur Shastri Institute of Management (LBSIM), Delhi - Reached Semifinals Proicere- Project Management Case Challenge Avartan 2021 National Institute of Industrial Engineering (NITIE), Mumbai - Reached Semifinals Seal The Deal Avenues '21 - The Annual Business Festival of SJMSOM, IIT Bombay Shailesh J. Mehta School of Management (SJMSOM), Indian Institute of Technology (IIT), Bombay - Reached Semifinals
Arunika Khaitan	Corporate Chanakya IIM Rohtak Finalist
Ayush Sharma	Competition Name - Product Quest Organizing Institute Name - IIT Delhi Position - Finalist (Final Round Results Awaited) Team Name - Zenith
Ayush Sisodia	Winner of IPL Fever Quiz kn D2c. 21st Rank in the Marketer's Edge quiz organised by Business Hub.
Bhavya Vishishta Kondamuri	SDA Bocconi Asia Center
Deepika Gupta	Productivitea - Product Management Competition by LBSIM : finals

Harshit Makhijani	Competition Name - Product Quest Organizing Institute Name - IIT Delhi Position - Finalist (Final Round Results Awaited) Team Name - Zenith
	Competition Name - Strat-Jack Organizing Institute Name - IIM Ahemdabad Position - Semi-Finalist Team Name - Zenith
Himansh Mittal	Competition Name - Product Quest Organizing Institute Name - IIT Delhi Position - Finalist (Final Round Results Awaited) Team Name - Zenith
	Competition Name - Strat-Jack Organizing Institute Name - IIM Ahemdabad Position - Semi-Finalist Team Name - Zenith
Hitesh Bansal	Competition Name - Product Quest Organizing Institute Name - IIT Delhi Position - Finalist (Final Round Results Awaited) Team Name - Zenith
	Competition Name - Strat-Jack Organizing Institute Name - IIM Ahemdabad Position - Semi-Finalist Team Name - Zenith
Keshav Giria	All India finalist   IMT Ghaziabad, Udaan, the marketing and strategy B-School competition All India finalist   IIM Kozhikode, Impacto, the social entrepreneurship B-School Competition
Mrunal Shetty	Finals - HeuRistics   Bharathidasan Institute of Management (BIM), Trichy   Oct '20 Finals - Maçon National Level B-Plan Competition   ICFAI Business School (IBS), Hyderabad   Oct '20 Finals - Productivitea - Product Management Competition   Lal Bahadur Shastri Institute of Management (LBSIM), Delhi   Sept '21
Prachiti Dad	1st Runner-Up in HRace organized by IIM Indore
Preeti Singh	Flipkart 5.O organised by D2C ,Reached 2nd round Team name -Preeti Singh (Team leader), Prakash kumar Singh,Sakshi sharma
Rishin Dubey	ARTHA - NEETI
Riya Bansal	Productivitea - Product Management Competition by LBSIM : finals
Ronak Arya	Seal the deal Priocere

Sagnick Panda	Brand-O-Mania 2020, National Retail Summit, K J Somaiya Institute of Management (KJ SIM), Mumbai - Winner Parivartan, SAMRIDDHI 2020, Goa Institute of Management (GIM), Goa - National Finalist (Top 8) Saudagar 2020, IIM Udaipur ; Op-Era, NMIMS, Mumbai ; - Pre-Finals AlphaBeta 2021, IIT Jodhpur - Top 3 i-Mobilothon 2021, Skoda-Volkswagen Group - International Finalist (Student segment).
Sakshi Sharma	Equity research challenge, IIM Kashipur
Suchita Goel	Secured 3rd position in the "Tax Mafia" event Conducted by the finance Club of Amity University business School. I registered for the Event through the D2C Platform. There were three rounds in total of this Event. Made it to the Final Round of the "SAMADHAN 2021" Case Study Competition of "Symbiosis Institute of International Business" in which only four teams made it to the final round. There were three rounds in total of this Event.
Vanshika Bansal	Adhishattha- The Best Manager Competition (Reached final round, 3 rounds in total)
Vanshika Bansal	Pro Marketing Competition by Pregrad (2nd Rank) Corporate Chanakya under Synopia by SSBF (1st Rank)
Vishal Gupta	Marketer's Edge - The Marketing Quiz Competition Business Hub -> Rank 21 (Ayush Sisodia, Vishal Gupta) CEO, 000,000 for a day LBSIM, Delhi -> Semifinalist (Anupreet Dubey, Vishal Gupta) Imperium I The Strategy Case Study Event Atharv 2021, IIM Indore -> Semifinalist (Anupreet Dubey, Hari pandey, Vishal Gupta)
Yashi Jain	second position in HRace- IIM Indore

## Laboratories and equipment

SME established a scholar hub for its PhD students, equipped with a state-of-the-art AV facility, and a working space for 34 students.



SME Scholar Hub

## Outreach activities

As part of its admissions campaign, SME conducted a series of online masterclasses to raise awareness on the role of technology in management and the management of technology. More than 15 masterclasses were conducted on topics ranging from Digital Platforms, Digital transformation, Role of Technology in Management, Technology foresight, Changing Landscape of E-Commerce and Last-Mile Logistics etc.

As part of the Padharo IIT event, SME organized a number of events that included a demonstration on case-based teaching (conducted by Dr Jitesh Mohnot), a workshop on Design Thinking (led by Dr. Nimish Vohra), and poster presentation by the scholars and faculty of SME IIT Jodhpur.



Students attending a demonstration on case-based teaching, during Padharo IIT event

1. Prof. Sangeeta Sahney served as a Chairperson for National seminar, "Impact of Covid-19 on Indian Industry and Economy", organised at Rajiv Gandhi University, Rono Hills, Doimukh, Arunachal Pradesh: on 18th Nov, 2022 (Online)
2. Prof. Sangeeta Sahney served as a Chair, "International Society for Data Sciences & Innovation – Global (ISDSI-G)", IIM Nagpur, 27-12-2021 to 30-12-2021 (Online)
3. Prof. Sangeeta Sahney served as a Chair, "Indian Academy of Management (INDAM) Conference", IIM Rohtak, 07-01-2022 to 09-01-2022 (Online)
4. Prof. Sangeeta Sahney served as Chair, "Management Doctoral Colloquium and VGSOM research scholars' day", VGSOM, IIT Kharagpur, 02-02-2022 to 03-02-2022 (Online)
5. Prof. Sangeeta Sahney served as a resource person for "Research Methodology and Data Analysis" - AICTE STTP at the Centre for Management Studies, 16-08-2021 to 21-08-2021, NERIST, Nirjuli NERIST, Arunachal Pradesh (Online)
6. Prof. Sangeeta Sahney acted as a resource person "Sustainable Change Management in Technical Institutes for NEP – 2020 Implementation", ATAL FDP at Government Engineering College, 23-08-2021 to 27-08-2021, Bilaspur, Government Engineering College, Bilaspur
7. Dr. Krishna Kumar Balraman was an invited Speaker at PES University's Entrepreneurial Symposium - Anthah Prerana 2022 - on July 1st, 2022 on the theme 'Discovering New Entrepreneurial Frontiers'.
8. Dr. Devi Prasad Dash chaired a session in symposium, "Global Symposium on Contemporary Issues in Finance and Economics", 28 Dec -29 Dec, 2021 at Faculty of Management Studies, Siksha O Anusandhan (SOA) University, Bhubaneswar, Odisha as well as one of the speakers for the symposium.
9. Dr. Devi Prasad Dash delivered a lecture in hypothesis testing, "Workshop on Research Methodology", organized by Dept of Economics, MANUU, Hyderabad 21-27 March, 2022 (Virtually).

10. Dr. Deepak Saxena was invited as a speaker on the topic of Blockchain during a workshop for NTPC executives hosted by IIT Delhi.
11. Dr. Amit Singh delivered a guest lecture on “Solid Waste Management” at Amity University, Ranchi, Jharkhand, India
12. Dr. Amit Singh chaired a session in International Conference on Operations Management (ICOM 2022) organized by The Department of Operations and IT, IBS Hyderabad, India
13. Dr. Anuj Pal Kapoor curated and launched SANDSTONE SUMMIT 2.0 as part of Outreach activities. Four Line-ups (HR Shastra, Praesidium, Impresario and In-Conversation) were launched, with over 30 Senior level Executives Invited on a Single Platform.
14. Dr. Anuj Pal Kapoor Launched first of its kind (In India) candid B School talk show (In-Conversation).
15. Dr. Anuj Pal Kapoor acted as faculty in-charge for Prometeo 2022 (Technical Fest, IIT Jodhpur) and hosted over 36 CXOs as part of corporate outreach.
16. Dr. Anuj Pal Kapoor worked as a core team member in conducting Padharo IIT, the open house event of IIT Jodhpur, which received over 10,000 footfall.
17. Dr. Anuj Pal Kapoor acted as Chair, “Management Doctoral Colloquium and VGSOM research scholars’ day”, VGSOM, IIT Kharagpur, 02-02-2022 to 03-02-2022.
18. Dr. Monika Tanwar was invited as Speaker to the Public Systems Planning and Optimization webinar at IIT Delhi.
19. Dr. Jitesh Mohnot was invited as speaker at IXI summit, organized by Uincept, a leading ed-tech accelerator.
2. Aparna, S.M. and **Sahney**, S., “A Three-Way Interaction Model of Research Output: Investigating the Role of Age, Technological Aids and Knowledge Sharing”, 11th edition of *Conference on Excellence in Research and Education (CERE)*, at the Indian Institute of Management Indore, during 18th-20th June 2021.
3. Aparna, S.M. and **Sahney**, S.,” Organizational Learning and Resilience: The Role of Creative Problem-Solving Capacity and Knowledge Leakage”, *IDSJ-Global International Conference on Leading Business in a FLUID World*, IIM Nagpur, December 27-30, 2021.
4. Arora, S., **Sahney**, S. and Pradhan, D. (2022), “Potential Benefits and Descriptive Norms on Webrooming: Applying an Extended Model of Goal-Directed Behaviour”, *International Journal of Retail and Distribution Management* Vol. 50, No. 3, pp. 377-397, Emerald.
5. Behera, S. R., Mishra, T., **Dash**, D. P., & Mallick, L. (2021). What drives energy consumption in brics countries? Evidence from ARDL bounds testing approach. *The Singapore Economic Review*, 2150053.
6. Bhattacharya, S., **Murthy**, V., & Bhattacharya, S. (2022). The social and ethical issues of online learning during the pandemic and beyond. *Asian Journal of Business Ethics*, 11:275–29. <https://doi.org/10.1007/s13520-022-00148-z>
7. **Dash**, D. P., & Dash, A. K. (2021). Oil Consumption–pollution Dynamics in the Asia-Pacific Region: The Importance of Institutional Factors. *Energy Research Letters*, 3(Early View), 30058.
8. **Dash**, D. P., & Sethi, N. (2022). Pandemics, Lockdown And Economic Growth: A Region-Specific Perspective On Covid-19. *Buletin Ekonomi Moneter Dan Perbankan*, 25, 43-60.
9. **Dash**, D. P., Dash, A. K., & Sethi, N. (2021). Understanding the pandenomics: Indian aviation industry and its uncertainty absorption. *The Indian Economic Journal*, 69(4), 729-749.

## Faculty Publications

1. Ahmed, M., & **Pratap**, S. (2021). Constraint absorption in emerging economies: the role of business groups. *International Journal of Organizational Analysis*. 1934-8835.

10. **Dash, D. P., Dash, A. K., & Sethi, N. (2022).** Designing hydro-energy led economic growth for pollution abatement: evidence from BRICS. *Environmental Science and Pollution Research*, 29(21), 31252-31269.
11. Dhall, M., Tyagi, R., Tungdim, M.G., Nilupher, Gupta, U., Devi, K. S., Kaur, J., **Kapoor, A.P.**, Saini, M. P., Dhall, Rulu P., Bhasin, P., Kapoor S., "Nutrition, Physical Activity and Psychological Status During Lockdown Due to Covid 19," Editor *Acta Scientiarum Health Sciences*, Vol 43.
12. Dibenedetto, S., & **Saxena, D. (2022).** Safety of Minors on Social Media Websites: Italian Parent Perceptions and Mitigation. *International Journal of Adult Education and Technology (IJAET)*, 13(1), 1-14.
13. Dutta, V. and **Sahney, S. (2022),** "Relation of Principal Instructional Leadership, School Climate, Teacher Job Performance, and Student Achievement", *Journal of Educational Administration*, Vol. 60, No. 2, pp. 148-166, Emerald.
14. Gupta R., **Kapoor, A.P.** and Verma, H., "Politics and Neuromarketing: A Case of Bengal Elections (2021) in India," *Neuromarketing Science & Business Association (NMSBA)*, Netherlands, 2022.
15. Kaplan J. M., and McGourt, J. (Adopter for India: Venkatesha **Murthy**) An Indian adaptation of the "Patterns of Entrepreneurship Management, Wiley, ISBN: 978-1-119-71363-0 (The Indian adaptation version is expected to be out this year 2022).
16. **Kapoor, A. P.** and Chaudhary, K. , "How Green is Your Life: Towards a Sustainable Consumption Label Index", *TERI Doctoral Consortium*, 2021.
17. **Kapoor, A. P.** and M. Viji, "Following you wherever you go: Mobile shopping 'cart-checkout' abandonment," *Journal of Retailing and Consumer Services*, vol. 61, p. 102553
18. **Kapoor, A. P.** and M. Viji, "Want it, Rent it: Exploring Attributes Leading to Conversion for Online Furniture Rental Platforms, ". *J. Theor. Appl. Electron. Commer. Res.* 2021, 16, 188-207
19. **Kapoor, A.P.**, and K. Chaudhary, "How Green is Your Life: Towards a Sustainable Consumption Label Index", 8th *PAN IIM World Management Conference*, 2021.
20. **Kuiti, M. R.**, Hazra, N. K., & Finkelstein, M. (2022). A note on the stochastic precedence order between component redundancy and system redundancy for k-out-of-n systems. *Communications in Statistics-Theory and Methods*, 51(15), 5003-5011.
21. **Mohnot, J., Pratap, S., & Saha, B. (2021).** Governance of Marwari capital: Daily living as a decolonial 'matrix-of-praxis' intermeshing commercial, religious and familial spheres. *Organization*, 28(5), 741-772.
22. **Murthy, V., & Paul, B. (2022).** Entrepreneur and employee negotiated labour market flexibility in small firms. *Labour and Industry*, 1-36: <https://doi.org/10.1080/10301763.2022.2098565>.
23. **Murthy, V., Gaur, D. and Bhaduri, K.,** "Parents, Pupils, Pedagogues, and Policies: A Rectangle of School Education for Immigrant's Children", *Systemic Practice and Action Research* (Published online) <https://doi.org/10.1007/s11213-021-09582-9>
24. Panda, C., **Dash, A. K., & Dash, D. P. (2022).** Assessment of Risk Factors of Road Traffic Accidents: A Panel Model Analysis of Several States in India. *Vision*, 09722629221113251.
25. Ray, S.K. and **Sahney, S. (2021),** "Personal Cultural Orientation and Green Purchase Intention: A Case of Electric Two-wheelers in India", Earlycite, *Journal of Asia Business Studies*, Emerald.
26. Saha, M.D. and **Sahney, S. (2022),** Exploring the relationships between Socialization Agents, Social Media Communication, Online Shopping Experience, and Pre-Purchase Search: A Moderated Model, *Internet Research*, Vol. 32, No. 2, pp. 536-567, Emerald.
27. **Saxena, D., Brady, M., Lamest, M., & Fellenz, M. (2022).** Bridging the marketing-finance divide: use of customer voice in managerial decision-making. *Qualitative Market Research: An International Journal*, 25(3), 361-382. DOI: <https://doi.org/10.1108/QMR-09-2020-0113>.
28. Sethi, N., & **Dash, D. P. (2022).** A Perspective on Energy Consumption Balance: Quality of Life, Governance, and Carbon Emissions in APEC. *Energy Research Letters*, 3(Early View), 32621.
29. **Singh, A., Jenamani, M., Thakkar, J., & Dwivedi, Y. K. (2021).** A Text Analytics Framework for Performance Assessment and Weakness Detection From Online Reviews. *Journal of Global Information Management (JGIM)*, 30(8), 1-26.

30. Sreekumar, H., & **Pratap**, S. (2022). Forging the nation state: an advertising history of Tata Steel, India. *Journal of Historical Research in Marketing*, (ahead-of-print).
31. **Tanwar**, M., Park, H., & Raghavan, N. (2021). Multistate Diagnosis and Prognosis of Lubricating Oil Degradation Using Sticky Hierarchical Dirichlet Process–Hidden Markov Model Framework. *Applied Sciences*, 11(14),
32. **Tanwar**, M., Raghavan, N., & Khanam, S. (2021, December). Condition Based Maintenance Policy for Crankcase Lubricating Oil in Diesel Locomotives. In *2021 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM)* (pp. 1593-1598). IEEE.
33. **Tanwar**, M.: Effect of Information Sharing on Supply Chain Management: A Case Study, *Recent Advances in Mechanical Engineering Springer*, 2021.

## Ongoing Sponsored/ consultancy projects

- Project Title: Wage discrimination across sectors amidst covid-19 pandemics- A gendered**

### **perspective from the selected Northern Indian states**

PI: Dr. Devi Prasad Dash

Co-PI: Dr. Anuj Kapoor

Sponsoring Agency: NCW, Govt. of India

Amount in Lakhs: INR 18,64,500/-

Start Date and End Date : 2nd Oct 2021 (1 Year)

- Project Title: Does Location Spur Innovation? Evidence across the Indian Manufacturing Sectors**

Co-PI: (Dr. Devi Prasad Dash is the Co-PI).

Funding Agency: Indian Council of Social Science Research (ICSSR) for the year 2021-22.

- Project Title: Edible emulgel-based novel, cost-effective formulation for colon targeted synbiotic-drug delivery**

PI: Dr. Indranil Banerjee, BIG18-BIRAC Project

(Dr. Venkatesha Murthy is a Business consultant in the project)

Start year 2022



MBA students at the iconic Ghanta Ghar as part of their induction program



Students enjoying cultural performance as part of their induction program

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# Centres

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# Centre for Emerging Technologies for Sustainable Development

## Introduction

### Vision

The vision of the Centre for Emerging Technologies for Sustainable Development is to be a partner in tapping the potential of emerging technologies for creating a sustainable and prosperous future for India.

### Mission

- To provide a platform for non-governmental and governmental collaborators to work together to apply emerging technologies for finding and implementing solutions towards achieving SDG targets.
- To help develop scientific temper societies to understand technologies that are sustainable or technologies that are using sustainability aspects.
- To innovate solutions towards challenges in location specific problems related to energy use, education, water management, infrastructure, traditional livelihood skills, and health.
- To perform applied research in areas such as agriculture, environment, healthcare, waste management, pollution, livelihood and rural development.

- To make synergistic policy suggestions to handle issues in energy use, agriculture, water management, local pollution in a region and its influences on health

### Area of Specialization

- Ecosystem Science
- Sustainable Development
- Geospatial Science
- Sustainability Auditing or accounting/ESG (Financing/Risk Mitigation)
- Public Health
- Human Ecology
- Sustainable Urban Planning
- Learning Science and Instructional Design (Education Technology)
- Natural Resource Management (including Net Zero goals)
- Sustainability of Water

### Faculty details

At present, the following faculty members are associated with the Centre.

Santanu Chaudhury, Mentor	Department of Computer Science & Engineering
Anand Krishnan Plappally, Head	Department of Mechanical Engineering
Krishna Kumar Balaraman	School of Management & Entrepreneurship
Pradip K Tewari	Department of Chemical Engineering
Arun Kumar Singh	Department of Electrical Engineering

Farhat Naz	Department of Humanities & Social Sciences
Vivek Vijay	Department of Mathematics
KJ George	Department of Humanities & Social Sciences
Pradeep Kumar Dammala	Department of Civil Engineering
Sudipta Das	Professor of Practice System Engineer at Tata Consultancy Services
Bhanu Prasad	Professor of Practice Coach - Impact Innovation, Entrepreneurship, Partnerships Digital Impact Square, A TCS Foundation Initiative
Shobhana Singh	Department of Mechanical Engineering
Sandeep Kumar Yadav	Department of Electrical Engineering
Ambesh Dixit	Department of Physics
Gaurav Kumar	School of Management & Entrepreneurship
Alok Ranjan	Department of Humanities & Social Sciences
Prashant Kumar Gupta	Department of Chemical Engineering
Ankita Sharma	Department of Humanities & Social Sciences
Rajlaxmi Chouhan	Department of Electrical Engineering
Nitin Bhatia	Department of Electrical Engineering
Vikky Anand	Department of Chemical Engineering
Suchetana Chakraborty	Department of Computer Science & Engineering
Debasis Das	Department of Computer Science & Engineering
Mitali Mukerji	Department of Bioscience & Bioengineering
Ramesh Asapu	Department of Chemical Engineering
Deepak Arora	Department of Chemical Engineering
Sudipto Mukhopadhyay	Department of Mechanical Engineering
Meenu Chhabra	Department of Bioscience & Bioengineering

## ETSD Seminar series 2021-22

### Series 5: Sustainability Talk Series – Education Vertical (SDG4) (July 2021)

- **Session 1:** Prudent Ecosystem Management For Sustenance Of Water
- **Session 2:** Role of Sustainability in Higher Education (July-August 2021)

### Series 6: Next Generation EdTech Seminar Series (September 2021)

- **Title of the talk:** Nurturing disciplinary practices through research in the learning sciences
- **Title of the talk:** AI-powered Transformation of Learning Videos
- **Title of the talk:** e-Learning through eVidyaloka platform: Learner-centric solutions for last mile education

### Series 7: Rural Industries (November 2021)

- **Title of Talk:** Technology Intervention in Rural Industries-by Prof P B S Bhadoria, IIT KGP  
3rd International Conference on Rural Technology Development and Delivery (RTDD)

IIT Jodhpur hosted the conference on Rural Technology Development and Delivery (RTDD) 2022 from 04-06 March 2022. The conference had three different objectives:-

1. To bring together faculty and students involved working in RuTAG from across India to come and share their interventions on the fields.
2. To demonstrate solutions to local region specific, ecosystem specific, as well as climate specific challenges with use of appropriate technology.

3. To also enable awareness of integrated solution frameworks for demand driven problems, with the emergence of know-how such as modeling, automation and digitization coming into perspective.

The international conference RTDD 2022 focused and deliberated on different domains of rural

technology as enumerated below including design and development of on-farm and non-farm technologies which have much required scientific temperament towards solving site specific demand driven rural problems. There were six thematic segments to the conference:

Themes	Subtheme
Rural Environment	Waste Management
	Technologies for Sanitation
	Energy the Biological way
Rural Education	Participatory Technologies Outreach
	Communication Technologies
	Health: Physical and Mental
	Service Learning Approaches
Technology Intervention for Rural Livelihood	Craft,Pottery,including Folklore and Musical instrumentation
	Automation and Mechanization
	Food Processing and Management
	Archiving, Preservation and Analysis
Water Management and Agriculture	Technology for small farms
	Technologies for Management Technology
	Small farms Technologies
	Agriculture Waste Management Technology
	Landscape specific problem interventions
	Policy Interventions
Energy or Power interventions for Rural Areas	Farm Power
	Animal Power
	Renewable Approaches
	Policy Interventions
Digitization for Rural Areas	Supply Chain Management for Rural Sector
	Resource Mapping for villages
	Telemedicine

## RTDD 2022 recordings

- [https://youtu.be/PgkYmF\\_ZleI](https://youtu.be/PgkYmF_ZleI) - Day 1
- <https://youtu.be/pT8-YZCVfwQ> - Day 2
- <https://youtu.be/CtmBp8Zu1KM> - Day 3

## Faculty Laurels

- The Jal Jeevan Mission Chair professorship application was submitted towards its establishment with the main theme Sustainability of Water Sources

to the Jal Shakti Ministry during the last quarter of 202. We were fortunate to get the Chair in March 2022. This is a position with a funding of Rs 6 Crores. Prof Pradip Tewari, Visiting Professor and Head, Chemical Engineering was appointed as JJM Sustainability Chair Professor at IIT Jodhpur.

## Outreach activities

### HEFA CSR Project

1. More than 10 village schools across Jodhpur District have sustainable drinking water purification facility

### Central Waqf Council Project

2. More than 1000 waqf properties have been surveyed under the project GIS Survey Of Waqf Properties & Updation In An Online Waqf Assets Management System Of India (WAMSI)---- For State of Rajasthan

### SEE and Hola Projects

3. In collaboration with the Office of Infrastructure Engineering, See and Hola projects on sustainability of the campus have been carried out. The funding for the projects were through the office of Infrastructure Engineering.

### The major works are

- A first pond at IIT Jodhpur (behind the temple in the forest) has been constructed for enabling forest ecosystem to have enough water for its fauna and flora
- A mincing machine was installed for minimizing the size of organic waste. It is first of its kind for shredding the hardest organic waste found on

campus like tree cuttings, tender coconut etc.

- A thatched roof pathway has been constructed between the two porta cabin buildings of the School of Management and Entrepreneurship
- A app named Prakriti 1.1 for the assessment of fauna and flora on campus has been developed under this See and Hola projects
- A waste segregation project within the IIT Jodhpur campus has been done with Khamba compostor being installed in 4 distinct locations across campus
- A soil restoration and water conservation project by the gardens of Jodhpur Club has been accomplished with most of the trees surviving the harsh Jodhpur summer.

### UBA -RCI

- A series of two seminars have been conducted virtually for the Covid 19 prevention in the adopted villages along with more than 40 UBA PIs taking part in the event

### CETSD Internal Funding

- Project proposal of Algal biomass based carbon capture developed by Dr Meenu Chhabbra was supported for scale up with a team of faculty Prasenjit Sarkar and also Dr Hardik Kothadia joining from outside CETSD. Provisional patent for the technology was filed.

## Sponsored/consultancy projects

Project title	PI/Co-PI	Sponsoring agency	Amount in Lakhs	Start date	End date	Outcome
<b>On-going Projects</b>						
Unnat Bharat Abhiyan- Regional Coordinating Institute	Anand K Plappally	IIT Delhi	10 per year	April 2019	March 2026	We got extension of 5 years
UF Membrane Assisted Sorption Based Water Purification Systems in Rural Village Schools of Jodhpur District, Rajasthan	Anand K Plappally	HEFA	40	Oct. 2021	Oct. 2024	completed 10 installation in rural schools of Jodhpur District
GIS Survey Of Waqf Properties & Updation In An Online Waqf Assets Management System Of India (WAMSI)---- For State of Rajasthan	Anand K Plappally	Central Waqf Council	110	March 2022	Dec. 2022	IITJ gets first project from Ministry of Minorities
<b>Completed Projects</b>						
Mound Based Sub-Surface Irrigation, Rajasthan	Anand K Plappally	RuTAG	0.66	June 2021	January 2022	Patent on SSPV Filed

# Center for Technology Foresight and Policy (CTFP)

The Center for Technology Foresight and Policy (CTFP) came into existence on 14 January 2020. The center plans to focus on evolving areas of technology - such as metaverse, quantum technologies, future of mobility – with an aim to provide future roadmaps and policy recommendations. The center also plans to promote foresight and its methodologies in the public and private sectors.

The rich eco-system of IIT Jodhpur is an aid in creating technology foresight-based research agendas and view of alternate futures. CTFP has been building its resources and relationships the past year. It has been allocated its office and the setup is in progress. There have been initial discussions with organizations such as Technology Information, Forecasting and Assessment Council (TIFAC), DRDO, and Central Detective Training Institute, Jaipur (part of BPR&D). The futuristic focus of CTFP is in line with the needs of these organizations and initial discussions in May 2022 and July 2022 indicate areas of mutual synergy. CTFP also plans in the future to look at future roadmaps, applications, and policy implications of technologies such as terahertz, photonics, cyberwarfare, hypersonic systems.

CTFP anchored Moonshot 2022 that will take place in two stages. The results of the first round were announced on the Institute Foundation Day (2nd August 2022). There

were 21 submissions of which 6 have been selected to proceed to the next stage. The top entries will receive the prize money of Rs 5000. These qualified teams are eligible to submit a foresight-based technology feasibility roadmap of the idea and impact analysis by November 05, 2022. The top 2 teams will receive a cash prize of Rs 20000. Results will be announced in a special event on the eve of IITJ convocation (2022).

CTFP members visited CDTI, Jaipur on July 27, 2022 for a roundtable to discuss “Technology Infusion in Policing” (Two Photos Attached - Dr. Amandeep Singh Kapoor, IPS, Director, CDTI, Jaipur felicitating CTFP members). Discussion points that need to take forward include an MoU with CDTI/BPR&D, field research on impact of community policing, and a joint conference on Metaverse. There is also interest in conducting futuristic programs involving predictive methods for policing.

CTFP has also launched a call for post-doctoral positions at the center. Future plans include recruiting faculty with interest in technology and foresight and offering academic programs from the center.



## Faculty Members

1. Krishna Kumar Balaraman, School of Management & Entrepreneurship
2. Ankita Sharma, Department of Humanities & Social Sciences
3. Anand Krishnan Plappally, Department of Mechanical Engineering
4. Deepakkumar M. Fulwani, Department of Electrical Engineering
5. Farhat Naz, Department of Humanities & Social Sciences
6. Kirankumar R. Hiremath, Department of Mathematics
7. Sumit Kalra, Department of Computer Science & Engineering
8. Hardikkumar B. Kothadia, Department of Mechanical Engineering
9. Prasenjeet Tribhuvan, Department of Humanities & Social Sciences
10. K. J. George, Department of Humanities & Social Sciences

### Advisor

Following are the faculty members associated with the School



#### **Dr. Anurag Goel**

M.Sc. (Physics): University of Allahabad  
 Master's (Management/Public Administration): Carleton University, Ottawa  
 Ph.D. (Computer Science): University of Waterloo, Canada  
 IAS (Retd)  
 Former Secretary, Ministry of Corporate Affairs  
 Former Member, Competition Commission of India

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# **Section-8 Companies**

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# Technology Innovation and Start-up Center (TISC)

## Short introduction and association with IITJ (faculty of IITJ)

IITJ-TISC is a Section-8 Company promoted by IITJ, having a state-of-the-art Bioincubator funded under BioNEST scheme of BIRAC, Govt. TISC is hosted within the campus of IITJ and aligned with the Vision of IITJ, which is to promote technology thought and action and prepare needed technical human resources to meet the technology challenges of the nation. The Board of Directors of TISC is chaired by the Director IITJ and includes members drawn from Industry and Academia.

TISC aims to nucleate new-age ventures around the focal theme of AIoT, unique in the country. This next-generation technology is expected to impact all sectors of economy. Deep tech domains of TISC interests include: New materials- materials intelligence, Artificial Intelligence, Healthcare including Precision Medicine & Multi-omics, Cyber-security, Digital economy, Robotics, Advanced Communications, Quantum Computing, etc.

TISC provides all the common infrastructure facilities during the incubation period like Work stations, lab benches, meeting rooms, conference hall, common area, cafeteria, and printing facilities. The complete building is WiFi-enabled.

Programs/ workshops by domain experts are organized for incubatees/ pre incubatees. Regular sessions are conducted on IP awareness and capacity building of the incubatees/ applicants for filling relevant patents. Various awareness programs are continuously conducted in association with the Institution Innovation Council and Entrepreneurship Cell of IITJ.

IITJ Faculties involved as inventors and innovators in various projects get appropriate opportunities for incubation at IITJ TISC. IITJ has policies in place which encourages various faculties for promoting their startups through incubation. Also, based on the field of work Faculties are associated with student-led startups incubated at TISC as Faculty mentors. For initiating and executing various programs and projects funded by external agencies IITJ faculties are associated as Principal Investigator (PI) and give their valuable inputs and efforts till the completion of such programs/ projects. In addition to these, Faculties are associated in various training programs, certificate courses, entrepreneurship awareness program, and Hackathons being conducted by TISC from time to time. Engagement of the faculties in various initiatives being taken through the Institution Innovation Council (IIC) and Board of Innovation and Entrepreneurship is also acting like a bridge for bringing potential ideas for preincubation/ incubation at TISC.

## Initiatives during the period covered (e.g. MoUs, Projects, Collaborations)

### i. Collaboration between IITJ TISC and WhizHack Technologies Private Limited

TISC in collaboration with WhizHack collaborated and launched a certificate training program in advanced Cyber Security and Cyber Defense. More than 100 candidates have been trained through this course.

### ii. MoU between IITJ TISC and TiE Rajasthan

A MoU was signed between TiE Rajasthan and



IITJ TISC to undertake various incubation and mentoring programs leading to Startup building, growth and funding.

### iii. MoU between TISC and TIH iHub Drishti

For providing incubation support in exploring commercialization of innovative technologies/ research results owned/ in-licensed and/ or collaborated by iHub through Hub selected and/ or funded start-ups, a MoU was signed between TIH and TISC.

### iv. Mentoring IITJ TISC startups through PadUp Ventures and collaboration opportunities

To provide good mentoring support to incubated startups TISC had discussions for PadUp ventures and four Incubatees/Start-ups were selected by Pad Up ventures for their SAMRIDH program. Discussion for long term association are in advance stage.

## Activities (lectures/talks/hackathons/ competitions)

### i. Medical Device Hackathon (MEDHA) 2022

IITJ TISC associated with Biomedical Engineering and Technology Innovation Centre (BETIC), IIT Bombay and successfully conducted a Medical Device Hackathon. Two teams from TISC presented in the national level competition held at IIT Bombay.

Both of our recommended teams gave good performance, one of them given direct entry to the next round i.e., Medical Device Innovation Camp (MEDIC). The team will also get support up to Rs 20,000 for prototyping works. This training camp is conducted at IIT Bombay and BETIC team guides the selected teams during the camp. The other team got the certificate for 'Best Market Research'.

### ii. Visit of Dr. Nilotpal Ghosh from SERB and Interaction with TISC Incubatees:

TISC took the opportunity to invite Dr. Nilotpal Ghosh, Scientist-F, SERB to TISC and an interaction with our incubatees was held on 15th Nov, 2021. Dr. Ghosh gave insights on various funding as well as technical matters.

### iii. Visit of Secretary, Department of Biotechnology, GoI and Chairman, Board of Governors, IIT Jodhpur to TISC:

TISC organized an exhibition related to the work of its Incubatees as well as pre-Incubatees on the eve of the 7th Convocation of the Institute. Dr. Rajesh S Gokhale (Secretary, Department of Biotechnology, GoI) and Dr. R. Chidambaram (Chairman Board of Governors, IIT Jodhpur) on December 18, 2021 graced the occasion. About 20 participants presented their posters/ models/ prototypes.

### iv. Visit of CEO, ARTPARK-IISc. Bangalore to TISC

Shri Umakant Soni, CEO-ARTPARK visited IITJ TISC. A meeting for exploring opportunities for IITJ TISC startups as well as a joint accelerator program by ARTPARK, IITJ TISC, and iHub Drishti was held.

### v. Online webinars:

- A webinar on "Frugal Engineering: An Emerging Paradigm for Innovation and Startups" was organized on December 1st, 2021. The talk was delivered by Dr. P.K. Dan, IIT Kharagpur. Approximately 30 participants attended the event.
- Another webinar was held on topic entitled "Different Type of Business Entities for Startups under Indian Law" on 5th March 2022.
- Webinar on 'Registration of Start-ups as Private Ltd. companies-Dos and Don'ts' was arranged
- In association with MSME Technology center Bhiwadi webinar on "Hydraulic Servo Systems -Modeling, Simulation and Control" "Future of Materials Handling" and "Industrial automation and Programmable Logic Controllers (PLCs) for Automation" was arranged.
- Online awareness sessions for various Govt. funding schemes and preparing for these schemes like Biotechnology Ignition Grant (BIG) were conducted.

**vi. Short-term online course with the Department of Civil and Infrastructure Engineering:**

TISC in association with the Department of Civil and Infrastructure Engineering conducted a short-term online course on “Structural Health Monitoring” under Management Development Program (MDP) on Smart Infrastructure and Sustainability” during 03- 07 January 2022.

**vii. Presentation for MSME Idea Hackathon 2022**

MSME had invited ideas for Hackaton-2022. Six applications were received by TISC who had chosen IITJ as host institute for incubation. Based on screening committee evaluation two ideas were forwarded to MSME for funding support.

**viii. TISC participated in IIT Jodhpur open house “IIT Paadharo”**

IITJ TISC showcased its incubatees products through poster presentation, demos/ prototypes/ working models during IITJ Paadharo event.

**ix. Biotech Startup Expo-2022**

On the occasion of BIRAC foundation day, as part of BioNEST family, IITJ TISC presented about the work being done by our Incubatees/Startups and also the Entrepreneurial activities and environment at TISC and IITJ. The event was inaugurated by the Hon’ble Prime Minister of India and held in New Delhi.

**x. IITJ Foundation Day 2022**

On the occasion of IIT Jodhpur’s fifteenth (15th) Foundation Day on 2nd August 2022, Technology Innovation Start-up Center (TISC) organized

an exhibition of all Incubatees/ Startups/ Pre-Incubatees.

**xi. Talk Series- under the Vigyan se Vikas umbrella**

To commemorate the build up to India @ 75 celebrations, BioNEST at IIT J TISC organized a series of talks under the Vigyan se Vikas umbrella to Showcase Potential, Journey and Impact of Biotechnology on the Society on the 28th of June 2021. The following eminent Bioscience researchers delivered their talks on this occasion:

- Prof Raghavan Varadarajan - Professor at the Molecular Biophysics Unit at IISc Bangalore
- Prof Dulal Panda - Chair professor – Biosciences and Bioengineering dept at IIT Bombay
- Prof Ashok Kumar – Biological Sciences and Bioengineering department at IIT Kanpur
- Prof Suman Kumar Dhar – professor at the Special Centre for Molecular Medicine of Jawaharlal Nehru University.
- Prof Souvik Maiti – Sr Principal scientist at Institute of Genomics and Integrative Biology

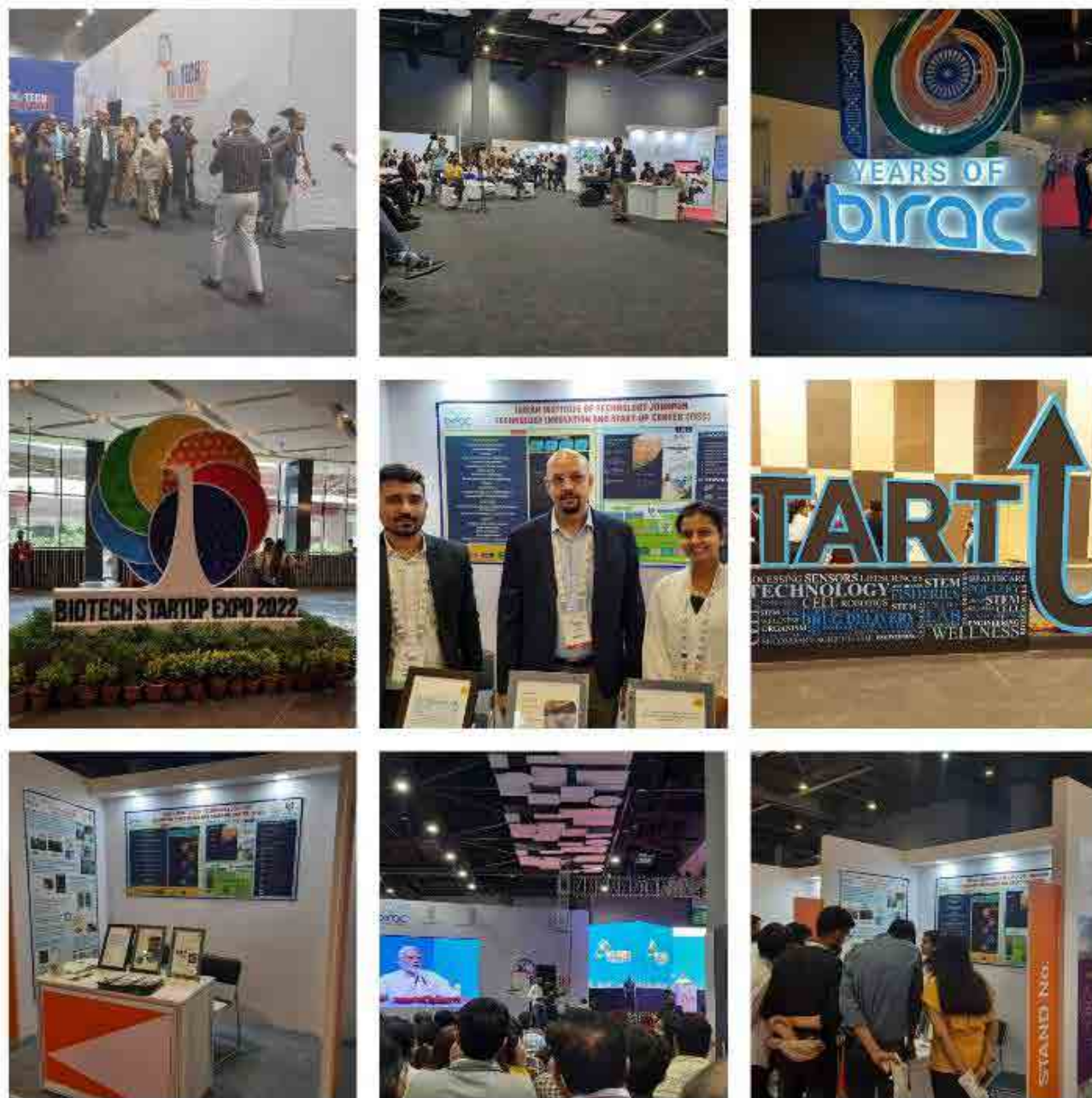
**xii. Visit of Dr Samir K. Brahmachari to IITJ TISC**

IITJ TISC organized visit and interaction of Dr Samir K. Brahmachari, former DG-CSIR with IITJ TISC Incubatees and MMT students as well.

**xiii. Time to time interaction with IITJ students and faculty were done through E-Cell and Institution Innovation Council.**







**Achievements (Product development/technology transfer/start-ups OR incubation)**

- A total of 07 no. products/technologies have been developed by TISC incubatees. Product of one of the incubatee startups (Divya Plasma Solutions Pvt. Ltd) was launched during IITJ Foundation Day.

**Current Incubatee/Start-ups projects:**

S. No	Name	Faculty/Student/MSME/BIG	Project/Product title
1	Dr Saakshi Dhanekar	Faculty under (BIRAC BIG Grant)	Indigenous alcohol breath analyser for prevention of drink and driving case
2	Dr Amandeep Kaur	Faculty under (BIRAC BIG Grant)	An Endoscopic Camera System
3	Mr. Vigyan Gadodia	Student along with faculty advisor Dr Ram Prakash (MSME)	Small-scale Milk Disinfection System
4	Mr. Wilfred Kisku	Student along with faculty advisor Dr Amandeep Kaur (MSME)	Human Perception driven on-chip compression for power efficient CMOS image sensors
5	Mr. Bibhudutta Satapathy	Student along with faculty advisor Dr Deepak Mishra (MSME)	Non-Contact Blood Oxygen Saturation Measurements
6	Mr. S.Subburayalu	Student along with faculty advisor Dr Ravi K.R. (MSME)	Self-cleaning of Endoscope
7	Dr. Neelam Rathore	IIT Bombay Alumni	Safe Sanitization: Easy production of different concentrations of hypochlorous acid from the homebased ingredients, water, and electricity
8	Dr Anup Kakwani	IITJ MMT 2020 (Master Degree) Student	Novel Root Canal Irrigation Device
9	Thilak Chakravarthy	IITJ MMT 2020 (Master Degree) Student	Developing Socket- Based Anti-Fogging Lens for ENT Endoscopes
10	Rajshree	IITJ MMT 2020 (Master Degree) Student	Continuous BP Monitoring using a Convenient Non-Invasive Cuffless Device
11	Dr Ram Prakash	Faculty Start-up	Indoor Air Purifier Systems (Divya Plasma Solutions Pvt. Ltd)
12	Dr Sumit Kalra	Faculty Start-up	Telemedicine Solutions (Novealthy Innovations Pvt. Ltd)

**Facilities set up for BioNEST Bioincubator**

TISC had got the grant for setting up the BioNEST Bioincubator from BIRAC. Facilities in terms of seating space, lab benches, high end equipments have been made operational progressively. Many of these equipments have been installed and are being used by the incubatees.





### i. SEED Fund Support and Monthly assistance Policy

TISC Board approved policy for SEED Fund and Monthly assistance for incubatee startups. Under this lump sum assistance as well as monthly assistance will be provided to eligible startups.

### ii. Interaction with various stakeholders

Various meetings were held from time to time to build external relations with ecosystem partners e.g. iStart Rajasthan, TiE Rajasthan, Ratanada Ventures, MSME Technology Center Bhiwadi, Marwari Catalyst, HDFC Bank to name a few.

### iii. Incubation of MMT students

Three student ideas coming from Master's in medical technologies program, a joint program of IITJ and AIIMS Jodhpur have been provided incubation support for one year at TISC.

# Jodhpur City Knowledge and Innovation Foundation (JCKIF)

## Introduction

Jodhpur City Knowledge and Innovation Foundation (JCKIF), is a Section-8 company (Non-Profit Organization) established on 31st March, 2021 under the Companies Act 2013 to carry out and sustain the activities of Jodhpur City Knowledge and Innovation Cluster (JCKIC). JCKIC is one of the six clusters sanctioned by the Office of the Principal Scientific Adviser (OPSA) to the Government of India on the recommendation of the Prime Minister's Science, Technology and Innovation Advisory Council (PM-STIAC) to create an Atmanirbhar Bharat through Science & Technology. Indian Institute of Technology Jodhpur (IITJ) is the nodal agency for JCKIC.

JCKIF acts as a facilitator for Jodhpur Cluster to create strong linkages among Academic Institutions, R & D Institutes, National & State Research Laboratories, Government Agencies and Industries of the city of Jodhpur and its surroundings. Faculty members of IIT Jodhpur community are associated with JCKIF in the capacity of PI or Co-PI for different projects under six verticals, namely Medical Technologies, Handicrafts and Handlooms, Water and Environment, I-Governance, AIoT Innovation Hub and Thar DESIGNS

## Initiatives

### Projects

**JCKIF has financially supported the following projects:**

- Smart Graded-Water Supply Grid: In this project, the objective is to develop and collect essential data related to the water supply system of IIT Jodhpur,

and use AIoT based smart management to maximize water utilization at minimum expenditure.

- Jodhpur Urban Air Quality Monitoring Project (JUMP): In this project, the objective is to study the indoor and ambient air quality in different micro-environments of Jodhpur, and assess the level of awareness about air pollution among the residents of Jodhpur.
- Thar Designs: Towards integrated study of the desert ecosystem to propel discoveries, inventions and innovation for mitigating water and health challenges and catalyzing growth of industry and agriculture for sustenance and livelihood to evolve strategies for sustained management of natural resources, ecological development and integrative precision health in arid regions'. A pilot study of project "Ecosystem phenomics inspired solutions for one health" has undertaken various objectives related to Bioprospecting, Bioinspiration, Biological Soil Crusts (BSCs), Ecosystem phenomics and Citizen Science of Thar.
- Handicrafts and Handlooms: Partnered with a private company to develop AR-VR (Augmented and Virtual Reality) based Web Portal, E-Commerce and Digital Museum for the upliftment and promotion of local artisans and their crafts.
- I-Governance: Involved in co-development with a private company towards providing smart traffic management solutions for the City of Jodhpur.



## Programmes

- Masters, PhD and Masters-PhD Programs in Medical Technologies (MMT) jointly offered by IIT Jodhpur & AIIMS Jodhpur was initiated in FY 2020-21 with 25 students. Further 19 more students have joined the program in FY 2021-22 taking the tally to 44 students registered under the program.
- 44 registered students, 03 pre-incubates, 8 Patents submitted as of now
- JCKIF providing financial support to some MMT students as stipend and for procurement of glassware, chemicals etc.



- b. MoU signed with Rajasthan State Industrial Development & Investment Corporation Limited (RIICO) on October 05, 2021 in the presence of Shri. Parsadi Lal Meena, then Hon. Minister of Industry, Govt. of Rajasthan.



## MoUs

JCKIF has signed MoUs with many Academic institutes and Research organizations, as well as with Industries.

- MoU signed on September 05, 2021 with All India Institute of Medical Sciences (AIIMS), Defence R&D Organization (DRDO), Central Arid Zone Research Institute (ICAR-CAZRI), National Institute on Implementation Research (ICMR-NIIRNCD), Dr. Sarvepalli Radhakrishnan Rajasthan Ayurved University Jodhpur, Dr. Sampurnanand Medical College (SNMC), Jodhpur Industries Association (JIA), Rao Jodha Park, Podar Educational Institutions.

- c. Agreement signed between RajCOMP Info Services Pvt. Ltd. (RISL), IIT Jodhpur and JCKIF on February 22, 2022



## Activities

JCKIF has been involved in a plethora of activities around the year.

- A series of 12 lectures titled “Thar Talk Series: AI and Beyond” was organized jointly by the School of Artificial Intelligence and Data Science (AIDE), IIT Jodhpur and JCKIF.
- JCKIF in collaboration with NIFT Jodhpur and IIT Jodhpur has organized the 2nd and 3rd Need Assessment Workshop Series “Crafts, Tourism and the Pandemic – gauging the current status”, on April 12, 2021 and May 01, 2021.
- Two lectures under “Biodesign Talk series” were organized under the joint programs in Medical Technologies by IIT Jodhpur and AIIMS Jodhpur on July 10, 2021 and Sep 25, 2021.

## Achievements

Startups incubated in the area of Medical Technologies.

# TIH - iHub Drishti Foundation

The TIH (Technology Innovation Hub) at IIT Jodhpur, named iHub Drishti, focuses on building cyber-physical systems for Computer Vision (CV), Augmented Reality (AR) and Virtual Reality (VR). It is a Section-8, Not-for-profit organisation promoted by and at IIT Jodhpur under National Mission on Interdisciplinary Cyber physical System (NM-ICPS) of Government of India.

In FY 2021-22, iHub Drishti has developed 20 technologies as part of RAKSHAK (Remedial Action, Knowledge Skimming, and Holistic Analysis) initiative of DST. The hub has translated some of these technologies into products/ databanks:

1. Campus Rakshak: A product bouquet consisting of technically astute components to cater: (i) A badging system that enables the real-time implementation of interventions for COVID. (ii) The app that builds an anonymous contact graph, which can aid contact tracing. (iii) A novel smart pooling scheme to quantitatively screening resulting in considerable savings in screening cost. (iv) Simulator that tracks the spatial movement of agents which enables rich visualisation of activity on campuses. Pilot commercial run has been done at IIIT hyderabad and IIT jodhpur campuses.
2. Smart Health Solution for Rapid Mass Screening using Integrated Telemedicine for Homecare: Monitoring SpO<sub>2</sub>, heart rate, temperature of human body. Web and Android Application for video conference and chat support. The telemedicine solution is supported in Hindi, Bangla and English. The solution has been deployed at IIT Jodhpur PHC, and at a village in Sundarban area, West Bengal.
3. Other prototypes/products are: (i) AI-based platform to monitor and identify smell, taste and key COVID-19 therapeutic hotspots. (ii) Lakshman Rekha - A biometric smartphone App for strict post-COVID home quarantine management. (iii) Social distance alert - a wrist band for COVID based on RFID and bluetooth technology.
4. Databanks: 4 databanks have been created under RAKSHAK program: (i) Chest CT scans data of Indian COVID-19 patients, (ii) Radiology data for SARS nCov-2, (iii) Speech and Coughing breathing sound data, (iv) 5 lungs diseases chest X-Ray dataset.

iHub Drishti has cohosted IEEE International Conference on Automatic Face and Gesture Recognition 2021. It has co-organised SRS 2022 in collaboration with ACM student chapter IIT Jodhpur. It has also organised a hackathon in collaboration with Prithvi.AI (Industry Partner).

A MOU has been signed and five projects initiated in collaboration with DRDO CAIR: (i) Real-time 3D scene reconstruction and localization of autonomous ground vehicles in unknown environments, (ii) Seeing through occlusions, (iii) Visual intelligence generation from wide area sensing, (iv) TrustMe: Explainable adversarial attack detection and mitigation for object recognition algorithm, (v) Human-in-loop control for semi-autonomous system under presence of multimodal sensing and actuation delays.

Following projects initiated through Open Call: (i) Game development with ASI, (ii) India Anatomy Project Umbrella, (iii) Improving doctor-patient communication using VR, (iv) Haptics based medical simulators for palpation and tele-diagnosis, (v) Content creation solution for AR VR, (vi) Digital museum development with Rajasthan Government.

iHub Drishti has installed and commissioned an AI System built on NVIDIA A100, NVIDIA DGX A100 which is the universal system for all AI workloads and offers unprecedented compute density, performance and flexibility in the world's first 5 petaFLOPS AI system.

The TIH team is led by Prof. Mayank Vatsa, the Project Director, and Dr. Manas Bairagi, Chief Executive Officer (CEO).

# IIT Jodhpur Technology Park

The Indian Institute of Technology Jodhpur promotes and supports the technology thoughts and actions towards the societal reach out / impact as important extension activities and the Scientific Social Responsibilities. In fulfillment of the above, IIT Jodhpur has been engaged in the (a) creation of a vibrant ecosystem that incubates and promotes learning, research, inventions and eventually innovations; and (b) providing technology innovations as a force to as many industries as possible for the economic value creation. The latter is planned through the IIT Jodhpur Technology Park in the sprawling campus of IIT Jodhpur having advanced facilities for industry engagement and scale-up of innovation capacity by leveraging the available intellectual capital at IIT Jodhpur. We are working towards diffusion of the fruits of cutting-edge R&D from IITJ by setting up state-in-art infrastructure having facilities for design and development of advanced technologies. Pending the construction and set-up of a fully functional Technology Park with all add-on facilities, a mini version has already been established at the Innovation Centre in the Pocket-B of the main campus. With a few Centres of Excellence in the contemporary technology verticals, this mini version of the Technology Park at the Innovation Centre envisaged for the creation of a thriving techno-entrepreneurial ecosystem. This is expected to boost the creation of new age technology ventures and directly contribute to the capacity building for emerging industries. Presently the industries associated at IIT Jodhpur Technology Park are as follows.

## 1. **Johari Digital Healthcare Limited (JDHL), Jodhpur:**

One of the first MDSAP and US FDA certified GMP audited manufacturing company in India working on design, development, engineering and production of electronic healthcare devices to be distributed worldwide, has set up a Centre of Excellence for Medical Technologies at the Innovation Centre powered by JDHL. They inaugurated their centre on 3rd January 2022 at IIT Jodhpur Tech Park. The grand inauguration was done in the presence of esteemed guests including Prof. Santanu Chaudhury, Director, IIT Jodhpur, Prof. Sampat Raj Vadera, Deputy Director, IIT Jodhpur, Mr Satyendra Johari & Mrs Nisha Johari, Founders, Johari Digital Healthcare Ltd. and other dignitaries.



Dignitaries during inauguration session of 'Johari Center of Excellence' at IIT Jodhpur Technology Park

Mr. Satyendra Johari, CEO & Founder, Johari Digital (JDHL) said it is a win-win situation for both JDHL and IIT Jodhpur. This collaboration will enable core research into innovations for world-class product development in the country. The R&D needs lots of efforts before the product gets into commercialization with complete quality controls and Johari Digital can play an important role to bridge the gap. Mrs. Nisha Johari, Co-founder, Johari Digital, shared that having such a CoE would provide an opportunity to the budding engineers to be absorbed for world class product development within the country and can help stop the brain drain from premium institutes like IIT. Through this venture we look forward to a great future.

At this occasion, Prof. Santanu Chaudhury expressed his happiness for this initiative and mentioned that there are several emerging technologies coming up at IIT Jodhpur potentially in different spaces. Some of these technologies are in the space of electronics as well as mechanical applications where joining hands with Johari will bring a set of products through this collaboration which will be conceptualized, indigenously developed and engineered so as to bring up products of Indian origin. This CoE will lead to the development of products which have originated from India, the entire IP as well as the manufacturing capability will also be with India. For a new IIT like IIT Jodhpur this alliance with a Global player like Johari in Jodhpur has a huge value. This will nucleate a MedTech industrial ecosystem in the country.

During the event, Johari Digital showcased numerous advanced technologies in healthcare which are Engineered to manufacture for Global Industries. Johari Digital is a global Medtech company with 40+ years of expertise in medical device manufacturing. The manufacturing facility complies with MDSAP, ISO 13485:2016 and FDA (21 CFR 820) standards and processes. Johari's versatile product development portfolio has innovative life science products, diagnostic devices, new AI & ML based Medical Technologies and therapeutic devices. The company provides

manufacturing solutions to global MedTech giants as well as innovative start-ups. In this CoE a few projects have already been initiated with the help of faculties and students of IIT Jodhpur.

2. **Rajasthan Solar Association (RSA)** launched the Centre of Excellence for Renewable Energy at the Indian Institute of Technology, IIT Jodhpur Technology Park, on Friday, 28th January 2022. An MoU was signed between IIT Jodhpur Tech Park and RSA which aims at supporting research and development work for renewable energy. The event was followed by a formal meeting of CSR stakeholders such as Elektrolites Power Ltd, Oil India Ltd., Udaipur Cement Works Ltd., Renew Power Pvt. Ltd., Brookfield Renewable, Greenko Group –a few of them be mentioned. The faculty experts from the Institute working in the different areas of renewable energy also made presentations. These include Prof. Manoj Choudhary, Dr. Deepak Fulwani, Dr. Prodyut Chakraborty, Dr. K. R. Ravi, Dr. Shobhana Singh, Dr. Ritu Gupta, Dr. V. Narayanan, Dr. Ambesh Dixit and Dr. Meenu Chhabra.

**Some of the focus areas of research in this collaboration would be:**

- » Advanced electronics
- » Remote monitoring
- » Trackers and inverters
- » Automatic cleaning systems
- » Solar, thermal and wind-solar
- » Interventions in solar panel technologies
- » Research on polysilicon and entire value-chain
- » AI and deep learnin



MoU Exchanged between IITJ Tech Park and RSA

In addition to above, various specific courses and programs will also be designed to up-skill the available workforce resources. This collaboration would make IIT Jodhpur Technology Park a vital manufacturing hub that will provide consistent industry exposure to the students, professionals and other stakeholders.

3. **WhizHack Technologies Private Limited** also came in an agreement with IIT Jodhpur Tech Park and a Centre of Excellence (CoE) in Cyber-Physical-Systems Security has been planned to be started w.e.f. 1st June 2022 to encourage and promote cooperation for developing jointly

branded Advocacy, Training programs and Product Development in the mentioned areas. WhizHack Technologies is the first Indian product engineering and human capital development company for managing complete value chain of secured cyber environment.

There are other proposals for centres of excellence under discussion and these are from a proposal from M/s KritiKal Solutions Pvt. Ltd., TagTaste Foods Pvt. Ltd. and Sonani Jewels Pvt. Ltd. Surat. to set-up a centre at IIT Jodhpur Technology Park.

# IITJ Marudhara Foundation

IIT Jodhpur Marudhara Foundation is a company set up under Section 8 of the Companies Act 2013 to support IIT Jodhpur in bridging the funding gaps. In order to work smoothly and efficiently, IIT Jodhpur Marudhara Foundation can retain 2-5% of the donations, grants etc it receives to meet expenses and sustain itself, before remitting the balance funds to IIT Jodhpur. Marudhara Foundation is incorporated in 2019 with the following objectives:

- To encourage, promote and facilitate education and research and other activities of the Indian Institute of Technology Jodhpur (Institute)
- To apply to the Government, public bodies, urban, local, municipal, district and other bodies, corporations, companies or other persons for and to accept grants or money, equipment, land, buildings, donations, gifts, subscriptions and other assistance with a view to promote and further the objects of the Company.
- To encourage dialogue with industries for research and consulting projects

Being a non-profit entity, Marudhara Foundation is eligible to avail Income Tax exemption under Section 12A/12AA of the IT Act. IIT Jodhpur Marudhara Foundation has received the 80G and 12AA

certificates thus donors will be benefited. Marudhara Foundation can seek donations from companies and donors, to obtain its initial Corpus or Seed funding required to set up the office and begin operations. IITJ Marudhara Foundation has its registered office at IIT Jodhpur and it envisages to set up a liaison office in New Delhi managed by a two-member team, i.e., CFO (Chief Financial Officer) and Financial Analyst or Accountant after seeking prior regulatory approvals.

Recently, IIT Jodhpur Marudhara Foundation has also reconstituted its board and added five new Board of Directors. IIT Jodhpur Marudhara Foundation also initiated the crowd funding as a result of this, 34 students of IIT Jodhpur have agreed to donate their caution money to IIT Jodhpur Marudhara Foundation. The foundation has applied for a payment gateway; the payment gateway will enable it to receive national as well as international funds, grants and donations.

# Staff Members

The following are the Staff Members engaged in various Offices and Departments of the Institute.

Staff Members	
Name	Designation
Dr. Kshema Prakash	Deputy Librarian
Amardeep Sharma	Joint Registrar
Ashok Kumar Khanduri	Joint Registrar
Naresh Joshi	Deputy Registrar
Jayita Sarkar	Scientific Officer
Shakti Ranjan Patra	Assistant Registrar
Himmat Singh	Assistant Registrar
Baikuntha Nath Sahu	Assistant Registrar
Prashant Bhardwaj	Assistant Registrar
Malati T.	Assistant Registrar
Ashish Kachchawaha	Assistant Registrar
Anand Padegaonkar	Assistant Executive Engineer (Civil)
Gaurav Bhansali	Assistant Executive Engineer (Electrical)
Jayanta Borthakur	Manager (ICT) – Networking
Ashish Vyas	Manager (ICT) – System Administration
Rimpesh Katiyar	Technical Superintendent
Narendra K. Singh	Technical Superintendent
Rinkesh Kumar Mangal	Technical Superintendent
Dheerendra Kumar Yadav	Technical Superintendent
Poonam Chand Sankhla	Technical Superintendent
Gaurav Nigam	Superintendent
Sandeep Singh Chandel	Superintendent
Sharabh Pradhan	Superintendent
Naresh Chouhan	Superintendent
Vinay Kumar	Assistant Engineer (Electrical)
Amit Kumar Soni	Assistant Library Information Officer
Kamleshkumar Patel	Assistant Library Information Officer
Chunni Chhatwani	Senior Library Information Assistant



Staff Members	
Name	Designation
Ashish Kumar	Junior Engineer (Civil)
Amit Kumar	Junior Engineer (Electrical)
Laxman Singh	Junior Superintendent
Darsh Kumar Khatwani	Junior Superintendent
Ashok Gehlot	Junior Superintendent
Hanuman Singh	Junior Superintendent
Arjun Das	Physical Training Instructor
Arun Narayanan P J	Assistant Industry Liaison Officer
Sharad Srivastava	Senior Assistant
T. Madhavi Lata	Senior Assistant
Gurpreet KaurVirdi	Senior Assistant
Dhani Ram	Senior Assistant
Ram Singh Ratnu	Senior Technical Assistant
Swati Kushwaha	Senior Assistant
Rakesh Kumar	Senior Assistant
Rashmi Dhyani	Senior Assistant
Trilotama Singh	Senior Assistant
Vivek Verma	Senior Technical Assistant
Praveen Suthar	Senior Technical Assistant
Ganpat Choudhary	Senior Technical Assistant
Gajraj Sharma	Senior Technical Assistant
Shubham Pandey	Senior Technical Assistant
Kailash Chander	Senior Technical Assistant
Shashank Choudhary	Junior Assistant
Dheeraj Upadhyay	Junior Assistant
Neeraj Kumar	Junior Assistant
Suresh Chandra Phulara	Junior Assistant
Ramniwas Dhayal	Junior Assistant
Sapna Sankhla	Junior Assistant
Narayan Dadhich	Junior Assistant
Poonam	Junior Technical Assistant
Naveen Kumar	Junior Technical Assistant
Ravi Jangid	Junior Technical Assistant
Sampatlal N Suthar	Junior Technical Assistant
Shyam Sunder Singh	Junior Assistant
Ishmeet Singh	Junior Assistant
Ganesh Kumawat	Junior Assistant
Shankar Singh	Junior Assistant
Lalit Mohan	Junior Assistant
Arjun Singh	Junior Assistant
Robin Singh Kaintura	Junior Assistant
Sambaji	Junior Assistant

**Staff Members**

Name	Designation
Sunil Kumar	Junior Assistant
Deepika Sharma	Junior Assistant
Mahendra Singh Meena	Junior Assistant
Kalpana Deep	Junior Assistant
Bonagiri Umamaheswara Rao	Junior Technical Assistant

**Staff Members (Standing Committee)**

S. C. Bose	Advisor (Academics)
P. G. Basak	Advisor (Administration) & Offg. Registrar
S. D. Jatav	Audit Officer
Kirity Kumar Roy	Advisor (Industry-Academia Interface)
Nivedita Verma	English Language Instructor
Mohit Mathur	Manager (Facilities)
Dr. G. Kiran Arya	Medical Officer

**Honours & Accolades****Meritorious Staff Award 2021-22**

	NIL	Group A
Ashish Kumar	Junior Engineer (Civil)	Group B
Neeraj Kumar	Junior Assistant	Group C

**Honours & Accolades****Meritorious Staff Award 2020-21**

	NIL	Group A
Bharat Pareek	Technical Superintendent	Group B
Darsh Kumar Khatwani	Senior Assistant	Group C

**Honours & Accolades****Meritorious Staff Award 2019-20**

Shakti Ranjan Patra	Assistant Registrar	Group A (Jointly awarded)
Anand Padegaonkar	Assistant Executive Engineer (Civil)	
Laxman Singh	Junior Superintendent	Group B
Gajraj Sharma	Technical Assistant	Group C

# New Initiatives towards Vision 2025

Aside from setting up an Office for Planning and Resource Generation and a Vision coordination committee to implement the carefully thought-out vision, the Institute is actively taking coordinated efforts on several fronts to realize the lofty vision that it has embarked on.

Curriculum, pedagogy and student life cycle: On the academic front, the Institute recently revamped its curriculum across departments with the aim of creating human resources that can solve the problems of the future. The revamped curriculum also offers increased flexibility to the students to build their own B.Tech. program by selecting various capability-linked opportunities (minors, departmental specializations, dual degrees etc.). The Institute has launched new programs including BS programs (Chemistry & Physics), PG programs (M. Sc. in Computational Social Science, Executive M.Tech. programs in various domains), certificate courses and continuing education programmes. A new school of liberal arts (SoLA) has been established by the Institute with the goal of advancing liberal arts education and research in the Country. The Institute has also established a new model for the B.Tech. program with the launch of the B.Tech. program in Engineering Science. All new programs and the revamped curriculum of existing courses are being delivered using innovative pedagogical methods. Faculty Members using innovative teaching methods are regularly recognized by teaching excellence and the Dr. Vandana Sharma award for Innovation in Teaching. The Institute has setup the facility required for delivery of these course contents online, offline and in hybrid mode, preparing itself for a future, where education will largely be online. In addition

to the academic activities, IIT Jodhpur enables students to have an enriching experience by being part of various co-curricular and extra-curricular activities. To this effect, the Institute has organized and functionalized the student councils and their constituent boards and societies:

## Student Activity Council (SAC)

- Board of Art & Culture
- Board of Literary Affairs
- Board of Student Sports
- Board of Student Welfare
- Board of Hostel Affairs

## Academic and Co-Curricular Activity Council (ACAC)

- Board of Academic Interactions
- Board of Co-curricular affairs
- Board of Departmental Society
- Board of Innovation and Entrepreneurship
- Board of Career Development
- Society for Alumni Affairs

Several activities and events were organized with great enthusiasm in the last financial year by the student bodies creating an enriching environment for the student campus life.

Research, collaboration and industry connect: IIT Jodhpur's research focus areas have expanded substantially and the Institute has ventured into several interdisciplinary research areas in partnership with industry, government and academic institutions of national

and international repute. Of particular note, the Institute has entered into memoranda of understanding with the Electronic Industries Association of India; Siemens Software; Rajasthan State Industrial Development and Investment Corporation Ltd.; Wiley India Private Limited; Institut Polytechnique De Grenoble to collaborate on various frontier areas. This has been facilitated largely by the Office of Corporate Relations and the Office of International Relations & Outreach, recently set up by the Institute. Our corporate relations does not restrict engagement with industry just for sponsored research and consultancy, but also for industry level skilling, reskilling and upskilling. In a consistent move towards engaging with industry for research, departmental industry days were organized by various academic units of the Institute. The Institute also recognizes upcoming and senior researchers within the Institute by awarding young and senior researcher awards during its annual foundation day celebrations. In addition to research excellence awards, the Institute has also launched the Moonshot competition to stimulate innovative ideation among its Faculty Members. The Institute has launched the International Research Mobility Grant scheme for young Faculty Members to enable them to establish international research collaborations and visit these Institutions of repute. Work from IIT Jodhpur has been published in journals and conferences of national and international repute. The Institute has consistently worked towards improving intellectual property (IP) among the IITJ community. The Office of Research and Development, empanelled several distinguished IP attorneys and experts to support researchers in securing their IPs. It is noteworthy that two patents were granted, three filed and one published in the financial year 2021-22. The Institute also transferred technology for the CODE device for better indoor air quality maintenance to M/s. Divya Plasma Solution Pvt. Ltd. Noida.

Infrastructure, financial plan and outreach: The Institute is among the top in second generation IITs, who have completed infrastructure as per the revised DPR 2015. With phases 1 and 2 successfully completed, the Institute has had a growth spurt with the erection of various academic and non-academic buildings in the last year. As always, the focus of our infrastructure development has been sustainability. To this effect the Institute has

initiated several sustainability actions under the two major verticals (Horticulture and Landscaping (HoLa) and Society, Energy and Environment (SEE)) of its unique campus sustainability program. With a futuristic vision, the Institute had constituted a new financial model taskforce in order to innovate financial management of the Institute. The taskforce recently submitted its interim report. The Institute is also actively pursuing CSR funding from various avenues and philanthropic donations through different channels to sustain its rapid growth. The Institute recognizes the value of outreach and constantly engages with different stakeholders through dedicated channels. As an Institute with scientific social responsibility, IIT Jodhpur engages with local stakeholders for the benefit of the region. One such major initiative is the provision of clean water to local schools by design and installation of water purification systems. The Institute also led several projects under the Unnat Bharat Abhiyan during the COVID-19 outbreak for development of relevant technologies. To engage with various stakeholders on various fronts, the Institute has set up section 8 companies such as:

- The IITJ Marudhara foundation to encourage, promote and facilitate education and research and other activities of the Institute, engage with industry, PanIIT Alumni and other major stakeholders for the overall development of the Institute.
- iHub Drishti established under National Mission on Interdisciplinary Cyber-Physical System (NM-ICPS). The hub endeavors to ramp up its activities encompassing development of technology and products, setting up state-of-the-art labs, generation of intellectual properties, increasing CPS research base, development of entrepreneurial ecosystem, job creation, human resource development and international collaboration.
- Jodhpur City Knowledge and Innovation Cluster / Foundation created with the goal to provide a necessary platform to create synergy between all the stakeholders to make use of available knowledge as well as to develop advanced technologies, creative skills, state of the art infrastructure, and innovative environment in an organized manner so as to ensure sustainable and systematic development of the city of Jodhpur.

- IITJ Technology Innovation and Start-up Center, the umbrella incubation center of IITJ has a mandate to incubate Deep-Tech startups along with the aim of developing a vibrant entrepreneurship ecosystem in the institute and the larger region in the state of Rajasthan. IITJ TISC received the coveted BioNEST grant from Biotechnology Industry Research Assistant Council (BIRAC) to set up a Bio Incubator which gained the distinction of becoming the first instance of a Bio Incubator in the state of Rajasthan
- IIT Jodhpur has also set up a technology park having advanced facilities for industry engagement and scale-up of innovation capacity by leveraging the available intellectual capital at IIT Jodhpur. The goal of IIT Jodhpur's technology park is to provide technology innovations as a force to as many industries as possible for the economic value creation.

Overall, the Institute has not only grown rapidly, but also meaningfully on various fronts towards the vision that it had set for itself.

## Planning & Resource Generation

New Financial Model Task Force produced an Interim Report which documents the necessary steps for the up-gradation of existing practices and putting in place prudent measures for better overall management.

Coordinating review of vision implementation at various academic units. For resource generation, the office has been approaching several corporates and sharing different opportunities for supporting the institute. Associate Dean (Planning & Resource Generation) was also part of an institute-level delegation and made a presentation at the inauguration of the IIT Jodhpur Alumni Association - North America chapter.



## International Relations and Outreach

The Office of International Relations and Outreach looks after the international collaborations, alumni relations, and continuing education program, in the Institute. Details of National and International MoUs arranged through the Office of International Relations and Outreach are as below.

S. No.	MoU / Agreement signed between	Date of signing
1	MoU between Dr. SARVEPALLI RADHAKRISHAN RAJASTHAN AYURVED UNIVERSITY, JODHPUR & IIT JODHPUR	24.02.2021
2	License Agreement between Confederation Of Indian Industry and IIT Jodhpur	06.01.2021
3	MoU between Wiley India Private Limited and IIT Jodhpur	17.08.2021
4	MoU between Institut polytechnique De Grenoble and IIT Jodhpur	01.05.2021
5	MoU between Sharman Foundation and IIT Jodhpur	25-04-2022

S. No.	MoU / Agreement signed between	Date of signing
6	MoU between The University at Albany, State University of New York, USA and IIT Jodhpur	19.05.2022
7	MoU between The University at Albany, State of New York, USA and IIT Jodhpur (Deptt. of CS&E)	19.05.2022
8	MoU between The University at Albany, State of New York, USA and IIT Jodhpur (Deptt. of Electrical Engineering)	19.05.2022
9	MoU between The University at Albany, State of New York, USA and IIT Jodhpur (SM&E)	19.05.2022
10	Co-operation Agreement for joint Multi-institutional International Education, (among University at Buffalo (The State University of New York), IIT Delhi, IIT Kanpur, IIT Bombay, IIT(BHU) Varanasi and Ashoka University Sonipat Research, and Training	17.05.2022
11	Agreement for a Joint PhD Degree Program (JPD) between IIT Jodhpur and University at Buffalo	17.05.2022

### Sharman Foundation Scholarship for B. Tech. Students

The Institute has collaborated with Sharman Foundation, USA, a USA-based non-profit organization founded by Dr. Vinay Jain and his family for providing funding support for at-need students in India to pursue education in a technical field. The foundation has been providing funding support to many UG students at various IITs for the last few years and IIT Jodhpur is included on the list this year. The Foundation is giving scholarships to an individual who is having an annual household income of less than 5 lac rupees.

### Alumni Relations

Alumni are important stakeholders of the Institute. The Alumni Relations Committee (ARC) primarily focuses on engagement of alumni in a purposeful manner, which benefits the Alumni, Students, and the Institute. The Committee enables and facilitates activities that (1) Benefit our Alumni (2) Foster mutual trust and (3) Promote professional and technical excellence.



**Dr. Kaushal A Desai**  
Associate Dean, International Relations and Outreach



**Dr. Shankar Manoharan**  
Chairman, ARC



**Dr. Samanwita Pal**  
Associate Dean, Students



**Dr. Kshema Prakash**  
Member



**Dr. Ashish Pathak**  
Member



**Dr. Shaheb Ahmed**  
Member



**Dr. Rajendra Nagar**  
Member



**Ms. Gurpreet Kaur Virdi**  
Office of Alumni Relations



**Ms. Apeksha Mathur**  
Office of Alumni Relations

The Alumni of IIT Jodhpur have always brought pride to their Alma Mater by excelling in their respective professions as part of multinational companies, esteemed institutions of research, prominent institutions of higher education or rapidly growing entrepreneurial ventures. A glimpse of the initiatives undertaken by the Alumni Relations Committee along with the Society of Alumni Affairs in the last year are presented below:

### The Alumni Connect-PG Orientation 2021

A panel discussion featuring IIT Jodhpur PG alumni was organized as part of the PG Orientation 2021 Program scheduled on 22.07.2021. Our Alumni Ms. Nupur Rathore, Ph.D. in Electrical Engineering (Class of 2020), a Senior Technical Lead in Mercedes; Ms. Namrata Pant (Class of 2019) M.Tech, in Bioscience & Bioengineering

currently working as Researcher in Tata Research and Development Centre and Ms. Shruti Srivastava, M.Tech. in Information and Communication Technology (Class of 2018), Senior Associate, Technology in Morgan Stanley served as panelists. Alumni oriented the new students by sharing their experiences, hardships and learnings during their tenure at IIT Jodhpur and offered guidance to PG students on how they can make the most of their time here at IIT Jodhpur to prepare themselves for a career in the real world. The Alumni strongly focused on being a student and learner throughout life, exploring opportunities coming your way and accepting the changes and just keep going and being focused to achieve your targets. The discussion was further followed by the Breakout session with each Alumni for the new students. The event ended with the formal vote of thanks proposed by Dr. Shankar Manahoran.



## Alumni Town Hall

On 30 October 2021 the Alumni Relations Committee (ARC) organized an Alumni townhall to address key questions from prospective and current undergraduate students on navigating through the various stages of life at an IIT. Mr. Tejas Muley, Manager R&D, Michelin India B.Tech. (ME), Class of 2012; Mr. Sundara Tejaswi Digumarti, Postdoctoral Researcher, Oxford Robotics Institute, UK., B.Tech. (EE), Class of 2012; Mr. Siddarth Jain Chief of Staff OSD, Govt. of India B.Tech. (ME), Class of 2014; Mr. Harsh K Gandhi, Ph.D. in Electrical Engineering, Caltech B.Tech. (EE), Class of 2021; and Mr. Tanmay Sethi, Co-Founder - Nebula Innovations B.Tech. (ME), Class of 2014 served as panelists of the event.



## The Alumni Connect-Samanvay UG Orientation 2021

Samanvay, the Alumni connect event was organized on 4 December 2021 as the final leg of the UG orientation program for the 2021 batch of UG students at IIT Jodhpur. The event started with a welcome address by the Chairman (Alumni Relations Committee), Dr. Shankar Manoharan. The event was graced by invited speaker Ms. Mahua Mukherjee Co-Founder, The Star in me - A career advancement platform for women, Alumna of IIT Kharagpur. Ms. Mukherjee shared her journey as a student and the path she took to become an entrepreneur. She also discussed key skills that new students need to build through academic and cocurricular activities at IITs. Mr. Shashank Kumar, Founder at PushOwl (Acquired by Sendinblue) and alumnus of IIT Jodhpur, delivered a talk on “Building the foundation of entrepreneurship during college”. This was followed by a panel discussion among alumni of IITJ Ms. Swathi Manda Researcher in Massachusetts, USA; Ms. Akansha Saran, Graduate Research Assistant, Austin, USA; Dr. Rohit Maitri, Senior Data Scientist, KPMG, Amsterdam, Netherlands; Dr. Arun Balajee Vasudevan, Researcher, Adobe, Zurich, Switzerland. All the participants were benefited by the experience of the speakers and panelists. The event was

concluded with a vote of thanks by Mr. Haider Ali Quadri, Vice President, Society for Alumni Affairs.



## Alumni Induction Program 2021

On 18 December 2021, the Alumni Relations Committee organized an Alumni Induction program followed by Dinner on the eve of the convocation of the Institute. The event started with the welcome address by Chairman Alumni Relations Committee, Dr. Shankar Manoharan followed by an Induction address by Prof. Santanu Chaudhury, Director IIT Jodhpur. Our beloved Chairman Board of Governors, Prof. R. Chidambaram addressed the graduates and motivated them to work for the betterment of the Nation. The event

concluded with a formal vote of thanks by Dr. Kaushal Desai, Associate Dean International Relations and Outreach followed by Dinner. In a fundraising campaign organized by the Alumni Relations Committee as part of this event, 34 Students of Class of 2022 chose to donate their caution deposit to the IIT Jodhpur Marudhara foundation, a section 8 Company of IIT Jodhpur. We are grateful and applaud our Alumni, who have contributed to the welfare of the Institute and the student community.





### Annual Alumni Day 2022

The Annual Alumni Day of the Institute was organized virtually on the 26th of March 2022. The event was organized by the Alumni Relations Committee in collaboration with the IIT Jodhpur Alumni association. The event was attended by IIT Jodhpur Alumni across the world and by the IIT Jodhpur community. The event began with a welcome address by Dr. Shahab Ahmad, Event Lead, Alumni Relations Committee IIT Jodhpur. Prof. Santanu Chaudhury, Director IIT Jodhpur addressed the Alumni on the vision for IIT Jodhpur and how Alumni can contribute to achieving the vision. Prof.

Chaudhury also outlined the various interesting updates to the academic programs of the Institute. He underscored how IIT Jodhpur considers Alumni as one of the key stakeholders of the Institute by describing several measures taken by the Institute to onboard in various roles at IIT Jodhpur. Mr. Tanmay Sethi, President, IIT Jodhpur Alumni Association, highlighted Initiatives & Roadmap for 2022 from the IIT Alumni Association. This was followed by an address by Dr. Deepak Fulwani, Associate Dean (Planning & Resource Generation) in which he introduced the IITJ Marudhara Foundation, a section 8 company of the Institute.



#### Mr. Shashank Kumar

Recognition of Excellence in Young Alumni Awards (REYA) Winner 2022  
 Class of 2013 of B. Tech. Computer Science and Engineering  
 Founder, PushOwl (Acquired by Sendinblue)  
 Category : Excellence in Entrepreneurship

The main highlight of the evening included the presentation ceremony of the Recognition of Excellence in Young Alumni Awards (REYA). Mr. Shashank Kumar (Class of 2013), B.Tech., in Computer Science and Technology was conferred with the REYA award for Excellence in Entrepreneurship by Prof. Chaudhury. A citation on the merit of the awardee, was read out by Dr. Kaushal Desai, Associate Dean (International Relations & Outreach). Mr. Shashank made acceptance speeches highlighting how IIT Jodhpur had helped him to reach his current positions in his career. The event concluded with a formal vote of thanks proposed by Dr. Kaushal A Desai. At the end of the formal event, breakout sessions were organized in five popular areas for Alumni to network and build connections among themselves and with students.

### First Alumni Meet of the Indian Institute of Technology Jodhpur in the United States

IIT Jodhpur Alumni are bringing laurels to the Institute from across the world. Since most of our

overseas alumni are based out of the United States (US), IIT Jodhpur organized its First US-based Alumni Meet bringing our Alumni in the US together and closer to the Institute. On 14th May 2022, the first US-based Alumni Meet was organized in Washington DC. Professor Santanu Chaudhury, Director, IIT Jodhpur, along with a delegation of Faculty Members met Mr. Ron Gupta, President, PanIIT USA who emphasized on strengthening the alumni activities in the US. One of the key announcements was the formation of the IIT Jodhpur Alumni Association - North America chapter with Mr. Suraj Nadipelly, Mr. Kedar Vaidya, and Dr. Heena Rathore as the focus group for initiating linked activities. Mr. Vinod Gupta, businessman, Pan IIT Alumnus, and philanthropist offered his guidance and advice on forming the Alumni chapter. Notably, Mr. Gupta also played a key role in setting up the Vinod Gupta School of Management, IIT Kharagpur at IIT Kharagpur during the early 1990s. Mr. Anshul Kumar, Counsellor (Education and Community Affairs from the Embassy of India, US, was also present at the meeting.



## Alumni Laurels

Bootstrapped Startup PushOwl, founded by IIT Jodhpur Alumnus Gets Acquired by French Firm Sendinblue



PushOwl is a bootstrapped Indian startup founded by Mr. Shashank Kumar an Alumnus of IIT Jodhpur (B.Tech. in Computer Science & Engineering, Class of 2013) has been acquired in September 2021 by France based SaaS company Sendinblue. PushOwl makes an online marketing tool for e-commerce stores to enable web push notification. Mr. Shashank Kumar will also be joining the Sendinblue leadership team as VP of Product.

### Ms. Shivani Meena- First female mining engineer to work in Coal India's underground quarry:

Our Alumnus of B.Tech. Electrical Engineering, Class



of 2018, Ms. Shivani Meena, the first female engineer of the excavation cadre to contribute to the quarry, after the first female mining engineer to work in Coal India's underground quarry. She has created history

### Shivani, 1st woman excavation engineer, shatters glass ceiling

PRESS TRUST OF INDIA  
Ranchi, 10 September



Gone are the days when only men covered in soot would clamber out of the inhospitable and exacting confines of a coal mine.

Breaking the glass ceiling, Shivani Meena, an IIT Jodhpur alumna, has become the first woman excavation engineer to work in an open cast mine at Coal India arm CCL.

She will be posted at CCL's Rajarappa project, one of the important enterprises of the coal mining behemoth. Until now the position belonged to men.

The feat follows another milestone when Ankansha Kumari became Coal India's first woman mining engineer to work in an underground mine at CCL's Churi facility in North Karanpura area in Jharkhand.

"Nari Shakti (women power) all the way! Congratulations @ CCL Ranchi. Hoping that this will open avenues for more female professionals to join the mining sector," Union Coal Minister Pralhad Joshi said in a tweet.

by contributing to the machined opencast quarry of Rajarappa project (OCP) in Ramgarh. She will oversee the maintenance and repairs of heavy machines (HEMM).

## Executive Education

The IIT Jodhpur (IITJ) CEP Office was established to meet the knowledge upgrading and upskilling needs of working professionals in the S&T industry, academia, and government. Under this initiative CEP office is coordinating PG Diploma in Data Science and Cloud Computing, M Tech in Augmented Reality and virtual Reality, M Tech in Robotics and Mobility Systems programs for Working Professional in addition to M.Tech. in Data and Computational Science. Also, one short term program on Data Analytics and Fundamentals of Machine Learning (ML) for Process Modelling is scheduled for October 2022. The Continuing Education Program is an outreach initiative of IIT Jodhpur which aims to cater to the training and development needs of the working professionals who have a need for specific training that is crucial to their professional success.

Open courses which are currently offered by the CEP Office at IIT Jodhpur are either:

- Short-term open courses which typically lasts from few days to week(s):  
A Short-Term CEP Course On Data Analytics and Fundamentals of Machine Learning (ML); Department of Chemical Engineering IIT Jodhpur from 6th –8th Oct,2022: This course aims to benefit Industrial Professionals, Practicing Engineers from Government/ Private organizations, Researchers and Faculty and Students from Chemical /Civil / Mechanical Engineering branches. The main aim of the course is to provide the introduction and comprehensive fundamental understanding of key concepts required for process data analytics, algebra, machine learning algorithms, statistics and optimization to enable process modelling.
- Long-term courses which last from several weeks to years:  
Post Graduate Diploma and Certificate in Data Engineering & Cloud Computing: For the Academic Year 2022-2023: This is a twelve (12) months intensive program, developed by IIT Jodhpur with marketing partner Wiley. In this program,

the students will imbibe the technologies and methodologies to manage the complete lifecycle of a data engineering project - from big data collection to insight generation using machine learning techniques, experiential learning in Data Engineering with a focus on Cloud Computing. This program aims to benefit aspiring and current software and technology professionals. Currently there are 52 candidates successfully enrolled for this program through the CEP Office.

Executive M.Tech program for Cognizant employees in the following specialization: For the Academic Year 2022-2023: M.Tech (Data and Computational Science) by the Department of Mathematics at Indian Institute of Technology Jodhpur: The Objective of the program is to develop strong understanding of fundamentals of Data Mining, Machine Learning, and Numerical Techniques in the students who participate in this program.

Executive M.Tech. in Augmented Reality and Virtual Reality (AR & VR) by the School of AI and Data Science, IIT Jodhpur in collaboration with TIH iHub Drishti, IIT Jodhpur: The School of AI and Data Science, IIT Jodhpur in collaboration with TIH iHub Drishti Foundation, IIT Jodhpur offers Executive M.Tech in Augmented Reality and Virtual Reality (AR & VR) in which along with the Cognizant employees anyone who fulfills the eligibility criteria can enroll. This program has been designed to cater to the immediate requirement of working manpower trained in emerging AR & VR technologies.

Executive M.Tech program in (Robotics and Mobility Systems) is offered by the Department of Electrical Engineering at Indian Institute of Technology Jodhpur to the Cognizant employees and open to the public: The Objective of the program is to develop strong understanding of fundamentals of Robotics and Mobility Systems.

Currently there are 300 candidates from Cognizant who have successfully enrolled for these three Executive M.Tech programs through the CEP Office .

Our team at CEP office along with the faculties are expert in using the right mix of learning methodologies, with a clear view of the desired goals.

# Academics

## Introduction to the activities of Office of Academics

The Office of Academics manages academic programmes of the Institute which includes admissions to various courses such as B.Tech, BS, M.Tech, M.Sc, M.Sc.-M.Tech., MBA, M.Tech.-Ph.D, Masters, Masters-Ph.D. and Ph.D. (which are based on JEE advanced, GATE, JAM, CAT and UGC NET), Academic Registration, Examinations (online/offline) etc. The Office of Academics successfully conducted the 7th Convocation held on 19 December 2021 in physical mode wherein a total of 402 degrees (180 -B.Tech, 67 -M.Sc., 128 -M.Tech and 27 -Ph.D) were awarded.

### New Initiatives taken by the Office during the period covered

In the Academic Year 2021-22 the Institute had successfully registered with NAD implementation via DigiLocker to facilitate students to get authenticated documents/certificates in digital format directly from their original issuers anytime, anywhere without any physical interface.

### New Programmes Started

The Institute has planned to introduce new UG & PG industry-ready programmes as envisaged in the New Education Policy 2020. A list of new programmes slated to be started from the next academic year at the Institute is placed as under:

1. BS Program - BS Program in Chemistry with specializations, BS Program in Physics with Specializations

2. Master of Science Programs- M. Sc. in Computational Social Science
3. Master of Technology Programs- Robotics and Mobility Systems, Intelligent Communication Systems, Executive - Intelligent VLSI Systems, Augmented Reality and Virtual Reality (AR & VR) for Working Professionals, Augmented Reality and Virtual Reality (AR & VR) Part-time project sponsored, Intelligent VLSI Systems for Part-time and Part-time project sponsored categories, Robotics and Mobility Systems for working professionals, Executive - Cyber Physical Systems
4. Master of Technology - Doctor of Philosophy (M.Tech.-Ph.D.) Dual Degree Programs- Intelligent Communication Systems

### Certificate courses

1. PG Diploma in Data Engineering and Cloud Computing program will start from A.Y. 2022-23.
2. A joint certificate course on Digital healthcare systems by IIT Jodhpur and AIIMS Jodhpur will start soon.

### A new School of Liberal Arts

The Institute has proposed to establish the School of Liberal Arts (SoLA) that aspires to be a forerunner in Liberal Arts education and research by establishing inter and transdisciplinary research collaborations and pedagogic innovations that sit centrally at the intersections of liberal arts, scientific, and technological domains across the country and abroad.

## A new academic model: B.Tech. in Engineering science

In the Academic Year 2021-22, the Institute introduced a new academic model by providing an option to B.Tech. students after 1st year to pursue a targeted focus area in Science and Engineering to meet demands of emerging industrial and academic requirements. The students are required to complete core course requirements in the first two years of study. Further, the students can outline their own curriculum in the form of electives for the remaining two years selecting courses from across disciplines of engineering, science, and humanities. The students on graduation would be awarded B.Tech in Engineering Science degree. Similar to regular B.Tech. students, students enrolled in Engineering Science can also use 10 credits out of stipulated electives and 10 additional credits to earn a minor/specialization as an add-on to the B.Tech degree.

## UG specializations leading to dual degree BTech+MTech/MBA

Students who have already opted for Major/Department Specialization, Minor/Interdisciplinary Specialization can opt for a dual-degree Programme from the eighth semester provided they have earned a minimum of 130 graded Credits with at least 6 CGPA at the end of the 7th semester. As a special case, a student may be allowed to opt for a dual degree by the end of 8th Semester if the student has at least 6 CGPA and continued specialization.

## Teaching Excellence award

The Institute awarded the teaching excellence award for AY 2020-21 on the Institute foundation day held on 02 August 2021 to the following faculty members:

1. Dr. Dip Shankar Banerjee
2. Prof. Mayank Vatsa
3. Dr. Kothadia Hardikkumar Bhupendra

**Also, the Institute awarded Dr. Vandana Sharma Memorial Award Teaching Innovation to the below faculty members:**

1. Dr. Manish Narwaria
2. Dr. Rajlaxmi Chouhan

## Programmes offered

The Institute offered the following Academic Programs in the A.Y. 2021-22.

### 1. Bachelor of Technology Programs

1. Bioengineering
2. Computer Science and Engineering
3. Electrical Engineering
4. Mechanical Engineering
5. Material Engineering
6. Chemical Engineering
7. Civil and Infrastructure Engineering
8. Artificial Intelligence and Data Science

### 2. Master of Science Programs

1. Chemistry
2. Mathematics
3. Physics
4. Digital Humanities

### 3. Master of Technology Programs

1. Bioscience & Bioengineering
2. Computer Science & Engineering
3. Computer Science and Engineering- Artificial Intelligence
4. Cyber Physical Systems
5. Sensors and Internet of Things
6. Advanced Manufacturing and Design
7. Data and Computational Sciences
8. Thermofluids Engineering
9. Materials Engineering
10. Chemical Engineering
11. Civil and Infrastructure Engineering with specialization in Environmental Engineering
12. Civil and Infrastructure Engineering with specialization in Energy
13. Executive - Artificial Intelligence
14. Executive – Data and Computational Science

#### 4. Doctor of Philosophy Programs

1. Biosciences and Bioengineering
2. Chemistry
3. Computer Science & Engineering
4. Electrical Engineering
5. Humanities & Social Sciences
6. Mathematics
7. Mechanical Engineering
8. Metallurgical & Materials Engineering
9. Physics
10. Chemical Engineering
11. Civil and Infrastructure Engineering
12. Management and Entrepreneurship
13. Artificial Intelligence and Data Science

#### 5. Master of Science - Master of Technology Programs

1. Data and Computational Sciences
2. M.Sc. in Physics and M.Tech. in Materials Engineering

#### 6. Master of Technology - Doctor of Philosophy (M.Tech.-Ph.D.) Dual Degree Programs

1. Bioscience & Bioengineering
2. Computer Science & Engineering
3. Artificial Intelligence
4. Communication and Signal Processing
5. Cyber Physical Systems

6. Sensors and Internet of Things
7. Data and Computational Sciences
8. Materials Engineering
9. Mechanical Design
10. Advanced Manufacturing
11. Thermofluids Engineering
12. Civil and Infrastructure Engineering with specialization in Environmental Engineering
13. Civil and Infrastructure Engineering with specialization in Energy
14. Chemical Engineering

#### 7. Doctor of Philosophy Program in Interdisciplinary Areas

1. Robotics and Mobility Systems Technologies
2. Science of Intelligence
3. Digital Humanities
4. IoT & Applications
5. Quantum Information and Computation
6. Smart Healthcare
7. Space Science & Technology
8. Medical Technologies

#### 8. MBA

#### 9. Masters - Ph.D. Dual Degree

1. Medical Technologies

#### 10. Masters Programs

1. Medical Technologies



## Ph.D. Thesis Defense

The following Ph.D. Students defended their theses successfully during this 2021-22 year (01 April 2021 to 31 March 2022):

S. No.	Roll No.	Name	Thesis Title	Supervisor	Department	Thesis Defense Date
1	PG201384003	Mr. Anuj Kumar Bharti	Feature Binding in Working Memory	Dr. Sandeep Kumar Yadav	EE	03-Apr-21
2	P14EE001	Mr. Ajay Kumar Mahato	Fabrication and Characterization of Photo-Sensitive Organic Field-Effect Transistors	Dr. Shree Prakash Tiwari	EE	03-May-21
3	P16CY001	Mr. Gaurav Bahuguna	Fluorinated Nanomaterials for Energy and Sensing Application	Dr. Ritu Gupta	CY	05-May-21
4	P14BL003	Mr. Amitap Khandelwal	Development of algae assisted Microbial Fuel Cell for power generation and algae cultivation	Dr. Meenu Chhabra	BB	16-Jun-21
5	P15ME201	Mr. Aniket Dilip Monde	Solidification and Shrinkage: Analytical and Numerical Model Development with Case Studies	Dr. Prodyut Ranjan Chakraborty	ME	01-Jul-21
6	P16EE002	Mr. Gaurav Jajoo	Blind Signal Modulation Recognition through Clustering Analysis of Constellation Signature	Dr. Sandeep Kumar Yadav	EE	07-Jul-21
7	P15HS201	Ms. Abhra Paul	Writing the Earth: An Ecocritical Reading of the Selected Works of Barbara Kingsolver	Dr. Vidya Sarveswaran	HSS	19-Jul-21
8	P15PH002	Ms. Jyoti Saini	Probing New Physics Through Bottom and Top Quark Decays	Dr. Ashutosh Kumar Alok	PH	28-Oct-21
9	P14CHM001	Ms. Erum Gull Naz	Theoretical Investigations of Unimolecular and Bimolecular Reaction Dynamics in Gas Phase	Dr. Manikandan Paranjothy	CY	03-Nov-21
10	P15ME004	Mr. Sumit Mahajan	Design and development of SMAW electrode coatings for dissimilar metal welds in USC power plants	Dr. Rahul Chhibber	ME	10-Nov-21
11	P16PH002	Mr. Ram Milan Sahani	Metal Oxide Nanostructures & Composites for Ionizing Radiation Detection and Measurement	Dr. Ambesh Dixit,	PH	23-Nov-21

S. No.	Roll No.	Name	Thesis Title	Supervisor	Department	Thesis Defense Date
12	P16CY002	Mr. Urgunde Ajay Bhimashankar	Fabrication of Nanostructured Electrodes for Bio-sensing and Energy Applications using Ni-Co Functional Inks	Dr. Ritu Gupta	Chemistry	23-Nov-21
13	P15MA002	Mr. Rohit Kumar	Renormalizations of Unimodal and Bimodal Maps with Low Smoothness	Dr. V.V.M.S. Chandramouli	Mathematics	30-Nov-21
14	P15BL001	Mr. Ishan Agrawal	Dopamine Induces Functional Extracellular Traps in Microglia	Dr. Sushmita Jha	Bioscience and Bio engineering	20-Dec-21
15	P15PH003	Ms. Khushboo Dixit	A study of Quantum Mechanical aspects in Neutrino Oscillations	Dr. Ashutosh Kumar Alok	Physics	27-Dec-21
16	P14BS004	Ms. Manju Kumari	Facilitative Effect of EEG Neurofeedback on Social Cognition through Mu Suppression	Dr. Ankita Sharma	BISS	25-Jan-22
17	P16CS003	Ms. Shreya Goyal	Fine Grained Feature Representation using Computer Vision Techniques for Understanding Indoor Space	Dr Chiranjoy Chattopadhyay, Dr Gaurav Bhatnagar	Computer Science and Engineering,	27-Jan-22
18	P14BS001	Mr. Alankar Agarwal	Analysis of Lattice Boltzmann Method for Turbulent Flow Simulation on Multi-core GPU Architecture	Dr. B. Ravindra, Dr. Akshay Prakash (IIT Kharagpur)	Enrolled in Focus Group - BISS associated with Mechanical Engineering	18-Feb-22
19	P14CS002	Mr. Ravi Sharma	A Multi Objective Beacon Placement Strategy for 3D Point Cloud Representation of Indoor Environments	Dr. Venkataramana Badarla (IIT Tirupati)	Computer Science and Engineering,	30-Mar-22

A Workshop on New Education Policy 2020 and Action Points for IITs has been organized by IIT Jodhpur on 15th September 2021.

## Collaborations - Memoranda of Understanding (MoU)

The following is a list of MoUs signed by IIT Jodhpur with various Institutions/organizations/companies:

S. No.	MoU / Agreement signed with	Date of signing	Objective	Duration	Ending Date of MoU
1	Mahindra & Mahindra Ltd. Automotive and Farm Equipment Sectors Mumbai	26.11.2014	Mutual desire to expand Industry Academia Cooperation by offering an opportunity to the Faculty Members and Students at IITJ to get industry experience and to the senior professionals of M&M to get academic experience.	3 years	25.11.2017
2	TATA Motors, Mumbai	01.08.2014	Mutual desire to expand Industry-Academia Cooperation by offering as opportunity to the faculty members and students at IITJ to get industry experience and to the senior professionals of TML to get academic experience.	3 years	31.07.2017
3	Larsen & Toubro, Mumbai	06.01.2015	Mutual desire to expand Industry-Academia Cooperation by offering as opportunity to the faculty members and students at IITJ to get industry experience and to the senior professionals of L&T to get academic experience.	5 years	05.01.2020
4	The TATA Power Company Ltd. Mumbai	15.01.2015	<ul style="list-style-type: none"> <li>Mutually help in continually upgrading the curriculum and designing the courses of the Program.</li> <li>Help students in designing and realizing the project objectives that are of mutual interest.</li> </ul>		
5	TATA Consultancy Services Ltd. and IIT Jodhpur	15.01.2015	<ul style="list-style-type: none"> <li>Exchange of Scholars, Researchers and Students for research through inbound and outbound Sabbaticals.</li> <li>Exchange and co-authoring of scholarly and research publications and other information in areas of interest to both parties.</li> </ul>		
6	Indian Institute of Science, Bangalore	30.03.2015	To Promote and enhance collaborative research in the areas of Renewable Energy and related fields of research by using the medium of Faculty Members, Researchers, Research Students and scientists associated with the partner institutes.	5 years	29.03.2020

S. No.	MoU / Agreement signed with	Date of signing	Objective	Duration	Ending Date of MoU
7	IIT Rajasthan Jodhpur and TVS Motor company Limited, Hosur (TN)	09.06.2015		5 years	08.06.2020
8	AIIMS Jodhpur and IIT Jodhpur	10.07.2018	Joint pursuit of education, advancement of research and product development.	Unless it is mutually agreed otherwise.	
9	AIIMS Jodhpur and IIT Jodhpur	06.09.2018	Joint Center for Healthcare Technologies	Unless it is mutually agreed otherwise	
10	Central Connecticut State University New Britain, Connecticut, USA and IIT Jodhpur	08.10.2018	To implement academic exchange and cooperation in teaching, research and training for the advancement and dissemination of learning hereby affirm the intent to reach agreement about the following programs and activities: <ul style="list-style-type: none"> <li>• Exchange of faculty and staff</li> <li>• Exchange of students</li> <li>• Training and joint research activities</li> <li>• Exchange of academic materials and other information</li> </ul>	5 years	
11	CSIR-CEERI, Pilani	21.01.2019	Based on the principle of reciprocity and expresses the interest of both Institutions in exchanging scholars, students, academic information and materials in the belief that the research and educational process at both Institutions will be enhanced and that mutual understanding between their respective scholars and students will be increased by the establishment of such exchange programs.	5 years	20.01.2024
12	NVIDIA Graphics Private Limited and IIT Jodhpur	30.01.2019	To establish IITJ-NVIDIA centre for next generation AI Research (AINEXT)- Artificial Intelligence	3 years	29.01.2022
13	CSIR-Institute of Genomics & Integrative Biology, Delhi	25.02.2019	Collaboration in the areas of mutual interest which would multidisciplinary scientific, technological and educational problems of relevance to the country.	5 years	24.02.2024

S. No.	MoU / Agreement signed with	Date of signing	Objective	Duration	Ending Date of MoU
14	National Digital Library of India, a project of MHRD	26.02.2019	Collaboration to carry out research and develop a production quality Digital Representation Generation tool for Bangla scanned image textual contents.	11 months	Jan/20
15	National Coordinating Institute IIT Delhi (Unnat Bharat Abhiyan) and Regional Coordinating Institute, IIT Jodhpur	06.03.2019	MoU in line with Unnat Bharat Abhiyan, Ministry of Human Resource Development		
16	NARA Institute of Science and Technology, National University Corporation (NAIST), Japan	04.05.2019	To develop and promote mutual cooperative relationship in the fields of Education and Academic Research, and to promote academic exchanges between NAIST.	5 years	03.05.2024
17	M/s. Samsung India Electronics Private Limited (SIEL) and IIT Jodhpur	15.05.2019	Carrying out Research & Development including but not limited to reports, updates, commentaries, outputs, other written documents etc.	1 year	14.05.2020
18	Council of Scientific & Industrial Research (CSIR), New Delhi	02.08.2019	IITJ and CSIR desire to implement, in the areas of mutual interest, cooperative and collaborative activities, which would address multidisciplinary scientific, technological and educational problems of relevance to the country.	5 Years	01.08.2024
19	ANSYS Software Pvt. Ltd., IIT Jodhpur, and Entuple Technologies Pvt. Ltd.	29.08.2019	To promote the Industry-Academic interaction activities especially in the field of Electric vehicles, IoT, Antenna Design and IC design and associated technologies and to promote research, capability and technology development in the same area.	3 years	28.08.2022

S. No.	MoU / Agreement signed with	Date of signing	Objective	Duration	Ending Date of MoU
20	Samsung India Electronics Private Limited (SIEL).	12.09.2019 executing & w.e.f. 16.09.2019	Academic collaboration by way of special industry-oriented courses, jointly by IIT-Jodhpur & SIEL, technical talks & industry expert lectures/demonstrations, minor/major student projects & student technical contests at IIT-Jodhpur subject to the consent of the concerned faculty and the department in this regard. SIEL will support running industry-oriented courses & provide the education to IIT Jodhpur students as agreeable to IIT-Jodhpur keeping in forefront the interest of the students and that for purpose of providing students, an education as per the need of the market.	3 years	15.09.2022
21	College of Life Sciences, Kaohsiung Medical University, Taiwan and IIT Jodhpur (Letter of Intent)	17.10.2019	To Develop Academic and Educational cooperation and to promote mutual understanding between the two universities and further extend the academic and educational cooperation through following programs and activities: <ul style="list-style-type: none"> <li>• Exchange of Faculty, Researchers and administrative staff.</li> <li>• Exchange of students and developing study programs.</li> <li>• Exchange of academic information and materials</li> <li>• Implementation of Dual-degree programs.</li> <li>• Study abroad programs; joint educational programs; joint supervision of PhD Scholars.</li> </ul>	-	16.10.2020
22	Cognizant Technology Solutions India Pvt. Ltd. and IIT Jodhpur	18.12.2019	Research and Development Agreement	3 years	17.12.2022

S. No.	MoU / Agreement signed with	Date of signing	Objective	Duration	Ending Date of MoU
23	Defence Laboratory (DRDO) Jodhpur and IIT Jodhpur	18.12.2019	To Promote relations that mutually benefit each Institute, this being the primary aim of R&D and Academic collaboration and S&T cooperation towards developing new as well as improved products & technologies for strategic defence techniques.	Shall remain in force, unless it is mutually agreed otherwise.	
24	IITJ Technology Innovation Start-up Centre	01.01.2020	Promote technology Thought and action; and prepares needed technical human resources to meet the technology challenges of the nation.	5 years	31.12.2025
25	Robosurg Med-Tech Pvt. Ltd.	16.01.2020	To Provide Research Advisory and conduct activities related to SSI robotic Project.	5 years	
26	PhiMetrics Telecom Value Added Services Pvt. Ltd	24.01.2020	MoU for the research project titled "Voice and Video Analysis"	4 months	
27	Oil India Limited	24.01.2020	To collaborate for promotion of Research, innovation & education and provide a model for industry-academia partnership	5 years	
28	Dayalbagh Educational Institute Dayalbagh, Agra & Environtech Instruments Pvt. Ltd., New Delhi	24.01.2020	Development of sensors with IMPRINT SERB project	3 years	
29	Umalexmi Organics Pvt. Ltd	24.01.2020	Umalexmi Organics has expressed its intent and offer to avail the services of Institute for consultancy on research methodology and technical know-how, inputs, guidance and strategic insights and opportunity to participate in iron impurity Removal Project.	5 years	
30	BlockApps AI Pvt. Ltd. (Bangalore)	19.02.2020 w.e.f. 01.01.2020	Development of Segmentation Algorithms for Surveillance and AI-assisted Health Diagnosis	5 years	31.12.2025
31	Centre for Advanced Research in Imaging Neuroscience & Genomics, New Delhi	07.04.2020	CARING and IITJ desire to implement, in the arear of mutual intrest, cooperative and collaborative activities, which would address multidisciplinary scientific, technologiasl and educational problems of relevance to the country.	3 years	

S. No.	MoU / Agreement signed with	Date of signing	Objective	Duration	Ending Date of MoU
32	ISCON Surgicals Ltd., Jodhpur	05.05.2020	Transfer of technology titled “An Advanced Photocatalytic Oxidation Sterilization System Based on UV-Light and Metal Oxide Nanoparticles Catalyst to treat N-95 Filtering Face-Mask Respirators for reuse” developed by IIT Jodhpur.	1 year	
33	Kamtech Associates Pvt. Ltd.	05.05.2020	Transfer of technology titled “An Advanced Photocatalytic Oxidation Sterilization System Based on UV-Light and Metal Oxide Nanoparticles Catalyst to treat N-95 Filtering Face-Mask Respirators for reuse” developed by IIT Jodhpur.	3 years	
34	Chempharm Industries India Pvt. Ltd.	05.05.2020	Transfer of technology titled “An Advanced Photocatalytic Oxidation Sterilization System Based on UV-Light and Metal Oxide Nanoparticles Catalyst to treat N-95 Filtering Face-Mask Respirators for reuse” developed by IIT Jodhpur.	1 year	
35	Parappadi Technology Pvt. Ltd.	05.05.2020	Transfer of technology titled “An Advanced Photocatalytic Oxidation Sterilization System Based on UV-Light and Metal Oxide Nanoparticles Catalyst to treat N-95 Filtering Face-Mask Respirators for reuse” developed by IIT Jodhpur.	1 year	
36	Johari Digital Healthcare Limited	07.05.2020	Transfer of technology titled “An Advanced Photocatalytic Oxidation Sterilization System Based on UV-Light and Metal Oxide Nanoparticles Catalyst to treat N-95 Filtering Face-Mask Respirators for reuse” developed by IIT Jodhpur.	3 years	
37	Zintex Blue Ocean Pvt. Ltd., Jaipur	16.05.2020	Transfer of technology titled “An Advanced Photocatalytic Oxidation Sterilization System Based on UV-Light and Metal Oxide Nanoparticles Catalyst to treat N-95 Filtering Face-Mask Respirators for reuse” developed by IIT Jodhpur.	1 year	
38	All India Institute of Medical Sciences, Nagpur	16.05.2020	Transfer of technology titled “An Advanced Photocatalytic Oxidation Sterilization System Based on UV-Light and Metal Oxide Nanoparticles Catalyst to treat N-95 Filtering Face-Mask Respirators for reuse” developed by IIT Jodhpur.	1 year	



S. No.	MoU / Agreement signed with	Date of signing	Objective	Duration	Ending Date of MoU
39	TRS Solutions LLP	10.04.2020	Collaborative research in the area of Artificial Intelligence in Medical imaging to advance Radiology diagnostic Capabilities.		
40	GE India Industrial Pvt. Ltd. (including subsidiaries and affiliates of General Electric Company, USA("GE"))		Evaluating technology, exploring research opportunities and/or engaging in future research.	3 years	
41	Deakin University, ABN 56721584203 of 1 Gheringhap Street, Geelong, Victoria, Australia	22.01.2020	Sharing of information relevant to potential collaborative research and development projects to facilitate an understanding of each party's expertise, capabilities and requirements.	3 years	
42	Samsung India Electronics Private Ltd. and IIT Jodhpur	15.05.2020	Carrying out Research & Development including but not limited to reports, updates, commentaries, outputs, other written documents etc.		
43	Brandeis International Business School, Brandeis University, Waltham, Massachusetts	08.08.2020	The principle of reciprocity and expression of interest for collaboration among both institution in teaching learning and research and to explore the promotion of academic cooperation and exchange might include.		
44	All India Institute of Medical Sciences, Nagpur	20.08.2020	Promote relations that mutually benefit each Institute, this being the primary aim of a true academic collaboration; and S&T cooperation towards developing devices for diagnostics and treatment towards providing improved quality of healthcare.	Shall remain in force, unless it is mutually agreed otherwise.	
45	Agreement with L'INSTITUT FRANCAIS EN INDE (IFI)		IFI will provide all necessary support to IIT Jodhpur to run the French language classes under the conditions expressly mentioned below. The sole purpose of this agreement is the promotion and enhancement of the French language in partnership with IIT Jodhpur and its students and faculty.	1 year	
46	NTPC Vidyut Vyapar Nigam Limited	03.09.2020	To Own, Acquire, Establish, Operate and Maintain Generating Stations, Transmission Systems and Distribution Systems.	25 years	

S. No.	MoU / Agreement signed with	Date of signing	Objective	Duration	Ending Date of MoU
47	(Non Disclosure Agreement) M/s Watsan Envirotech Private Limited (CIN U29253 TN2013PT C091052)	01.09.2020	For Improvement of formulations and performance based on various types of water alleviations, using different models of G filters across India.	3 years	
48	(Non Disclosure Agreement) M/s Watsan Envirotech Private Limited (CIN U292 53TN20 13PTC 091052)	01.09.2020	For Improvement of formulations and performance based on various types of water alleviations, using different models of G filters, additionally modified with different variations of carbon/graphite nanostructures coated and tried on various substrates other than G filters, for creating filters and filter mediums	3 years	
49	(Non Disclosure Agreement) Department of Information Technology, Jodhpur and Police Commissionerate, Jodhpur	04.09.2020	To set up a City Knowledge and Innovation cluster in Jodhpur to achieve the objective of effective and efficient governance.	3 years	
50	General Agreement for Educational and Scientific cooperation and Student Exchange 2020-2025 between Indian Institute of Technology Jodhpur and Universite De Technologie De Troyes, France	01.09.2020	To provide opportunities for students and staff to gain global experience, to foster collaboration among faculty members in education and research and develop international academic projection	5 years	
51	General Memorandum of Understanding between The University of Western Australia	17.09.2020	Objectives are below: <ul style="list-style-type: none"> <li>• Exchange of staff</li> <li>• Joint research activities</li> <li>• Joint conferences and other academic meetings Exchange of academic materials and information Exchange of students.</li> </ul>	5 years	
52	Hearthhealth Technologies Private Limited (HTPL) Bengaluru	20.10.2020	Collaboration between the parties for Use of Technologies in Medical Image Analysis, Diagnosis and Prognosis.	2 years	

S. No.	MoU / Agreement signed with	Date of signing	Objective	Duration	Ending Date of MoU
53	Johari Digital Healthcare Ltd.	10.11.2020	To promote and facilitate Innovation, Commercialization and Mentorship of the Projects undertaken the aegis of JCoE and find solutions to specific problems in the area of Medical Devices and Technologies, wherein each Project undertaken shall be preceded with a Definitive Agreement recording the terms and conditions governing the Project.	3 years	
54	Johari Digital Healthcare Ltd. (JDHL) and IITJ Technology Park Jodhpur	11.11.2020	To cooperate for the purpose of <ul style="list-style-type: none"> <li>(i) practicing and encouraging technology transfer and commercialization of innovations to increase research related economic growth in regions country and the overseas,</li> <li>(ii) identify and seek out joint business opportunities through national and international networking, and</li> <li>(iii) work out a common yearly planning for activities and Match Making events to be shared also with local economic promotion agencies, start-ups</li> <li>(iv) Leverage the expertise of Knowledge Partners in Healthcare, Environment and Livelihood.</li> </ul>	3 years	
55	MoU reg. Scheme of Fund for Regeneration of Traditional Industries (SFURTI)-between IITJ as Technical Agency and Khandi & village Industries Commission (KVIC) as Nodal Agency	27.10.2020	signed to implement Scheme of Fund for Regeneration of Traditional Industries (SFURTI)-between IITJ as Technical Agency and Khandi & village Industries Commission (KVIC) as Nodal Agency	3 years	
56	Agreement between National Research Lobachevsky State University of Nizhny Novgorod, Russia	9.11.2020	Implementation of cooperation in teaching, academic, student exchange and research, academic exchange of students (PhD Students)	5 years	

S. No.	MoU / Agreement signed with	Date of signing	Objective	Duration	Ending Date of MoU
57	Pingala AI Pvt, Ltd. Noida UP	12.7.2020	To help incubate & accelerate novel technologies and business ideas by IITJ start-ups into viable commercial products.	3 years	
58	Memorandum of Understanding LA Trobe University and IIT Jodhpur	02.12.2020	To engage with each other in a program of co-operation to explore potential collaborations such as staff and student exchanges, projects or programs.	5 years	
59	WHIZHACK TECHNOLOGIES PRIVATE LIMITED AND INDIAN INSTITUTE OF TECHNOLOGY JODHPUR	09.12.2020	To encourage and promote cooperation in the fields of Cyber Security and IoT (Interest of Things) for developing jointly branded Advocacy, Training programs and Product Development.	3 years	
60	Multi Institutional MoU between (Meity) IIT Bombay and IIT Jodhpur & other IITs		<ul style="list-style-type: none"> <li>To provide a state-of-the-art experimental research faculty to all the program participants (as well as participants from other academic institutes and the industry) to carry out experimentation of their research ideas, and trials of then subsystems they are building as part of the program.</li> <li>To provide a common platform for exchange of ideas, knowledge sharing etc. by organizing workshops, conclaves and training sessions for participants of the programs and also from other educational institutes in the country.</li> <li>To serve as a resource center for coordination of all the activities with the stake holders of the multi-institutional project.</li> <li>To monitor progress towards completion of the deliverables proposed by the collaborations in their respective institute's proposals and achievement of the overall project objectives.</li> </ul>	1 year	
61	Department of Information Technology & Communication, Govt. of Raj. AND IIT Jodhpur	04.12.2020	To promote Start-up ecosystem in the State of Rajasthan by partnering with DoIT & C by leveraging its extensive experience and resources for the promotion of start-ups.	3 years	

S. No.	MoU / Agreement signed with	Date of signing	Objective	Duration	Ending Date of MoU
62	Deakin University ABN 56721584203 of 1 Gheringhap Street, Geelong, Victoria, Australia and IIT Jodhpur	21.10.2020		5 years	
63	Student Exchange Agreement between Indian Institute of Technology Jodhpur and Ecole Pour L'Informatique ET Les Techniques Avances, France	12.12.2020		5 years	
64	Memorandum of Understanding for Academic Collaboration between EPITA, School of Engineering & Computer Science, France and IIT Jodhpur	12.12.2020	To establish a cooperative relationship with the aim of developing and fostering academic links between the institutes.	5 years	
65	Memorandum Of Understanding (MOU) is Made on this 6th day of January 2021	06.01.2021	Scholar lab Foundation a registered Not For profit company under Section 8 (1) of The Companies act 2013		
66	Porte Automations Private Ltd.	29.05.2020	Plasma Based Sterilizing system for Indoor Air Quality to fight COVID-19	6 months	
67	Pyrotech Electronics Pvt. Ltd. (Unit-1)	10.06.2020	Transfer of technology titled "An Advanced Photocatalytic Oxidation Sterilization System Based on UV-Light and Metal Oxide Nanoparticles Catalyst to treat N95 Filtering Face-Mask Respirators for reuse" developed by IIT Jodhpur	1 years	
68	NACL Industries Limited	10.06.2020	Wheras Licensor has developed an advanced Photocatalytic Oxidation Sterilization System based on UV-light and metal oxide Nanoparticles Catalyst to treat N95 Filtering Face-mask Respirators and other accessories for reuse (Technology) bu healthcare workers for protection from air born transmissions as in diseases such as, COVID-19, SARS CoV and other Influenzas.	3 years	

S. No.	MoU / Agreement signed with	Date of signing	Objective	Duration	Ending Date of MoU
69	Police Commissionerate Jodhpur, Abhay Command & Control Center	04.09.2020	IIT Jodhpur is in process to set up a City Knowledge and Innovation a cluster in Jodhpur to achieve the objective of effective and efficient governance, following are the targets. (i) Waste Water Management (ii) AI based Innovation in Public Services (iii) Environment Pollution Mitigation	3 years	
70	IITJ and NIRDPR	15.09.2020	The MoU is based on the principle of reciprocity and expresses the interest of collaboration among both Institutions in 1. Technology Development & Translation 2. Exchange of academic information and materials 3. Faculty and Student exchange 4. Infrastructure sharing	5 years	
71	Jai Narayan Vyas University, Jodhpur	05.11.2020	To share the facility and expertise related to Bioscience available and to explore, extend and strengthen the functional collaboration between the two Institutes in the areas of bioscience related research.		
72	MSME Technology Centre Bhiwadi	24.12.2020	The objective of this Memorandum of Understanding is to provide a formal basis for interaction between MSME Technology Centre Bhiwadi to enhance collaboration in Engineering, production and research areas for Micro, Small and Medium Enterprises (MSMEs).	3 years	
73	Universite Polytechnique Hauts-de-France, UPHF and IIT Jodhpur	28.01.2021	This master agreement expresses the parties' will to collaborate in the fields of research and enhancement of its results, education and training and to thus contribute to disseminate knowledge and culture.	5 years	
74	TATA CONSULTANCY SERVICES LTD. AND IIT JODHPUR	18.02.2021	To promote cooperation in areas of mutual interest for the benefit of both institutions.	7 years	

S. No.	MoU / Agreement signed with	Date of signing	Objective	Duration	Ending Date of MoU
75	IIT KHARAGPUR for Installation and Support of ERP System	04.02.2021	To install the ERP software developed by Indian Institute of Technology Kharagpur into server / system of First Party and make necessary customization by localized team of First Party for day-to-day use of the institute and making policy decisions by competent authority of the institute.	3 years	
76	Dr. Sarvepalli Radhakrishnan Rajasthan Ayurved University, Jodhpur	24.02.2021	The Parties are interested in exploring the possibility of establishing a collaborative relationship, to conduct relevant activities aligned to their respective research interests and expertise.		
77	License Agreement between Confederation of Indian Industry and IIT Jodhpur	06.01.2021	A. The Parties are desirous of working together to create, publish and provide online courses on diverse subjects for enhancing employability to the Subscribers/Authorised Users i.e., students professionals. B. To facilitate working together and provide online courses to public at large, both the parties have agreed to abide by the terms and conditions as contained in this Agreement.	12 Months	
78	Rajasthan State Industrial Development and Investment Corporation Ltd.	05.10.2021		2 years	
79	Wiley India Private Limited	17.08.2021			
80	Agriculture University, Jodhpur	06.12.2021		5 years	
81	Siemens Software (India) Private Limited	24.09.2021	Development of affordable and efficient technological solutions/products for healthcare especially in the areas of point-of care devices, IoT based devices, remote healthcare, medical implants, diagnostics, therapeutics, medical devices AI for healthcare, rehabilitation engineering and assistive technology, medical waste management etc. This will not only help to suffice the unmet technological need in the healthcare sector but will reduce import dependence and make the country self-reliant.	1 year	

S. No.	MoU / Agreement signed with	Date of signing	Objective	Duration	Ending Date of MoU
82	Mai Bharat	14.05.2020			
83	Samsung India Electronics Private Limited	24.02.2021			
84	Institut Polytechnique De Grenoble	01.05.2021			
85	National Law University, AllMS Jodhpur and IIT Jodhpur				
86	Power purchase agreement between NTPC Vidyut Vyapar Nigam Limited and IIT Jodhpur	17.12.2021			
87	MoU between The University at Albany, State University of New York, USA and IIT Jodhpur	19.05.2022	This Agreement represents the entire agreement between the parties and supersedes all prior negotiations, representations or agreements, either written or oral.	3 years	
88	The University at Albany, State of New York, USA and IIT Jodhpur (Deptt. of CS&E)	19.05.2022	This Agreement represents the entire agreement between the parties and supersedes all prior negotiations, representations or agreements, either written or oral.	5 years	
89	The University at Albany, State of New York, USA and IIT Jodhpur (Deptt. of Electrical Engineering)	19.05.2022	This Agreement represents the entire agreement between the parties and supersedes all prior negotiations, representations or agreements, either written or oral.	5 years	
90	MoU between The University at Albany, State of New York, USA and IIT Jodhpur (SME)	19.05.2022	This Agreement represents the entire agreement between the parties and supersedes all prior negotiations, representations or agreements, either written or oral.	5 years	



S. No.	MoU / Agreement signed with	Date of signing	Objective	Duration	Ending Date of MoU
91	Co-operation Agreement for joint Multi-institutional International Education, (among University at Buffalo (The State University of New York), IIT Delhi, IIT Kanpur, IIT Bombay, IIT(BHU) Varanasi and Ashoka University Sonipat Research, and Training	17.05.2022	The general objective of this agreement is to establish a multiparty collaborative framework for long-term multi-institutional and international collaboration in educational and research fields that are compatible with the orientation and mission of each institution	5 years	
92	Agreement for a Joint PhD Degree Program (JPD) between University at Buffalo	17.05.2022		5 years	
93	Electronic Industries Association of India	27.09.2021	A. The Parties are desirous of working together to create, publish and provide online courses on diverse subjects for enhancing employability to the Subscribers/Authorised Users i.e. students professionals. B. To facilitate working together and provide online courses to public at large, both the parties have agreed to abide by the terms and conditions as contained in this Agreement.	3 years	
94	Shivani Scientific Industries Ltd	16-06-2022	Co Creating, Design Thinking and Innovation for Various Enterprises Open Innovation Cohorts engaging Faculty and Students, Research and Development of Product PoCs, Pilots and Scale Ups, Writing joint projects for third party funding, Educational Activities including but not limited to course/fractal teaching, co-teaching courses, Co-advising students on thesis and projects, and other mutually agreeable educational activities.	5 Years	15-06-2027
95	Sharman Foundation	25-04-2022	To provide educational opportunities to talented students to fulfill their career goals by providing scholarships.		

# Research

## Introduction to the activities of the Office of R&D

The Indian Institute of Technology Jodhpur lays a strong emphasis on research projects including Sponsored Research projects, Consultancy, Fellowship, Award Money and Conference & Workshops etc. The Office of Research & Development is specifically set up in the Institute to provide specialized administrative and managerial support for the operation of Sponsored Research Projects, Consultancy projects and other related R&D activities. The institute is setting up many modern laboratories and continuously supporting infrastructure through these R&D projects.

### Major R&D activities including administrative and accounting support are:

1. Sponsored Research Projects, Consultancy projects and other projects which includes overall administrative support in accomplishing targets as defined in the projects. Human resource support is also provided by the Office of R&D by way of recruitment and establishment matters of project staff including project funded JRF/SRF/PDF.
2. The Office of R&D maintains various project funds and generates resources for its own operation and for further development of research activities and to provide support to faculty members, departments, schools, centers. Some projects are also operational for various online educational programs for departments / schools. Funding is being supported through project funds and by way of creation and management of DDF/CDF/SDF.
3. The Institute encourages faculty members by providing research initiation grants (Seed Grant projects) for new faculty members during the first two years of their joining. Funding support upto Rs. 25 Lakhs is provided under the project. It helps in setting up laboratories and research initiation.
4. The Office of R&D plays a pivotal role in administration of National and International Conferences, Workshops and Seminars etc which are being organized in the Institute. The Office provides support in maintaining financial transactions, receiving sponsorship, account maintenance and utilization certificate etc.
5. The Office of R&D is coordinating the activities of Institute IP Management Group and providing administrative support to the Inventors in filing of Intellectual Property Rights applications. The Office of R&D is also coordinating with institute empaneled IP attorneys.
6. The Office of R&D is coordinating the activities of Technology/Knowledge Transfer Group and providing support through execution of agreements between the Institute and Industry / external agencies.
7. A separate account is being created through overhead contributions made by the Project Investigators as a Professional Development Account (PDA); PDA provides the flexibility to the PIs for their research and professional related expenditure. The Office of R&D is maintaining the Professional Development Account of all faculty members.
8. The Office of R&D is providing support through Loan / Advance from R&D Overhead against the sanctioned grant to the PIs. The office is also providing support in procurement through project funds.

9. Issuances of Invoices to various funding agencies as well as sponsoring agencies.
  10. The Office of R&D is providing support for International research and collaboration through its new scheme namely International Research Mobility Grant with financial grant upto Rs. 10 Lakh to the young faculty members after following a rigorous two stage peer review process for selection of projects.
  11. Supporting Institute Awards (Research Excellence, Meritorious Staff etc.) through R&D overhead
  12. Management of online portals of PFMS / GeM / Bharatkosh etc. for project related activities
- a. Anjan Sen & Associates, Patent & Trade Mark Attorneys
  - b. Lakshmikumaran & Sridharan
  - c. S. Majumdar & Co. Patent & Trademark Attorney
  - d. Aumirah IP (Adastra IP Private Limited)
2. The Office of R&D has also launched a new scheme namely International Research Mobility Grant and provides this grant to young faculty members after following a rigorous two stage peer review process for selection of projects. This scheme will support the faculty members and increase the collaboration with International level reputed researchers. During the Financial Year IRMG awarded to following faculty members :

### New Initiatives taken by the Office during the FY 2021-22

1. The Office of R&D has empanelled four reputed and expert IP Attorneys to support inventors in the Filing of Patents, Design, Copyright etc :

S. No.	Name of Faculty	Title of Project
1	Dr. Raviraj Vankayala, Assistant Professor, Department of Bioscience & Bioengineering	Near Infrared Light Activatable Erythrocyte Membrane Coated Black Phosphorous Nanosheets for Targeted Bioimaging and Photo-Chemotherapy of Breast Cancer Cells
2	Dr. Nipun Arora, Assistant Professor, Department of Mechanical Engineering	Role of Passive Deformation on the Aerodynamic Performance of a Flexible Flapping Wing
3	Dr. Debasis Das, Assistant Professor Department of Computer Science & Engineering	Secure Communication and Searching System for Vehicular Cloud Computing
4	Dr Moumita Mandal, Assistant Professor, Department of Mathematics	Super convergence Results for Integro- Differential Initial and Boundary Value Problems by Spectral Projection Methods

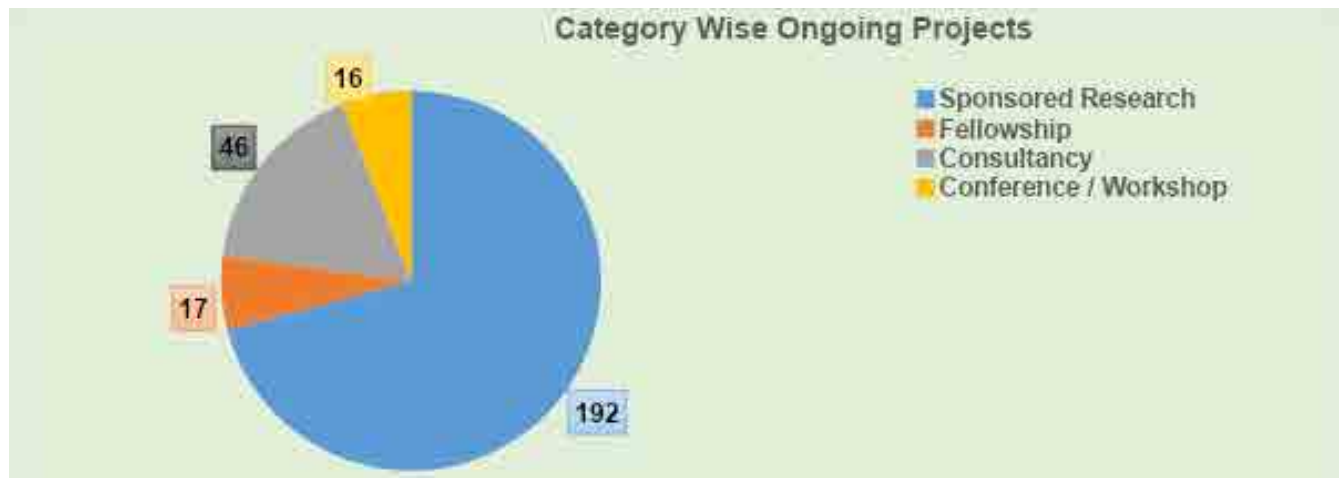
3. The Office of R&D is supporting and awarding Institute Research Excellence Award on the occasion of Institute Foundation Day, during the Financial Year 2021-22 the award has been given to following faculty members :

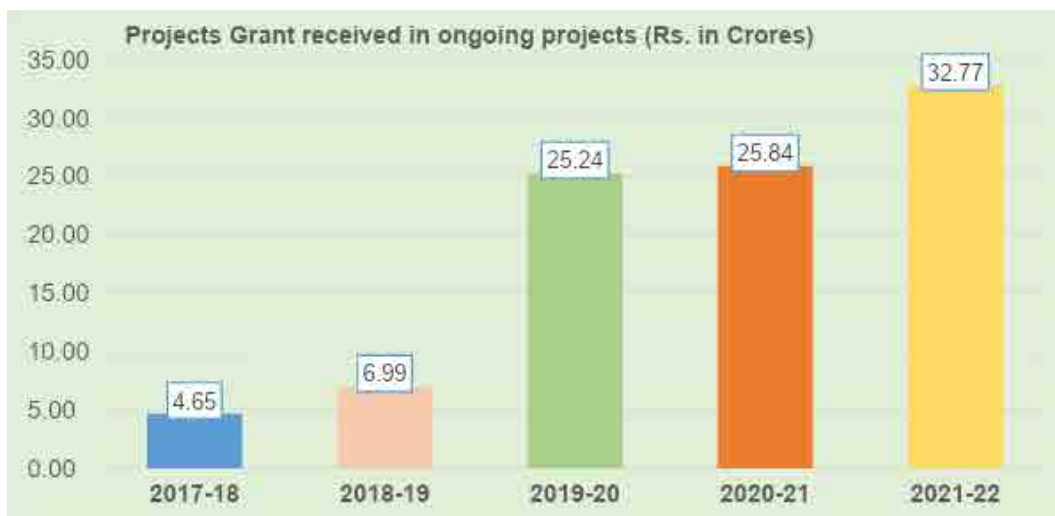
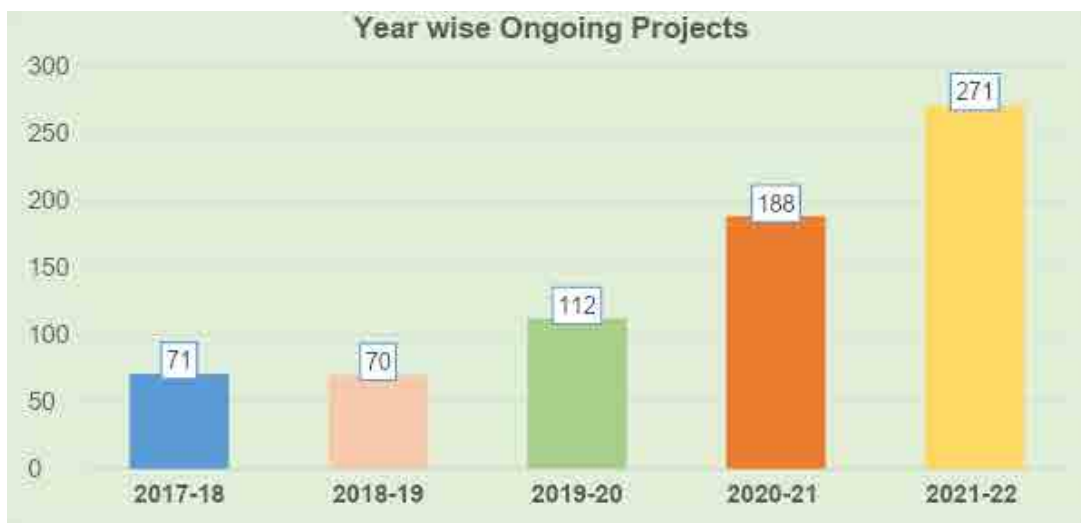
S. No.	Category of Award	Name of Faculty
1	Senior Researcher Award (Engineering)	Prof. Richa Singh, Professor, Department of Computer Science & Engineering
2	Senior Researcher Award (Humanities)	Dr. Vidya Sarveswaran Associate Professor, Department of Humanities & Social Sciences
3	Young Researcher Award (Engineering)	Dr. Raviraj Vankayala Assistant Professor, Department of Bioscience & Bioengineering
4	Young Researcher Award (Science)	Dr. Ritu Gupta Associate Professor, Department of Chemistry
5	Young Researcher Award (Humanities)	Dr. Farhat Naz Assistant Professor, Department of Humanities & Social Sciences

- 4. The Office of R&D has prepared the guidelines for Creation of Department / Centre / School Development Fund and rationalization of overhead.
- 5. The Office of R&D has launched the General Information on R&D Booklet which contains all the basic information and norms related to R&D.

## Graphical presentation of R&D Projects

### 1. Status of Ongoing R&D Projects





## Apart from the above projects

1. The Institute has supported 31 seed grant projects worth Rs. 6.10 Crores sanctioned grant during Financial Year 2021-22.
2. The Institute has awarded 4 International Research Mobility Grant projects during the Financial Year 2021-22.

### Note on Patents

#### A. Patents Granted to IIT Jodhpur during F.Y. 2021-22

1. Patent Title : Automatic Speech Generation

Patent Number: 380040 Patent Application No. : 201911035856

Applicant: 1. IIT Jodhpur 2. AIIMS Jodhpur

Inventors: Dr. Sumit Kalra, Assistant Professor, Department of CSE, IIT Jodhpur  
Dr. Arpit Khandelwal Assistant Professor, Department of Electrical Engineering, IIT Jodhpur

Dr. Amit Goyal, Dr. Abhinav Dixit and Dr. Nithin Prakasan Nair from AIIMS

Jodhpur

Date of Filing: 05.09.2019

Date of Published: 01.11.2019

Date of Grant: 26.10.2021

**Brief Description:** Various preordained situations result in a disease or injury to people and deprive them of their natural ability to communicate verbally. The diseases which affect the voice and language of people may include congenital impairments, such as cerebral palsy, intellectual impairment and autism, and acquired conditions, such as amyotrophic lateral sclerosis and Parkinson's disease. The present subject matter describes methods and systems for automatically generating speech which will be language-independent and facilitate communication between people with speech impairments and others. In an example implementation, the consonant and the vowel can be from Hindi language phonetics. A phonetic is assigned to the received electrical signals based on the comparison. An audio signal is generated by an audio transmitter corresponding to the assigned phonetic and based on trained data associated with vocal characteristics stored in a machine learning unit. The generation of the audio signals according to the phonetic having combination of vowels and consonants leads to the generation of speech and enables the people to audibly communicate with other people using gestures only. The speech synthesis technique of the present subject matter uses phonetics, and therefore the speech generation is independent of any language.



2. Patent Title : Metal Nanoparticles Intercalated Clay for Solvent Free Hydrogenation of Squalene Into Squalane

Patent Number: 384054

Patent Application No. : 201611009866

Applicant: 1. IIT Jodhpur 2. Dr. Rakesh K Sharma 3. Vineet Kumar Soni

Inventors: Dr. Rakesh K Sharma, Associate Professor, Department of Chemistry, IIT Jodhpur

Mr. Vineet Kumar Soni, Research Associate Department of Chemistry

Date of Filing: 21.03.2016

Date of Published: 26.01.2018

Date of Grant: 10.12.2021

**Brief Description:** The patent is about the innovation on application of modified Rajasthani Clay in chemical transformations for converting squalane, which is produced by microalgae to squalene which is used as biofuel and value-added products for cosmetic, nutraceutical, pharmaceutical industries, and condom lubricants. The Squalane is a natural product which is found in shark liver and millions of sharks are killed every year to obtain this chemical. This discovery could save the eco-system by saving sharks and also fulfill the needs of human beings with large scale production.

The patent includes process innovation to develop sub-nanometer-sized palladium particles in the layers of clay. The hydrogenation reaction occurs in solvent free condition to give pure saturated hydrocarbon (squalane) without any toxic aromatics and side products. The catalyst was reusable more hundred cycles without loss of performance.

**B. Patent Filed by IIT Jodhpur during F.Y. 2021-22**

1. Patent Title : Teeth Holder Assembly for Jaw Rehabilitation Devices and Orally Intercepted Devices  
Patent Application No. : 202211012504  
Date of filing: 08.03.2022  
Applicant: Indian Institute of Technology Jodhpur

**Inventors:**

1. Dr. Kaushal A Desai, Associate Professor Department of Mechanical Engineering, IIT Jodhpur.
2. Mr. Priyanshu Raj Shrivastava, M.Tech. Mechanical Engineering, IIT Jodhpur.
3. Dr. Ankita Chugh, Assistant Professor, Department of Dentistry, AIIMS Jodhpur.

2. Patent Title : Human Jaw Path Tracing Planar Mechanism for Jaw Rehabilitation Device  
Patent Application No. : 202211012501  
Date of filing: 08.03.2022  
Applicant: Indian Institute of Technology Jodhpur

**Inventors:**

1. Dr. Kaushal A Desai, Associate Professor Department of Mechanical Engineering, IIT Jodhpur.
2. Mr. Priyanshu Raj Shrivastava, M.Tech. Mechanical Engineering, IIT Jodhpur.
3. Patent Title : A Portable, Non-Invasive and Lightweight System for Stimulation Over Skin Surface  
Patent Application No. : 202211012866  
Date of filing: 09.03.2022  
Applicant: Indian Institute of Technology Jodhpur

**Inventors:**

1. Dr. Kaushal A Desai, Associate Professor Department of Mechanical Engineering, IIT Jodhpur.
2. Mr. Pratik C Sorathiya, JRF, Mechanical Engineering, IIT Jodhpur
3. Dr. Prathamesh H Kamble, Assistant Professor, Department of Physiology, AIIMS Nagpur

**C. Patent Published during F.Y. 2021-22 filed by IIT Jodhpur**

1. Patent Title : A Hydrogen-Annealed Bimetallic Oxide And Implementations Thereof  
Patent Application No. : 201911031662  
Date of filing: 05.08.2019  
Date of published: 27.08.2021  
Applicant: Indian Institute of Technology Jodhpur

**Inventors:**

1. Dr. Rakesh Kumar Sharma, Associate Professor, Department of Chemistry, IIT Jodhpur.
2. Ms. Devika Laishram, PhD Student, Department of Chemistry, IIT Jodhpur.
3. Mr. Kiran Prakash Shejale, PhD Student, Department of Chemistry, IIT Jodhpur.



# Events

## Celebration of National Festivals and Observance of Days of National Importance

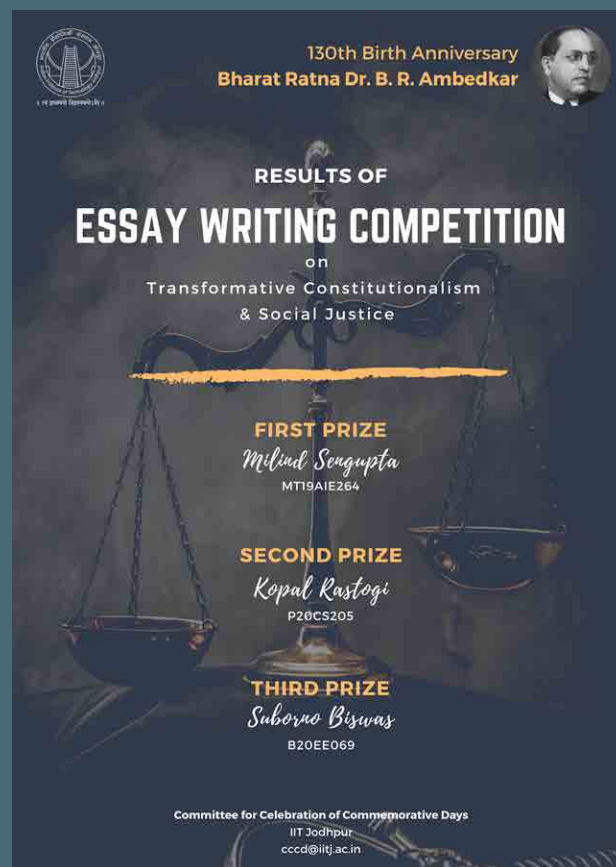
### Dr. B. R. Ambedkar Jayanti

14 April 2021

Bharat Ratna Dr. B. R. Ambedkar fought for social justice, equality, political and civil rights, and was the Chief Architect of the Indian Constitution. On the occasion of his 130th Birth Anniversary this 14th of April, the Committee for Celebration of Commemorative Days (CCCD) organized an Essay-Writing Competition on Transformative Constitutionalism and Social Justice (in English and Hindi).

#### Themes of submission included:

1. Transformative Constitutionalism
2. Social Justice and Civil Rights



**Winning Entries (English)**

Constitutional Morality: Guiding Light in these times of Darkness

**Milind Sengupta**

Transformative Constitutionalism - A Tool for Conceptualizing Social Justice

**Kopal Rastogi**

Change and Simultaneous Acceptance is the Only Constant

**Suborno Biswas**

Special Mention (Hindi)  
नागरिकता संशोधन अधिनियम 2019  
देवीदत्त जोशी

## World Creativity & Innovation Day

### 21 April 2021

IIT Jodhpur organized a small Virtual Exhibition on Art and Innovation on 23 April 2021 as a part of the celebrations of World Creativity & Innovation Day (April 21). The gallery showcased innovations, photography and art entries submitted by students, faculty and family members.



3D Virtual Information

### 11 May 2021

National Technology Day is celebrated on May 11 every year to highlight the achievements of engineers and scientists, and marks the anniversary of the day in 1998 when India achieved a major technological breakthrough by successfully carrying out nuclear tests at Pokhran, Rajasthan. As the second wave of Covid-19

continues to ravage across the country, IIT Jodhpur organized National Technology Day celebrations across May and June 2021 through an Invited Talk by Dr. R. Chidambaram (June 21, 2021) and a Panel Discussion (May 21, 2021).

On Jun 21, 2021, the CCCD organized an invited talk by Dr. R. Chidambaram, Chairman, Board of Governors

of IIT Jodhpur, and former Principal Scientific Adviser to the Government of India, who coordinated the nation's nuclear weapons program during the Pokhran tests. The talk was on 'The Many Dimensions of National Security' and was attended by 350+ students and professionals from IIT Jodhpur and educational institutions across Rajasthan and beyond.

Earlier, a Panel Discussion on the theme of Technology & Management Interventions against Covid-19 was held on May 21, 2021 where role of technology (in detection, prevention, cure, data analyses, future projections), management (logistics - availability of medicines, infrastructure, patient management in hospitals,

therapeutics), social media (and its impact), and survival 'kits' (preventive measures, exercises, yoga) were discussed. The panelists included:

- Dr Kuldeep Singh, Dean (Academics), Professor and Head, Department of Pediatrics, AIIMS Jodhpur
- Dr Anil Kumar Tiwari, Associate Professor, Department of Electrical Engineering, IIT Jodhpur
- Dr Krishna Kumar Balaraman, Head, School of Management and Entrepreneurship, IIT Jodhpur
- Dr Suman Kundu, Assistant Professor, Department of Computer Science & Engineering, & Head (CC), IIT Jodhpur

#### Program

5:00 pm Introduction

5:05 pm Director's Address

5:15 pm Panel Discussion on  
**Technology & Management Interventions against Covid-19**

#### Panelists

**Dr Kuldeep Singh**  
Dean (Academics)  
Professor and Head, Department of Pediatrics  
AIIMS Jodhpur

**Dr Anil Kumar Tiwari**  
Associate Professor  
Department of Electrical Engineering  
IIT Jodhpur

**Dr Krishna Kumar Balaraman**  
Head, School of Management  
and Entrepreneurship  
IIT Jodhpur

**Dr Suman Kundu**  
Assistant Professor, Department of Computer  
Science & Engineering, Head (Computer Centre)  
IIT Jodhpur

**21 May 2021**  
**5:00 - 6:30 PM**



Event Number  
**184 903 3162**  
Password  
**technology2021**



Committee for Celebration  
of Coventionative Day

ccs@iitj.ac.in

## International Day of Yoga

21 June 2021



IIT Jodhpur celebrated International Day of Yoga 2021 with enthusiasm jointly with students, staff and faculty members. Major activities as a part of this program included (i) Yoga Challenge (ii) Dissemination of Yoga-related awareness information.

### (i) IDY2021 Yoga Challenge

The Board of Student Sports at IIT Jodhpur organized a Yoga Challenge for all students, faculty and staff members. The contest invited video submissions of participants doing Yogasanas with points assigned proportion to the difficulty of the asanas. Several students submitted entries in the contest and a leaderboard was maintained on the @iitjodhpursports Instagram Channel. Winners were announced on 21 June 2021, and would receive e-certificates.

Yoga Challenge 2021 Winners

#### First Prize (88 points)

Nilesh (B20ME050)

#### Second Prize (tied between 4 participants with 84 points)

Kolli Sumaja (M20CI013)

Shubha Dhama (B18EE061)

Aakash Saplya (B20BB052)

Satyam Soni (B20CI039)

#### Third Prize (83 points)

Indu Gupta (P20MT005)

### (ii) Dissemination of Yoga-related awareness information

While the Board of Student Sports continued to share Yoga-related awareness over social media over the weeks leading up to 21 June, the information on Common Yoga Protocol and information available on <https://yoga.ayush.gov.in/> was shared with IIT Jodhpur.

## 75th Independence Day

**15 August 2021**

आज़ादी का अमृत महोत्सव

The 75th Independence Day of the country was celebrated in mixed mode on 15 August 2021 with a colorful blend of technical and cultural pre-events, and a solemn virtual gathering to join the flag hoisting, Independence Day Address by the Director, and cultural performances. This year's program included:

- Flag Hoisting and National Anthem (Live-streamed from Admin Block)
- Independence Day Address by the Director, Prof. Santanu Chaudhury (Boardroom)
- Cultural Performances by Students of IITJ and KV, & Faculty and Staff Members
- Inauguration of an Eco-friendly Roof as a part of the Campus Sustainability Project coordinated by CETSD in collaboration with OIE
- Tree Plantation (near new Workshop building)





### Independence Day Pre-Events

- To celebrate the emergence of science & technology in Independent India, the Board of Cocurricular Affairs organized two tech contests:
  - Tech Ideation Competition: Idea for India (Idea of a new technology or product for self-reliant India)
  - App to Bridge the Gap (Concept of an app that can empower the people)
- Photo Contest on 'Art & Technology' and Video Contest on 'Emergence of science & technology in Independent India' was organized for Faculty and Staff Members on the topic 'Art & Technology'.
- Article Writing Competition by PHEME - Newsletter Club and Board of Literary Affairs was organized for Students on the themes:
  1. What, according to you, is the most important technological breakthrough after independence and why?
  2. Is India really independent when it comes to scientific evolution?
  3. How has scientific freedom and a constructive environment post independence resulted in a more self reliant India ?
- Drawing, Singing, Poetry, Dance, Musical Instrument Competitions for Campus children were organized by the Office of Students.

## Teachers' Day

05 September 2021



IIT Jodhpur celebrated Teachers' Day 2021 through a range of academic and cultural events on 04-05 September 2021. A Workshop on Next-Generation Education Technology was organized on Saturday, 04 September by the EdTech vertical of the Institute, with invited speakers and national participation. On Sunday, 05 September, a spectacular program was organized by the Academic and Co-curricular Activity Council (ACAC) and the Student Activity Council (SAC) in offline mode to pay tribute to all the teachers. The program was held in blended mode where all staff and faculty members and students present on campus joined the event in person in the Lecture Hall Building. Since the Covid pandemic has started, this was the first event that was celebrated in physical mode.

The program began with welcoming the faculty members in Indian tradition, followed by lamp lighting by senior professors, Saraswati Vandana, and a Speech on Dr. Radhakrishnan by Ph.D.

Student Amar Chouhan. The event included an exciting cultural show including dance, drama and musical performances. The students also organized an entertaining surprise quiz for faculty members.

Prof. Santanu Chaudhury, Director, IIT Jodhpur, delivered an address to all students and faculty members on this occasion. The student council felicitated all faculty members with plants. The event concluded with a vote of thanks by Lokesh Panwar, General Secretary, ACAC.



## Engineer's Day

### 15 September 2021

As a part of the Engineer's Day Celebrations 2021, the NEP Action Committee of the Institute organized a workshop on New Education Policy 2020 and Action Points for IITs on 15 September 2021.

Universal high-quality education is important for developing and maximizing talents and resources for the good of the individual and society. With the quickly changing employment landscape and global ecosystem, education must build character, enable learners to be ethical, rational, compassionate, and caring, while at the same time prepare them for gainful, fulfilling employment. The National Education Policy 2020 (NEP 2020) combines the futuristic vision for the country with its glorious past. The NEP 2020 encourages a multidimensional skillset, builds upon traditions and values, focuses on cultural-linguistic diversity and different backgrounds, and emphasizes breaking the disciplinary boundaries and pedagogical change for cognitive-affective-life skill development. July 2021 is marked as one year of National Education Policy; a nationwide celebration rejoiced and re-affirmed the commitment toward the reformation suggested in the policy.

The workshop included addresses by eminent invited speakers:

- Sh. Rakesh Ranjan, Additional Secretary, Technical Education, Ministry of Education
- Prof. R. K. Shevgaonkar, Professor Emeritus, IIT Bombay and Former Director, IIT Delhi
- Prof. Sarit Kumar Das, Institute Chair Professor, IIT Madras and Former Director, IIT Ropar

The image shows a promotional graphic for a workshop. On the left, three circular portraits of speakers are shown with their names and titles. On the right, a table lists the workshop schedule. At the bottom, there is a 'Join us Live on' banner with a YouTube icon and a Cisco Webex logo with the password 'IITJ'.

Date: 15 September 2021 Time: 3:30 PM	
Introduction	3:30 PM
Welcome Address By Prof. Santanu Chaudhury, Director IIT Jodhpur	3:35 PM
Address by Sh. Rakesh Ranjan	3:45 PM
Address by Prof. R.K. Shevgaonkar	4:15 PM
Address by Prof. Sarit Kumar Das	5:00 PM
Discussion/Vote of Thanks	5:45 PM

**Sh. Rakesh Ranjan**  
Additional Secretary, Technical Education  
Ministry of Education

**Prof. R. K. Shevgaonkar**  
Professor Emeritus, IIT Bombay  
Former Director, IIT Delhi

**Prof. Sarit Kumar Das**  
Institute Chair Professor, IIT Madras  
Former Director, IIT Ropar

Join us Live on Password: IITJ



## Gandhi Jayanti

### 02 October 2021

Gandhi Jayanti was celebrated on 02 October 2021 jointly by CCCD and the Student Senate. The event was organized in hybrid mode in LHB 110 of the IIT Jodhpur Campus.

#### The program was as follows:

Address by the Director

Speech on Gandhi Jayanti by Pranav Goswami (B20CS025)

Invited talk by Dr. Subodh Kerkar

Dr. Subodh Kerkar is a medical practitioner, installation artist, and activist who uses art to comment on social, political, religious, and other issues. His artwork sits at the intersection of politics and history. Dr. Subodh Kerkar had always been connected with Mahatma Gandhi from his childhood. He had the opportunity to grow up in the company of Gandhians including Jnanpith Awardee and Padma Bhushan Ravindra Kelekar, Dada Dharmadhikari, and Justice Chandrashekhar Dharmadhikari amongst others. For the last 6 years, he has been an ardent student of Mahatma Gandhi's life and teachings and has created a number of works based on the Mahatma.

#### Cultural Performances

- Bhajan by Harisharan R (M21ID005)
- Dance performance by Ek Bharat Shreshth Bharat, Ritish (B20BB031), Vikram (M20PH027), Khushal Sonawat (B19ME037), Ranbir Singh (B19BB035)
- Musical performances by Harshith Reddy (B20AI018), Pranjal (B20ME081), Harshita Kalani (B20CS019)

The India Quiz was organized by the Quiz Club of IITJ.

## National Education Day

### 11 November 2021

India marks National Education Day on November 11 to memorialize the birthday of Maulana Abul Kalam Azad, the first Minister for Education in India. The CCCD, in association with the EdTech Vertical and the Institute Publications Committee, celebrated National Education Day 2021 with the following events.

EdTech Talk on "Making Virtual Reality Real for K12 Education" by Mr. Aditya Vishwanath (CEO, Inspirit and Knight-Hennessy Scholar/PhD Candidate at Stanford University) on 12 November 2021 at 6:30 PM [organized by EdTech Vertical, CETSD]

#### About the Speaker

Aditya co-founded Inspirit with the aim to support global access to immersive, interactive, and collaborative learning experiences. He is a Knight-Hennessy scholar and PhD candidate at Stanford University. Previously, he worked with the Google Education team where he explored strategies to integrate low-cost virtual reality toolkits into curriculum, and was a three-time recipient of the President's Undergraduate Research Award at Georgia Tech. Before Inspirit, he co-founded MakerGhat, a makerspace and incubator network for high-school students.

## Student Contests:

Extempore Competition on “How do you envision the future of education?”

11 November 2021 / 7:00 - 8:00 PM / LHB 308

(2 min per participant; Top three winners receive e-certificates)

Essay/Article Writing Contest on “The Future of Education”

[Submission Deadline: 19 November 2021]

Sub-themes include, but are not limited to,

- Diversity and Inclusion in Engineering Education
- AI-enabled Education
- Multilingual Education
- K-12 STEM Education
- Gamification in Education

Top three winners received e-certificates. The top (one) entry was to be considered for inclusion in the upcoming issue of Techscape: The Science, Technology and Education Journal (Convocation Issue)

Selected entry for Techscape (Convocation Issue) - by Stuti Aswani

## Constitution Day

### 26 November 2021

Constitution Day, also known as ‘Samvidhan Divas’, is celebrated in our country on 26th November every year to commemorate the adoption of the Constitution of India. On 26th November 1949, the Constituent Assembly of India adopted the Constitution of India, which came into effect from 26th January 1950.

The Hon’ble President of India led the celebrations of Constitution Day live from the Central Hall of Parliament on 26 November 2021 from 11:00 AM onwards. The live telecast was available on Sansad TV/DD/other channels and online portals.

All were invited to actively participate at:

- Portal for reading Preamble to the Constitution in 23 Languages (<http://readpreamble.nic.in>)
- Portal for Online Quiz on Constitutional Democracy (<https://constitutionquiz.nic.in>)

Constitution Day Program (Sunday, 28 November, 2021)

6:00 PM Constitution Day Speech by Student Representative

6:05 PM Reading of the Preamble

6:10 PM Address by the Director, Prof. Santanu Chaudhury

6:25 PM Invited Talk on “Constitutions and Constituencies” by Prof. Satish Deshpande, Professor of Sociology, University of Delhi

7:10 PM Vote of Thanks



### Invited Talk on "Constitutions and Constituencies"

by Prof. Satish Deshpande, Professor of Sociology, University of Delhi

#### About the Speaker

Satish Deshpande M.A, Economics (JNU), MA, PhD (California) teaches Sociology at DSE, Delhi University. His most recent books are the edited volumes *Sectarian Violence in India: Hindu-Muslim Conflict, 1966-2015* (with Sanjay Palshikar, Orient Blackswan 2019), *The Problem of Caste* (Orient Blackswan 2014), and *Beyond Inclusion: The Practice of Equal Access in Indian Higher Education* (with Usha Zacharias, Routledge 2013). His other publications include *Contemporary India: A Sociological View* (2003) and (with Ghanshyam Shah, Harsh Mander, Sukhadeo Thorat and Amita Baviskar) *Untouchability in Rural India* (2006) He is the recipient of the 2012 Malcolm Adisheshiaiah Award for distinguished contributions to development studies. His areas of interest include caste and class inequalities; the theory and practice of social justice; the history and politics of the social sciences; South-South intellectual interactions; higher education; and issues in social science teaching, especially the

challenges of language. Prof Deshpande contributes regularly to the Indian Express, EPW and other national and international periodicals and has taught at St.Stephen's College and DSE (DU), CSDS (Delhi), UOH (Hyderabad), and has been a Visiting Professor at Department of Anthropology, University of Chicago and UC (San Francisco).

#### About the Talk on "Constitutions and Constituencies"

Is our Constitution an orphan? Who cares for it, has a stake in it, works for it? Which particular interests or forces defend the universal values of the Constitution? What have we learnt about -- and from -- the Constitution in seven decades?

#### Student Contests

Debate and Quiz Competitions (01 - 03 December, 2021)

Contact: Board of Literary Affairs (bla@iitj.ac.in)

**26 November 2021 / 11 AM**  
11 AM: Address by Hon'ble President of India (Live on Sansad and DD)

Check out:

- Portal for reading Preamble to the Constitution in 23 Languages (<http://readpreamble.nic.in>)
- Portal for Online Quiz on Constitutional Democracy (<https://constituitionsquiz.nic.in>)

**28 November 2021 / 5:00 PM**  
Reading of the Preamble  
Address by the Director

Invited Talk on "Constitutions and Constituencies" by Prof. Satish Deshpande, Professor of Sociology, University of Delhi

**01 - 03 December 2021**  
Debate and Quiz Competitions (Board of Literary Affairs)

Committee for Celebration of Commemorative Days, ccd@iitj.ac.in

**Preamble to the Constitution of India**

WE, THE PEOPLE OF INDIA, having solemnly resolved to constitute India into a SOVEREIGN SOCIALIST SECULAR DEMOCRATIC REPUBLIC and to secure to all its citizens: JUSTICE, social, economic and political; LIBERTY of thought, expression, belief, faith and worship; EQUALITY of status and of opportunity; and to promote among them all FRATERNITY assuring the dignity of the individual and the unity and integrity of the Nation; IN OUR CONSTITUENT ASSEMBLY this 26th day of November, 1949, do HEREBY ADOPT, ENACT AND GIVE TO OURSELVES THIS CONSTITUTION

## Republic Day

**26 January 2022**

IIT Jodhpur celebrated the 73rd Republic Day in mixed mode on 26 January 2022 as a part of Azadi ka Amrit Mahotsava. The event included unfurling of the National Flag (live-streamed from Admin Block), followed by the National Anthem. This was followed by the Director's address from the Boardroom and colorful cultural performances from the IITJodhpur community and students of KV IIT Jodhpur. As per the tradition, the Office of Students and various Student Boards organized various competitions for campus children and students of IIT Jodhpur, whose results were announced during the program.

9:25 am Arrival of the Director, Prof. Santanu Chaudhury

9:30 am Flag Unfurling and National Anthem (Heads and Deans are invited to join in person outside Admin Building)

9:40 am Republic Day Address by the Director (Live-streamed from the Boardroom)

9:50 am Speech by General Secretary (SAC), Srujan Kumar Kankatala

9:55 am Cultural performance by KV Students

10:10 am Cultural performance by IITJ students, faculty, staff and EBSB

10:50 am Announcement of results of Student Contests and Children's Competitions

11:00 am Vote of Thanks by Prof. Kamaljit Rangra, Chairman CCCD

11:05 am End of Virtual Event





## International Mother Language Day

21 February 2022

CELEBRATING LINGUISTIC AND CULTURAL DIVERSITY

International Mother Language Day अन्तर्राष्ट्रीय मातृभाषा दिवस

21 February 2022

Contribute to the Language Diversity Map of IIT Jodhpur Campus

Committee for Celebration of Commemorative Days Indian Institute of Technology Jodhpur

On the occasion of अन्तर्राष्ट्रीय मातृभाषा दिवस / International Mother Language Day on Monday, February 21, 2022, the CCCD along with the Board of Literary Affairs organized virtual celebrations with colorful cultural performances, regional language poetry contest, and a language diversity survey.

**The program included:**

Introduction by the MC, Dr. Katyayanee Sharma

Historical Significance of मातृभाषा दिवस

Results of Language Diversity Survey @ IITJ

Address by the Director, Prof Santanu Chaudhury

Cultural performances in various Indian Languages

**Cultural performances by**

- Giridhara Uppala (Telugu)
- Akshath Krishnan (Malayalam)
- Surya Mitra (Bangla)
- Niranjana (Malayalam)
- Dr Kshema Prakash (Tamil)

- Divyang Palshetkar (Marathi)
- Kanchan Jha (Hindi)
- Karooka Kundu (Bangla)
- Dr Srijan Sengupta (Bangla)
- Harisharan (Tamil)
- Manasi Mukherjee (Kannada)
- Dr Shrutidhara Sarma (Assamese)
- Suryanshu Mukhopadhyay (Bangla)
- Sapna Sankhla (Rajasthani Ghoomar)
- Prof Santanu Chaudhuri (Bangla)

Announcement of Winners of Regional Language Poetry Competition (organized by Board of Literary Affairs)

First: Bhagwan Das (M21MA055)

Second: Jarpala Ashok (B21BB038)

Third: Pranav Saraswat (D20CI002)

Vote of Thanks by Dr Rajlaxmi Chouhan (Convener, CCCD)





Charanam (2)

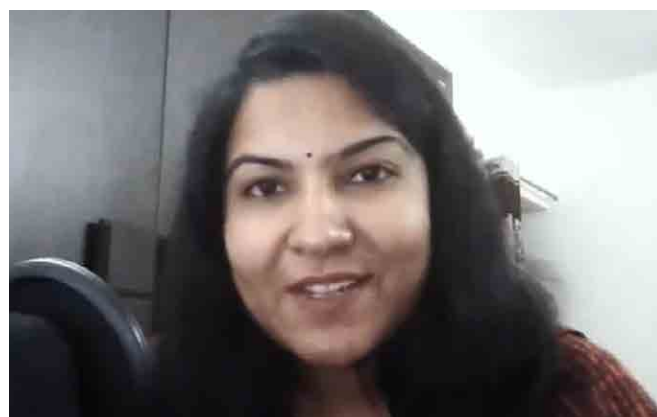
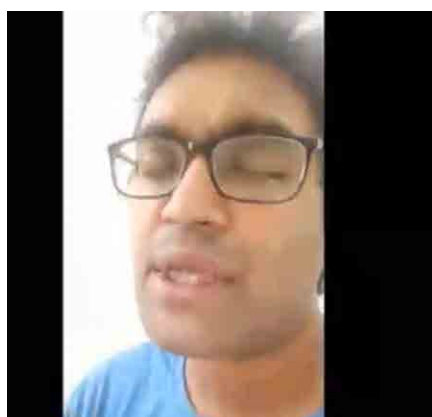
Thirayin pin nirkindraay Kanna  
You stand behind the curtains, Oh Krishna

Unnai marai othum jnaniyar mattume kanpaar  
And you can be seen only by wise men who learn Vedas (marai)

Enraalum kurai onrum enakillai Kanna  
But still I do not have any complaints/regrets/problems,  
Oh Krishna

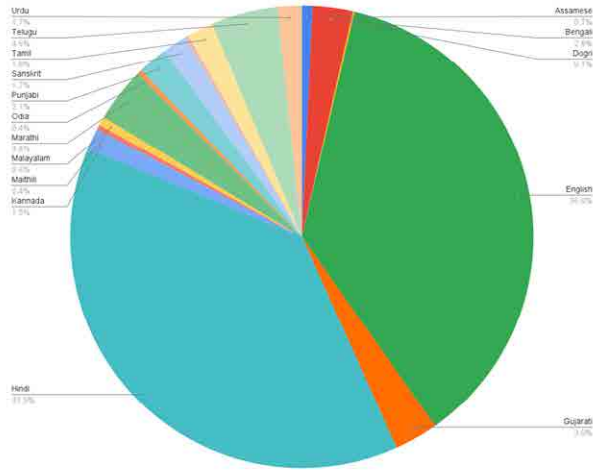
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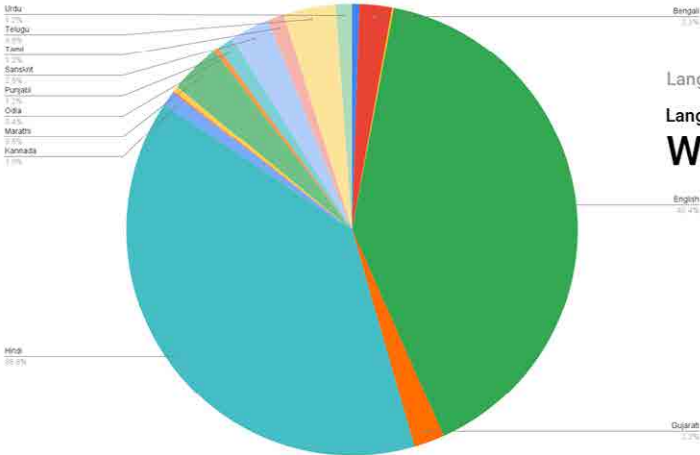


# Language Diversity@IIT Jodhpur



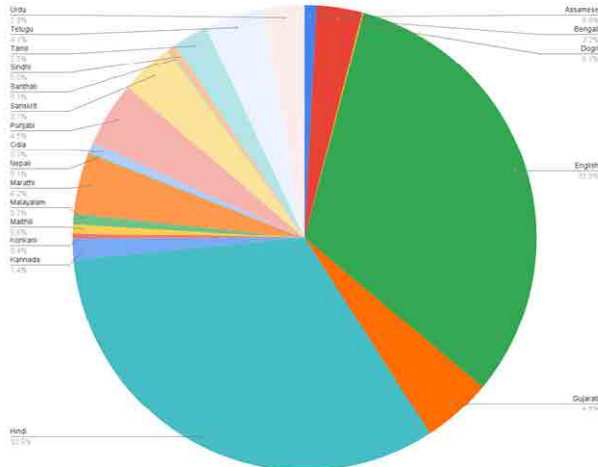
Language Diversity@IITJ

### Languages we Speak



Language Diversity@IITJ

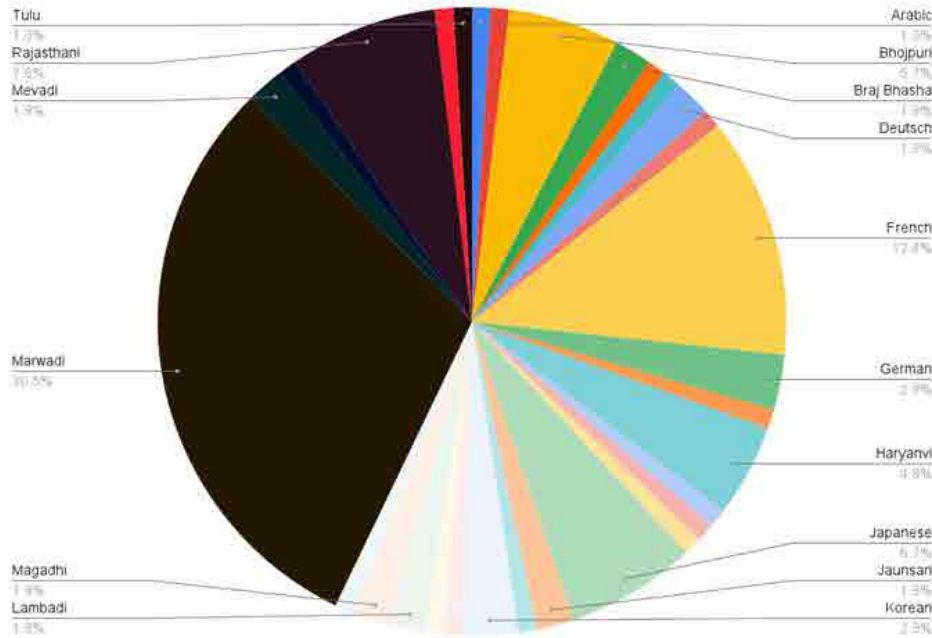
### Languages we can Write in



Language Diversity@IITJ

### Languages we Understand

Multilingualism at IITJ  
On an average, IITJ residents understand 3.1 languages including English and Hindi



Language Diversity@IITJ

## Other Dialects and Languages

## National Science Day

28 February 2022



IIT Jodhpur celebrated National Science Day 2022 on 28 February 2022 with a Seminar on "INDIA's Journey in Science and Technology: Aspirations to Achievements", jointly organized with the MBM Engineering College, Jodhpur, Jai Narain Vyas University, Jodhpur, Institution's Innovation Council (Ministry of Education Initiative) in collaboration with

Jodhpur City Knowledge and Innovation Cluster (JCKIC), supported by Vigyan Prasar, Department of Science and Technology (DST).

These celebrations were a part of Azadi ka Amrit Mahotsav and Prometeo 2022: the National Technical and Entrepreneurial Festival of IIT Jodhpur.

**The event included:**

Invited Talks on

- “From Raman Effect to Nuclear Power” by Prof. R. Chidambaram, DAE-Homi Bhabha Professor, BARC, Chairman, Board of Governors, IIT Jodhpur
- “Proud to be a Player and Spectator of Post-Independent India’s Scientific Journey” by Prof. Samir Brahmachari, Former Director General of the Council of Scientific & Industrial Research, Scientist and Founder Director, CSIR- Institute of Genomics & Integrative Biology
- “Celebrating Human Diversity in India: A Legacy of Prasanta Chandra Mahalanobis” by Prof. Partha P.

Majumder, Distinguished Professor and Founding Director, National Institute of Biomedical Genomics, National Science Chair Professor, Science & Engineering Research Board, Gol, Former Professor, Indian Statistical Institute, Kolkata

- “A Brief History of Future: India's Journey in S&T” by Prof. Ashutosh Sharma, Former Secretary, Department of Science & Technology, Government of India, Institute Chair Professor & C. V. Seshadri Chair Professor, IIT Kanpur

**Popular Science Lecture on:**

"Invisible Empire: How Viruses and Microbes Shape Our World" by Mr. Pranay Lal, Writer & Biochemist

## International Women’s Day

**08 March 2022**

IIT Jodhpur celebrated International Women’s Day 2022 on Tuesday, 08 March 2022, with an invited talk and panel discussion. The program included:

5:30 PM Introduction

5:35 PM Address by the Director, Prof. Santanu Chaudhury

5:45 PM Invited Talk by Prof. Sangeeta Sahney, Head, Department of Humanities and Social Sciences &

Professor, School of Management & Entrepreneurship, IIT Jodhpur

6:00 PM Panel Discussion on ‘Gender equality today for a sustainable tomorrow’ (Panelists: Prof. Sangeeta Sahney, Prof. Mitali Mukerji, Dr. Ranju Mohan, Dr. Katyayanee Sharma, Mrs. Laxmi Kashyap; Moderator: Dr. Prasenjit Tribhuvan)

6:45 PM Vote of Thanks



Panel Discussion on 'Gender equality today for a sustainable tomorrow'

IIT Jodhpur has also been running a series on social media showcasing research and achievements of female faculty members during Feb - Mar 2022.

## Institute Lectures

An Institute Lecture was delivered on 11th March 2022 by Prof. Samir Brahmachari titled “Disruptive innovations in healthcare technologies for India to pole vault with soft landing: Can IITians make a difference”.



Prof. Samir Brahmachari, Ex-DG CSIR, is the Academy Professor of the Academy of Scientific and Innovative Research, former Professor of Biophysics, Indian Institute of Science, Bangalore, and the Chief Mentor of Open-Source Drug Discovery. He is also the Chief Mentor of several startups in genomic diagnostics and digital health. He was previously the Founder Director of CSIR – Institute of Genomics and Integrative Biology (1997-2007), the former Director-General of CSIR India, and Secretary, DSIR, Government of India (2007-2013). He is the recipient of many national and international awards including the Shanti Swarup Bhatnagar Prize. He is an elected fellow of The World Academy of Sciences, the European Society of Preventive Medicine, and a member of all four National Academies of Science & Engineering, India.

## 14th Foundation Day 2021 of IIT Jodhpur

### 02 August 2021

The 14th Foundation Day of the Indian Institute Technology was celebrated at IITJ Auditorium on 02 August 2021 in hybrid mode. Prof. Ashutosh Sharma, Secretary, Department of Science & Technology, Government of India was the Chief Guest on this occasion in an online mode. Prof. Sanjeev Misra, Director, AIIMS Jodhpur was the Guest of Honour for the function. The function was presided over by Dr. R. Chidambaram, Chairman Board of Governors, IIT Jodhpur, in online mode. Prof. Santanu Chaudhury, Director, IIT Jodhpur in his Welcome Address highlighted the achievements of IIT Jodhpur and mentioned that IIT Jodhpur’s vision is Future Driven wherein it is striving to keep pace with the exponential changes that are taking place in the technology domain to respond to societal challenges and aspirations. He also mentioned that IIT Jodhpur is the first second generation IIT to complete the target of building infrastructure and enrolling the number of students. He also described some of the unique academic programs initiated by IIT Jodhpur. Prof. Sanjeev Misra in his address mentioned that both IIT Jodhpur and AIIMS Jodhpur being institutes of national importance are closely collaborating with each other particularly in the areas of Medical Technologies. The joint program on Medical Technologies between the two institutes is a significant initiative to address the healthcare related challenges of the country. Prof. Ashutosh Sharma, Secretary DST, Government India gave a talk titled “Challenges, Opportunities, Directions and Processes of Science & Technology in the New Millennium”. He mentioned that the intersection between science and society is compelling. He emphasized that multidisciplinary, interdisciplinary and transdisciplinary research is the need of the hour. He further mentioned that four M’s are highly important Mechanics, Materials, Machines and Man. He said that the drivers of

future technologies will be the level of comfort, quality of life, good health, to control over the surroundings and create a world that we would like to live in. Dr. R. Chidambaram in his presidential address talked about knowledge creation and consumption. Knowledge in the industry system and knowledge in the academic system should be in equilibrium. Some of the areas such as nuclear, space and few others, the knowledge in the industry system is at par with industry in the developed countries. He emphasized the need for the Technology Foresight. He also talked about the moonshot projects. In the cultural program organized in the evening, a number of colourful performances, including, dance, drama, storytelling, songs, poems, etc., were given by the students, staff, faculty and their family members.



## 7th Convocation of IIT Jodhpur

### 19th December 2021

The 7th Convocation of Indian Institute of Technology Jodhpur was organized on 19 December 2021 in the Lecture Hall Complex of the Institute. On the occasion a video message of Honourable Education Minister, Shri Dharmendra Pradhan was telecast to all the audience. Dr. Rajesh Gokhale, Secretary, Department of Biotechnology, Government of India was the Chief Guest on the occasion. Dr. R. Chidambaram, Chairman, Board of Governors, IIT Jodhpur presided over the function. Prof. Santanu Chaudhury, Director, IIT Jodhpur while presented Institute Report mentioned that IIT Jodhpur has embarked on an ambitious mission to establish itself as one of the top destinations in the country for a wholesome education with right mix of flexible academics, cutting-edge research, curiosity-driven innovation and curriculum built on technology foresight. He mentioned that despite COVID pandemic, the Institute has progressed on all fronts including infrastructure, academics, research, and technology development. Dr. R. Chidambaram, Chairman BOG, IIT Jodhpur in his presidential address appreciated the progress made by IIT Jodhpur. He mentioned that IIT Jodhpur has taken many important steps towards implementation of New Education Policy of the country. He also expressed that Jodhpur City Knowledge and Innovation Cluster, one of the six clusters in the country established by the Office of PSA, Government of India, is progressing very well to enhance cooperation among the proximate institutes, academia and industry under the leadership of IIT Jodhpur. While congratulating the graduating students, he emphasized that they should work toward making India a Knowledge Economy and a Developed Country. The Chief Guest of the function, Dr. Rajesh Gokhale, in the convocation address shared his experiences of life with the graduating students. He emphasized that it is important to understand how to create one's own identity in this increasingly intertwined world, that makes 'real life' interesting yet challenging. He shared a few important lessons of life such as "Find your niche while accepting failures", "Be open to press the reset button all the time", and "Partnerships and shared vision are key to do new things and only ideas are not enough". On the occasion, 404 graduating students were conferred degrees. These include

180 B.Tech., 67 M.Sc., 130 M.Tech. and 27 Ph.D. 59 B.Tech. students were also awarded specialization/ minor area certificates in a wide range of areas including Artificial Intelligence, Internet of Things, Thermofluids Engineering, Robotics and Entrepreneurship & Management.



# Facilities

## Center for Advanced Scientific Equipment (CASE)

Center for Advanced Scientific Equipment (CASE) at the IIT Jodhpur was established in 2018. The CASE has an endeavor to provide a state-of-the-art instrumentation facility in the multidisciplinary field of research to the undergraduate, graduate, Ph.D students and the faculties of this esteemed institute as well as researchers from other institutes across the country. Currently, a total number of 93 high-end instruments are under CASE facility. Currently, The space allotted for the CASE facility (Room No. 111 & 112, ground floor, Chemistry building) houses 22 pieces of equipment, including various sophisticated instruments such as 500 MHz NMR, Single Crystal XRD, Powder XRD, AFM, SEM, PPMS Dynacool, SQUID, Surface area analyzer, DSC, TGA, etc. The rest of the equipment under CASE facility are located in various departments of the institute. The overall day-to-day activities and the policy of the center is determined by a committee of faculty of this Institute. The main objective of the CASE is to offer users of IIT Jodhpur and external users smooth access to the high end equipment for their research activity. Moreover, CASE is aimed to provide hands-on training for students of IIT Jodhpur as well as external users by arranging training programs and workshops on various sophisticated instruments for their professional growth. To fulfill these objectives CASE facility provides its users with a transparent and well-maintained booking system through which users can book slots for measurement in any equipment under the CASE facility persuasively. Further, the CASE committee

appointed a faculty in charge of each of the instruments under CASE for smooth running and maintenance of the equipment. Faculty in charge organize training programs at certain time intervals on various equipment such as NMR, Raman spectrometer, SEM etc. for giving training to the internal students. In addition to this CASE has recently organized a DST funded week long (8th August-14th August, 2022) workshop, “Synergistic Training Utilizing the Scientific and Technological Infrastructure” (STUTI), on instrumentation to provide training for underprivileged students across the country. It was inaugurated by The Director, IIT Jodhpur Prof. Santanu Chaudhary, on 8th August, 2022. A total number of 45 students were shortlisted for participating in this program out of the 300 students registered online for STUTI. And 42 participants from 12 states, such as Tamil Nadu, Delhi, MP, Maharashtra, Bihar, UP, Kerala, Rajasthan, Haryana, Utrakhand, Gujrat, and Panjab, participated in this program. By providing such an opportunity towards the external user’s CASE facility is thriving to extend its service to all national institutes and R & D organizations for accessing this facility on a minimal chargeable basis.

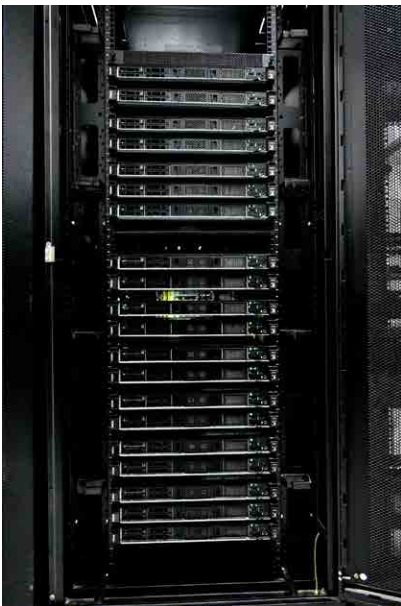
## Computer Centre

The Institute has a modern Computer Centre to cater its allround IT requirements starting from computing resources to last mile internet connectivity. Computer Center is the nucleus of major computing activities for students, staff members and faculty members. A modern data center equipped with High Performance Computing (2500 CPU Cores) and AI supercomputers (4 DGX A100) providing 20000 plus teraflops of computing power is the heart of this computing facility.

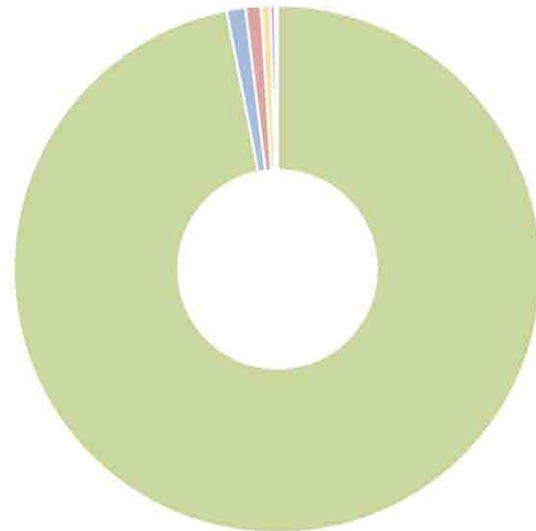
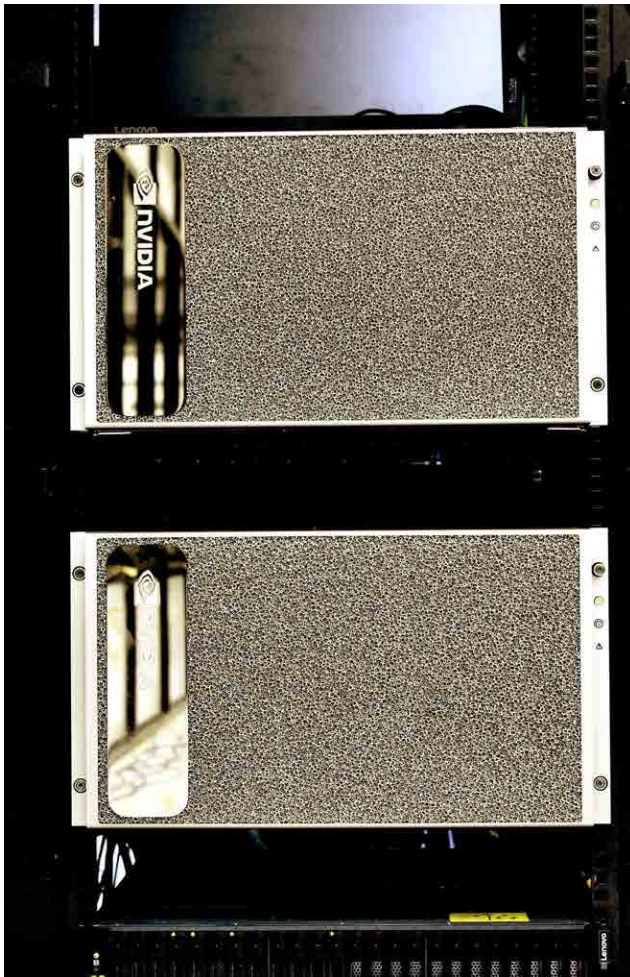


The Computer Center is powered by a 10 G backbone. Presently the institute's internet requirements are met by 4 Gbps Internet lease line. The institute network

consists of 2 Core switches, more than 400 access and distribution switches and 700 wireless access points with high availability. This network covers the entire campus including service stations and gates. Further the network is protected by the latest UTM that provides seamless protection from any cyber threats. It also provides secure VPN connectivity to IIT Jodhpur fraternities while they are not inside the campus. The Computer Center of IIT Jodhpur is the proud host of 4 DGX A100 AI Supercomputers out of which two new DGX A100 AI Supercomputers are added in the financial year 2021-2022 from TIH iHub Drishti. The data center also hosts several computing servers, application servers, mini HPCs and 0.5 Petabyte storage servers. Six license servers of various operating systems from Windows and GNU/Linux family are used to hosting various licensed software like MatLab, Mathematica, Cadence, Mentor Graphic, Ansys, PSCAD, Solidworks and many more from different departments. Computer Center hosts all the required websites of the institute including the institute main website. All the needs of DNS are maintained by the computer center at their datacenter. Multiple Domain Name Servers (DNS) with three separate internet service providers have been deployed to eliminate single points of failure and dependence on a single internet service provider (ISP).







#### Resolution

Total Issues: **3293**

Done	3191
Won't Do	38
Duplicate	31
Declined	19
Unresolved	9
Hardware failure	3
Known Error	1
Software failure	1

Computer Center uses the industry standard Service Desk Ticketing System to manage all support requests including technical support and complaints. Computer Center completed a year on this supporting platform solving more than 3000 support tickets in a year. Several new services have been introduced during the financial year 2021-22 including automations and on-premise cloud services. In order to achieve the institute's vision objectives, Computer Center initiated establishing several cloud applications based on open source projects, e.g., OwnCloud, MatterMost, OpenStack to name a few.

### Major Initiatives in FY 2021-22

- **E-office Implementation:** The institute is adopting the e-file module of e-office at IIT Jodhpur, following in the footsteps of a DIGITAL INDIA. The process of implementation of e-office was started in March, 2021 with the help of e-Office Project Division, National Informatics Centre. With the active involvement of the Computer Center team, Faculty and Administrative staff of IITJ eOffice was successfully implemented in FY 2021-22. On May 3, 2022, Prof. Professor Santanu Chaudhury, the esteemed director of IIT Jodhpur, officially inaugurated the e-office.



- **Private Cloud Storage Facility:** An open source private cloud file storage service (using OwnCloud) has been installed on unified storage at Computer Center. It enables secure storage, collaboration and sharing between members of IITJ. This storage facility will further reduce the dependency of public cloud storage like Google Drive, Dropbox, Onedrive etc.
- **Mattermost Messaging Platform:** In order to reduce the dependency on third party vendors and keep our communication data (which is absolutely critical to be in our hands) with IIT Jodhpur itself, Computer Center hosted open source MatterMost Messaging platform. Mattermost provides secure communication, collaboration, and orchestration of work across teams and tools.

### Facilities

The Computer Center provides facilities of internet, email, IP telephone, cloud storage, WiFi, computing, VPN, LDAP, license server, online classrooms (such as moodle), FTP, and on premise web hosting to IIT Jodhpur fraternities. Computer Center also provides SSL certificates for all the iitj.ac.in domains and subdomains.

### Resources

The Institute has several key resources at the Computer Center which includes softwares, hardwares, operating systems and laboratories with modern computers. At present two computer laboratories, one with 45

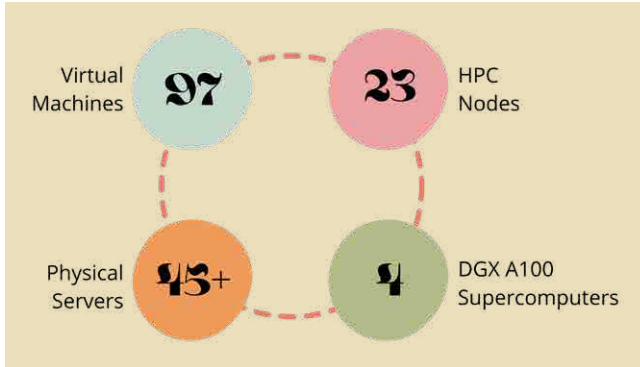
terminals and another with 40 terminals are operated by the Computer Center. These laboratories have seating capacity of 110 and 120 respectively. Computer Center has licenses of Microsoft Windows Operating Systems, Microsoft Office, RHEL, RHVM and Matlab. Details of the resources are provided below.

### Hardware Infrastructure

The Computer Center has the following hardware infrastructure to provide several facilities and services inside the campus.

- 4 NVIDIA DGX A100 AI Supercomputer
- NAS storage with 200 TB space
- PFS storage with 200 TB space
- SAN storage with 30 TB space
- Unified storage with 50 TB space
- Cisco WebEx room 70 duals currently installed at the Board Room
- WebEx room 55 single currently installed at CDC Room
- WebEx board 85 and Room Kit Pro Precision 60 currently available at LHB
- Cluster of 14 Servers consisting of 3 Cisco, 4 Dell and 7 Lenovo server
- Fortinet UTM and FortiAnalyzer
- Cisco Communication System: CUCM, Voice Gateway and CMS in HA for IP Phones
- IP Phone (440 phone installed till date)
- Network equipments 1000+

### Hosted VM's & Physical Server



- Google Workspace for Education: Unlimited
- Google Workspace Education Plus: 250 Faculty License and 2500 Student License
- MATLAB License: Unlimited Institute Wide Access
- WebEx
- Advanced Space Meetings: 2520 Licenses
- Meeting Suite: 2520 Licenses
- Device: 120 Licenses
- Jira License: 15 Agent License

### Software Licenses

- Red Hat Enterprise Linux
- Standard License: 26 License
- HPC: 56 License
- RHVM: 40 License
- Microsoft campus wide license with Office 365
- Microsoft 365 A3 for students use benefit : 4000
- Microsoft 365 A3 for faculty : 200
- O365EDUA3OpnFac ShrdSvr ES : 2
- Win Server Standard Core : 32
- SQL Svr Ent Core : 2
- Google

### Training Organized by Computer Center

- Slack User-end Training (online)
- e-Office training for Master trainers (offline)
- e-Office user training (offline and online)
- Microsoft Office to all Staff member
- Word
- Excel
- Unicode and keyboard setup for Hindi language use in Windows (online)

### Young and Dynamic Team

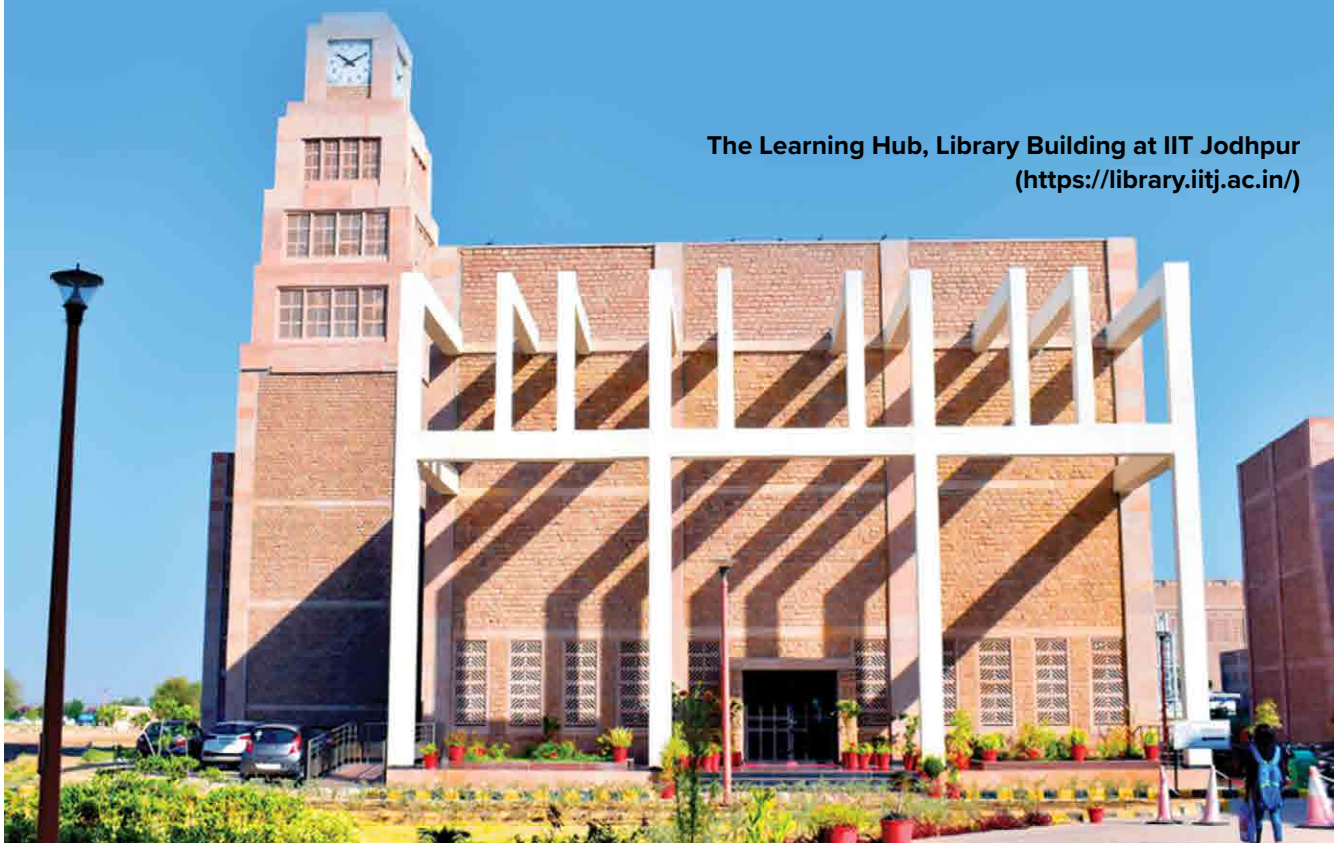
The computer center is managed by a young and dynamic team of experienced engineers and faculty members. Several new members joined the technical workforce in FY 2021-22.



# Library

The Learning Hub, i.e., the library supports teaching and research activities of the Institute by facilitating acquisition, organization and dissemination of knowledge resources, and also by providing library & information services to IIT Jodhpur community. The Learning Hub of the Institute is situated prominently at the entrance of the academic area of the Institute, stands as the tallest structure on the campus scaling over 15m from the ground; keeps time for the entire campus with a 4-way clock at the clock tower, only the third in the city of Jodhpur. It functions under the guidance of the Library Committee, which has representatives from all Departments, and Student Representatives.

**The Learning Hub, Library Building at IIT Jodhpur**  
(<https://library.iitj.ac.in/>)



## Collection

The Library has a rich and growing collection of approximately 15,600 volumes of books and e-books, which include textbooks, and books of general and reference nature. A wide range of scholarly journals, databases and research support tools are also subscribed from various sources for the academic and research purposes of the Institute.

## Services & Facilities

The following services and facilities are being provided by the Library to its registered users:

1. Member & Circulation Services,
2. Orientation & User Education,
3. Borrowing Facility,
4. Reference & Information Service,
5. Course Reserves,
6. Current Awareness Service,
7. Inter Library Loan & Document Supply, and
8. Digital Library Facility & Services.

Biometric enabled RFID technology: The library services are automated through Biometric enabled RFID technology using smart library solution for an effective management of the library and providing enhanced services like, self-check-out, self-check-in (book drop), security of materials, inventory management and finding misplaced items, stock verification, visitor counter, Smart Card issuance, etc.

Digital resources: Digital resources are accessible through the user-friendly, responsive Library website, which is a comprehensive site maintained by Library. These include the Library subscribed resources, online catalogue, lists of useful resources accessible in the open domain like the open access journals, books, repositories, video lectures, open courseware. These resources are continuously updated.

A resource guide portal has also been developed and maintained by Library, wherein, resources i.e., books available in Library, subscribed journals, resources accessible in open domain are listed and linked, course-wise.

Library subscribes to the Plagiarism Detection Tool and Remote Access Tool for its users. Orientation sessions and Library Instruction sessions for Students are conducted by the Library Staff Members during registration of new students and on demand.

Some of the important journal resources and academic & research support tools subscribed by the Library are:

### A. Journal Resources

1. AiChE Journal
2. American Association for Advancement of Science - Science Online
3. American Chemical Society (ACS) Journals
4. American Institute of Physics (AIP) Journals
5. American Physical Society (APS) Journals
6. American Society for Civil Engineers (ASCE) Journals
7. American Society for Mechanical Engineers (ASME) Digital Library
8. Association for Computing Machinery (ACM) Digital Library
9. ASTM Standards & Digital Library
10. Begell House Digital Library
11. EBSCO Business Source Ultimate
12. Elsevier Science Direct
13. Emerald Management Journals
14. IEEE Xplore Digital Library
15. Institute of Physics (IoP)
16. Journal of Visualised Experiments (JoVE)
17. JStor
18. Optical Society of America (OSA)
19. Oxford University Press (OUP)
20. Project MUSE
21. Royal Society of Chemistry
22. Sage - Institute for Mechanical Engineers (IMechE) Journals
23. Society for Industrial & Applied Mathematics (SIAM) Digital Library
24. Springer Nature
25. Taylor & Francis - SSH, S&T Collections

**B. Research Magazines**

1. Chemical & Engineering News
2. Economic & Political Weekly
3. Harvard Business Review
4. MIT Sloan Management Review
5. The Economist

**C. Research Databases**

1. EPW India Time Series
2. IndiaStat
3. Institute for Studies in Industrial Development (ISID)
4. MathSciNet
5. RemoteXs
6. SciFinder Scholar-n
7. Scopus

8. ShodhShuddhi (Ouriginal)
9. Turnitin Feedback Studio
10. Web of Science

**D. eBooks**

1. Cambridge University Press
2. EBSCO eBooks
3. Elsevier Science
4. McGraw-Hill Access Engineering
5. Oxford University Press
6. ProQuest eBook Central
7. Taylor & Francis
8. Wiley Interscience

**E. Leisure Reading**

Press Reader

The vital statistics of Library for FY 2021-22, are as follow:

S. No.	Description	Statistics
<b>1.</b>	<b>Print Books</b>	<b>Total 249</b>
	a. Number of titles added	154
	a. Number of volumes added	101
<b>2.</b>	<b>eBooks</b>	
	a. Number of titles & volumes added	85
<b>3.</b>	<b>Number of Scholarly Resources subscribed (For CY 2021)</b>	<b>Total 49</b>
	a. Fulltext resources	32
	b. Archive of fulltext journals	4
	c. Research databases	6
	d. Research support tools	5
	e. Fulltext Standard	1
	f. Digital Newspaper & Magazines	1
<b>4.</b>	<b>Document Supply &amp; Inter Library Loan service requested fulfilled</b>	<b>Total 124</b>
	a. Document supply of articles & research papers	123
	b. Books arranged on Inter Library Loans	1
<b>5.</b>	<b>Circulation Transactions</b>	<b>Total 4,460</b>
	a. Number of book check-outs	1,957
	b. Number of book check-ins	1,910
	c. Number of book renewals	586
	d. Number of book recalls	7

**Library Services during COVID-19 pandemic period:**

In response to the unprecedented pandemic situation, the Library swiftly responded to it by switching its methods and offering the following services and facilities to their users:

1. Rapid acquisition of eBooks
2. Off-campus access of Library resources to all users
3. Transformed Circulation Services by following COVID-19 protocols in a way that would best suit the users without having to compromise on their requirements
4. Intensified Document Delivery Services

**Memberships: The Library is a core member of the eShodhSindhu:** Consortium for Higher Education Electronic Resources, operated by INFLIBNET Center, Gandhinagar, through which subscriptions to major resources are fulfilled. Besides, the Library is a member of DDeveloping Libraries NETwork (DELNET), New Delhi through which the Library meets its Inter Library Loan requirements.

**Workshops & Trainings Conducted:** *The Learning Hub Workshop Series*, Season 1 and Season 2 were organized by the Library for the user community to spread awareness about the resources subscribed by the library and other useful academic and research support tools available for use to them, during March-May 2021, and September-November 2021, respectively. Several resource experts and writing experts were invited to address the users in optimally using the resources available to them. Some of the important ones include EBSCO and ProQuest eBooks platform, McGraw Hill Access Engineering, Elsevier's Scopus and Mendeley, Web of Science and EndNote, RemoteXs, Grammarly, Turnitin, Original (FKA Urkund), Oxford University Press, Cambridge University Press, Journal of Visualised Experiments (JoVE), Springer Link, IndiaStat, EPW India Time Series, SciFinder Scholar-n, to name a few.



Stacks &amp; General Section



RFID Gate &amp; Drop-Box



Circulation Counter



Reading Room

## Library Staff Activities

1. Dr. Kshema Prakash, Mr. Amit Kumar Soni, Mr. Kamleshkumar J. Patel, and Mr. C. Chhatwani attended One Day Specialized Online Awareness Program on Shodhganga for University Coordinators/Library Professionals from CFTIs/INIs organized by INFLIBNET Centre, Gandhinagar on 8 February 2022.
2. Dr. Kshema Prakash, Mr. Amit Kumar Soni, Mr. Kamleshkumar J. Patel, and Mr. C. Chhatwani attended Training on e-Office Management as e-Office Digitization Coordinator/Nodal Coordinator from the Office of Library, and Office of Publications, IIT Jodhpur, on 2 March 2022, organized and conducted by the Computer Centre of the Institute.
3. Mr. Kamleshkumar J. Patel attended Online NAELIN 2021 on “The Future Ready Libraries and Librarian: Thinking the Unthinkable” organized by Developing Library Network (DELNET), New Delhi during 6-8 December 2021.
4. Mr. Kamleshkumar J. Patel and Mr. Chhuni Chhatwani attended One-day online Conference on “Transforming Libraries & Empowering LIS Professionals” organized by Developing Libraries Network (DELNET), New Delhi and National Library of Sri Lanka, on 9th March 2022.
5. Mr. Kamleshkumar J. Patel and Mr. Chhuni Chhatwani attended DELNET Online Annual Lecture on “Navigating Pathway: Preparing the Future Workforce of LIS Professionals” by Trish Hepworth on 22nd March 2022.

## Scholarly Publications

1. Patel, K. J., Prakash, K. and Parekh, Y. R. (2021). Open Educational Resources: An overview. Towards Excellence. Vol. 13, Issue 2, June 2021, pp. 295-306, ISSN - 0974-035X.

## Professional Activities

1. Dr. Kshema Prakash delivered an expert lecture on “Research Data Management and Role of Libraries” on 25th February 2022 as a Resource Person in Short Term Training Program on “Role of Libraries & Librarians in Pandemic Era,” organized by Resource Centre & IQAC of Gandhinagar Institute of Technology and sponsored by AICTE & GTU, from 21-02-2022 to 26-02-2022.
2. Mr. Kamleshkumar J. Patel delivered a talk on “Take Control of your Library Data: SubjectsPlus” on 26th February 2022 as a Resource Person in Short Term Training Program on “Role of Libraries & Librarians in Pandemic Era,” organized by Resource Centre & IQAC of Gandhinagar Institute of Technology and sponsored by AICTE & GTU, from 21-02-2022 to 26-02-2022.
3. Dr. Kshema Prakash delivered an expert lecture on “Research Data Management and Role of Libraries” on 3rd March 2022 as a Resource person in one-week AICTE sponsored Short Term Training Program on Research Excellence and Academic Development: Modern Library Practices in Present Scenario, organized by Pt. Deendayal Upadhyay Central Library, J.C. Bose University of Science & Technology, YMCA, Faridabad during 28.02.2022 – 05.03.2022.
4. Dr. Kshema Prakash delivered a talk as Guest Speaker on “What books say to us? Significance of literary resources in shaping career.” at an Online National Webinar on the occasion of Librarian’s Day (129th Birth Anniversary of Dr. S. R. Ranganathan) on 12 August 2021 at SSR Institute of Management & Research, Silvassa.
5. Dr. Kshema Prakash delivered an Expert Lecture on “The Power of Words: Interpersonal Communication Skills for Academic Librarians” on 6 August 2021 during the AICTE-RGPV Joint Teachers Training Program - One week online



Short Term Training Programme (STTP) on “Library Automation, Management and Innovative Library Services” organized by Department of Central Library, Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal, Madhya Pradesh during 2-7 August 2021.

- 6. Dr. Kshema Prakash delivered an Expert Lecture on “(K)night in the Library” on 4 August 2021 during UGC Sponsored Refresher Course on ‘The New Normal: Reinventing Libraries and

Librarianship’ conducted by UGC-HRD Centre, Dr. Hari Singh Gour Vishwavidyalaya, Sagar, Madhya Pradesh, during 31 July – 14 August, 2021.

- 7. Dr. Kshema Prakash reviewed an article for the Canadian Journal of Learning and Technology/ La revue canadienne de l’apprentissage et de la technologie, in December 2021.
- 8. Dr. Kshema Prakash served as Managing Editor for TechScape: The Science, Technology and Education Journal of IIT Jodhpur.



Amit



Chhatwani



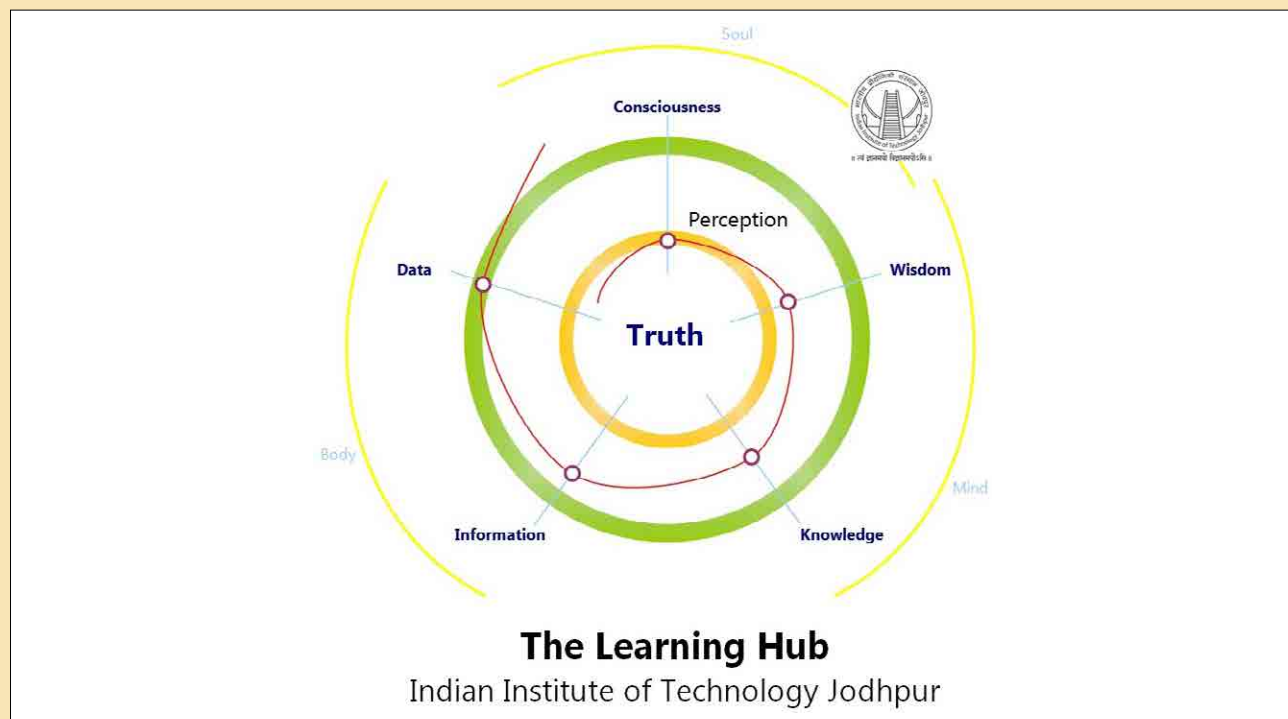
Kamlesh



Rinkesh



Kshema



# Our Campus

IIT Jodhpur moved to its Permanent Campus during May-June 2017, which is 25 kms away from the heart of Jodhpur city. Sprawling over three land parcels (Pocket A, Pocket B and Pocket C) on NH-62, Jodhpur-Nagaur Highway. IIT Jodhpur campus has 852 acres of land. The Campus was awarded a 5-star rating by the Green Rating for Integrated Habitat Assessment (GRIHA) council for its scrupulous planning. The ecological, cultural & social values associated with this site is protected by taking inspiration from the vernacular building layouts, design elements & treatments for the Campus Landscape & architecture. The key elements of the vision for the IIT Jodhpur Campus includes:

- Sustainability & carbon Neutrality: Creating a smart, Intelligent Eco-Campus;
- Campus as “Living Laboratory”: Demonstrating futuristic Technologies;
- Respect for the Jodhpur’s desert ecology & Local architectural heritage;
- Quality living & learning environment based on cross- disciplinary interactions; and
- Creation of a unique identity for the prestigious IITs.

The planning of the Campus aims to reach Net-zero Energy, Water & Waste, making the Campus self-sustainable. The other salient features of the Permanent Campus are:

- (1) Walk to work concept – the campus is pedestrian oriented and bicycle dominant;
- (2) Learning facilitated anywhere, anytime with wireless ICT backbone (including Multi-media enabled learning spaces with flexible, shared public spaces and hybrid classrooms);

- (3) Smart infrastructure with GRIHA 4/5 star compliant buildings and GRIHA LD benchmark campus (incorporating centralized chiller plant for air conditioning, a utility tunnel housing all the MEP services, dense desert settlement morphology, low height buildings (3 storeys) built with low embodied energy materials, and improved local and traditional methods);
- (4) Plantation with native species, soil stabilization, protection from dusty wind to arrest erosion, desertification, and building-up soil moisture over time;
- (5) Rain water harvesting, and water reduction and sewage recycling, together greening the site over time; and
- (6) Segregation of wastes and customized recycling.

Faculties and Staff Members are residing on campus. Total 132 Type B Houses and 84 Type C houses have been constructed along with 12 new hostel buildings and two hostel buildings are under construction. The salient feature of these hostels is Air Conditioned Room accommodation in all hostel buildings. Two dedicated dining hall buildings catering to the needs of students and other residents with a mess and a canteen in each, that serves hygienic and nutritious food. Essential services and amenities have been established to facilitate residents in their day-to-day needs. There is a Primary Health Center (PHC) being managed by M/s. Goyal Hospital & Research Centre, Jodhpur, on contract. Its activities are supervised by the Medical Users’ Services Committee in consultation with the Medical Officer of IIT Jodhpur. Basic services like the groceries, dining and food court, bank, stationery, laundry, beauty parlor and

gents salon, vegetable shop, cycle repairing shop etc. are operational in the Campus.

Kendriya Vidyalaya is also functional in the campus which is housed in Pocket B of IIT Jodhpur campus.

There is a dedicated bus service for commuting from the Campus to and from the city of Jodhpur.

The photographs shown in the pages to follow, give a glimpse of the campus of IIT Jodhpur.



A Birds Eye View – IIT Jodhpur Campus



Director's Bungalow



Hostel Blocks



Housing Society (Type-B)





Housing Society (Type-C)



Berms

## Facilities on Campus

The following are some facilities that are available in Permanent Campus of IIT Jodhpur:

- (a) **ATM & Bank:** The State Bank of India and the Canara Bank, IIT Jodhpur Branch are operational in the campus which provides banking solutions to the IIT fraternity. Their ATMs are housed in the Community Centre Building, Lecture Hall Building & Main Administration Building, enabling the entire IIT Jodhpur fraternity ease of transactions.
- (b) **Dining Hall:** The two Dining Hall Buildings has a Mess and a Restaurant in each that caters to the need of all students and employees. They provide hygienic food, fresh juices and various other snacks. The mess offers good quality food, regularly monitored by the Wardens for hygiene and nutritional values, and provided at affordable cost.
- (c) **Gymnasium:** All student hostels have well-equipped gymnasium for students.
- (d) **Entertainment Room:** Every hostel consists of recreation facilities (like TV Rooms, where students can enjoy matches and watch movies) along with indoor games (like table tennis and caroms).
- (e) **Laundry Service:** Students and residents are facilitated with a dedicated laundry service on campus.
- (f) **Shopping Center:** Various shops catering to the primary needs of students and residents, like grocery, dairy products, stationery, grooming services; All are housed in the Community Center Building and berms.
- (g) **Transport Services:** The Institute has a bus service running between the Permanent Campus and Jodhpur City at regular intervals, exclusively for the Students, faculty and staff of the Institute.
- (h) **Medical Services:** The Primary Health Center operated by M/s. Goyal Hospital & Research Center Pvt. Ltd., Jodhpur, on contract, provides routine health services to students and residents of the Campus. Besides this fully functional, round-the-clock, Primary Health Center in the campus, IIT Jodhpur avails services from the All India Institute of Medical Sciences and the associated Hospitals of the S. N. Medical College and some specialized hospitals. The Institute has agreements with a few prominent hospitals for priority treatment to its employees and students. These include: Goyal Hospital and Research Center, MediPulse Hospital, Vasana Eye Care Hospital, Vasundhara Hospital and other hospitals.
- (i) **Post Office:** To cater the requirement of Postal Services of the campus residents a post office is now functional at the main gate of the campus.
- (j) **E-Rikshaw Service:** For providing commuting services inside the campus premises for visitors, E-Rikshaw service is provided by the Institute.
- (k) **Jodhpur Club:** This facility is developed exclusively for the requirement of faculties and staff members along with their family members. It houses a restaurant, Indoor Badminton Court (wooden floor), space for Gymnasium, Library, 200 Seating Capacity multipurpose hall etc. The Euro Kids Preschool and Daycare has also started functioning in the Jodhpur Club.
- (l) **Art Work:** Adding to the beauty of campus following artworks have been developed-
  - (i) **Brain Tree:** This sculpture employs the motif of the circuit as seen on a printed circuit board. It is contoured to take the form of the brain. It suggests the overlapping of human and artificial intelligence, leaving the possibilities to the imagination. This is not only about the potential of neurotechnology but the potential of leveraging machine intelligence with the purpose of enhancing the human experience, through establishing connections in the same way that a PCB connects electronic or electrical components, to perform a function of value.
  - (ii) **Circle of Success:** This sculpture, situated at the entrance of the Institute, represents the circular dance of knowledge like the cosmic dance of Nataraja- an interplay of the circles of creation, preservation and destruction- besides the balletic form of the compass upon a drawing board release ripples in the form of circles. Science itself is a tool giving expression to thought and imagination. The circle is a universal symbol representing perfection, eternity. The circular form is also used to

represent the Zero which was first used in India as a value on its own.

- (iii) **Water Fountain Sculptures:** Water Fountains are developed to enhance the beauty of the campus in front of the Administrative Block, Lecture Hall Building and at the Community Centre. Water Fountain in front of the administrative block is a sculpture made from steel and decorated with Jet Brown Granite boundary. The other water fountains are Ball Fountains where the ball consists of solid granite stone rotated with the pressure of water.

For its copybook-style Master Plan, the Master Plan of IIT Jodhpur's Permanent Campus has been awarded 5 Star Rating by the Green Rating for Integrated Habitat Assessment (GRIHA) Council under GRIHA LD V1 category

on 11 December 2018. The campus design of IIT Jodhpur visualizes all parts of all zones as interdependent, integral networks, like the metabolism of a living organism, integrating social, economic and environmental sustainability to become a near-zero emission campus. Unlike a campus where buildings are spread out, increasing infrastructure and water consumption and creating heat islands, this campus uses a series of compact urban clusters typical of desert settlements. The campus is designed to be a flexible plug and play system by using a series of service tunnels, trenches and serviceable shafts that allow easy maintenance and upgrading of all wired and piped services without breaking open a wall, slab or road.



Community Centre



Community Centre



Dining Hall



Primary Health Centre



Fountain in front of Administration Building



Brain Tree Circle

## Academic & Research Facilities

The Permanent Campus of IIT Jodhpur spreads across 852 acres of land located ~24 km away from the center of the city of Jodhpur on National Highway 62 towards Nagaur, N-NE from the center of Jodhpur. It has 3 parcels of land. Presently constructions exist in Pockets A and B. The First and Second phase of construction is completed and the construction of the Third phase will commence shortly. Buildings that are being used for its academic, research and administrative activities are:

1. Main Building, housing the administrative offices of the Institute;
2. The Learning Hub, housing the Library of the Institute
3. Lecture Hall Building with 8 class rooms of 60 seating capacity, 02 class room of 120 seating capacity and a 325-seater and 650-seater classroom each. All the classrooms are air conditioned, equipped with modern learning facilities like the Internet and audio-visual facilities;
4. The Basic Laboratories are established in one building;
5. Department of Computer Science & Engineering (CSE) Building houses the Departments of CSE, Mathematics, and Humanities & Social Sciences.

Also, the laboratories of Computer Science & Engineering are established in this building;

6. Chemistry Building housing the Department of Chemistry;
7. Electrical Building housing the Department of Electrical Engineering;
8. Mechanical Building housing the Department of Mechanical Engineering;
9. Physics Building housing the Department of Physics;
10. Metallurgical and Materials Building housing the Department of Metallurgical & Materials Engineering and Department of Chemical Engineering;
11. Bioscience & Bioengineering building housing the Department of Bioscience & Bioengineering;
12. Incubation & Innovation Centre Building housing the Technology Innovation and Startup Centre for nurturing innovation and entrepreneurship in various domains;
13. Semi-Permanent Building for Animal House and School of Management & Entrepreneurship;

- 14. Duchenne Muscular Dystrophy (DMD) Centre is established in a part of Primary Health Centre building;
- 15. Kendriya Vidyalaya runs in the First Building of IIT Jodhpur in Pocket B.
- 16. School of Artificial Intelligence and Data Science;
- 17. Workshop Building which also house Civil and Infrastructure Engineering Department;
- 18. Central Instrumentation facility Building.

- 19. Berms: Eastern (23 nos.) and Western (28 nos.) - Each berm comprises 5 bays and provides ample space for housing Laboratories for the Departments of Civil & Infrastructure Engineering, Chemical Engineering, Research Labs on Interdisciplinary Research, Gymkhana, commercial establishments etc.

The photographs in the following pages provide a glimpse of the Campus of IIT Jodhpur.



Admin Building



The Learning Hub: Library Building



Basic Lab Building



Chemistry Building



Civil and Infrastructure Engineering Building



Computer Science Engineering Building





Electrical Engineering Building



Metallurgical & Materials Engineering and Chemical Engineering Building



Berms



Bioscience and Bioengineering Building



Computer Centre Building



Central Instrumentation Facility Building



School of Artificial Intelligence and Data Science Building

## Sports Facilities

A separate Sports Zone is developed to provide excellent Indoor and Outdoor Sports Facilities to the students, Faculty and Staff Members. The playing facilities presently developed outdoor are:

- (1) Cricket Ground with separate practice pitches;
- (2) Foot Ball Ground;
- (3) Hockey Ground;
- (4) Synthetic Basket Ball Courts;
- (5) Synthetic Lawn Tennis Courts;

- (6) Synthetic Athletic Track;
- (7) Volleyball Courts; and
- (8) Kabaddi Courts.

The Indoor Stadium (Aakash Complex) houses the following facilities:

- (1) Badminton Courts;
- (2) Table Tennis Courts;
- (3) Squash Courts (Single & Double); and
- (4) Gymnasium.



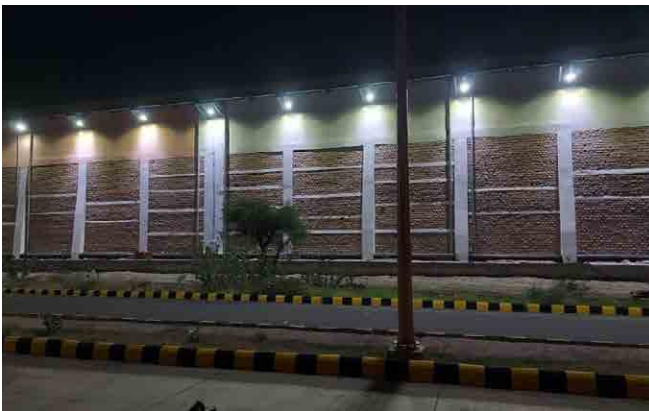
Stadium and Outdoor Courts



Cricket Ground Practice Pitches



Aakash Building



Aakash Building



Sports Facility – Indoor (Aakash Complex)

## OBC, PwD, Minority Cell

An OBC, PwD and Minority Cell for ensuring the proper utilization and adoption of reservation policies and guidelines issued by the Government of India, is functional at IIT Jodhpur. The Cell deals with matters related to grievances received from OBC, PwD, and Minority employees, and students, in the Institute. The Cell acts as a communicator between the Institute and the Ministry of Education in matters related to the OBC, PwD, Minority students and employees in the Institute. The Cell has not received any grievances from either students or employees belonging to OBC, PwD, or Minority categories during the Financial year 2021-22.

## SC/ST Cell

The Institute is sensitive about any kind of discrimination against Students and Employees of SC and ST Categories. Therefore, an SC and ST Helpdesk for ensuring the proper utilization and adaptation of reservation policies and guidelines issued by the Government of India is functional at IIT Jodhpur. The Institute ensures that Faculty Members, Staff Members, and Students desist from any act of discrimination of any kind against Students and employees belonging to these categories.

The Helpdesk deals with matters related to grievances received from SC and ST employees and students in the Institute. The Helpdesk acts as a communicator between the Institute and the Ministry of Education in matters related to SC and ST students and employees in the Institute.

The Cell has not received any grievances from either students or employees belonging to the SC/ST category during the Financial year 2021-22.

## Vigilance Office

As per the guidelines received from CVC and Ministry of Education, the Vigilance Awareness Week was observed from 26th October to 1st November 2021. During this week, Extempore Speech Competition (Hindi or English) and Essay Writing Competition (Hindi or English) were organized for the students and employees of the Institute. There have been no cases of vigilance in the Institute during the Financial Year 2021-22.

## Internal Complaints Committee

The Internal Complaints Committee has been constituted as per the requirement of the act. The committee decided to place posters pertaining to awareness on the Sexual Harassment of Women at Work Place (Prevention, Prohibition and Redressal) Act, 2013 (POSH Act). The posters were put up at Hostels, Students Mess, departments and other buildings of the institute. There was 1 recorded case which was resolved by conciliation.

## Office of Hindi

The Office of Hindi has organized Hindi Pakhwada during 14th to 28th September, 2021, at Indian Institute of Technology Jodhpur, in which competitions viz., Essay Writing, Chitra Dheko Kahani Likho and Hasya/ Vyangya/ Kavita Paath were organized through online medium for the employees of the Institute. More than 50 participants took part in it. Also, during the inaugural ceremony of the Hindi Diwas celebrations, the Hindi Bhasha Specialist encouraged the employees to work in Hindi language during their day-to-day official works. In order to motivate the employees to work in Hindi language, an Official Language Workshop was organized on 15th February 2022. The employees were provided training on filling the Quarterly Progress Reports of Hindi Rajbhasha.

## Office of Publications



The Office of Publications at IIT Jodhpur oversees the publication of documents namely, the Annual Report of the Institute, TechScope: The Science, Technology and Education Journal of IIT Jodhpur (3 issues per

year), Convocation Reports, Institute Brochures and other periodical publications. The Office works under the guidance of the Institute Publication Committee consisting of faculty and staff members. The Office coordinates with various stakeholders and authors from within and outside of the Institute, and designing and printing teams, in bringing out these publications and facilitates the broadcast and dissemination of these publications from time to time.

## Primary Health Centre

IIT Jodhpur provides round the clock health care facilities to Students, Faculty and Staff Members of the Institute, at its Permanent Campus. This fully equipped and self-sufficient facility is run by M/s. Goyal Hospital & Research Center Private Limited, Jodhpur, on contract. Presently, the following facilities are available at the Primary Health Center (PHC).

1. Qualified Medical Doctors,
2. Regular Visits of Specialist Doctors,
3. Paramedical Staff,
4. Diagnostic laboratory,
5. Physiotherapy Unit,
6. Pharmacy,
7. 24 Hours Emergency Room, and
8. An ACLS Ambulance.

Besides this, IIT Jodhpur is also availing facilities available at the All India Institute of Medical Sciences, S. N. Medical College and some specialized hospitals. The Institute has agreements with a few prominent hospitals for priority treatment to its employees and students. These include: Goyal Hospital and Research Center, MediPulse Hospital, ASG Eye Hospital, and Vasundhara Hospital.

The Health Center coordinates and supervises the treatment of students, employees, and their dependents during hospitalization in other hospitals that are empaneled by the Institute, to provide treatment. On request, the Health Center extends its health care services to Institute visitors during their stay on campus. Under emergency circumstances medical services are also extended to the non-IIT Jodhpur community residents in the residential campus. Details like patient records, medicine procurement/ disbursement, assets, equipment of the Health Center are all computerized. Visits of Specialist Doctors are scheduled at the Primary Health Center regularly. PHC also organizes Covid-19 vaccination and blood donation camps in coordination with the State Government of Rajasthan.



Primary Health Centre Building

institute with dedication and commitment. OPD services were provided in the Institute PHC to all the residents of the campus by the medical officer of the Institute and Doctors and support medical staffs from Goyal Hospital (the medical service provider at PHC). Arrangements were made to provide medical services (both OPD & IPD) to its residents in four different empanelled hospitals in Jodhpur.

FY2021-22 were significantly hit with 2nd and 3rd wave of COVID. During that time, efforts were made to keep the campus safe from the COVID-Pandemic. 14 vaccination camps were organized for both covishield and covaxin (including precautionary doses) inside

the campus for its residents (faculty, staff, their family members, and students) and altogether 3145 number of vaccinations were done. During the same time, 5829 number of RT-PCR tests were conducted in the campus with help of the support staff of the Institute, PHC and AIIMS Jodhpur. The PHC and MSUC both played crucial role in management of COVID inside the campus including management of COVID patient in super isolation.

During that period, eye check-up camp was organized in association with ASG Eye hospital. Arrangement was also made for specialist doctor visit in the campus (orthopaedics, gynaecologist, paediatrician).

### A glimpse of the vaccination camp conducted inside the campus for its students, faculty, staff, and their family members



# STUDENTS

## Student Council

As per the Constitution of SAC and ACAC, President of the various Boards under SAC and ACAC has been appointed to organize the student activities in a smooth manner over offline and online platforms.

### Student Activity Council (SAC)

1. Board of Art & Culture
2. Board of Literary Affairs
3. Board of Student Sports
4. Board of Student Welfare
5. Board of Hostel Affairs

### Academic and Co-Curricular Activity Council (ACAC)

1. Board of Academic Interactions
2. Board of Co-curricular affairs
3. Board of Departmental Society
4. Board of Innovation and Entrepreneurship
5. Board of Career Development
6. Society for Alumni Affairs

## Student Fests & Events

### BOARD OF LITERARY AFFAIRS

The activities of the board are as under:

- **Intra-Club Poster and caption writing competitions:** To improve writing and designing skills among club members, we organized various caption writing and poster designing competitions on different occasions and festivals.
- **Freshanza'21 Magazine:** Published the magazine digitally for the Freshanza event organized by SWC, which entrapped all the essence of the event.
- **Republic Day Article Writing Competition (open to all):** The board has organized an Article writing competition for all IITJ Students with a prize worth 2.2k on the occasion of Republic Day.
- **Intern Central:** To provide insightful knowledge and a roadmap to intern-seeking students by seniors, the board organized a show called "Intern Central," where the board called seniors who got interns to share their experiences.
- **Cover IITJ-related news:** From time to time, the board covered news related to our campus, like NIRF Ranking of IITJ, Dacby, Yule ball organized by litsoc, etc.
- **Azadi ka Amrit Mahotsav Article Writing Competition:** The board organized an article writing competition that was open to all IITJ students on the occasion of "Azadi ka Amrit Mahotsav," of prize worth:3.5k which was judged by Dr. Prasenjeet Tribuvan.
- **PHEME Website:** PHEME to enhance its reach and for providing blog posts, news, articles, and information, and interaction to build a website, though the website is running on a temporary domain, but as we get budget, we will launch it officially.
- **Aarambh:** PHEME presented AARAMBH, where we prepared a fun questionnaire for freshers to express their feelings and experiences of getting into an IIT.

## Quiz Society

- India Quiz: Quiz Society conducted the India Quiz on the occasion of Azadi ka Amrit Mahotsava, which was presented to a large audience at LHC.

- Spandan Quizzes: For the Inter-Hostel fest, the board organized a total of three quizzes:

## MELA Quiz, Cricket Quiz



- Prometeo Quiz: For the Institute's flagship technology event, the Quiz Society was given responsibility to organize TechBuzz, a tech quiz which received participants from all over the world. An informal quiz was also organized for the students present on campus.
- Constitution Quiz: The board organized a quiz on the diversity and constitution of India on the occasion of Constitution Day
- Bootup Quiz: The Bootup Quiz, which is meant to be the freshers' first quizzing experience, was organized and saw good participation from all students.
- Valentine's Day Quiz: Keeping the annual tradition alive, the board organized a valentine's day quiz which was part of a collaboration with the Literature Society.
- Quiz Bootcamp: To find emerging quizzing talents from the first year students and grow our Instagram

Page, the board organized a bootcamp which consisted of students framing 1 question per day for 30 days which were then uploaded to our Instagram.

- General Quiz: This was the first quiz organized completely by the freshers which helped them gain valuable feedback from the experienced members.

## Literature Society

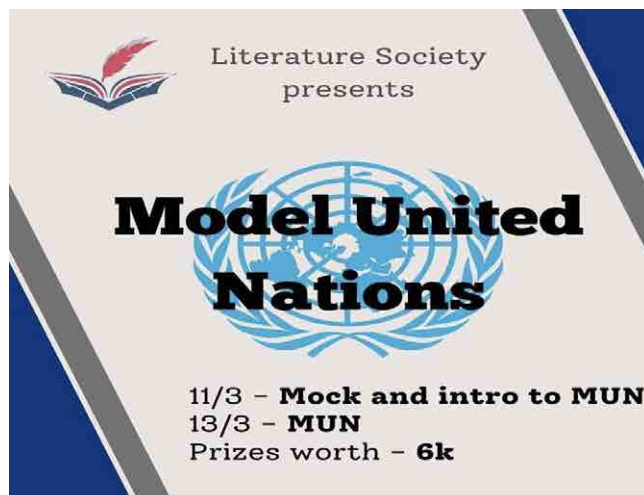
### • Devils Pen

A halloween's day event, where the board invited halloween themed entries such as poems/articles/stories and posted them on our Instagram page.

### • Exordium

The introductory session for batch 2021. The event saw a participation of almost 200 students. The event was themed on Norse mythology and involved various word games and literature related competitions.

- Regional Language Poetry**  
On the occasion of 'National Mother Language Day', the board invited entries in various languages and posted them on our instagram page for a social media based competition. There was a participation by 34 students and the event saw an overall interaction of more than 6000 accounts over Instagram.
- Constitution Day Debate**  
It was a 3 day debating extravaganza wherein the freshers displayed their debating skills. As the theme suggests, the topics were based on the laws and clauses mentioned in the Indian Constitution. The students were full of enthusiasm and participated with the utmost zeal. Winners were awarded with various cash prizes and everyone had a great debating experience. There were a lot of first time debaters who took further interest in debating and were eager to be a part of the "debating club"- Literature Society.
- Model United Nations**  
This session was taken to instill an interest and build a culture of MUN among students. MUN is the perfect platform to discuss issues of national and international importance. Students participating can hone their communication skills and evolve as diplomats and bureaucrats. MUN is a 2-3 day event wherein each participant, formally called delegate, represents a country and talks about their stand on a given agenda, and at the end propose possible solutions to curb the same.
- Republic Day Debate:** This event was organized by the Literature Society with the purpose of instilling curiosity amongst the students about Indian polity and world democracy. Students who participated in the event got a hands-on experience of a formal Parliamentary style debate. It was a vast resource of new knowledge and visions about India's democratic policies. The winning team was awarded prize money.
- Valentines Day Event (Jointly With Quiz Society):** This was a jointly hosted event by the Literature Society and the Quiz Society. Scheduled on 14th Feb, students took part in the quiz conducted and the fun activities organized. Students were required to take part in pairs. Activities included whose line is it anyway, in which participants were required to create eye-catching lines based on a picture presented.
- Spandan (JAM, Word Games, Stand Up, Poetry, Debate):** Literature society was responsible for coordinating 6 events in the literature section of our inter-hostel fest: Spandan. Like every year, Spandan was organized to bring out the zeal and competition between the students among themselves. Spandan was inaugurated with an EDM night performance by professional DJs. The 2-day long fest saw great competitions among students and hostels. Students challenged their batch mates, seniors, and juniors in all the domains. The competitions were a blend of cultural and arts along with some informal competitions too. Some of the competitions include dance, singing, acting, poetry, jam, painting, fashion show, movie spoof, and many more. Huge participation was witnessed in events like Antakshari, Dumb charades, and others.
- Hindi Debate (Collaboration with IIT BHU):** Literature Society in collaboration with The Literature Society of IIT BHU organized a session on Hindi Debate in order to initiate a culture of Hindi debating in the institute. The session was later followed by a practice debate to help students get acquainted with the idea of Hindi Debate.
- Fandom Event:** LIT's Chamber of Witchcraft and Wizardry 2.0 was the second installment of the Harry Potter Fandom Event that was held last year. The event started off with the Sorting





Ceremony, which was held in the online mode, to sort everyone in their respective houses. We had a series of competitions planned following the sorting ceremony. The first event in line was the Quiz Competition, whose first round was held in the online mode followed by the final round in LHC. Students participated with enthusiasm and it was an amazing experience for them as well as for the organizing team. After this we had a Wizarding Debate Competition, which was again, held in the online mode. It was a healthy debate as students were eager to prove their point and win the competition for their house. The following competition was the Treasure Hunt, which saw maximum participation from students. The organizing team hid the clues throughout the college and students, with their house teams, had to find all the clues and the team that finished first was the winner. The entire event was concluded with Yule Ball, a literary dance night that was all about dancing and a literary event alongside, where we declared the champions from individual houses.

- Alongside, we had an ongoing Fan-fiction writing competition. Students came up with amazing After Battle of Hogwarts stories. Also, during the event, the organizing committee streamed the Harry Potter Series in LHC 110 to ignite people's interest in the wizarding world and also to help the existing Harry Potter fans brush up on the details. Overall the event was a huge success.

### Board of Art and Culture

**Frame-X Progress Report:** The Film-making and Video editing society conducted a number of events during the academic year 2021-22. The following events were conducted within the society during the academic year 2021-22. Apart from all the listed events the society also covered all the different events that took place within the campus and also collaborated with other societies under BAC.

### The vital statistics of Library for FY 2021-22, are as follow:

Event	Date
Teacher's day events recorded	5 September 2021
Sangam music video recording	9 November 2021
Recorded Diwali celebrations and events in campus	4 November 2021
Recorded the events of the convocation	19 November 2021
Made a farewell video on the occasion of convocation	19 November 2021
Made a video of Fresher's orientation 2k21	22 November 2021
Conducted interviews for Freshers Introduction video 2k21	15 December 2021
Conducted competition on the occasion of new year : ABLAZE (open for all)	25 December 2021
Conducted introductory session of Frame-X for freshers 2k21	9 January 2022
Freshers Introduction video 2k21 released on youtube	9 January 2022
First video editing session conducted : Adobe Premiere Pro	11 January 2022
Conducted freshers competition 2k22	13 January 2022
'Nostalgic moments' series started on instagram which showcases IITJ culture and provides glimpses of past fests such as spandan, ignus etc.	December - February

Event	Date
Christmas, Republic day, hostel glimpse, Jodhpur in few secs : videos uploaded on instagram page of Frame-X	
Second video editing session conducted : Adobe After Effects	18 January 2022
Class Song Shoot & Release	14 May 2022
Campus Tour Shoot & Release	12 July 2022
Freshers' Short film Making Challenge	10 June 2022

### The following videos were released during the academic year 2021-22.

- Freshers' Introduction 2021
- Freshers' Competition Entries
- Class Song'22
- Campus Tour Video 2022

### Ateliers

- **Introduction Session:** The motive of this session was to introduce the Fine Arts and Crafts Society to the new students of IIT Jodhpur, and interact with them in order to know their interests and expectations from the society
- **Open Theme competition:** It was held from 31st December'21 to 2nd January 2022. Candidates were free to create an artwork on any theme, with no restriction related to medium of art whatsoever, in order to bring out creativity and maximum participation. The artworks were uploaded on our official instagram page, and a 2 way judgment was made based on the engagement of the artwork on our page and their skills by our panel of judges.
- **Competition Poster**
- **Sketching Session:** The session was organized in order to give students an insight into the basics of sketching, materials used, different techniques involved like hatching, scribbling, stippling, contour lines etc., in order to master the art form. Our alumni, Pawan Kishor was invited to take this session.
- **Soft Pastel Session:** The session was aimed to introduce the students into the basics of soft pastels, how to use them the right way in order to create some beautiful artworks through various techniques.
- **Republic day competition:** Organized on the occasion of 73rd Republic Day. The theme of the competition was 'Tiranga', where participants were to create an art work using only the three colors of the Indian national flag.
- Events hosted by Society in Spandan week
- **Face Painting Competition:** Participants had to paint their partner's faces, based on the theme "Binge Watch".
- Soft pastel competition
- Charcoal painting
- Costume Designing
- Sketching Competition
- Tshirt Painting

### Dramatics Society Annual Report

- **Teacher's Day Skit:** On the occasion of Teacher's Day'21, the Dramatics Society performed an online skit, 'The Talk Show'. It's video is available on the instagram page of the Dramatics Society.




- **Online Meetings**

1. **Interaction Meeting:** The first online meeting with the new batch of students was an interaction meeting.
2. **Theatre Basics:** Second meeting was focused on the basics of theatre. The students also had to perform some on the spot tasks.

Offline sessions on voice modulation, improv etc. were also organized.

### Sangam Progress Report

- **Introductory Session:** The music society forms an integral part of the diverse life on campus. On the arrival of the new batch to the college, the society held its introductory session for the freshers and enthusiastically welcomed them. They were made familiar with the club, and events held by them and were encouraged to audition for the same to create some of the best, unforgettable memories.
- **Auditions:** This was the official process for the selections of Music Society 2022. The Auditions were conducted in online mode and consisted of two rounds. The first one was "Video Submission" round where students were asked to submit two videos, one of them singing along with a backtrack and one without backtrack. The students cracking this round were called up for video interviews which was the last round of the selection process. A team of 19 students from different programs was selected for Music Society last year, which is always open for inclusions.




## MUSIC SOCIETY INTRO


27

DEC

9.30 PM



*with a surprise for freshers...*



Links will be shared with you through mail

- Music Video (When We Feel Young):** Reconnecting with your younger self and memories, with the help of music. With the feeling of nostalgia, a delightful music video of the song when we feel young was created. The music video was made on campus, in collaboration with frameX that helped in cinematography.



- Music Video (Vo Dekhnay Mei):** Continuing the streak of online performances, society released its phenomenal cover of vo dekhnay mein. This one was made when the members were at their respective homes. It was especially appreciated greatly by the new batch of freshers.

- Live Online Performance (Ombre App):** Ombre App in collaboration with Sangam, Music Society, IIT Jodhpur presented Soul Strings where Harshita Kalani, a core member of Sangam performed live. The performance left everyone vibing with the beautiful Harmony and a never ending melody.



- **Republic Day Music Videos:** Celebrating the 73rd republic day, new members started their journey. There were two wonderful performances by the freshers on this auspicious occasion. One group sang bharat ki beti, while the other group did the song o desh mere.
- **Valentines Day Medley:** On the occasion of love month, we released 'Valentine's special mixtape' which included various romantic melodies for the audience to enjoy and fall in love with. In this event, almost the entire music society participated. Seniors guided juniors on various things and by working together, they came up with 6 songs. These were combined into one video which was live shown on youtube. Songs performed were ek ajnabee x jab koi baat, aradhike, sab tera x mast magan, you and me x darkhast, just maath mathalli, aahatein.



- **Performances in Informal Nights of Prometeo 22:** Sangam, the music society performed in open mic held in the annual tech-fest of the college, prometeo. The performance was conducted rather informally and relished by everyone present. It was a mesmerizing performance.



- **Extravaganza:** A Music Society Exclusive (Spandan 22): Extravaganza is a music-society exclusive event held in Spandan every year and like every year, it was a grand success this year as well. It consisted of over 10 terrific performances that managed to captivate everyone. It was an amazing and memorable experience for the members of the club as well as the audience who enjoyed thoroughly.



- Music Video (Zehnaseeb):** Doing one last performance online, freshers once again came up with a soulful music video of song zehnaseeb. In this one, seniors showed confidence in juniors where they implemented what they had learned. Starting from song selection to video production, everything was done by the juniors.



- Jamming sessions Throughout The Year:** Jamming sessions are informal music sessions where members come together and sing without preparations. They are fun, light-headed and help in coming up with harmonies, improvisation of songs, connecting, etc. These are held now and then, as and when members are available.

## Shutterbugs Progress Report

- Introductory session:** The first meet of shutterbugs with freshers2021 was an introductory session taken on 27th December in online mode. Session was basically for introducing the club to freshers like how the club works and what freshers will get from this club.
- Secretary (Shivansh Gahlaut), Joint secretaries (Rushil Patel and Prajwal Chand) and Core

members of the club were present in the session. Below are some pics of the session.

- "I Do" photography:** So, this was an open theme competition, which happened on 5th of January 2022 which was Organized by Shutterbugs with a prize worth Rs 6000. This competition was organized so that interested students could get to know about their talent and how creative they are,

could learn from the same, which would definitely work to grow the club.

- **Photo of the week:** An event organized to encourage people to take aesthetic photos of any scene possible, i.e, try to see even common day to day scenes in a different point of view and try to capture the same.
- **Basics of photography:** The basics of the photography session were held in online mode 22 Jan 2022 In the presence of the shutterbug's team Shivansh Gahlaut (Secretary) , Rushil Patel and Prajjwal Chand(Joint secretary) and Core members, they taught everything about photography and the types of photography. Many of them improved their basic skills after this session.
- **Republic day competition / Jewels of india:** On the occasion of Republic Day, Shutterbugs organized a competition named 'Jewels of India' whose theme was to capture creative photographs showing our Tricolor flag. A lot of beautiful entries were there. After the judgment by the team, top 3 photos were selected as winning entries.
- **Photo Walk:** On an early morning with pleasant clouds, the Shutterbugs team organized a fun filled

photo walk to the hills near the campus, which is famous here among students with the name 'Kali Pahadi'. Along with the Secretary(Shivansh Gahlaut), Joint Secretary(Rushil Patel) and members of the Core Team, many 'shutterbugs' from the first year joined this making the number to around 60. After a track on the hills, there was a wait for the sunrise. Till that, the Shutterbugs team made groups of the students and gave one camera to each group, and reminded them about the basics of camera. Photographers from the first year were very excited for the sun to rise. They were ready with settings to capture the moment, and the sun rose beyond the hills. Freshers enjoyed capturing the sunrise, nearby hills, buildings and also our beautiful campus from a distance.

- **Offline Camera Workshop:** On the night of May 27, 2022, the team of Shutterbugs organized a workshop on the use of cameras. In this workshop, many 'shutterbugs' from UG as well as PG students were there. The team taught them about the basics of photography, DSLR cameras, exposure triangle, and various camera settings.





## Society of Alumni Affairs (SAA)

The Society of Alumni Affairs (SAA), IIT Jodhpur, envisions building a mutually beneficial relationship with the Alumni of the Institute by purposeful engagement for the betterment of the student community. The society co-organized the following events along with the Office of Alumni Relations

- Ask an Alumnus Sessions / Alumni Townhalls
- Alumni connect session for UG orientation
- Alumni connect session for PG orientation
- Alumni Induction Dinner
- Annual Alumni Day

## BOARD OF CO-CURRICULAR AFFAIRS

The Board of co-curricular affairs envisions moving forward the technical and scientific culture of the college. The board focuses on the active participation of college students in all national and international technical contests or events.

### Our key focus areas include:

- Allow students to explore and strengthen talents outside of academics.
- Allow students to build friends and participate in group activities outside of the tight circle of the regular classroom.
- Help to build confidence and self-esteem in students

- Provide a way to keep students supervised outside of college hours.
- Help build skills that are not necessarily taught in the classroom but are crucial for the future.

## Activities under BCCA in the academic year 2021-22

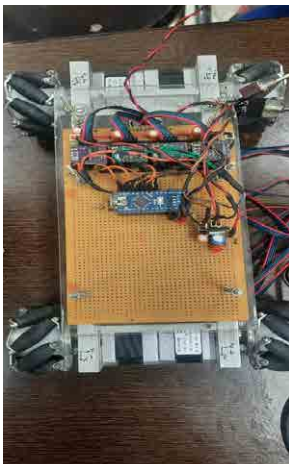
- Held various contests within the societies.
- Participated in ABU Robocon 2022 for the 1st time and qualified for round 2 with an impeccable score of 100.
- Participated in SAE E-BAJA, the first time building an electric car on campus.
- Participated in Inter IIT TechMeet 10.0 and scored the best rank among all 2nd gen IITs and 8th overall.
- Involved in organizing Prometeo'22, the annual technical and entrepreneurship fest of IIT Jodhpur after a harsh lockdown of 1.5 years
- Organized club sessions both online and offline mode.
- Held offline workshops so the students could have a hands-on experience using new technologies.
- SAE BAJA Team: Participated in SAE E-BAJA, the first time building an electric car on campus.



- **Inter IIT Tech Meet:** Participated in Inter IIT TechMeet 10.0 and scored the best rank among all 2nd gen IITs and 8th overall.



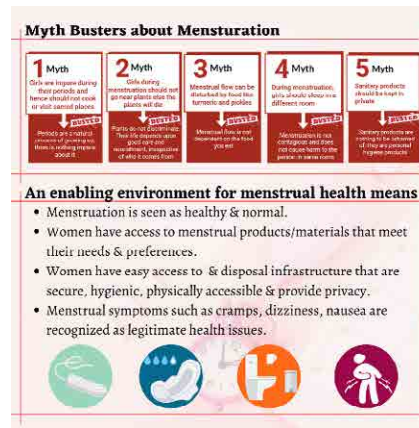
- **Robocon Team:** Participated in ABU Robocon 2022 for the 1st time and qualified for round 2 with an impeccable score of 100.



- **Tree Plantation Drive:** On the eve of 75th Independence Day, with a motive to do something beneficial for our country, RAC IIT Jodhpur conducted a Tree Plantation Drive. Over 50 volunteers, appreciating the value of trees, planted roughly 40 “Karanji” trees on the IIT Jodhpur campus and committed to care for those plants. This event would also boost the amount of flora at IIT Jodhpur. RAC IIT Jodhpur wishes to thank all participants for helping to make this event a big success.



- Pankh Udaan:** Creating awareness about Menstrual Health and Hygiene and diseases caused by it by Rotaract Club of IIT Jodhpur, RID 3053. In the era of the internet, the main objective of Pankh Udaan is to raise awareness through the use of social media. The primary goal was to raise awareness about disease caused if not proper menstrual hygiene is not followed . A total of 5 Rotaract club volunteers came together to research the content of various topics and design the posters, which were to be posted on Instagram. The post has received over 100+ views and 40+ likes and further counting. The goal is to reach out to as many people as possible and dispel myths about these topic, which Rotaract Club is doing admirably.



- Webinar on- Importance of Diet, Exercise and Vaccine:** It focused on maintaining health during the global pandemic organized by Rotaract Club of IIT Jodhpur, RID 3053. The Rotaract club at IIT Jodhpur hosted a webinar titled "Importance of Diet, Exercise, and Vaccine," which debunked vaccination myths, provided advice on how to maintain a healthy diet, and finally discussed the benefits of exercise. The goal of this session was to make people aware of their health and assist them in taking the necessary steps to maintain it during the global pandemic. The speaker was Dr. Prakash Jakhar (Senior Doctor at IIT Jodhpur). The session was held online, and Dr. Prakash even addressed the attendees' concerns. Around 20 people attended the session, and they were grateful to Dr. Prakash for delivering such a well-informed talk.
- Finance Wellness Workshop:** Creating awareness about proper financial behaviour organized by Rotaract Club of IIT Jodhpur, RID 3053. The Rotaract club at IIT Jodhpur hosted a workshop on Personal Finance on 10th October. The speaker was Karthik CS (Co-Founder @ Knowise). Various investment strategies were discussed. Around 30 participants benefited from the workshop.
- E-Safar (A Virtual Tour):** On the occasion of "World Tourism Day," RAC IIT Jodhpur, in collaboration with RAC Vizag City, arranged a virtual tour of eight locations, including Goa, Rajasthan, and Bihar. This virtual trip was indeed enjoyed by more than just 30 virtual tourists.
- Run for your Dil:** Focused on developing a healthy lifestyle organized by Rotaract Club of IIT Jodhpur, RID 3053; Rotaract Club of Curchorem-Sanvordem, RID 3170 and 31 other clubs from all over India. On the occasion of World Heart Day, RAC IIT Jodhpur, in collaboration with other clubs, organised a 28-day Bingo Fitness Challenge titled "Run for your Dil." In order to promote a healthy lifestyle, participants were required to complete small tasks such as running or working out on a daily basis, to get rid of unhealthy behaviour. This fitness challenge drew over 200 participants.
- Webinar on- Suicide Prevention Day:** Emphasize the value of life organized by Rotaract Club of IIT Jodhpur, RID 3053. The Rotaract club at IIT Jodhpur hosted a webinar titled "Creating Hope Through Action" on the occasion of World Suicide Prevention Day. The speaker was Mr. Prasad Gadkari (Consultant Clinical Psychologist & Student Counsellor at IIT Jodhpur). The session suggested some measures for taking good care of mental health, gave an overview on warning signs of suicide ideation and some tips to deal with suicidal thoughts. There were over 45 participants who benefitted from the session.



## Ek Bharat Shreshtha Bharat, IIT Jodhpur

To celebrate the unity in diversity of our nation and maintain and strengthen the fabric of traditionally existing emotional bonds between the people of our country, to showcase the rich heritage and culture, customs, and traditions the following activities were organized by the EBSB club IIT Jodhpur India

Regular webinars and awareness talks are organized to promote the theme of the EBSB program. To facilitate greater participation of students; various activities are planned to be organized under the 'Ek Bharat Shreshtha Bharat' Programmed depending on the interest and skills of every individual like dancing, drama skits, presentations, poetry, anchoring etc.

### Republic day

Our first identity is determined by our nationality if humanity is our first religion. Any prejudices we may have towards religion, geography, society, or politics will not be able to trump our Indian identity. On the occasion of Republic day, our team participated in various events like singing and poetry.



## Webinar: Geographical and cultural diversity



*Ek Bharat Shreshtha Bharat Club, IIT Jodhpur*  
*presents*

**Title of the talk - "Geographical and cultural diversity"**

**Date and time: 4 pm, 26th Feb 2022 (Saturday)**





**Dr. SALEEM MIR**  
Cluster Innovation Centre  
University of Delhi

**ABOUT THE SPEAKER**

Dr. Salim Mir is currently working as an assistant professor at the Cluster innovation center (University of Delhi). He has completed his PhD from Delhi School of Economics in the year 2014. His area of research are: Digital Humanities, Tourism and Hospitality, Demography and population studies. Dr Salim was gold medalist and the recipient of many awards such as Research Fellowship in Sciences for Meritorious Students, under the scheme of University Grants Commission (UGC), King Saud Gold Medal. He is also affiliated to many professional bodies such as National Association of Geographers of India, Association of Geographical Studies.

Monthly Webinar organized by EBSB club, IIT Jodhpur and the title of the webinar was “Geographical and cultural diversity”. Dr. Salim Mir (Assistant professor, DU) stunned everyone with his words and knowledge. He inspired all of us to be united and to understand and respect others feelings, living habits, food, and cultures.

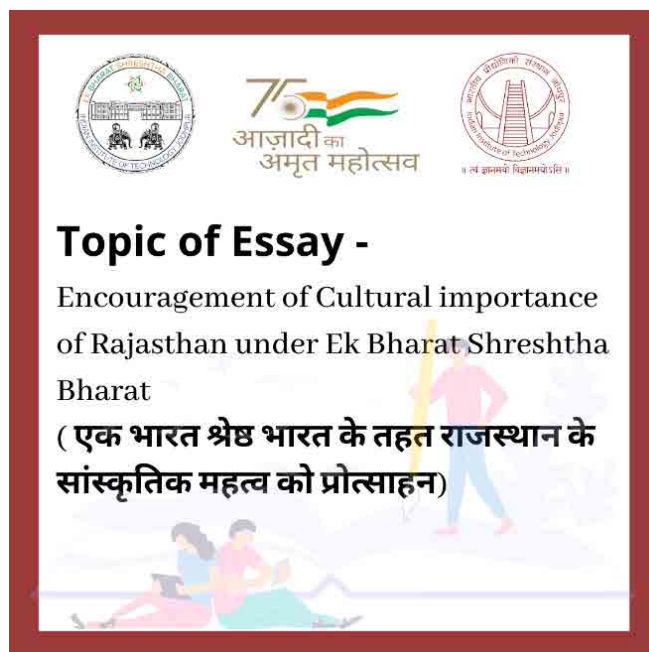
Poetry & Essay competition under “Azadi Ka Amrit Mahotsav” organized by EBSB IIT Jodhpur

EBSB IIT Jodhpur organized competitions to celebrate Azadi Ka Amrit Mahotsav. It is an initiative of the Government of India to celebrate and commemorate 75 years of independence and the glorious history of

its people, culture, and achievements. This Mahotsava is dedicated to the people of India who have been instrumental in bringing India thus far in its evolutionary journey.

### In this event, there was two competitions:

1. **Self-composed Song/Poetry:** Contribution of women in the freedom struggle (स्वतंत्रता संग्राम में महिलाओं का योगदान)
2. **Essay:** Encouragement of Cultural importance of Rajasthan under Ek Bharat Shrestha Bharat (एक भारत श्रेष्ठ भारत के तहत राजस्थान के सांस्कृतिक महत्व को प्रोत्साहन)



### Ambedkar Jayanti

Bhimrao Ramji Ambedkar, popularly known as Baba Saheb, was a prominent 20th-century Indian politician, lawyer, social reformer, and economist who is most known for having fought for the rights of the Dalits, or the country's “untouchables. Baba saheb Ambedkar was responsible for establishing the “Constitution of India.” He was a well-known statesman who spoke up for socially underprivileged groups. On the occasion of Ambedkar Jayanti, our EBSB team member Furkan Ansari deliver sensational Poetry.



### Independence day: Azadi Ka 75th Amrit Mahotsava

The Government of India has launched the Azadi Ka Amrit Mahotsav to honor and remember 75 years of growth in India and the illustrious past of its people, culture, and accomplishments. All that is progressive about India's sociocultural, political, and economic character is embodied by Azadi Ka Amrit Mahotsav. This Mahotsav is devoted to the Indian people who, in addition to playing a key role in the country's progress to this point, also possess the strength and capacity to realize Prime Minister Modi's goal of enacting India 2.0,

which is inspired by the spirit of Atmanirbhar Bharat.

On this great occasion, EBSB team Participated with great enthusiasm. The Poem by Shreyash Gupta on the theme of Beti Bachao Beti Padhao was heart-tearing and sensational.

India's royal state of Rajasthan is renowned for its

extensive cultural legacy. Folk dances are significant because they tell stories in a distinctive and engrossing way while also being aesthetically attractive. Our EBSB team members Shaily Singh & Shivangi Tripathi did the duo dance performance, which forced the audience to jump on their seats.



Apart from that, Rachana did the Bharat Natyam, which is one of the most famous Indian classical dance styles, and is thought to be the ancestor of many other Indian classical dance styles.

As we know, one of life's most basic necessities is water. Without water, life would not even be remotely feasible. One could argue that while

people can survive without food, they cannot in any way survive without water. So to deliver the message of water saving and proper utilization of water, on the eve of the Independence day event, Our EBSB skit team did a Mime, and the theme was Save Water. The Audience's eyes got teary, and a huge round of applause was creating a vibration in Building.



EBSB IIT Jodhpur Participants with faculties on the Evening of Independence day



## Student WellBeing

The Student Wellbeing Committee (SWC) has been an integral part of IIT Jodhpur since 2008. It takes care of the mental wellbeing and overall happiness factor of all the students of IIT Jodhpur. Every year, it strives to ensure that every student gets to know the Institute in intricate details and to help absorb all the opportunities that the Institute creates. It works towards making the transition of new Students from their homes to the Institute a memorable one. The objective of the Student Wellbeing Committee is to provide friendly support to the new students for their well-being during their stay on the campus and for their personal & professional developments. In essence, the Student Wellbeing Committee promotes the development of students along three aspects, namely: (1) Academic: It provides information about different academic programs of the Institute, and suggests efficient time management and study skills, (2) Extra-Curricular: It strives to develop talents in students, and encourages them to discover their extra-curricular interests/hobbies. Also, it provides an interface with the Institute activities, and provides a platform for interaction with the Institute; and (3) Personal: It provides a cushion against homesickness, and assists in adjusting to the new environment (including concerns and difficulties arising during their stay at the Institute) by providing personalised guidance. Also, it provides psycho-education and confidential referral services to students.

The team tries to ensure that IITJ is not just an institute, but a home away from home for the students. The Student Wellbeing Committee is headed by a Faculty Member, as the Chairperson, and ably supported by Faculty Members, Counsellor, Well-Being Moderator and two teams (UG and PG) of students. The student counsellor plays the role of growth coach and the well-being moderator is the primary contact for the students. They are available 24 x 7 especially the well being moderator who is available on the campus at the disposal of students.

In addition to the above, the Student Wellbeing Committee strives to:

- (1) Maintain a ragging-free campus;
- (2) Help in organizing Orientation Program for new students to acquaint them with the Institute;
- (3) Organize lectures and trainings on:
  - (a) Stress management,
  - (b) Time management,
  - (c) Health care and hygiene,
  - (d) Substance Abuse,
  - (e) Relationships,
  - (f) Cope with homesickness,
  - (g) Addiction and others, and
  - (h) motivational lectures by eminent speakers;
- (4) Coordinate with YourDost for mental wellbeing of the students. And organizing workshops on the key issues faced by the students.
- (5) Organize events for encouraging interaction among students of different years, and Staff and Faculty Members.

The details of the events organized by SWC are also mentioned on the website: <http://swc.iitj.ac.in/>. The following activities were conducted in the past year:

### PG Activities (Sept, 2021 onwards)

#### Underneath the Stars

##### 17th March 2022

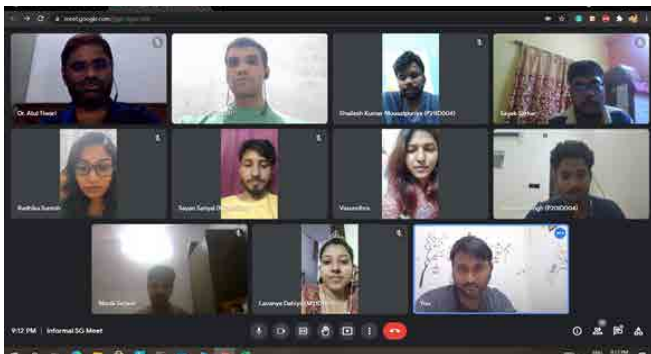
This event was conducted to celebrate Happiness Day, for which a movie screening was done and the movie screened was "Chhichhore". The message of the movie was to focus on your efforts and work each day to excel your skills or talent. It also focused on the journey through which you learn multiple things rather than just focusing on the success of the destination. It was the IITJ's first ever Open-air Movie Screening.



## Importance of Mental Wellbeing during the Pandemic

**17th January 2022**

The session was organized virtually to help students to deal with the ongoing stress for dealing with uncertain life situations. Agenda of the webinar was to focus on the mental, physical and emotional well-being of the students. Tools were provided which they can use in their daily routine for a healthier and happier lifestyle.



## Gratitude Day

**19th March 2022**

Postcards were distributed to students to express their gratitude to each other and cherish the happy moments they had at the campus. Evening was followed with fun and laughter by reminiscing the memories and appreciating each other.

## Dussehra Celebration ‘Good over Evil’

**15th October 2021**

A bonfire to remember the victory of good over evil. Students gathered to share their ideas and stories to initiate conversations. It was an evening full of laughter and storytelling about their deeds to achieve or to get their tasks done in life.



## PG Orientation

(22nd July, 22 - 27th July, 22)

A week full of various activities for the fresh batches. Getting back on campus after almost 2yrs, and missing campus life, students seemed excited about the in-person orientation. Team organised various activities like plantation drives, mini marathons, informal sessions, interactive sessions, to introduce the batches to their seniors, campus infrastructure, and campus life. Orientation week helped the students to make themselves comfortable with the campus life and clear out their doubts about their courses, academic life, co-



curricular activities. Also, there were various activities for students to showcase their talent. Students were also rewarded with the prizes later on.

## UG Activities conducted for the AY 2021-22 (Sep'21 onwards)

### Freshanza - Jan 17, 2022

Fresher's organized by the UG team for the new batches. Students did organize various competitions where the talent of new batches can be show.cased. A virtual evening filled with poetry, dance, music, laughter and lots of fun



## Gratitude day and Happiness day

(20th March, 2022)

An evening full of fun and laughter. Students wrote messages of gratitude for their classmates, friends, seniors, mentors, and others. Postcards were given to students, where they expressed their gratitude. The evening was followed up by a poetry and open mic to showcase their talent.



## Connecto Patronum

(15th December, 22)

An event which utilized the unique architecture of AirMeet. In an Airmeet, there are many tables (breakout rooms) and anyone can join any table to have a conversation with the people already sitting at the table. This is to promote conversations and encourage students to talk about their problems, interests and their lives with their peers. An initiative to encourage students to make interactions with others by helping them to share more and work on their growth.

## Interactive sessions with UG team and new students

(28th January, 22)

Interactive sessions were organized to discuss the experiences or challenges faced by the students. A discussion to help each other and come up with the solutions to overcome challenges.

## Building Meaningful Relationships During College Life

(For UG and PG students)

**26th August,22 - 27th August,22**

Workshop and orientation was organized by YourDost to introduce students with the platform and how accessible it can be in their daily lives. Speaking to a counselor and seeking out professional help by

sitting in the comfort of their room. YourDost platform is providing professional help to students via text messages, video calling or voice calling. Students can sign-up at the portal at any time of their requirement and access the facility.

During the second day of their orientation, Ms. Jyotsna Sodhi, Counseling Psychologist, YourDost was present throughout the day. She took a workshop on maintaining meaningful relationships, she spoke about setting the tone and staying aware about the red flags while being part of the relationship. Later, she was available for the individual counseling sessions. Students did sign up for the individual sessions with her.



## Career Development Cell

The Career Development Cell (CDC) aspires to provide comprehensive career counseling to IIT Jodhpur students' during their academic involvement and after graduation. CDC performs various individual and collective activities relating to training and placement process planning, career development, counseling, competence/skill assessment, decision making. CDC fosters students' abilities, competencies, and interests and assists them in developing professional skills, knowledge, and positive attitude to manage their career path. The entire placement process was conducted virtually with more than 200+ companies participated in the Placement Season 2021-2022. Some renowned companies that participated in the placements are Microsoft, Google, Deloitte, American Express, Housing, Gartner, Graviton Research Capital, Oracle, DE-Shaw, Arcesium, Oil India, Tata Consultancy Services, L&T Engineering, Maruti Suzuki, Amazon, Accenture, ZS Associates, Nippon Steel, Mahindra & Mahindra, Tata Consulting Services, Tata Elxsi and many more.

### Key statistics from the season 2021-2022

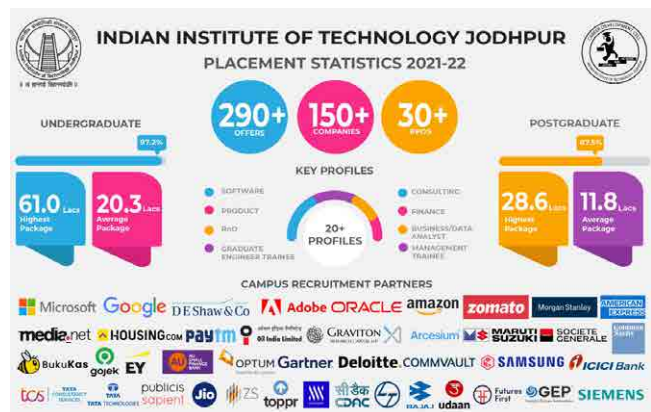
- 200+ companies participated in Internship and Placement.
- Total Number of offers – 373 offers
- Total no. of students placed- 345 (B.Tech. – 172, Students, M.Tech.- 88 Students, M.Sc.- 29 student, MBA- 55)
- B.Tech. placement percentage – 97%, M.Tech. – 75%, M.Sc. -52%, MBA- 100%
- Average salary offered to the B.Tech. Students – 20.66 Lakhs, MTech. – 11.57 Lakhs, MBA- Rs. 13 Lakhs

### Activities in the season 2021-2022

- Internship and placement planning
- Individual/Group Career Counselling

- Interaction Sessions with industry professionals
- Effective Job Search Strategies
- Soft Skills Training Sessions
- Welcome/Introduction Sessions
- Mock Interview Sessions

IIT Jodhpur continues its endeavour to develop programmes and course pedagogy, providing both academic rigour and industry relevance. It has, over a period of time, become one of the preferred choices for recruiters owing to inter-disciplinary and industry-aligned courses. Career Development Cell (CDC) partners with students and industry to succeed in finding life-long career fulfilment. The roles and profiles offered to students during this placement season is a testament of the diversified and relevant courses offered at IIT Jodhpur. In addition, we have successfully built coherent relationships with our campus partners and strive to improve the students' as well as the recruiters' experience year after year. The Institute has designed a curated capability programme to prepare students for the campus placement process. Throughout the year, the CDC at IIT Jodhpur organises career development workshops, mock interviews, leadership talks, soft skill training and personality development activities.



B.Tech				
B.Tech.	Placed	Unplaced	Registered	Placement %
CSE	62	0	62	100.00%
EE	45	1	46	97.83%
ME	34	3	37	91.89%
BB	31	0	31	100.00%
<b>Total</b>	<b>172</b>	<b>4</b>	<b>176</b>	<b>97.73%</b>

MTech				
Program	Placed	Unplaced	Registered	Placement %
CSE	13	1	14	92.86%
AI	15	1	16	93.75%
DCS	10	0	10	100.00%
SIOT	5	3	8	62.50%
CPS	10	0	10	100.00%
AMD	9	2	11	81.82%
TFE	7	2	9	77.78%
MT	2	5	7	28.57%
CH	7	4	11	63.64%
CI	9	10	19	47.37%
<b>Total</b>	<b>87</b>	<b>28</b>	<b>115</b>	<b>75.65%</b>

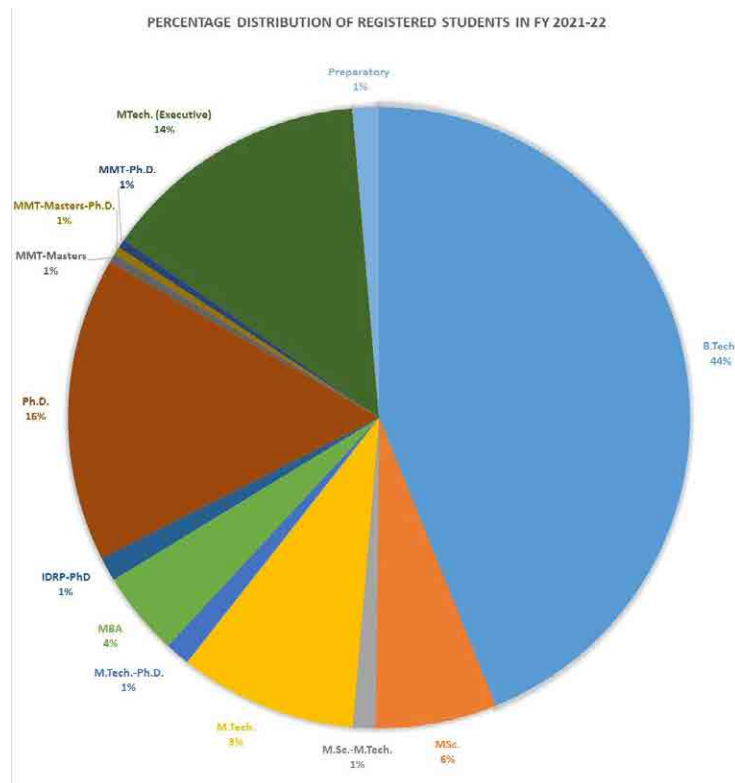
M.Sc.				
Program	Placed	Unplaced	Registered	Placement%
Chemistry	12	8	20	60%
Digital Humanities	6	9	15	40%
Mathematics	2	5	7	29%
<b>Total</b>	<b>29</b>	<b>36</b>	<b>56</b>	<b>52%</b>

MBA				
Program	Placed	Unplaced	Registered	Placement%
MBA	Placed	Unplaced	Registered	Placement %
MBA	55	0	55	100%

## Registered Students in IIT Jodhpur

IIT Jodhpur has, as on 31 March 2022, a total of 3329 students registered in various programs offered by the Institute. The table and chart below depict the program-wise break-up of the registered students in the Institute.

Academic Program	Number of Registered Students
B.Tech.	1461
MSc.	210
M.Sc.-M.Tech.	39
M.Tech.	307
M.Tech.-Ph.D.	43
MBA	146
IDRP-PhD	42
Ph.D.	527
MMT-Masters	16
MMT-Masters-Ph.D.	13
MMT-Ph.D.	15
MTech. (Executive)	464
Preparatory	46





# Financial Position

## Balance Sheet as on 31 March 2022

Amount in Rupees

SOURCES OF FUNDS	Current Year	Previous Year
CORPUS/CAPITAL FUND	10,38,76,60,344	10,65,21,47,175
DESIGNATED/EARMARKED/ENDOWMENT FUNDS	73,43,55,374	37,40,02,715
CURRENT LIABILITIES & PROVISIONS	2,86,27,58,979	3,02,84,72,433
<b>TOTAL</b>	<b>13,98,47,74,697</b>	<b>14,05,46,22,323</b>

APPLICATION OF FUNDS	Current Year	Previous Year
FIXED ASSETS	11,80,26,08,734	11,19,43,06,213
Tangible Assets	11,52,53,20,568	11,11,12,88,414
Intangible Assets	4,24,35,128	5,77,97,274
Capital Works-in-Progress	23,48,53,038	2,52,20,524
INVESTMENTS FROM EARMARKED/ENDOWMENT FUNDS		
Long Term		
Short Term		
INVESTMENTS - OTHERS		
CURRENT ASSETS	2,07,59,59,358	2,42,06,31,222
LOANS, ADVANCES & DEPOSITS	10,62,06,605	43,96,84,889
MISCELLANEOUS EXPENDITURE NOT WRITTEN OFF		
<b>TOTAL</b>	<b>13,98,47,74,697</b>	<b>14,05,46,22,323</b>

## Grant-in-Aid

S.No.	Particulars	Recurring (Object Head 31)	Salary (Object Head 36)	Non-Recurring (Object Head 35)	Total
A	Grants-in-Aid				
	(i) Grant Received during F.Y. 2021-22	63,56,45,622	45,13,00,000	16,00,00,000	1,24,69,45,622
	(ii) EWS Grant Received during F.Y. 2021-22	2,54,00,000	-	-	2,54,00,000
	Total Grant Received	66,10,45,622	45,13,00,000	16,00,00,000	1,27,23,45,622





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