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INDIAN INSTITUTE OF TECHNOLOGY INDORE

ANNUAL REPORT 2020

Contents

Director's Message

As IIT Indore enters in the 3rd decade of 21st Century, it carries forward the culture of untiring hard work and excellence in research, teaching, institute development, and administration. The year 2020 posed many difficult challenges situations due to COVID19 pandemic. IIT Indore not only met these challenges through proactive approach, and visionary, innovative, adaptive, and human-centric leadership and decision making but also converted the challenges into opportunities. This year witnessed consolidation of IIT Indore position nationally and internationally as one of the fastest-growing institutions. The Institute achieved its highest ever NIRF ranking by securing 10th NIRF rank in 2020 and 64th rank in the Young University Rankings 2020 by the Time Higher Education. The Institute also received the largest ever external grant of Rs. 100 cr. grant by DST to establish Technology Innovation Hub (TIH) on the vertical of "System Modeling, Simulation, and Visualization" under National Mission on Interdisciplinary Cyber Physical Systems (NM-ICPS). The Institute awarded 233 B.Tech, 57 M.Tech, 58 MSc., 6 M.S. (Research) and 58 PhD degrees during 8th Convocation held in the mixed modes of virtual and physical. In last one year the institute has added significant academic and infrastructural facilities to enable world-class research and teaching.

Over the last eleven years, the institute has made significant marks in India and worldwide, across different verticals. Our faculty colleagues, along with their researchers in the last one decade, have also shown immense perseverance to attain new heights of excellence in research, teaching and outreach. Our graduating students have been employed in the best of the companies and many have also chosen the less travelled path of entrepreneurship. It is indeed a proud moment for us when our students contribute to the society by creating the jobs and changing the lives. The teaching and research environment of the institute has been supported by efficient administration. Our researchers continue with their ground-breaking discoveries, as observed in the quality of publications and their impressive citations, patents, technology development, creating skilled manpower. Vision of the Institute to engage undergraduates in long-term research projects in a way not done anywhere else in the country, has paid rich dividends. So has the Institute's policy of stringent review of progress of the doctoral thesis.

Vision for future is (i) to establish industrial research park to accelerate industry-academia collaboration for the development of innovative, socially relevant and globally competitive technologies, products, and processes, encourage and support the start-ups, spin-offs, entrepreneurship by our students, significant increase patenting and technology licensing; (ii) Increase internationalization, inclusiveness, and outreach at grassroot-level so as to contribute in the development of our immediate neighborhood through technological innovations; (iii) accelerate the chosen path in promoting interdisciplinary research in the cutting edge areas; (iv) focus on ancient Indian Knowledge systems; (v) to introduce more dual/joint degree programs with leading institutions from across the world.

I gratefully acknowledge the hard work put in by all the students, staff and faculty members in placing IIT Indore on the world map of research and academic excellence and extend my heartfelt congratulations.

Prof. Neelesh Kumar Jain
Director (Officiating), IIT Indore

Board of Governors, IIT Indore

Chairman

Professor Deepak B. Phatak
Indian Institute of Technology Indore

Members

Professor Pradeep Mathur
Director, Indian Institute of Technology Indore
till December 31, 2019

Professor Neelesh Kumar Jain
Director (Officiating),
Indian Institute of Technology Indore, since
January 01, 2020

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Additional Secretary (TE), Govt. of India
Ministry of Human Resource Development

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Department of Technical Education & Skill Development,
Govt. of Madhya Pradesh

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IIT Kanpur

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Executive Chairman
SB Energy (Soft Bank Group) New Delhi

Dr. Krushna R. Mavani (Senate Nominee)
Professor
HoD, Department of Physics, IIT Indore

Professor Anand Parey (Senate Nominee)
Professor
Department of Mechanical
Engineering, Dean, Resources
Generation IIT Indore

Mr. S.P. Hota
Registrar I/c, (Secretary to BoG)
IIT Indore

Institute Functionaries

Director (Officiating), IIT Indore
Professor Neelesh Kumar Jain

Dean, Academic Affairs
Dr. Devendra L.Deshmukh

Dean, Administration
Dr. Pritee Sharma

Dean, Research & Development
Dr. I. A. Palani

Dean, Student Affairs
Dr. Santosh K. Vishvakarma

Dean, Infrastructure Development
Dr. Manish Kumar Goyal

Dean, International Affairs
Dr. Kapil Ahuja

Dean, Resources Generation
Professor Anand Parey

Registrar I/c, IIT Indore
Mr. S. P. Hota

Associate Deans

Academics (PG Programs)	:	Dr. Eswara Prasad Korimilli
Academics (Infrastructure)	:	Dr. Antony Vijesh
Academics (UG Programs)	:	Dr. Ram Bilas Pachori
Faculty Affairs	:	Dr. Amod C. Umarikar
Research and Development- I	:	Dr. Bhupesh Kumar Lad
Research and Development- II	:	Dr. Bhargav Vaidya
Administration	:	Dr. Somnath Dey
Infrastructure Development-I	:	Dr. Guru Prakash
Infrastructure Development-II	:	Dr. Srivathsan Vasudevan
Student Affairs	:	Dr. Ajay Kumar Kushwaha

Heads of School

Humanities and Social Sciences	:	Dr. Nirmala Menon

Heads of Departments

Computer Science & Engineering	:	Dr. Surya Prakash
Electrical Engineering	:	Dr. Vipul Singh
Mechanical Engineering	:	Dr. Santosh Kumar Sahu
Chemistry	:	Dr. Biswarup Pathak
Mathematics	:	Dr. Md. Aquil Khan
Physics	:	Professor Krushna R. Mavani
Astronomy, Astrophysics and Space Engineering	:	Dr. Abhirup Datta
Biosciences and Biomedical Engineering	:	Dr. Sharad Gupta
Metallurgy Engineering and Materials Science	:	Dr. Vinod Kumar
Civil Engineering	:	Dr. Neelima Satyam Devarakonda

Senate

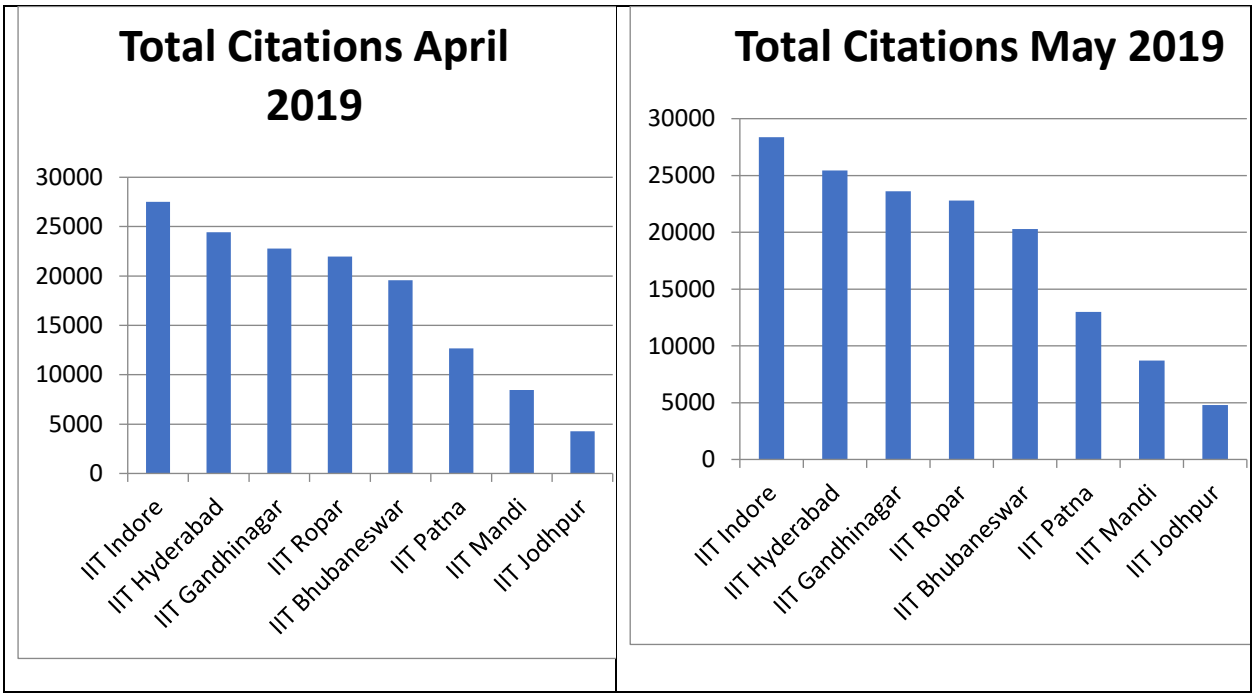
Professor Neelesh Kumar Jain
Director (Officiating), IIT Indore and Chairman, Senate

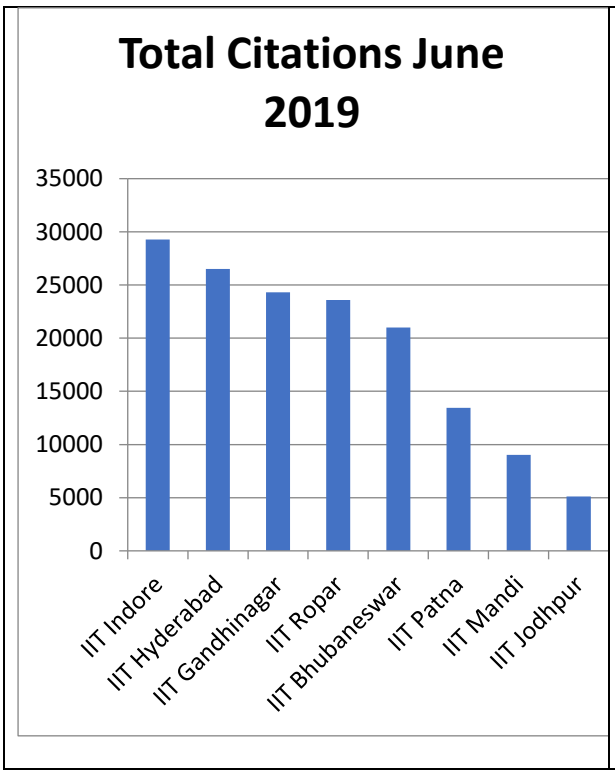
External Experts	
Dr. M.K. Surappa Dean, Faculty of Engineering and Professor Department of Materials Engineering Indian Institute of Science Bangalore	**Dr. R. Balasubramanian** Department of Mathematics, Institute of Mathematical Sciences Chennai
Professor Sudhir Chella Rajan Humanities and Social Sciences Coordinator (Land-Use) Indo-German Centre for Sustainability Indian Institute of Technology Madras	**Prof. R. Narasimhan** Professor, Department of Mechanical Engineering Indian Institute of Science Bangalore,
Deans	
Dr. Devendra L Deshmukh Dean, Academic Affairs, Associate Professor, Mechanical Engineering	**Dr. Pritee Sharma** Dean, Administration, Associate Professor, School of Humanities and Social Sciences
Dr. Manish Kumar Goyal Dean of Infrastructure Development, Associate Professor, Civil Engineering	**Dr. Kapil Ahuja** Dean, International Affairs, Associate Professor, Computer Science & Engineering
Dr. I. A. Palani Dean, Research and Development, Associate Professor, Metallurgy Engineering and Materials Science	**Dr. Santosh Kumar Vishvakarma** Dean, Student Affairs, Associate Professor, Electrical Engineering
Professor Anand Parey Dean, Resources Generation, Professor, Mechanical Engineering	
Heads	
Dr. Neelima Satyam D HOD, Civil Engineering, Associate Professor, Civil Engineering	**Dr. Surya Prakash** HOD, Computer Science and Engineering, Assistant Professor, Computer Science and Engineering
Dr. Santosh Kumar Sahu HOD, Mechanical Engineering, Associate Professor, Mechanical Engineering	**Dr. Vipul Singh** HOD, Electrical Engineering, Associate Professor, Electrical Engineering

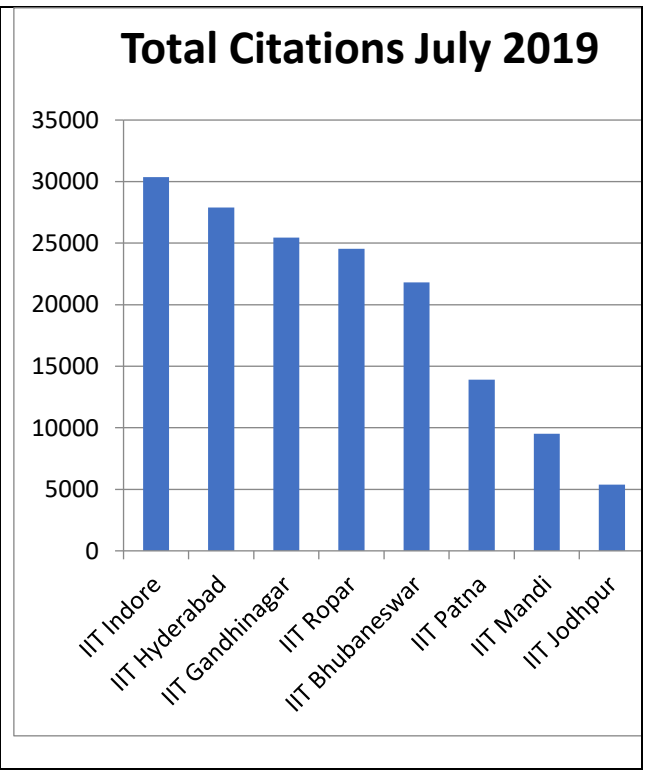
Dr. Vinod Kumar HOD, Metallurgy Engineering and Material Science (MEMS) Assistant Professor, MEMS **Professor Krushna R. Mavani** HOD, Physics, Professor, Physics **Dr. Md. Aquil Khan** HOD, Mathematics, Associate Professor, Mathematics **Dr. Abhirup Datta** HOD, Discipline of Astronomy, Astrophysics and Space Engineering (DAASE), Associate Professor, DAASE	**Dr. Sharad Gupta** HOD, Biosciences and Biomedical Engineering (BSBE) Associate Professor, BSBE **Dr. Biswarup Pathak** HOD, Chemistry, Associate Professor, Chemistry **Dr. Nirmala Menon** HOD, School of Humanities and Social Sciences (SHSS) Associate Professor, SHSS
Head of Centers and Services	
Professor Sandeep Choudhary Head, Center for Rural Development and Technology, Professor, Civil Engineering **Dr. Neminath Hubbali** Head, Computer Center Associate Professor, Computer Science and Engineering **Dr. Santosh Kumar Vishwakarma** Head, Center for Futuristic Space and Defense Technologies	**Dr, Mukesh Kumar** Head, Center of Advanced Electronics Associate Professor, Electrical Engineering **Dr. Pavan Kumar Kankar** Head, Counselling Services Associate Professor, Mechanical Engineering **Prof. Suman Mukhopadhayay** Head, Sophisticated Instrumentation Center **Dr. Abhishek Rajput** **Head, Training and Placement** Associate Professor, Civil Engineering
Professors	
Professor Narendra S. Chaudhari Computer Science and Engineering **Professor Neelesh Kumar Jain** **Professor Anand Parey** Mechanical Engineering **Professor Ram Bilas Pachori** **Professor Abhinav Kranti** **Professor Vimal Bhatia** Electrical Engineering	**Professor Sandeep Chaudhary** Civil Engineering, **Professor Avinash Sonawane** **Professor Ganti. S. Murthy** Biosciences and Biomedical Engineering **Professor Subhendu Rakshit** **Professor Krushna R. Mavani** **Professor Sarika Jalan** Physics

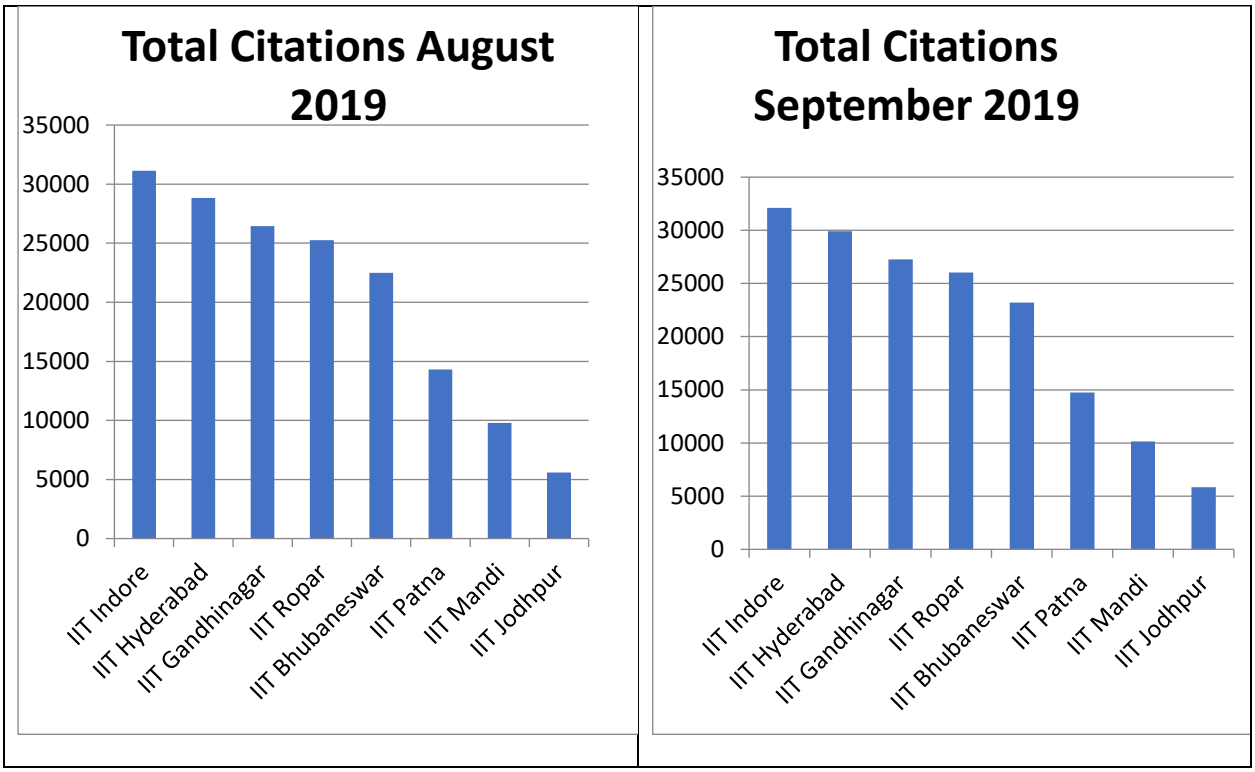
Professor Rajneesh Misra Professor **Suman Mukhopadhyay** Chemistry	
Other Authorities	
Deputy Librarian **Ms. Anjali Bandiwadekar** **Convener, Health Center Committee** **Dr. Hemant Borkar** Assistant Professor, Metallurgy Engineering and Materials Science **Alumni Representative** **Mr. Jwalant Shah** **Secretary, Senate** **Mr. S. P. Hota** Registrar I/c, IIT Indore	**Chief Warden** **Dr. Lalit Borana** Assistant Professor, Civil Engineering **Deputy General Manager, Central Workshop** **Dr. Anand Petare** **Academic Secretary, Student Gymkhana** **General Secretary, Student Gymkhana**

Showcasing IIT Indore
IIT Indore Citations during 2019-20





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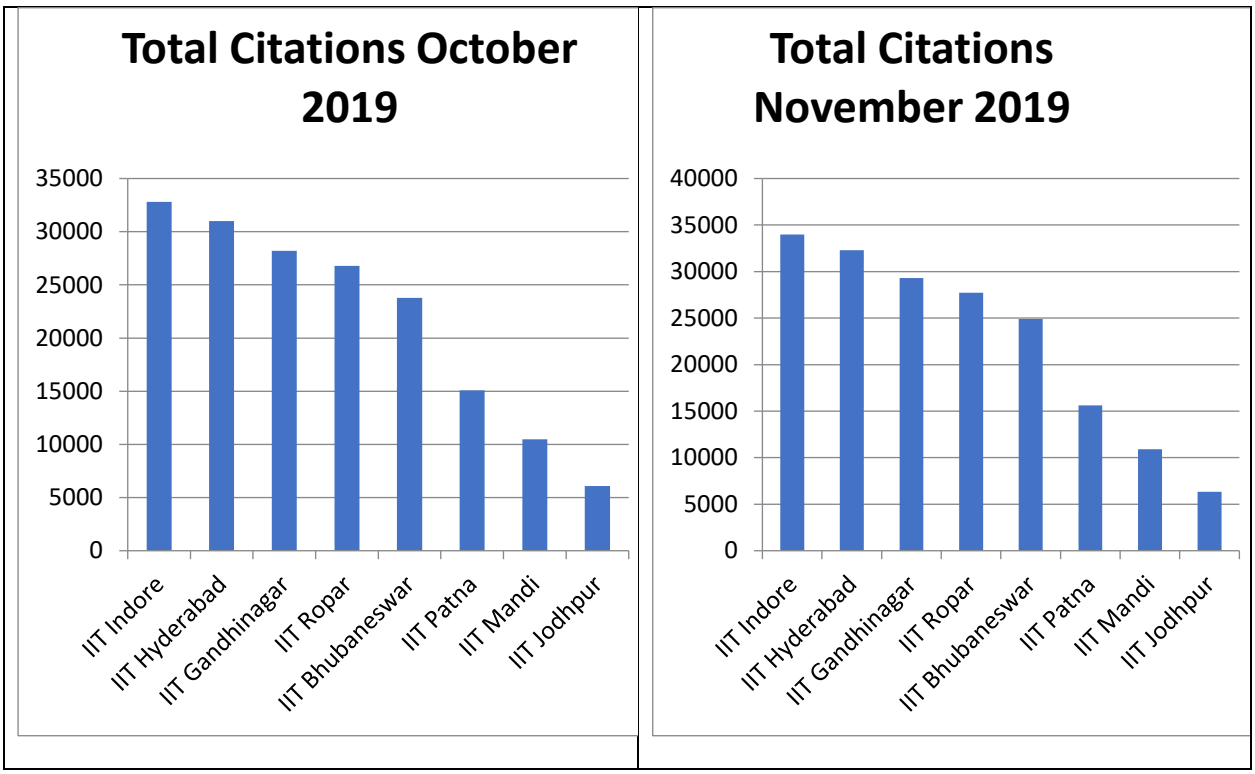
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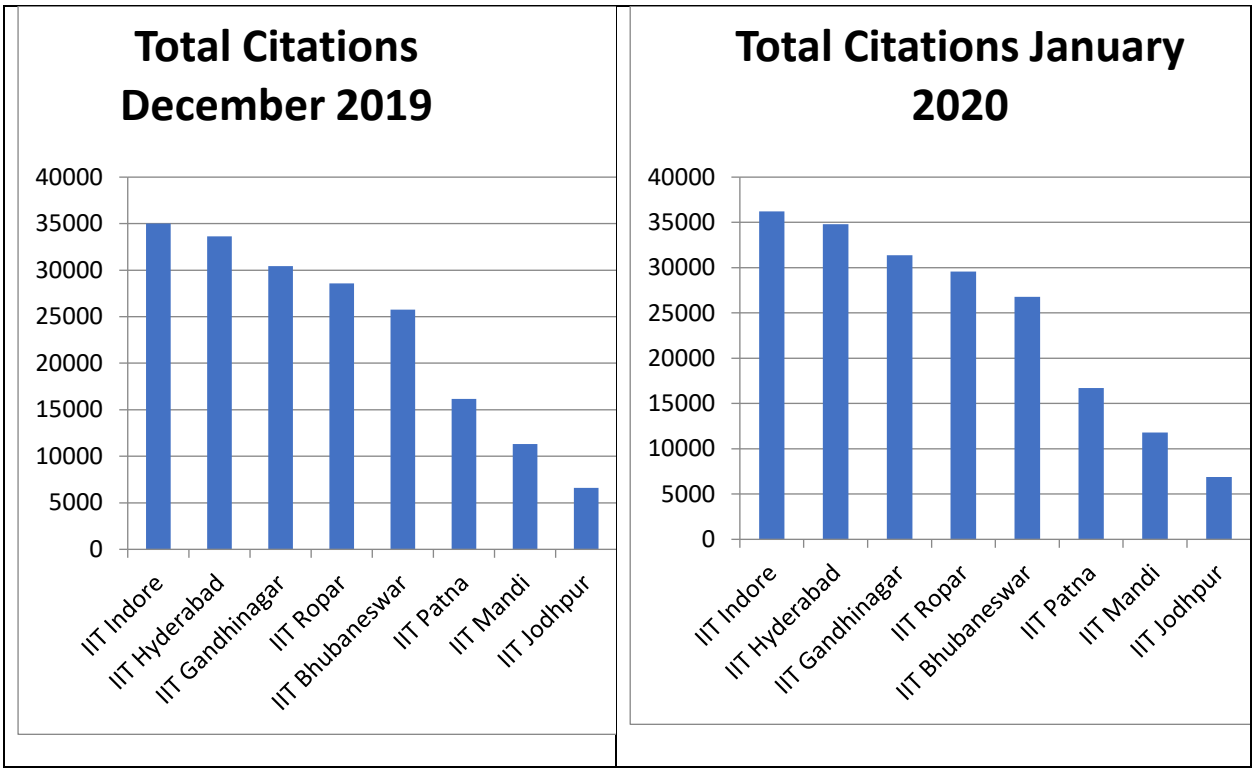
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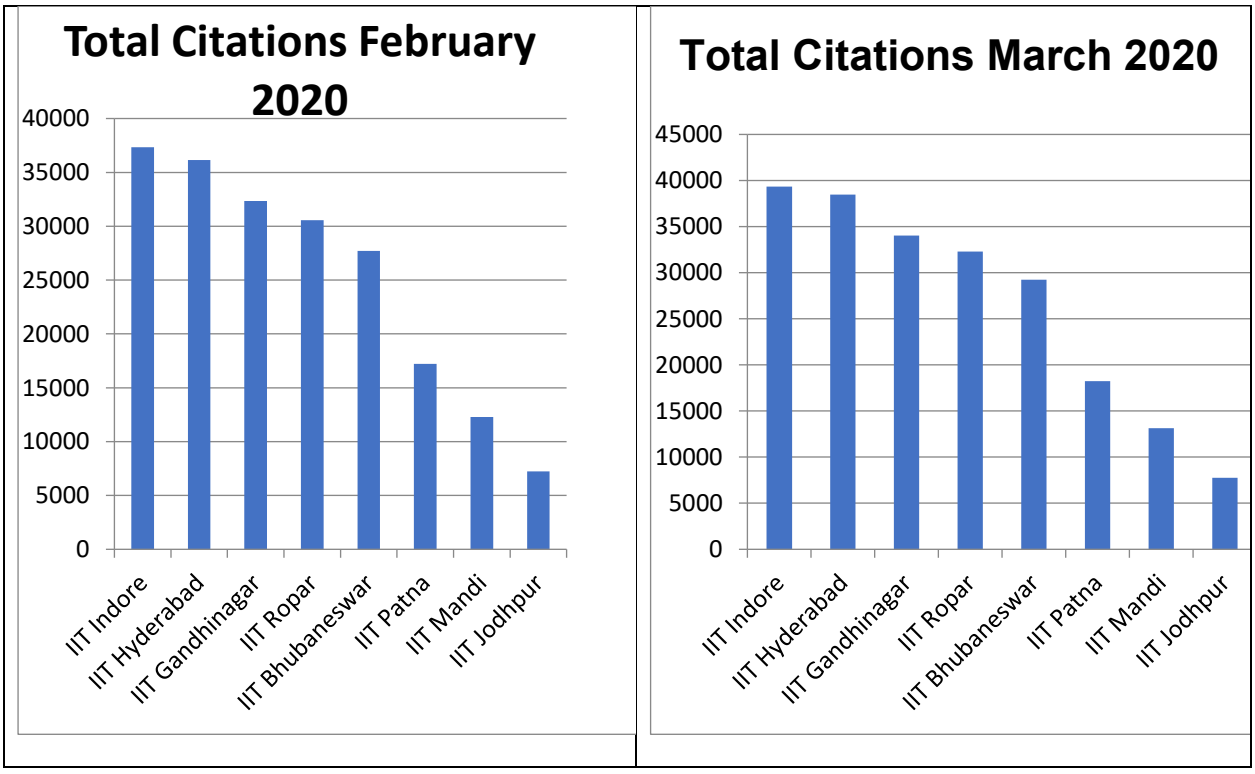
IIT Jodhpur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IIT Hyderabad
IIT Gandhinagar
IIT Ropar
IIT Bhubaneswar
IIT Patna
IIT Mandi
IIT Jodhpur

Department of Computer Science and Engineering

The Department of Computer Science and Engineering (CSE) was set up in July 2009. It offers Bachelor of Technology (B.Tech.), Master of Science (MS), and Doctor of Philosophy (Ph.D.) programs. The department adopts a modern approach to teaching wherein students are rendered in adequate academic freedom to innovate and learn in the process. State of the art facilities including the latest software and advanced hardware are available in various laboratories for the use in both teaching and research. This facilitates adequate implementation of major B.Tech. projects and for verification and validation of research results. The faculty members of the department are from diverse streams and specializations. Being a part of an emerging and relatively new institute, together with extremely competent research faculty, the CSE faculty of IIT Indore offer a unique interactive platform for the students to explore the arena of fundamental and applied research.

Achievements, Awards and Recognitions

1. A total of 24 Ph.D. and 306 B. Tech students have graduated from the Department of CSE until March 2020.
2. Faculty members of the Department of CSE have published 59 papers in reputed journals whereas a total of 17 papers are published in conference proceedings in the year 2019-2020. There are two books and 11 books chapters also published from the department in the same year.
3. Department of CSE has been granted 09 sponsored research projects in the year 2019-2020.
4. Department of CSE has conducted two TEQIP short-term courses in the year 2019-2020.
5. In THE World University Rankings 2020, Indian Institute of Technology Indore ranked 251–300 in Computer Science.
6. Team *FenmentTree* of CSE, IIT Indore consisting of **Mr. Kumar Abhinav**, **Mr. GVS Akhil** and **Mr. Kalpit Kothari** made it to the World Finals of the ICPC 2020
7. **Mr. Rahul Choudhary** of CSE has received The President of India Gold Medal in the 2019 Convocation of IIT Indore.
8. **Ms. Apoorva Joshi** of CSE has received The Institute Silver Medal in the 2019 Convocation of IIT Indore.
9. **Mr. Vinit Haresh Shah** of CSE has received The Institute Silver Medal (for all-round performance) in the 2019 Convocation of IIT Indore.
10. **Mr. E Ranjith Kumar** and **Mr. Prajwal Chandra Nalla** of CSE have received the Best BTech Project (BTP) award in the 2019 Convocation of IIT Indore
11. The team *ByteBandits* of CSE, IIT Indore consisting of **Mr. Mrigank Krishan**, **Mr. Vaibhav Anand**, **Mr. Vishnunarayan K I** and **Mr. Sarthak Jain** has secured 1st place in India and 9th globally in CSAW CTF (Finals) 2019 held at IIT Kanpur from November 6 - 9, 2019.
12. Poster **of Mr. Pramod C. Mane**, Dr. Nagarajan Krishnamurthy, and **Dr. Kapil Ahuja** won the 2nd prize at Intl. Conf. on Game Theory and Networks, Assam, Sept. 2019.
13. **Dr. Kapil Ahuja** administered six externally sponsored research projects worth half-a-million USD in the year 2019-2020.
14. **Dr. Kapil Ahuja** organized a mini-symposium at 11th Preconditioning Conference in Univ. of Minnesota, Minneapolis, USA, July 2019.
15. The research group of **Dr. Gourinath Banda** has successfully developed the Hard-Real Time *Kernel* in Rust Programming Language based on HARTEX Architecture. The development team consisted of **Mr. Kanishkar J** (a final year CS undergrad) and **Dr. Gourinath Banda.** The kernel is named as HaRSaRK_RS, an acronym for "HARd SAfe Real-time Kernel in RuSt language". It is available as an open source project and product for download via GitHub. It is at TRL 4.
16. The research group of **Dr. Gourinath Banda** has demonstrated the application of state-of-the-art simulator's in developing OEDR module for autonomous vehicles. This work received support from the German company IPG in the form of extended license to their state-of-the-art simulator called "IPG CarMaker". This product is a first of its kind at TRL 3 selected for showcasing on IPG from academia towards their "Apply & Innovate – TECH WEEKS 2020".

17. The startup DFPL has sponsored a Bachelor dissertation project which resulted in a framework that provides critical data collection and dashboard infra that enables efficient decision making to impacting resource utilization to crop production. This product is hosted on GitHub; being proprietary, it is not made open source. It is at TRL 3.
18. **Samsung Innovation Award 2019:** A project entitled "Fingerprint Spoof Buster" of Ram Prakash, Ashwini Jha, and Ashutosh Anshul, which was mentored by Dr. Somnath Dey received Merit Award in November 2019.
19. **Dr. Somnath Dey** was in the Technical Programme Committee member of 7th International Conference on Mining Intelligence & Knowledge Exploration (MIKE 2019) organized from December 19 - 22, 2019 at NIT Goa, India
20. **Dr. Somnath Dey** was in the Technical Programme Committee member of 8th International Conference on Pattern Recognition and Machine Intelligence (PReMI 2019) organized from December 17-20, 2019 by Tezpur University in collaboration with Machine Intelligence Unit, ISI Kolkata.
21. **Dr. Somnath Dey** was in the Technical Programme Committee member of International Conference on Machine Intelligence and Data Science Applications (MIDAS 2020) organized from September 4-5, 2020 at University of Petroleum and Energy Studies, Dehradun, India.
22. **Dr. Somnath Dey** was in the Technical Programme Committee member of International Conference named International Conference on Future Communication & Computing Technology (ICFCCT-2020) organized from March 13-14, 2020 at Guntur.
23. **Dr. Puneet Gupta** delivered an invited talk in a conference on the topic "Promotion of Artificial Intelligence in education sector" organized by MHRD in IIT Delhi.
24. **Dr. Neminath Hubballi** received DUO India fellowship to visit City University of London for collaborative work
25. **Dr. Neminath Hubballi** visited Norwegian University of Science and Technology from May 2019 to June 2019 as a visiting professor.
26. **Dr. Bodhisatwa Mazumdar** nominated as the Working Group Member (WGM) for IEEE Standard 1413.1 (reliability Prediction Working Group) and IEEE 1624 (IEEE Standard for Organizational Reliability).
27. **Dr. Bodhisatwa Mazumdar** delivered a lecture on the topic "Machine Learning Fundamentals" at Military College of Telecommunication Engineering (MCTE), Mhow.
28. **Dr. Bodhisatwa Mazumdar** delivered a lecture on the topic "Cryptography Fundamentals for BlockChain Applications" at Rajiv Gandhi Proudyogiki Vishwavidyalaya Bhopal.
29. **Dr. Bodhisatwa Mazumdar** delivered a lecture on the topic "BlockChain Fundamentals and Applications" at Indore Institute of Science and Technology, Indore.
30. **Dr. Surya Prakash** was in the Organizing Committee of 2020 International Conference on Artificial Intelligence and Embedded Systems (ICAIES 2020) organized from February 13-15, 2020 at Hyderabad, Telangana.
31. **Dr. Surya Prakash** was in the National Advisory Committee of 2020 International Conference on Automation, Signal Processing, Instrumentation and Control (i-CASIC 2020) organized from February 27-28, 2020 at VIT Vellore, Tamilnadu.
32. **Dr. Surya Prakash** amd Dr. Punit Gupta were in the Technical Program Committee of UPCON 2019 organized from November 8-10, 2019 jointly by Aligarh Muslim University, Ohio State University and National Power Training Institute at Aligarh, India.
33. **Dr. Anirban Sengupta** became Ex-Officio Member, IEEE Consumer Electronics Society Board of Governors, 2020
34. **Dr. Anirban Sengupta** has received ACM Honor. He was selected to feature in 'Researcher Spotlight' of prestigious ACM SIGDA (Special Interest Group on Design Automation) Newsletter by Intel for the Jan 2020 issue for his contributions on "Hardware Security".
35. **Dr. Anirban Sengupta** has been awarded 'IEEE Chester Sall Memorial Consumer Electronics Award - in Jan 2020 for outstanding contribution on "DSP Design Protection in CE through Algorithmic Transformation Based Structural Obfuscation".

36. **Dr. Aruna Tiwari** participated in Machine Learning/Artificial Intelligence track of the 33rd International Conference on Design (VLSID) 2020 as Distinguished Person. The conference was organized in Bangalore, India from January 04-08, 2020.
37. **Dr. Aruna Tiwari** conducted a special Session on "Evolutionary Algorithms and Applications" in the 9th International Conference on Soft Computing for Problem Solving (SocProS) 2019. The conference was organized in Liverpool Hope University, Liverpool, UK from September 02-03, 2019.
38. **Dr. Aruna Tiwari** delivered an invited tak on "Optimization of Hybrid Soft Computing Model with Evolutionary Approach and their Applications" in the 9th International Conference on Soft Computing for Problem Solving (SocProS) 2019. Organized in Liverpool Hope University, Liverpool, UK from September 02-03, 2019.
39. **Dr. Aruna Tiwari** visited Dr. Stephen. L. Smith (Graduate Admissions Tutor, Department of Electronics, University of York, UK) for a research collaboration on "Cancer Disease Diagnosis using Soft Computing Algorithm" during September 04-06, 2019.
40. **Dr. Aruna Tiwari** was appointed as an examiner for a master thesis of University of York UK, PhD. She also evaluated and participated in the defense as an external examiner for a total of three theses of various IITs and NITs.
41. **Dr. Aruna Tiwari** has been appointed as an Institute level Nodal Officer (Jan 2020) for the Ministry of Electronics and Information Technology (MeitY) for three years

Faculty Members: Profiles

Department of Computer Science and Engineering

From the HoD's Desk

Dr. Surya Prakash
Associate Professor & HOD
surya@iiti.ac.in

Introducing faculty members of CSE

- Dr. Kapil Ahuja
- Dr. Gourinath Banda
- Dr. Narendra S. Chaudhari
- Dr. Somnath Dey
- Dr. Punit Gupta
- Dr. Neminath Hubballi
- Dr. Bodhisatwa Mazumdar
- Dr. Surya Prakash
- Dr. Anirban Sengupta
- Dr. Abhishek Srivastava
- Dr. Aruna Tiwari

CSE@IIT Indore has a strong research groups comprising of around 21 PhD and 15 MS (Research) scholars currently. The department has the presence of close to 250 undergraduate students.

Department research areas:

Current CSE faculty and students focus on a wide range of emerging research areas. These include

- Networking, Network Security, System Security, Cloud Computing, Cloud Security, Dependable Systems & Network Management, and Enterprise Management.
- Embedded Systems (Cyber-physical Systems, Internet-of-Things, Wireless Sensor Networks, etc.), their Formal Verification (Model Checking, Abstract Interpretation, Program Transformation & Generation, Program Analysis) and Semantics-based Emulation of Languages & Systems.
- Algorithms and Theoretical Computer Science, Algorithmic Graph Theory, Computational Complexity.
- Computational Science & Engineering, Numerical Linear Algebra, Numerical Analysis and Optimization
- Big Data Analytics, Soft Computing, Computational Intelligence, Artificial Intelligence, Learning Algorithms, Neural Networks, Genetic Algorithms, Evolutionary Approaches, and Game Artificial Intelligence (AI)..
- Pattern Recognition, Computer Vision, Image Processing, Biometrics, Human-Computer Interaction, Machine Learning, and Deep Learning
- Hardware Security, Side Channel Analysis Attacks on Cryptographic Implementations, Security Aspects in Emerging VLSI Technologies, Security of Hardware Accelerator and Machine Learning for VLSI.
- CAD-VLSI, EDA, High-Level Synthesis, IP core Security, Hardware Trojan, Fault Security, Digital Watermark in Digital Chip, Optimization of Hardware Accelerators, and Design Automation.
- Service-Oriented Systems, Dynamic Systems, Geographically Distributed Development Environments, Agile Techniques, Software-as-a-Service and Wireless Sensor Networks.
- Natural Language Processing, Social Network Analysis, Information Retrieval, and Data Mining.
- Autonomous vehicles, Certification framework for Safety Assurance in Autonomous Vehicles.

Notable General Achievements:

- Computer Science and Engineering attracts some of the most highly ranked JEE candidates to its undergraduate programme.
- The department has a strong thrust towards the involvement of undergraduate students in its research programmes.
- Faculty members have complete freedom to tailor courses as and how they deem appropriate.
- The department embraces the Open Sources movement and its laboratories conform to the use of Open Source Technologies for most applications.
- The department houses some of the most advanced computing facilities.
- Faculty members in the department come with a vast research experience behind them from the best institutions in India and abroad.
- The department is proud of a very strong programming culture amongst its students that is in ample display in various hackathons, and prestigious programming contests like the ACM-ICPC.
- The camaraderie between faculty members in the department is very positive and informal and makes for a great experience.
- The department provides a secure working environment for all its members.
- Many CSE faculty members have been awarded sponsored research and GIAN (Global Initiative of Academic Networks) projects.
- CSE faculty members have active collaborations with institutes of high repute in India and across the globe (France, Germany, Singapore, Canada, USA, etc.).

Facilities in CSE

- The Department of CSE has three general purpose/undergraduate laboratories and one MS (Research) laboratory. Along with this, we have around 10 research laboratories.
- The general-purpose laboratories consist of three high-end computing servers supporting a full-fledged Network File System (NFS) and LDAP functionalities. We also have a Moodle Server to cater the teaching needs.
- The general-purpose laboratories have around 210 computing terminals catering to the academic requirements of undergraduate and graduate students. These laboratories also serve the need of various placement activities. All the terminals in these labs offer Windows and Linux working environments with a thrust towards the use of Open-Source Software for various applications.
- The Department also has a high-performance cluster for the development of scalable soft computing learning algorithms for big data handling as well as for running of large computational science and engineering, image processing, and cloud computing application codes.

Dr. Gourinath Banda
Associate Professor
gourinath@iiti.ac.in

PhD : Roskilde University, Denmark, 2010
Previous Employment (includes post-doctoral experience) - Chief Engineer, Advanced Technology Group, Samsung India

Statement of Research Interests

a. Broad research area
- Embedded Systems
- Cyber Physical Systems' Design and Verification
- Runtime Systems for Cyber Physical System
- Real-time Kernels
- Open source software
- Automomous vehicles algorithms and safety engineering

a. Research Highlights
- Developed Hard real-time kernel HARTEX in under 10K code foot print
- Generic verification frameworks for high-level modelling formalisms for reactive cyber physical systems
- Confluence modalities for out of the sync interactions in mobile UIs
- Developed the OneIOT protocol V1 and V2
- OEDR development for Autonomous Vehicles
- Algorithms for autonomous vehicles and support systems for traffic scheduling
- Formal verification of algorithms for Autonomous vehicles

Patents – Two

Projects active during April 2018-March 2019

Title - IMPRINT2: Development of Lizard-like Robotic Spy Surveillance System
Duration 2019 to 2022
Funding Agency - DST
Brief Description - The project is about developing a lean robot surveillance framework that could be exploited during hostage situations.

Dr. Somnath Dey
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PhD. Indian Institute of Technology Kharagpur
Previous Employment (includes post-doctoral experience)
Assistant Professor, Indian Institute of Technology Indore, *[August 2013-August 2019]*
Visiting Assistant Professor, Indian Institute of Technology Indore *[January 2013-August 2013]*

Statement of Research Interests

a. Broad research area

- Biometric Security, Biometric Template Protection, Biometric Crypto System, Biometric Master Print.

b. Research Highlights

Fingerprint recognition techniques are dependent on the quality of fingerprint images. An efficient enhancement algorithm improves the performance of recognition algorithms for poor quality images. Performance improvement of the recognition algorithms will be more if the enhancement process is adaptive to the fingerprint qualities (wet, dry or normal). In our research, a fingerprint quality assessment (FQA) algorithm is proposed to assign the appropriate quality class of dry, wet, normal dry, normal wet, and good quality using Fuzzy C-means clustering technique to each fingerprint image. It considers seven features namely, mean, moisture, variance, uniformity, contrast, ridge valley area uniformity (RVAU), and ridge valley uniformity (RVU) to cluster the fingerprint images into suitable quality class. Fingerprint images of each quality class undergo through a two-stage fingerprint quality enhancement (FQE) process. In the first stage, a quality adaptive preprocessing (QAP) method is used to preprocess the fingerprint images. Next, fingerprint images are enhanced with Gabor, short-term Fourier transform (STFT), and oriented diffusion filtering (ODF) based enhancement techniques in the second stage. Experimental evaluations are performed on a quality driven database of FVC 2004. Results show that the performance improvement of 1.54% to 50.62% for NBIS matcher and 1.66% to 8.95% for VeriFinger matcher are achieved while the QAP based approaches are used in comparison to the current state-of-the-art enhancement techniques. In addition, the experimentation is also performed on FVC 2002 database to validate the robustness and efficacy of the proposed method.

c. **Awards and Achievements -** Published more than 10 articles in 2019-2020. Technical Programme Committee members for several International Conferences.

Publications (includes journal articles, books and book chapters) *Upto a selection of best three*

- R. Saxena and S. Dey, "DDoS Attack Prevention Using Collaborative Approach for Cloud Computing", Cluster Computing: The Journal of Networks, Software Tools and Applications, Springer, 23 (2), pages1329–1344, 2020. (IF: 3.458)
- R. Dwivedi, S. Dey, M. A. Sharma and A. Goel, "A Fingerprint Based Crypto-biometric System for Secure Communication", Journal of Ambient Intelligence and Humanized Computing, Springer, vol. 11(4), pages. Pages. 1495–1509, 2020. (IF: 4.594)
- R. Saxena and S. Dey, "A Generic Approach for Integrity Verification of Big Data", The Journal of Networks, Software Tools and Applications, Springer, 22 (2), pages. 529-540, 2020. (IF: 3.458)

Events/ Seminars organized - TEQIP sponsored 3-days Short-Term Course on "Introduction to Scientific Computing in Engineering" from January 15-17, 2020.

Projects active during April 2019-March 2020
Title - Design and Development of Efficient Cancelable Template Generation Methods for Fingerprint and Iris Biometrics
Duration - 2017 – 2020
Funding Agency - SERB-DST

Brief Description -This project is mainly aimed to develop cancelable template generation methodology for fingerprint and iris biometrics. Further, this project has following objectives.

- To develop biometric image quality assessment methodology.
- To explore novel feature extraction techniques for fingerprint and iris biometric leading to superior performance.
- To propose indigenous cancelable template generation and template protection techniques for fingerprint and iris biometric to deal with the different type of attacks.
- To integrate state-of-the-art biometric data capture environment which would be comparable to any existing facilities in the world.

Dr. Surya Prakash
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Dr. Surya Prakash (PhD.: IIT Kanpur) is an Associate Professor. His field of research includes Biometrics, Pattern Recognition, Image Processing, Computer Vision, Machine Learning, Deep Learning and Printer Forensics. He is currently working on the development of efficient and secure biometric techniques for human recognition using face, ear and fingerprint data. His efforts are also towards development of technologies for securing biometric template, particularly for fingerprint based biometric systems. He is also currently working in the domain of printer forensics and exploring its usage in securing the interface between the printers and the human.

Research Highlights

- Use of 2D and 3D biometrics for human recognition
- Human recognition using face, ear and fingerprint biometrics
- Image quality assessment and enhancement
- Biometric Template Security
- Printer Forensics

Selected Publications

- Syed Sadaf Ali, Iyyakutti Iyappan G, Surya Prakash, Pooja Consul and Sajid Mahyo, *Securing Biometric User Template using Modified Minutiae Attributes*, Pattern Recognition Letters, 129, pp. 263-270, January 2020. DOI: https://doi.org/10.1016/j.patrec.2019.11.037
- Syed Sadaf Ali, Iyyakuti Iyappan G, Sajid Mahyo and Surya Prakash, *Polynomial Vault: A secure and robust fingerprint-based authentication*, IEEE Transactions on Emerging Topics in Computing, pp. 1-14, 2019. (Accepted, available online). DOI: https://doi.org/10.1109/TETC.2019.2915288
- Iyyakutti Iyappan G and Surya Prakash, Ishan R. Dave, and Sambit Bakshi, *Unconstrained ear detection using ensemble based convolutional neural network model*, Concurrency and Computation: Practice and Experience, Wiley, 32(1), January 2020. DOI: https://doi.org/10.1002/cpe.5197

Events/Seminars/Conferences Organized

1. Dr. Surya Prakash was in the Organizing Committee of 2020 International Conference on Artificial Intelligence and Embedded Systems (ICAIES 2020) organized from February 13-15, 2020 at Hyderabad, Telangana.
2. Dr. Surya Prakash was in the National Advisory Committee of 2020 International Conference on Automation, Signal Processing, Instrumentation and Control (i-CASIC 2020) organized from February 27-28, 2020 at VIT Vellore, Tamilnadu.

Dr. Anirban Sengupta
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Dr. Anirban Sengupta is an Associate Professor in the Department of Computer Science and Engineering at Indian Institute of Technology (IIT) Indore. He has more than 230 publications including 11 Patents and 4 books. His is Fellow of IET, Fellow of British Computer Society, IEEE Distinguished Lecturer and IEEE Distinguished Visitor.

Major Awards and Honors

- Ex-Officio Member, IEEE Consumer Electronics Society Board of Governors, 2020
- ACM Honor: Selected to feature in 'Researcher Spotlight' of prestigious ACM SIGDA (Special Interest Group on Design Automation) Newsletter by Intel for the Jan 2020 issue for my contributions on "Hardware Security".

- Awarded 'IEEE Chester Sall Memorial Consumer Electronics Award - in 2020 for outstanding contribution on "DSP Design Protection in CE through Algorithmic Transformation Based Structural Obfuscation"
- Awarded 'IEEE Consumer Electronics Society 'Certificate of Appreciation' for outstanding services as TPC Chair of 9th IEEE Int'l Conference on Consumer Electronics (ICCE) Berlin, Germany, 2019.
- Awarded / Elected Fellow of The Institution of Engineering and Technology (IET) - since 2019.
- Awarded / Elected Fellow of British Computer Society (BCS) - since 2019.
- Awarded IEEE Distinguished Visitor by IEEE Computer Society - (2019 - 2021).
- Awarded IEEE Distinguished Lecturer by IEEE Consumer Electronics Society - (2017- 2019).
- Elected 'Chairman of IEEE Computer Society Technical Committee on VLSI (TC-VLSI)' for a term from Oct 2018 - 2020.
- Awarded 'Renowned Alumni Award' by JIS/Techno India, West Bengal in 2020.
- Awarded 'IEEE Consumer Electronics Society Service Award' for serving as Conference Chair of 37th IEEE Int'l Conference on Consumer Electronics (ICCE), Las Vegas, 2019 .
- Awarded IEEE Consumer Electronics Society 'Outstanding Editor Award' for "Outstanding Contributions to the Hardware Section of the IEEE Consumer Electronics Magazine".
- Awarded IEEE Consumer Electronics Society 'Best Research Award 2018' for outstanding contribution on "Intellectual Property-Based Lossless Image Compression for Camera Systems" in IEEE CEM.
- Awarded 'IEEE Consumer Electronics Society Best Paper Award 2019' in IEEE CE Society's Flagship Conference - 37th IEEE Int'l Conference on Consumer Electronics (ICCE), LV.

Professional Leadership Role in Scientific Community - Editors

- Deputy Editor-in-Chief: IET Computers and Digital Techniques (2018 - Present)
- Editor-in-Chief: IEEE VLSI Circuits & Systems Letter, IEEE CS-TC on VLSI (2017 - Present)
- Associate Editor: IEEE Transactions on VLSI Systems (TVLSI) (2018 - Present)
- Associate Editor: IEEE Transactions on Aerospace & Electronic Systems (TAES) (2016 - 2020)
- Associate Editor: IEEE Transactions on Consumer Electronics (TCE) (2019 - Present)
- Transactions on VLSI Systems (TVLSI) (2016 - 2017)
- Guest Editor: IEEE Transactions on CAD of Integrated Circuits & Systems (TCAD) (2019 - Present)
- Associate Editor, IEEE Letters of the Computer Society (LOCS) (2019 - Present)
- Digital Techniques (CDT) (2015 - 2018)
- Senior Editor: IEEE Consumer Electronics Magazine (CEM) (2017 - 2019)
- Consumer Electronics Magazine (CEM) (2016 - 2017)
- Associate Editor: IEEE Canadian Journal of Electrical and Computer Engineering (2018 - Present)
- VLSI Circuits & Systems Letter (2015 - 2017)
- Digital Techniques (CDT) (2017 - 2018)

Random recent publications

- Anirban Sengupta, Mahendra Rathor "Enhanced Security of DSP circuits using Multi-key based Structural Obfuscation and Physical-level Watermarking for Consumer Electronics systems", IEEE Transactions on Consumer Electronics (TCE) , Volume: 66, Issue:2, May 2020, pp. 163-172
- Anirban Sengupta, E. Ranjith Kumar, N. Prajwal Chandra "Embedding Digital Signature using Encrypted-Hashing for Protection of DSP cores in CE", IEEE Transactions on Consumer Electronics (TCE), Volume: 65, Issue:3, Aug 2019, pp. 398 – 407
- Anirban Sengupta, Mahendra Rathor "Protecting DSP Kernels using Robust Hologram based Obfuscation", IEEE Transactions on Consumer Electronics (TCE), Volume: 65, Issue: 1, Feb 2019, pp. 99-108

Dr. Aruna Tiwari
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Dr. Aruna Tiwari (PhD.: RGPV Bhopal) is an Associate Professor. She works in the areas of soft computing and machine learning frameworks which are able to perform learning by handling real-life ambiguous situations. Dr. Tiwari's work concentrates on the following specific areas: artificial neural networks, fuzzy clustering, genetic programming and their applications to bioinformatics, medical diagnosis, etc. She actively collaborates with other research and academic institutions such as C-DAC, Pune, CSIR-CEERI, Pilani, Indian Institute of Soyabean Research and University of Technology, Sydney, Australia.

Major awards, achievements, recognitions

- Distinguished person in Machine Learning/Artificial Intelligence track in 33rd International Conference on Design **(**VLSID) 2020, January 04-08, Bangalore, India.
- Special Session on "Evolutionary Algorithms and Applications", 9th International Conference on Soft Computing for Problem Solving - SocProS 2019 (Unlocking the Power and Impact of Artificial Intelligence) SEPTEMBER 02-03, 2019 LIVERPOOL HOPE UNIVERSITY, LIVERPOOL, U.K.
- Invited Talk on: "Optimization of Hybrid Soft Computing Model with Evolutionary Approach and their Applications", 9th International Conference on Soft Computing for Problem Solving - SocProS 2019 (Unlocking the Power and Impact of Artificial Intelligence) SEPTEMBER 02-03, 2019 LIVERPOOL HOPE UNIVERSITY, LIVERPOOL, U.K.
- For research collaboration assignment with Dr. Stephen. L. Smith (Graduate Admissions Tutor, Department of Electronics, University of York, UK), during September 04-06, 2019 on "Cancer Disease Diagnosis using Soft Computing Algorithm".
- Appointed examiner: Master Thesis evaluated for University of York UK, PhD Thesis evaluated/defense conducted of IIT, NIT(Nos. 3)
- Appointed Institute level Nodal Officer (Jan 2020) for Ministry of Electronics and Information Technology (MeitY) for three years.
- Two PhD scholars submitted Ph.D. Thesis. Scored overall grade A. Defense was over in May 2020. In all, total Ph.D.s awarded under my Guidance is seven.

Projects sanctioned

- **Sponsoring Agency:** Indo-Norwegian collaboration in intelligent offshore mechatronics systems (INMOST), Norwegian Research Council (RCN) under INTPART Scheme**.**
  Funding Amount: 56,20,000 NOK (42, 000 NOK for IIT Indore);
  Duration: Three years (2020-2023)
  Collaborators: Lead Partner in Norway: Prof. Jing Zhou and Prof. Linga Reddy Cenkeramaddi, University of Agder (UiA), Norway, Participants from other institutes: Prof. Houxiang Zhang from

NTNU, Norway, Dr. Jan Einar Gravdal from NORSE, Norway, Dr. Saidi Reddy Parne from NIT Goa, India, Dr. Santosh Kumar Vishvakarma, Co-Principal Investigator: Prof. Ram Bilas Pachori, Dr. Aruna Tiwari and Dr. Abhinoy Singh from IIT Indore, Dr. Rama Krishna Sai Gorthi from IIT Tirupati and Dr. Shaikshavali Chitraganti from IIT Palakkad.

- **Sponsoring Agency:** The Ministry of Electronics and Information Technology (MeitY), Government of India. This is a Consortium Project
  Title: "Resource Constrained Artificial Intelligence".
  Funding Amount: Two Crore Forty Four Lakh INR;
  Duration: Three years (2020-2023)
  Collaborators: CSIR CEERI Pilani (Chief PI), IIT Indore (as Co-PI), IIT Jodhpur (Co-PI), IIIT Allahabad (Co-PI).

Courses/conferences/workshops organized

- Technical Education Quality Improvement Programme(TEQIP) sponsored active learning course on Fundamentals of Data Analytics from Nov 30 - Dec 03, 2019 with course faculty Dr. Vinti Agarwal, Postdoctoral Researcher Department of Information Security and Communication Technology, NTNU, Norway.

Journal articles published

- Neha Bharill, Aruna Tiwari, Aayushi Malviya, Om Prakash Patel, Akahansh Gupta, Deepak Puthal, Amit Saxena, and Mukesh Prasad, Fuzzy knowledge based performance analysis on big data, *Neurocomputing, Elsevier,* vol. 389, pp. 218 - 228, 2020.
- Animesh Chaturvedi, Aruna Tiwari, Dave Binkley, and Shubhangi Chaturvedi, Service Evolution Analytics: Change and Evolution Mining of a Distributed System, *IEEE Transactions on Engineering Management*, 2020.
- Animesh Chaturvedi, Aruna Tiwari, and Shubhangi Chaturvedi, SysEvoRecomd: Network Reconstruction by Graph Evolution and Change Learning, *IEEE Systems Journal,* 2020.

Dr. Bodhisatwa Mazumdar
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Dr. Bodhisatwa Mazumdar (PhD.: IIT Kharagpur) is an Assistant Professor at CSE. His primary research interest is in the area of hardware security with particular emphasis on side-channel vulnerabilities of cryptographic algorithms and implementations and IC logic locking techniques. The Cryptography and Hardware Security research group is presently involved in determining power analysis-based and fault analysis-based side-channel vulnerabilities of lightweight cryptographic implementation. Further, the research group focuses on different security aspects of present day logic synthesis techniques.

Research Highlights:

Our research group has pinpointed locations in Feistel block ciphers that have increased vulnerabilities against fault analysis based attacks. The work is based on developing the entropy reduction model as increased fault based queries are made to such block ciphers. Further, approximation based vulnerabilities in the present-day logic locking techniques have been adopted as standard for protection against IC piracy and counterfeit production. The work has been published in IEEE VLSI Design conference and its extensive

analysis has been accepted as a publication in Springer journal of Electronic testing. Prior to this work, we pinpointed side-channel vulnerabilities and removal attacks on conventional logic locking techniques.

Selected Publications

1. Ghanshyam Bairwa, Souvik Mandal, Tatavarthy Venkat Nikhil, Bodhisatwa Mazumdar, "Linear Approximation and Differential Attacks on Logic Locking Techniques", VLSI Design 2019: 365-370.
2. Bodhisatwa Mazumdar, Soma Saha, Ghanshyam Bairwa, Souvik Mandal, Tatavarthy Venkat Nikhil, "Classical Cryptanalysis Attacks on Logic Locking Techniques", J. Electronic Testing 35(5): 641-654 (2019).
3. Abhrajit Sengupta, Bodhisatwa Mazumdar, Muhammad Yasin, Ozgur Sinanoglu, "Logic Locking With Provable Security Against Power Analysis Attacks",IEEE Trans. on CAD of Integrated Circuits and Systems 39(4): 766-778 (2020).

Dr. Abhishek Srivastava
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Dr. Abhishek Srivastava (PhD.: University of Alberta, Canada). His area of research Ubiquitous Computing.

Research Highlights

The research endeavours of the group of Dr. Abhishek Srivastava is broadly in the area of Ubiquitous Computing and more specifically focuses on the following areas: the group is working towards the development of technology agnostic wrappers for Internet-of-Things deployments. This effectively permits seamless functioning of heterogeneous systems to get useful work done; the group has also started looking at effectively implementing learning algorithms to work on resource constrained environments; the group is also looking at technology deployments monitoring assisted living environments.

List of publications

1. Rane D. and Srivastava A., "A Novel Approach to Dynamic Pricing for Cloud Computing Through Price Band Prediction". *Accepted in Computers, MDPI,* 2020.
2. Rane D., Shakhov V., and Srivastava A., "CBPM: A dynamic pricing model for cloud-based sensing infrastructure" *Problems of Informatics*, Russian Federation, No. 1 (38), pp. 20-41, 2019.

Research Projects

1. Transnational Partnership for Excellent Research and Education in Disruptive Technologies for a Resilient Future (Approved), Funding Agency: The Research Council of Norway, (Indian Principal Investigator), 2020-2023
2. Use of Machine Learning Techniques for Improved Surveillance of the Melghat Tiger Reserve, Funding agency: Defries-Bajpai Foundation, USA, (Principal Investigator), 2020-2022

Dr. Neminath Hubballi
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Dr. Neminath Hubballi (PhD.: IIT Guwahati) is an Associate Professor in the department of Computer Science and Engineering. His research group works in the area of Network Security, System Security and Fault Detection in Networks. He also leads Indo-Norway research project on Digital Forensics. Prior to joining IIT Indore, he has worked for Corporate Research Centers of Hewlett-Packard, Infosys and Samsung where his main research was focused on distributed computing and mobile security. He was also a visiting Professor in Norwegeain University of Science and Technology in the year 2019. He has been awarded with DUO-India fellowship 2020 to visit City University of London for collaborative research work.

PhD. - Indian Institute of Technology Guwahati

Previous Employment (includes post-doctoral experience) Hewlet-Packard Infosys Lab Samsung R&D
Academic associations with other institutions (Affiliate/Adjunct/ Visiting posts)
Visitng Professor at Norwegian University of Science and Technology

Statement of Research Interests

a. Broad research area - Network Security, System Security, Fault Detection in Networks, Cloud Security

b. **Research Highlights -** Our research group works in the broad area of cyber security focusing on identification of exploitable vulnerabilities and developing defense techniques. Our recent works have been in the following areas

- Fault Detection in Networks: Our research group has been working on developing methods for monitoring Computer Networks for identifying and localizing faults. This is done with active measurements with periodic test queries sent to various network elements to assess their health status.
- Performance Optimization of Deep Packet Inspection: Deep Packet Inspection has applications in providing Quality of Service to various applications and cyber security related monitoring. This is one of the most computationally demanding operation. Our research group has been working on developing methods to improve operational speed of Deep Packet Inspection. This is achieved by minimizing the quantum of content screened and implementing Deep Packet Inspection methods on hardware platforms.
- Anomaly Detection: In spite of various security methods adopted for protecting networked systems and applications, cyber attacks are inevitable. Anomaly detection methods help in detecting any abnormal behaviors observed by monitoring various events and network traffic. Our group has developed such methods to detect anomalies against different applications like Secure Socket Shell, Dynamic Host Configuration Protocol and Hypertext Transfer Protocol.
- Malware Detection: Malware is one of the prominent means through which cyber attacks are executed. Our group has recently strated working in developing methods for identifying malware and also classifying them into various families.

c. Awards and Achievements - DUO-India 2020 fellowship to visit City University of London.

Patents, Publications, Events and Seminars - Publications (includes journal articles, books and book chapters) *Upto a selection of best three*

- **Neminath Hubballi**, Mayank Swarnkar and Mauro Conti, "BitProb: Probabilistic Bit Signatures for Accurate Application Identification", IEEE Transactions on Network and Service Management, IEEE, 2020
- Pratibha Khandait, **Neminath Hubballi** and Katrin Franke, "Towards Automating Detection of Anomalous HTTP Requests with Joint Probability Estimation of Characters", 15th ACM ASIA Conference on Computer and Communications Security (AsiaCCS 2020), Taipei, Taiwan
- 2. Diksha Golait and **Neminath Hubballi**, "Detecting Anomalous Behaviour in VoIP Systems: A Discrete Event System Modeling", IEEE Transactions on Information and Forensic Security, Vol 12(3), PP 730-745, IEEE, 2017.

Events/ Seminars organized - A course on "Digital Forensics" under SPARC Scheme with Prof, Katrin Franke of Norwegian University of Science and Technology.

Dr. Kapil Ahuja
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Dr. Kapil Ahuja received his Ph.D. degree from Virginia Tech, Blacksburg, VA, USA. He received his Postdoctoral training at the Max Planck Institute, Germany.

He is currently an Associate Professor in computer science and engineering with IIT Indore, India. In the past, he was a Visiting Professor at TU Braunschweig, Germany, TU Dresden, Germany, and Sandia National Labs, USA. He is working on mathematics of data science as well as computational science with research interests in artificial intelligence, machine learning, numerical methods, and optimization.

Academic associations with other institutions (Affiliate/Adjunct/ Visiting posts)
Visiting Professor, TU Braunschweig (2014)
Visiting Professor, TU Dresden (2017, 2018)
Visiting Professor, Sandia National Labs (2018)

Research Highlights - On the data science end, this year's research breakthrough has been finding conditions that mathematically capture the impact of link formation between a pair of agents on the resource availability of other agents in a social cloud network. This work has won the best poster award at a reputed International Conference on Game Theory.

On the computational science end, this year's research breakthrough has been reducing the simulation time of a real-life automotive problem (1.2 million size) from eight days to three days.

Selected Publications -

- C. Gautam, A. Tiwari, S. Suresh, and **K. Ahuja**. Adaptive Online Learning with Regularized Kernel for One-Class Classification. *IEEE Transactions on Systems, Man, and Cybernetics: Systems*, DOI: 10.1109/TSMC.2019.2907672, 2019 (available online).
- P. C. Mane, **K. Ahuja** and N. Krishnamurthy. Externalities in Endogenous Sharing Economy Networks. *Applied Economics Letters, Taylor & Francis*, DOI:10.1080/13504851.2019.1683507, 2019 (available online).
- R. Agrawal, **K. Ahuja**, C. Hao Hoo, T. D. Anh Nguyen, and A. Kumar. Parallel FPGA Router using Sub-Gradient method and Steiner tree. *Electronics, MDPI*, DOI: 10.3390/electronics8121439, 2019 (available online).

Research Projects –

- IIT Indore and LU Hannover Partnership in Physics, Chemistry, Bio Science & Computational Science (Funded by DAAD, GOI).
- Biorthogonal Krylov Subspace Bases and Short Recurrences (Funded by SERB, DST, GOI).
- A Digital Narratology of Technology as Literary Actors and Artefacts of Settings in Indian English Novels (Funded by SPARC).
- Cancer Research using Soft Computing Techniques (Funded by Translate MedTech Secondment Scheme, UK).
- Nonlocal Models: Mathematics, Computation and Applications (Funded by Indo-US Science and Technology Forum)
- Novel Hardware Design for Low Power Neural Networks (Funded by ASA Program of German Ministry for Economic Cooperation and Development).

a. **Broad research area** - Dr. Kapil Ahuja works in the field of Mathematics of Data Science & Computational Science. Specifically, artificial intelligence, machine learning, soft computing, numerical methods, game theory, and optimization.

b. Awards and Achievements -

- Poster of Mr. Pramod C. Mane, Dr. Nagarajan Krishnamurthy, and **Dr. Kapil Ahuja** won the 2nd prize at Intl. Conf. on Game Theory and Networks, Assam, Sept. 2019.
- **Dr. Kapil Ahuja** organized a mini-symposium at 11th Preconditioning Conference in Univ. of Minnesota, Minneapolis, USA, July 2019.
- **Dr. Kapil Ahuja** administered six externally sponsored research projects (worth half-a-million USD) in the year 2019-2020.
- **Dr. Kapil Ahuja** published seven papers in prestigious journals in the year 2019-2020.

Publications (includes journal articles, books and book chapters)

- C. Gautam, A. Tiwari, S. Suresh, and **K. Ahuja**. Adaptive Online Learning with Regularized Kernel for One-Class Classification. *IEEE Transactions on Systems, Man, and Cybernetics: Systems*, DOI: 10.1109/TSMC.2019.2907672, 2019 (available online).

- P. C. Mane, **K. Ahuja** and N. Krishnamurthy. Externalities in Endogenous Sharing Economy Networks. *Applied Economics Letters*, Taylor & Francis, DOI:10.1080/13504851.2019.1683507, 2019 (available online).

- R. Agrawal, **K. Ahuja**, C. Hao Hoo, T. D. Anh Nguyen, and A. Kumar. Parallel FPGA Router using Sub-Gradient method and Steiner tree. *Electronics, MDPI*, DOI: 10.3390/electronics8121439, 2019 (available online).

Events/ Seminars organized

- Indo-German Winter School on Computational Math, February 2020.
- Indo-US Bilateral Training on Nonlocal Models, August 2019.

Projects active during April 2019-March 2020

Title - IIT Indore and LU Hannover Partnership in Physics, Chemistry, Bio Science & Computational Science.
Duration 2019-2023
Funding Agency - A New Passage to India scheme of DAAD.
Brief Description PI from Indian side; 6 Indian and 10 German academicians

Title - Biorthogonal Krylov Subspace Bases and Short Recurrences.
Duration - 2018-2021
Funding Agency - MATRICS Scheme of Department of Science and Technology (DST-SERB), India.
Brief Description PI; no other investigator

Title -A Digital Narratology of Technology as Literary Actors and Artefacts of Settings in Indian English Novels.
Duration - 2019-2020
Funding Agency SPARC Scheme of Ministry of Human Resources & Development (MHRD), India.
Brief Description - Co-PI from Indian side; 2 Indian and 2 UK academicians

Title - Cancer Research using Soft Computing Techniques.
Duration 2019
Funding Agency - Translate MedTech Secondment Scheme, UK
Brief Description -Co-PI from Indian side; 2 Indian and 1 UK academicians

Title - Nonlocal Models: Mathematics, Computation and Applications.
Duration 2019
Funding Agency Indo-US Science and Technology Forum, New Delhi
Brief Description Sponsored visit of Prof. Radu and Dr. Parks to IIT Indore

Title - Novel Hardware Design for Low Power Neural Networks.
Duration 2018 – 2019

Funding Agency ASA Program of German Ministry for Economic Cooperation and Development
Brief Description PI from Indian side; 2 Indian and 2 German academicians.

Dr. Puneet Gupta
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PhD, 2016, Department of Computer Science & Engineering, Indian Institute of Technology Kanpur.
Previous Employment (includes post-doctoral experience)

- Post-doctoral Researcher, Tampere University, Finland, *[August 2018-Feb 2019]*

Scientist, TCS Innovation Labs, INDIA, [July 2016-August 2018]

Statement of Research Interests

a. **Broad research area -** Artificial Intelligence, Deep Learning, Machine Learning, Computer Vision and Image Processing

b. Research Highlights - Developing techniques for following tasks:

- Performing heart rate estimation using non-contact face videos
- Face anti-spoofing using human vital parameters\
- Adversarial attacks and defences on well established Deep Learning systems

c. Awards and Achievements

- Currently supervising one PhD and two MS (Research) scholars. Also supervising several B.Tech projects.
- Attended and delivered invited talk in the conference on
- "Promotion of Artificial Intelligence in education sector" organized by MHRD in IIT Delhi.
- Member in Technical Program Committee, UPCON 2019.
- Reviewer of several reputed journals like IEEE transactions on cybernetics, Pattern Recognition, Digital Signal Processing, and so on.
- A QIP course entitled, "Machine Intelligence" was approved and planned to be conducted in March 2020. Unfortunately, it was cancelled due to coronavirus pandemic.
- A NPIU course on "Deep Learning" is approved in March 2020 but its schedule is delayed due to coronavirus pandemic.
- Applied for a project in SERB under SRG scheme and waiting for its results.

Patent - K Maurya, R Hebbalaguppe, **P Gupta**, "Systems and methods for performing hand segmentation", US Patent App. 16/534,998, 2020
P Gupta, B Bhowmick, A Pal, "Face video based heart rate monitoring using pulse signal modelling and tracking", US Patent App. 15/900,788, 2019

Publications (includes journal articles, books and book chapters)
Book Chapters

- **Puneet Gupta,** Phalguni Gupta. "Slap Fingerprint Authentication and Its Limitations." The Biometric Computing: Recognition and Registration (2019): 143-163.
- **Puneet Gupta,** Esa Rahtu, "MLAttack: Fooling Semantic Segmentation Networks by Multi-layer Attacks", German Conference on Pattern Recognition (2019), 401-413.

Journal
Puneet Gupta, Brojeshwar Bhowmick, Arpan Pal "MOMBAT: Heart Rate Monitoring from Face Video using Pulse Modeling and Bayesian Tracking", Computers in Biology and Medicine, Volume 121, 2020, Elsevier.

Events/ Seminars organized -

- A QIP course entitled, "Machine Intelligence" was approved and planned to be conducted in March 2020. Unfortunately, it was cancelled due to coronavirus pandemic.
- A NPIU course on "Deep Learning" is approved in March 2020 but its schedule is delayed due to coronavirus pandemic.
- Member in Technical Program Committee, UPCON 2019.

Dr. Narendra S. Chaudhari
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Dr. Narendra S. Chaudhari is with the Indian Institute of Technology, Indore since Aug 2009 as a Professor of Computer Science and Engineering. He had been Director of Visvesvaraya National Institute of Technology (VNIT) Nagpur (M.S.) since June 2013 till June 2018 (five year term). In VNIT Nagpur, he promoted institute-wide research with multi-disciplinary projects, successfully addressed issues about nurchuring human resources, introduced student mentorship program, involvement of alumni for entrepreneurship amongst students and promoted international collaborations and innovation culture. He initiated innovation centre at VNIT Nagpur and provided leadership for product development that resulted in patents and technology transfer for engineering products.

He had additional charge of Director of Maulana Azad National Institute of Technology (MANIT), Bhopal from March 2016 to May 2017. During 2016-2017, he provided leadership for technical education at national level as: (i) Chairman, Central Regional Committee, AICTE, MHRD, Govt. of India, and, (ii) Co-convener and secretary, standing council of NITs, MHRD, Govt. of India. Since Sept 2010 to June 2013, he was Dean - Research and Development (Dean - R&D), IIT Indore, and in this duration he has sown seeds of research culture in IIT Indore. Since 2001 to July 2009, he was with the School of Computer Engineering, Nanyang Technological University (NTU), Singapore. In NTU Singapore, he was Coordinator, International Exchange Program, and Dy. Director, GameLAB, the lab which initiated entertainment computing in Singapore. From 1990 to 2001, he was Professor of Computer Science in M.Sc. DRDO Program, Ministry of Defense (Govt. of India) at Devi Ahilya University, Indore and from 1988 to 1990, he was a *Reader* in M.Sc. DRDO Program, Ministry of Defense (Govt. of India) at Devi Ahilya University, Indore.

Narendra has completed his undergraduate, graduate, and doctoral studies at Indian Institute of Technology (IIT), Mumbai, India, in 1981, 1983, and 1988 respectively. After his Bachelor's (B.Tech.) degree (First Class with distinction) in Electrical Engg., he had the exposure to industrial experience in the areas of electronics controllers (in Larson and Toubro, Mumbai) as well as software development (in Tata Consultancy Services, Mumbai). Since 1988, he was involved in graduate level training for the defense scientists (Ministry of Defense, Govt. of India) in the area of Computer Science till 1999. Subsequently, he was a visiting faculty member in Southern Cross University, NSW (Australia), and on another visiting assignment with Freie Universitat, Berlin (Germany) in 2000.

Narendra has shouldered many senior level administrative positions in universities in India as well as abroad. A few notable assignments include:

(i) *Vice Chancellor,* Uttarakhand Technical University (UTU), Dehradun since Jan 2019 till date,
(ii) *Director,* Visvesvaraya National Institute of Technology (VNIT) Nagpur (M.S.) since June 2013 till June 2018,
(iii) *Director*, Maulana Azad National Insitute of Technology (MANIT), Bhopal since March, 2016 to May 2017,

(iv) All India Council for Technical Education (AICTE) till June 2017,
(v) Government Engineering College, Chandrapur (M.S.)
(vi) Indian Insitute of Information Technology (IIIT), Nagpur since March, 2016 till June 2018,
(vii) NITs: 14 July 2016 – June 2018,
(ix) IIT Indore (2010-2013),

Naerndra's significant research work contributions are in the areas of machine learning, network security and mobile computing, game AI, novel neural network models like binary neural nets and bidirectional nets, context free grammar parsing, optimization, parallel algorithms, and graph isomorphism problem. Some of his important contributions are: (i) Authentication Protocols and Security Mechanisms for Cellular Networks, (ii) generalization of notion of alignment in bioinformatics sequences to fuzzy similarity and its usage for identification of Context Free structure in languages, (iii) rerouting strategies in Multi-Protocol Label Switching (MPLS) networks, (iv) applications of soft-computing techniques like genetic algorithms for cutting stock problems, and for credit risk estimation. He has delivered invited talks and presented his research results in several countries like America, Australia, Canada, Germany, Hungary, Japan, United Kingdom, etc.

Narendra has supervised more than fourty doctoral students and published more than three hundred seventy five papers. Narendra has represented India in year 2015 and 2016 as part of academic delegation accompanying with Honorable President of India in Sweden, Belarus and P.R. China. In 2017, he represented India for the formation of BRICS Network University. In Sept. 2017, he visited St. Petersberg Mining University where he initiated India's collaborations with that University in Russia.

Total Publications: 375			
Category	Total	International Level	National Level
(A) Journal Papers	154	122	32
(B) Conference Papers	193	157	36

1. Number of Books published/under publication: **12**
2. Number of Ph.D. guided: Completed - **40** and in progress : **02**
3. Number of M.Tech. dissertations guided : **> 80**

Narendra is *Fellow* of the Institution of Electronics and Telecommunication Engineers (IETE) (India), *Senior member* of Computer Society of India, *Senior Member* of IEEE, USA, *Member* of Indian Mathematical Society (IMS), *Member* of Cryptology Research Society of India (CRSI), and member of many other professional societies. From 2015 to 2017, Narendra had been *Chairman*, IEEE-MP Subsection and Computer Society of India Nagpur Chapter. Currently, he is President of Indian Academy of Mathematics, Indore.

PUBLICATIONS by Narendra S Chaudhari

Summary (total publications: 375)			
Category	**Total**	**International Level**	**National Level**
Journal Paper	153	121	32
Conference Paper	194	158	36
Books, monographs and chapters	23	11	12
Others (Technical Reports)	5	-	5

A. PAPERS IN PREMIUM JOURNALS: (42)

1. Prakash Chandra Sharma, and Narendra S. Chaudhari, "A Tree Based Novel Approach for Graph Coloring Problem using Maximal Independent Set", *Wireless Personal Communications* Vol. 110, N0. 3 pp. 1143-1155 (2020).
2. Sneha Kanchan, G.Singh, Narendra S. Chaudhari, "EASPSC: Efficient authentication of SignRecryption protocol using shareable clouds in VANET groups", *Peer-to-Peer Networking and Applications*, Vol. 13 No. 1, pp. 388-411. (Online on 20th Aug. 2019) (Springer).https://doi.org/10.1007/s12083-019-00789-1 (2020).
3. Mohit Gupta and Narendra S. Chaudhari, "Anonymous Roaming Authentication Protocol for wireless network with backward unlinkability, exculpability and efficient revocation check", *Journal of Ambient Intelligence and Humanized Computing*, Vol 10, No. 11 pp 4491-4501 Weblink: https://doi.org/10.1007/s12652-018-1131-6 (01 Nov. 2019).

Department of Electrical Engineering

Faculty Members of Electrical Engineering

Faculty Members 2019-20

- Prof. Abhinav Kranti
- Dr. Abhinoy K Singh
- Dr.Amod C Umarikar
- Dr. Mukesh Kumar
- Dr. Prabhat K Upadhyay
- Prof. Ram Bilas Pachori
- Dr. Vimal Bhatia
- Dr. Vipul Singh
- Dr. Vivek Kanhangad
- Dr. Saptarshi Ghosh
- Dr. Shaibal Mukherjee
- Dr. Swaminathan Rambadran
- Dr. Santosh K Vishvakarma
- Dr. Srivathsan Vasudevan
- Dr. Trapti Jain

From the HoD's Desk

Dr. Vipul Singh
Associate Professor,
Department of Electrical Engineering,
vipul@iiti.ac.in

The vision of the department is to impart quality education and promote inter-disciplinary, industry-oriented advanced scientific research to address the challenges and develop future technologies for societal requirements. The Department of Electrical Engineering (EE) at IIT Indore has been a major center for both academic and research programs in various branches of electrical engineering, which includes micro/nanoelectronics, communication & bio-medical signal processing, power electronics and power systems. The department has grown significantly in terms of faculty strength with diversified specializations, state of the art research facilities and undergraduate and postgraduate students' strength.

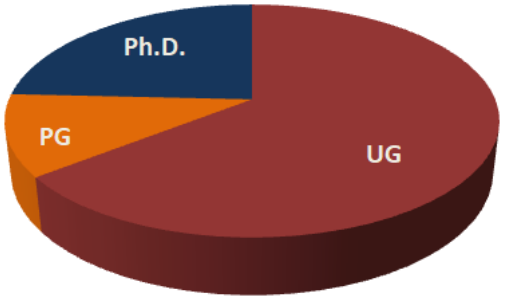
The academic programs offered by the department include B. Tech., M. Tech., M. S. (Research) and Ph. D. Two M. Tech. programs namely (i) Communication and Signal Processing and (ii) VLSI Design and Nanoelectronics are currently being offered. The department also hosts many Post-Doctoral Fellows and Scientists from time to time.

The department presently has fourteen faculty members and one DST Inspire Fellow, having proven expertise in diverse areas of Power Electronics and Power Systems, Micro and Nano-electronics, Organic & Flexible Electronics, Communications, Signal Processing, Image Processing, RF-Microwave, Electromagnetics, Frequency selective surfaces, estimation and filtering and Bio-photonics etc. In addition to the state of the art UG/PG laboratories department also has the following specialized research laboratories:-

- Bio-medical Signal Processing Laboratory
- Bio-Photonics Laboratory
- Devices, Circuits and System Design Laboratory
- Hybrid Nanodevice Research Laboratory
- Low Power Nano-Electronics Laboratory
- Optoelectronic Nanodevice Research Laboratory
- Molecular and Nanoelectronics Research Laboratory
- Power Electronics and Power Systems Laboratory
- Wireless Communication Research Laboratory
- Stochastic Control Laboratory
- Future Generation Communication Systems Laboratory
- Advanced Electromagnetics Laboratory
- Pattern Recognition and Image Analysis Laboratory
- Signals and Software Group

The department currently has about 18 ongoing research projects funded by various external agencies including Department of Science & Technology, SERB, Council of Scientific and various, ISRO and others. The department is consistently moving forward in research activities as evidenced by publications in various high quality International Journals and Conferences and the patents filed. During the Academic year 2019-20 the EE published

more than hundred journal papers in high impact journals. During this academic year one of the key highlight was a high valued project granted by DST-Nanomission having a net worth of ~ INR 1.4 Crore. The strong footing of Department of EE is further proven by the number of Ph.D. students graduated. A total of 20 students successfully completed their Ph.D. from the Department in the AY 2019-20 alone, which is nearly one-fourth of the total number of Ph.D. students graduated till date since the inception of the Department. The percentage share of different students presently studying in the department is shown in the pie chart below.



The faculty members of EE strive to instill analytical and practical skills in the students. This is systematically achieved by incorporating various sub-components as a part of the regular course learning and evaluation, industry-relevant projects, field trips and real-time assignments that would substantially benefit in understanding and utilization of concepts. In addition to that, students of various categories have been supported to attend numerous conferences, competitions and winning laurels. As a result, our students have secured several foreign internships (viz. DAAD, Fulbright fellowships etc.) along with higher studies option with scholarships from top Universities and also appreciation of their work in industries.

A constantly evolving environment has been created in IIT Indore, where the community interacts frequently in looking for out-of-the box solutions to solve problems, invited many industries to visit our department and have constant discussions on various problems with academia to get insights. An interdisciplinary approach followed by EE faculty members has emerged taking up some of these engineering problems as projects and internships that have been successfully solved by our students. This has resulted in collaborations with industry for sponsored research.

Some of the key notable achievements by the faculty members of the department during the AY 2019-20, are as given below:-

- Dr. Amod C Umarikar received Best Teacher Award of IIT Indore in February, 2020.
- Dr. Prabhat K Upadhyay became the editor of IEEE Communication Letters.
- Prof. Ram Bilas Pachori became the editor of IETE technical review journal.
- Prof. Ram Bilas Pachori also backed the premium award for Best paper in IET Science, Measurement & Technology Journal.
- Dr. Shaibal Mukherjee was the proud recipient of the 2020 DUO-India Professor Fellowship Award, and the 2019 DAAD Fellowship Award.Dr. Saptarshi Ghosh received the prestigious Matsumae International Foundation Research Fellowship Award.
- Prof. Vimal Bhatia was awarded IETE- Prof SVC Aiya Memorial Award 2019.

Professor Abhinav Kranti
Professor
akranti@iiti.ac.in

PhD. - University of Delhi, India
Previous Employment (includes post-doctoral experience) - Post-doctoral fellow at Université catholique de Louvain, Belgium (2002 – 2004).
Research fellow at Queen's University of Belfast, UK (2005 - 2009).
Researcher at Tyndall National Institute, University College Cork, Ireland (2010).
Assistant Professor at Indian Institute of Technology Indore, India (2010 – 2013).
Associate Professor at Indian Institute of Technology Indore, India (2013 – 2017).
Professor at Indian Institute of Technology Indore, India (since 2017).

Statement of Research Interests

a. **Broad research area -** Capacitorless Dynamic Random Access Memory (1T-DRAM), Steep Switching Transistors, Vertically Stacked Transistors, and Material-Device-Circuit Co-design for the development of next generation logic and memory technology.
b. **Research Highlights -** Steep switching specific scaling methodology is showcased to attain a sharp increase in drain current in a triple-gate junctionless transistor along with an associated negative value of total gate capacitance. Logic and memory functionality of vertically stacked bi-directional junctionless transistor, which can be operated as nMOS or pMOS depending on the biases applied. The architecture has shown potential to reduce the transistor count to realize logic operations.
c. **Awards and Achievements –**
   - Award for Excellence in Teaching at IIT Indore in January 2019
   - Best Technology Development Award at IIT Indore in January 2019 (as part of the six member team).
   - An outstanding reviewer for Nanotechnology, IOP, 2017 German Academic Exchange Service (DAAD) scholarship to visit RWTH Aachen under Bilateral Exchange of Academics Program, June 2017.
   - Award for Excellence in Teaching at IIT Indore in January 2017.
   - Research article featured in the Lab Talk at nanotechweb.org entitled, "Transistor 'imperfection' leads towards perfection" in October 2016.

Patents, Publications, Events and Seminars

Patents - A. Kranti and N. Navlakha, Multiple gate tunneling field effect transistor device for capacitorless dynamic memory, Indian Patent Filed, Filing date: 01/03/2016, App no. 201621007078, Publication Date: 17/11/2017, Overall status: Pending. A. Kranti and M. Gupta, Multiple gate junctionless MOSFET (Metal Oxide Semiconductor Field Effect Transistor), Indian Patent Filed, Filing date: 07/07/2015, App no. 2594/MUM/2015, Publication Date: 13/01/2017, Overall status: Pending.

Publications (includes journal articles, books and book chapters) –

- M. Gupta and A. Kranti, Bi-directional junctionless transistor for logic and memory applications, IEEE Trans. Electron Devices, vol. 66, pp. 4446-4452, 2019.
- M. Gupta and A. Kranti, Relevance of device cross-section to overcome Boltzmann switching limit in 3d junctionless transistor, IEEE Trans. Electron Devices, vol. 66, pp. 2704-2709, 2019.
- Y.V. Bhuvaneshwari and A. Kranti, Estimation of doping in junctionless transistors through dc characteristics, Semiconductor Science and Technology, vol. 34, 055020, 2019.

Events/ Seminars organized - Organized (jointly with Dr. Bhupesh Lad) a TEQIP-III funded short term course on Significance, Securing and Sustainability (S^3) of Externally Funded Research Projects in Higher Education Institutes (HEIs) from December 16-21, 2019.

Projects active during April 2019-March 2020

Title- Functionality enhancement of reconfigurable transistors by implementing standalone and embedded 1T-DRAM

Duration - 3 years (2020-2022)
Funding Agency - Department of Science and Technology, Government of India
Brief Description- A key component for dense integration is the augmented functionality attained with the same type of transistors being used for logic as well as memory blocks. In this context, it is imperative to examine the feasibility of reconfigurable transistors for dynamic memory (standalone and embedded) applications.

Dr. Abhinoy Kumar Singh
Inspire Faculty
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PhD. - Indian Institute of Technology Patna
Previous Employment (includes post-doctoral experience)

- Adani Institute of Infrastructure Engineering, Ahmedabad, 26-06-2018 to 09-10-2018
- Postdoctoral Researcher, McGill University, Montreal, Canada 01-05-2018 to 31-05-2019.
- Assistant Professor, Shiv Nadar University, Greater Noida, India, 05-12-2016 to 26-02-2017.

Statement of Research Interests

a. **Broad research area -** Estimation and filtering, Stochastic process, Target tracking

b. Research Highlights

- Got one project from the Department of Science and Technology, India (Core Research Grant).
- Hired three PhD students.
- Four journal articles got accepted for publication.
- For more journal articles are submitted and currently under review at different stage.

c. Awards and Achievements

- Received core research grant from the Department of Science and Technology, Government of India.

Publications (includes journal articles, books and book chapters) - A total of four journals published between April 2019 to March 2020.

Three best publications:

- **Abhinoy Kumar Singh,** Mihailo V. Rebec and Ahmad Haidar, "Kalman Filter-Based Real Time Calibration Algorithm for Continues Glucose Monitoring Systems", IEEE Transactions on Control Systems Technology, In press.
- **Abhinoy Kumar Singh,** "Exponentially-fitted Cubature Kalman Filter", IEEE Transactions on Circuit and Systems I, In press, DOI: 10.1109/TCSI.2020.2985867
- Abhinoy Kumar Singh, "Fractionally delayed Kalman filter", *IEEE Automatica Sinica*, vol. 7, no. 1, pp. 169 - 177, Dec. 2019.

Events/ Seminars organized - Short term courses:

- Short term course on "Industrial Applications of Control Systems and Signal Processing", at Indian Institute of Technology Indore, organized between 19-24 Aug. 2019.
- Short term course on "Control Systems and Signal Processing: Solutions to Biomedical Problems", at Indian Institute of Technology Indore, organized between 3-4 June 2019.

Conference organizing committee:

- Student travel grant co-chair, IEEE ANTS 2018, 16-19 Dec. 2018, Indore, India.
- Exhibition co-chair, V-DAT 2019, to be held in July 2019, Indore, India.

Projects active during April 2019-March 2020
Title - New estimation and filtering algorithms, and their possible application in continuous glucose monitoring.
Duration - 5 Years
Funding Agency - Department of Science and Technology (DST), Government of India

Brief Description - The project is given under inspire faculty award and the sanctioned amount is 35 Lakhs INR. A PhD student has been hired and currently working under this project

The objective is to develop new algorithms for nonlinear estimation and filtering as well as to develop new algorithms for monitoring of glucose concentration in type-1 diabetes patients.

Title - Advanced Nonlinear Filtering Using Improved Quadrature Rule
Duration - 3 Years
Funding Agency - Department of Science and Technology (DST), Government of India
Brief Description - The project is given under Core research grant and the budget is 29.37 Lakhs INR. A JRF has been hired and currently working under this project.
The objective of this project is to develop new estimation and filtering techniques specific to nonlinear systems. Further, the new techniques to be available under the class of quadrature rule based filtering.

Dr. Amod C. Umarikar
Associate Professor
amodu@iiti.ac.in

PhD. - IISc Bangalore, 2007
Previous Employment (includes post-doctoral experience)
Post Doctoral Associate: July 2007-January 2009: University of Minnesota
Lecturer, BITS Pilani Goa Campus: March 2009-September2009

Statement of Research Interests

a. Broad research area
   1) Application of power electronics in renewable energy systems.
   2) Modelling and simulation of power electronic systems.
   3) Power quality analysis

b. Research Highlights -

- Current research in my group is on development of standalone PV system based on impedance source converters. In this we are focusing on quasi z-source converter based standalone PV system.
- Another research area in which we are working is in control techniques of grid connected converters. In this area, we have focused in synchronverter control technique for grid connected and standalone inverters.
- Power quality analysis is another area in which we are currently working on application of signal processing techniques in the analysis and extraction of parameters which define power quality.

c. **Awards and Achievements -** Received Best Teacher Award of IIT Indore in February 2020.

Publications (includes journal articles, books and book chapters) - Karthik Thirumala; Aditi Kanjolia; Trapti Jain; Amod C. Umarikar, "Empirical wavelet transform and dual feed-forward neural network for classification of power quality disturbances", International Journal of Power and Energy Conversion, 2020 Vol.11 No.1, pp.1 – 21, DOI: 10.1504/IJPEC.2020.104805

Projects active during April 2019-March 2020
Title - Modelling and Control of Grid Connected Photovoltaic Systems
Duration - November 2019-September 2020
Funding Agency - TEQIP, Phase III
Brief Description - In this project, grid connected PV inverter will be modelled for different control strategy and these will be verified in Real Time Digital Simulator (RTDS).

Dr. Mukesh Kumar

PhD. -Tokyo Institute of Technology, Japan
Previous Employment - (includes post-doctoral experience)

1. Postdoctoral (JSPS) Research Fellow (2009-2010), Tokyo Institute of Technology, Japan
2. Exchange Researcher (2008-09) at University of California Berkeley, USA

Statement of Research Interests

a. Broad research area

Associate Professor
mukesh.kr@iiti.ac.in

- Silicon Photonics
- Optoelectronic Devices
- Nano-scale Devices
- Device Fabrication (Micro/Nano Fabrication)

b. Research Highlights - We are working on the design, fabrication and characterization of silicon photonic devices for broadband communication, computing and information storage. Recently a silicon nanophotonic memory based on resistive switching is developed with an on-off extinction ratio of 10 dB. The proposed device is an excellent example of the combination of novel device physics and semiconductor technology. Also, a CMOS compatible optical modulator based on Si-ITO is realized with Si-ITO heterojunction enabling intensity modulation with high extinction ratio of 7dB via electrical tuning of optical absorption.

c. Awards and Achievements - Ms. Swati Rajput, PhD Scholar under Dr. Mukesh Kumar in Electrical Engineering is conferred with Young Scientist Award by Madhya Pradesh Council of Science and Technology for the Best paper presented during 34th Young Scientist Congress.

Publications (includes journal articles, books and book chapters)

1. V. Kaushik, S. Rajput and M. Kumar, "Broadband Optical Modulation in Zinc Oxide based Heterojunction via Optical Lifting," **Optics Letters**, Vol. 45 (2) pp. 363-366 (2020).
2. S. Rajput, V. Kaushik, S. Jain ,P. Tiwari , A. K. Srivastava and M. Kumar, "Optical Modulation in Hybrid Waveguide based on Si-ITO Heterojunction," **Journal of Lightwave Technology**, vol 38 (6) pp. 1365-1371 (2020).
3. L. Singh, S. Jain and M. Kumar, "Electrically Writable Silicon Nanophotonic Resistive Memory with Inherent Stochasticity," **Optics Letters**, Vol. 44, No. 16,2019.

Projects active during April 2019-March 2020

Title - Fabrication of Silicon Photonic Devices for Optical Interconnects
Duration - 2019-2022
Funding Agency - Nano Mission, DST
Brief Description - The objective of the project is to design and fabricate silicon based nanostructured photonic device (a multi-functional device with three functions: Nanophotonic Waveguide, Coupler and Phase-shifter) for multidisciplinary applications like optical communication, optical interconnects and bio-chemical sensing. The proposed device can be a building block for making nano-scale integrated devices for on-chip sensing and for large-scale photonic circuits.
The proposed project will be a promising step towards realization of high speed nanophotonic devices (Photonic Modulator and Logic Devices) for optical networks, interconnects and for Bio-chemical Sensing.

Title - Nano Optoelectronics Sensing platform for fast and efficient Lab-On-Chip applications
Duration - 2016-2019
Funding Agency - SERB, DST
Brief Description - A Novel Design of slot waveguide for bio-Sensing is characterised with cost-effective fabrication process. The proposed device has shown sensing capability for surface antigen HBsAg, a principal marker of hepatitis-B viral infection, with a high sensitivity of 1200 nm/RIU with a figure of merit of 300. The device offers flexibility in accommodating the bio-sample in a desirable area.

Title - Silicon Nanophotonic Platform for Optical Guidance and Control in Broadband Communication
Duration - 2020-2023
Funding Agency – CSIR
Brief Description - The objective of the project is to design, fabricate and characterize a Silicon based Nanophotonic device which can prove to be a building block for making nano-scale integrated photonic circuits for various on-chip applications. The primary target would be to come up with a novel and versatile design of the on-chip device and then to study and simulate its properties.

This approach of hybrid devices naturally extends the capabilities of both plasmonics and semiconductor photonics and can be applied to subwavelength laser devices, such as visible nanolasers and terahertz lasers as well as optical integrated circuits to efficiently manipulate the light on scales much smaller than the wavelength of light.

Dr. Prabhat Kumar Upadhyay
Associate Professor
pkupadhyay@iiti.ac.in

PhD. - Department of Electrical Engineering, Indian Institute of Technology Delhi,
Previous Employment (includes post-doctoral experience)
Assistant Professor, Department of Electronics & Communication Engineering, BIT Mesra, Ranchi

Statement of Research Interests

a. Broad research area

- Wireless and Mobile Communications
- Cooperative Relaying Technologies, PHY Security
- Multiple-Input Multiple-Output (MIMO) Systems
- Cognitive Radio and Spectrum Sharing Techniques
- Molecular Communications and Nano-networking

b. **Research Highlights -** Wireless Communications (WiCom) Research Group, led by Dr. Prabhat K. Upadhyay, is actively involved in cutting-edge research and development to cater to the emerging needs of the next generation wireless communication systems. It has developed and analyzed various spectral-efficient algorithms and spatial diversity schemes that will help the design of future wireless networks to accommodate the increasing data traffic demands over a limited spectrum. He has been supervising many research projects and dissertations toward PhD (6 completed & 5 ongoing), MTech (7 completed & 1 ongoing), and BTech (17 completed & 2 ongoing) degrees. The research work has contributed a significant number of publications in IEEE journals and conferences.

c. Awards and Achievements

- Editor in the Journal Frontiers in Communications and Networks
- Editor of IEEE Communications Letters.
- Coordinator of BRICS Multilateral Research and Development Project.
- Guest Editor, IEEE Transactions on Cognitive Communications and Networking, Special Issue on "Energy-Harvesting Cognitive Radio Networks".

Patents, Publications, Events and Seminars

Publications (includes journal articles, books and book chapters)

During April 2019-March 2020, there are 10 publications in Journals, 9 publications in Conference proceedings, and 1 publication in Book Chapter.

Journal Articles:

[1] V. Singh, P. K. Upadhyay, and M. Lin, " On the Performance of NOMA-Assisted Overlay Multiuser Cognitive Satellite-Terrestrial Networks," IEEE Wireless Communications Letters, vol. 9, no. 5, pp. 638-642, May 2020.

[2] V. Singh, S. Solanki, P. K. Upadhyay, D. B. da Costa, and J. M. Moualeu, "Performance Analysis of Hardware-Impaired Overlay Cognitive Satellite-Terrestrial Networks with Adaptive Relaying Protocol," IEEE Systems Journal, accepted for publication, Jan. 2020.

[3] S. Solanki, V. Singh, and P. K. Upadhyay, "RF Energy Harvesting in Hybrid Two-Way Relaying Systems with Hardware Impairments," IEEE Transaction on Vehicular Technology, vol. 68, no. 12, pp. 11792-11805, Dec. 2019.

Book Chapters:

[1] V. Bankey, P. K. Upadhyay, and D. B. da Costa, "Physical Layer Security in Hybrid Satellite-Terrestrial Relay Networks," Physical Layer Security-Theory and Practice, Khoa N. Le (Ed.), Springer Nature, 2020.

Events/ Seminars organized

- Track Co-Chair, Radio Access and Softwarisation (RAS), European Conference on Communications and Networking (EuCNC) 2020, Dubrovnik, Croatia, 15-18 June, 2020.
- Publicity Co-Chair, International Conference on Advanced Communication Technologies and Networking (CommNet), Rabat, Morocco, April 2019.

Projects active during April 2019-March 2020

Title - Performance Analysis of Diffusion-Based Molecular Communication Systems with Active Receivers
Duration - 3 Years (2018-2021)
Funding Agency - Council of Scientific and Industrial Research (CSIR), Govt. of India
Brief Description - The project aims to investigate the performance of the diffusion-based molecular communication (DMC) systems with more realistic and complex transmitters and receivers. With the modelling of spherical transmitter and active receivers, it is of interest to analyze the performance of DMC systems on the basis of estimation of various system parameters and evaluation of relevant performance measures.

Title - Design and Development of Large-Scale Ambient Energy Harvesting Wireless Networks (LargEWiN)
Duration - 2019-2022 (3 Years)
Funding Agency - BRICS: CNPq-Brazil, DST-India, MOST & NSFC-China, and DST & NRF-South Africa
Brief Description - This project aims to empower the large-scale wireless networks with the ambient energy harvesting and the emerging communication technologies to promote the green economy in a more efficient, reliable, and sustainable manner. It seeks to address the system performance, planning, and resource allocation problems by exploiting cooperation among available network resources with renewable and/or radio frequency (RF) energy sources for implementation of Large-Scale Ambient Energy Harvesting Wireless Networks (LargEWiN). Especially, it intends to integrate the more appealing millimeter wave (mmWave) technology into LargEWiN for its potential futuristic deployment.

Title - Development of Green and Secure Communication Techniques for Future Wireless Networks
Duration - 5 Years (2017-2022)
Funding Agency - Young Faculty Research Fellowship under 'Visvesvaraya PhD Scheme for Electronics & IT' of MeitY, Govt. of India
Brief Description - The project aims at development of energy-efficient network planning and resource allocation strategies in the context of green wireless communications. The wireless techniques used for improving spectral efficiency often lead to decrease in energy efficiency and vice-versa. Therefore, a careful design for future wireless networks is desirable in view of both energy and spectral efficiency. Moreover, owing to the broadcast nature of the medium and the associated security vulnerabilities, it is important to augment secrecy even at physical layer of communications.

Dr. Ram Bilas Pachori
Professor
pachori@iiti.ac.in

PhD. - IIT Kanpur, India
Previous Employment (includes post-doctoral experience)

- Associate Professor at Department of Electrical Engineering, School of Engineering, Indian Institute of Technology Indore, from 27 September, 2013 to 17 December, 2017.
- Assistant Professor at Department of Electrical Engineering, School of Engineering, Indian Institute of Technology Indore, from 02 December, 2009 to 26 September, 2013.
- Assistant Professor at Communication Research Center, International Institute of Information Technology, Hyderabad, India from 01 April, 2008 to 30 November, 2009.

- Post-Doctoral Fellow in the Charles Delaunay Institute, FRE CNRS 2848, System Modelling and Dependability Laboratory, University of Technology of Troyes, France from 01 April, 2007 to 31 March, 2008.

Academic associations with other institutions (Affiliate/Adjunct/ Visiting posts)

- Visiting Scholar at Intelligent Systems Research Centre, School of Computing and Intelligent Systems, Ulster University, Magee Campus, Northern Ireland, UK from 01 December, 2014 to 31 December, 2014.
- Visiting Professor at School of Medicine, Taylor´s University, Subang Jaya, Malaysia, from 01 December, 2018 to 30 November 2019.

Statement of Research Interests

a. **Broad research area -** Signal Processing and Machine Learning

b. **Research Highlights -** The automated identification systems based on signal processing and machine learning techniques for diagnosis of various diseases like epilepsy, glaucoma, coronary artery disease, diabetes, congestive heart failure, septal defects, myocardial infarction, atrial fibrillation, amyotrophic lateral sclerosis, sleep disorders, alcoholism, human emotions, etc. have been developed. The new methods for analysis of non-stationary signals have been proposed.

Research Profile at Google Scholar on July 28, 2020:
Citations: 6278, h-index: 42, i10-index: 101.

c. **Awards and Achievements**

- Associate Editor: Electronics Letters (January 2019 to present)
- Associate Editor for 42nd Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC) in conjunction with the 43rd Annual Conference of the Canadian Medical and Biological Engineering Society, July 20-24, 2020, Montreal, Canada (Theme: Biomedical Signal Processing).
- Associate Editor: Biomedical Signal Processing and Control (Elsevier) (February 2018 to present).
- Editor: IETE Technical Review Journal (May 2017 to present).
- Delivered invited talks in reputed institutes.
- Subject expert for faculty selection committee in reputed institutes.
- Reviewer of reputed journals and conferences.
- External examiner of PhD theses in reputed institutes.
- Appreciation certificate from the IEEE BITS Pilani K.K. Birla Goa Campus, Goa, India for sharing expertise and experience at LUMINI 2019, 15th September, 2019.
- 2019 Premium Award for Best Paper in IET Science, Measurement & Technology journal, November 2019.
- Appreciation certificate from the Chairman, IEEE Kharagpur Section, IIT Kharagpur for making a presentation under IEEE Lecture Series at IEEE Kharagpur Section, 27 January, 2020.

Publications - (includes journal articles, books and book chapters)

Journal articles:

- P. Gaur, K. McCreadie, R.B. Pachori, H. Wang, and G. Prasad, Tangent space features based transfer learning classification model for two-class motor imagery brain-computer interface, International Journal of Neural Systems, vol. 29, no. 10, 1950025, December 2019.
- T. Siddharth, R.K. Tripathy, and R.B. Pachori, Discrimination of focal and non-focal seizures from EEG signals using sliding mode singular spectrum analysis, IEEE Sensors Journal, vol. 19, issue 24, pp. 12286-12296, December 2019.
- R.K. Tripathy, A. Bhattacharyya, and R.B. Pachori, Localization of myocardial infarction from multi lead electrocardiogram signals using multiscale convolution neural network, IEEE Sensors Journal, vol. 19, no. 23, pp. 11437-11448, December 2019.

Books:

- D.S. Sisodia, R.B. Pachori, and L. Garg, Advancement of artificial intelligence in healthcare engineering, IGI Global, 2020, ISBN: 9781799821205.

Book chapters:

- R.R. Sharma, P. Meena, and R.B. Pachori, Enhanced time-frequency representation based on variational mode decomposition and Wigner-Ville distribution, In: S. Jain and S. Paul (Eds.) Recent Trends in Image and Signal Processing in Computer Vision, Springer, 2020.
- D. Bhati, A. Raikwar, R.B. Pachori, and V.M. Gadre, Three channel wavelet filter banks with minimal time frequency spread for classification of seizure-free and seizure EEG signals, In: D.S. Sisodia, R.B. Pachori, and L. Garg (Eds.) Advancement of Artificial Intelligence in Healthcare Engineering, IGI Global, 2020.
- R. Singh and R.B. Pachori, Iterative filtering based automated method for detection of normal and ALS EMG signals, In: S. Jain and S. Paul (Eds.) Recent Trends in Image and Signal Processing in Computer Vision, Springer, 2020.

Events/ Seminars organized

- Short term course on control system and signal processing: Solutions to biomedical problems, 03-04 June, 2019, Indian Institute of Technology Indore, Indore, India (with Dr. A.K. Singh).
- TEQIP-III 6-days short term course on Industrial applications of control systems and signal processing, 19-24 August, 2019, Indian Institute of Technology Indore, Indore, India (with Dr. A.K. Singh).
- Faculty training programme on data science & analytics, Sponsored by TEQIP-III, MHRD, March 02-12, 2020, IIT Indore, Indore, India (with Dr. P. Kar, Dr. M. Tanveer, Dr. A. Dutta, Dr. S. Manna, and Dr. S. Das).

Projects active during April 2019-March 2020

Title - Development of a portable acoustic sensor based canine pregnancy detection system and biomarker-based canine pregnancy test kit.
Duration - Two years (March 2018- March 2020)
Funding Agency - Department of Biotechnology (DBT)
Brief Description - Total cost: Rs. 30,00,000. Principal Investigator: Dr. Debasis Nayak, Co-Principal Investigators: Dr. Ram Bilas Pachori, Dr. Niranjan Sahoo, Dr. Gourinath Banda.

Title - Detection of human brain disorders using novel machine learning approaches
Duration - Three years (October 2017-October 2020)
Funding Agency – CSIR
Brief Description - Total cost: Rs. 31,26,240, Principal Investigator: Dr. M. Tanveer, Co-Principal Investigator: Dr. Ram Bilas Pachori.

Title - A multi-class computer-aided system for diagnosis of cardiovascular disease using non-invasively measured cardiac signals
Duration - June 2019-September 2020
Funding Agency -TEQIP Collaborative Research Scheme, National Project Implementation Unit (NPIU), Government of India.
Brief Description - Total cost: Rs. 1046000, Principal Investigator: Dr. Abhay Upadhyay, Co-Principal Investigators: Dr. Ram Bilas Pachori, Dr. Rishi Raj Sharma, Mr. Shashikant Verma, Dr. Rajeev Sharma.

Title - Advanced nonlinear filtering using improved quadrature rule
Duration - Three years (February 2020-February 2023)
Funding Agency - SERB, Government of India
Brief Description - Total cost: Rs. 33, 00,000, Principal Investigator: Dr. Abhinoy Kumar Singh, Co-Principal Investigator: Dr. Ram Bilas Pachori.

Dr. Santosh Kumar Vishvakarma
Associate Professor
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Dr. Santosh Kumar Vishvakarma obtained his PhD. from IIT Roorkee in 2010. He worked in the Microelectronics and VLSI Group at the department of Electronics and Computer Engineering under the supervision of Dr. S. Dasgupta, & Dr. A. K. Saxena. His research area was MOS device modeling and SRAM circuit design. He has also worked as a Post-Doctoral Fellow at UnikUniversity Graduate Center, Kjeller, Norway with Prof. Tor. A. Fjeldly under the Project COMON (Compact Modeling Network) on Compact Modeling development and parameter extraction of Nonconventional MOS Devices. During his post-doc tenure, he developed the analytical compact model of Multigate MOSFET especially Square and Circular cross-section GAA MOSFET.

Currently, he is an Associate Professor in the department of Electrical Engineering where he is engaged in teaching, research in the area of Modeling and Simulation of conventional and nonconventional MOS device Structures and Circuit & System Design. He is also the reviewer of the following journals: IEEE, Elsevier, IET, IOP Sciences, etc. Dr. Vishvakarma is a Member of IEEE, Professional Member of VLSI Society of India, Associate Member of the Institute of Nanotechnology, Life member of Indian Microelectronics Society (IMS), India.
His research goals and research focuses include the design, simulation, and implementation of the Low Power, Secure and Highly reliable Circuits and System design for IoT Applications.

Research Highlights

- SRAM Design and Architecture
- Reliable, Secure and Energy-Efficient Circuit Design
- Digital ASIC/SoC Design
- In-Memory Computing
- SoC/FPGA based CNN Hardware Accelerators
- NAND Flash Memory Device
- Advanced MOS Devices
- Device Circuit Co-Design

Research Projects

He has been engaged in the following collaborative works during the year 2019-20.

- Indo-Norwegian collaboration in Intelligent Offshore Mechatronics Systems (INMOST)
  (Funding by: Norwegian Research Council (RCN) under INTPART Scheme)
- Special Manpower Development Program for Chip to System Design (SMDP-C2SD)
  (Funding by**:** Ministry of Electronics and Information Technology (Meity), Govt. of India.)
- Evaluation of Stability and Performance analysis of reliable 3D Cyl GAA-TFET based 6T SRAM cell.
  (Funding by**:** Scientist Pool Scheme of CSIR, HRDG, Govt. of India)
- Hybrid SRAM Memory Architecture for Multi-Core Processor
  (Funding by: Science and Engineering Research Board (SERB), Govt. of India)
- Teaching Learning Centre (TLC)
  (Funding by: Department of Higher Education, Ministry of Human Resource Development, Govt. of India)

Fellowship Awarded:

- Mr. Gopal M Raut: Received ASA Program, Germany fellowship to work three months (April 2019 to June 2019) with Prof. Akash Kumar at TU Dresden, Germany.
- Mr. Gopal M Raut: Received HiPEAC fellowship to work three months (Oct. 2019 onward) with Prof. Akash Kumar at TU Dresden, Germany.

Conference Organized:
VLSI Design and Test, 23rd International Symposium, VDAT 2019, Indore, India, July 4–6, 2019.

Journal articles published:

- Sajid Khan, Ambika Prasad Shah, Shailesh Singh Chouhan, Neha Gupta, Jai Gopal Pandey, and Santosh Kumar Vishvakarma, "A Symmetric D flip-flop based PUF with improved uniqueness", Elsevier, Microelectronics Reliability, vol. 106, pp. 113595, March 2020.
- Gopal Raut, Ambika Prasad Shah, Vishal Sharma, Gunjan Rajput, and Santosh Kumar Vishvakarma, "A 2.4-GS/s Power-Efficient, High-Resolution Reconfigurable Dynamic Comparator for ADC Architecture", Springer, Circuits, Systems, and Signal Processing, pp. 1-14, Feb. 2020.
- Vivek Pogra, Santosh Kumar Vishvakarma, Balwinder Raj, "Design and Performance Analysis of Application Specific Integrated Circuit for Internet of Things Application, " Sensor Letters, ASP, Vol. 18, No. 1, pp. 31-38(8), January 2020.

PhD. - University of Oklahoma, USA in 2009
Previous Employment - (includes post-doctoral experience)
Post Doctoral Research Scientist - Center of Quantum Devices (CQD), Electrical Engineering and Computer Science, Northwestern University, Illinois, USA, June 2009-July 2010

Dr. Shaibal Mukherjee
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Statement of Research Interests

a. Broad research area

- Photovoltaics for energy
- Non-volatile resistive random access memory
- Novel heterostructures for HFET
- High performance UV photodetectors
- Flexible and low-cost hybrid bio-chemical sensor

b. Research Highlights

Manpower development (as Main Supervisor)

PhD - Completed: 5 (out of total 12)
Ongoing: 10
M.Tech. Project - Completed: 2 (out of total 3)
B.Tech. Project/Intern Completed: 12 (out of total 17)

Summary of research output

Journal papers: 6 (out of total 87)
Proceedings in international conference: 12 (out of total 85)
Patents: 3 (out of total 6)

c. Awards and Achievements

Funds from external agency

Project completed: 8
Project ongoing: 5
Total fund gathered: Approx. INR 6.0 crores

- Recipient of **2020 DUO-India Professor Fellowship Award** to visit Linköping University under Bilateral Exchange of Academics Program
- Recipient of **2019 DAAD Fellowship** to visit Karlsruhe Institute of Technology under Bilateral Exchange of Academics Program, 2019
- Recipient of **Young Faculty Research Fellowship (YFRF)** under Visvesvaraya PhD Scheme for Electronics and Information Technology, Ministry of Electronics and Information Technology (MeitY)
- Nanyang Technological University Singapore – Sponsored Assistance awarded to Mr. Mangal Das, a PhD student graduated under the supervision of Dr. Shaibal Mukherjee, to attend and present work at ICMAT 2019, Singapore
- Nanyang Technological University Singapore – Sponsored Assistance awarded to Mr. Md Arif Khan, a PhD student graduated under the supervision of Dr. Shaibal Mukherjee, to attend and present work at ICMAT 2019, Singapore
- **DST International Travel Support** awarded to Mr. Mangal Das, a PhD student graduated under the supervision of Dr. Shaibal Mukherjee, to attend and present paper in **9th International Conference on Key Engineering Materials, Oxford, March 29 - April 1, 2019.**

Patents -

- **Conjugated compound for resistive switching, device, and method of fabrication**
  Inventors: Apurba K Das, Shaibal Mukherjee, Rohit G. Jadhav, Amitesh Kumar
  Patent No. 201921027542, FILED, July 10, 2019.
- **Organo-acidified zinc oxide carbon monoxide sensor**
  Inventors: Shaibal Mukherjee, Apurba K Das, Ajay Agarwal, Biswajit Mandal, Aaryashree, Sayan Maiti
  Patent No. 201921026594, FILED, July 3, 2019.
- **Hybrid mesoporous composites gas sensors**
  Inventors: Shaibal Mukherjee, Apurba K Das, Ajay Agarwal, Aaryashree, Biswajit Mandal, Ankan Biswas
  Patent No. 201921026576, FILED, July 3, 2019.

Publications (includes journal articles, books and book chapters)

Journals (*3 best journals out of 15 peer-reviewed and high-impact journal papers*)

- Gaurav Siddharth, Brajendra S. Sengar, Vivek Garg, Md Arif Khan, Ruchi Singh, and Shaibal Mukherjee, *Analytical performance analysis of CdZnO/ZnO-based multiple quantum well solar cell*, **IEEE Transactions on Electron Devices**, vol. 67, no. 3, pp. 1047-1051, March 2020. (**Impact factor: 2.704**)
- Md Arif Khan, Pawan Kumar, Gaurav Siddharth, Mangal Das, and Shaibal Mukherjee, *Analysis of drain current in polycrystalline MgZnO/ZnO and MgZnO/CdZnO HFET*, **IEEE Transactions on Electron Devices**, vol. 66, no. 12, pp. 5097-5102, December 2019. (**Impact factor: 2.704**)
- Gaurav Siddharth, Vivek Garg , Brajendra S. Sengar , Ritesh Bhardwaj, Pawan Kumar, and Shaibal Mukherjee, *Analytical study of performance parameters of InGaN/GaN multiple quantum well solar cell*, **IEEE Transactions on Electron Devices**, vol. 66, issue 8, pp. 3399-3404, June 26, 2019. (**Impact factor: 2.704**)

Events/ Seminars organized –

- **Technical Program Committee Member** in the domain of Crystal Growth and Epitaxy Committee in 20th International Workshop on The Physics of Semiconductor Devices (IWPSD), Kolkata, December 17-20, 2019
- **Technical Instructor** in TEQIP sponsored short term course on *Industrial Applications of Control Systems and Signal Processing*, IIT Indore, August 19-24, 2019
- **Publicity Chair** *of 23rd Edition of International Symposium on VLSI Design and Test Conference (VDAT-2017)*, IIT Indore, July 4-6, 2019.
- **Technical Committee Member** of the *9th International Conference on Key Engineering Materials (ICKEM 2019)*, Oxford, United Kingdom, March 29-April 1, 2019

Projects active during April 2019-March 2020 (As PI)

Title - Development of ZnO-based heterostructures for HEMT applications (REVISED)
Duration - 2016-2020
Funding Agency - DST SERB
Brief Description - Development of ZnO-based HEMTs

Title - Fabrication of ZnO/MgZnO based ultraviolet photodetector
Duration - 2016-2020
Funding Agency - CSIR
Brief Description - Development of ZnO/MgZnO-based UV photodetectors.

Title - Complex Cu-containing semiconductors and layered structures for economically-viable, environmentally-benign, and high-performance ultrathin solar cells
Duration - 2019-2021
Funding Agency - DST-RSF Bilateral Project for Joint Research Cooperation between India and Russia
Brief Description - Development of Cu-based new materials for solar cell applications

Title - 2D-TMD and carbon dot embedded metal-oxide nanomaterials for ultrasensitive and ultraselective H_2S
Duration - 2019-2022
Funding Agency - MHRD STARS
Brief Description -Development of ultrasensitive and ultraselective H_2S sensor.

Dr. Srivathsan Vasudevan
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PhD. - Nanyang Technological University (NTU), Singapore
Previous Employment - (includes post-doctoral experience)
Research Associate, Singapore General Hospital, Singapore

Statement of Research Interests

a. **Broad research area -** Biomedical instrumentation, Advanced electronics, High Performance Computing

b. Research Highlights

- Cost effective biomedical instrumentation for clinical applications
- Parallel processing of high performance computing algorithms
- Instrumentation development for varied applications

Publications - (includes journal articles, books and book chapters)

Abhijeet Gorey, Srivathsan Vasudevan, M. S. Ansari, Priyanka Bhagat, Satish Phatak, Norman Sharma and George C K Chen, Development of a compact laser-diode based frequency domain photoacoustic sensing system: Application of human breast cancer diagnosis, Review of Scientific Instruments, vol. 90, pp. 114101, 2019

Abhijeet Gorey, Deblina Biswas, Anshu Kumari, Sharad Gupta, Norman Sharma, George C. K. Chen, Srivathsan Vasudevan, Application of continuous-wave photoacoustic sensing to red blood cell morphology, Lasers in Medical Science, 2018

Deblina Biswas, Srivathsan Vasudevan, George C K Chen, and Norman Sharma, Quantitative photoacoustic characterization of blood clot in blood: A mechanobiological assessment through spectral information, Review of Scientific Instruments, vol. 88, pp. 024301, 2017.

Projects active during April 2019-March 2020

Title - Development of multi-spectral photoacoustic imaging and sensing system for non-invasive imaging and characterization of tumor vasculature during angiogenesis using zebrafish xenograft and chicken chorioallantoic membrane (CAM) model
Duration - 2019-2020 Dec
Funding Agency - SERB (DST)
Brief Description - The proposed work would explore the potential of a biomedical imaging technique for detection and growth of cancer.

Title - Reducing computaional complexity using FPGA to study structure and dynamical properties of nano-particles.
Duration - 2017-2020
Funding Agency - SERB (DST)
Brief Description - The proposed work is exploring the potential of FPGA (advanced electronic board) for performing high performance computing applications.

Dr. Saptarshi Ghosh
Assistant Professor
sghosh@iiti.ac.in

PhD. - Indian Institute of Technology Kanpur, India
Previous Employment (includes post-doctoral experience)
Aug' 2017 – Nov' 2018: Postdoctoral Research Fellow in Chung-Ang University, Seoul, South Korea.

Statement of Research Interests

a. Broad research area

- Electromagnetics
- Frequency selective surfaces
- Metamaterials
- Microwave absorbers
- (5) Microwave antennas

b. Research Highlights

- Experimental demonstration of different types of passive and active microwave absorbers
- Use of frequency selective surfaces to realize different types of microwave devices, e.g. filters, polarizers, absorbers, rasorbers, antennas
- Exploitation of metamaterial properties to construct ultra-thin and flexible structures
- Use of cutting-edge technologies, such as 3D printing, inkjet printing, liquid metal technology to realize electromagnetic devices
- Development of microwave and mm-wave antennas.

c. Awards and Achievements (April 2019-March 2020)

- **Outstanding Reviewer Award:** Selected as one of the 2019 Outstanding Reviewers of IEEE Antennas and Wireless Propagation Letters.
- **Recipient of MIF Fellowship:** Received the prestigious Matsumae International Foundation (MIF) research fellowship for visiting Tokyo Institute of Technology, Japan.

Publications (includes journal articles, books and book chapters)

- Minseok Kim, Heijun Jeong, Daecheon Lim, **Saptarshi Ghosh**, and Sungjoon Lim, "Low-Cost and Miniaturized Metamaterial Absorber using 3D Printed Swastika Symbol," *Microwave and Optical Technology Letters*, vol. 62, pp. 1709–1715, 2019.
- **Saptarshi Ghosh**, and Sungjoon Lim, "A Miniaturized Bandpass Frequency Selective Surface Exploiting 3D Printing," *IEEE Antennas and Wireless Propagation Letters*, vol. 18, no. 7, pp. 1322-1326, 2019.
- Ratanak Phon, **Saptarshi Ghosh**, and Sungjoon Lim, "Novel Multifunctional Reconfigurable Active Frequency Selective Surface," IEEE Transactions on Antennas and Propagation, vol. 67, no. 3, pp. 1709-1718, 2019.

Projects active during April 2019-March 2020

Title - Design and Development of Cost-Effective Compact Millimeter-Wave Antennas for 5G Wireless Communication (Role: PI)
Duration -2 Years
Funding Agency - DST-SERB

Title - Functionality Enhancement of Reconfigurable Transistors by Implementing Standalone and Embedded IT-DRAM (Role: Co-PI)
Duration - 3 Years
Funding Agency - DST-SERB

Dr. Swaminathan R
Assistant Professor
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PhD. Indian Institute of Technology (IIT) Kharagpur, 2016
Previous Employment - (includes post-doctoral experience)
Research Fellow, Nanyang Technological University (NTU) Singapore (June 2015 to Feb 2019).

Statement of Research Interests

a. **Broad research area** - Wireless Communications, Communication Systems

b. Research Highlights

- Space-Air-Ground Integrated Networks (SAGIN),
- Hybrid Optical-RF Communication
- Non-Line- of-Sight (NLOS) Ultraviolet (UV) Optical Wireless Communication
- Blind Channel Code and Interleaver Reconstruction Techniques
- Index Modulation Techniques for Next-generation Wireless Communication
- Energy Harvesting Schemes for Integrated Optical-RF Networks
- Non-Orthogonal Multiple Access (NOMA) Techniques
- Intelligent Reflecting Surface-based Wireless Communications
- Machine Learning for Communication Systems/Wireless Communications

Publications (includes journal articles, books and book chapters)
Journal Publications:

- S. Sharma, A. S. Madhukumar, and Swaminathan R, ``Switching-based cooperative decode-and-forward relaying for hybrid FSO/RF networks'', *IEEE/OSA Journal of Optical Communications and Networking (JOCN)*, vol. 11, no. 6, pp. 267-281, June 2019.
- Swaminathan R and A. S. Madhukumar, ``Blind parameter estimation of turbo convolutional codes: noisy and non-synchronized scenario'', *Elsevier Digital Signal Processing*, vol. 95, Article. 102577, Dec. 2019.
- Swaminathan R, A. S. Madhukumar, and W. Guohua, ``Blind estimation of code parameters for product codes over noisy channel conditions'', *IEEE Transactions on Aerospace and Electronic Systems*, vol. 56, no. 2, pp. 1460-1473, April 2020.

Projects active during April 2019-March 2020
Title - High-Altitude Platform Station based Hybrid FSO/RF Communication for Future Satellite Communication Systems.
Duration - Dec 2019 – Dec 2021
Funding Agency - SERB – DST, Start-Up Research Grant (SRG)
Brief Description - A comprehensive performance analysis of a high altitude platform station (HAPS) based hybrid free space optics (FSO)/radio frequency (RF) satellite communication (SATCOM) system over varying weather and atmospheric turbulence conditions with pointing errors will be carried out. From the performance analysis, the performance gain obtained due to backup RF links and HAPS compared to the existing single-hop FSO-based SATCOM systems will be reported.

Dr. Trapti Jain
Associate Professor
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PhD. - IIT Kanpur
Previous Employment (includes post-doctoral experience)
1) Assistant Professor, IIT Mandi, H.P. (Dec. 2010 to 8th June 2012)
2) Faculty member, Madhav Institute of Technology and Science, Gwalior, M.P. (May 1999 to November 2010)

a. **Broad research area** - Power System
b. **Research Highlights -** Since the operational philosophy of tomorrow's power grid is expected to change significantly with the technological advancements, the focus of our research group is towards analyzing the impact of these technologies on the operation of power systems and determining the measures needed to mitigate possible negative impact. Stable operation of microgrids, use of synchrophasor technology for security assessment of power syste, power quality monitoring and data analytics in smart grid are the few thrust areas of our research.

Publications (includes journal articles, books and book chapters)
6 Journal publications, 2 Conference publications, 1 book chapter

- E.S.N. Raju P and Trapti Jain, "A Two-level Hierarchical Controller to Enhance Stability and Dynamic Performance of Islanded Inverter-based Microgrids with Static and Dynamic Loads", *IEEE Transactions on Industrial Informatics,* Vol. 15, No. 5, pp. 2786-2797, May 2019.
- Vinay K Tiwari, Amod C Umarikar and Trapti Jain, "Field Programmable Gate Array-Based Measurement System for Real-Time Estimation of Single-Phase Electric Power Quantities", IEEE Sensors Journal, Vol. 19, pp. 5086-5097, July 2019.
- T. Venkatesh and Trapti Jain, "Synchronized measurements based transient security assessment of power systems using AdaBoost Classifiers", *IET Generation, Transmission and Distribution,* Vol. 13, No. 17, pp. 3980-3987, September 2019.

Projects active during April 2019-March 2020
Title - Development of Smart Grid Research Facility
Duration - 2016-2021
Funding Agency - DST
Brief Description - Simulations have been a powerful and convenient tool for carrying out research in various areas of power system. With the advancement of power electronic converter technologies having high-frequency pulse width modulation signals, traditional offline simulations are no longer suitable to study the system having large number of switching devices. Furthermore, this type of simulation usually lacks the hardware interface with real devices. The controllers developed should ideally be validated on the actual system in real time environment. However, due to the high cost and risk involved, it is difficult to test new control schemes on the actual power system.

In order to overcome the aforementioned problems, a Real Time Simulator (RTS) capable of running a large and complex model at the physical time is required. The RTS facilitates the simulation of the power system networks, power electronic and control circuits in real time environment. It provides improved system understanding and validation of controllers through real time Hardware in-the-loop (HIL) tests.

Prof. Vimal Bhatia
Professor
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PhD. The University of Edinburgh, UK.
Previous Employment (includes post-doctoral experience)

C-DOT (India), Hughes Software Systems (India), DTS (UK), AudioSoft (UK), AmberFin (UK), and Openwave Systems (UK).

Academic associations with other institutions (Affiliate/Adjunct/ Visiting posts)
Adjunct faculty at IIT Delhi and IIIT Delhi.

Statement of Research Interests

a. **Broad research area -** Future Communication and Signal Processing Systems

b. **Research Highlights -** Proposing new architectures and solutions for communications and signal processing problems. In particular, solutions for visible light communications for efficient high speed data transfer. The research on algorithm design for large/massive-MIMO, and NOMA schemes are currently being explored in my research group. We have also been able to demonstrate world's first standard (IEEE 802.22) compliant TV-White Space platform on open source software and hardware with improved channel estimation, spectrum sensing and data rates. We have also explored compressed sensing based techniques for ultra-wide band communications. Validation of achievable data rates and outage by the future cooperative networks is found by our work on theoretical bounds under various channel conditions, modulation techniques and practical system considerations. The quality and innovative research has been well accepted and recognized by the IEEE, Elsevier, Springer, OSA, IET and IETE publications. Published articles have featured in the most downloaded/popular article list. The research has been accepted in leading conferences/workshops in communications and signal processing including ICC, Globecom, WCNC, VTC, SPAWC, SPCOM, ANTS, NCC, EUSIPCO, SSPD, Photonics and others. Some of the papers have received travel grants from DST and IEEE SPS.

c. **Awards and Achievements - IETE-Prof SVC Aiya Memorial Award 2019**

Patents (filed) -12
Publications - (includes journal articles, books and book chapters)

Over 200 journals and conferences published. Three representative publication in FY 2019-20:

- V. Bhatia, P. Swami, S. Sharma, and R. Mitra "Non-orthogonal Multiple Access - an Enabler for Massive Connectivity", Special Issue on 5G and Beyond – Springer Nature Journal of IISc, 2020
- P. Swami, M. Kumar, V. Bhatia, and T. Ratnarajah, "Performance Analysis of NOMA Enabled Hybrid Network with Limited Feedback", IEEE Transactions on Vehicular Technology, 2020.
- S. Sharma, K. Deka and V. Bhatia, "Thresholdless Detection of Symbols in Nano-Communication Systems", IEEE Transactions on Nano-Bioscience, 2020.

Events/ Seminars organized –

- Indo-UK Workshop on at IEEE ANTS 2019.
- CEP on at Wireless Communications 2019.

Projects active during April 2019-March 2019

Title - Edge Caching for High Capacity Wireless Networks exploiting Big Data Analytics and Machine Learning
Duration - 2 years
Funding Agency - Ministry of Human Resource and Development, India and UKIERI, UK
Brief Description - Developing machine learning algorithms for big data analytics for edge computing.

Title - 6G for Sustainable Development
Duration - 2 years
Funding Agency - Ministry of Human Resource and Development, India and UKIERI, UK
Brief Description - Developing machine learning algorithms for big data analytics for edge computing.

Title - Design and implementation of robust communication receiver based on OFDM in interference limited channels for TVWS
Duration - 4 years
Funding Agency - Ministry of Electronics and Information Technology, India
Brief Description - Algorithm and prototype development of IEEE 802.22 receiver.

Title - Design of efficient strategies for phase estimation in optical metrology using advanced signal processing techniques
Duration - 3 years
Funding Agency - Department of Science and Technology, India.
Brief Description - To study and propose measurement of dynamic variables using advance signal processing techniques.

Title - High Capacity Wireless Network Architecture Using Machine Learning.
Duration - 3 years
Funding Agency - Department of Science and Technology, India – UKIERI, UK.
Brief Description - To study and propose machine learning algorithms for wireless networks.

Title - Indo-Finish exchange program
Duration - 6 months
Funding Agency - DST-AKA
Brief Description - Indo-Finish exchange program

Dr. Vipul Singh
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PhD. - Kyushu Institute of Technology, Wakamatsu, Kitakyushu, Fukuoka, Japan, 808-0196.
Previous Employment (includes post-doctoral experience)

- Associate Professor in Department of Electrical Engineering at IIT Indore (June, 2016-till date).
- Assistant Professor in Department of Electrical Engineering at IIT Indore (November, 2010-June, 2016).
- Post-doctoral fellow at Research Institute of Electronics, Shizuoka University, Hamamatsu, Japan (April, 2009 – November, 2010).

Statement of Research Interests

a. **Broad research area -** Organic electronics, synthesis of nanostructured materials, Hybrid devices, bio/chemical/gas sensors, Photoluminescence spectroscopy, Novel deposition techniques, Solar blind detectors, and Piezoelectric materials.

b. **Research Highlights -** Molecular and Nanoelectronics Research Group (MNRG), led by Dr. Vipul Singh was established in 2011. We are into solution processed material synthesis of inorganic & organic semiconductors. We utilize the unique opto-electronic properties exhibited by these nanostructured materials towards demonstration of functional devices viz. photodetectors, photo transistors and other type of sensors. We are interested in studying the photo-generated charge carrier dynamics in semiconductors. We are also focussed towards development organic photosensitive transistors using novel techniques. Of particular interest to us is the LSPR effect in nanostructured materials.

c. Awards and Achievements

- Delivered invited lectures on topics related to Organic electronics, under the G2E2 program by Government of Japan, from 8th-12th December, 2019.
- Reviewer of various DST project proposals.
- Reviewer of various reputed international journals.
- Reviewer of Ph.D. theses within India.
- One of our journal papers was selected for the cover page of the ***IEEE Sensors Letters***.
- Examiner of M. Tech. projects of Institutes within India.

Publications (includes journal articles, books and book chapters)
Best three papers out of total 16 papers published in peer reviewed Sci indexed journals during 01/04/2019 to 31/03/2020.

- Akash Tripathi, Tejendra Dixit, Jitesh Agrawal and **Vipul Singh**, "Bandgap Engineering in CuO Nanostructures: Dual-band, Broad band and UV-C Photodetectors"; ***Applied Physics Letters***, vol. 116 **(2020)** 111102.
- Jitesh Agrawal, Tejendra Dixit, I A Palani and **Vipul Singh**, "Electron Depleted ZnO Nanowalls Based Broadband Photodetector"; ***IEEE Photonic Technology Letters***, vol. 31 **(2019)** 1639.
- Jitesh Agrawal, Tejendra Dixit, I A Palani and **Vipul Singh**, "Ultra-Low Voltage UV Photodetector"; ***IEEE Sensors Letters***, vol. 3 **(2019)** 3501504.

Events/ Seminars organized

- Organized a TEQIP-III funded short term course on "*Photovoltaic Technology: From Devices towards Systems*", held at IIT Indore from December 16-18, 2019.
- Member organizing team of COPEN-2019 Conference, held at IIT Indore, from December 12-14, 2019.
- Gave Invited lecture under a TEQUIP-III sponsored short term course in MANIT, Bhopal, Madhya Pradesh.

Projects active during April 2019-March 2020

Title - "Development of Low Voltage, High Sensitivity Organic Photosensitive Transistors for Near Infrared Light Sensors"
Duration - 3 years (2017-2020)
Funding Agency -Department of Science and Technology, Government of India

Brief Description - The project aims towards development of low voltage and high sensitivity OFETs, by employing conducting polymers having lower band gap and novel techniques for the development of the high sensitivity OFET. These OFETs would be sensitive towards NIR region of wavelength and can be employed for biomedical applications.

Title - "Development of High Sensitivity ZnO Nanostructures Based Gas Sensing Array for Space Applications"
Duration - 2 Years (2019-2021)
Funding Agency - ISRO, Respond Scheme
Brief Description - In this project we intend to develop high sensitivity ZnO nanostructures based gas sensors for sensing NOX gases. As a final aim of the project we intend to develop sensor based array for sensing mixture of gases in complex environments. Metal nanoparticles will be decorated on these nanostructures for improving their specificities.

Title - "Design and Development of Laser Decal Transfer Based Micro 3D Printer for Printing Microdevices"
Duration - 2 Years (2018-2020)
Funding Agency -DST, Technology Development Board, Advanced Manufacturing Technology
Brief Description - In this project we intend to utilize the Laser Induce Forward Transfer Technique (LIFTT) for transferring alloyed metal nanoparticles for development of micro three dimensional printer which can be utilized for printing 3D structures over substrate useful for device development.

Dr. Vivek Kanhangad
Associate Professor
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PhD. - The Hong Kong Polytechnic University (HK PolyU)
Previous Employment - Visiting Faculty, International Institute of Information Technology Bangalore (IIITB) (2010-2012)

Statement of Research Interests

a. **Broad research area** - Signal and Image Processing with focus on Biometrics and Biomedical Applications.

b. **Research Highlights -** Pattern Recognition and Image Analysis (PRIA) research group at IIT Indore is primarily engaged in addressing research problems related to biometric recognition. With the development of high-resolution fingerprint scanners, high-resolution fingerprint-based biometric recognition has received increasing attention. Level-3 fingerprint features, which include very fine details such as pores, are generally observable in fingerprint images having a resolution greater than 800 dpi. Pore features have been found to be effective for fingerprint recognition. Accurate detection of pores is crucial for biometric recognition using high-resolution fingerprints. Recently, we have developed a deep convolutional neural network (CNN) based method for detecting pore coordinates in high-resolution fingerprint images. We have also developed a CNN-based framework for high-resolution fingerprint recognition.

c. Awards and Achievements

- Editorial board member of IEEE Biometrics Compendium Journal.
- Member of IEEE SMC technical committee on Biometrics and Applications.
- Technical program committee member for reputed international conferences on biometrics.

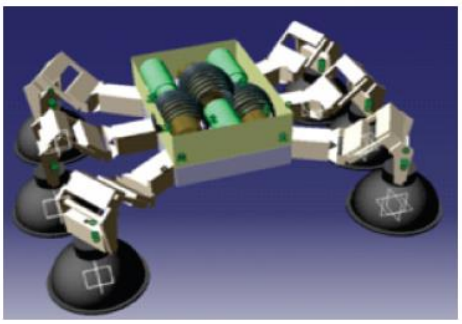
Publications (includes journal articles, books and book chapters)

- Vijay Anand and Vivek Kanhangad, "PoreNet: CNN-Based Pore Descriptor for High-Resolution Fingerprint Recognition," *IEEE Sensors Journal*, vol. 20, no. 16, 2020.
- Ankita Jain and Vivek Kanhangad, "Gender recognition in smartphones using touchscreen gestures," *Pattern recognition Letters*, vol. 125, pp. 604-611, July 2019.
- 3. Vijay Anand and Vivek Kanhangad, "Pore detection in high-resolution fingerprint images using deep residual network," *Journal of Electronic Imaging*, vol. 28, no. 2, April 2019.

Events/ Seminars organized

- A five-day short-term course on Signal and Image Processing with Hands-on Sessions from 2 March 2020 to 6 March 2020.
- 2. Invited seminar in the department of electrical engineering by Professor S. C. Dutta Roy (A former professor of electrical engineering at the Indian Institute of Technology Delhi) on 5 April 2019.

Department of Mechanical Engineering



Research Thrust/Facility

- Microchannel heat transfer, Nuclear thermal Hydraulics, combustion and Computational Fluid Dynamics
- Thermal management of power-dense electronics
- Condition monitoring and prognosis
- Micro-mechanics and Nano-Mechanics, High Entropy Alloys
- Laser and Additive manufacturing, Smart Manufacturing
- Mechatronic and Control

Application Areas

- Biomechanics and composite structure
- Gear Manufacturing and Noise vibration Harness (NVH)
- Smart Manufacturing
- Green energy and Bio fuels
- Robotics and Control
- Automotive and Aerospace
- Electronic and Steel Processing
- Waste Energy Harvesting
- Health prediction of the hydraulic systems

From HOD's Desk

Dr. Santosh K. Sahu
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The Mechanical Engineering department is committed to provide quality education by carrying out robust research programs and working closely with industry. The Department offers various programmes such as BTech, MTech, MS(Research) and PhD. Currently, the department offers two MTech programmes (i) Production and Industrial Engineering and (ii) Mechanical System Design. One of our major objectives is to provide quality engineering education with basic as well as specialized engineering training required for the present and emerging requirements of the society. The department also has a responsibility to conduct relevant social research with cutting-edge technology; to provide continuing education to practicing industrial engineers; and, to develop industry/academia collaborations. The department also organizes continuing educational programs. It comprises of 19 regular faculties.

Achievement of Department in the current reporting year (2019-2020)

- Developed world class infrastructures in various cutting edge technologies including, Industry 4.0, autotronics, additive manufacturing, smart materials, spray diagnosis, thermal hydraulics, micro-channel heat transfer, computational fluid dynamics, vibration and condition monitoring, atomistic modelling among others.
- Secured funding from different external funding agencies including SERB, DST, CSIR, ISRO, DRDO, Royal Academy of Engineering, RSF and OVDF scheme.
- Strong international linkage through VAJRA faculty scheme, SPARC programme and conducting multiple GIAN courses
- The Department has published around 100 Research publications in reputed International Journals.
- Department has built strong linkage in terms of consultancies and man power training with industries such as Vovlo Eischer, WABCO India Ltd and John Deere.
- Alumnus from the department is placed in reputed industries and R&D centres including ISRO, DRDO. In addition, the students have also received scholarship to pursue their higher studies including post-doctoral fellowships in highly ranked abroad universities.

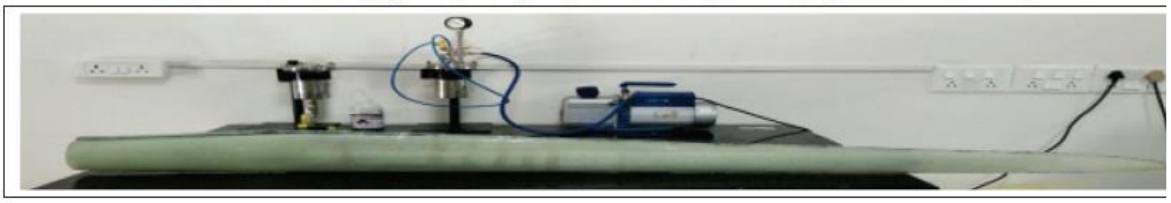
Research at glance – Discipline of Mechanical Engineering

Pulsed Laser Deposition System

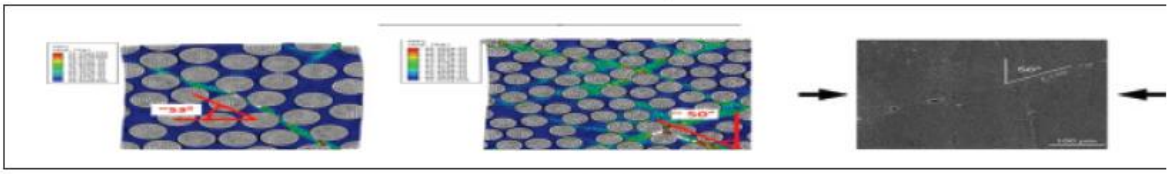
Real-time scaled down prototype of ANKUR-LL 2

Design of Hybrid Underwater Vehicle with fin propulsion

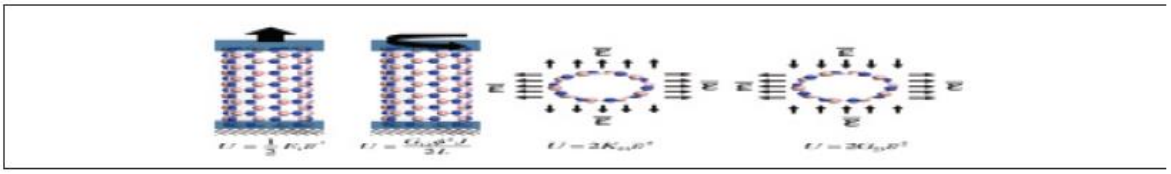
Design, manufacturing and computational research @ composite materials lab



Continuum simulations @ composite meterials lab



Molecular dynamic studies at ATOM lab



Profile - Faculty Members

Prof. Neelesh Kumar Jain
Mechanical Engineering
nkjain@iiti.ac.in

PhD - IIT Kanpur (2003)
Previous Employment - (includes post-doctoral experience)
IIT Rookree (17 June 2004 to 28 Jan 2010)
Oklahoma State University, Stillwater, USA (July-Dec 2008)
South Asia International Institute, Hyderabad (June 2003-May 2004)
Netaji Subhash Institute of Technology, Delhi (July 2002-June 2003)

Statement of Research Interests

b. Broad research areas

- Additive Manufacturing of Metallic Materials and biomedical implants
- Development of FGM and SMM by µ-Plasma Transferred Arc Process
- Micro-joining of Thin Sheets
- High Quality Gear Finishing by Advanced Finishing Processes
- Sustainable Hobbing of Gears
- Near Net-shape Manufacturing of Meso-sized Gears
- Manufacturing of Non-Circular Gears by WSEM
- Advanced and Hybrid Machining Processes
- Micromachining and Nano-finishing Processes
- Modeling and Optimization of the Manufacturing Processes

b. Research highlights

- Development of micro-plasma transferred arc (µ-PTA) wire and powder deposition processes for various meso-sized additive manufacturing (AM) of different metallic materials, knee implants from biocompatible materials, developing functionally graded materials (FGM) and shape memory materials (SMM)
- Development of electrochemical honing (ECH) and pulse-ECH process as an economical and sustainable alternative process for high quality finishing of different types of cylindrical and conical gears
- Development of abrasive flow finishing (AFF) process for high quality finishing of spur and bevel gears
- Establishing WEDM as near-net shape manufacturing process for high quality meso-sized cylindrical, conical, and non-circular gears through extensive.
- Experimental research, modeling and optimization

c. Awards and Achievements

- **Prof. Neelesh Kumar Jain** of Mechanical Engineering appointed as Director (Officiating) of IIT Indore with effect from 1st Jan 2020 till further notice or resumption of charge by the new Director, whichever earlier.
- Appointed Associate Editor, **International Journal of Precision Technology** (Inderscience)
- Editorial Board Member, **Journal of Micromanufacturing** (Sage Publications UK)
- Chief Guest, **World Engineers Day** Function by Indore Chapter of Institution of Engineers on 6th March 2020 and delivered ***key-note lecture*** on **Sustainability in Infrastructure Development in India.**
- Chief Guest, Seminar on **"Enabling 5G in India"** organized by **Telecom Regulatory Authority of India (TRAI)** on 24th Jan 2020
- Jury Member for Industries Case Study Competition "**Re-inventing the Future: Great Teams at Work**" organized by ***Manufacturing Today Magazine*** of Aditya Birla Group 26 Aug. 2019 organized by at Hotel Radison Blu Indore .

Patents - One (complete specifications filed)
Magnetic Field Assisted Micro-plasma Transferred Arc Powder Additive Layer Manufacturing Process (Inventors: Mayur Sudhakar Sawant, Pankaj Kumar, Neelesh Kumar Jain) Indian Patent Application No. 201921022471 published on 20th Dec 2019.

Publications - (includes journal articles, books and book chapters)

- Sagar H Nikam, **Neelesh Kumar Jain,** Mayur S. Sawant **(2020)** "Optimization of parameters of micro-plasma transferred arc additive manufacturing process using real coded genetic algorithm" **The International Journal of Advanced Manufacturing Technology,** 106(3), 1239-1252, DOI: 10.1007/s00170-019-04658-2 (Jan 2020) (**Impact factor: 2.63**)
- Ştefan Ţălu, Slawomir Kulesza, Miroslaw Bramowicz, Sunil Pathak, **Neelesh Kumar Jain (2019)** "Multiscale Surface Texture and Fractal Analysis of Straight Bevel Gears Finished by PECH and PECF Process" **Materials and Manufacturing Processes,** 34 (16), 1882-1887, DOI: 10.1080/10426914.2019.1683578 (Dec 2019). (**Impact Factor: 3.05**)
- Mayur S Sawant, **Neelesh Kumar Jain,** Sagar H. Nikam **(2019)** "Theoretical Modelling and Finite Element Simulation of Dilution in Micro-plasma Transferred Arc Additive Manufacturing of Metallic Materials" **International Journal of Mechanical Sciences**, 164, Article 105166, DOI: 10.1016/j.ijmecsci.2019.105166 (Dec 2019) (**Impact factor: 4.13**)

Projects active during April 2019-March 2020
Title - DST-FIST Project on Gear Engineering
Duration - 2015-2020
Funding Agency - DST, Govt. of India
Brief Description - Development of Centre of Excellence in Gear Engineering by acquiring state-of-facilities and infrastructure and developing expertise to pursue cutting-edge research on various aspects of different types of gears.

Dr. Devendra Deshmukh
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PhD. - IISc Bangalore (2012)

Statement of Research Interests

a. **Broad research area -** Combustion Engines, Laser diagnostics in Spray and Combustion and Modelling

b. **Research Highlights**

- Multicomponent spray modelling for biodiesel under LTC condition
- Low Temperature Combustion engine using biofuels
- Dense spray characterization with liquid volume fraction and SMD distribution in dense sprays
- Combustion diagnostics in flames using structured illumination
- Optical engine diagnostics in diesel engine

c. Awards and Achievements

- DST-SERB project on "Dense spray characterization"
- Received grant under SPARC project for "Structured Illumination for Turbid and Turbulent Environments (SITTE)"
- Received project under special call on Combustion from SERB-NCCRD "Investigation of Biodiesel Spray in an Optical Diesel Engine.

Publications - (includes journal articles, books and book chapters)

- V.D. Chaudhari, D. Deshmukh, "Challenges in charge preparation and combustion in homogeneous charge compression ignition engines with biodiesel: A review," Energy Reports, Volume 5, 2019, Pages 960-968, ISSN 2352-4847
- Aniket P. Kulkarni, D. Deshmukh, " Improvements in laser sheet dropsizing using numerical and experimental techniques," International Journal of Multiphase Flow, Volume 110, 2019, Pages 273-281, ISSN 0301-9322.
- Lanjekar, R. D., & Deshmukh, D. " A review of the effect of the composition of biodiesel on NOx emission, oxidative stability and cold flow properties" Renewable and Sustainable Energy Reviews. 2016.

Events/ Seminars organized

- SERB School on "Combustion Diagnostics and Modelling" 2013
- A public Lecture by Prof.Peter Lindstedt in colloboration with UKIRE 2014
- Workshop on "Sprays And Combustion Diagnostics" 2019

Projects active during April 2018-March 2019

Title - "Investigation of Biodiesel Spray in an Optical Diesel Engine"
Duration - 2017-2019
Funding Agency - SERB
Brief Description - Interaction of biodiesel spray with flow field inside the optical diesel engine.

Dr. Anand Parey
Professor
anandp@iiti.ac.in

PhD. - Indian Institute of Technology Delhi

Previous Employment - (includes post-doctoral experience)

- Lecturer in Department of Mechanical Engineering, BITS Pilani Goa Campus from Aug 2005 to Nov. 2006.
- Post-Doctoral Fellowship from the University of Alberta, Edmonton, Canada from Dec 2006 to Dec 2007.
- Manager-Technology in Global R&D Centre, Crompton Greaves Ltd. Mumbai from April 2008 to August 2008.
- Manager in Heavy Engineering Division, Larsen and Toubro Ltd. Mumbai, from Sep. 2008 to July 2009,

Statement of Research Interests

a. Broad research area

- Condition monitoring,
- noise and vibration isolation
- Signal processing of mechanical systems

b. Research Highlights

- Developed algorithm for fault detection of wind turbine gearbox

Publications - (includes journal articles, books and book chapters)

- Parey, A., Singh, A., Gearbox fault diagnosis using acoustic signals, continuous wavelet transform and adaptive neuro-fuzzy inference system, Applied Acoustics, vol. 147, pp. 133-140, 2019.
- Raghuwanshi, N.K., Parey, A., A New Technique of Gear Mesh Stiffness Measurement Using Experimental Modal Analysis, Journal of Vibration and Acoustics, Transactions of the ASME, vol.141(2),021018, 2019.

- Sharma, V., Parey, A., Performance evaluation of decomposition methods to diagnose leakage in a reciprocating compressor under limited speed variation, Mechanical Systems and Signal Processing, vol. 125, pp. 275-287, 2019.

Events/ Seminars organized

- Artificial Intelligence and Advanced Signal Processing Techniques for Engineering Applications; 05-07 October 2018.
- Research and Development in Condition Monitoring of Rotating Machines; 10-12 December 2018. Vibration Monitoring Techniques for Machinery Fault Diagnosis; 18-19 March 2019.

Projects active during April 2019-March 2020

Title - Internal noise measurement, analysis, source identification and design counter measures for trucks and buses (Funded by DST UAY). Design, Modeling and diagnostic of wind turbines for sustainable energy efficiency (Funded by DST,India-Tunisia Joint Research).

PhD. - Indian Institute of Technology Madras, 2010

Previous Employment (includes post-doctoral experience)
Jan 2012- Sep 2016- Assistant Professor, IIT Indore
Sep 2010- December 2011 Post-Doctoral Researcher, Graduate School of Information science and Electrical Engineering.

Dr. I.A.Palani
Associate Professor
palaniia@iiti.ac.in

Statement of Research Interests

a. Broad research area

- Soft Robotics
- Mechatronics system design
- Laser Assisted Micro-Manufacturing
- Additive Manufacturing
- Micro-Nano Fabrication
- Shape Memory alloys
- Smart materials and structures

b. Research Highlights

- On an Indian context we are the first to develop shape memory alloy bi-morph for different functional applications
- On an Indian context the group is the first to make tailor made shape memory alloy structures using additive manufacturing route
- On an Indian context our group is the first to demonstrate actuation in SMA welded structures
- On an Indian context we are the first to demonstrate SMA integrated jelly fish soft robotic structure for under water robotic systems
- On an Indian Context our group is the first to demonstrate laser nitriding of Engine blocks in collaboration with industry.

c. Awards and achievements

- Best M.Tech Thesis project for the year 2019 from Institute of Smart materials and structures society, IISC Bengaluru.
- My Research Group Received Best paper award for the year 2019-2020 from IIT Indore.
- Received best teacher award for the year 2019 from IIT Indore.
- Conferred as Member Institute of Engineers, India

- Awarded DST Travel grant for delivering talk in the International conference on Shape memory alloy Super elastic conference (SMST 2019), Konstanz, Germany

Patents - Indian Application No.: 201821038754, Title: "Strained SMA bimorph & spring based condition monitoring system for fluid leak detection in hydraulic hoses"

Publications - (includes journal articles, books and book chapters)

- P Rajagopalan, Gaurav Khandelwal, **IA Palani**, Vipul Singh, Sang-Jae Kim, Elucidations on the Effect of Lanthanum Doping in ZnO Towards Enhanced Performance Nanogenerators, International Journal of Precision Engineering and Manufacturing-Green Technology, 2020(I.F 4.59)
- S Jayachandran, K Akash, SS Mani Prabu, M Manikandan, M Muralidharan, A Brolin, **IA Palani,** Investigations on performance viability of NiTi, NiTiCu, CuAlNi and CuAlNiMn shape memory alloy/Kapton composite thin film for actuator application, **Composites Part B: Engineering**, 176,107182,2019 (I.F -6.86)
- SSM Prabu, HC Madhu, CS Perugu, K Akash, R Mithun, PA Kumar, **I.A.Palani**, Shape memory effect, temperature distribution and mechanical properties of friction stir welded nitinol, Journal of Alloys and Compounds 776, 334-345,2019 (I.F- 4.75)

Events/ Seminars organized

- Coordinator for conducting smart Hackathon for the year 2019, organized by Innovation cell, MHRD, Government of India.
- TEQUIP course on micro-Manufacturing, 9th to 11th December 2019.
- International Conference of Precision Meso, Micro and Nano Engineering, 12th-14th December 2019

Projects active during April 2019-March 2020

Title - Development of thick and thin NiTi shape memory alloy porous structures using laser and wire arc additive manufacturing
Duration- 3 years (2019- 2022)
Funding Agency- DST:RSF with St Petersburg university Russia (Total cost for Indian Counterpart is 88 Lakhs)
Brief Description - The main objective of the project is to Shape memory alloy micro-porous structures for different functional applications using Additive Manufacturing Technique.

Title - Design and development of Laser Decal Transfer based Micro 3D Printer for printing micro devices
Duration - 2 years (2019-2021)
Funding Agency - DST:AMT (38 Lakhs)
Brief Description - The objective of the project is to develop micro-3d printers for printing metals and alloyed structures for MEMS and other functional applications.
Title - Laser assisted peening and Nitriding of worm shafts
Duration - 1 year (2019-2020) (5 Lakhs)
Funding Agency - WABCO India Ltd (consultancy)
Brief Description - The objective of the project is relaize the laser assisted surface processing on worm shaft and wheels using novel laser assisted processing.

Title - Laser assisted forming of Shape memory alloy thin sheets
Duration - 1 year (2019-2020)
Funding Agency - GE PVT Ltd (consultancy) 5 Lakhs
Brief Description - The objective of the project is realize the laser assisted forming of thins SMA sheets for aerofoil applications.

Dr. Shanmugam Dhinakaran
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PhD. - IIT Kharagpur (2008)

Previous Employment

- Department of Fluid Dynamics and Heat Transfer, Université de Valenciennes et de Hainaut Cambresis, France
- Department of Chemical Engineering; Department of Mechanical Engineering, Faculty of Engineering, University of Porto (FEUP), Porto, Portugal
- Department of Biological Engineering, University of Minho, Braga, Portugal
- Laboratoire de Physico-Chimie des Polymères,Université de Pau et des Pay de L'Adour, Pau, France.

Statement of Research Interests

a. **Broad research area**

- Computational Fluid Dynamics and Heat transfer; Heat Transfer in Porous Media; Biofluid Mechanics and Bioheat Transfer.

b. **Research highlights**

- Research in nanofluids, related to modelling and enhancement in heat transfer, has been extensively performed in the last few decades. Especially studies related to computational fluid dynamics (CFD) are drawing attention with the advent of better numerical techniques and tools.

c. Awards and achievements

- Completed two research projects (SERB and CSIR)
- Received funding of Rs. 53,52,000 for organizing 7 GIAN Courses at IIT Indore.
- Two Ph.D students graduated in the year 2018
- Guided 5 M.Tech and 7 B.Tech students for their M.Tech and B.Tech Projects, respectively.
- Received funding under Indo-Japan Cooperative Science Programme - 2018 in June 2019.
- Reviewer of international reputed journals such as Energy; Applied Energy; International Journal of Heat and Mass Transfer; Ocean Engineering; Applied Thermal Engineering; Heat and Mass Transfer; Powder Technology; Computers and Fluids; Energy Conversion and Management.
- Gave a keynote Lecture on "Application of Porous Media theory in Biomedical Engineering", at the 6th International Conference on Applications of Porous Media, held on July 6 - 9, 2017 at Tianjin, China.

Publications - (includes journal articles, books and book chapters)

Best Three publications

- K. Anirudh, and **S. Dhinakaran** (2020). Numerical study on performance improvement of a flat plate solar collector filled with porous foam. RenewableEnergy (Elsevier, **ImpactFactor**: 5.439) - In Press.
- K. Anirudh, and **S. Dhinakaran** (2020).Performance improvement of a flat-plate solar collector by inserting intermittent porous blocks. RenewableEnergy (Elsevier, **ImpactFactor**: 5.439), 145, 428-441
- K. Anirudh, and **S. Dhinakaran** (2018). On the vortex shedding and unsteady flow past a two-dimensional porous square cylinder. Journal of Wind Engineering and Industrial Aerodynamics (Elsevier, **ImpactFactor**: 3.01), 179, 200-214.

Other International Journal Publications:

- T.R. Vijaybabu and **S. Dhinakaran** (2019). MHD natural convection around a permeable triangular cylinder inside a square enclosure filled with Al2O3 − H2O nanofluid: An LBM study, **International Journal of Mechanical Sciences** (Elsevier; **Impact Factor**: 4.134), 153-154, 500-516.
- K. Anirudh, and **S. Dhinakaran** (2018). Effect of Prandtl number on the forced convection heat transfer from a porous square cylinder. International Journal of Heat and Mass Transfer (Elsevier, **Impact Factor**: 4.346), 126, 1358-1375.
- T.R. Vijaybabu, K. Anirudh, and **S. Dhinakaran** (2018). LBM simulations of unsteady flow and heat transfer from a diamond-shaped porous cylinder. International Journal of Heat and Mass Transfer (Elsevier, **Impact Factor**: 4.346), 130, 267-293

- T.R. Vijaybabu, K. Anirudh, and **S. Dhinakaran** (2018). Lattice Boltzmann simulations of flow and heat transfer from a permeable triangular cylinder under the influence of aiding buoyancy. International Journal of Heat and Mass Transfer (Elsevier, **Impact Factor**: 4.346), 117, 899 – 917
- T.R. Vijaybabu, K. Anirudh and **S. Dhinakaran** (2017). Mixed convective heat transfer from a permeable square cylinder: A lattice Boltzmann analysis. International Journal of Heat and Mass Transfer (**Impact Factor**: 4.346), 115, 854 - 870.
- R. Deepak Selvakumar and **S. Dhinakaran** (2017). Effective viscosity of nanofluids — A modified Krieger–Dougherty model based on particle size distribution (PSD) analysis. Journal of Molecular Liquids (Elsevier, **ImpactFactor**: 4.561), 225, 20 - 27.
- R. Deepak Selvakumar and **S. Dhinakaran** (2017). Forced convective heat transfer of nanofluids around a circular bluff body with the effects of slip velocity using a multi-phase mixture model. International Journal of Heat and Mass Transfer (Elsevier, **Impact Factor**: 4.346), 106, 816-828
- R. Deepak Selvakumar and **S. Dhinakaran** (2017). Heat transfer and particle migration in nanofluid flow around a circular bluff body using a two-way coupled Eulerian-Lagrangian approach. International Journal of Heat and Mass Transfer (Elsevier, **Impact Factor**: 4.346), 115, 282-293
- R. Deepak Selvakumar and **S. Dhinakaran** (2016). Nanofluid flow and heat transfer around a circular cylinder: A study on the effects of uncertainties in effective properties. Journal of Molecular Liquids (Elsevier, Impact Factor: 4.561), 223, 572 - 588.
- R. Deepak Selvakumar and **S. Dhinakaran** (2016). A multilevel homogenization model for the thermal conductivity of nanofluids based on Particle Size Distribution (PSD) analysis, Powder Technology (Elsevier, **ImpactFactor**: 3.413), 301, 210 - 317.
- **S. Dhinakaran**, M.S.N. Oliveira, F.T. Pinho and M.A. Alves (2013). Steady flow of power-law fluids in a 1:3 sudden expansion. Journal of Non-Newtonian Fluid Mechanics (Elsevier, **ImpactFactor**: 2.27), 198, 48-58.

Events/ Seminars organized

1. GIAN Course on ''An advanced introduction to the finite volume methods in computational fluid dynamics with OpenFOAM'', Prof. Marwan Darwish, Department of Mechanical Engineering, American University of Beirut, Lebanon, Sep 5-9, 2016. **Amountfunded**: Rs. 5,44,000.
2. GIAN Course on ''Advances and Opportunities in Passive Micro and Miniature Technologies for Energy and Thermal Systems'', Prof. Amir Faghri, University of Connecticut, USA, Jan 9-13, 2017. **Amountfunded**: Rs. 5,44,000.
3. GIAN Course on ''Energy, Education and Innovation'', Prof. Yunus Ali Çengel, University of Nevada, USA, March 12-16, 2018. **Amountfunded**: Rs. 5,44,000.
4. GIAN Course on ''Advanced Combustion modelling with Computational Fluid Dynamics'', Prof. Weeratunge Malalasekera, Loughborough University, UK, April 8-12, 2019. **Amountfunded**: Rs. 5,44,000.
5. GIAN Course on ''Lattice Boltzmann modelling of multiphase and multicomponent flows'', Prof. A.A. Mohammad, University of Calgary, Canada, Aug 5-16, 2019. **Amountfunded**: Rs. 8,16,000.

Dr. Santosh K. Sahu
Associate Professor
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PhD. - Indian Institute of Technology Kharagpur, India
Previous Employment -

- Assistant Professor, (March 2008 - October 2009), Department of Mechanical Engineering, National Institute of Technology Rourkela, India
- Assistant Professor, (October 2009-June 2016), Department of Mechanical Engineering, Indian Institute of Technology, Indore
- Visiting Scholar, (September 2011 - January 2012), School of Nuclear Engineering, Purdue University, USA

Statement of Research Interests

a. Broad research area

- Thermal Engineering and Fluid Flow

b. Research Highlights

- Thermal Engineering
- Thermal-Hydraulics of Nuclear engineering
- Nano fluids
- Gas flow through Micro channels
- Impinging Jets
- Synthetic Jet
- Heat Exchanger
- Pool Boiling Heat transfer Phase Change Materials

c. Awards and Achievements

- Research article selected as qualified student award winner of the student paper competition in the ASME 2019 Power Conference (POWER2019) USA, 2019.
- SERB-Purdue University Overseas Visiting Doctoral Fellowship (OVDF) is awarded to PhD student to carry out doctoral research at Purdue University, USA during January 2019- January 2020.
- Research Visit to Purdue University, USA (October 2-19, 2019) under SERB-Purdue University Overseas Visiting Doctoral Fellowship, 2019.
- Member, American Society of Mechanical Engineering (ASME).
- Life Member, Indian Society for Heat and Mass transfer (ISHMT).
- Track Session Chair for 25th National and 3rd International ISHMT-ASTFE, Heat and Mass Transfer Conference (IHMTC-2019), 2019, IIT Roorkee.

Publications - (includes journal articles, books and book chapters)

- Singh P.K. , Sahu, S.K., Upadhyay P.K., Jain A.K., 2020, Experimental investigation on thermal characteristics of hot surface by synthetic jet impingement, Applied Thermal Engineering, 165, 114596.
- Sharma A.K., Sahu, S.K., 2019, The thermal and rewetting behavior of hot moving surface by water jet impingement, Applied Thermal Engineering, 159, 113950.
- Paulraj M. P., Sahu S. K., 2019, Conjugate heat transfer enhancement of laminar slot jets with various nanofluids on an array of protruding hot sources using MPM approach, Numerical Heat Transfer, Part A: Applications, 76:4, 232-253.

Projects active during April 2019-March 2020

Title - Development of light weight heat sink integrated with phase change material (PCM) for cooling applications (Ongoing).

- Thermal management of electronic components using phase change material (Ongoing)
- Heat transfer analysis of melting and solidification of phase change materials for concentrated solar power plants (completed)
- A novel thermal management system for electric vehicle batteries using phase change composite (ongoing)

Duration - 3-years, 5-Years, 1-Year, 3-years

Funding Agency - DST India, DST India, SERB India, CSIR India

Brief Description

- DST/TMD/MES/2K17/65 (G)
- DST/INSPIRE/03/2017/000041
- SB/S9/Z-03/2017-XXIV (2018-2019) 22(0807)/19/EMR-II

Dr. Kazi Sabiruddin
Associate Professor
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Ph.D. from IIT Kharagpur (2010)

Previous Employment (includes post-doctoral experience)

- BIT Mesra as Assistant Professor (2009-2010)
- JUET Guna as Assistant Professor (2010-2011)

Statement of Research Interests

a. Broad research area

- Surface Engineering

b. Research Highlights

- Thermally sprayed ceramic coatings
- Plasma sprayed alumina coating for tribological applications
- Synthesis of hydoxyapatite powder from natural resources
- D-Gun coated alumina as TBC
- Plasma sprayed HA for biomedical application
- Explosively coated Ni-Al

Publications (includes journal articles, books and book chapters)

- Vishal Sharma, Kazi Sabiruddin, An investigation on D-gun sprayed Al2O3-SiC coatings, Surface & Coatings Technology, Volume 375, 2019, pp 303-314
- Balmukund Dhakar, Kazi Sabiruddin, "Effect of Particle size of Al_2O_3 feedstock on the phases of Plasma Sprayed Al_2O_3-Cr_2O_3 coatings". 9th Asian Thermal Spray Conference (ATSC 2018), Nanyang Executive Centre, NTU, Singapore.

Dr. Pavan Kumar Kankar
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PhD. - Indian Institute of Technology Roorkee

Previous Employment
(includes post-doctoral experience)

- Assistant Professor, PDPM Indian Institute of Information Technology, Design and Manufacturing (July 25, 2011-December 03, 2018)
- Visiting Research Associate, Villanova University, Villanova, Pennsylvania, USA (May 2014 to July 2014)

Statement of Research Interests

a. Broad research area

- Condition Monitoring of Mechanical Components
- Machine Design, Vibration, Soft computing, Nonlinear Dynamics

b. Research Highlights

- Force and vibration analysis during root canal shaping
- Bearing and gear condition monitoring
- Buckling analysis of telescopic hydraulic cylinder
- Health prediction of the hydraulic systems
- Skin lesion classification using transfer learning approach

Publications - (includes journal articles, books and book chapters)

- A.S. Minhas, G. Singh, J. Singh, P.K. Kankar, S. Singh, A novel method to classify bearing faults by integrating standard deviation to refined composite multi-scale fuzzy entropy, Measurement, Volume 154, 15 March 2020, 107441
- J. Prakash, P.K. Kankar, Health prediction of hydraulic cooling circuit using deep neural network with ensemble feature ranking technique, Measurement, Volume 151, February 2020, 107225
- A. Nayak, P.K. Kankar, P.K. Jain, N. Jain, Force and Vibration Generated in Apical Direction by Three Endodontic Files of Different Kinematics during Simulated Canal Preparation: An in Vitro Analytical Study, Proceedings of the Institution of Mechanical Engineers, Part H: Journal of Engineering in Medicine 233, no. 8 (August 2019): 839–48.

Events/ Seminars organized

- Coordinator of TEQIP sponsored Short Term Course on "Application of MATLAB in Bioengineering", January 27 – 31, 2020, (With Coordinator: Dr Girish C. Verma and Dr. Kiran Bala).
- Coordinator of TEQIP sponsored Short Term Course on "Programming for Research Applications using MATLAB, June 29 - July 01, 2019.

PhD. - IIT Delhi

Previous Employment - (includes post-doctoral experience)

- Research Engineer, GE Global Research, March 2010-September 2011
- IIT Indore, Assistant Professor, September 2011-January 2017

Dr. Bhupesh K. Lad
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Statement of Research Interests

a. Broad research area

- Industrial and Systems Engineering (Smart Manufacturing, Prognostics, Reliability)

b. **Research Highlights -** Conventional Enterprise Resource Planning (ERP) and Manufacturing Execution Planning (MES) tools are typically centralized in their operations and thus have limited capabilities for dynamic adaptation of the production plan required for any intelligent or smart manufacturing. First time in the literature, a novel agent-based operations planning approach considering production, maintenance, quality, and inventory is developed for next generation manufacturing systems. The approach provides quick response to dynamics conditions. The results of comprehensive investigation reveal colossal reduction in computation time (47 to 86 percent) over centralized approach for approximate same solution for various manufacturing scenarios. Also, the approach delivers 0.05 to 38.5 percent economic improvements over centralized approach under dynamics conditions. Moreover, the approach offers flexibility to choose degree of integration based on the performance and computational time of the overall approach. The results of extensive performance investigation show that the proposed approach has capability to realize the ultimate benefits of Industry 4.0. The results are breakthrough in the field of smart manufacturing, especially from operations planning perspective.

c. Awards and Achievements

- Hamied-Cambridge Visiting Lecture fellowship, University of Cambridge, University of Cambridge International Strategy Office, Cambridge, UK, 2016
- Best Technology Development Award of IIT Indore 2018, eRespirocare (Jointly with 5 other members)
- Started an start-up company in 2019
- Received CSIR travel grant for international conference, March 2019
- Invited talk at Visiting Professors Annual Conference of Royal Academy of Engineering (RAE), 25-27 September 2017 at Birmingham, UK

- Runner up position in Newton Prize 2017

Patents

- Method And System For Providing Smart Communications For Distributed Operations Planning In An Industrial Network, B. K. Lad, M. S. Kulkarni, V. S. Pandhare, N. Agrawal, K. Upasani, M. Bakshi, Indian Patent Office, Application No. 201621007003
- Thermo-Mechanical Test Bench for Reliability Estimation of Shape Memory Alloy (SMA) Springs. I A. Palani, B. K. Lad, Tameshwar Nath, Pradeep Kundu, Application No.: 201621007005
- A Metal Inert Gas (MIG) based additive manufacturing technique for fabricating shape memory allow ring, Priya Chouhan, Shiva Sekar, I.A. Palani, and B. K. Lad, Indian Patent Office, No.: 201721007136 (Filled on February 28, 2017).

Publications - (includes journal articles, books and book chapters)

- Jain, A.K. and Lad, B.K. Prognosticating RULs while exploiting the future characteristics of operating profiles, Reliability Engineering & System Safety, Volume 202, October 2020, 107031.
- Kumar, S., Manjrekar, V., Singh, V., and Lad, B. K., Integrated yet distributed operations planning approach: A next generation manufacturing planning system, "Journal of Manufacturing Systems", Vol. 54, pp. 103-122, 2019. DOI: 10.1016/j.jmsy.2019.12.001.
- Manish Rawat, Bhupesh Kumar Lad, Abhishek Sharma, Simulation-based joint optimization of fleet system modularity and level of repair decisions considering different failure rates of components, Grey Systems: Theory and Application, 2020.

Events/ Seminars organized

- COPEN 2019
- Workshop on Smart Manufacturing, Dec 2019
- Short Term Course on Significance, Securing and Sustainability (S3) of Externally Funded Research Projects in Higher Education Institutes (HEIs), held at IIT Indore from December 16-21, 2019.

Projects active during April 2019-March 2020

Title - Industry-Academia Consortium for Digitization in Small and Medium Enterprises (SMEs)
Duration - April 2019 to March 2021
Funding Agency -RAE, London
Brief Description -

- Structured methodology to assess SME maturity for digitalisation
- Development of four digital solutions for SMEs
- Laboratory scale validation and demonstration
- Implementation guidelines and Commercialization

PhD. - Indian Institute of Technology Delhi, India

Previous Employment - (includes post-doctoral experience)

- Assistant Professor, (Oct 2009–June 2016) Department of Mechanical Engineering,IIT, India.
- Senior Design Engineer (Sep. 2008 – Sep. 2019) Tata Consulting Engineers Limited, Vikroli, Mumbai.

Dr. Ritunesh Kumar
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Statement of Research Interests

a. Broad research area

- Thermal Engineering

b. Research Highlights

- Desiccant Cooling System.

- Heat Transfer at Microscale
- Renewable fuels.

c. Awards and Achievements

- SERB VAJRA award to host Prof. Amitabh Narain of Michigan Tech University.

Publications - (includes journal articles, books and book chapters)

- Effect of microchannel heat sink configuration on the thermal performance and pumping power, MP Vasilev, RS Abiev, R Kumar International Journal of Heat and Mass Transfer, 2019 141, 845-854.
- Numerical Study on Mitigation of Flow Maldistribution in Parallel Microchannel Heat Sink: Channels Variable Width Versus Variable Height ApproachR Kumar, G Singh, D Mikielewicz Journal of Electronic Packaging, 2019 141 (2), 021009.
- 3. Performance intensification of regeneration process for non-corrosive plastic plate vertical falling film tower, R. Kumar, D. Patil, F. Xiao, T. Lu, Applied Thermal Engineering, 2019, 162, 114301.

Projects active during April 2018-March 2019

Title - Design and development of a new innovative parallel microchannel heat sink with mitigated flow maldistribution. Heat transfer intensification in novel design micro-pin-fin heat sink for microprocessor cooling with improved temperature uniformity.

Duration - 2-years, 2-Years.

Funding Agency - Department of Science and Technology (DST), India

Brief Description -

- DST/INT/Pol/P-29/2016.
- 2. DST/INT/RUS/350.

Dr. Satyajit Chatterjee
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PhD. - Mechanical Engineering, IIT Kharagpur

Statement of Research Interests

a. Broad research area

- Surface Technology
- Coatings Tribology
- Solid Lubrication

b. **Research Highlights -** Dr Satyajit Chatterjee (Associate Professor, Mechanical Engineering) and Coatings Tribology group's research endeavors include Surface Technologies, Coatings' Tribology and Solid Lubrication with a primary focus on the development of protective coatings with a suitable combination of hardness, thermal stability, wear and corrosion resistance and low friction characteristics following different methods and procedures. Hard coatings can be manufactured in-situ or ex-situ through laser surface alloying (LSA) or powder metallurgical routes. Manufacturing such hard metal matrix or ceramic matrix composite coatings can increase the potential of a metal surface in tribological applications. Weare also involved in the development of electroless Ni plating, which is also one effective route to manufacture metal alloy or composite coatings with considerable superiority in terms of hardness and tribological properties and has relevance to aerospace, automotive, chemical and electrical industries. Presently, we are trying to find a way to incorporate lubricious phases into the electroless coating matrix with a view to improve its frictional properties.

Publications - (includes journal articles, books and book chapters)

- Debjit Misra, Balmukund Dhakar, E. Anusha, S. M. Shariff, Suman Mukhopadhyay, Satyajit Chatterjee, Evaluation of Nanomechanical and Tribological Properties of Laser Surface Alloyed Boride-Nitride-Carbide Ceramic Matrix Composite Coatings, Ceramics International, 2018, Volume 44, pp 17050–17061.

- Debjit Misra, S.M. Shariff, Suman Mukhopadhyay, Satyajit Chatterjee, Analysis of instrumented scratch hardness and fracture toughness properties of laser surface alloyed tribological coatings, Ceramics international, 2018, Volume 44, pp 4248–4255.
- Debjit Misra, Sumit Barange, Hillol Joardar, Jityendra Kumar, Alok Kumar Das, Suman Mukhopadhyay, Satyajit Chatterjee, Comparative study on the tribological properties of laser post-treated and untreated AISI304 stainless steel matrix composite reinforced with hard ceramic particles (TiB2–TiN–SiC) and prepared by ex-situ P/M route, Ceramics international, 2019, Volume 45, Issue 15, pp 18852–18864.

Dr. Shailesh I. Kundalwal
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PhD. - IIT Kharagpur

Previous Employment - (includes post-doctoral experience)

- Associate Professor, IIT Indore, Aug 2019-present
- Assistant Professor, IIT Indore, Feb 2017-Aug 2019
- Visiting Assistant Professor, IIT Indore, Jan-Feb 2017
- Banting Fellow, University of Toronto, Canada, Oct 2015-Dec 2016
- Postdoctoral Researcher, Masdar Institute of Science and Technology, UAE, Apr-Sept 2015
- Postdoctoral Fellow, University of Toronto, Canada, Dec 2013-Feb 2015

Statement of Research Interests

a. Broad research area

- Composite Structures
- Finite Element Applications
- Flexoelectricity and Piezoelectricity
- Mechanics of Nanostructures
- Nanomechanics and Micromechanics
- Nanotechnology in Engineering
- Smart Materials and Structures

b. **Research Highlights -** The Applied and Theoretical Mechanics (ATOM) Laboratory at IIT Indore, founded and directed by Dr. Shailesh. I. Kundalwal, Associate Professor of Mechanical Engineering. The ATOM Lab undertakes research primarily in the following areas: Mechanics of Carbon- and Boron-Based Nanostructures, Nanomechanics and Micromechanics of Composites, Nanotechnology in Engineering, Finite Element Analysis of Composites and Experimental Characterization of nanostructures . The lab's mission is to lead the advancement and application of multifunctional nano- and micro-structures addressing the challenges associated with their multifaceted aspects via numerous nanomechanical and micromechanical techniques.

c. Awards and Achievements

- Biography listed in **Who's Who in the World** (International)
- **Recognition:** Member, Spark Evaluation Committee, Swiss National Science Foundation (International)
- Runner-up in the highly competitive "*Dare to Dream*" DRDO Innovation Contest 2019.
- **Elsevier Recognized Reviewers Recognitions:** Int J of Mechanical Sciences (July 19), Physica E (Aug 2019), European J of Mech – A/Solids (Aug 2019), Mechanics of Materials (Sept 119), Composite Part A (Oct 19).
- **SERB International Travel Award:** for presenting paper at IEEE 14th International Nanotechnology Materials & Devices Conference (NMDC 2018), Portland, Stockholm, Sweden by PhD Student-Vijay Choyal (National).
- **Shastri Research Student Fellowship by Shastri Indo-Canadian Institute**: for pursuing doctoral research by PhD student – Vijay Choyal (International).

Publications - (includes journal articles, books and book chapters)
Three best selected papers out of 7 published in 2019-20 year.

- Vijay Choyal, Kundalwal SI. Transversely isotropic elastic properties of multi-walled boron nitride nanotubes under a thermal environment, *Nanotechnology* 31, 395707, 2020. (IF: 3.399)
- Vijay Choyal, Kundalwal SI. Enhancing the piezoelectric properties of boron nitride nanotubes through defect engineering, *Physica E: Low-dimensional Systems and Nanostructures*, 2020, accepted (PHYSE_2020_588R1). (IF: 3.176)
- Kundalwal SI, Choyal VK, Vijay Choyal, Nitin Luhadiya. Effect of defects and doping on electromechanical response of boron nitride nanosheets, *Nanotechnology*, 2020, accepted (NANO-125293R1). (IF: 3.399).

Projects active during April 2019-March 2020

Title - Characterizing the flexoelectric phenomena in monolayer/layered hexagonal boron nitride nanosheets and development of their nanoelectromechanical systems
Duration - 2018-21
Funding Agency - SERB-DST
Brief Description - This project aims to determine the elastic, flexoelectric and piezoelectric properties of single as well as layered h-BNNs so that a new class of light weight and high strength piezoelectric NEMS can be formed for multifarious nanotechnology applications.

Title- Modeling of multifunctional carbon-based composite flexoelectric and piezoelectric energy harvesters: beam, cylinder, plate and shell
Duration - 2018-21
Funding Agency -CSIR
Brief Description - The broad aim of this project is to initiate research efforts to build a rational approach for determining the elastic and piezoelectric properties of GRNC, and develop analytical and numerical models of beam, plate, cylinder and shell made of GRNC for energy harvesting and SHM applications.

Title - Unraveling the potential of graphene quantum dots for hydrogen storage in fuel cells
Duration - 2019-22
Funding Agency - DST
Brief Description - This project aims at unraveling the potential of GQDs. This project undertakes each aspect at atomistic scale-level incorporating established and robust concepts such as pores, functionalization, strain, edge, GBs and temperature, and stacking sequence effects etc. for exploring the possibility of GQDs for H2 storage.

Title - Modeling and development of high-strength and lightweight CNT-based composite structures for high performance electromagnetic interference shielding of space vehicles
Duration - 2020-23
Funding Agency- ISRO
Brief Description - This project aims at Modeling and development of high-strength and lightweight CNT-based composite structures for high performance electromagnetic interference shielding of space vehicles.

Dr. Indrasen Singh
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PhD. - Indian Institute of Science Bangalore (2016)

Previous Employment - (includes post-doctoral experience)

- Post-doctoral fellow at NUS, Singapore, from October 2016-April 2017.
- Software Developer at PTC software India Pvt. Ltd. July 2007 to Aug 2010.
- Scientist at DRDO from Sep 2004 to July 2007.

Statement of Research Interests

a. Broad research area

- Mechanical behaviour of materials.
- Computational solid Mechanics, Fracture mechanics, finite element methods.

- Amorphous metals.
- Crystal Plasticity.
- Piezoelectric materials.

b. Research Highlights

- Deformation and fracture behavior of nanoglasses and nanoglass-metallic glass nano-composites.
- Understanding the mechanics of deformation in piezo-electric materials through experiments and complementary finite element simulations.
- Understanding the effect of Surface Mechanical Attrition Treatment (SMAT) process in FCC metals.
- Deformation and fracture response of BCC single crystals.
- Mechanical response of metallic glass composites.
- Deformation behaviour of metallic glass honey-comb structures.
- Understanding the indentation mechanics in Nanoglasses.
- Finite element modelling of additive manufacturing process.

Publications - (includes journal articles, books and book chapters)

- S.S. Hirmukhe, K. Eswar Prasad, I. Singh (2020) Investigation of pressure sensitive plastic flow in nanoglasses from finite element simulations. Scripta Materialia 180 (2020) 45–50.
- V.S. Kathavate, B. Praveen Kumar, I. Singh, K. Eswar Prasad (2020) Effect of sub and above-curie temperature annealing on the nanomechanical properties of PMN-PT piezoceramics. Ceramics International. https://doi.org/10.1016/j.ceramint.2020.01.155
- SS Hirmukhe, KE Prasad, I Singh (2019) Finite element analysis of tensile deformation of nanoglassmetallic glass laminate composites. Computational Material Science 161, 83-92.

Dr. Yuvraj K Madhukar
Assistant Professor
yuvrajmadhukar@iiti.ac.in

PhD (2016) - Indian Institute of Technology Kharagpur, India
Effect of water-jet on quality improvement of various laser material processing modalities

Previous Employment - (includes post-doctoral experience)
Post Doctoral Research Associate (December 2015–November 2017)
Heriot-Watt University, Edinburgh, Scotland, UK. Process control of laser hybrid additive manufacturing

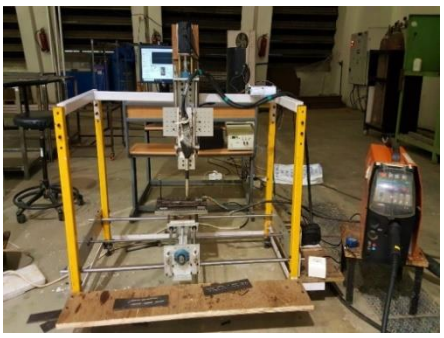
Statement of Research Interests

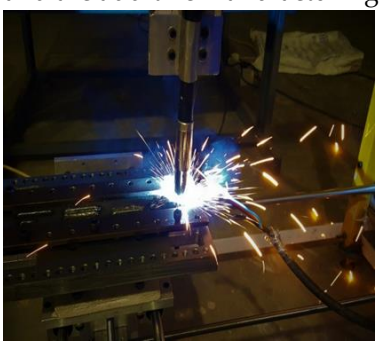
a. Broad research area

- Advanced Manufacturing Processes
- Laser Material Processing
- Additive Manufacturing

b. Research Highlights

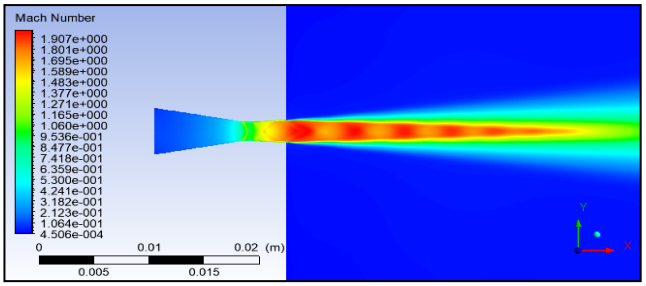
Design, development and control of wire and arc additive manufacturing process.

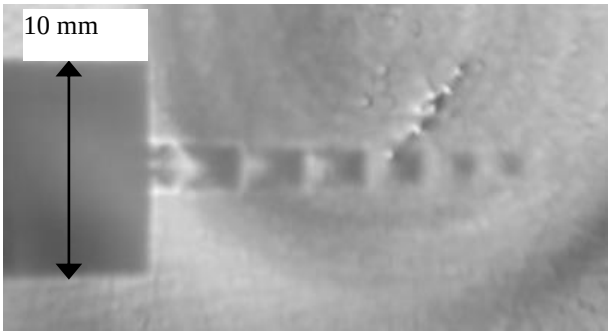






Development of supersonic nozzle for manufacturing applications





Dr. Ankur Miglani
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PhD. Indian Institute of Science (IISc) 2015

Previous Employment - (includes post-doctoral experience)

- Jan. 2017 – Nov. 2019: Purdue University: SERB Indo-US Postdoctoral Fellow
- Apr. 2016 – Oct. 2016: Korea Advanced Institute of Science and Technology (KAIST): BK-21 Postdoctoral Fellow
- Dec. 2015 – Apr. 2016: Indian Institute of Science: Research Associate
- Aug. 2008 – Aug. 2009: Chevron shipping LLC.

Statement of Research Interests

a. Broad research area

- Combustion of next-generation fuels: Gel fuels and nanoparticle laden fuels
- Thermal management of power-dense electronics: Flow boiling in microchannels
- Microfluidics
- Soft matter: Instabilities in drying colloidal systems
- Application of Machine learning based pattern recognition to energy systems

b. Research Highlights - Designed and developed a ***droplet combustion facility*** that enables the thermo-fluidic characterization of vaporization and combustion of next-generation fuels (nanoparticle laden fuels and gelled fuels)
Focus area: Nanofluid fuelsand gel fuels/propellants
Highlight: First-of-its-kind demonstration of the interplay thermo-physical processes governing the burning behavior of conventional liquid fuels laden with energetic nanoparticles

- Development and updating of a ***two-phase microchannel heat-sink model*** (developed in MATLAB) to generate design guidelines for the performance prediction of a two-phase microchannel heat sink, accounting for the effects of flow maldistribution and thermal coupling between the channels

Focus area: Thermal Management of Electronics, flow boiling in microchannels, flow instabilities in boiling microchannels
Highlight: First-of-its-kind quantitative characterization of static instability induced flow maldistribution between boiling parallel microchannels

- Developed a numerical model that enables the characterization of the ice formation modes during flow freezing in microchannels and generates design guidelines for ***ice valve cooling mechanism for microfluidic platforms*** *Focus area:* Microfluidics, Phase-change microfluidic ice valves, Flow freezing in microchannels
  Highlight: Demonstration of the fastest closing time of a phase ice-valve (compared to the existing open literature) for microfluidic flow control applications

c. Awards and Achievements –

- Best Poster award: Annual Review meeting of NSF Graduated Cooling technologies Research Centre (CTRC), Purdue University, Oct. 2019.
- SERB Indo-US postdoctoral fellowship 2016 with PURDUE University.
- Brain Korea 21 (BK-21) postdoctoral fellowship with KAIST.
- B.K. Subba Rao gold Medal for best thesis in the department of mechanical engineering, IISc
- Dr. C.P. Srivastava scholarship for 8 consecutive semesters (Total = US $4500) in undergraduate studies
- Vasanth. J. Seth memorial gold medal for overall academic topper in BS Marine Engineering (2004-2008).
- Chairman's Gold medal for best all-round performance in BS Marine Engineering (2004- 2008).
- Certificates of merit and individual medals for securing first position in following courses: (1) Marine Engineering, (2) Drawing and design, (3) Naval Architecture, (4) Thermal Engineering and (5) Electrical and Electronics.
- Named in the list of honor at Tolani Maritime Institute (BITS Pilani University)
- CSIR (Council of Scientific and Industrial Research, India) Foreign Travel Grant: US $1100 (2013)
- American Physical Society (APS) division of fluid dynamics (DFD) foreign travel grant: US $1000 (2014)
- Chellaram shipping certificate of achievement for highest marks in marine engineering knowledge.
- Certificate of merit awarded by CBSE (Central board of Secondary Education, India) for featuring in top 0.1% successful candidates in Physics in 12^{th} grade (2003).

Publications - (includes journal articles, books and book chapters)

- A. Jain, **A. Miglani**, J.A. Weibel, and S.V. Garimella. The effect of channel diameter on flow freezing in microchannels. ***International Journal of Heat and Mass Transfer, In Press*** (2020)
- A. Jain, **A. Miglani**, Y. Huang, J.A. Weibel, and S.V. Garimella. Ice formation modes during flow freezing in a small cylindrical channel. ***International Journal of Heat and Mass Transfer*** 128 (2019): 836-848.
- A. Jain, **A. Miglani**, J.A. Weibel and S.V. Garimella. Ice valve formation in a microfluidic chip. ASME SHTC, 13-15 July 2020. To appear as Heat Transfer Visualization in ***ASME J. Heat Transfer***.

Events/ Seminars organized –

- AICTE QIP course on Thermal Management of Power Dense Electronics: Current Status and Challenges, March 1 – 7, 2020.

Details of AICTE QIP Course from March 1 – 7, 2020

Title of the Course - Thermal Management of Power Dense Electronics: Current Status and Challenges

Brief Statement of the importance of the course

Utilization of two-phase flow for heat dissipation in the need of the hour for keeping the

temperature of electronic devices within acceptable limits. These range from day-to-day use devices such as mobiles and laptops to cooling of large- scale servers and high-computing clusters. In this regard, this course enabled the participants to gain both a theoretical understanding as well as hands-on experience on active/passive cooling techniques that are being currently explored for thermal management.

Lectures and labs were distributed over 20 sessions (1.5 hour per session and 4 sessions per day). A total 28 participants registered and attended the course from within as well outside Madhya Pradesh.

Course highlights are summarized below:
28 Participants 3 Invited Speakers (2 Industry, 1 Academia) 6 Internal Speakers
16 Theory lectures 4 Lab sessions

Invited talks/lectures/presentations

Industry/Agency/Conference	Title of the talk/lecture/presentation	Remark
Choithram Hospital	A simple method of rapid detection of blood borne diseases through drying of blood	Invited talk
Ace Chemical and Engineerings	Design of experimental test facility for testing fire resistant properties of FRP used in the body of commercial vehicles, Ace Chemicals and Engineering, Indore, 30 Jan 2020	Invited talk
	drops, *Choithram Hospital and Research Center*, Indore, 20 Jan 2020	
Intel	Two-phase thermal management of power dense electronics	Invited talk

Dr. Satyanarayan Patel
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PhD. - Indian Institute of Technology Mandi, 2016

Previous Employment - (includes post-doctoral experience)
Alexander von Humboldt Postdoctoral Research in Technische Universität Darmstadt, Germany Nov. 2016- 2019.

Statement of Research Interests

a. Broad research area

- Waste Energy Harvesting
- Solid-State Cooling Materials and Methods
- Dielectric Materials for High Energy Density Capacitors
- Piezoelectric and Pyroelectric Materials

b. **Research Highlights -** I have been working on engineering and scientific aspects of ferroelectric materials in view of high energy density capacitors, waste (thermal and mechanical energy harvesting) and solid-state refrigeration applications.

c. Awards and Achievements

- Young Achiever Award (YAA) 2020 in the academic excellence category from Indian Institute of Technology Mandi.
- Sectional Committee Member under Materials Science category by Indian Science Congress Association, Kolkata 2020.

- Keynote speaker in short term course on "Emerging Trends in Mechanical Engineering" from 8-12th June 2020 at Dr. K.N. Modi University Newai, Rajasthan on "Solid-state Refrigeration and Energy Storage".

Publications - (includes journal articles, books and book chapters)

- Sandip Khobragade and Satyanarayan Patel "Thermal Energy Harvesting Capabilities in Lead-Free $Ba_{0.85}Ca_{0.15}Ti_{0.9-x}Sn_xZr_{0.10}O_3$ Ferroelectric Ceramics" *Journal of Electronic Materials*, 49(2), 1194-1203, 2020.

Dr. Dan Sathiaraj
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PhD. - Indian Institute of Technology Hyderabad, India

Previous Employment - (includes post-doctoral experience)

- Postdoctoral Researcher at Institute for Solid state and Material Physics, (Metal Physics Division) TU Dresden, Germany from May 2017 to November 2019 (Alexander Von Humboldt Research award fellow)
- Worked as Assistant professor in Mechanical engineering department, SRM University, Chennai, from July 2016 to April 2017
- Worked as Senior Research Fellow from Jan 2016 – June 2016 at IIT Hyderabad, in MSME department.

Academic associations with other institutions (Affiliate/Adjunct/ Visiting posts)

- Accepted for Visiting research scientist for the period of May 2021 to July 2021 at Institute for Solid state and Material Physics, (Metal Physics Division) TU Dresden, Germany.

Statement of Research Interests

a. Broad research area

- Design and Manufacturing, Thermo-mechanical processing of Advanced Materials

b Research Highlights

- Micro, Nano- machining of MEAs and HEAs (MEAs: Medium entropy alloys; HEAs:High entropy alloys).
- Surface modification Engineering
- Severe plastic deformation (SPD), Low temperature deformation, Recrystallization and grain growth study
- Finite element analysis of SPD processes
- Mechanical and functional property study

c. Awards and Achievements

- Best Alumni Award at IIT Hyderabad (Academics category)
- Alexander Von Humboldt Research Award for three months research stay at TU Dresden
- Reviewer of various International Journals; Programme committee members for ICNB 2020

Publications - (includes journal articles, books and book chapters)

- G Dan Sathiaraj, A Pukenas, W Skrotzki, Texture formation in face-centered cubic high-entropy alloys, Journal of alloys and compounds, 826 (2020) 154-183. (Impact factor: 4.65) https://www.sciencedirect.com/science/article/abs/pii/S0925838820305466

Dr. Harekrishna Yadav
Assistant Professor
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PhD. - Indian Institute of Technology Bombay

Previous Employment - (includes post-doctoral experience)

- Postdoctoral Fellow: Faculty of Mechanical Engineering, Technion-Israel Institute of Technology, Israel (December 2017 - October 2019)
- Assistant Professor: Department of Mechanical Engineering, University of Petroleum and Energy Studies, Dehradun, India (September 2010 - June 2011)

Statement of Research Interests

a. **Broad research area**

- Shear Flow, Fluid Structure Interaction, Flow and Turbulence Measurement using Optical Techniques, Heat Transfer Enhancement, Internal Combustion Engine, Alternative Energy.

b. Research Highlights -

- During engine operation, many different variables influence the spray and mixture formation characteristics such as gas properties, bulk fluid motion, turbulence, location of moving parts, nozzle type, etc. The efficiency of an internal combustion engine and its exhaust emission is directly or indirectly coupled with the underlying flow field that need to be examine by optical techniques.
- Understanding the Effect of vortical structures on velocity and turbulent fields of a pulse impinging turbulent jet.
- Study of interaction of the coaxial jet
- The role of surface texturing on the behavior of boundary layer separation of wind turbine.

Publications - (includes journal articles, books and book chapters)

- Mishra, A., Yadav, H., Djenidi, L., and Agrawal, A., (2020). Effect of jet inclination and surface spacing on heat transfer and flow characteristic of a pulse impinging jet. Experiments in Fluids, 61(3), 1-16.
- Yadav, H., Joshi, A., Chaudhari, M., and Agrawal, A. (2019). An experimental study of a multi-orifice synthetic jet with application to cooling of compact devices. AIP Advances, 9(12), 125108.
- Yadav, H., Venugopal A., Prabhu, S.V., and Agrawal, A., (2020). Study on connecting tube dynamics for transient pressure measurement. Sadhana 45 (1).

Events/ Seminars organized

- AICTE -QIP Sponsored Course on Thermal Management of Power Dense Electronics: Current Status and Challenges" from 01-03-2020 to 07-03-2020.

Dr. Girish Chandra Verma
Assistant Professor
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PhD. - Indian Institute of Technology Delhi (2018)

Previous Employment (includes post-doctoral experience)
Early-doctoral fellow at IIT Delhi, from November 2018-April 2019.

Statement of Research Interests

a. Broad research area

- Ultrasonic assisted machining processes.
- Magnetic field assisted finishing processes.
- Additive manufacturing.
- Theoretical study of machining processes.

b. Research Highlights

- Additive manufacturing of functionally graded material.
- Analytical modelling of ultrasonic vibration assisted milling process responses.
- Parametric and statistical study of ultrasonic vibration assisted machining processes.
- Parametric and statistical study of magnetic abrasive finishing process.

c. Awards and Achievements

- Gandhian Young Technological Innovation (GYTI) Awards, 2018.
- Best paper at AIMTDR 2018.
- Padmashri Manmohan Suri Project Award, 2013.

Patents - Tool for producing variable magnetic field by permanent magnets for nano finishing holes, 1911/DEL/2014

Publications (includes journal articles, books and book chapters)

- G.C. Verma, P.M. Pandey, U.S. Dixit, Modeling of static machining force in axial ultrasonic-vibration assisted milling considering acoustic softening, Int. J. Mech. Sci. 136 (2018) 1–16.
- G.C. Verma, P.M. Pandey, U.S. Dixit, Estimation of workpiece-temperature during ultrasonic-vibration assisted milling considering acoustic softening, , Int. J. Mech. Sci. 140 (2018) 547–556.
- G. C. Verma, P. M. Pandey, and U. S. Dixit, An experimental study on surface roughness and frictional property of ultrasonic-vibration-assisted milled surface, (2019) Proc. IMechE Part C: J Mechanical Engineering Science

Events/ Seminars organized

- Organized a one-week short-term course on 'Application of MATLAB in Bioengineering; under TEQIP-III during 27th to 31st Jan, 2020.

Department of Civil Engineering

Dr. Neelima satyam D
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and
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.in

PhD. - 2006, IIT Delhi

Previous Employment
(includes post-doctoral experience)

- JSPS Fellow - Geotechnical Engineering Laboratory, University of Tokyo, Japan - Jan 2013-March 2013
- Assistant Professor - Earthquake Engineering Research Centre, International Institute of Information Technology Hyderabad, India - 2013- 2017
- Visiting Researcher - Institute of Geophysics, University of Stuttgart, Germany June 2018 - July 2018

Publications (includes journal articles, books and book chapters)
Three Best Publications

- Meghna Sharma, Neelima Satyam, and Krishna R. Reddy (2020), "State-of-the-Art Review of Emerging and Biogeotechnical Methods for LiquefactionMitigation in Sands", Journal of Hazardous, Toxic, and Radioactive Waste, ASCE, 10.1061/(ASCE)HZ.2153-5515.0000557,(I.F./C.S.-2.4).https://doi.org/10.1007/s11069-019-03658-5)
- Minu Treesa Abraham, Neelima Satyam, Biswajeet Pradhan, and Abdullah M. Alamri (2020), "IoT-Based Geotechnical Monitoring of Unstable Slopes for Landslide Early Warning in the Darjeeling Himalayas", Sensors, MDPI 20(9) 2611, https://doi.org/10.3390/s20092611. (I.F. - 3.275).
- Nitin Tiwari, Neelima Satyam and Kundan Singh (2020), "Effect of Curing on Micro-Physical Performance of Polypropylene Fiber Reinforced and Silica Fume stabilized Expansive Soil Under Freezing Thawing Cycles", Scientific Reports, Nature, https://doi.org/10.1038/s41598-020-64658-1, (I.F.- 3.998).

Events/ Seminars organized

- **Course Coordinator** for Three Days Short Course on GEOTECHNICAL ASPECTS OF EARTHQUAKE ENGINEERING during 26th - 28th December 2019**.**

Statement of Research Interests

a. Broad research area

- Geotechnical Earthquake Engineering
- Dynamic Soil Structure Interaction Analysis
- Foundation Engineering
- Liquefaction Modelling
- Landslide Hazard Assessment and Monitoring
- Rock Mechanics and Underground Structures

b. Research Highlights

- IoT-Based Geotechnical Monitoring of Unstable Slopes for Landslide Early Warning in the Darjeeling Himalayas
- Emerging and Biogeotechnical Methods for LiquefactionMitigation in Sands
- Micro-PhysicalPerformance of Polypropylene Fiber Reinforced and Silica Fume stabilized Expansive Soil

c. Awards and Achievements

- Editor of Special issue on "Landslide: Forecasting, Assessment and Mitigation", Indian Geotechnical Journal, Springer 2020
- Executive member (Elected), Indian Society of Engineering Geology (Indian National group of the International Association for Engineering Geology and Environment) for the term 2020-2021
- Member, Technical committee 220 (Field Monitoring in Geomechanics) of International Society of Soil Mechanics and Geotechnical Engineering (2019- till date)
- Convener, Soil Dynamics and Earthquake Geotechnical Engineering -36 International Geological Congress 2020
- Convener, International Cooperation by Indian Geotechnical Society for the term 2019-2020
- Member, Preliminary Review Committee, Shastri Indo-Canadian Institute, MHRD for the term 2018-2019
- Executive Council member (Elected),Indian society of Engineering Geology for the term 2020-2021Honorable Director, Institute and Industry Interaction: Professional Development Council, Association of Consulting Civil Engineers, India (2018-till date)

Projects active during April 2019-March 2020

Title - Geospatial numerical modelling of debris flow for quantitative landslide risk assessment considering the entrainmnet

Duration - 2018-2021

Funding Agency - ISRO, GOI

Brief Description - A geospaial numerical modelling is being developed o predict the runout distance, volume and other time dependent parameters of debris flows, considering entrainment. The multiphase model will be based on the solution of depth averaged shallow water equations.

Title - "Development of Landslide Early Warning System and Real Time Monitoring, Uttarakhand , NRDMS

Funding Agency - DST, GOI

Title - Performance analysis of recycled plastic waste for bitumen roads, Government of MP

Duration - 2019-2021

Brief Description - The project is to evaluate the performance of the recycled plastic waste included bituminous road in Indore city considering the NDT and DT methods.

Prof. Sandeep Chaudhary
Professor
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PhD. - 2006, IIT Delhi

Previous Employment - (includes post-doctoral experience)

Faculty in MNIT Jaipur from October 1996 to May 2017

Post-Doctoral Fellow, Structural System Laboratory, Kunsan National University, Kunsan, S. Korea from August 2010 to July 2011

Statement of Research Interests

a. Broad research area

- Structural Engineering
- Building Materials

b. Research Highlights

- Characterized waste industrial ashes and feasibility assessment to use in fly ash bricks
- Optimized moisture content and mixing sequence for bricks
- Developed non-destructive tool for Measuring the micro-level homogeneity of building material mix
- Established Rheology of rubbersied self-compacting concrete

c. Awards and Achievements

- Chair of Standing Committee 1 of Asian Concrete Federation

- Core member of **NDMA**, GoI for Development of detailed outline for Resource Material on Earthquake Engineering
- International Steering Committee member of "The 9th Asia-Pacific Young Researcher Graduate Symposium 2019" held at Tongji University, Shanghai, China from December 19-20, 2019.
- Scientific Committee member of "3rd ACF Symposium on Assessment and Intervention of Existing Structures" held at Hokkaido University, Sapporo, Japan from September 10-September 11, 2019

Patents - *Published*

Gupta, T., Chaudhary, S., Sharma, R. K., and Jain, S. (2020). "Method of Preparation of Conplas Paver Block Utilizing waste Polythene.", Application No. 202011002264 A, The Patent Office Journal No. 10/2020 Dated 06/03/2020.

Publications (includes journal articles, books and book chapters)

- Gupta, V., Pathak, D., Siddique, S., Kumar, R., and Chaudhary, S. (2020). "Study on the mineral phase characteristics of various Indian biomass and coal fly ash for its use in masonry construction products." Construction and Building Materials, 235, 117413
- Gupta, T., Patel, K.A., Siddique, S., Sharma, R.K., and Chaudhary, S. (2019). "Prediction of mechanical properties of rubberised concrete exposed to elevated temperature using ANN." Measurement, 147, 106870.
- Jain, A., Gupta, R., and Chaudhary, S. (2019). "Performance of self-compacting concrete comprising granite cutting waste as fine aggregate." Construction and Building Materials, 221, 539-552.

Events/ Seminars organized

- Organised a self-financedShort Term Course on "Precast and Prefabricated Buildings", from 27-01-2020 to 31-01-2020 at IIT Indore, Indore.
- Organised a self-financedShort Term Course on "Sustainable Construction Practices", from 13-10-2019 to 15-10-2019 at IIT Indore, Indore.

Projects active during April 2019-March 2020

Title - Natural-coloured functionally graded rubberised geopolymer system: A cement-less solution for optimised concrete paver manufacturing
Duration - August 2018-December 2020
Funding Agency - DST, GOI
Brief Description - It is an International Collaborative Project under DST UKIEIR Scheme. The collaborating institute is University of Edinburgh, UK

Title - Sustainable and economical functionally graded rubberized concrete pavements
Duration -August 2017-August 2019 (Extension applied)
Funding Agency -DST, GOI
Brief Description -It is an International Collaborative Project under Indo Tunisia Scheme. The collaborating institute is University of Carthage, Tunisia.

Title -Safeguarding heritage structures using seismic metamaterials
Duration -March 2018-March 2020
Funding Agency -DST, GOI
Brief Description - It is an International Collaborative Project under SPARC Scheme. The collaborating institutes are UNIVERSITÉ AIX-MARSEILLE, France and Imperial University, UK.

Dr. Munir Ahmad Nayak
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munir_nayak@iiti.ac.in

PhD. The University of Iowa, USA

Previous Employment (includes post-doctoral experience)
Postdoctoral Associate (Cornell University, USA)

Statement of Research Interests

a. Broad research area

- Atmospheric Rivers, Hydrologic extremes, Optimization of water resources systems
- Application of Bayesian methods in hydrologic extremes

b. Research Highlights

- Our research mainly focuses on hydrologic extreme such as floods and droughts. Our research group at IIT Indore has found significant remote connections between droughts at multiple regions across the globe. We have also established a link between an atmospheric river and a recent extreme flood over Kerala, India. In one of statistical modelling our works, we have shown how to model the spatio-temporal frequency of extreme precipitation events over a large domain, which has been a challenging task in the literature.

c. Awards and Achievements

- Editorial Board Member as Review Editor, Frontiers in Water, 2019–Present
- Guest Associate Editor, Frontiers in Water, 2020

Events/ Seminars organized

- Urban flood forecasting and risk mapping: present status and future needs

Projects active during April 2019-March 2020

Title - Atmospheric Rivers and Extreme Precipitation over India
Duration - Fall 2018 – Summer 2021
Funding Agency - Science and Engineering Research Board (SERB), Department of Science and Technology (DST), India
Brief Description - The objectives of the project are:

- To search for the presence of Atmospheric Rivers (ARs) over India.
- To understand how ARs are related to or brought about by the Asian Summer Monsoon.
- To estimate the fraction of extreme rainfall events that can be attributed to ARs.

Title - Safety & functionality of Navnera Barrage in Peak floods, such as the one in 2019
Duration - 1 month
Funding Agency - DilipBuilcon, Ltd
Brief Description - The consultancy assignment involves analyzing hydrologic data such as peak flows, and providing safety and functionality requirements of the dam during peak floods, such as the one in 2019.

Title - Proof-checking of design and drawings for the work "Survey, planning, design and construction of Navnera Barrage including Hydro-mechanical works, across river Kalisindh near village-Abra, Tehsil-Digod, District-Kota, Rajesthan under Eastern Rajasthan Canal Project (ERCP) Phase-1 (A) on EPC single responsibility turnkey basis.
Duration -1 year
Funding Agency -DilipBuildcon Ltd
Brief Description - DilipBuildcon Limited, Bhopal, M.P.is constructingNavnera Barrage across river Kalisindhin Rajasthan. The Design & Technical Audit and Assistant Vice President (Technical)of the company approached undersigned for proof checking of the design and drawings of the dam vide letters dated 25.01.2019 and 01.01.2019. In further communication, the contractor has agreed to pay the consultancy charges. The communication is attached herewith.

Dr. Lalit Borana
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PhD. - The Hong Kong Polytechnic University

Previous Employment (includes post-doctoral experience)
2014 – 2015 The Hong Kong Polytechnic University, Hong Kong Post-Doctoral research
2015 - 2017 ONLYgeotechnics Ltd., Hong Kong Project Manager /Geotechnical Engineer
2016–2017 The Hong Kong Polytechnic University, Hong Kong Post Doc Fellow
2017- Till date ,Indian Institute of Technology- Indore, India Assistant Professor

Statement of Research Interests

a. Broad research area

- Unsaturated Soil Mechanics
- Geotechnical health monitoring

b. Research Highlights

- Slope Stability Analysis Based on Real-time Displacement Measurements.
- Development of a preliminary slope stability calculation method based on internal horizontal displacements.
- Investigations on Accumulated Permanent Axial Strain of a Subgrade Fill under Cyclic High-Speed Railway Loading.

c. Awards and Achievements

- Guest Editor for "International Journal of
- Distributed network sensors" by Sage Publishers (UK).
- Chief Guest in Workshop on "Recent Trends in Earthquake Resistant Design of Buildings", Sistec Bhopal; 1-3 November 2018.

Publications (includes journal articles, books and book chapters)

Peer Reviewed SCI Journals

a. Singh MJ, Feng WQ, Xu DS, Borana L (2020) Experimental study of compression behavior of Indian black cotton soil in oedom-eter condition. Int J Geosynth Ground Eng . doi: https ://doi.org/10.1007/s4089 1-020-00207 -0
b. W-Q. Feng, J-H. Yin, L. Borana, J-Q. Qin, P-C. Wu, J-L. Yang. (2019). A Network Theory for BOTDA Measurement of Deformations of Geotechnical Structures and Error Analysis, Measurement, Elsevier, vol. 146, pp. 618-627.
c. Chen, W-B.,Feng, W.Q., Yin J.-H., Borana, L. and Chen, R.P. (2019). Characterization of permanent axial strain of granular materials subjected to cyclic loading based on shakedown theory. Construction and Building Material, Elsevier: 198:751–761.

Events/ Seminars organized

- A lecture of Prof. Jian Hua Yin
- Bridge Designing competition
- Industrial site visits
- Basketball competition

Projects active during April 2019-March 2020

Title - Development of Infrastructure of New campus of IIM Udaipur
Duration - 14 month
Funding Agency - CPWD, New Delhi
Brief Description - TPQA services for the new infrastructure development at IIM Udaipur, Rajasthan.

Title - Stability Check of Lakundar Bridge
Duration - 1 month

Funding Agency - Oriental Str. Engg. Pvt Ltd, New Delhi
Brief Description - Stability Check of the Bridge located in four laning section of Biaora-Dewas section of Nh-3 in Madhya Pradesh under NHDP Phase IV.

Dr. Saikat Sarkar
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PhD. - IISc Bangalore
Previous Employment - (includes post-doctoral experience)
Postdoc Texas A&M University (2015-2017)
Visiting Assistant Professor IIT Bhubaneswar (2017-2018)
Assistant Professor NIT Rourkela (2018)

Statement of Research Interests

a. Broad research area

- Computational Mechanics: Forward and Inverse problems

b. Research Highlights

- Metamaterials for large scale civil engineering applications, e.g. seismic metmaterials; protective armors using metamaterials.
- Quantitative prediction of structural failure via deriving upscaled continuum theory with a focus towards modelling large deformation and crack propagation leading to structural failure.
- Designing light weight civil engineering structures via development and application of evolutionary optimization schemes considering displacement, stress and buckling constraints.

Publications (includes journal articles, books and book chapters)

- T Varma, S Sarkar, Designing polymer metamaterial for protective armor: a coarse-grained formulation, Meccanica, 2020, doi.org/10.1007/s11012-020-01201-6.
- T. Varma, S Sarkar, G Mondal, Buckling Restrained Sizing and Shape Optimization of Truss Structures, Journal of Structural Engineering, 2020, 146 (5), 04020048.
- M Nowruzpour, S Sarkar, JN Reddy, D Roy, A derivative-free upscaled theory for analysis of defects, Journal of the Mechanics and Physics of Solids,2019, 122, 489-501.

Events/ Seminars organized

- Organized a workshop (as DUGC CE convener) for modifying B.Tech. syllabus for Civil Engineering at IIT Indore, by inviting eminent faculty members from IISc and other IITs.
- Invited Prof. Debasish Roy from the Department of Civil Engineering at IISc Bangalore for giving a talk at IIT Indore.
- Invited Prof. Ram Mohan Vasu from the Department of Instrumentation and Applied Physics at IISc Bangalore for giving a talk at IIT Indore.

Projects active during April 2019-March 2020
Title - A peridynamics-like framework to predict failure of concrete structures
Duration - 3 yrs.
Funding Agency -SERB
Brief Description - As PI. Development of novel computational framework for analysis of failure of concrete structures.

Title - Safeguarding heritage structures using seismic metamaterials
Duration - 2 yrs.
Funding Agency - SPARC
Brief Description - As co-PI. Designing seismic metamaterials towards saving heritage structures against earthquake.

Dr. Mohd Farooq Azam
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PhD. University of Grenoble, France

Previous Employment -(includes post-doctoral experience)
INSPIRE Faculty at National Institute of Hydrology, Roorkee (March 2015-November 2017)

Statement of Research Interests

a. Broad research area - Glaciology and Hydrology

b. Research Highlights

The research work covered by scientific magazines from the interest of general population:

- Dr. Mohd Farooq Azam's recent research work "SNOWMELT IS THE MAJOR DRIVER FOR RIVER RUNOFF IN THE WESTERN HIMALAYA" covered by International Environment Science Magazine "MONGABAY" for the interest of local population.
  http://india.mongabay.com/2019/07/snowmelt-is-a-major-driver-of-runoff in-the-chhota-shigri-catchment/
- The research work on Himalayan Glaciology "How glaciers in the western Himalayas are reacting differently to climate change and human activities" from Dr. Mohd Farooq Azam's team is featured in Mongabay, a science magazine.

  https://india.mongabay.com/2020/07/how-glaciers-in-the-western-himalayas-are-reacting-differently-to-climate-change-and-human-activities/

c. Awards and Achievements

- Received the IRD (institute for research and development), France award for one month visiting professor at University of Grenoble, France.

Publications (includes journal articles, books and book chapters)

- **Azam M. F.,**Patrick Wagnon, Christian Vincent, A. L. Ramanathan, Naveen Kumar, S. Srivastava, J. G. Pottakkal, and P. Chevallier. "Snow and Ice melt contributions in a highly glacierized catchment of Chhota Shigri Glacier (India) over the last five decades." ***Journal of Hydrology*** 574 (2019): 760-773 (**Impact Factor =4.405**).
- Mandal A.,Ramanathan AL. **Azam M.F.**, et al. (2020).Understanding theinterrelationships amongmass balance, meteorology, discharge andsurface velocity on Chhota Shigri Glacier over2002–2019 using in situ measurements.***Journal of Glaciology*** 1–15. https://doi.org/10.1017/jog.2020.42(**Impact Factor = 3.2**).
- Nizam S., Sen I.S., Vinoj V., Galy V., Selby D., **Azam M.F.**, Pandey S. K., Creaser R. A., Agarwal A. K., Singh A. P., and Bizimis M. (2020). Biomass-Derived Provenance Dominates Glacial Surface Organic Carbon in the Western Himalaya. ***Environmental Science & Technology*** **2020** *54* (14), 8612-8621. DOI: 10.1021/acs.est.0c02710 (**Impact Factor = 7.5**).

Projects active during April 2019-March 2020

Title - Glacio-hydrological studies in the Himalaya
Duration - March 2015 to March 2020
Funding Agency - DST SERB
Brief Description - The project involves the hydrological modelling of selected Himalayan glacierized catchments.

Dr. Abhishek Rajput
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PhD. - June 2017 From IIT Roorkee

Previous Employment (includes post-doctoral experience)
Postdoctoral (from Oct 17 to Nov 18) at The Korean Ships and Offshore Research Institute, Busan, Republic of Korea.

Statement of Research Interests

a. Broad research area

- Structural and Impact Mechanics Corrosion

b. Research Highlights

- Influence of corrosion on the mechanical properties of structural steel.
- Effect of corrosion on various type of steel
- Response of carbon fiber reinforced polymer under projectile impact.
- Behavior of concrete under high rate of loading

c. Awards and Achievements

- Became Senator of IIT Indore in the capacity of faculty in charge Training & Placement at IIT Indore

Publications (includes journal articles, books and book chapters)

- Ballistic performances of concrete targets subjected to long projectile impact 2018. A Rajput, MA Iqbal, NK Gupta; Thin-Walled Structures 126, 171-181
- Effects of the surface preparation on the life of epoxy coating in steel ship plates: an experimental study 2019. Abhishek Rajput, Meral Ak, Sang Jin Kim , Sung Hwan Noh, Jae Hyeong Park, Jeom Kee Paik; Ships and offshore structures, Doi:https://doi.org/10.1080/17445302.2019.1565072
- Fresh and sea water immersion corrosion testing on marine structural steel at low temperature 2019. A Rajput, JH Park, S Hwan Noh, J Kee Paik; Ships and Offshore Structures, 1-9.

Events/ Seminars organized

- Organized a Short-Term Course on "Sustainable Construction Practices" from 13-15 October 2019, at IIT Indore.

Projects active during April 2019-March 2020

Title - Third Party Quality Assurance for the project "Development of infrastructure of new campus of IIM Udaipur"
Duration - 14 Months
Funding Agency -IIM Udaipur
Brief Description - The new construction of IIM Udaipur campus is in progress. I look after this project as Co-PI to ensure the quality of construction work.

Title - Crack investigation in railway bridge no. 10 between Rau and TIHI on Indore to Dahod new BG line section.
Duration - 3 Months
Funding Agency - Indian Railway
Brief Description - Crack investigation has been carried out in the prestressed box girder railway bridge to assess the condition of bridge for the functioning of railway operations.

Title - Nonlinear finite element analysis of concrete damage due to impact loading
Duration - 10 Months
Funding Agency - TEQIP
Brief Description - Finite element modelling and analysis has to perform to understand the behaviour of concrete under projectile impact.

Dr. Guru Prakash
Assistant Professor
guruprakash@iiti.ac.in

PhD. - University of Waterloo (2013-2017)

Previous Employment (includes post-doctoral experience)
Post-doctoral fellow (2017-2018) - University of Waterloo

Statement of Research Interests

a. Broad research area

- Structural Health Monitoring and Reliability Assessment

b. Research Highlights

- A probabilistic approach to structural health monitoring of a reinforced concrete beams.
- Damage detection and localization in bridge components using static and dynamic responses.
- Reliability assessment of bridges under fatigue loading.
- A Bayesian approach to dam health monitoring using dam responses.

c. Awards and Achievements

- **Certificate of outstanding contribution in reviewing** by Journal of Reliability Engineering and system safety (May, 2018).
- University of Waterloo Graduate Scholarship for good academic performance and scholarly contribution (Fall, 2017).

Publications (includes journal articles, books and book chapters)

- Prakash, G., Narasimhan, S. & Al-Hammoud, R. (2019). A two-phase model to predict the remaining useful life of corroded reinforced concrete beams. Journal of Civil Structural Health Monitoring, pp 1-17. https://doi.org/10.1007/s13349-019-00327.
- Prakash, G. "A Bayesian approach to degradation modeling and reliability assessment of rolling element bearing." Communications in Statistics-Theory and Methods (2020): 1-22.
- Prakash G. Kaushik A. A Change-Point based Wiener Process Degradation Model for Remaining Useful Life Estimation Journal of Safety and Reliability (Accepted)

Events/ Seminars organized

- **Session Chair,** Materials Processing for Precision Engineering International Conference on Precision, Meso, Micro & Nano Engineering, IIT Indore, December 12 – December 15. http://copen2019.iiti.ac.in/index.php/main.
- Invited Prof. Mahesh D. Pandey, University of Waterloo, Canada for guest lecture at IIT Indore, February, 2020.

Projects active during April 2019-March 2020

Title - Assessment of progressive collapse of steel truss railway bridgesduration-, funding - Rs.1.25 lakhs, role - PI.
Duration - 1 year
Funding Agency -Technical education quality improvement programme (TEQIP) collaborative Research,
Brief Description - In this project, a twenty feet 2D warren truss model will be made at IIT Indore laboratory with the similar member properties (as in numerical model) to observe the real behavior of the truss.

PhD. -Jadavpur University, Kolkata, India 2017

Previous Employment (includes post-doctoral experience)
Assistant Professor, Heritage Institute of Technology, Kolkata. (15.07.2013 to 23.12.2018).

Statement of Research Interests

Dr. Kaustav Bakshi
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a. Broad research area

- Bending and vibration characteristics of laminated composite structures.
- Nonlinear finite element analysis of civil engineering structures.
- Failure predictions and crack propagation of civil engineering structures with and without composite stiffeners.
- Instability of laminated composite shell roofs.
- Impact response studies for civil engineering structures

b. Research Highlights

- Static bending and dynamic response studies of laminated shell panels
- First Ply failure prediction of laminated composite shell panels
- A comparison of geometrically linear and nonlinear approaches in failure prediction.
- Progressive damage detection in composite panels
- Instability behaviour of laminated composite shell panels.
- Buckling studies of steel hollow columns using geometric and material nonlinearities
- Impact induced failure prediction.

c. Awards and Achievements

- Invited to join the editorial board of the international journal "Insight – Mechanics", Pisco Med Publisher.

Publications (includes journal articles, books and book chapters)

- K. Bakshi and D. Chakravorty (2020). First Ply Failure Study of Laminated Composite Conoidal Shells Using Geometrically Nonlinear Formulation. Recent Advances in Theoretical, Applied, Computational and Experimental Mechanics, pp. 119 – 131.https://doi.org/10.1007/978-981-15-1189-9_10.
- K. Bakshi and D. Chakravorty. (2020). Numerical Study on Failure of Thin Composite Conoidal Shell Roofs Considering Geometric Nonlinearity. KSCE Journal of Civil Engineering, 24 (3), 913 – 921. https://doi.org/10.1007/s12205-020-1464-5.K. Bakshi and D. Chakravorty. (2020), A Finite Element
- Prediction of First Ply Failure and Delamination in Composite Conoidal Shells Using Geometric Nonlinearity.Sadhana (Springer), Accepted in press.

Projects active during April 2019-March 2020
Title - Technical testing and analysis of materials
Duration - 3 days
Funding Agency - Gujarat Construction Company
Brief Description - The company asked for technical testing of civil engineering materials as PI.

Dr. Manish Kumar Goyal
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PhD. - Indian Institute of Technology Roorkee

Previous Employment (includes post-doctoral experience)

- Assistant Professor Indian Institute of Technology Guwahati
- Indo-US WARI Fellow, University of Nebraska, Lincoln, USA
- Postdoctoral Fellow, McGill University, Canada
- Postdoctoral Fellow, Nanyang Technological University, Singapore
- Research Assistant, University of Waterloo, Waterloo, Canada,
- Manager- CNIA Pvt. Ltd., Bangalore
- Assistant Manager-Jones Lang LaSalle Pvt. Ltd., Chennai and New Delhi
- Academic associations with other institutions - Visiting faculty, Aristotle University of Thessaloniki, Thessaloniki

Statement of Research Interests

a. Broad research area

- Water management, climate change
- Flood modelling
- Water Supply and water audit
- Water scarcity and drought
- Water use Efficiency and crop yield Modeling

b. Research Highlights

- Resilience of River Basins and Hydrological Modeling
- Hydro-climatology and Statistical Downscaling
- Irrigation Management and Crop Modeling Applications
- Multivariate Statistical Analysis, Machine Learning Models and Data Mining

c. Awards and Achievements

- Awarded American Society of Civil Engineers (ASCE's)-Visiting International Fellowship 2019.
- Received Prof R J Garde Research Award 2019.

His research interests include Water resources engineering, GIS and remote sensing applications in water and environment and climate change. After a brief stint in corporate, he pursued PhD degree at IIT Roorkee in collaboration with University of Waterloo, Canada. He went to pursue further research as postdoctoral fellow at Nanyang Technological University Singapore and McGill University, Canada.
Dr Goyal has 'i' index and 'h' index equal to 42 and 23, respectively with total citations at 1499. He holds more than 100 publications on different domain of GIS and Remote Sensing, Water Resources, climate change, hydrological and hydrodynamic modelling, snow and glacier melt, soil carbon sequestration, anthropogenic changes, risk and resilience. He serves as an Associate Editor for the ASCE-Journal of Hazardous, Toxic and Radioactive Waste.

He recently edited a book on Sustainability: Fundamentals and Applications with John Wiley & Sons with contribution from subject experts from over 10 countries, has received overwhelming response from worldwide. His contribution fetched him Recipient of American Society of Civil Engineers (ASCE's) Environmental and Water Resources Institute (EWRI) Visiting International Fellowship (VIF) -2019, Prof R J Garde Research Award, India Society of Hydraulics, 2019, Recipient of American Society of Civil Engineers (ASCE)-Best Theoretical-Oriented Paper Award 2018, NVIDIA GPU Research Grant 2018, IEI Young Engineers Award in Civil Engineering Division, 2017-18, Indo-US WARI Fellowship Award (2016), DST –SERB Young Scientist-fast track grant (2015), Inspire Faculty award, 2014, Erasmus Mundus Interweave Award, Europe 2014, JSPS fellowship award, University of Tokyo, Japan (2013) and Canadian Commonwealth Scholarship Award.

Patents - A METHOD FOR MEASURING HYDROLOGICAL RESILIENCE OF A REGION IN RESPONSE TO WARMING SHIFTS (patent filed)

Publications (includes journal articles, books and book chapters)

- Dubey, S., and **Goyal, Manish Kumar** (2020). Glacial Lake Outburst Flood (GLOF) Hazard, Downstream Impact, and Risk over the Indian Himalayas. Water Resources Research, 56, e2019WR026533. ***Impact Factor: 4.14***
- Sinha, J., Das, J., Jha, S. and **Goyal Manish Kumar** (2020). Analysing model disparity in diagnosing the climatic and human stresses on runoff variability over India. Journal of Hydrology, 581, p.124407. ***Impact Factor: 4.405***
- Das, J., Jha, S. and **Goyal Manish Kumar** (2020). Non-stationary and copula-based approach to assess the drought characteristics encompassing climate indices over the Himalayan states in India. Journal of Hydrology, 580, p.124356. ***Impact Factor: 4.405***

Events/ Seminars organized

- 6 Days Active Learning Course on Recent Advancements in Water Resources and Environmental Engineering. April 22-27, 2019, Sponsored by TEQIP, Department of Civil Engineering & Department of Biosciences and Biomedical Engineering.
- Short Term Course on Sustainable Water Resources Management under Changing Climate. 28 May 2018 - 02 June 2018, Sponsored by TEQIP, Department of Civil Engineering.

Projects active during April 2019-March 2020

Title - Identification hydropower sites and critical glacial lakes for sustainable water resources management in Himachal Pradesh
Duration - 3 Years
Funding Agency - National Mission on Himalayan Studies (NMHS)
Brief Description - In India, energy demand has increased considerably during last few decades. In order to meet this increasing energy demand sustainably, there is a need to move towards low-carbon energy sources. Himalayan water towers have a huge potential for generating clean and renewable energy. Small Scale Hydropower Projects (SHP) could provide clean and renewable energy and have a minimal impact on ecology and biodiversity. In this project, hydrological model and geospatial techniques would be used to identify hydropower potential zones for establishing small hydropower projects. A multi-criteria approach would be adopted which will integrate the geospatial and hydrological data together to identify hydro power potential zones and suitable sites locations for SHP along the stream network. Global warming has resulted in glacier retreating and snowmelt which further results in the formation of glacial lakes. These glacial lakes when breach could result in Glacial Lake Outburst Flood (GLOF) causing flash flood downstream. The GLOF hazard has become a prominent concern for harnessing hydropower potential of the Himalayan regions. Therefore, it is important to identify the hotspot, monitor the health of these lakes and estimate the potential risk associated with GLOF. Present project work would use satellite imaginary and a detailed inventory of glacial lakes would be prepared. For the detection of glacial lakes, three indexes namely; Normalized Difference Vegetation Index (NDVI), Normalized Difference Water Index (NDWI) and Normalized Difference Turbidity Index (NDTI) would be used. After mapping of the glacial lakes, the vulnerability of glacial lakes would be analyzed based various parameters such as the area of lake (> 0.1km2), lake is attached with parental glaciers and/or at the snout of the glacier, steep slope, freeboard, potential flood volume, possible lowering height. The GLOF parameters such as Potential Flood Volume (PFV) and lowering height (Hp) of glacial lakes would be calculated using Steep Lakefront Area (SLA) approach. To identify the risk associated with the GLOF hydrodynamic modeling of the critical glacial lake would be done. Rural livelihoods in Himalayan regions are highly dependent on availability of water. The project would also aim to identify linkage between water use pattern and livelihood in the selected villages of the area. The project would also work towards formulating strategy for increasing the water use efficiency and capacity building of village level institutions.

Department of Chemistry

Vision Statement:

Chemistry is considered as "Central Science" as it bridges all sciences and applied fields via molecular world. Since the establishment of the Department of Chemistry in 2009 at IIT Indore, the faculty members and the students have worked relentlessly to establish a Department of Excellence for high-end academic and research activities in Chemical Sciences. Keeping the immense contribution of chemistry in solving the global problem in Energy, Environment and Healthcare, we at the Department of Chemistry focus on research activities on various fundamental and applied research areas in Chemical Sciences. The development of state-of the-art facilities for research activities has been a continuous pursuit. The department focuses on the pursuit of innovation in education and research maintaining high professional standards, promoting a diverse and inclusive environment. Along with the promotion of personal growth and development of career of faculty and staff, the Department is constantly promoting outreach contribution of the campus, community, and popularises Chemistry in the young minds.

At present the Department of Chemistry comprises of 17-faculty members, 5-post-doctoral fellows and 100+ Ph.D. students.

Research areas and funding:

Faculty and students are involved in the research activities in several frontier areas of chemical sciences that include nanotechnology, organic light harvesting materials, organometallic pharmaceuticals, asymmetric synthesis, heterocyclic chemistry, biosensor metal clusters, molecular fluorescence spectroscopy, computational aspects of materials and molecular inhibitors for disease targets, drug discovery, catalysis, clean energy, green and sustainable chemistry and total synthesis of natural products. Research in these areas has been recognised by the scientific community in the form of international peer-reviewed research publications and lectures in national and international conferences. Our research is supported by generous funding from private as well as Government agencies, particularly DST-SERB, CSIR, DBT, DAE and DAAD.

Teaching:

The Department of Chemistry at IIT Indore is the only 2nd generation IITs built in India to introduce a two-year master's program in Chemistry wherein a full year, specially 2nd year of the program, is dedicated for laboratory research in the field of students choice. Since 2013, this unique programme devotes a full year to solve real research problems in the laboratory and give an exposure to students if they would like to proceed with a doctoral program in their higher studies. This makes sure only qualified and motivated students pursue doctoral program and contribute to the welfare of the society. Additionally, students decide on their journey for doctoral program or look for a lucrative job after the completion of master's program at IIT Indore.

Prof. Rajneesh Misra
Professor
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Ph.D (2007) in Chemical Sciences. IIT, Kanpur, India.

Previous Employment (includes post-doctoral experience)
Professor (2017)-IIT Indore Associate Professor (2013-2017)-IIT Indore
Assistant Professor (2009-2013)- IIT Indore
University of Kyoto, Japan (2008- 2009)
Postdoc at Georgia Tech University, Atlanta, USA (2007-2008)

Statement of Research Interests

a. Broad research area

- Development of new organic/inorganic materials for Photonic and electronic applications.

b. Research Highlights

- Our research interest focuses on design, and synthesis of conjugated organic molecules for organic electronics, and photonics such as solar cells, field-effect transistors, light-emitting diodes, and multi-photon absorption.

Publications (includes journal articles, books and book chapters)

- Yogajivan Rout, Vivek Chauhan and Rajneesh Misra* Synthesis and characterization of isoindigo-basedpush–pullchromophores. ***J. Org. Chem.,*** 2020 *7*, 4611–4618

- Yogajivan Rout, Shaikh M. Mobin and **Rajneesh Misra***, Tetracyanobutadiene (TCBD) functionalized benzothiadiazole derivatives: effect of donor strength on the [2+2] cycloaddition–retroelectrocyclization reaction. *New J. Chem*., **2019**, *43*, 12299-12307.

- Faizal Khan, Anupama Ekbote and **Rajneesh Misra***, Reversible mechanochromism and aggregation induced enhanced emission in phenothiazine substituted tetraphenylethylene. *New J. Chem*., **2019**, **43**, 16156-16163.

Projects active during April 2019-March 2020

Title - Diketopyrrolopyrrole based Low Cost Accepor for Bulk Heterojuncion Organic Solar Cells
Duration - 2017 - 2020
Funding Agency - Indian National Science Academy

Title - Tuning the Homo-Lumo gap of donor-acceptor Benzothiadiazoles
Duration - 2018 - 2021
Funding Agency – CSIR

Title - Development of new small molecules and device architectures for highly efficient and reliable organic solar cells
Duration - 2017 - 2020
Funding Agency -SERB

Title - Doner-Acceptor NIR absorbing tetracyanobutadiene and expanded tetracyanobutadiene derivatives of ferrocenyl functionalized BODIPYs
Duration - 2019 - 2022
Funding Agency – SERB

Prof. Suman Mukhopadhyay
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Ph.D degree in synthetic inorganic chemistry from Jadavpur University in 2004.

Previous Employment (includes post-doctoral experience)
2006- FCT Post-doctoral Fellow, Institute Superior Técnico in Portugal, Lisbon.
Post-doctoral Fellow, National University of Singapore.
2009- EPFL in Lausanne (Switzerland) as a Marie-Curie International Incoming Fellow.
2010- Assistant Professor , IIT Indore, India
2013- Associate Professor, IIT Indore, India
2018-till date - Professor, IIT Indore, India

Statement of Research Interests
Prof. Mukhopadhyay's current research interests are organometallic compounds in therapeutic and mechanism, bioinspired catalysis, molecular recognition, metallogels and applications. His work also encompasses areas like self-sorting and molecular machine.

a. Broad research area
- Transition Metal Chemistry

b. Research Highlights
- Metal based soft materials in sensing, catalysis and self-healing materials.
- Ruthenium(II) based anticancer compounds and their mode of action.
- Heterodonor ligands and their complexes in sensing of heavy metal ion and explosives.
- Bioinspired transition metal catalysis
- Biomimetic model complexes

c. Awards and Achievements
- Best Teacher Award, 2018

Publications (includes journal articles, books and book chapters)
- Mechanistic and thermodynamical aspects of pyrene based fluorescent probe to detect picric acid, Bidyut Kumar Kundu, Pragti Porwal, Reena Kyarikwal, Shaikh M Mobin, Suman Mukhopadhyay, New J Chem, 2019, 43, 11483.
- Comparative study on the tribological properties of laser post-treated and untreated AISI304 stainless steel matrix composite reinforced with hard ceramic particles (TiB2–TiN–SiC) and prepared by ex-situ P/M route, Debjit Mishra, Sumit Barange, Hilol Joardar, Jitendra Kumar, Alok Kumar Das, Suman Mukhopadhyay, Satyajit Chatterjee, Ceramics International, 2019, 45, 18852.
- Cobalt metallogel interface to selectively sense L-Tryptophan among essential amino acids, Novina Malviya, Chanchal Sonkar, Rakesh Ganguly, Suman Mukhopadhyay, Inorg. Chem. 2019, 11, 7324.

Projects active during April 2019-March 2020
Title - Exploring tetrazole based transition metal complexes in the field of catalysis, luminescent materials and bioactivity
Duration - Three years
Funding Agency - CSIR
Brief Description - Tetrazoles being versatile class of ligands has been explored extensively for synthesis of transition metal complexes and their properties like catalysis, luminescence and bioactivity have been extensively explored.

Dr. Apurba K Das
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apurba.das@iiti.ac.in

Ph.D. in Chemistry, Indian Association for the Cultivation of Science (Jadavpur University), Kolkata, India

Previous Employment (includes post-doctoral experience)

- Postdoctoral Research Associate (2006-2008), University of Manchester, Manchester, UK
- Postdoctoral Research Fellow (2008-2009), University of Strathclyde, Glasgow, UK
- Assistant Professor (2009-2016) in Chemistry, Indian Institute of Technology Indore, Indore, India
- Associate Professor (2016 onwards) in Chemistry, Indian Institute of Technology Indore, India
- Academic associations with other institutions - Visiting Faculty (November-December 2019) at University College London, London, UK

Statement of Research Interests

a. Broad research area

- Bio-organic Chemistry
- Supramolecular chemistry

b. Research Highlights

- Biomaterials
- Peptide and nucleobase-based nanostructured materials
- Systems Chemistry
- Supramolecular electronics
- Organic-Inorganic hybrid materials
- Electrocatalytic Organic Reactions

c. Awards and Achievements

- 2020 International Research Fellowship awarded to Dr. Apurba K Das by Kyoto University, Japan.
- Overseas Visiting Doctoral Fellowship (OVDF) awarded to Mr. Ankan Biswas (September 2019 – February 2020) to work at University College London, London, UK.

Patents

- Pi-Conjugated Compound for Resistive Switching, Device and Method of Fabrication Thereof
  Inventors: **A. K Das**, S. Mukherjee, R. G. Jadhav, A. Kumar
  Patent application number 201921027542, July 10, 2019.
- Hybrid Mesoporous Composites Gas Sensors
  Inventors: S. Mukherjee, **A. K Das**, A. Agarwal, Aaryashree, B. Mandal, A. Biswas
  Patent application number 201921026576, July 3, 2019.
- Organo-acidified Zinc Oxide Carbon Monoxide Sensor
  Inventors: S. Mukherjee, **A. K Das**, A. Agarwal, B. Mandal, Aaryashree, S. Maiti
  Patent application number 201921026594, July 3, 2019.

Publications (includes journal articles, books and book chapters)

- P. K. Gavel, N. Kumar, H. S. Parmar, A. K. Das*, Evaluation of a Peptide-Based Coassembled Nanofibrous and Thixotropic Hydrogel for Dermal Wound Healing, *ACS Applied Bio Materials*, 2020, *3*, 3326-3336.
- T. Ghosh, A. Biswas, P. K. Gavel, A. K. Das*, Engineered Dynamic Boronate Esters Mediated Self-healable Biocompatible G-quadruplex Hydrogels for Sustained Release of Vitamins, *Langmuir*, 2020, *36*, 1574-1584.
- A. Biswas, T. Ghosh, P. K. Gavel, A. K. Das*, PEG Functionalized Stimuli Responsive Self-healable Injectable Dynamic Imino-boronate G-quadruplex Hydrogel for the Delivery of Doxorubicin, *ACS Applied Bio Materials*, 2020, *3*, 1052-1060.

Events/ Seminars organized

- Organized ''International 3D Bioprinting Research Symposium'' at University College London, London, UK on November 22, 2019 (Role: Convener, Organizing Committee).

Projects active during April 2019-March 2020

Title - Development of cation-switchable functionalized nucleobase based metallohydrogels for drug delivery
Duration - 2018 - 2021
Funding Agency - CSIR

Title - Development of 3D Printable Biomimetic Hydrogels (Bio-inks)
Duration - 2018 – 2020
Funding Agency - DST

Title - Complex Cu-containing Semiconductors and Layered Structures for Economically-Viable, Environmentally-benign, and High Performance Ultrathin Solar Cells
Duration - 2019 - 2021
Funding Agency – DST

Dr. Anjan Chakraborty
Associate Professor
anjanc@iiti.ac.in

PhD - Indian Institute of Technology Kharagpur (2007)

Previous Employment (includes post-doctoral experience)
2016 : Associate Professor, IIT Indore, India
2007 - 2008: Postdoctoral Fellow, Penn State University, USA
2008 - 2009: Postdoctoral Fellow, Florida State University, USA
2009 - 2009 September: Postdoctoral fellow, Kobe University, Japan
October 2009- Assistant Professor, IIT Indore, India

Statement of Research Interests

a. Broad research area

- Study of different biological systems by fluorescence spectroscopy

b. Research Highlights

- Interaction of liposomes with metal ions and nanoparticles
- Dynamics of interfacial region of lipid bilayers in presence of nanoparticles and metal ions using spectroscopic techniques
- Study of nanoparticles-liposomes assemblies for biological application, drug delivery systems
- **Application of spectroscopic techniques for the investigation of liposomes-drug interactions**

Publications (includes journal articles, books and book chapters)

- Interaction of monomeric and self-assembled aromatic amino acids with model membranes: self-reproduction phenomena
  S.K. De, A Chakraborty, Chemical Communications 55 (100), 15109-15112.
- Effect of Surface Ligand and Temperature on Lipid Vesicle–Gold Nanoparticle Interaction: A Spectroscopic Investigation
  N Kanwa, A Patnaik, SK De, M Ahamed, A Chakraborty, Langmuir 35 (4), 1008-1020.
- Influence of Trivalent Metal Ions on Lipid Vesicles: Gelation and Fusion Phenomena
  S.K. De, N Kanwa, A Chakraborty, Langmuir 35 (19), 6429-6440
- Interaction of aliphatic amino acids with zwitterionic and charged lipid membranes: hydration and dehydration phenomena, N Kanwa, S. K De, A Maity, A Chakraborty, Physical Chemistry Chemical Physics 22 (6), 3234-3244

Dr. Biswarup Pathak
Associate Professor
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Ph.D. (Theoretical Chemistry): Hyderabad Central University, December 2007

Previous Employment (includes post-doctoral experience)

- August 2007 - December 2007: Research Associate, Indian Institute of Science (IISc) Bangalore
- January 2008 - July 2009: Postdoctoral fellow, Jackson State University, USA
- September 2009 - May 2012: Postdoctoral fellow, Uppsala University, Sweden
- May, 2012- June, 2016: Assistant Professor (Chemistry), IIT Indore
- June, 2016- Present: Associate Professor (Chemistry), IIT Indore
- Academic associations with other institutions – June 2017-February 2018, Australian National University.

Statement of Research Interests

a. Broad research area

- Computational Material Science

b. Research Highlights

- Total 150 publications in international journals (1 JACS, 2 Angew Chemie, 1 Nano-Letter, Nature Communication, 13 in Journal of Physical Chemistry C, 2 Chem Comm, 8 PCCP, 4 Nanoscale, 3 Journal of Materials Chemistry A). Total No. of citations: ~3000, H-index: 31 (Google Scholar) : I-10 index (Google Scholar) : 83; Some Highlights of some of our papers: 10 Cover page articles published in reputed journals such as Angew Chemie, Nanoscale, Journal of Materials Chemistry A, Applied Physics Letter, Chemistry An Asian Journal

c. **Awards and Achievements**

- **DUO-India Professor Fellowship Award, 2020**
- Featured in **Journal of Physical Chemistry Young Scientist Special Issue, 2019**
- **SPARC Research Grant Awards, MHRD, India, 2019**
- **Early and Mid-Career Research** Fellowship from Indian National Science Academy, **2017**
- Best Research Paper Award from IIT Indore, **2016**

Publications (includes journal articles, books and book chapters)

- Recent Advances in Graphene-Like 2D Materials for Spintronics Applications, Indrani Choudhuri, Preeti Bhauriyal, **Biswarup Pathak***, Chemistry of Materials, 20, 8260-8285, **2019.**
- Size Evolution Dynamics of Gold Nanoclusters at an Atom-Precision Level: Ligand Exchange, Growth Mechanism, Electrochemical, and Photophysical Properties, M. P. Maman, Akhil S. Nair, H. Cheraparambil, **Biswarup Pathak***, S. Mandal*, Journal of Physical Chemistry Letters, 11, 1781-1788, **2020.**
- Unique Dirac and Triple Point Fermiology in Simple Transition Metals and their Binary Alloys, Chiranjit Mondal, C. K. Barman, S. Sarkar, S. R. Barman, A. Alam, **Biswarup Pathak***, Physical Review B, 99, 155108, **2020.**

Projects active during April 2019-March 2020

Title - Designing of core-shell nanocluster based electrodes for fuel cell applications
Duration - 2017 - 2020
Funding Agency - CSIR

Title - Atomistic Modelling of Pt-Nanocluster Based Electrocatalysts for Fuel Cell Applications
Duration - 2019 - 2022
Funding Agency - SPARC MHRD

Title - Rational Design of Transition Metal Based Nanoalloys/Two Dimensional Materials for Direct Conversion of CO_2 into a Gasoline Fuel

Duration - 2020 - 2022
Funding Agency - VR Sweden
Brief Description - International Project (Supported from VR Sweden)

Title - Reversible Alkali Metal Based Hydrides for High Temperature Thermal Energy Storage
Duration - 2017 - 2020
Funding Agency - DST

Title - **Designing of Mn-Based Catalysts for Conversion of Ethanol to Butanol: A Biofuel Alternative to Gasoline**
Duration - 2020 - 2023
Funding Agency - DST SERB

Dr. Shaikh M. Mobin
Associate Professor
xray@iiti.ac.in

PhD. - University of Mumbai
Previous Employment (includes post-doctoral experience)

- 1999 – 2011, Worked as a X-Ray Crystallographer at National Single Crystal X-ray Diffraction Facility, IIT Bombay and Sophisticated Instrument Center (SIC), IIT Indore
- Feb. 2012- Oct. 2016, Assistant Professor, Department of Chemistry, IITI
- Nov. 2016 onwards, Associate Professor, Department of Chemistry, IITI

Statement of Research Interests

a. Broad research area

- Dr Shaikh had develop his multi-disciplinary research group working in wide area of research including Solid-state structural transformation, Design and synthesis of newer class of MOFs / COFs and their applications in energy storage, conversion and biomedical devices, exploring metal nano-oxide materials for energy storage, conversion, optical and electro-chemical sensing, metal nano-oxide materials derived by employing metal complexes / MOFs as single-source molecular precursors as catalyst in organic transformation and developing greener c-dots for bioimaging and biomarkers. Moreover, the research group designs and synthesizes small molecules as cellular organelles target and docking.

b. Research Highlights

- In 2019-20 group was invited to write the following articles in several special issues:
- *Coord. Chem. Rev.*, 2020,*411*,213241.(*Invited Review for a Special Issue: Celebrating 60th Birthday of Prof. Goutam K. Lahiri, IIT Bombay*).
- *Chem. Asian. J.*, 2020,*15*(8),1339-1348.(*Invited Article as a Special Collection: 2nd International Conference on Organometallics and Catalysis (ICOC)-2020*).
- *Cryst. Growth & Des.* , 2019,*1910*,5483-5490.(*Invited Article for a Virtual Special Issue: Structure Property Relationship in Crystalline Solids*)
- *Chem. Asian J.*, 2019, 3566-3571.(*Invited Article for a Special Issue: Metal-Organic Frameworks and Their Applications*)

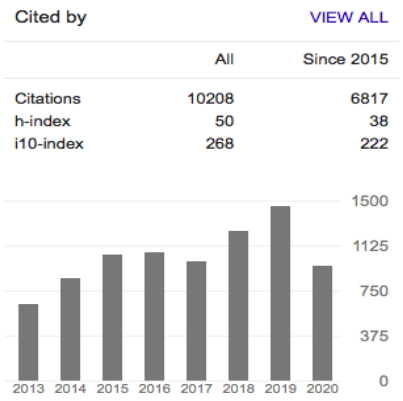
c. Awards and Achievements

- Recognized as the Outstanding Reviewers for Dalton Transactions in 2018 (*Dalton Trans.*, 2019, *48*, 4758-4758).

Publications

Publications Summary (2019-20)

No. of Publications from our Group at IIT Indore : 34
No. Publications from IIT Indore in Collaboration : approx. 29
Total No. of Publications :approx. 63
(For complete list : http://people.iiti.ac.in/~xray/pubs.html)



Courtesy Goggle Scholar

Any other of if you think deemed to fit into the annual report

Invited International Talk:

- Deliver a Keynote Lecture at International Symposium on Nanotechnology 2020 organized by American International University Bangladesh (AIUB), March 12, 2020 (Delivered via Skype).
- Invited by Arab German Young Academy of Sciences and Humanities (AGYA) as a **Keynote Speaker** for a Workshop on Emerging Materials for Water and Energy at Cairo, Egypt. November 2019.
- Invited for **Inaugural Talk** of the same workshop for practical sessions at University of Fayoum, Egypt. November 2019.

Projects active during 2019- 20

Title - Development of biosensors and antibacterial imaging agents for rapid and effective detection of bacteria by employing certain metal complexes and nanomaterials

Duration - 3 years

Funding Agency - {01(2935)/18/EMR-II} **Council for Scientific and Industrial Research (CSIR),** New Delhi.

Brief Description - This ongoing project is focussed on sensing of bacteria.

Dr. Sampak Samanta
Associate Professor
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Ph.D. (Synthetic Organic Chemistry) 2004: Indian Association for the Cultivation of Science (IACS), Jadavpur, Kolkata.

Previous Employment (includes post-doctoral experience)

- Feb. 2004-Nov.2004: Post-doctoral Fellow, The University Missouri at Rolla, Missouri, USA.
- Dec. 2004-May 2007: Post-doctoral Fellow, The University of Texas at San Antonio, Texas. USA.
- June 2007-May 2009: JSPS Post-doctoral Fellow, Tokyo University of Science, Tokyo, Japan.
- June 2009-June 2010: Senior Research Scientist, Ranbaxy Laboratories Limited, NDDR, R&D-III, Medicinal Chemistry, Guragon.
- July 2010-October 2010: Senior Research Scientist, Daiichi Sankyo Research Centre in India, Medicinal Chemistry, Gurgaon.
- October 2010-June 2016: Assistant Professor at IIT Indore.
- June 2016-continuing: Associate Professor at IIT Indore

Statement of Research Interests

a. Broad research area

- Asymmetric synthesis, Metal mediated synthetic transformation, Green chemistry, Total synthesis of biologically active compounds.

b. Research Highlights

- Asymmetric synthesis
- Heterocycles
- Metal mediated synthetic transformation
- Green chemistry
- Photocatalyst
- Total synthesis of biologically active compounds
- Medicinal Chemistry
- Agrochemicals

Publications (2019-2020) (includes journal articles, books and book chapters)

- $CuCl_2$-catalyzed NO bond cleavage of oxime esters: approach to imidazoheterocycles and furo [3,2–*c*] chromenyl fused imidazoles, Santosh K Gudimella, Amanpreet Kaur, Ram Kumar, Sampak Samanta, Tetrahedron Letters, 2020, 61, 152147.
- 1, 6-Aza-Michael addition of para-quinone methides with N-heterocycles catalyzed by Zn $(OTf)_2$: A regioselective approach to N-diarylmethyl-substituted heterocycles, Soumita Guin, Hemonta K, Saha, Ashvani K Patel, Santosh K Gudimella, Subhankar Biswas, Sampak Samanta, Tetrahedron, 2020, 76, 131338.
- 1, 6-Addition of vinyl p-quinone methides with cyclic sulfamidate imines: access to 4-hydroxyaryl-2, 6-diarylpyridines, Soumita Guin, Santosh K Gudimella, Sampak Samanta, Organic & Biomolecular Chemistry, 2020, 18, 1337-1342

Events/ Seminars organized

- Serving as a Member of Organizing Committee: An International Conference on "Emerging Trends in Chemistry", Organized by Department of Chemistry, IIT Indore, July 12-15, 2019.

Projects active during April 2019-March 2020

Title - Enantioselective Organocatalysis: A Valuable Strategy for the Synthesis of Important Class of Spirooxindoles/3,3-Disubstituted Oxindoles and Related Scaffolds
Duration - 2019 - 2022
Funding Agency - SERB (CRG/2018/001111)

Dr. Tridib Kumar Sarma
Assistant Professor
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Ph.D. (2004), Indian Institute of Technology Guwahati

Previous Employment (includes post-doctoral experience)

- August 2004-May 2005: Post-doctoral Fellow, The University of Heidelberg, Heidelberg, Germany.
- June 2005-December 2006: Alexander-von-Humboldt Post-doctoral Fellow, The University of Heidelberg, Heidelberg, Germany.
- April 2007-June 2009: JSPS Post-doctoral Fellow, University of Tokyo, Tokyo, Japan
- August 2009-: Assistant Professor at IIT Indore.

Statement of Research Interests

a. Broad research area

- Nanomaterials, self-assembled nanostructures, hydrogels, Heterogeneous catalysis

b. Research Highlights

- Nanomaterials
- Molecular self-assembly
- Hydrogels
- Green chemistry
- Heterogeneous catalysis
- Photocatalysis
- Chemistry at Nano-bio interface

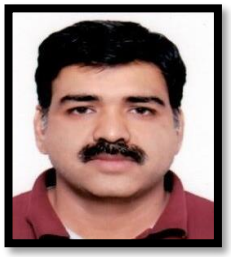
Publications (2019-2020) (includes journal articles, books and book chapters)

2020

- Copper Pyrovanadate Nanoribbons as Efficient Multi-enzyme Mimicking Nanozyme for Biosensing Applications, S Jain, B Sharma, N Thakur, S Mishra, T K Sarma ACS Applied Nano Materials, 2020, accepted Manuscript.
- Cationic Organic Nanoaggregates as AIE Luminogens for Wash-Free Imaging of Bacteria and Broad-Spectrum Antimicrobial Application, A Panigrahi, VN Are, S Jain, D Nayak, S Giri, T K Sarma, ACS Applied Materials & Interfaces 12 (5), 5389-5402.

2019

- Visible-Light Induced Enhancement in Multi-catalytic Activity of Sulfated Carbon dots for Aerobic Carbon-Carbon Bond Daisy Sarma, Biju Majumdar, Tridib K. Sarma, Green Chemistry 21 (24), 6717-6726.



Dr. Sanjay Kumar Singh
Associate Professor
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Ph.D. (Chemistry), A.P.S. University, Rewa, M.P., India 2007

Previous Employment (includes post-doctoral experience)

- 2008-2010, JSPS Postdoctoral Fellow, National Institute of Advanced Industrial Science and Technology (AIST), Ikeda, Osaka, Japan.
- 2010-2011, Postdoctoral Research Scientist, National Institute of Advanced Industrial Science and Technology (AIST), Ikeda, Osaka, Japan.
- 2011-2012: Alexander von Humboldt Postdoctoral Fellow, Institute of Inorganic Chemistry, Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany. (Host Researcher: Prof. Peter W. Roesky)
- May 2012-Feb 2017: Assistant Professor, IIT Indore, India.
- Feb 2017 – Present: Associate Professor, IIT Indore, India.

Statement of Research Interests

a. Broad research area

- Inorganic Chemistry and Organometallics: Catalysis
- Catalysis for Energy and Environment:
- Catalyst synthesis and design (organometallic and coordination chemistry of transition metals and Nanoparticles) for various organic transformation (C-C and C-H bond activation), biomass transformation (biofuel), H_2 generation and storage, and CO_2 capture and utilization.

b. Research Highlights

- Dr. Singh's research group has undertaken the task to development of homo- and heterogeneous catalytic systems for various important reactions of industrial applications. It includes Hydrogen generation (Storage and Production), CO_2 capture and sequestration, and the transformation of biomass waste to fuel and fine chemicals. Efficient protocols have been developed and optimized to utilize waste materials including plastic and other lab wastes to value-added products. The products include H_2 gas, metal-organic frameworks for H_2 and CO_2 capture, porous adsorbents for CCU, and biomass derived open-chain hydrocarbons and oxygenated long-chain compounds for application as fuel. The developed catalysts and reactions protocols have been appeared in several peer reviewed research journals including Inorg. Chem., Catal. Sci. Technol., ChemCatChem, Chem. Asian J., Eur. J. Inorg. Chem., J.

Chem. Edu., Energy & Fuels, and so on. He has also submitted two patents. Their work of transforming lab waste to CO_2 capture material was also covered in Nation News Papers (Dainik Bhashkar, FreePress journals). He has several research projects from DST-SERB, CSIR and MES. These students are now pursuing their respective Post-doc and PhD positions at renowned institutions in RWTH-Aachan, KAUST, KIT, Oslo University, Hokkaido University.

Patents - Sanjay Kumar Singh, Mahendra Kumar Awasthi, Catalyst for low temperature hydrogen production, **India Patent**, Application No. 201921040586 date: Oct. 7, **2019**

Publications (includes journal articles, books and book chapters)
2019/2020

- D. Panda, E. A. Kumar, and S. K. Singh*, Introducing Mesoporosity in Zeolite 4A bodies for Rapid CO2 Capture, ***J. CO_2 Util.*, 2020,** 40, 101223. **(IF 5.189)**
- S. Patra, S. K. Singh*, Hydrogen production from Formic acid and Formaldehyde over Ruthenium Catalysts in Water, ***Inorg. Chem.*, 2020,** 59, 4234-4243. **(IF 4.85)**
- D. Panda, S. Patra, M. K. Awasthi, S. K. Singh*, Lab Cooked MOF for CO_2 Capture: A Sustainable Solution to Waste Management, ***J. Chem. Edu.*, 2020**, 97, 1101-1108. **(IF 1.763)**
- H. Deka, A. Kumar, S. Patra, M. K. Awasthi, S. K. Singh*, Synthesis, structure and catalytic activity of manganese(II) complexes derived from bis(imidazole)methane-based ligands, ***Dalton Trans.*, 2020**, 49, 757-763. **(IF 4.05)**
- M. K. Awasthi, S. K. Singh*, Ruthenium Catalyzed Dehydrogenation of Alcohols and Mechanistic Study, ***Inorg. Chem.***, **2019**, 58, 14912-14923 **(IF 4.85)**

Events/ Seminars organized
National Science Day, Feb. 28, 2020 (Organising Committee Convenor)
International Conference on Emerging Trends in Chemistry, Jul. 12-15, 2019

Projects active during April 2019-March 2020
Title - Development of active molecular based on transition metal complexes for efficient C-H bond activation and functionalization
Duration - 2017 - 2020
Funding Agency - CSIR (01(2885)/17/EMR-II)
Brief Description - This project targets the development of catalysts for C-H bond activation reactions in water. We have developed several efficient catalysts for C-H arylation reactions.

Title - Development of new catalytic systems for efficient transformation of biomass/biomass derivatives to biofuel components
Duration - 2017 - 2020
Funding Agency - SERB-DST (EMR/2016/005783)
Brief Description - This project targets the development of efficient catalyst and catalytic process to utilize biomass derived components to valuable chemicals and fuel components. We have developed several efficient catalysts for the transformation of furfural, 5-HMF to value-added chemicals such as FDCA, Levulinic acid, tetrahydrofuran, GVL and others.

Title - Reversible Alkali Metal Based Hydrides for High Temperature Thermal Energy Storage
Duration - 2017 - 2020
Funding Agency - DST (DST/TMD/MES/2k16/50)
Brief Description - This project targets the design and development of high temperature thermal energy storage system based on alkali metal-based hydrides.

Dr. Satya S. Bulusu
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PhD, University of Nebraska (2006)

Previous Employment (includes post-doctoral experience)

- 2007 - 2008 : Postdoctoral Fellow, University of Nebraska, US
- 2009 - 2010 : Postdoctoral Fellow, York University, Canada
- 2010 - 2011 : Postdoctoral Fellow, University of New Brunswick, Canada
- 2011 - 2012 : Assistant Professor, Shobhit University, India
- Apr 2012 - 2018 : Assistant Professor, IIT Indore, India
- 2018-Present : Associate Professor, IIT Indore, India

Statement of Research Interests

a. Broad research area

- Computational Chemistry, Structural evolution of Nanoclusters and Nanoalloys, Global Optimization Methods, Algorithms for predicting Transition State, DFT Guided Monte Carlo Simulations

b. Research Highlights

- Developing machine learning methods (Artificial neural networks) for chemical problems.
- Modelling of atomic environments
- Developing sampling algorithms
- Using hardware technologies to parallelize our programs that will help to extend the above methods to experimentally relevant sizes.

c. Awards and Achievements

- Best Poster for my student at an international conference.
- Best Poster Presentation award in "*Theoretical Chemistry Symposium*", organized by Birla Institute of Technology and Science, PILANI. The title of the Poster presented, ``A transferable artificial neural network model for atomic forces in nanoparticles".

Publications (includes journal articles, books and book chapters)

Structural evolution in gold nanoparticles using artificial neural network based interatomic potentials
S Jindal, SS Bulusu The Journal of Chemical Physics 152 (15), 154302 (2020)

Projects active during April 2019 -March 2020

Title - Reducing computational complexity using FPGA to study structure and dynamical properties of nanoparticles
Duration - 2017 - 2020
Funding Agency – SERB

Dr. Chelvam Venkatesh
Associate Professor
cvenkat@iiti.ac.in

Ph.D., Department of Chemistry, IIT Kanpur, Kanpur India, (2005).

Previous Employment (includes post-doctoral experience)

- Postdoctoral Research Fellow, Institut fur Chemie und Biochemie-Organische Chemie,Freie Universitat Berlin,Berlin, Germany(May 1, 2006 to September 30, 2006).
- Alexander von Humboldt Research Fellow, Institut fur Chemie und BiochemieOrganische Chemie,Freie Universitat Berlin, Germany (October1, 2006 to May 31, 2008).
- Postdoctoral Research Associate, Department of Chemistry, Purdue University, WestLafayette, USA (August 1, 2008 to May 30, 2012).
- Assistant Professor June 2012-Dec. 2018, IIT Indore
- Associate Professor Dec. 2018-till date, IIT Indore

Statement of Research Interests

a. Broad research area

- Synthesis of natural products, heterocycles, carbocycles and small molecule targeting ligands or inhibitors for therapeutic and diagnostic applications of pathological diseases.

b. Research Highlights

- Total synthesis of biologically important natural products
- Design and synthesis of heterocycles and carbocycles of biological importance
- Developing new methodologies for construction of C-C and C-X (X =N,O,S,P) bonds
- Design, synthesis and diagnostic applications of new targeting ligands for cancers and inflammatory diseases
- Drug delivery systems, near-infra red fluorescence, nuclear Imaging and bioconjugate chemistry
- Synthesis of Inhibitors for drug targets.

c. Awards and Achievements

- Alexander von Humboldt Fellowship, Berlin, Germany, 2006-2008
- Research Associate Fellowship, Council of Scientific and Industrial Research (CSIR), India, 2005-2006
- Senior Research Fellowship, Council of Scientific and Industrial Research (CSIR), India, 2002-2005
- Junior Research Fellowship, CSIR-NET (National Eligibility Test) in Chemical Sciences, 1999-2002
- 5 Qualified Graduate Aptitude Test in Engineering (GATE), India, 1998

Patents

- New small molecule inhibitors/ligands for early diagnosis and therapy of prostate specific membrane antigen (PSMA+) cancers and neurodegenerative diseases, Venkatesh, C., Sengupta, S., Krishnan, M. A., Pandit, A. Nov. 2018, Indian patent, Application no. 201821044594.
- Method and system for metal-free solvent-free synthesis of fused-pyrido heterocycles and their biomedical applications, Venkatesh, C., Dudhe, P., Krishnan, M. A., Sonawane, A., July 2019, Indian Patent, Application no. 201921029311.
- Effect of spacers on the binding affinity of PSMA targeted diagnostic agents in detection of prostate cancer in 3Dspheroid or tissue models, Venkatesh, C., Krishnan, M. A., Pandit, A. Aug. 2019, Indian patent (Provisional filing)
- CA IX Ligand targeted bio-conjugates with nanoparticles for diagnosis and treatment of cancers over-expressing CA IX receptors, Venkatesh, C., Kirschning, A., Drager, G., Sharma, C., Dudhe, P., Sept. 2019, European Patent (in process)
- New small molecule inhibitors/ligands for early diagnosis and therapy of prostate specific membrane antigen (PSMA+) cancers and neurodegenerative diseases, Venkatesh, C., Sengupta, S., Krishnan, M. A., Pandit, A. Application no. 16695851, Nov. 2019, PCT/USA
- Method and system for metal-free solvent-free synthesis of fused-pyrido heterocycles and their biomedical appplications, Venkatesh, C., Dudhe, P., Krishnan, M. A., Sonawane, A., July 2020, Application no. PCT/USA
- Method and system for metal-free solvent-free synthesis of fused-pyrido heterocycles, Venkatesh, C., Dudhe, P., Krishnan, M. A., Sonawane, A., July 2020, 202010697100.X, China

Publications (2019-2020) (includes journal articles, books and book chapters)

- Structure activity relationships (SAR) study to design and synthesis new tubulin inhibitors with enhanced anti-tubulin activity: In silico Approach, Pandit, A., Yadav, K., Reddy, B. R., Sharma, R., Venkatesh, C., J. Mol. Struct., 00, (2020) in press
- Defects induced multicolor down- and up-conversion fluorescence in Se doped ZnO nanorods by single wavelength excitation, Rao, A. V. R. Venkatesh, C., Optical Materials, 107, 110122 (2020).
- Role of oxygen defects in the basicity of Se doped ZnO nanocatalyst for enhanced triglyceride transesterification in biodiesel production, Rao, A. V. R. Dudhe, P., Venkatesh, C., Catalysis Commun. 00, (2020) in press.

Events/ Seminars organized

- Workshop at Leibnitz University of Hannover, Germany; Dec-2018 2. Emerging Trends in Chemistry July 12-15, 2019, International conference organised at IIT Indore.

Projects active during April 2019-March 2020

Title - Design, Synthesis and Biological Evaluation of Bcr-Abl Inhibitors Active Against Wild and Mutant Bcr-Abl Tyrosine Kinases
Duration - 2020-2023
Funding Agency - DST-SERB, Govt. of India, Co-PI
Brief Description - In this project, we will use the synthetic approaches to develop sulphonamides containing lead molecules. Further on the basis of preliminary in vitro assay studies, structural optimization and molecular modification of identified lead molecules will be performed through in silico docking and molecular modelling studies, using CADD software against virtual protein of LIMK2 then novel derivatives of 2-Benzyl- 1-oxo-N-phenyl-1,2,3,4- tetrahydroisoquinoline-6-sulfonamide (3) and N-Benzyl-N-methyl-2-(Nphenylsulfamoyl) pyrimidine-5- carboxamide (4) will be designed and synthesized and characterized followed by in vitro assessment of novel LIMK2 inhibitors by using MTT assay in breast cancer cell lines and LIMK2 inhibition assay kit respectively. The in vivo biological activity of most active compounds will be investigated for most active LIMK2 inhibitors in mouse xenograft models. Finally Molecular dynamics simulation studies will be performed to calculate the free energy of binding of druglike molecule with a protein.

Title - A novel prostate specific membrane antigen or glutamate carboxypeptidase II inhibitor as a therapeutic agent for amyotrophic lateral sclerosis and targeting moiety for PSMA+ cancers
Duration - 2019-2020
Funding Agency - DST-SERB-Purdue Overseas Research Grant (International Project)
Brief Description - In this project we have developed small molecule inhibitors that modulate NAAG peptidase enzymatic activity and exhibit a great potential for slowing disease progression in ALS by preventing excitotoxicity in motor neurons. GCPII inhibition by our AAPT molecule would trigger motor neuroprotection by reducing glutamate excitotoxicity and slow the progression of neurodegeneration in ALS considerably. These studies would further establish GCPII as a highly attractive therapeutic target for the clinical treatment of ALS by delaying pathological abnormality and mortality.

Title - Ligand Targeted NIR Dye/Fe3O4 Nanoconjugates for dual (Optical/MRI) Imaging and Hyperthermia to treat Metastatic Castration Resistant Prostate Cancer.
Duration - 2019-2023
Funding Agency - "A New Passage to India-German-Indian Higher Education Cooperation" DAAD.
Brief Description - As metastatic castration resistant prostate cancer (mCRPC) is resistant to anti-androgen therapies and chemotherapeutic drugs, our aim is to deliver 2-[3-(1,3-dicarboxypropyl)ureido] pentanedioic acid (DUPA, a ligand specific to PSMA overexpressed in mCRPC) conjugated Cy5.5 and Fe3O4 for dual (optical and MRI) imaging and therapeutic purposes to cancer cells. This project presents the design, synthesis and biological evaluation of a dual imaging probe containing optical imaging NIR Cy5.5 dye, which provides functional details of molecular events and Fe3O4 for magnetic resonance imaging (MRI) to obtain anatomical information required for accurate mCRPC spread. As compared to conventional spherical nanoparticles, Fe3O4 nanorods of similar material volume provide a superior T2 contrast effect with 1.5–2 times higher relaxivity (R2) value for efficient visualization in MRI. The Fe3O4 nanorods as contrast agent can also be used for therapy using hyperthermia principle. The enhanced MRI contrast and hyperthermia properties of nanorods are attributed to the higher surface area and anisotropic morphology. Furthermore, as compared to spherical nanoparticles, nanorods offer longer blood circulation times, stronger interaction with tumors, enhanced retention at tumor sites and improved targeting efficiency, making them excellent candidates as targeting carriers or MRI contrast agents.

Title - Indigenous Targeted Radiopharmaceuticals for Detection and Therapy of Prostate Malignancy
Duration - 2020-2021
Funding Agency - BIRAC/DBT Startup at KIIT Bubaneshwar
Brief Description - In this project we will develop indigenous diagnosis and therapy of prostate cancer with newly designed targeting ligand developed in our lab at IIT Indore.

Dr. Amrendra K. Singh
Assistant Professor
aks@iiti.ac.in

Ph.D., IIT Bombay, July 2003 – April 2009.

Previous Employment (includes post-doctoral experience)

- December 2008 – February 2010: Research Associate, IIT Bombay, India.
- March 2010 – February 2012: Postdoctoral Fellow, Lund University, Sweden.
- May 2012 – July 2015: Research Associate, Michigan State University, USA.
- October 2015 – May 2016: Research Scientist, IIT Indore, India.
- June 2016 – Present: Assistant Professor, IIT Indore, India.

Statement of Research Interests

a. Broad research area

- Inorganic, Organometallic Chemistry and Catalysis

b. Research Highlights

- Bifunctional ligands with disparate metal binding sites for the preparation of homo- and hetero-bimetallic complexes.
- Cooperative metal-metal interactions for the multi-electron reduction of small molecules.
- Transition metal complexes with a focus on metal-ligand multiple bonds (MLMB).
- Multidentate N-heterocyclic carbene (NHC) ligands.

Publications (includes journal articles, books and book chapters)

- Abdel-Magied, A. F.; Theibich, Y.; Singh, A. K.; Rahaman, A.; Doverbratt, I.; Raha, A. K.; Haukka, M.; Richmond, M. G.; Nordlander, E. Asymmetric hydrogenation of an α-unsaturated carboxylic acid catalyzed by intact chiral transition metal carbonyl clusters–diastereomeric control of enantioselectivity. *Dalton Trans.* **2020,** *49,* 4244-4256.
- Ji, R. S.; Tauqeer, M.; Singh, A. K.; Pathak, B.; Mobin, S. M.; Mathur, P. Unusual Demetalation of Iron from [2]Ferrocenophane Skeleton of Di-nuclear Ferracycle Carbonyl Complex. *Appl. Organomet. Chem.* **2020,** *34,* e5431.
- Aldrich, K. E.; Fales, B. S.; Singh, A. K.; Staples, R. J.; Levine, B. G.; McCracken, J.; Smith, M. R.; Odom, A. L. Electronic and Structural Comparisons between Iron(II/III) and Ruthenium(II/III) Imide Analogs. *Inorg. Chem.* **2019,** *58,* 11699-11715.

Events/ Seminars organized

- Member (Treasurer) of the Organizing Committee of International Conference on Emerging Trends in Chemistry, July 12-15, 2019, IIT Indore.

Projects active during April 2019-March 2020

Title - Designing Bimetallic Complexes with Cooperative Metal-Metal Interactions for the Multi-electron Reduction of Small Molecules
Duration - 2017 - 2020
Funding Agency – SERB

PhD, IIT Bombay, 2009 – 2014

Previous Employment (includes post-doctoral experience)
2015 - 2016: Postdoc fellow, University of Franch-Comte, Besancon, France.
2016 - 2018: Postdoc fellow (N-PDF), IIT Indore
2018: Joined IIT Indore as Assistant Professor

Dr. Abhinav Raghuvanshi
Assistant Professor
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Statement of Research Interests

a. Broad research area

- Inorganic and Organometallic Chemistry of late transition metals

b. Research Highlights

- Luminescent complexes of Cu(I) coordination complexes
- TADF materials based on late transition metals
- POSS derived hybrid materials

Publications (includes journal articles, books and book chapters)

Journal Article:

Raghuvanshi, A.; Knauer, L.; Viau, L.; Knorr, M.; Strohmann, M.; Acta Cryst. 2020. *E76*, 484-487

Book Chapter:

Jha, B. N.; Singh, N.; Raghuvanshi, A. (2020), Catalytic activity of iron N-heterocyclic carbene complexes in "*Organic Synthesis- A Nascent Relook*" (Intech Open, ISBN: 978-1-78985-944-7)

PhD. Institute: Indian Institute of Technology Madras Year: 2015
Previous Employment (includes post-doctoral experience)

- Postdoctoral Associate at IIT Madras, India (July 2015-December 2015)
- Postdoctoral Fellow at Julius-Maximilians-Universität Würzburg, Germany (February 2016-December 2017)
- SERB Postdoctoral Fellow at Julius-Maximilians-Universität Würzburg, Germany (January 2018-January 2019)
- Joined IIT Indore, Assistant Prof (Feb 2019)

Dr. Dipak Kumar Roy
Assistant Professor
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Statement of Research Interests

a. Broad research area

- Main group and organometallic chemistry

b. Research Highlights

- Low-valent s- and p-block compounds and small molecule activation
- Multiply bonded main group compounds
- Organic-Inorganic hybrid polymers

c. Awards and Achievement

- SERB Overseas Post-Doctoral Fellowship, Dept. of Science and Technology, Govt. of India, 2016-17
- "Werner prize"- Best Ph.D. thesis in Inorganic and Analytical Chemistry, Indian Institute of Technology Madras, India, 2016
- CSIR-SRF (Council for Scientific & Industrial Research-Senior research fellowship) in Chemical Sciences, 2013
- CSIR-JRF (Council for Scientific & Industrial Research-Junior research fellowship) in Chemical Sciences, 2011

Publications

- Lenczyk, C., Roy, D. K., Oberdorf, K., Nitsch, J., Dewhurst, R. D., Radacki, K., Halet, J.-F., Marder, T. B., Bickelhaupt, F. M., Braunschweig, H. Toward Transition-Metal-Templated Construction of Arylated B_4 Chains by Dihydroborane Dehydrocoupling. Chem. Eur. J. 2019, 25, 16544
- Lenczyk, C., Roy, D. K., Nitsch, J., Radacki, K., Rauch, F., Dewhurst, R. D., Bickelhaupt, F. M., Marder, T. B., Braunschweig, H. Steric Effects Dictate the Formation of Terminal Arylborylene Complexes of Ruthenium from Dihydroboranes. Chem. Eur. J. 2019, 25, 13566.

Dr. Selvakumar Sermadurai
Assistant Professor
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Ph.D. (Chemistry), Indian Institute of Technology Kanpur, U.P., India 2009

Previous Employment (includes post-doctoral experience)

- July 2009-Sep 2013, Postdoctoral Fellow, North Dakota State University, Fargo, USA.
- Nov 2013-Sep 2017: Postdoctoral Fellow, Kyoto University, Japan.
- Nov 2017-Aug 2019: UGC-Assistant Professor, Central University of Haryana, Mahendergarh, India.
- Sep 2019 – Present: Assistant Professor, IIT Indore, India.

Statement of Research Interests

a. Broad research area

- Organic Synthesis and Catalysis

b. Research Highlights

- Visible light Photoredox Catalysis
- Development of new methodologies using Hypervalent iodine reagents
- Asymmetric Catalysis
- Synthesis of biologically active natural products
- Continuous-Flow Chemistry
- Green Chemistry

c. Awards and Achievements

- Early Career Research Award from SERB -2019-2022

Publications (includes journal articles, books and book chapters)

- Recent Development in Direct C-H functionalization of Quinoxalin-2(1H)-ones under Radical Addition Process. Monika.; Selvakumar, S.* *Synthesis* **2019,** *51*, 4113.

Events/ Seminars organized

- As an organizing committee member for **Chemistry In-house symposium (CHEM2020)**, Feb. 12, 2020

Projects active during April 2019-March 2020

Title - Development of Hypervalent Iodine(III) Reagents Mediated Photocatalytic Si-H Functionalization and Exploration of Distal Group Migration
Duration - 2019 - 2022
Funding Agency - SERB-DST (ECR/2018/000413)
Brief Description - This project aims to develop mild photocatalytic methods for the synthesis of functionalized heterocycles.

Dr. Umesh A. Kshirsagar
Assistant Professor
uakshirsagar@iiti.ac.in

Ph.D - Institute: CSIR-National Chemical Laboratory, Pune. Year: 2011

Previous Employment (includes post-doctoral experience)

- Research Assistant: CSIR-National Chemical Laboratory, Pune. (May 2010 - Jan 2011).
- Postdoctoral Research Fellow: Ben-Gurion University, ISRAEL. (Oct. 2011 - June 2013).
- DST-INSPIRE Faculty: CSIR-IICT, Hyderabad. (June 2013 - May 2014).
- DST-INSPIRE Faculty: Savitribai Phule Pune University, Pune. (May 2014 - Jan 2019).
- Assistant Professor: Savitribai Phule Pune University, Pune. (Jan 2019 - Sep 2019).
- Joined IIT Indore, as Assistant Professor (Sep. 2019).

Statement of Research Interests

a. Broad research area

- Synthetic Organic Chemistry

b. Research Highlights

- Photo-redox catalysis in Organic synthesis
- Transition metal catalysis in Organic synthesis
- C-H Activation
- Natural Product Synthesis
- Green Chemistry

c. Awards and Achievements

- "DST-INSPIRE Faculty" Award (2013).
- "PBC-ISRAEL Postdoctoral Fellowship" for Outstanding Post-Doctoral Researchers from India & China (2012).
- "First Rank" (M.Sc. Chemistry 2004) University of Pune.
- "Best Research Scholar" Award (2010) from KEERTHI SANGORAM Memorial - NCL Research Foundation.
- "Best Poster Award" at National Science Day Celebration 2010.
- Qualified "National Eligibility Test" (CSIR/UGC-NET/JRF – 2004) in Chemical Sciences.
- CSIR-JRF & SRF in Chemical Sciences (2005-2020).
- Qualified "State Eligibility Test" (SET-2004) in Chemical Sciences for the lectureship.

Dr. Tushar Kanti Mukherjee
Associate Professor
tusharm@iiti.ac.in

Ph.D - Institute: IIT Bombay, Mumbai. Year: 2007

Previous Employment (includes post-doctoral experience)

- Postdoctoral Scientist: Columbia University Medical Center, New York, USA (2007-2010)
- Joined IIT Indore, as Assistant Professor, IIT Indore, India (Dec. 2010)
- May 2016 – Present: Associate Professor, IIT Indore, India.

Statement of Research Interests

a. Broad research area

- Single molecule spectroscopy, Fluorescence imaging

b. Research Highlights

- Protein-Protein and Protein-NP interaction
- Self-assembled Luminescent Materials
- Nanocomposite based Energy Transfer Processes
- Fluorescence Sensing

Publications (includes journal articles, books and book chapters)

- Vaishnav, J. K.; Mukherjee*, T. K. "Highly Photostable and Two-Photon Active Quantum Dot-Polymer Multicolor Hybrid Coacervate Droplets" Langmuir **2019**, 35, 11764-11773.
- Maiti, S.; Jadhav, R. G.; Mobin, S. M.; Mukherjee, T. K.; Das*, A. K. "Insights into the Aggregation Behaviour of Benzoselenadiazole-Based Compound and Generation of White Light Emission" ChemPhysChem **2019**, 20, 2221-2229.
- Vaishnav, J. K.; Mukherjee*, T. K. "Surfactant-Induced Self-Assembly of CdTe Quantum Dots into Multicolor Luminescent Hybrid Vesicles" Langmuir **2019**, 35, 6409-6420.
- Singh, S.; Vaishnav, J. K.; Mukherjee*, T. K. "Quantum Dot-Based Hybrid Coacervate Nanodroplets for Ultrasensitive Detection of Hg2+" ACS Appl. Nano Mater. **2020**, 3, 3604-3612.
- Saini, B.; Singh, R. R.; Nayak, D.; Mukherjee*, T. K. "Biocompatible pH-Responsive Luminescent Coacervate Nanodroplets from Carbon Dots and Poly(diallyldimethylammonium Chloride) Toward Theranostic Applications" ACS Appl. Nano Mater. **2020**, 3, 5826-5837.
- Vaishnav, J. K.; Mukherjee, T. K. “Selective Uptake and Modulation of Nanomatal Surface Energy Transfer from Quantum Dot to Au Nanoparticle across Lipid Bilayer of Liposomes” J. Photochem. Photobiol. A **2020**, 401, 112773.

Department of Mathematics

The department of Mathematics at IIT Indore has been a major center for both academic and research programs in various branches of Mathematics. The department has been constantly engaged in frontier areas of research and encourages collaborative research with other Science and Engineering Departments. The department currently offers Ph. D and M. Sc. programs in Mathematics and envisages other master programs in allied fields such as statistics and applied computing.

The faculty of the department is quite well qualified and motivated with a strong commitment to teaching and research. This is reflected through (i) various academic events of national and international importance conducted in the department, (ii) ongoing research projects sponsored by several funding agencies such as NBHM, SERB, DST, CSIR, and (iii) research publication in reputed journals. Further, the department is also engaged in promoting Mathematics among Under Graduate students in India through *Madhava Mathematics Competition*. The department also conducted lectures by eminent mathematicians from reputed institutes around the world such as Ohio University (USA), Tohoku University (Japan), Shantou University (Republic of China), Sapienza University of Rome, etc.

Dr. Md. Aquil Khan
Associate Professor
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PhD. Indian Institute of Technology Kanpur

Previous Employment (includes post-doctoral experience)

- Visiting Researcher, University of Amsterdam, The Netherlands, from September 2009 to August 2010
- Post-doctoral Fellow, The Institute of Mathematical Sciences (IMSc) Chennai, from Nov 2010 to March 2011
- Marie-Curie Fellow, Fraunhofer SIT, Darmstadt, Germany, from May 2011 to April 2012

Statement of Research Interests

a. **Broad research area**

- Modal Logic, Rough Set Theory

b. Research Highlights

- Currently, we are working on a generalized rough set model based on a structure where we have a collection of subsets of the domain of discourse along with the accessibility relation. We also aim to propose a modal logic for such a structure that can be used to reason about the approximation operators based on the proposed rough set model.

Publications (includes journal articles, books and book chapters)

- Md. Aquil Khan, Vineeta Singh Patel:
  Knowledge and approximations: A formal study under the perspective of information systems and rough set theory. Inf. Sci. 524: 97-115 (2020)

Events/ Seminars organized

- Technical Program Committee Member, The International Joint Conference on Rough Sets (IJCRS 2020), La Habana, Cuba, June 29-July 3, 2020.
- Co-organizer, International Conference on Computational Mathematics and its Applications (CMA 2019), November 12-14, 2019, IIT Indore, India.

Projects active during April 2019-March 2020
Title - Representation Theorems for Some Structures Inherited from Rough Set Theory
Duration - Nov 7, 2019 to Sep 6, 2020
Funding Agency - TEQIP III
Brief Description - In this project we aim to study representation theorems for structures inherited from rough set theory.

Dr. Sk. Safique Ahmad
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Ph.D. - IIT Guwahati

Previous Employment - (includes post-doctoral experience)
- Institute of Mathematics, Technical University Berlin

Statement of Research Interests
a. Broad research area
- Numerical Linear Algebra, Operator Theory, Quaternion Linear Algebra

b. Research Highlights
- Inverse eigenvalue problems arise in many applications and have a unique attraction because of their coefficient matrices have different structures such as symmetric, T-even and T-odd, sparsity, etc. The objective of an inverse eigenvalue problem is to construct a physical system that maintains a articular structure that gives various spectral properties. Inverse eigenvalue problems arise in a remarkable variety of applications, including system and control theory. We have developed a mathematical method on perturbation analysis of structured matrix pencils, matrix polynomials. Dr. Ahmad also works on quaternion linear algebra and focuses on localization theorems for matrices over quaternion division algebra, which includes the Ostrowski, Brauer, and Gerschgorin type of theorems. His research group also works on perturbation analysis of linear, nonlinear, and singular Multi-parameter problems including infinite matrices.

Publications (includes journal articles, books and book chapters)
- S. S. Ahmad, Perturbation analysis for palindromic and anti-palindromic eigenvalue problems, ETNA, Volume 51, pp. 151–168, 2019.
- R. Alam, S. S Ahmad, Sensitivity Analysis of Nonlinear Eigenproblems, SIAM J. Matrix Anal. Appl., 40(2), 672–695, 2019
- 3. S. S. Ahmad and P. Kanhya, Structured perturbation analysis of sparse matrix pencils with s-specified eigenpairs, Linear Algebra and its Applications, Vol. 602 , pp. 93-119, 2020

Events/ Seminars organized
- International Conference on Mathematical Modelling and Scientific Computing (ICMMSC-2018) July 19-21, 2018.

Projects active during April 2019-March 2020
Title - On Inverse Eigenvalue Problems for structured matrix pencils
Duration - 3 years
Funding Agency - SERB
Brief Description - Structured eigenvalue problems arise in many applications and have a special attraction because of their coefficient matrices have special structures such as symmetric, T-even and T-odd, sparsity, etc. The objective of an inverse eigenvalue problem is to construct a physical system that maintains a particular special structure as well as that gives spectral property. Inverse eigenvalue problems arise in a remarkable variety of applications; including system and control theory. We have developed a mathematical Theory on perturbation analysis of structured matrix pencils, matrix polynomials.

Dr. Swadesh Kumar Sahoo
Associate Professor
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PhD. - Indian Institute of Technology Madras

Previous Employment - (includes post-doctoral experience)
Indian Institute of Technology Madras

Statement of Research Interests

a. Broad research area

- Complex Analysis, Hyperbolic-type metrics

b. Research Highlights

- Geometric characterizations of certain domains in terms of hyperbolic-type metrics.
- Problems in analytic function theory include Taylor coefficient estimates, Bohr radius problems, area estimates of complex domains, properties of complex integral operators, etc.
- Harmonic mappings
- Generalizations of the hyperbolic metric and their mapping properties
- Applications of above and mathematical philosophy
- Geometric properties of special functions

Projects active during April 2019-March 2020
Title - The Hurwitz metric and univalent functions
Duration - February 19, 2020 – February 18, 2020
Funding Agency - Science and Engineering Research Board (SERB)
Brief Description - It is a Mathematical Research Impact Centric Support (MATRICS) project. This deals with mapping properties of the Hurwitz metric and its generalizations in the setting of hyperbolic geometry and successive coefficient problems in univalent function theory.

Dr. V. Antony Vijesh
Associate professor
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PhD. - Indian Institute of Technology Madras

Previous Employment - (includes post-doctoral experience)

- 01/2008 to 11/2008 Assistant Professor Centre For Mathematical Sciences, Pala Kerala – 686574, India
- 12/2008 to 10/2010 Reader I.I.S.T, Thiruvananthapuram, Kerala
- 11/2010 to 6/2016 Assistant Professor Indian Institute of Technology Indore

Statement of Research Interests

a. **Broad research area**

- Numerical analysis

b. Research Highlights

- Two radial basis functions based collocation schemes, differentiated and integrated methods (DRBF and IRBF), are extended to solve a class of nonlinear fractional initial and boundary value problems. Before discretization, the nonlinear problem is linearized using generalized quasilinearization. An interesting proof via generalized monotone quasilinearization for the existence and uniqueness for fractional order initial value problem is given. This convergence analysis also proves quadratic convergence of the generalized quasilinearization method. Both the schemes are compared in terms of accuracy and

convergence and it is found that IRBF scheme handles inherent RBF ill-condition better than corresponding DRBF.

Publications (includes journal articles, books and book chapters)

- K. Harish Kumar and V. Antony Vijesh, Legendre wavelet based iterative schemes for fourth order elliptic equations with non-local boundary conditions, Engineering with Computers (Springer), To appear.
- G. Chandhini, K.S. Prashanthi and V. Antony Vijesh Direct and integrated radialfunctions based quasilinearization schemes for nonlinear fractional differential equations, BIT Numerical Mathematics (Springer), Vol.60, 31{65, 2020.
- Rupsha Roy, V. Antony Vijesh and G. Chandhini, Iterative methods for fractionalorder Volterra population model, Journal of Integral Equations and Applications Project Euclid), Vol.31, 245{264, 2019. https://doi.org/10.1016/j.camwa.2017.09.008

Events/ Seminars organized

- Organized a QIP course Special functions for scientists and engineers from 02nd March 2020 to 06th March 2020 at IIT Indore. (Jointly organised with Dr. Sanjeev Singh and Dr. Santanu Manna)

Projects active during April 2019-March 2020

Title - Higher Order Compact Finite Difference Methods and Monotone Iterative Algorithms For Nonlinear Partial Differential Equations.
Duration - 2019-2021.
Funding Agency - DST-SERB (MATRICS)
Brief Description - Recently, attempts are made to accelerate the finite difference based iterative procedures with monotone property. One way of accelerating the numerical algorithm is by solving the linear differential equation efficiently at each step of the iterative procedure. For example, most of the finite difference methods available in the literature have used central Difference scheme to approximate the Laplace operator. Consequently, the numerical algorithms have at most second order accuracy. By adding additional mesh points with the difference schemes researchers have improved the accuracy. In such a situation, if the new additional mesh points are not directly adjacent to the point of interest then the finite difference approximation along the boundary points require special Attention. Moreover, the resultant matrix system will have higher bandwidth. To avoid this complication, finite difference methods in which the new additional mesh points chosen from directly adjacent to the point of interest (compact stencil) are studied in literature. Most of these compact finite difference methods have been developed for linear differential equation. Moreover, when they combined with iterative scheme, to solve a nonlinear partial differential equation the iterative scheme may not converge as well as may not posses the Monotone property. In recent years, developing higher order compact finite difference iterative method for nonlinear partial differential equation which posses the monotone property has attracted special attention. In this direction, developing an efficient fourth order compact finite difference method and monotone iterative algorithms for the fourth order quasilinear elliptic boundary value problems is the main aim of this project.

Dr. Anand Parkash
Assistant Professor
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PhD. - IIT Kanpur

Previous Employment - (includes post-doctoral experience)

- Visiting Faculty, IISER Bhopal

Statement of Research Interests

a. Broad research area

- Commutative Algebra

b. Research Highlights

- I am working on Prime Submodules and Radical Formulae. For commutative rings with unity, intersection of all prime ideals is equal to the set of all nilpotent elements and it is called the radical formula for rings. Prime

submodules are generalization of prime ideals and some radical formulae have been defined for modules.

Dr. Niraj Kumar Shukla
Associate Professor
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PhD. - Indian Institute of Technology Madras

Previous Employment - (includes post-doctoral experience)

- Associate Professor at Indian Institute of Technology Indore since December 11, 2018 onwards.
- Assistant Professor at Indian Institute of Technology Indore from April 02, 2012 to December 10, 2018.
- Assistant Professor in the Department of Mathematics, Central University of Bihar, Patna from Jan. 16, 2012 to March, 2012.
- Assistant Professor in the Department of Mathematics, UCER, Naini, Allahabad from Aug. 20, 2011 to Jan. 15, 2012.
- Assistant Professor in the Department of Mathematics, Galgotias University, Greater Noida from July 01, 2011 to Aug. 19, 2011.
- Assistant Professor in the Department of Mathematics, Raj Kumar Goal Institute of Technology, Ghaziabad from Feb. 23, 2011 to June, 2011.
- Guest faculty at the Department of Mathematics, University of Allahabad, Allahabad from July, 2010 to Feb. 22, 2011

Statement of Research Interests

a. Broad research area

- Wavelet, Frame and Harmonic Analysis

b. Research Highlights

- Sobolev wavefront sets and 2-microlocal spaces play a key role in describing and analyzing the singularities of distributions in microlocal analysis and solutions of partial differential equations. Employing the continuous shearlet transform to Sobolev spaces, in this paper we characterize the microlocal Sobolev wavefront sets, the 2-microlocal spaces, and local Ho ̈lder spaces of distributions/functions. We then establish the connections among Sobolev wavefront sets, 2-microlocal spaces, and local Ho ̈lder spaces through the continuous shearlet transform.

Publications - (includes journal articles, books and book chapters)

- A. Gumber and Niraj K. Shukla, Pairwise orthogonal frames generated by regular representations of LCA groups, Bull. Sci. Math., 152(2019), 40-60.
- A. Gumber and Niraj K. Shukla, Finite dual g-framelet systems associated with an induced group action, Complex Anal. Oper. Theor, 13 (2019), 2993–3021.
- Niraj K. Shukla, S.C. Maury and S. Mittal, Semi-orthogonal Parseval wavelets associated to GMRAs on local fields of positive characteristic, Mediterranean Journal of Mathematics, vol. 16(5), pp. 20 pages, 2019.

Projects active during April 2019-March 2020

Title - Study of sampling theorem on local fields and its applications
Duration - 2019-2020.
Funding Agency - TEQIP-III

Title - A study of Shearlet frames and Shearlet transform
Duration - 2018-2021.
Funding Agency - CSIR, New Delhi

Title - Study of generalized TI system and wave-packet systems over LCA groups
Duration - 2018-2021.
Funding Agency - NBHM, DAE, Mumbai

Brief Description - Sobolev wavefront sets and 2-microlocal spaces play a key role in describing and analyzing the singularities of distributions in microlocal analysis and solutions of partial differential equations. Employing the continuous shearlet transform to Sobolev spaces, in this paper we characterize the microlocal Sobolev wavefront sets, the 2-microlocal spaces, and local Ho lder spaces of distributions/functions. We then establish the connections among Sobolev wavefront sets, 2-microlocal spaces, and local Ho lder spaces through the continuous shearlet transform.

Dr. Ashisha Kumar
Assistant Professor
akumar@iiti.ac.in

PhD. - IIT Kanpur

Previous Employment - (includes post-doctoral experience)

- Dr. DS Kothari Post-Doctoral Fellow at IISc Bangalore Jan 2011-Nov 2013

Statement of Research Interests

a. Broad research area

- Harmonic Analysis

b. Research Highlights

- End-Point Estimates of Radon Transform

Publications - (includes journal articles, books and book chapters)

- K.M. Neeshu, C. Rani, R. Kaushik, M. Tanwar, D. Pathak, A. Chaudhary, A. Kumar, Rajesh Kumar, Size Dependence of Raman Line-Shape Parameters Due to Confined Phonons in Silicon Nanowires, Adv. Mater. Process. Technlog., 2020.

Dr. Vijay Kumar Sohani
Assistant Professor
vsohani@iiti.ac.in

PhD. - HRI Allahabad

Previous Employment - (includes post-doctoral experience)

- NBHM Post doc at IISc Bangalore during November 2013-July 2016.

Statement of Research Interests

a. Broad research area

- Harmonic Analysis and PDE

b. Research Highlights

- Estimates of the kernel of the Schrodinger Propagator for the discrete Hermite Operator

Publications (includes journal articles, books and book chapters)

- Dispersion Estimates for the Discrete Hermite Operator (Jointly with Devendra Tiwari), accepted for publication in Indian J. Pure Appl. Math

Events/ Seminars organized

- Co-organizer, International Conference on Computational Mathematics and its Applications (CMA 2019), November 12-14, 2019, IIT Indore, India.

Projects active during April 2019-March 2020

Title - Some problems on Nonlinear Schrodinger equation (NLS) and Hardy- Sobolev inequality for the twisted Laplacian

Duration - March 2019- 2021

Funding Agency - Science and Engineering Research Board (SERB) (Mathematical Research Impact Centric Support (MATRICS))

Brief Description - In this project, I will investigate various properties including scattering and global existence of the Schrodinger equation associated with the Twisted Laplacian.

Fundamental solution for the p-sub-Laplacian on the Heisenberg group play an in important role in proving Hardy-Sobolev inequality for general p on the Heisenberg group, see Adimurthi and A. Sekar (Proc. Roy. Soc. Edinburgh Sect. A, 2006). My aim will be to investigate the properties of fundamental solution for the twisted p-Laplacian and to prove Hardy-Sobolev inequality for general p.

Dr. M. Tanveer
Associate Professor
mtanveer@iiti.ac.in

PhD. - Computer Science

Previous Employment - (includes post-doctoral experience)

- 2017-2019: Assistant Professor of Mathematics, IIT Indore
- 2016-Present: Ramanujan Fellow of Mathematics, IIT Indore
- 2015-2016: Postdoctoral Research Fellow at Rolls-Royce@NTU Corporate Lab, NTU, Singapore.
- 2012-2015: Assistant Professor of Computer Science and Engineering, LNMIIT Jaipur.

Academic associations with other institutions

- 11/2019 - Visiting Professor at NTUST, Taiwan

Statement of Research Interests

a. Broad research area

- Machine learning, deep learning, optimization.

b. Research Highlights

- The OPTIMAL research roup focusses on the following research areas:
- Optimization
- Machine Learning
- Support Vector Machines
- Biomedical Signal Processing
- Deep Learning
- Neuroimaging
- Applications to Alzheimer's Disease and Dementias

c. Awards and Achievements

- 04/2019 – 03/2020
  Guest Editor (Associate Editor) of Special Issue on "Robust Data Analysis and Its Applications" in Annals of Operations Research, Springer. [SCI Indexed with Impact Factor 2.58]
- Associate Editor of IEEE SMC 2020.
  Guest Editor (Associate Editor) of Special Issue on "Randomization-Based Deep and Shallow Learning Algorithms" in Applied Soft Computing, Elsevier. [SCI Indexed with Impact Factor 5.47]
- Guest Editor (Associate Editor) of Special Issue on "Artificial intelligence and deep learning for biomedical applications" in Multimedia Tools and Applications, Springer.
  [SCI Indexed with Impact Factor 2.31]
  Lead guest Editor (Associate Editor) of Special Issue on "Advanced machine learning algorithms for biomedical data and imaging" in Multimedia Tools and Applications, Springer.
  [SCI Indexed with Impact Factor 2.31]
- Lead guest Editor (Associate Editor) of Special Issue on "Advances of machine learning in data analytics and visual information" in Multimedia Tools and Applications, Springer.
  [SCI Indexed with Impact Factor 2.31]
- Lead guest Editor (Associate Editor) of Special Issue on "Computational Intelligence for Biomedical Data and Imaging" in ACM Transactions on Multimedia Computing, Communications, and Applications (TOMM).
  [SCI Indexed with Impact Factor 3.27]

- Editorial Review Board Member: Applied Intelligence, Springer. [SCI Indexed with Impact Factor 3.32]
- Section Editor: Smart Science and Taylor Francis (Scopus and ESCI indexed).
- Visiting Professor at NTUST, Taiwan during Nov. 2019.

Publications - (includes journal articles, books and book chapters)

- M Khan, T Hussain, M Tanveer, G Sannino, V Albuquerque (2020). Cost-Effective Video Summarization using Deep CNN with Hierarchical Weighted Fusion for IoT Surveillance Networks, IEEE Internet of Things Journal, 7(5): 4455-4463.
  [SCI Indexed with Impact Factor: 9.93]
- M. Tanveer, Tarun Gupta, Miten Shah (2020). Pinball Loss Twin Support Vector Clustering, ACM Transactions on Multimedia Computing, Communications, and Applications (TOMM).
  [SCI Indexed with Impact Factor: 3.27]
- Tarun and Miten are B.Tech. (CSE) 2nd year students of IIT Indore.
  M.A. Ganaie, M. Tanveer, P.N. Suganthan (2020). Oblique decision tree ensemble via twin bounded SVM, Expert Systems with Applications, Elsevier, 143: 113072.
  [SCI Indexed with Impact Factor: 5.45]

Events/ Seminars organized

- TEQIP Sponsored 04 days Short Term Course on Fundamentals of Data Analytics at IIT Indore during Nov. 30-Dec. 03, 2019. [Coordinator]
- International Conference on Computational Mathematics and its Applications (CMA 2019) at IIT Indore during November 12-14, 2019. [General Chair]
- Special Session on "Non-parallel Support Vector Machine Classifiers" under IEEE SMC 2019 from October 06-09, 2019, Italy. [Organising Chair]
- Special Session on "Soft Computing: Data Driven Approach for Bio-medical and Healthcare" under IEEE SMC 2019 from October 06-09, 2019, Italy. [Organising Chair].

Projects active during April 2019-March 2020

Title - Classification and prediction of Alzheimer disease using multimodal imaging data
Duration - 2016-2021
Funding Agency - Science and Engineering Research Board (SERB), New Delhi, INDIA under Ramanujan Scheme
Brief Description - The main objective is to develop a new machine learning approach that can integrate multimodal data in order to classify Alzheimer disease patients and predict their evolution, starting from the earliest stages of the disease.

Title - Optimization models and algorithms for non-parallel support vector machines
Duration - 2017-2020
Funding Agency - Science and Engineering Research Board (SERB), New Delhi, INDIA under Ramanujan Scheme.
Brief Description - Support vector machine (SVM) is one of the most important techniques of machine learning for classification problems. Twin support vector machine (TWSVM) is regarded as a milestone in the development of the powerful SVM. Our aim to develop novel optimization techniques for non-parallel support vector machines.

Title - Detection of human brain disorders using novel machine learning approaches
Duration - 2018-2021
Funding Agency - Council of Scientific & Industrial Research (CSIR), New Delhi, INDIA under Extra Mural Research (EMR) Scheme
Brief Description - Epilepsy is one of the most common neurological disorder diseases affecting over 70 million people world-wide, 85% of which belong to the developing countries. Epilepsy is an electrophysiological disorder of the brain, characterized by recurrent seizures. Electroencephalogram (EEG) is a test that measures and records the electrical activity of the brain, and is widely used in the detection and

analysis of epileptic seizures. The proposed machine learning approach can be used as a tool for assisting doctors for automated seizure detection.

Title - Development of novel machine learning algorithms for automated detection of seizure using EEG signals
Duration - 2019-2022
Funding Agency - Department of Science and Technology (DST) research project under ICPS - Data Science Research Initiative Scheme
Brief Description - The main objective of this project is to develop novel machine learning approach for automated detection of seizure using EEG signals. The performance of the developed approach will be compared with the existing approaches using several measures including classification accuracy, sensitivity, specificity, computational complexity and Matthews's correlation coefficient etc.

Title - Digital forensic knowledge integration and intelligence (DIREKT-Intel)
Duration - 2019-2021
Funding Agency - Ministry of Human Resource and Development (MHRD) research project under SPARC Scheme
Brief Description - Digital forensic investigation involves collecting digital evidence from multiple digital devices and analyzing the evidence to reconstruct crime scenes. Traditional digital forensic methods assume a clean, and complete evidence to reconstruct a crime scene. However digital evidence collected from a real crime scene can be noisy, incomplete and misleading. In addition, the evidence required may be hidden within thousands of logs generated from devices, different applications and security components. Thus in this project we will propose methods which can handle large volumes and variety of digital evidence and work with noisy and /or partial data. These objectives are achieved in this project by developing novel event correlation algorithms which can handle missing and incomplete set of logs, designing threat intelligence driven proactive event logging and evidence collection models, developing hypothesis testing methods and also proposing novel Neuro Fuzzy based computational intelligence algorithms for digital forensics.

Dr. Sanjeev Singh
Assistant Professor
snjvsngh@iiti.ac.in

PhD. Indian Institute of Technology Madras

Previous Employment (includes post-doctoral experience)

- SERB- National Post-Doctoral Fellow, Indian Institute of Technology Indore, June 23, 2017 to September 29, 2017
- Post-Doctoral Fellow, Stat Math Unit, Indian Statistical Institute Chennai Centre, December 08, 2016 to June 22, 2017.
- Pre-Doctoral Fellow, Department of Mathematics, Indian Institute of Technology Madras, June 04, 2016 to December 03, 2016.

Statement of Research Interests

a. Broad research area

- Special Functions, Differential Equations, Geometric Function Theory

b. Research Highlights

- Currently, we are working on various properties of some special functions, namely, Bessel function, Hyper-Bessel function, Struve function, Marcum function, etc. We work on geometric as well as classical properties of these special functions.

Publications (includes journal articles, books and book chapters)

- I.Aktas, Á.Baric,S. Singh: Geometric and monotonic properties of hyper-Bessel functions, Ramanujan Journal, 51, (2020) 275-295, https://doi.org/10.1007/s11139-018-0105-9

Events/ Seminars organized

- QIP course on "Special function for Scientists and Engineers", March 2-6, 2020, IIT Indore

Dr. Bapan Ghosh
Assistant Professor
keshab.bapan@iiti.ac.in

PhD. - Indian Institute of Engineering Science and Technology, Shibpur

Previous Employment (includes post-doctoral experience)

- Visiting Researcher, INRIA Sophia Antipolis (France) from January 2014-July 2014
- Assistant Professor, NIT Meghalaya from January 2015-September 2019

Statement of Research Interests

a. Broad research area

- Nonlinear Dynamics and Mathematical Biology

b. Research Highlights

- We are working on delay differential equations applied to population dynamics problems. More specifically, we are interested to study the dynamics of spatially coupled system of predator-prey models under the influence of time delay factors. It is interesting to explore how delayed dispersal can stabilize or destabilize system dynamics. Several mathematical theories, methods and computational techniques are implemented to investigate complex dynamics. Balanced harvesting approach applicable to biological conservation theory is another research theme in our group. We focus to address the extinction, persistence, ecological resilience, trophic structure, etc. in multi-specie models.

Publications (includes journal articles, books and book chapters)

- B. Ghosh, O. L. Zhdanov, B. Barman, E. Ya. Frisman, Dynamics of stage-structure predator-prey systems under density-dependent effect and mortality, Ecological Complexity , vol. 41, pp. 100812, 2020

Dr. Santanu Manna
Assistant Professor
santanu@iiti.ac.in

PhD. - IIT (ISM) Dhanbad

Previous Employment (includes post-doctoral experience)

- International Newton Fellowship (Newton Bhabha Fellow) at Keele University, UK

Academic associations with other institutions (Affiliate/Adjunct/ Visiting posts)

- Indian Institute of Technology Indore (2016-2019)
- Indian Institute of Science Education and Research Kolkata (2015-2016)

Statement of Research Interests

a. Broad research area

- Partial Differential Equations,
- Wave Propagation,
- Mathematical Seismology

b. Research Highlights

- Dr. Manna is working on Applied Partial Differential Equations and Mathematical Modelling of Geomechanics including asymptotic analysis, modelling of physical systems, wave propagation and theoretical seismology. His team is also working on the development, numerical and analytical study for solving large-scale scientific and engineering problems in wave field. Moreover, Dr. Manna is working on earthquake source parameters and earthquake statistical analysis of the extensive earthquakes data in order to get the most efficient earthquake forecasting analysis.

c. Awards and Achievements

Foreign Visit:

- 2019 United Kingdom, Newton-Bhabha Fellow, 1st Feb to 19th Sept 2019.
- 2019 Russia, Saint Petersburg, June 23-30, 2019.
- 2019 Spain, Valencia, July 14-20, 2019.

- 2019 USA, Syracuse University, July 31- August 4, 2019.
- 2019 USA, Brown University, August 4-10, 2019.

Publications (includes journal articles, books and book chapters)

- Manna, S. and Anjali, T.C., Rayleigh type wave dispersion in an incompressible functionally graded orthotropic half-space loaded by a thin fluid-saturated aeolotropic porous layer, Applied Mathematical Modelling (Elsevier), Accepted, 2020.
- Sharma, D.K.; Bachher, M.; Manna, S.; Sarkar, N., Vibration analysis of functionally graded thermoelastic nonlocal sphere with dual-phase-lag effect, Acta Mechanica (Springer), Accepted, 2020.
- Manna, S., Datta, B.N., Ahmad, S.S. (Eds.), Mathematical Modelling and Scientific Computing with Applications, Springer-Nature Book in Mathematics & Statistics vol. 308, DOI: 10.1007/978-981-15-1338-1, 2020.

Events/ Seminars organized

- Coordinator (2020): One week Workshop under Quality Improvement Programme (QIP), on "Special Functions for Scientists and Engineers", held during March 02-06, 2020, IIT Indore.
- Coordinator (2020): 10 Days Faculty Training Programme under TEQIP-3 (NPIU) on "DATA Science and Analytics", held during March 02-12, 2020, IIT Indore.
- Coordinator (2020): TEQIP-III Active Learning Course on "Introduction to Scientific Computing in Engineering", held during January 15-17, 2020, IIT Indore.

Projects active during April 2019-March 2020

Title - Rayleigh wave propagation under various effective boundary layers
Duration - 2019-2020
Funding Agency- TEQIP-III under Collaborative research project scheme
Brief Description - The principal target of the proposal is to establish a straightforward analytical and numerical treatment of internal structure behaviour of elastic parameters in low-frequency as well as high-frequency vibrations of symmetric piecewise uniform anisotropic non-homogeneous media due to Rayleigh wave propagation.

Title - Asymptotic Analysis of The Surface Wave Field in an Irregular Boundary Surface Semi-Infinite Medium
Duration - 2019-2020
Funding Agency - TEQIP-III under Collaborative research project scheme
Brief Description - The focus of this project to study the surface wave field in an irregular boundary surface semi-infinite half-space induced by an interior time-harmonic point source. Hyperbolic-elliptic asymptotic model for surface elastic waves will be studied in detail.

Dr. Vinay Kumar Gupta
Assistant Professor
vkg@iiti.ac.in

PhD. - RWTH Aachen University, Germany

Previous Employment (includes post-doctoral experience)

- **Commonwealth Rutherford Fellow** (postdoc), Mathematics Institute, University of Warwick, United Kingdom (26 March 2018 - 28 September 2019)
- **Assistant Professor**, Department of Mathematics, SRM Institute of Science and Technology, Chennai, India (01 September 2016 - 19 March 2018)
- **Post-doctoral Fellow**, Max Planck Institute for Dynamics and Self-Organization, Göttingen, Germany (14 January 2016 - 31 August 2016)
- **Associate Software Engineer**, Accenture Services Pvt. Ltd., Mumbai, India (16 August 2007 - 16 July 2008)

Statement of Research Interests

a. Broad research area

- Mathematical modelling of rarefied gases

b. Research Highlights

- For rarefied gas flows with moderate rarefaction, traditional models, such as the Euler or Navier–Stokes equations, are inadequate while direct numerical solutions of the Boltzmann equation are computationally very expensive. Dr. Gupta works on developing sophisticated models that describe these flows with comparatively very less computational cost using the tools of kinetic theory. At present, his research interests also include modelling rarefied granular gases, noble gas mixtures and granular gas mixtures as well.

Publications (includes journal articles, books and book chapters)

- **Gupta, V. K.** (2020) Moment theories for a d-dimensional dilute granular gas of Maxwell molecules, Journal of Fluid Mechanics, 888, A12 (Pages: A12-1 to A12-57).
- Shukla, P., Biswas, L. and **Gupta, V. K.** (2019) Shear-banding instability in arbitrarily inelastic granular shear flows, Physical Review E, **100**, 032903.

Projects active during April 2019-March 2020

Title - Analytical and numerical study of rarefied binary gas mixtures
Duration - June 2018 – June 2021
Funding Agency - Science and Engineering Research Board (SERB), Government of India (under MATRICS scheme)
Brief Description - Under this project, the investigator is investigating some benchmark/physical problems in binary monatomic gas mixtures analytically and/or numerically with the developed Grad and regularized moment models.

Dr. Bibekananda Maji
Assistant Professor
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PhD. - 21st February, 2017

Previous Employment - (includes post-doctoral experience)

- 26th December, 2016 - 31st September, 2019, National Post-doctoral Fellow at IIT Gandhinagar

Publications (includes journal articles, books and book chapters)

- P. K. Dey, P. Das, S. S. Rout, and B. Maji, Perfect powers in alternating sum of consecutive cubes, Glasnik Mathematicki, Vol 55, 37–53, 2020.
- H. Y. Li, B. Maji, and T. Kuzumaki, A Generalization of the Secant Zeta Function as a Lambert Series, Mathematical Problems in Engineering, Article 7923671, 2020.

Dr. Charitha Cherugondi
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PhD. Indian Institute of Technology Kanpur

Previous Employment (includes post-doctoral experience)

- Assistant professor, Department of Mathematics, NIT Calicut, 2009-2011.
- Postdoctoral Researcher at NAM, University of Goettingen, 2011-2015.

Statement of Research Interests

a. Broad research area

- Optimization theory

b. Research Highlights

- Nonsmooth regularization for solving variational inequalities through the generalization of the suitable gap functions for variational inequalities with set valued maps.
- Algorithmic strategies for solving vector variational inequalities and vector optimization problems.

- Algorithms involving a combination of a proximal step and a gradient step for solving a convex optimization problem with specific structure on the constraint set.

Projects active during April 2019-March 2020
Title - Solutions strategies for vector optimization problems and variational inequalities-a gap function approach through regularization.
Duration - Dec 2019- March2020
Funding Agency - DST
Brief Description - This project focuses on a thorough study of solution methods for a few classes of problems in the area of convex optimization, which includes mathematical analysis and algorithmic strategies. One of the aims of this project is to investigate the algorithmic strategies for solving a vector optimization problem through gap function approach, while exploiting the error bounds that are constructed. Further, this project attempts a detailed study regularization strategy for solving a vector optimization problem. Another aim of this project is to investigate the solution methods for a variational inequality through approximating the dual gap function. Another part of work in this direction is to generalize the regularization strategy that we used to directly regularize the function that is appearing in a variational inequality.

Dr. Anupam Pal Choudhury
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PhD. - TIFR- Centre for Applicable Mathematics, Bangalore

Previous Employment - (includes post-doctoral experience)
Post-doctoral Research scholar, RICAM, Linz, Austria

Statement of Research Interests

a. Broad research area

- Partial Differential Equations

b. Research Highlights

- Inverse problems and partial differential equations of evolution type

Publications (includes journal articles, books and book chapters)

- The equivalent media generated by bubbles of high contrasts: Volumetric metamaterials and metasurfaces (Joint work with Habib Ammari, Durga Prasad Challa, Mourad Sini), Multiscale Model. Simul. 18 (2020), no. 1, 240-293.

Department of Physics

From the desk of Head:

Department of Physics was established in July 2009 at the time of inception of IIT Indore. The department has shown expansion in every aspects including number of students, faculty members, research projects and research facilities year by year. In the present era, when research and education has become an utmost important aspect of the progressive life and culture, the department has developed very advanced research facilities to train and educate students with a blend of basic knowledge. With the advanced PG courses and training, the department targets to enhance the perception of students in education and research. As a result, the department has shown a rapid growth in publications with a total of *530* publications in international journals and total external funding worth *Rs 13.7 crore* through research projects. Presently there are *21* ongoing projects worth Rs *8.8 crore* supported by the external funding agencies.

Our faculty members have expertise in diverse areas like theoretical and experimental condensed matter physics, theoretical and experimental high energy physics, complex networks and nonlinear dynamics, and computational physics.

Accomplishments of Department of Physics

1. No. of PhD. students graduated since inception in 2009: 32
2. No. of MSc. students graduated (program started in 2013): 73
3. No. of international conferences held : 02
4. Journal papers: 530
5. Conference papers: 40
6. Book chapters: 04
7. Projects completed: 18
8. Ongoing projects: 21

Prof. Krushna R. Mavani
Professor & Head
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Prof. Krushna R. Mavani is working as Professor in the Department of Physics. She joined IIT Indore in 2009 after completing her postdoctoral tenure of about 3.5 years at Osaka University, Japan and Kyoto University, Japan. She was awarded by 'Wakastayoshiki' research fund as Principal Investigator for her project at Kyoto University. Before this, she worked as a Research Fellow at Tata Institute of Fundamental Research (TIFR), Mumbai for about 3 years. In 2003, she completed her PhD. from Saurashtra University, which included major collaboration with TIFR, Mumbai. She also worked as Junior Research Fellow in a collaborative project of Saurashtra University and Inter-University Centre for Acceleration (Former Nuclear Science Centre), New Delhi, on High Temperature Superconductor Thin Films.

Selected publications

- Tuning of exchange bias with interfacial ferromagnetism in NdNiO3/NdMnO3 heterostructures S. Harisankar, Mahesh Chandra, **K. R. Mavani**.
  Journal of Magnetism and Magnetic Materials 477, 35 (2019).
- Strain-mediated effects of oxygen deficiency and variation in non-Fermi liquid behavior of epitaxial $PrNiO_3$ thin films
  Harisankar S, Kavita Soni, Ekta Yadav, **Krushna R. Mavani,**
  Journal of Physics: Condensed Matter 31 (2019).
- UV activated visible-blind Ga:ZnO photodetectors using the GLAD technique: a comparative study in different gas atmospheres and temperatures
  Ankit Soni, Komal Mulchandani, K. R. Mavani.
  J. Mater. Chem. C, 2020,8, 7837-7846 (2020)

Research Highlights:

She works in the area of Experimental Condensed Matter Physics. Her research interests include Terahertz Spectroscopy of functional oxides, thin films, multilayered structures and nanostructures by Pulsed Laser Deposition method. She studies phenomena like first order metal- insulator transition, structure-property correlations, charge dynamics in functional oxides, strongly correlated properties and phase transitions. Currently, her research group includes six PhD. students. Four PhD. and three M.Sc. students have been graduated under her guidance.

The group's research focuses on:

- Growth of high quality crystalline thin films.
- Growth of nanostructures using PLD
- Study of Structure-Property correlation
- Functional Oxides and Devices based on that.

Current Research Projects:

- Terahertz spectroscopic investigations on oxygen adsorption-desorption effects in nanoporousZnO films for visible-blind UV photodetection (Funded by SERB, GOI).
- Influence of Strain and Carrier Injection on Electrical and Magnetic Properties of RNi1-xDxO3 (R=Rare earth metal, D = Dopant) Thin Films and Multilayers (Funded by BRNS)

Prof. Subhendu Rakshit
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Prof. Subhendu Rakshit obtained his PhD degree from University of Calcutta in 2001 and moved to Harish Chandra Research Institute, Allahabad and then to the Technion, Israel for his postdoctoral research. After a brief stint at the Saha Institute of Nuclear Physics, India in 2005 he continued his postdoctoral studies at TU-Dortmund, Germany till 2008. After that he moved to TIFR, India as a Visiting Scientist before joining IIT Indore in July 2009. Currently he is interested in the physics studies related to the IceCube experiment located at the Antarctica measuring high-energy neutrinos coming from extra-galactic sources and explorations of physics beyond the standard model of particle physics.

Broad area of research : Theoretical High Energy Physics.

Selected Publications:

- Strong constraints on non-standard neutrino interactions: LHC vs. IceCube, By Sujata Pandey, Siddhartha Karmakar and Subhendu Rakshit, JHEP 11 (2019) 046.
- Relaxed constraints on the heavy scalar masses in 2HDM, By Siddhartha Karmakar and Subhendu Rakshit, Phys. Rev. D 100 (2019) 055016.

Research Highlights:

Extremely high energetic neutrinos that arrive at Earth from extragalactic sources allow us to probe physics at an energy scale accessible to the Large Hadron Collider (LHC) at CERN and beyond. We presented a comparative study between IceCube and LHC to constrain interaction of neutrinos with the matter. We have also explored if additional Higgs like scalars do exist in Nature and how they may leave their imprints in experimental measurements at the LHC. Especially, if new physics beyond the Standard Model of Particle physics do exist at very high energy, what could be its possible implication while deciphering such measurements.

Research Projects:

- Flavour physics and dark matter: reconnecting the dots (Funded under DAAD-DST, GOI). It is a bilateral collaboration project with TU-Dortmund, Germany.
- Exploring New Physics with Dark Matter and Neutrinos (Funded by SERB-DST, GOI under Core Research Grant scheme).
- Additional scalars, neutrinos and the origin of the Universe: The dark connection (Funded by SERB-DST, GOI under MATRICS scheme).

Prof. Sarika Jalan
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Prof. Sarika Jalan has done her PhD.in non-linear dynamics and Complex Systems from Physical research laboratory and was Senior research fellow at the National University of Singapore, Singapore and guest Scientist and Post doctorate fellow, respectively, at Max Planck Institute for the Physics of Complex Systems, Dresden, and Max-Planck Institute of Mathematics in the Sciences, Leipzig Germany. She is elected executive council member of International society of complex systems (CSS) 2019-2021. She is Editorial board member of Chaos Soliton & Fractals, as well as Associate Editorial Board member of Chaos: An interdisciplinary journal of nonlinear systems.

Area of research is Complex Systems, Computational Biology and Nonlinear Dynamics.

Selected Publications:

- Inter-layer adaptation induced explosive synchronization in multiplex networks, Anil Kumar, **Sarika Jalan*** and Ajay Deep Kachhvah, Phys. Rev. Res. 2 (2), 023259 (2020)
- Wheel graph strategy for PEV localization of networks, **Sarika Jalan*** and Priodyuti Pradhan, EPL 129, 46002 (2020)
- The human body as a super network: digital methods to analyse propagation of ageing, Harry Whitwell, Maria Giulia Bacalini, Oleg Blyuss, Shangbin Chen, Paolo Garagnani, Susan Yu Gordleeva, **Sarika Jalan**, et. al., Frontiers in Aging Neuroscience 12, 136 (2020)
- Principal eigenvector localization and centrality in networks: Revisited, Priodyuti Pradhan, Angeliya C.U. and **Sarika Jalan***, Physica A 124169 (2020)
- Explosive synchronization in frequency displaced multiplex networks, **Sarika Jalan*,** Anil Kumar and Inmaculada Leyva, Chaos (Fast Track) 29 (4), 041102 (2019)
- Delay Regulated Explosive Synchronization in Multiplex Networks, Ajay Deep Kachhvah and **Sarika Jalan***, New Journal of Physics 21, 015006 (2019)

Research Highlights:

Dr. Jalan primarily explores into structural and dynamical behaviors of real-world complex systems where the underlying network can be expressed in multiplex framework, these can be broadly stated as:

- Complex Networks.
- Spatio-temporal Chaos.
- Synchronization in Spatially Extended Systems.
- Spectral Graph Theory.
- Computational Biology.

Events and Seminars Organized:

- Mini-symposium "Complex Networks" at CNSD 2019, December 2019, IIT Kanpur.

Invited Talks and Colloquia:

- 4th International Conference on Computational Intelligence and Networks (CINE 2020), 27-29 February 2020 held at ISI Kolkata.
- Invited speaker at WE-Heraeus-Seminar on Quantization of Dissipative Chaos: Ideas and Means 16 - 20 December 2019 at the Physikzentrum Bad Honnef, Germany
- Invited talk at CNSD 2019, 11-16 December 2019, held at IIT Kanpur
- Invited speaker, International conference on complex systems CSS 2019, September 30-October 04, 2019, held at NTU Singapore
- Invited speaker at minisymposium on Bio Networks organized at PhysCon 2019, 08-11 September, Kazan Russia.

Research Projects:

- Spectral Analysis of Multiplex Networks (Funded by BRNS).
- Extreme Value Statistics and evolution of various patterns in real world complex systems (Funded by CSIR, GOI).
- Analysis of Interplay of Multiplexing and Optimization in Complex Networks (Funded by DST, GOI)

Dr. Sudeshna Chattopadhyay
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Dr. Sudeshna Chattopadhyay (Bandyopadhyay) is an Associate Professor in Department of Physics at IIT Indore. Dr. Chattopadhyay has done her PhD. from the Saha Institute of Nuclear Physics, Calcutta, India, and postdoctoral research at the Department of Physics, Northwestern University, USA (2008-2010), and subsequently joined as a Research Associate in the Department of Materials Science and Engineering, Northwestern University, USA, under Energy Frontier Research Center (EFRC) project in collaboration with Argonne National Lab, (2010-2012), before starting to work as an Assistant Professor at IIT Indore from June 2012. She holds an affiliated Assistant Professor of Physics in Department of Physics, New Mexico State University (NMSU), USA (since Sept 1, 2015). She is a recipient of Deutscher Akademischer Austausch Dienst (DAAD) Faculty Award (2013).

Selected Publications (2019-2020):

- "Confinement induced variation of compositional ratio in amorphous silicon carbide thin films and effect in optical properties"
- Aakash Mathur, Dipayan Pal, Ajaib Singh, Rinki Singh, Parasmani Rajput, R. J. Chaudhary, and Sudeshna Chattopadhyay*, Journal of Non-Crystalline Solids, 536, 120009 (2020).
- "Thickness dependence of infrared lattice absorption and excitonic absorption in ZnO layers on Si and SiO2 grown by atomic layer deposition"
- Nuwanjula S. Samarasingha, Stefan Zollner, Dipayan Pal, Rinki Singh, and Sudeshna Chattopadhyay, Journal of Vacuum Science & Technology B, 38, 042201 (2020).
- "An efficient pH sensitive hydrogel, with biocompatibility and high reusability for removal of methylene blue dye from aqueous solution" Rinki Singh, Dipayan Pal, AakashMathur, Ajaib Singh, Mena Asha Krishnan, Sudeshna Chattopadhyay, Reactive and Functional Polymers, 144, 104346 (2019).
- "Structure and morphology of atomic layer deposition grown ZnO thin film / nanostructure on polymeric template" Ajaib Singh, Aakash Mathur, Dipayan Pal, Amartya Sengupta, Rinki Singh, Sudeshna Chattopadhyay, Materials Today Proceedings,18 (3), 1517-1523 (2019).
- "Dual ion beam grown silicon carbide thin films: variation of refractive index and band gap with film thickness"Aakash Mathur, Dipayan Pal, Ajaib Singh, Rinki Singh, Stefan Zollner and Sudeshna Chattopadhyay, Journal of Vacuum Science & Technology B, 36, 041802 (pg. 1-10) (2019).
- "Violet emission of ALD grown ZnO nanostructures on confined polymer films: Defect origins and emission control via interface engineering based on confinement of underneath polymer template"

- Aakash Mathur, Dipayan Pal, Ajaib Singh, Amartya Sengupta, Rinki Singh, and Sudeshna Chattopadhyay*, Macromolecular Chemistry and Physics, 1800435 (pg. 1-7) (2019).
- "Near room temperature atomic layer deposition of ZnO thin films on poly (methyl methacrylate) (PMMA) templates: A study of structure, morphology and photoluminescence of ZnO as an effect of template confinement"
- Ajaib Singh, Aakash Mathur, Dipayan Pal, Amartya Sengupta, Rinki Singh, Sudeshna Chattopadhyay*, Vacuum, 161, 398 – 403 (2019).

Patent:

"Method of enhanced lithiation of doped silicon carbide via high-temperature annealing in an inert atmosphere" Mark C. Hersam, Albert L. Lipson, Sudeshna Bandyopadhyay (Chattopadhyay), Hunter. J. Karmel, Michael J. Bedzyk, U.S. Patent No.: US 8,734, 674 B1; Date of Patent: May 27, 2014.

Research Highlights:

Her research is focused on Experimental Condensed Matter Physics:

- Study of Surface and Interfaces – nanomaterials, thin-films, structure property relationship - optical properties, photocatalytic activity, application in solar cell.
- Electrical Energy Storage- building better batteries and supercapacitors – Li and Al ion batteries.
- Soft matter physics.
- Biomedical Applications of Nanotechnology: Bio-instrumentation.

Events and Seminars Organized:

Organized/Conducted A Short Term Course on "Differential Equations: Theory, Computation and Applications" under Continuing Education Program (CEP) at IIT Indore 11-14 December 2017. Program organizing committee of the four-day interdisciplinary course: Drs. Santanu Manna (Mathematics), Parimal Kar (BSBE), Antony Vijesh (Mathematics), Sudeshna Chattopadhyay (Physics).

Research Projects:

- "Study of structural and electronic properties of low-dimensional systems of technological importance", German Academic Exchange Service (DAAD) funded project LUH-IIT Indore Partnership (2019-2023) under the "A New Passage to India program". The proposal from Leibniz University Hannover (LUH) with IIT Indore, as one of the recipients among six, from IIT Indore.
- DST-FIST grant proposal for Raman Spectrophotometer (Funded under DST-FIST), as a contributor from the Department, a Department of Physics proposal.
- "Structural orientation effects of new low dimensional hybrid perovskites on their physical properties", as Co-PI, in collaboration with TIFR, India (Jan 2020- Dec 2022)

Dr. Rajesh Kumar
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Dr. Rajesh Kumar is an experimental solid state physicist. He completed his PhD. from IIT Delhi and was a post-doctoral Scientist at NRC-NINT, University of Alberta, Canada before joining IIT Indore. His area of interest includes Nanoscience & Nanotechnology, Raman Spectroscopy, Electrochromic Devices, Silicon nanostructures, synthesis and applications of functional nanomaterials, organic and inorganic semiconductors, Sensors.

Selected Publications:

- Devesh K. Pathak, Anjali Chaudhary, Manushree Tanwar, Uttam K Goutam, and Rajesh Kumar, Nano-cobalt oxide/viologen hybrid solid state device: Electrochromism beyond chemical cell, Appl. Phys. Lett. 116, 141901 (2020).

- Anjali Chaudhary, Devesh K Pathak, Suchita Kandpal, Tanushree Ghosh, Manushree Tanwar, Rajesh Kumar, Raw hibiscus extract as redox active biomaterial for novel herbal electrochromic device, Solar Energy Materials and Solar Cells 215, 110588 (2020).
- Manushree Tanwar, Devesh K. Pathak, Anjali Chaudhary, Shailendra K. Saxena and Rajesh Kumar, Unintended Deviation of Fermi Level from Band Edge in Fractal Silicon Nanostructures: Consequence of Dopants' Zonal Depletion, J. Phys. Chem. C 124, 16675 (2020).
- Anjali Chaudhary, Devesh K. Pathak, Manushree Tanwar, and Rajesh Kumar, Tracking Dynamic Doping in a Solid-State Electrochromic Device: Raman Microscopy Validates the Switching Mechanism, Anal. Chem. 92, 6088 (2020)
- Anjali Chaudhary, Devesh K Pathak, Manushree Tanwar, J. Koch, H Pfnür, Rajesh Kumar Polythiophene-nanoWO_3 bilayer as an electrochromic infrared filter: a transparent heat shield Journal of Materials Chemistry C 8, 1773 (2020).

Research Highlights:

His approach towards research is two fold where he not only investigates the basic physical phenomena taking place at microscopic level but also designs materials for real applications like field emission and electrochromic displays, sensors and energy storage. Inspired by nature, recently his group has synthesized different organic, inorganic, hybrid as well as Herbal nanomaterials for such applications. His group has discovered a new method for quantification of short-range order in amorphous materials by simply utilizing Raman spectroscopy.

The metal oxide nanothorns developed in his group has shown thousand times improvement in field emission properties and has potential in application as display devices. A recent development has been done in obtaining multiple color switching from designed electrochromic device using conducting polymer. His group has also developed a method to design nanomaterials for a specific purpose.

Events and Seminars Organized:

Demonstration in outreach activity on Science Day-2020.

Research Projects/Achievements:

- **Fabrication and Investigation of Electrochromic Electrodes for Improving Device Performance** (Funded ~ 30Lakhs INR by SERB, GOI).
- Awarded **"Best technology Development award-2020"** by IIT Indore for development of "*Electrochromic Heat Shield: a Cool device*".

https://timesofindia.indiatimes.com/city/indore/iit-is-marvel-project-a-device-that-filters-heat-from-sunlight/articleshow/68455885.cms

The Times of India: Indore, 18 March 2019

IIT-I's marvel project: A device that filters heat from sunlight

Meenakshi Sharma
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HOW THE 'COOL' MACHINE WORKS

- When an electrical bias of 1V is applied, the device becomes transparent allowing only visible light to pass but filters the heat (infrared radiation) from sunlight. This helps a building remain cooler than external environment without compromising on visibility
- This property of the device is used for lighting and thermally insulating features of buildings

Indore: It's a eureka moment for Indian Institute of Technology (IIT) Indore. A research team has developed technology that will keep houses and cars cooler than external environment by insulating about 50 per cent of direct heat from the sun. The electrochromic device can be used in smart windows, flexible devices, automobile industry to modulate colour and heat with one's requirements without compromising on visibility inside. Currently, the device is 50 per cent heat insulated. But the quest for perfection is on as the institute is working on enhancing capacity to around 70 per cent for better results.

A team of four members were working on this technology for over three years sociate professor of Physics at IIT-Indore, main investigator Anjali Chaudhary, Devesh Pathak and Manushree Tanwar.

Kumar said, "This device insulates the two environments and minimizes flow of heat. It allows normal light to pass through but blocks the heat. It stops approximately 50 per cent heat component of sunlight de temperature." It is easy to install the device on transparent glass substrates as well as on flexible ones allowing one to integrate them on windows of any shape.

Kumar said that in winters inside temperature can be kept warm with help of this device that can be easily fitted on to any normal glass used in buildings, cars and industries.

sunlight that falls on earth consists of visible and infrared radiation. If these two components are isolated, a better solution to use them can be achieved with minimum utilization of energy.

Currently, almost 41 per cent of energy consumption in the world takes place to maintain appropriate light and temperature conditions in buildings.

Main Investigator Anjali Chaudhary said that the device insulates two sides so that comparatively less energy is required to maintain temperature, either by air conditioning or heating, in one side. The new technology relies on organic materials and consumes very little energy. The institute is planning to apply for patent once performance of device reaches 70 per cent of heat

आईआईटी ने आर्गेनिक सामग्री से बनाई स्मार्ट विंडो डिवाइस

इंदौर। नईदुनिया रिपोर्टर

ज्यादातर घरों या इमारतों में देखने को मिलता है कि सूर्य की रोशनी के लिए बनाई गई खिड़कियों से रोशनी तो आती है, लेकिन साथ में सूर्य की हिटिंग भी प्रवेश करती है। इससे घर या इमारत में अगर एयर कंडीशनर्स होता है तो इससे बाहरी से आ रही हिटिंग से उपकरण को तापमान ठंडा बनाए रखने के लिए ज्यादा वर्क करना पड़ता है। इससे एनर्जी की खपत बढ़ जाती है। (आईआईटी) इंदौर ने एक ऐसी टेक्निक ईजाद की है जिससे इमारत, घर या चार पहिया वाहनों के अंदर के तापमान को बेहतर बनाए रखा जा सकता है। ऑल आर्गेनिक फ्लेक्सिबल इलेक्ट्रोक्रोमिक डिवाइस नाम का उपकरण स्मार्ट विंडो की तरह काम करता है। इससे सूर्य से आने वाली रोशनी को फिल्टर किया जा सकता है। यानी बंद कमरे में रोशनी तो आएगी, लेकिन इसकी हिटिंग अंदर नहीं आ पाएगी। डिवाइस में आर्गेनिक सामग्री का उपयोग किया गया है, जिससे

सूर्य की रोशनी के तापमान का असर घर के अंदर नहीं होगा

41 फीसदी एनर्जी का उपयोग वातावरण को संतुलित करने में

आईआईटी द्वारा दी गई जानकारी में कहा गया है कि दुनिया में 41 फीसदी एनर्जी का उपयोग हम इमारतों और घरों के अंदर वातावरण को संतुलित करने में कर देते हैं। इस तरह के डिवाइस का उपयोग करने से बाहर के वातावरण का असर घर के वातावरण पर नहीं पड़ेगा। बस और अन्य वाहनों में भी इस डिवाइस का उपयोग करके एनर्जी बचाई जा सकती है। आईआईटी इंदौर के डॉ. राजेश कुमार और अंजलि चौधरी ने रिसर्च

Dr. Pankaj R. Sagdeo
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Dr. Pankaj R. Sagdeo has done his PhD. from UGC-DAE CSR Indore and held positions of Scientific Officer-D at Bhabha Atomic Research Centre, Visakhapatnam, and Postdoctoral Researcher at UGC-DAE- CSR Beamline on Indus-I and Indus-II Indian Synchrotron source.

The research group headed by Dr. Pankaj Sagdeo is mainly working on the physics of highly correlated electron systems such as Manganite, High Tc superconductors, titanates, nickelite, cuperates etc. and exploring the Physics of Solar Cell materials.

Selected Publications:

- M Kamal Warshi, Anil Kumar, Aanchal Sati, S Thota, K Mukherjee, Archna Sagdeo, Pankaj R Sagdeo, Cluster Glass Behavior in Orthorhombic SmFeO3 Perovskite: Interplay Between Spin Ordering and Lattice Dynamics, Chemistry of Materials, 32, 1250, 2020.
- A Kumar, MK Warshi, M Gupta, PR Sagdeo, The magneto-elastic and optical properties of multiferroic GaFeO3-δ 514, 167210, 2020.
- A Kumar, S Umrao, PR Sagdeo, Orbital facilitated charge transfer originated phonon mode in Cr-substituted PrFeO3: A brief Raman study, Journal of Raman Spectroscopy 51 1210, 2020.

Research Highlights:

- Physics of Highly correlated electron systems: To improve the efficiency of CMR, Multiferroic and high temperature superconductivity materials.
- Physics of solar Cell: Optical Spectroscopy to probe the electronic structure near band edge to stretch the efficiency of solar cell and photovoltaic devices.
- Instrumentation Developments: Design and development of specialized scientific instruments to investigate and critical characterization of materials.
- X-ray and neutron scattering and material characterization: Using synchrotron-based x-ray source and nuclear reactors for critical characterization of materials.

Research Projects:

Exploring new methodology to estimate the values of onsite coulombic repulsive energy (U) and charge transfer energy in transition metal oxides through combined optical and structural studies (Funded by SERB, DST, GOI).

Dr. Preeti A. Bhobe
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Dr. Preeti Bhobe is an experimental condensed matter physicist. She has done her PhD. from Goa University and was JSPS postdoctoral fellow at Institute for Solid state physics (ISSP), University of Tokyo and RIKEN, Spring8 synchrotron source, Japan and postdoctoral fellow at Tata Institute of Fundamental Research, Mumbai, before joining IIT Indore in December 2011. She was a visiting scholar for 3 months at the Texas A&M University, College Station, Texas, USA in 2018-19.

Specialization: X-ray Absorption Fine Structure (XAFS), Photoemission Spectroscopy (PES), and Magnetism. Employs advanced experimental probes like XAFS, XMCD, and PES to investigate and understand a variety of properties and phenomena in solids.

Selected Publications:

- M. K. Majee and P. A. Bhobe, "Correlation of local crystal structural and physical properties of delafossite $CuCr_{1-x}Fe_xO_2$ ($0 \leq x \leq 1$) series", Inorg. Chem., Vol. 59, pp. 6790–6799 (2020)
- Tamalika Samanta, Daniel Salas, Velaga Srihari, I Karaman and P. A. Bhobe, "Emergent properties in the natural composite $Ni_2MnSb_{0.5}Al_{0.5}$" J. Phys. D: Appl. Phys., Vol. 53, pp. 225302 (2020)
- Tamalika Samanta, Sayan Chaudhuri, Sukriti Singh, V. Srihari, A. K. Nigam, P. A. Bhobe, "Structural, electronic, magnetic, and transport properties of the equiatomic Ni-based quaternary Heusler alloys", J. Alloys and Compds. Vol. 815, 153029 (2020)

Research Highlights:

- Over the past one year, Dr. Bhobe's research group carried out a thorough study of the crystal structure and magnetism in Heulser alloys and demonstrated the potential applications of composite structures in reducing the thermal conductivity in otherwise metallic materials. In another study, they have investigated the transparent conducting oxides and presented a fundamental understanding it the magnetic, transport and structural properties of this important class of materials. Besides, their work on chalcogenides based thermoelectric materials are also showing promising outputs.

Our recent findings demonstrate:

- Demonstration of half-metallicity in Cr substituted Fe_2TiSn compositions, (b) Improvement in the thermoelectric properties of SnSe using composite structures, (c) Demonstrated the presence of high temperature magnetic transition in $CuFeO_2$ delafossite oxides.

Research Projects:

- Half- Metallic Heusler Alloys for Spintronics Applications (Funded by SERB, GOI).

Dr. Somaditya Sen
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Dr. Somaditya Sen is an experimental condensed matter physicist who specialized on structure correlated physical properties analysis on some modified simple, as well as some complex oxide materials. He completed his PhD. from Indian Association for the Cultivation of Sciences, Jadavpur University. Later he did three postdocs in Taiwan, Japan and lastly USA. In Taiwan he was at National Taiwan University, while in Japan at University of Electrocommunications. His last postdoc position was at Electrical Engg. Department in University of Wisconsin Milwaukee before he got an appointment as a Research Associate in the Dept. of Physics, UWM. He joined IIT Indore in 2013 and served several important administrative roles including being a member of the Board of Governors. His research interest includes Ferroelectricity, Magnetism, Semiconductors and Nanomaterials.

Selected Publications:

- Emin Varghese, Sourabh Kumar, Biswarup Pathak, Somaditya Sen; "Temperature-induced crystallinity and vibrational properties in samarium orthovanadate" Phys. Rev. B 101, 174112 – Published 21 May

2020; doi: 10.1103/PhysRevB.101.174112.

- EG Rini, A Paul, M Nasir, R Amin, MK Gupta, R Mittal, S Sen; "Correlation of octahedral distortion with vibrational and electronic properties of LaFe1-xTixO3 nanoparticles" Journal of Alloys and Compounds, 154594 830 15459 2020; doi: 10.1016/j.jallcom.2020.154594.
- Saniya Ayaz, Prashant Kumar Mishra, R. K. Sharma, Shubhanshu Kamal, Somaditya Sen; "Structural, Optoelectronic, and Electrochemical Properties of Zn1−x(Ga0.5Al0.5)xO Nanoparticles for Supercapacitor Applications"; ACS Applied Nano Materials 2020, 3, 5, 4562−4573, doi: 10.1021/acsanm.0c00636.

Research Highlights:
The research target of his group is to synthesize single phase oxide materials and chemically modify them to study the structure correlated opto-electronic, magnetic, dielectric and ferroelectric properties of the materials. The materials synthesized in the lab are subjected to various physical parameter studies e.g. electronic bandgap and defect studies, carrier concentration and type determination, mobility factor, light and gas sensing properties, dielectric resonator properties, pressure induced properties, electrochemical properties, etc . The final target of the team is to obtain devices with multifunctional properties from these materials. The group also has recently incorporated a theory-experiment correlation in its recent works and hope to produce important contributions to the field. The group has graduated 7 PhD scholars and several Masters and Bachelors students. The graduated students have secured their next positions in internally recognized universities like Cornell University (USA), UCLA (USA), NTU (Taiwan), etc.

Events and Seminars Organized:
Delivered Invited Public Lecture on "Importance of Higher Education in Science and Technology in India"

Research Projects/Achievements:
Project Title: Large scale production of nanomaterials and thin films for semiconducting devices and astronomical research" DST AMT Project Proposal ~50 Lakhs

Dr. Manavendra N. Mahato
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Dr. Manavendra Mahato has done his PhD. from the University of Michigan, Ann arbor, USA and was Visiting fellow in TIFR, Mumbai. Dr. Manavendra Mahato's recent research includes finding quasinormal modes in the background of nh-stu black holes. Quasinormal modes are perturbations in the background of black holes with certain boundary conditions. They fall into the black hole horizon and decay far away from at spatial infinity. For asymptotic AdS spaces, they are outgoing at the boundary. These more play an important role in the thermalization of any perturbation in the black hole background.

Selected Publications:
"Quasinormal modes for nh-stu black holes" by M. Mahato and Ajay Pratap Singh, EPJC, 2018, 78:822

Research Highlights: **Dr. Mahato** works in the broad area of Theoretical high energy physics. He focuses on string theory topics in high energy physics mainly related to gauge gravity correspondence. The correspondence relates certain strongly coupled quantum field theories with certain gravitational solutions. Recently we calculated quasinormal frequencies of certain black holes numerically and studied their properties with temperature and size of the black hole. Thus, we pointed out to certain generic features of the black hole decay which are related to dynamics of decay of perturbations in corresponding field theories. In addition, we also investigated properties of certain perturbative black hole solutions of Einstein Maxwell gravity.

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Associate Professor
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Dr. Ankhi Roy has done her PhD. from IIT Bombay. Her group is working in main two domains of experimental heavy ion collisions. In one domain, Quark Gluon Plasma (QGP) is supposed to be produced at very high temperature but low baryon density. In this domain, the work is based on the analysis of the data available from the ALICE experiment, which is situated, at CERN. Mainly, they study different aspects of QGP physics through the heavy flavour hadron decays. In another domain, QGP is supposed to be formed due to high baryonic density. In this domain, they are involved in another experiment known as CBM (Compressed Baryonic Matter) which is situated at GSI, Germany. Their group mainly works in the simulation of the detector performance for this upcoming experiment. Recently, her group has joined Electron Ion Collider (EIC) experiment at BNL, USA. Main focus of her group is to understand different aspects of heavy flavor physics. Her group is also interested in phenomenological work related to the QGP state.

- Anisotropic flow of charged and identified hadrons at FAIR energies and its dependence on the nuclear equ (2019) 55: 216
- Three-nucleon dynamics in dp breakup collisions using the WASA detector at COSY-Jülich, P. Adlarson …A (2020)

Research Highlights:

Dr. Roy works on Experimental High Energy Physics, and her research highlights on:

- Semi-leptonic decays of Heavy Flavour Hadrons using ALICE data.
- Electron-Hadron Correlation of heavy Flavour hadrons study with ALICE data.
- Self normalized yield measurement of D0 meson with ALICE
- Application of Machine Learning in the data analysis of High Energy Physics
- Development of Cooling system of Muon Chamber (MuCH) Detector of CBM experiment
- Detector simulation of Electron Ion Collider Experiment

Research Projects:

- Leptons from heavy-flavour hadron decays in proton- proton collisions at the LHC (Funded by DST-DAAD).

Dr. Raghunath Sahoo, FInstP
Associate Professor
raghunath@iiti.ac.in

Dr. Raghunath Sahooha searved his Ph.D from the Institute of Physics, Bhubaneswar and has worked as a Postdoctoral fellow in Subatech, France, INFN fellow in INFN Padova, Italy in the STAR Experiment at the Brookhaven National Laboratory, USA and European Center for Nuclear Research (CERN), Geneva, Switzerland. Dr. Sahoo was also a Visiting Scientist at the University of Cape Town, South Africa and Institute of Physics, Bhubaneswar. **He is a Fellow of Institute of Physics, United Kingdom.**

Dr. Raghunath Sahoo's research group is active in ALICE at the Large Hadron Collider (LHC), CERN with light flavor spectra, charm onia production, photon, and neutral meson production in proton+proton collisions at the Teraelectron Volt (TeV) energies. He has made a visible contribution in ALICE intermsofnumberofanalysis notes and research papers with 6-PhDs awarded (6 more PhD students working in the group). So far around 58 students have got trained, which includes 11 postdoctoral fellows, MSc (research) and BTech projects. The group has also contributed to the understanding of the phenomenology of particle production in high-energy hadronic and nuclear collisions at GeV and TeV energies. In addition, Dr. Sahoo is working in the Compressed Baryonic Matter (CBM) experiment at FAIR, GSI, Dramstadt, Germany and the GARPES-3 experiment in the cosmic ray

observatory in Ooty, India. Dr. Sahoo is the Principal Investigator and Team Leader of ALICE and CBM experimental projects at IIT Indore. He has almost 20 years of research experience in high energy experiment.

Specialization: Particle spectra, thermodynamic and transport properties of matter created in high energy hadronic and heavy-ion collisions, application of equilibrium and non-extensive statistical mechanics in high energy physics, exploration of Quantum Chromodynamics (QCD) phase boundary and search for possible critical point, large scale data analysis, phenomenology of Quark-Gluon Plasma, study of hadronic showers in cosmic ray events.

Research highlights:

- Search for QGP-drop lets in hadronic(pp) collisions at the LHC energies.
- Transportpropertiesofthesystemsproducedinheavy-I onandppcollisions,in contrasttocondensed matter systems.
- Applicability of non-extensivity in high-energy physics.
- ResonancesandQuarkoniaproductioninproton+protoncollisionsattheLHC energies.

Selected Publications (Total=82):

- "Role of event multiplicity on hadronic phase lifetime and QCD phase boundary in ultrarelativistic collisions at energies available at the BNL Relativistic Heavy Ion Collider and CERN Large Hadron Collider."DushmantaSahu, SushantaTripathy, Girija Sankar Pradhan, and **Raghunath Sahoo**,**Phys. Rev. C 101, 014902 (2020) [Impact Factor: 3.308].**
- "Glauber model for a small system using the anisotropic and inhomogeneous density profile of a proton."Suman Deb, Golam Sarwar, Dhananjaya Thakur, Pavish S., **Raghunath Sahoo**, and Jan-e Alam,**Phys. Rev. D 101, 014004 (2020) [Impact Factor: 4.643].**
- "Effective-energy universality approach describing total multiplicity centrality dependence in heavy-ion collisions.", Edward K. Sarkisyan-Grinbaum, Aditya Nath Mishra, **Raghunath Sahoo**, and Alexander S. Sakharov,**Eur. Phys. Letters 127, 62001 (2019) [Impact Factor: 1.9].**

Events and Seminars Organized:

- Member, National Organizing Committee, DAE-BRNS Symposium on Nuclear Physics, Lucknow University, Lucknow, Dec. 23-27, 2019.

Invited Talks and Science Outreach:

- Recreating the Big Bang in Laboratory: Science and Technology.
  DAE, DST and Ministry of Culture Organized Vigyan Samagam (MegaScience Exhibition), National Science Center, New Delhi, 25 Jan. 2020 (Public Lecture)
- A Journey to the Beginning of the Universe.
  DAE, DST and Ministry of Culture Organized Vigyan Samagam (MegaScience Exhibition), National Science Center, New Delhi, 24 Jan. 2020 **(Public Lecture)**
- Understanding medium formation in small systems using heat capacity.
  64th DAE-BRNS Symposium on Nuclear Physics, University of Lucknow, India, 23-27 Dec., 2019.
- Event shape and multiplicity dependence of identified particle production and freeze-out scenario in pp collisions at $\sqrt{s}$= 13 TeV using PYTHIA8.
  Quark Matter-2019, Wuhan, China, 4-9 Nov. 2019
- Comparison of Chemical freeze-out parameters in p+p, p+Pb, Xe+Xe and Pb+Pb collisions at LHC energies.
  Quark Matter-2019, Wuhan, China, 4-9 Nov. 2019
- Do Proton-Proton collisions at the CERN Large Hadron Collider Energies produce droplets of Quark-Gluon Plasma?
  International Workshop on Frontiers in High Energy Physics (FHEP-2019), University of Hyderabad-IIT Hyderabad, 14-17 Oct., 2019 **(Invited Speaker)**
- New Directions in Physics of Proton+Proton Collisions at the LHC energies.
  Workshop on Dynamics of QCD Matter, NISER, Bhubaneswar, 15-17 August, 2019 **(Invited Speaker)**

- Big Bang, Little Bang and Mini-Bang: Characterizing a Partonic matter with ALICE at the CERN Large Hadron Collider."
  VINANST-13, Ha Long City, Vietnam, 07-09 Aug., 2019 **(Invited Speaker: ALICE Overview)**
- Possible Formation of Droplets of Quark-Gluon Plasma in Proton+Proton Collisions at the Large Hadron Collider Energies.
  36th Convention of Orissa Physical Society (OPS) and International Seminar on ``Emerging Trends in Physics and Applications (ISETPA-2019)", Parala Maharaja Engineering College, Berhampur, 02-04 Feb., 2019 **(Keynote Speaker)**

Research Projects:

- Study of High-multiplicity Proton+Proton Collisions at the LHC Energies using Event Shape Method.
  [Funding Agency: DAE-BRNS, Govt. of India: Rs. 25.03 Lakhs (2019-22)].
- A Large Ion Collider Experiment (ALICE) Upgrade, Operation and Utilization
  [Funding Agency: DAE-DST, Govt. of India, Rs. 3.20 Crores (2014-2020)].
- ALICE-Operation and Utilization
  [Funding Agency: DAE-DST, Govt. of India, Rs. 81 Lacs (2013-14)]

Awards and Recognitions

- **Dr. Raghunath Sahoo has been elected as a Fellow of Institute of Physics, United Kingdom (FInstP)**
- Guest Editor, Advances in High Energy Physics (Special Issue on "Particle Production in Small and Large Systems at High-Energy and High-Density Frontiers")
- Guest Editor, Advances in High Energy Physics (Special Issue on "Particle Production in High Energy Collisions 2020")
- The paper by Dushmanta Sahu, Sushanta Tripathy, Girija Sankar Pradhan and Raghunath Sahoo, Phys. Rev. C 101, 014902 (2020) got BEST POSTER award in DAE-BRNS Symposium on Nuclear Physics-2019, University of Lucknow.

Dr. Debajyoti Sarkar
Assistant Professor
dsarkar@iiti.ac.in

Dr. Debajyoti Sarkar obtained his PhD. from the City University of New York, USA and did his postdocs from Ludwig Maximilians University in Munich, Germany and from University of Bern, Switzerland. Before joining IIT Indore he was a visiting scholar at the Institute for Advanced Study, Tsinghua University in Beijing, China. Dr. Debajyoti Sarkar's recent research broadly includes string theory and its applications in gravity (general relativity) and quantum fields (quantum field theory). In particular, he is interested in the framework of Anti de Sitter (AdS)/ Conformal Field Theory (CFT) correspondence within string theory and their inter-connections with black holes physics, condensed matter and quantum information theory.

Selected publications:

1. Michael Haack, Debajyoti Sarkar and Amos Yarom.
``Probing anomalous driving,'' JHEP **04** 034 (2019).

Dr. Srimanta Pakhira
Assistant Professor&
Ramanujan Fellow
spakhira@iiti.ac.in

Dr. Pakhira's research group is active in Condensed Matter Theory, Electronic Structure Theory, Semi-conductor Physics, Magnetism, Physics of Novel Solar Cells, Renewable Energy Technology, Perovskite, Computational Materials Science, Computational Physics and Condensed Matter Nano science. They have also contributed to the understanding of Density Functional Theory (DFT) and applications in various areas of science.

Selected Publications:

1. Dharmarwardana, M.;† **Pakhira, S.**;† Welch, R. P.;† Narvaez, C. C.; Luzuriaga, M. A.; Arimilli, B. S.; McCandless, G. T.; Fahimi, B.; Mendoza-Cortes, J. L.; Gassensmith, J. J. **2020** Rapidly Reversibly Organic Crystalline Switch for Conversion of Heat into Mechanical Energy. ***ChemArXiV.***

†Equal Contribution: First Authorship.

- Sonkar, C.; Malviya, N.; Ranjana, R.; **Pakhira, S.**; Mukhopadhyaya, S. **2020** Mechanistic Insight for Targeting Biomolecules by Ruthenium(II) NSAID Complexes. ***ACS Applied Bio Materials.***, **Just Accepted Manuscript**.
- **Pakhira, S.,*** Mendoza-Cortes, J. L., **2020** Quantum Nature in the Interaction of Molecular Hydrogen with Porous Materials: Implications for Practical Hydrogen Storage. ***The Journal of Physical Chemistry C*** *124*, pp. 6454-6460. ***Impact Factor: 4.805.*** ***Corresponding Author**

Research Highlights:

Dr.Pakhira's research group works on Theoretical Condensed Matter Physics, Energy Materialsand Computational Materials Science.

His group's research highlights include:

- Condensed Matter Nano science and Computational Materials Science.
- Theory and Computations, Applications of Density Functional Theory (DFT), Electronic Structure Theory, Semi-conductor Physics, Magnetism, Physics of Novel Solar Cells, Renewable Energy Technology.
- Strong Correlation Effects in Electronic Materials, Hybrid Organic-Inorganic Perovskites and Theory of Novel 2D Materials, TMDs, Alkali-Ion Battery, H_2 and O_2 Evolution Reactions, O_2 and CO_2 Reduction Reactions
- Porous Materials such as MOFs, COFs, Zeolites, etc. and Their Applications, Hybrid Organic-Inorganic Perovskites and Theory of Novel 2D Materials and Their Applications in Electrocatalysis.

Research Projects:

- ***Construction of Porous Metal-Organic Frameworks (MOFs) and Covalent- Organic Frameworks (COFs) and Its Applications***, DST-SERB, Govt. of India. (Project Value: 35 Lakhs INR), PI-Dr. Srimanta Pakhira (Duration: 2018 - 2023).
- ***Development of New Two Dimensional Layer Structure Materials and Technique for Water Splitting: Applications in Hydrogen and Oxygen Evolution Reactions***, Early Career Research Award (ECRA), SERB-DST, Govt. of India. (Project Value: 53.14 Lakhs INR), PI-Dr. Srimanta Pakhira (Duration: 2019 - 2022).

Dr. Sudip Chakraborty
Assistant Professor
sudip@iiti.ac.in

Dr. Sudip Chakraborty is currently leading MATES (Materials Theory for Energy Scavenging) Lab consisting of 5 Ph.Ds, in Department of Physics, Indian Institute of Technology Indore as Assistant Professor of Physics, since March, 2019. After his joint PhD in BARC and University of Pune, he moved to Max Planck Institute, Düsseldorf in early 2011 as Max Planck Postdoctoral Fellow. In early 2013, he joined Uppsala University and worked there till February, 2019 as a Senior Researcher, while 4 Ph.Ds got their degree under his supervision, before he joined IIT Indore. He has served as potential reviewer for European Research Council (ERC) Advanced Grant and National Science Funding (NSF), while he was the co-chair of three consecutive European Materials Society (EMRS) Meeting between 2014 and 2016. He has been invited to be the Guest Editor for two journals: Frontiers in Chemistry and Catalysts. Presently, he has 98 International publications with total 550 Impact Factor, 2030 Citations and 26 h-index.

Selected Publications:

- Bi^{3+}- Er^{3+} and Bi^{3+}- Yb^{3+} Co-doped $Cs_2AgInCl_6$ Double Perovskite Near Infrared Emitter, H. Arfin, J. Kaur, **Sudip Chakraborty*,** A. Nag*, Angewandte Chemie , 59, 11307 (2020). (Selected as Editor's choice Hot Paper) [Impact Factor: 12.96]
- Tweaking Nickel with Minimal Silver in a Heterogeneous Alloy of Decahedral Geometry to Deliver Platinum-like Hydrogen Evolution Activity, R. Majee, A. Kumar, T. Das, **Sudip Chakraborty**, S. Bhattacharyya, Angewandte Chemie, 59, 2881 (2020). [Impact Factor : 12.96]
- Solid State Synthesis of Stable and Color Tunable Cesium Lead Halide Perovskite Nanocrystals and Mechanism of High-Performance Photodetection in Monolayer MoS2/CsPbBr3 Vertical Heterojunction, J. Ghosh, L. Mawlong, Manasa, G. B., M. Hossain, A. Pattison, W. Theis, **Sudip Chakraborty*,** P. K. Giri*, Journal of Materials Chemistry C, 8, 8917 (2020). [Impact Factor: 7.03]

Research Highlights:

Materials Modeling for Energy Harvesting through cutting edge computational methodology is the prime focus of the research. The specific research interests are:

- Code Development for Solid-Liquid Interface and Transition Pathway Prediction
- Hybrid Perovskites & Ultra-thin 2D Materials for Solar Cells and LED.
- Solar Hydrogen and Thermal Fuel, Photocatalytic Water Splitting
- Phonons based Stability and Defect Formation Mechanism.
- Computational High Pressure Physics: Structural and Phase Transformations.

Events/Seminars Organized:

Organized PAN-IIT (Indore, Bombay, Delhi, Kharagpur) Webinar Series on Materials Simulation: A Virtual Guided Tour (21st – 31st May, 2020) https://sites.google.com/view/msgtwebinar/

Research Projects:

- Indo-Swedish Research Funding on "Rational Design of Transition Metal Based Nanoalloys and Two Dimensional Materials for Direct Conversion of CO2 into Gasoline Fuel" worth 68 Lacs INR.
- International Visiting Faculty Funding in Quantum Matter and Materials Cluster, University of Köln, Germany.

Dr. Dipankar Das
Assistant Professor
d.das@iiti.ac.in

Dr. Dipankar Das is a theoretical physicist working on Particle Physics. He completed his PhD. from Saha Institute of Nuclear Physics, India and after that he worked as a postdoctoral researcher at the University of Valencia, Spain. Then he joined University of Calcutta, India as an Assistant Professor. From there, he moved to Lund University, Sweden to work as a Researcher. Dr. Das joined IIT-Indore on 31st October, 2019.

Selected Publications:

- Md Raju, J. P. Saha, D. Das, A. Kundu "Double Higgs boson production as an exclusive probe for a sequential fourth generation with wrong-sign Yukawa couplings", Phys. Rev. D 101 (2020) 5, 055036.
- G. C. Branco, D. Das, M. Levy, P. B. Pal, "Crossed two Higgs-doublet models: reduction of Yukawa parameters in the low-scale limit of left-right symmetry and other avatars", Phys. Rev. D XXX (2020) X, XXXXXX. (Accepted, in press)

Research Highlights:

His current interests involve models of radiative neutrino mass and their impacts on lepton flavor violation. He is particularly interested in extending the simple Zee model with some additional flavor symmetries that can produce predictive textures for the neutrino Majorana mass matrix and thus can provide correlated LFV signals. Apart from this, he also works on the extensions of the Scotogenic model that can provide a coherent connection between the neutrino mass and Dark Matter.

Department of Metallurgy Engineering & Materials Sciences (MEMS)

MEMS began as the Centre for Materials Science Engineering comprising of faculty from the Schools of Basic Sciences and Engineering and transitioned into a full-fledged department in 2016. Amongst its notable practices include TEQIP sponsored short term courses International workshops and Consultancy Projects to provide advanced knowledge in various areas of MEMS to students and faculty from other institutions.

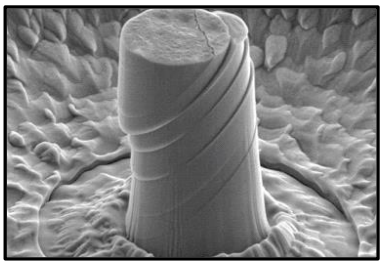
Achievements/ Accomplishments:

1. Short term courses: 10.
2. Workshops: 6
3. Active Projects:18
4. Awards: 12
5. Journal articles: 104.
6. Book (edited): 6.

Awards:

- **Dr. Parasharam M. Shirage** received "Materials Research Society of India Medal 2020".
- **Dr. Rupesh S Devan** received DUO-India Professor Fellowship Award from ASEM-DUO, S. Korea. (2020).
- **Dr. Rupesh S Devan**'s article "ChemistrySelect 3 (2018) 7891-7899" is among the top 10 % most downloaded papers in Wiley (2020)
- **Dr. Rupesh S Devan has become** Professional member, International Solar Energy Society (Oct. 2019)
- **Dr. Mrigendra Dubey** got invitation as an "Invited Research Visitor" in France - 2019.
- **Dr. Ajay Kumar Kushwaha** received best paper Award**:** 5NANO2021 (International Conference on Nanoelectronics, Nanophotonics, Nanomaterials, Nanobioscience & Nanotechnology), Organized by IEEE Photonics Society Student Chapter, Mangalam College of Engineering, Kerala.
- **Dr. Sunil Kumar** received Early Career Research project was awarded "Excellent" grade by the Expert Committee during the project Review/Monitoring Meeting held on 14th & 15th February 2020 at IIT Delhi.
- **Dr. Ram Sajeevan Maurya** received Early Career Research Award, SERB-DST, 2019
- **Dr. Srimanta Pakhira** received Early Career Research Award, SERB-DST, 2019

Department of Metallurgy Engineering and Materials Science



From the HOD's Desk:

Dr. Vinod Kumar
Assistant Professor
vkt@iiti.ac.in

The Department of Metallurgy Engineering and Materials Science (MEMS) is home to two separate programs in Metallurgical Engineering and Materials Science. Our focus is to carry out interdisciplinary research in material science field to find solutions for real-world intricate problems which benefit the society. Our goal is to understand the processing and structure of several classes of materials; and then correlate these to the properties, thus enhancing their performance. The department has 15 core faculty members, 1 Ramanujan fellow, and 1 adjunct faculty, Dr. Vilas Pol from Purdue University. MEMS faculty members working in various research areas, ranging from conventional metallurgy to modern materials science. The major research areas are spread across structural materials (Steels, Titanium alloys, High entropy alloys, Magnesium alloys, and Composite materials), energy conversion and storage materials (Solar Cells, Supercapacitors, Li-ion batteries, etc.), functional materials (Piezoelectrics, Gels, and Shape memory alloys), and computation materials science. MEMS department offers several courses at undergraduate and graduate levels. Besides PhD. program, there are currently 2 M.Tech programs (Materials Science & Engineering and Metallurgy Engineering) and an undergraduate program.

MEMS Faculty members

Research Thrust/Facility

- Physical & Mechanical Metallurgy
- Welding & Failure Analysis
- Non-destructive Evaluation of Materials
- Electronic & Energy Materials
- Nano Materials, Soft Materials
- Corrosion & Surface Engineering

Application Areas

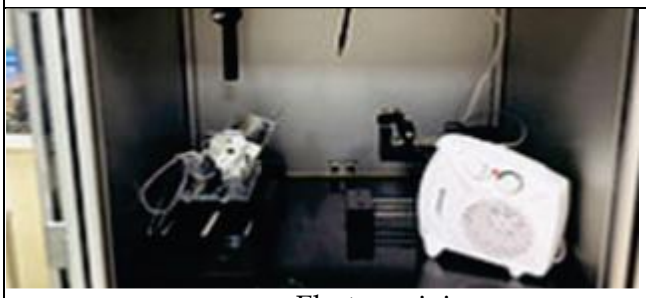
- Alloy Development for Light weight Automotive applications
- Alloy designing for High temperature applications
- Surface Engineering of Materials
- Synthesis & Design of Novel Materials for Energy Applications
- Characterizing the Physical & Mechanical Properties of Materials

Facilities in MEMS:

The department is well-equipped with the state-of-the-art facilities for synthesis/fabrication and characterization of a wide range of materials for various physiochemical and mechanical properties.

UV-Vis Spectroscopy

Hot Filament CVD



Electros pining

Rotary Evaporator

High Temperature Oven

Ultra Sonicator

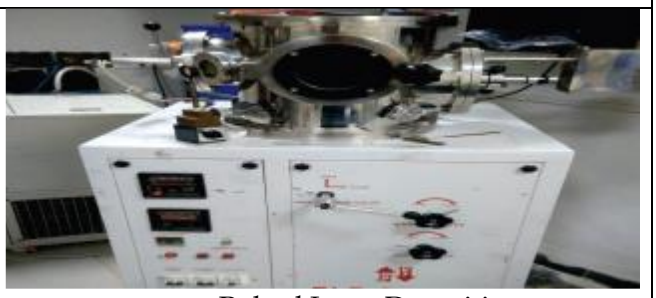
Nd:YAG Laser

Continuous Fibre Laser

DC + RF Sputtering

Flash Evaporation

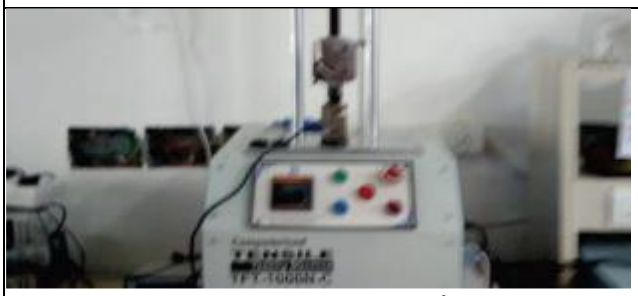
Arc Melting



Pulsed Laser Deposition

GMAW based Wire Arc Additive Manufacturing

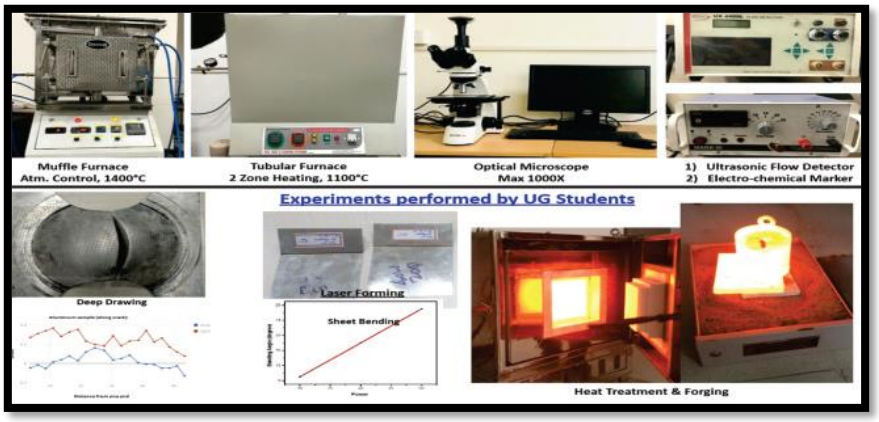
Optical Microscope



Straining Setup for SMA

Thermal Evaporation

Experiments for UG students

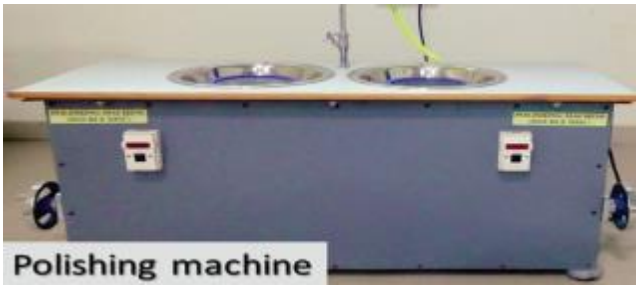


Tube Furnace

Polishing Machine

Specimen preparation equipment

High speed saw



Polishing machine

Mechanical testing equipment

Automatic Ball Indenter

Tensile testing m/c

Impact testing m/c

Dr. Parasharam M. Shirage
Associate Professor
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Dr. Parasharam M. Shirage PhD. from Shivaji University, Kolhapur, India, he worked as -
Postdoc Scientist at various institutions including: Tata Institute of Fundamental Research, India (2012-13);
Institute postdoctoral Fellow: AIST, Tsukuba, Japan (2008-2012);
JSPS Postdoc. Fellow: AIST, Tsukuba, Japan (2006- 2008);
Visiting Scientist: KERI, Changwon, South Korea (2004-2006);
and he was lecturer at Rajaram College, Kolhapur (Maharashtra Govt.) (2003-2004).

Dr. Shirage is Visiting Fellow at Toyota Technological Institute Nagoya, Japan and National Institute of Advanced Industry, Science and Technology (AIST, Tsukuba, Japan.

Selected Publications:

- Lichchhavi Sinha, Hyunju lee, Yoshio Ohshita, **Parasharam M. Shirage*, "**Defect Mediated $W_{18}O_{49}$ Nanorods Bundle for Non-Enzymatic Amperometric Glucose Sensing Applications"ACS Biomaterials Science & Engineering 6(4), 1909-1919 (2020) (IF 4.511)
- Darshna D Potphode, Lichchhavi Sinha, **Parasharam M Shirage*** "Redox additive enhanced capacitance: Multi-walled carbon nanotubes/polyaniline nanocomposite based symmetric supercapacitors for rapid charge storage" Applied Surface Science, 469, (162-172) 2019 (IF =5.155)
- Prateek Bhojane, Armel Le Bail, **Parasharam M Shirage*, "**A quarter of a century after its synthesis and with> 200 papers based on its use,Co $(CO_3)_{0.5}$ $(OH)\cdot_{0.11}$ H_2O' proves to be Co_6 $(CO_3)_2(OH)_8 \cdot H_2O$ from synchrotron powder diffraction data", IUCr Acta Crystallographica Section C: Structural Chemistry, *C75, 61-64,* 2019 (IF=8.678).

Research Highlights:

The research work of Dr. Parasharam Shirage focuses on Materials for Energy and Environment addressing: (i) Technology Development: Batteries, Supercapacitors, Solar cells, Sensors; (ii) Materials: For batteries, Supercapacitors, Solar cells, Sensors and Single Crystal Growth of Superconductors; and (iii) Processes: Process to grow large single crystals of $NbSe_2$ and related materials, Controlled growth of Nanostructures for Multifunctional applications.

His work on the next generation solar cells has led to solar efficiency of ~20 % in Pb-based and 3 % in Bi-based Pervoskite solar cells. He has contributed in the establishment of highly stable Pervoskite solar cell at varying temperatures, which has been a major drawback of the perovskite solar cells. Temperature stability has been attained by introducing a layer of a polymer between the Pervoskite layer and hole transport layer. The research work of Perovskite materials coating on the flexible substrates to fabricate the flexible solar cells is in progress. Different natural bio-based dyes were extracted to fabricate the TiO_2 based dye sensitized solar cells (DSSC's). So far 3 % efficiency has been achieved with one of the natural dyes.

Dr. Shirage has contributed a significant research work in the field of Supercapacitor and Batteries. It includes the new materials synthesis, structure solution and applications in batteries and supercapacitors. He has developed the metal oxide-, polymers- and carbon-based materials for the supercapacitor and battery applications with excellent energy density and power capacity and the portable device.

ZnO nanostructures were grown in controlled shape and size with well-regulated processing parameters and were tested for the multifunctional applications. The ZnO nanostructures were applied in Gas Sensing, Batteries and Supercapacitors, Field emission, Two photon absorption, humidity sensing, biosensing, solar cells, algal lipid extraction, *etc*.

A highly sensitive and selective nonenzymatic detection of glucose that has been achieved by hybridization of 1D α-MnO_2 nanorods modified with surface decoration of Co_3O_4 nanoparticles exhibited a high sensitivity of 127 μA mM^{-1} cm^{-2} (S/N = 3) with a detection limit of 0.03 μM.
He has done substantial work on the reduced graphene oxide *r*GO-polymer-Au nanomaterials based piezoelectric materials for energy harvesting. The Ag-*r*GO antifungal activity has also been tested. He has developed Cobalt ferrite shape and size tuned nano-particles synthesis and applications in magnetic energy storage and humidity sensing.

In the area of superconductivity, he has grown large (2 cm x 2 cm) single crystals of $NbSe_2$ and doped $NbSe_2$. These single crystals were employed for the physical properties (T_c, J_c and H_c) measurements to understand the origin of superconductivity and to provide the guiding principles for designing room temperature superconductors. He has invented several new superconductors and he is the first researcher to experimentally demonstrate an inverse isotope effect in high-T_c superconductors. He has done considerable

amount of work on recently invented topological insulators (TI). He has grown Tl's large single crystals and evaluated their physical properties to understand the underlying pairing mechanism of superconductivity. The innovative applications of the Tl for humidity sensing and field emission studies were also examined.

Events and Seminars Organized (2019-2020):

- Short term course on "Materials for Sustainable Energy " October 2020.
- Short term course on, " Scanning Electron Microscopy" 14 January 2020
- GIAN program on 'One-dimensional metal-oxide nanostructures: Recent developments in synthesis, characteristics and applications.' Department of Metallurgy Engineering and Materials Science, Indian Institute of Technology Indore, Indore, 453552, Speaker: Prof. Y. R. Ma, National Dong Hwa University, Taiwan, 1st to 10th Apr. 2019.

Research Projects (2019-2020):

Development of The Technique For The Growth of Metal Oxide Nano-Porous Materials For Supercapacitors Applications" (Funded by CSIR, GOI).

Research Awards (2019-2020):

- Awarded Materials Research Society of India Medal 2020.
- Life Member of Materials Research Society of India (2019).

Dr. Rupesh S. Devan
Associate Professor
rupesh@iiti.ac.in

Dr. Rupesh S. Devan is an Associate Professor since Dec. 2018. He has joined IIT Indore as Assistant Professor in March 2017. He received Ph.D. in Physics (Materials Science) from Shivaji University, Kolhapur, India. In 2007, he received a fellowship from the Ministry of Science of Technology (MOST) Taiwan and joined as Post-Doctoral Fellow at National Fong Hwa University, Taiwan. After availing the 'INSPIRE Faculty Award' (2014) from the Department of Science and Technology (DST) India, he joined the University of Pune, India (2014-2016), and moved to Central University of Punjab (2016) as Associate Professor.

He is Editor of the 'Chinese Journal of Physics' (Elsevier). He was also a guest editor for the special issue in J. of Nanomaterials (Hindawi) and Materials Today: Proceedings (Elsevier). His research is focused on materials for energy storage/conversion and photo-active materials. His research group utilizes nano-hetero-architectures and core-shell nanostructures for energy conversion/storage applications. In his research field, he has published 1 book, 2 book chapters, and 97 research articles in SIC journals (Citation: > 4000, h index: 38, and i10-index: 70).

Selected Publications (3 publications):

- N. Kitchamsetti, Y. R. Ma, P. M. Shirage, and **R. S. Devan***, "Mesoporous perovskite of interlocked nickel titanate nanoparticles for efficient electrochemical supercapacitor electrode" ***(J. Alloys and Compounds 833 (2020) 155134).*** (**DOI:** 10.1016/j.jallcom.2020.155134)
- P. R. Chikate, K. D. Daware, S. S. Patil, P. N. Didwal, G. S. Lole, R. J. Choudhary, S. W. Gosavi, and **R. S. Devan***, "Effect of Au loading in the enhancement of photoelectrochemical activities of Au@ZnO nano-heteroarchitecture" ***(New J. Chemistry 44 (2020) 5535-5544)***. (**DOI:** 10.1039/d0nj00004c)
- V. Manjunath, S. Bimli, K. H. Parmar, P. M. Shirage, and **R. S. Devan***, "Oxidized nickel films as highly transparent HTLs for inverted planar perovskite solar cells" ***(Solar Energy 193 (2019) 387-394).*** (**DOI:** 10.1016/j.solener.2019.09.070)

Research Highlights:

The major research highlights of our group are,

- The inverted planner perovskite solar cell fabricated at ambient atmosphere had delivered an efficiency of 9.7 %.
- The supercapacitor consisting of mesoporous ABO3 materials, had delivered excellent stability and power density.

- Controlled nano-hetero-architectures of metal@metal oxides delivered excellent electron emission and photoelectrochemical performance

Events and Seminars Organized:

- *GIAN program on 'One-dimensional metal-oxide nanostructures: Recent developments in synthesis, characteristics and applications.'* 1st - 10th Apr. 2019.

Research Projects:

Title: Role of Boron passivated 1D NiO nanostructures in the next generation charge/energy storage devices.
Funding Agency - UGC-DAE, CSR
Duration - 3 years (2017-2020)

Title: Solar thermal steam generation for water desalination utilizing hybrid perovskite solar cells
Funding Agency - SERB, DST
Duration - 3 years (2019-2022)

Research Facilities:

- Hot-Filament CVD
- Thermal Evaporator
- Electrospinning
- Electrochemical workstation
- UV-Vis Spectrometer
- Contact Angle Meter
- Photo-reactor
- Rotary Evaporator
- Spin Coater
- High Temperature Oven
- High Temperature Furnace
- Ultra Sonicator

Research Lab Name: Polymer and Nano-architectures Research Lab.
Achievements/Accomplishments (affiliated to IIT Indore):

A) Dr. Rupesh S. Devan
   - *DUO-India Professor Fellowship Award* from ASEM-DUO, S. Korea. (2020)
   - ***INSPIRE Faculty Award****,* (*2014-19*) Department of Science and Technology (DST), INDIA.
   - ***Editor,*** 'Chinese Journal of Physics' Elsevier publishers.
   - ***Editor,*** *Book:* **Application of one-dimensional Nanomaterials,** Publ.: American Scientific Publishers (ASP); (ISBN: *1-58883-263-5*)
   - ***Guest Editor***, *'Proceeding of International Conference on Materials & Environmental Science'* in *Materials Today: Proceedings, Elsevier, (2020).*
   - *Professional member*, International Solar Energy Society (Oct. 2019)
   - **Most Downloaded Article**: *ChemistrySelect 3 (2018) 7891-7899* is among the top 10 % most downloaded (Wiley - 2020)

B) Mr. Farhan Ali (M.Tech. Student)
   - TEEP@AsiaPlus *Internship fellowship*, Ministry of Education, Taiwan (Aug. 2019 – Feb. 2020)

C) Mr. Sharik Akhtar (M.Tech. Student)
   - TEEP@AsiaPlus *Internship fellowship*, Ministry of Education, Taiwan (Aug. 2019 – Feb. 2020)

Awards and Recognitions (2019-20):

Dr. Rupesh S. Devan
   - *DUO-India Professor Fellowship Award* from ASEM-DUO, S. Korea. (2020)

- ***Editor,*** 'Chinese Journal of Physics' Elsevier publishers.
- ***Editor,*** *Book:* **Application of one-dimensional Nanomaterials,** Publ.: American Scientific Publishers (ASP); (ISBN: *1-58883-263-5*)
- ***Guest Editor***, '*Proceeding of International Conference on Materials & Environmental Science*' in *Materials Today: Proceedings, Elsevier, (2020).*
- *Professional member*, International Solar Energy Society (Oct. 2019)
- **Most Downloaded Article**: *ChemistrySelect 3 (2018) 7891-7899* is among the top 10 % most downloaded papers in Wiley (2020)
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Mr. Farhan Ali (M.Tech. Student)

- TEEP@AsiaPlus *Internship fellowship*, Ministry of Education, Taiwan (Aug. 2019 – Feb. 2020)

Mr. Sharik Akhtar (M.Tech. Student)

- TEEP@AsiaPlus *Internship fellowship*, Ministry of Education, Taiwan (Aug. 2019 – Feb. 2020)

GIAN Courses during April 2019 - March 2020

Title of the Course - One-dimensional metal-oxide nanostructures: Recent developments in synthesis, characteristics, and applications (GIAN Program).
Brief Statement of the importance of the course - The objective of this course is to provide an introduction to, and overview of, the physics of the 1D metal-oxide nanostructures. It should be suitable for undergraduate physicists and engineers who are interested in this application of semiconductor physics and non-specialist graduates and others who require a background in the physical principles of the 1D metal-oxide nanostructures. The focus is on the basic semiconductor physics relevant to the 1D metal-oxide nanostructures, and how these relate to the design and function of practical devices.
The Approximate number of students and faculty who attended - ~b10
Academic Activities - Lectures and practical

Dr. Santosh S. Hosmani
Associate Professor
sshosmani@iiti.ac.in

Dr. Hosmani joined IIT Indore on 17-4-2017. He was the recipient of DAAD-scholarship for doing M.Tech. research at the University of Stuttgart. He did his Ph.D. work at Max-Planck-Institute for Metals Research, Stuttgart, Germany, and got a degree from the University of Stuttgart in 2006. Since June-2006. He has about 14 Years of Post-PhD experience in research, academics, and management. He held a regular faculty position at NIT-Surathkal, IIT-Delhi, and COE-Pune. He gained also an industrial experience as a Senior Manager at Bharat Forge Ltd, Pune.

Dr. Hosmani is leading the 'Surface Engineering and Heat Treatment' research-group in the Department of MEMS at IITI. Research interests of his group are surface engineering, tribology, physical metallurgy, and microstructure-properties correlation.

Selected Publications (3 publications):

- A.K. Litoria, C.A. Figueroa, L.T. Bim, C.I. Pruncu, A.A. Joshi, and S.S. Hosmani, "Pack-boriding of Low Alloy Steel: Microstructure Evolution and Migration Behavior of Alloying Elements", *Philosophical Magazine*, Vol. 100, No. 3, Pages 353-378 (2020).
- D. Singh, A.M. Gatey, R.S. Devan, V. Antunes, F. Alvarez, C.A. Figueroa, A.A. Joshi, and S.S. Hosmani*, "Surface Treatment Response of AISI 2205 and AISI 304L Steels: SMAT and Plasma-Nitriding", *Surface Engineering*, Vol. 35, No. 3, Pages 205-2015 (2019).
- A.M. Gatey, S.S. Hosmani, C.A. Figueroa, S.B. Arya, R.P. Singh, "Role of Surface Mechanical Attrition Treatment and Chemical Etching on Plasma Nitriding Behavior of AISI 304L Steel", *Surface and Coatings Technology*, Vol. 304, Pages 413-424 (2016).

Research Highlights:

There are various engineering applications where surface must perform a job different from the bulk of a component. On many occasions, just by altering 1–2 % of the total thickness of the components, the properties enhance their performance considerably. The list of applications requiring the manipulation of surface properties is unlimited, especially, in the field of automobile, petrochemical, food processing, nuclear, etc. Dr. Hosmani's group is currently working on the novel and promising approach of sever plastic deformation (SPD) of surfaces to manipulate the microstructure and the properties of ferrous and non-ferrous alloys. The group also focusses on the scientific aspects of surface-alloying and coatings.

Events and Seminars Organized (affiliated to IIT Indore):

- *Coordinator and Teaching Faculty*, TEQIP Sponsored 6-Days Short-term Course, "Industrial Metallurgy and Quality Control," IIT Indore. (11th to 16th February 2019).
- *Organizing Member*, TEQIP Sponsored 6-Days Short-term Course, "Advanced Materials and Processing," IIT Indore. (08th to 13th January 2019).
- *Convener and Teaching Faculty*, TEQIP Sponsored 3-Days Short-term Course, "Advanced Surface Science and Engineering," IIT Indore. (26th to 28th March 2018).
- *One of the three Conveners*, "International Workshop on Advanced Nanoscience and Engineering" at IIT Indore. (December 01, 2017).

Research Projects (affiliated to IIT Indore):

- "Wear Behavior and Microstructural Studies of Surface Mechanical Attrition Treated (SMAT) and Post-Treated Stainless Steels," *Sponsoring Agency*: DST-SERB (EMR Project Grant), *Sanctioned amount*: Rs. 50,85,520/- (March 2018 – March 2021).

Research Facilities:

- Metal forming, Heat-treatment, Tribology

Research Lab Name:

- Metal Forming and Surface Engineering & Heat Treatment Lab

Awards and Recognitions (2019-20):

- *Invited Talk* at National Seminar on Frontiers in Materials, National Institute of Technology, Karnataka, Surathkal, Mangalore (30th October 2019).

Dr. Mrigendra Dubey
Assistant Professor
mdubey@iiti.ac.in

Dr. Mrigendra Dubey did his PhD: from Indian Institute of Technology Guwahati. After completion of his PhD in 2011 Dr. Dubey has worked as DST-INSPIRE Faculty at IIT (BHU) Varanasi; UGC-DS Kothari Postdoctoral Fellow at BHU, Varanasi and Postdoctoral Fellow at Academia Sinica, Taipei, Taiwan.
His main research work includes Synthesis of Soft Materials- Metallogel, Superabsorbent Materials, Structural Supramolecular Materials Chemistry based on chiral ligands, Quantum dots etc. Soft materials, particularly gels, have attracted substantial interest owing to their fascinating morphology, optical, rheology and various physical properties.

Selected Publications:

- Cd^{2+}-induced Fluorescent Metallogel: A case of CHEF and ACQ phenomenon
  Manish K. Dixit C. Mahendar and Mrigendra Dubey*
  Chemistry – An Asian Journal, 2019, https://doi.org/10.1002/asia.201900559; Impact Factor: **3.698**.
- Li^{+}-induced Fluorescent Metallogel: a case of ESIPT-CHEF and ICT phenomenon
  Manish K. Dixit and Mrigendra Dubey*
  Phys. Chem. Chem. Phys, 2018, 20, 23762-23772; Impact Factor: **3.906**.
- Multi-stimuli responsive conductive sonometallogel: a mechanistic insight into role of ultrasound in gelation Vinay K. Pandey, Manish K. Dixit, Sébastien Manneville, Christophe Butcher and Mrigendra Dubey* **Journal of Materials Chemistry A**, 2017, 5, 6211-6218; Impact Factor: **10.733**.

Research Highlights:
Gels have attracted substantial interest owing to their fascinating morphology, optical, rheology and various physical properties. In the present era, gels are directly applicable in human daily routine life like medicine, cosmetics, electronic devices, tissue engineering etc. The direct applications as well as interesting chemistry of gels motivated me to establish my research lab for the synthesis of chiral inorganic gelators. Chirality tunes the morphology and exhibits the chiro-optical effects. The incorporation of metal with gelators may be associated with additional physicochemical properties such as magnetism, color, rheology, adsorption, emission, catalytic activity and redox behavior. To the date very few chiral inorganic gels are reported because of difficulty in the synthesis of enantiopure chiral gelator molecules as well as the incorporation of metal more often than not inhibits the gelation. Thus, I am actively involved in development of various kinds of materials (particularly gel materials) with special attention to - (i) Superabsorbent, (ii) Conductive, (iii) Charge transfer, (iv) Aggregation induced emission, (v) Chiro-optical, (vi) photophysical, (vii) morphological, (viii) Rheological and (ix) crystal engineering importance.

Research Projects:
DST-INSPIRE Faculty Award (Funded by DST, GOI).

Events/ Seminars organized:
- International Workshop on Advanced Materials Processing organised at IIT Indore, 26 December 2017 (Co-Convenor)
- Faculty Adviser, Model United Nation event -2018
- Faculty Coordinator, Model United Nation event -2019

Dr. Eswara Prasad
Assistant Professor
eswar@iiti.ac.in

Dr. Eswara Prasad Korimilli earned his ME and PhD. from the Indian Institute of Science, Bangalore. Prior to joining IIT Indore, he worked as a Postdoctoral fellow at the Department of Mechanical Engineering, The Johns Hopkins University, Baltimore, USA and was Assistant Professor at the School of Engineering, Mahindra Ecole Centrale, Hyderabad. He is also a Visiting Faculty at the Institute of Nanotechnology, Karlsruhe Institute of Technology, Germany (May-July, 2019); and Center for Advancing Materials Performance from the Nanoscale, Xi'an Jiaotong university (December 2017, May – July 2018), China. He heads the Mechanics of Materials group at IIT Indore and works in the broad area of mechanical behavior of materials.

Selected Publications:
- S. Hirmukhe, K. Eswar Prasad, I. Singh, Investigation of pressure sensitive plastic flow in nanoglasses from finite element simulations, Scripta Materialia 180 (2020) 45-50.
- V.S.Kathavate, B. Praveen Kumar, I.Singh, K. Eswar Prasad, Effect of sub and above-curie temperature annealing on the nanomechanical properties of PMN-PT piezoceramics, Ceramics International 46 (2020) 12876-12883
- BY Liu, K. Eswar Prasad, N Yang, F Liu, ZW Shan, In-Situ Quantitative TEM Investigation on the Dynamic Evolution of Individual Twin Boundary in Magnesium Under Cyclic Loading, Acta Materialia 179 (2019) 414-423.

Research Highlights:
His broad area of research is in Mechanical behavior of materials, Indentation mechanics, high strain rate deformation, Tribology. Currently his group is trying to understand the deformation behavior of materials at different length and time scales using novel experimental techniques. The current interest of materials includes HCP materials (e.g. Mg and Ti alloys), amorphous materials (e.g. metallic glasses and polymers), advanced ceramics (e.g. Piezoelectric materials and SiC), BCC metals (e.g. Mo and Ta) and polymer nanocomposites.

Events and Seminars Organized:

- Convener, 11th International conference on Materials Processing and Characterization to be held from December 15-17, 2020 at IIT Indore.
- Organizer of the Symposium "Material Behaviour Characterization Under High Strain Rate Loading" as a part of SICE 2020 held at IIT Bombay (December 11-13 & 18-20, IIT Bombay)
- Organized a GIAN course on "Integrated Computational Materials Engineering"July 8-13, 2019 IIT Hyderabad

Research Projects:

"Design and manufacturing of miniature Kolsky bar or Split Hopkinson Pressure Bar (SHPB) setup to characterize the very high strain rate deformation behavior of metals" DST-SERB 2019-2021.

Awards and Achievements:

- **Invited speaker** at 11th International Workshop on Materials Behavior at the Micro- and Nano-scale, June 7-11, 2018 at Xi'an Jiaotong University, Xi'an, China
- **Belt and road Overseas expert** and Visiting faculty fellow ship, School of Materials Science Engineering, Xi'an Jiaotong University (XJTU), China (December 2017, May - July, 2018)
- **Outstanding reviewer** recognition, Journal of Alloys and Chemical Compounds (September 2017)
- **Best oral presentation** at NMD-ATM 2016 held at IIT Kanpur in the category of *Science of metals and materials*.
- Listed in **Marquis Who's Who in World (**2016, 2018, 2019**)**
- Invited to attend a discussion meeting on **Frontiers in Structural Materials Research** organized by Indo-US Science Technology Forum (IUSSTF) at Coorg – India, Feb 2015
- **One among the 14 research students** to be selected from India to attend the JSPS-DST Asia Academic seminar held in Yokohama, Japan during December - 2009 (*Two of my posters were selected as invited posters for this conference*)
- **Best project of the year 2005** at TVS-Motor Company Ltd. (*This was given for increasing durability of the gear box by 3 years*)
- **All India 16th rank** in Graduate Aptitude Test for Engineers (GATE - 2002)
- **First Rank**, B. Tech. Class of '02, NIT Warangal.
- **State 10th rank** in Engineering Common Entrance Test (ECET – 1998

GIAN Courses during April 2019-March 2020

Title of the Course - Integrated Computational Materials Engineering for metals

Brief Statement of the importance of the course - The emphasis of the course was on understanding the scale bridging techniques in engineering materials.

Academic Activities - Besides co-organizing the course, delivered few lectures on dislocation dynamics

The Approximate number of students and faculty who attended - 70

Dr Vinod Kumar
Assistant Professor
vkt@iiti.ac.in

Joining date at IITI – 30 March, 2017

- Ph.D. Materials Science and Engineering, Indian Institute of Technology Kanpur, India, May 21, 2012.

Research interests

- Structure-Property correlation in High Entropy Alloys
- Phase Transformation
- Corrosion Engineering
- Structural Nanomaterials
- Thermomechanical Processing of Magnesium Alloys and Steels
- Failure Analysis

Experience

- **Assistant Professor** in the Department of Metallurgy Engineering and Materials Science at Indian Institute of Technology Indore (*March 30, 2017 – till date*).
- **Adjunct Faculty** in Materials Research Centre at Malaviya National Institute of Technology Jaipur *(22nd Aug. 2013 to 21st Aug. 2015).*
  Assistant Professor in the Department of Metallurgical and Materials Engineering at Malaviya National Institute of Technology Jaipur (*July 6, 2012 – March 29, 2017*).

Selected Publications (3 publications):

- S.K. Dewangan, S. Samal, and V. Kumar, Microstructure Exploration and an Artificial Neural Network Approach for Hardness Prediction in AlCrFeMnNiWx High-Entropy Alloys, J. Alloys Compd., Elsevier B.V, 2020, 823, p 153766, doi:10.1016/j.jallcom.2020.153766.
- Sheetal Kumar Dewangan, Vinod Kumar Sharma, Priyanka Sahu, Vinod Kumar "Synthesis and characterization of hydrogenated novel AlCrFeMnNiW high entropy alloy", International Journal of Hydrogen Energy. Elsevier Ltd, 2019, doi:10.1016/j.ijhydene.2019.08.113.
- P. Sahu, S. Solanki, S. Dewangan, and V. Kumar, Microstructure and Magnetic Behavior of FeCoNi(Mn-Si)x (x = 0.5, 0.75, 1.0) High-Entropy Alloys, J. Mater. Res., 2019, 34(5), p 829–840.

Research Highlights : Powder Metallurgy, and Physical Metallurgy

Events and Seminars Organized:

- 5 days short term **course** on Fundamental of corrosion science
- **workshop** on corrosion and electrochemistry.
- Microscopy **workshop** for DSX1000 digital microscope
- Model Unit Nation (MUN) event
- (5) Coordinator of "Training Program on Active Leaning: Phase C" organised from 25-06-2018 to 29- 06-2018 at IIT Indore, Indore for faculty members of MITS Gwalior and GEC Sundarnagar.
- Coordinator of "Training Program on Active Leaning: Phase B" organised from 18-06-2018 to 22-06-2018 at IIT Indore, Indore for faculty members of JEC Jabalpur and MITS Gwalior.
- Coordinator of "Training Program on Active Leaning: Phase A" organised from 11-06-2018 to 15-06-2018 at IIT Indore, Indore for faculty members of JEC Jabalpur.
- Coordinator of "Faculty Induction Workshop: Phase C" organised from 29-01-2018 to 02-02-2018 at IIT Indore, Indore for faculty members of REC Rewa, SATI Vidisha, SEI Pithoragarh and SGSITS Indore.
- Coordinator of "Faculty Induction Workshop: Phase B" organised from 23-01-2018 to 27-01-2018 at IIT Indore, Indore for faculty members of JEC Jabalpur and SGSITS Indore.
- Coordinator of "Faculty Induction Workshop: Phase A" organised from 17-01-2018 to 21-01- 2018 at IIT Indore, Indore for faculty members of UEC Ujjain and SGSITS Indore.

Research Lab Name: Non-equilibrium Advanced Materials Engineering (NAME) Lab

Dr. Jayaprakash Murugesan,
Assistant Professor
jayaprakash@iiti.ac.in

Date of joining: 12 June 2017
PhD : 2010 (Nagaoka University of Technology, Japan) Materials science and Engineering

Selected Publications (3 publications):

- Sangam Sangral, K Achyuth, Mahesh Patel, **Jayaprakash M,** Effect of fretting on fatigue behavior of Al alloys considering Environmental effect, **Materials Today**,15-1, pp 119-125, (2019)
- K Achyuth, Sangam Sangral, Mahesh Patel, **Jayaprakash M,** Fretting wear degradation behavior of Al-Si-Ni based cast Aluminum alloy under different environment, **Materials Today**,15-1, pp 103-108, (2019)

- **Jayaprakash M**, D. H. Ping, Y. Mittrai, Enhanced yielding strength of near-α Ti–Al–Zr–Sn high temperature alloys, Materials Science and Engineering A, 625 pp 131-139 (2015).

Research area: Materials joining, materials testing, fatigue, alloy development, surface engineering

- Fatigue and fretting fatigue behaviour of high strength alloys
- Dissimilar materials joining
- Friction stir processing of Al, Mg alloys
- Alloy development

Events and Seminars Organized:

- Convener for "International Workshop on Advanced Materials Processing", Organized at Department of Metallurgy Engineering and Materials Science, IIT Indore on 26 Dec 2017
- Organized a 3-day short course on Advanced SurfaceScience and Engineering (together with Dr. P. M Shirage, S. Hosmani, R.S. Devan and H. Borkar) sponsored by TEQIP on 26-28 March 2018.
- Convener for "6-day short course on Advances in Materials and Processing", Organized at Department of Metallurgy Engineering and Materials Science, IIT Indore in Jan 2019
- Convener for "One day workshop on Japanese Language " Organized at IIT Indore in March 2019

Research Projects:

- Effect of hydrogen environment on fatigue behavior of FSW Al- stainless steel joint, SERB-SRG, 28 lakhs, Dec 2019 – Dec 2021. (as PI)
- Development of Al based MMC through FSP route, TEQIP, 1.15 Lakhs, Sep 2019- Aug 2020. (as PI)
- Fretting fatigue and fretting wear behavior of Titanium Foam under simulated body fluid environment , TEQIP Collaborator research project (as a Mentor), 19 Lakhs, Dr. RAM SINGA R Y (PI from SG SITS Indore), myself as mentor.

Research Facilities:

- Fusion welding facilty (Gas welding, Arc welding, TIG< MIG welding)
- CMT welding,
- Friction stir welding
- Diffusion Bonding
- Wear tester

Research Lab Name: Welding Engineering Lab, Advanced Materials Joining and Materials Testing Lab.

Awards and Achievements:

- Sudharshan Bhat Memorial Prize for Best Master Thesis, IIT Madras 2006
- Monbukagakusho Japanese government scholarship 2006
- 3G Mind Research fellowship for Internship at Hitachi Ltd. 2008

Dr. Sumanta Samal
Assistant Professor
sumanta@iiti.ac.in

Dr. Sumanta Samal earned his doctorate from the department of Materials Science and Engineering, Indian Institute of Technology Kanpur in 2014, followed by three years of Post-Doctoral research experience in the Department of Metallurgical and Materials Engineering at the Indian Institute of Technology Madras.

His research and teaching interests include solidification, physical metallurgy, phase transformations and phase equilibria in materials, hot deformation behaviour in multicomponent/high entropy alloys, Phase selection kinetics in deeply undercooled metallic melts, phase field simulation for microstructural evolution.

Selected Publications:

- Reliance Jain, Rahul M R, Sumanta Samal, Vinod Kumar, Gandham Phanikumar, Hot workability of Co-Fe-Mn-Ni-Ti eutectic high entropy alloy, Journal of alloys and compounds, Vol. 822, 2020, doi:10.1016/j.jallcom.2019.153609, 153609.
- Rahul M R, Sumanta Samal, Gandham Phanikumar, Hot deformation behaviour and microstructural characterization of $FeCoNiCrNb_{0.5}$ eutectic high entropy alloy, Journal of Materials Processing and Performance, Vol. 8, pp., 2019, doi:10.1520/MPC20190014. Article Number: MPC20190014.
- Rahul MR, S. Samal, S. Venugopal, G. Phanikumar, Experimental and finite element simulation studies on hot deformation behaviour of $AlCoCrFeNi_{2.1}$ eutectic high entropy alloy, Journal of Alloys and Compounds, Vol. 749, pp. 1115–1127, 2018.

Research Highlights:

Our research interests include phase transformations and phase equilibria in materials, Processing- Structure-Property correlation in multicomponent/high entropy alloys, metastable phase formation in deeply undercooled alloys, Phase field simulation for microstructure evolution. The main areas of research are:

- Solidification: Experiments and Simulation
- Multicomponent/High Entropy Alloys
- Processing-Structure-Property Correlations
- Material design for high temperature applications
- Phase equilibria: Materials for future
- Thermo-mechanical Processing of structural materials

Research Projects:

Development of novel eutectic high entropy alloys for high-temperature applications, 2020-23. (Funded by BRNS, GOI)

Dr. Ajay Kumar Kushwaha
Assistant Professor
akk@iiti.ac.in

Dr. Kushwaha is a materials scientist, working in the area of design and synthesis of nanomaterials for energy devices. He received Ph.D. degree in Physics (Nanomaterials) from IIT Bombay in year 2014. He joined IIT Indore as Assistant Professor in Department of Metallurgy Engineering and Materials Science in September 2017. Since May 2019, he is also having administrative responsibility as Associate Dean of Students Affairs IIT Indore. He was Inspire Faculty at School of Engineering in IIT Indore during July 2016 to September 2017. Prior to join IIT Indore, he worked as a Scientist-I in Institute of Materials Research and Engineering, A*STAR, Singapore from Feb 2014 to July 2016. He also worked as Lecturer in Department of Physics at KCNIT Banda (2006-2007) and PSIT, Kanpur (2007). He is the recipient of DST-INSPIRE Faculty Award (2016) and SERB-Early Career Research Award (2017) from Government of India. Dr. Kushwaha is life-member of Indian Physics Association (IPA), Electron Microscope Society of India (EMSI) and Luminescence Society of India (LSI). He has published more than 50 research articles, International Patent (Technology is licensed) and several book chapters.

Research Laboratory: Nano & Energy Materials Laboratory (https://kushwaha09.wixsite.com/ajay/research)

Research interests:

- Nanomaterials & thin films
- 2-D materials based electronic devices
- Energy harvesting and storage
- Electrochemical sensors
- Electrochemical artificial synapses
- Anti-corrosion coatings

Statement of Research Interests

a. **Broad research area** - Nano and Energy Materials

b. Research Highlights

- Nanomaterials: Synthesis, characterization and application; Metal oxides, chalcogenides and 2-D Materials (Graphene & Mxenes); Surface modification, photo-electrochemistry & opto-electronic properties
- Energy Harvesting and Storage: Next generation solar cell; Photo/electrochemical water-splitting; Electrodes for next generation batteries
- Electrochemical Sensors: Bio-sensors; Medicinal plants & food quality; Soil & environmental pollutants
- Electrochemical Artificial synapses: Bio-inspired artificial electronic synapse; Memristive anodic oxides for neuromorphic computing; Electrochemical metallization memristive switching
- Anti-Corrosion Coatings: Corrosion in nanostructured metals and alloys; Corrosion protection applying coatings; Extraction of metals from e-waste

c. Awards and Achievements

- 2017, *Early Career Research Award* : SERB, Gov. of India
- 2016, *INSPIRE Faculty Award* : DST, Gov. of India
- 2013, *Young Scientist Travel Grant*: DST, Gov. of India
- 2008-13, *JRF & SRF* : MHRD, Gov. of India
- 2008, *CSIR-NET (Physical Sciences)*: CSIR, New Delhi
- 2007, *GATE (Physical Sciences)* : IIT Kanpur

Selected Publications:

- G. K. Dalapati, S. M.Panah, R. S. Moakhar, S. Chakrabortty, S. Ghosh, **Ajay Kushwaha**, R. Katal, C. S. Chua, G. Xiao, S. Tripathy, S. Ramakrishna, *Nanoengineered Advanced Materials for Enabling Hydrogen Economy: Functionalized Graphene–Incorporated Cupric Oxide Catalyst for Efficient Solar Hydrogen Production,* **Global Challenges** 4 (3), 2070031 (2020).
- N. Mukurala, R.K. Mishra, S.H. Jin, and **Ajay Kushwaha**, *Sulphur precursor dependent crystallinity and optical properties of solution grown Cu2FeSnS4 particles*, **Materials Research Express**, 6 (8), 085099 (2019).
- G. K. Dalapati, **Ajay Kushwaha**, M Sharma, V Suresh, S Shannigrahi, S Zhuk and S Masudy-Panah, *Transparent heat regulating (THR) materials and coatings for energy saving window applications: Impact of materials design, micro-structural, and interface quality on the THR performance,* **Progress in Materials Science,** 95, 42, (2018).

Research Highlights:

Dr. Kushwaha works on Nano and Energy Materials, especially emphasizing on following:

- Synthesis, characterization and application of metal oxides, chalcogenides and 2-D Materials (Graphene & Mxenes); surface modification, photo-electrochemistry & opto-electronic properties.
- Next generation solar cell; photo/electrochemical water-splitting, electrodes for next generation batteries
- Biosensors; sensors for food quality and medicinal plants, soil & environmental pollutants
- Bio-inspired artificial electronic synapse; memristive anodic oxides for neuromorphic computing; electrochemical metallization memristive switching
- Corrosion in nanostructured metals and alloys; corrosion protection applying coatings; extraction of metals from e-waste.

Awards and Achievements:

- ***Best paper Award*:** 5NANO-2021; Organized by IEEE Photonics Society Student Chapter, Mangalam College of Engineering, Kerala.

Events and Seminars Organized:

- *Member of Organizing committee*: Online national awareness program on covid-19, IAPT-RC-09 (May 12-13, 2020)
- *Chair*: 23rd International Symposium on VLSI Design and Test – VDAT (July 04-06, 2019).

Projects active during April 2019-March 2020

Title - Wet-chemical approach to fabricate visible-near infrared light harvesting photoelectrodes
Duration - 2016-2021
Funding Agency - DST
Brief Description - The efficient and safe generation of clean hydrogen is an exciting research area and PEC water splitting process has shown good possibility for hydrogen production, if suitable photocatalytic material is available. Though, various photocatalytic materials have been investigated, however, the overall water splitting efficiency is very low. The band engineering is unclear and complex as well as photocatalytic mechanism is not established. Metal oxides are the most studied photo catalyst and water splitting mechanism has been well investigated. Thus, hybrid electrodes could be the ideal candidates to harvest VIS-NIR light.

Title - Lead Free Inorganic Halide Perovskite Nanostructures for Solution-Processable Photovoltaic cell
Duration - 2018-2021
Funding Agency – SERB
Brief Description - Perovskite materials have excellent light absorption, charge carrier mobility and lifetime that leads to high device efficiency with possibility to realize a low-cost, scalable solar cell device, if issues of stability and environmental compatibility is addressed.

Title - Development of All Earth Abundant Elements based Nano-heterostructures for Solar Driven Water Splitting
Duration - 2019-2022
Funding Agency CSIR
Brief Description - All abundant earth element-based nano-heterostructures can harvest the wider segment of solar energy. The cost of the materials also reduced due to use of earth abundant elements.

Students information (Ph.D., M.Tech., B.Tech students):

Existing PhD Students

- Mukurala Nagaraju
- Siddhartha Suman
- Aditya Bhardwaj
- Lokanath Mohapatra

Existing M. Tech. Students

- Abhishek Kumar Jaiswal

Existing B.Tech. Students

- Mayank Garg
- Vartika Pathak
- Vishvesh Jain

Graduated PhD Students

- Dr. Abhishek Upadhayay (Co-Supervisor)

Graduated M.Tech. Students

- Harsh Vaid
- Hariom Sharma (Co-Supervisor)

Graduated B.Tech. Students

- Sheetal Paswan
- Emin Varghese
- Satyam Sharma
- Rahul Bakrani
- Sagar Goswami

Dr. Dhirendra K. Rai
Assistant Professor
dkrai@iiti.ac.in

Dr. Dhirendra Kumar Rai did his PhD. from: Indian Institute of Technology Bombay Before joining IIT Indore as Assistant Professor, Dr. Rai has been DST Young Scientist and a Post doctoral research at IIT Indore. The primary research focus of Dr. Rai's research group is to develop new hybrid materials through surface tailoring of compatible inorganic colloidal nanoparticles with specific organic functionalities for particular applications. Such surface functionalized materials with a suitable organic moiety can be employed for biological probing.

Selected Publications:

- "A Three-Dimensional C(II)-MOF with Lewis acid-base dual functional sites for Chemical Fixation of CO2 via Cyclic Carbonate Synthesis
  A. K. Gupta, N. Guha, Sarathkumar Krishnan, P. Mathur, D. K. Rai, ***Journal of CO_2 Utilization***, 39 (2020) 101173
- Safranin O-functionalized cuboid mesoporous silica material for fluorescent sensing and adsorption of permanganate
  S. Chatterjee, J. Qin, X. li, F. Liang, D. K. Rai, Y. W. Yang, ***Journal of material Chemistry B***, 8 (2020) 2238-2249.
- Selective and Recyclable Congo Red Dye Adsorption by spherical Fe3O4 Nanoparticles Functionalized with 1,2,3,5-Benzenetetracarboxylic Acid S. Chatterjee, N. Guha, S. Krishnan, A. K. Singh, P. Mathur, D. K. Rai, ***Scientific Reports*** 10 (2020) 111

Research Highlights:

Dr. Rai's research group works on Environmental Remediation and Sustainable energy conversion and storage. To mitigate the rampant CO2 emission, it is imperative to address the problem not only by CO2 sequestration but also by breaking our reliance on fossil fuel and seeking other sustainable energy sources that are eco-friendly. In this regard, Dr. Rai's research group is actively engaged in the design of new multifunctional materials that can capture and fix the environmental CO2 into valuable feedstock and can also be used for storage of electrochemical energy.

Awards and Achievements:

- Junior Research Fellowship from Council of Scientific and Industrial Research (2006).
- Senior Research Fellowship from Council of Scientific and Industrial Research (2009).
- Qualified Graduate Aptitude Test in Engineering (GATE) with all India rank 73 (2007).
- Shortlisted for prestigious Shyama Prasad Mukherjee (SPM) fellowship interview (2007).
- DST Young Scientist Fellowship (2015)

Dr. Abhijit Ghosh
Assistant Professor
aghosh@iiti.ac.in

PhD. - Indian Institute of Technology Kharagpur, 2016
Previous Employment - (includes post-doctoral experience)
Research Associate, Indian Institute of Science Bangalore

Dr. Abhijit Ghosh (PhD.: Indian Institute of Technology Kharagpur and Post. Doc.: Indian Institute of Science Bangalore). Dr. Abhijit Ghosh's broad field of expertise is in the area of Physical and Mechanical Metallurgy of steel. He has research experience in the field of crystallographic texture, grain boundary engineering, small scale mechanical testing, fracture micro mechanism and creep. Apart from experimental expertise, he also has a strong interest on the theoretical aspects of metallurgical fundamentals.

Selected Publications:

- Arya Chatterjee, A. Ghosh, A. Moitra, A.K. Bhaduri, R. Mitra, D. Chakrabarti, Role of hierarchical martensitic microstructure on localized deformation and fracture of 9Cr-1Mo steel under impact loading at different temperatures, International Journal of Plasticity, 104 (2018), pp. 104-133.

- Ghosh, S. Patra, A. Chatterjee, D. Chakrabarti, Effect of local crystallographic texture on the fissure formation during Charpy impact testing of low carbon steel, Metallurgical and Materials Transactions A, 47 (2016), pp. 2755-2772.
- Ghosh, S. Kundu, D. Chakrabarti, Effect of crystallographic texture on the cleavage fracture mechanism and effective grain size of ferritic steel, Scripta Materialia, 81 (2014) pp. 8-11.

Research Highlights:

- Developing Cold Rolled Grain Orientated (CRGO) electrical steel
- Correlating crystallographic texture with fracture
- Understanding the Cleavage crack deviation at grain boundaries

Research Projects:

Development of Cold Rolled Grain Oriented Electrical steel with high Si Content (Funded by DST, GOI).

Statement of Research Interests

a. Broad research area

- Crystallographic texture and grain boundary
- Physical Metallurgy of Steel
- Fracture mechanics and Micro-mechanism
- Computational Material Science

b. Research Highlights

- Developing Cold Rolled Grain Orientated (CRGO) electrical steel
- Correlating crystallographic texture with fracture
- Understanding the Cleavage crack deviation at grain boundaries

c. Awards and Achievements

- Inspire faculty award by Department of Science and Technology, New Delhi
- National Postdoctoral Fellowship
- Dr. D. S. Kothari Postdoctoral Fellowship

Projects active during April 2019-March 2020

Title - Development of Cold Rolled Grain Oriented Electrical steel with high Si Content
Duration - 5 years (2017-2022)
Funding Agency - DST (Under Inspire scheme)
Brief Description - Development of electrical steel is a matter of research interest for last 60 years. But, commercial production of electrical steel in India is yet to start. Therefore a systematic study on the development of electrical steel is indeed an absolute requirement for current Indian scenario. The origin of Goss texture in CRGO steel in not completely understood. The role of inhibitors (precipitate), CSL boundary and orientation dependent store energy on the abnormal grain growth is still debatable. Our work aims to address those issues.

Dr. Hemant Borkar
Assistant Professor
h.borkar@iiti.ac.in

Brief Introduction:

Dr. Hemant Borkar is at IIT Indore since Dec 2017. He got his doctoral studies in Materials Engineering from McGill University, Canada. Subsequently, he was a postdoctoral position at Jonkoping University, Sweden for 2 years followed by Senior Teaching Fellow position for 2 years at University of Warwick, UK. The broader area of his research revolves around Process-structure-property relationships in metals and Lightweight materials for automotive applications.

Selected Publications (3 publications):

- **Hemant Borkar,** Salem Seifeddine, Anders Jarfors, ''In-situ EBSD study of deformation behavior of Al-Si-Cu alloys during tensile testing'', Materials and Design 84 (2015) 36-47.
- **Hemant Borkar,** Raynald Gauvin, Mihriban Pekguleryuz, "Effect of extrusion temperature on texture evolution and recrystallization in extruded Mg-1%Mn and Mg-1%Mn-1.6%Sr alloys", Journal of Alloys and Compounds, 555 (2013) 219-224.
- **Hemant Borkar,** Majid Hoseini, Mihriban Pekguleryuz, "Effect of strontium on the texture and mechanical properties of extruded Mg-1%Mn alloys", Materials Science and Engineering A 549 (2012) 168-175.

Research Highlights:

- Materials and manufacturing
- Process-structure-property relationships in metals
- Lightweight components for transport applications
- Casting of light metals (Al and Mg), casting defects, casting simulation and experimental studies
- Deformation processing including extrusion, rolling, forming etc, deformation mechanisms
- Electron back scattered diffraction, in-situ deformation studies, crystallographic texture

Events and Seminars Organized:

- Organized 'Samsung Innovation Award' event as 'Student Entrepreunership Support Cell' (SESC) Convener
- Organized industy expert lecture on 'Auditing processes in manufacturing quality control' in Department of MEMS

Research Facilities:

- Electropolishing machine
- Vibratory polisher
- Muffle furnace
- Semi automatic polishing machine

Research Lab Name: Advanced Mechanical and Physical Metallurgy Laboratory

Awards and Achievements:

- Best Presentation Award, ICMST 2018 Conference, Aug 2018
- Departmental GREAT Conference Travel Award, 2010 & 2011
- McGill International Doctoral Award, 2008

Dr. Sunil Kumar
Assistant Professor
sunil@iiti.ac.in

Dr. Sunil Kumar (PhD: Indian Institute of Science Bangalore; Visiting Researcher: Polytechnic University of Catalonia- Barcelona Tech, Spain; Research Fellow: National University of Singapore). Dr. Kumar has joined IIT Indore as an INSPIRE Faculty in ***November 2015*** and continuing as Assistant Professor since ***December 2018***. Dr. Kumar's research focuses on the experimental investigations of structure–property–processing relationship in functional materials as a mean to develop technologically important novel materials with tailored properties. Of particular interest are materials for energy storage applications and lead-free piezoceramics. The research group led by Dr. Sunil Kumar is currently on the development of ceramic-polymer composite solid electrolytes as a mean to have safer, cheaper, and better performing electrochemical energy storage systems. More details about his research interest and research group can be found at: Solid State Ionics Lab

Selected Publications (3 publications):

- Tanvi Pareek, Sushmita Dwivedi, S. Ali Ahmad, Manish Badole, and Sunil Kumar | *Effect of NASICON-type $LiSnZr(PO_4)_3$ ceramic filler on the ionic conductivity and electrochemical behavior of PVDF based composite electrolyte,* ***Journal of Alloys and Compounds, 824 (2020) 153991***

- Sushmita Dwivedi, Tanvi Pareek, Manish Badole, Shadab Ali Ahmed, and Sunil Kumar | *Effects of $LaScO_3$ doping on structure, dielectric, and piezoelectric properties of $K_{0.5}Na_{0.5}NbO_3$ piezoceramics*, ***Journal of Applied Physics 127, 094104 (2020)***
- Tanvi Pareek, Birender Singh, Sushmita Dwivedi, Arun Kumar Yadav, Anita, Somaditya Sen, Pradeep Kumar, and Sunil Kumar | *Ionic conduction and vibrational characteristics of Al^{3+} modified monoclinic $LiZr_2(PO_4)_3$*, ***Electrochimica Acta*, 263** (2018) 533-543

Research Highlights:

- Fabrication of all-solid-state lithium batteries with $LiSnZr(PO_4)_3$+PVDF-LiTFSI as the compoiste solid electrolyte, Li4Ti5O15 (LTO) as the working cathode, and lithium metal as the anode. Li|CPE|LTO cell delivered a specific discharge capacity of 133 mAh/g and 88% capacity retention after 20 cycles at 0.1C rate. The addition of 15 wt% $LiSnZr(PO_4)_3$ improved the stability window up to 4.73 V and lithium-ion conductivity to 5.76 $\times 10^{-5}$ Scm^{-1} at 300 K.
- Modified the piezoelectric properties in KNN based material with $LaScO_3$ doping. The crystal structure varies from orthorhombic to a pseudocubic phase. High room temperature (at 300 K) dielectric constant ~ 1058 and low dielectric loss~ 0.03 at 100 kHz are observed for the composition with x = 0.03. The DC conductivity also decreases dramatically with the increase in $LaScO_3$ substitution.
- Fabrication of nano-grained $K_{0.50}Bi_{0.50}TiO_3$ (KBT) based ceramics with 80% improvement in d_{33} with the addition of a small amount of $BiAlO_3$ accompanied with drastic improvement in DC resistance.

Research Projects:

Title - *Development of Solid Electrolyte for All-Solid-State Rechargeable Lithium Batteries*
Duration - 5 years (2015-2020)
Funding Agency - Department of Science and Technology (**DST**) under **INSPIRE** Faculty Scheme.

Title - *Compositionally and Microstructurally Engineered Lead-Free Ceramics for Piezoelectric Applications*
Duration - 3 years (2017-2020)
Funding Agency - Science and Engineering Research Board (**SERB**), under **Early Career Research Award**

Research Facilities:

- **Material Syntheses and Device fabrication**
  - *Fume Hood*
  - *High-Temperature Muffle Furnaces and Tube Furnace with Different Environment*
  - *Analytical Balance with Density Meter*
  - *Mini Planetary Ball-mill*
  - *Magnetic Stirrers with Hot Plates*
  - *Hydrothermal Autoclave reactor*
  - *Vacuum Oven and Vacuum Pump(s)*
  - *25 Tonn Hydraulic Press*
  - *Inert Atmosphere Glove Box*
  - *Hand Press Die Cutter for Punching Electrodes*
  - *Ultrasonic Bath*
  - *Platinum Crucible*
  - *Hydraulic Hot Press (up to 600 K)*

- **Characterization Related**
  - *LCR Meter (1 mHz to 5 MHz)*
  - *Lakeshore Temperature Controller and High-Temperature Sample Holder for Temperature Dependent Impedance Analyzer in 90 – 800 K range*
  - *5 kV DC Power Supply for Poling of Piezoelectric Samples*
  - *Piezoelectric d33 Meter*
  - *Weiber Test Chamber for*
  - *Keithely Source Meter Unit (2450-EC) with Basic Electrochemistry Measurements*
  - *8 Channels Battery Tester*

- *Desktops*

Research Lab Name - *Solid State Ionics*
Awards and Recognitions (2019-20):

- **Early Career Research Award** (year 2017-2020), **Science and Engineering Research Board (SERB)**, Government of India.
- **DST- INSPIRE Faculty Award** (year 2015-2020).
- Early Career Research project was awarded "**Excellent**" grade by the Expert Committee during the project Review/Monitoring Meeting held on 14th & 15th February 2020 at IIT Delhi.

Dr Ram Sajeevan Maurya
Assistant Professor
ramsajeevan@iiti.ac.in

Brief Introduction:
Dr Ram Sajeevan Maurya is an Assistant Professor at the Department of Metallurgy Engineering and Materials Science, IIT Indore. He joined the institute on 19th of September 2019. His Academic Journey Ph.D degree in the Metallurgical and Materials Engineering department at IIT Kharagpur. Further, after five months of post-doctoral research at IIT Madras, Dr Maurya worked as an Assistant Professor in the department of Metallurgical and Materials Engineering at NIT Rourkela for one and half year before joining this institute. His field of interest are Bulk Metallic Glasses, High Entropy Alloys, ODS Alloys, Powder Metallurgy, Sintering etc.

Selected Publications (3 publications):

- RS Maurya, A Sahu, T Laha, Nanoindentation study on Al86Ni8Y6 glassy alloy synthesized via mechanical alloying and spark plasma sintering, International Journal of Materials Research, 111 (2020) 160-167
- A Sahu, RS Maurya, T Laha, Non-isothermal crystallization behavior of Al86Ni8Y6 and Al86Ni6Y4.5Co2La1.5 melt-spun ribbons, milled ribbon particles and bulk samples consolidated by spark plasma sintering, Thermochimica Acta, 684 (2020) 178486
- Ashutosh Sahu, RS Maurya, Soumitra Dinda, Tapas Laha, Phase Evolution-Dependent Nanomechanical Properties of Al86Ni8Y6 and Al86Ni6Y4.5Co2La1.5 Spark Plasma-Sintered Bulk Amorphous Composites, Accepted in Metallurgical and Materials Transactions A, 2020.

Research Highlights:

- Bulk Metallic glass (BMG) nanocomposites - Understanding the effect of multi-phase microstructure
- Oxide dispersion strengthened (ODS) alloys – Understanding the effect of addition of alloying elements,
- Design and development of Light Weight Eutectic High entropy alloys (HEAs),
- Materials synthesis by powder technology route – Mechanical alloying, Spark plasma sintering

Research Projects: Development of Light Weight Eutectic High Entropy Alloys, June 2019 to June 2022, Early Career Research Award, DST SERB
Research Facilities: Ball milling equipment
Research Lab Name: Advanced Powder Technology Laboratory
Awards and Recognitions (2019-20) - Early Career Research Award, SERB-DST, 2019

Dr. Dudekula Althaf Basha
Assistant Professor,

Dr. Dudekula Althaf Basha is an Assistant Professor at IIT Indore since 14th October 2019. He completed his Ph.D from Indian Institute of Science, Bangalore in 2014. Before joining as a faculty member at IIT Indore, he worked as a Post Doctoral Researcher at National Institute for Materials Science, Japan. His research interests are: Deformation behaviour of magnesium alloys, Phase transformation behaviour of alloy nanoparticles, Crack propagation behaviour study through in-situ microscopy techniques.

bashada@iiti.ac.in

Selected Publications (3 publications):

- **D.Althaf Basha,** N.Ravishankar and K.Chattopadhyay. Phase stability behavior of nanoscaled Bi-Pb alloys with peritectic composition in Zn matrix **Scripta Materialia** 143 (2018) 68-71.
- **D.A. Basha**, H. Somekawa, A. Singh, Crack propagation along grain boundaries and twins in Mg and Mg–0.3at.%Y alloy during in-situ straining in transmission electron microscope. **Scripta Materialia** 142 (2017) 50-54.
- **D.A. Basha,** R. Sahara, H. Somekawa, J.M. Rosalie, A. Singh, K. Tsuchiya, Interfacial segregation induced by severe plastic deformation in a Mg–Zn–Y alloy, **Scripta Materialia** 124 (2016) 169-173.

Research Highlights:

- Zn segregation to various boundaries at room temperature in ultrafine grain sized Mg-Zn-Y alloy
- Y segregation at grain boundaries leads to the change in crack propagation in Mg-Y alloys
- STEM-LAADF imaging permits to image ultrafine microstructural features in severely deformed alloys.
- Optimum grain size is shown to improve the ductility of magnesium alloys
- Y segregation at grain boundary leads to the change in crack propagation behaviour in Mg-Y alloys
- Nucleation of non-basal dislocation observed at grain boundary

Broad research area

- Deformation behaviour of magnesium alloys.
- Phase transformation behaviour of alloy nanoparticles.
- Crack propagation behaviour study through in-situ microscopy techniques.

Awards and Achievements

- Best Poster award, ISAJ symposium in TOKYO, 2017, Japan.
- JEST (Joint entrance screening test) in Physics conducted by DAE, ALL INDIA RANK-22,
- CSIR-NET qualified, June 2008.

Dr. Srimanta Pakhira
Assistant Professor and
Ramanujan Fellow
spakhira@iiti.ac.in

Dr. Srimanta Pakhira is working as a Ramanujan Fellow in the Department of Metallurgy Engineering and Materials Science (MEMS) since January 2018. Dr Pakhira has done his PhD. from the Indian Association for the Cultivation of Science (IACS) and Jadavpur University, Kolkata, West Bengal, India and he was Postdoctoral fellow in University of California at Berkeley and Lawrence Berkeley National Laboratory (LBNL), Berkeley, CA, USA; Nagoya University, Nagoya, Aichi, Japan; Florida State University, National High Magnetic Field Laboratory, Florida State University (FSU), Tallahassee, Florida, USA. He was a highly prestigious Japan Society for the Promotion of Science (JSPS) International Post-doctoral Fellow for outstanding Foreign Researcher in Japan and he was awarded highly prestigious Alexander von Humboldt Fellowship (AvH) International Post-doctoral Fellowship for Foreign Researcher in Germany. Dr Pakhira was conferred highly prestigious Ramanujan Fellow and Early Career Research Award (ECRA) from the Science and Engineering Research Board (SERB), Department of Science and Technology (DST), Govt. of India.

Dr. Pakhira's research group is active in Condensed Matter Theory, Electronic Structure Theory, Semi-conductor Physics, Magnetism, Physics of Novel Solar Cells, Renewable Energy Technology, Perovskite, Computational Materials Science, Computational Physics and Condensed Matter Nanoscience. They have also contributed to the understanding of Density Functional Theory (DFT) and applications in various areas of science.

Selected Publications:

- Dharmarwardana, M.;† **Pakhira, S.**;† Welch, R. P.;† Narvaez, C. C.; Luzuriaga, M. A.; Arimilli, B. S.; McCandless, G. T.; Fahimi, B.; Mendoza-Cortes, J. L.; Gassensmith, J. J. **2020** Rapidly Reversibly Organic Crystalline Switch for Conversion of Heat into Mechanical Energy. ***ChemArXiV.***
  †Equal Contribution: First Authorship.
- Sonkar, C.; Malviya, N.; Ranjana, R.; **Pakhira, S.**; Mukhopadhyaya, S. **2020** Mechanistic Insight for Targeting Biomolecules by Ruthenium(II) NSAID Complexes. ***ACS Applied Bio Materials.***, **Just Accepted Manuscript.**
- **Pakhira, S.,*** Mendoza-Cortes, J. L., **2020** Quantum Nature in the Interaction of Molecular Hydrogen with Porous Materials: Implications for Practical Hydrogen Storage. ***The Journal of Physical Chemistry C*** *124*, pp. 6454-6460. ***Impact Factor: 4.805.***

***Corresponding Author**

Research Highlights:

Dr. Pakhira's research group works on Theoretical Condensed Matter Physics, Energy Materials and Computational Materials Science.

His group's research highlights include:

- Condensed Matter Nanoscience and Computational Materials Science.
- Theory and Computations, Applications of Density Functional Theory (DFT), Electronic Structure Theory, Semi-conductor Physics, Magnetism, Physics of Novel Solar Cells, Renewable Energy Technology.
- Strong Correlation Effects in Electronic Materials, Hybrid Organic-Inorganic Perovskites and Theory of Novel 2D Materials, TMDs, Alkali-Ion Battery, H_2 and O_2 Evolution Reactions, O_2 and CO_2 Reduction Reactions
- Porous Materials such as MOFs, COFs, Zeolites, etc. and Their Applications, Hybrid Organic-Inorganic Perovskites and Theory of Novel 2D Materials and Their Applications in Electrocatalysis.

Research Projects:

- ***Construction of Porous Metal-Organic Frameworks (MOFs) and Covalent- Organic Frameworks (COFs) and Its Applications***, DST-SERB, Govt. of India. (Project Value: 35 Lakhs INR), PI-Dr. Srimanta Pakhira (Duration: 2018 - 2023).
- ***Development of New Two Dimensional Layer Structure Materials and Technique for Water Splitting: Applications in Hydrogen and Oxygen Evolution Reactions***, Early Career Research Award (ECRA), SERB-DST, Govt. of India. (Project Value: 53.14 Lakhs INR), PI-Dr. Srimanta Pakhira (Duration: 2019 - 2022).

Students Graduating in 2020 – Convocation - (MEMS)

B. Tech	34
M. Tech	10
MSE	10
Ph. D.	14

(Number of) Student Enrolments and Graduation(2019-20):

Enrolments(2019):

Ph.D (including dual degree):08
M.Tech (Metallurgy Engineering) :09
M.Tech (Materials Science and Engineering) :09
B.Tech (Metallurgy Engineering and Materials Science) :30

Graduation(2020):

Ph.D (including dual degree): 14
M.Tech (Metallurgy Engineering) :10
M.Tech (Materials Science and Engineering) :10
B.Tech (Metallurgy Engineering and Materials Science) :34

Department of Humanities and Social Sciences

Dr. Akshaya Kumar
Assistant Professor
Akshaya.kumar@iiti.ac.in

PhD. University of Glasgow, UK

Previous Employment (includes post-doctoral experience) Ambedkar University, Delhi (2016-17)

Statement of Research Interests

a. **Broad research area**

- Cultural Studies, Film Studies [Indian Cinema], Comparative Media Studies

b. Research Highlights

My recent work has been about media's expansion on digital platforms and its attendant overlaps with algorithmic governance, logistics, data mining, and informal labour. One of my papers on the intersection of political advertising and promotional calculus of platform capitalism was presented at *Digital Transactions in Asia* conference at Monash University Malaysia, Kuala Lumpur, and published in *Media International Australia.* Several other academic papers on the subject are in review or in development.

Publications (includes journal articles, books and book chapters)

Kumar, Akshaya. (2020) 'Deriving a Tangible Promotional Calculus: Platform Monopolies and Political Advertising.' *Media International Australia* 176 (1): 52-65.

Kumar, Akshaya. (2019) 'Informality in the time of Platformisation.' *Media Industries* 6 (2). doi: 10.3998/mij.15031809.0006.207.

Kumar, Akshaya. (2020) 'The Diffused Substance of Bhojpuri Indigeneity.' In Markus Schleiter and Erik de Maaker (eds) *Media, Indigeneity and Nation in South Asia.* Abingdon: Routledge, 90-104.

Projects active during April 2018-March 2019

Title - The Musical Mediation: Competitive and Collaborative Lives of Popular Music in North India
Duration - Two years
Funding Agency - ICSSR-IMPRESS
Brief Description - Mapping the recently emerged music studios, recording labs and live concerts of Bhojpuri, Maithili, Garhwali and Kumaoni speaking regions.

Dr. Ananya Ghoshal
Assistant Professor
aghoshal@iiti.ac.in

Ph.D. - The English and Foreign Languages University, Hyderabad (2016)
Previous Employment (includes post-doctoral experience)

- Fulbright Pre-Doctoral Fellow, Department of English, University of California, Berkeley (2010-2011)
- Junior Research Fellow (Ford Foundation grantee), Forum on Contemporary Theory, Baroda (2013)
- Academic Fellow, Forum on Contemporary Theory & Balvant Parekh Centre for General Semantics and Other Human Sciences, Baroda (2015-2017)
- Course Instructor, The English and Foreign Languages University (2008-2010)

Academic associations with other institutions (Affiliate/Adjunct/ Visiting posts)

- Official Alumni Ambassador, University of California, Berkeley
- Reviewer- Routledge India, Taylor & Francis Group
- Resource Person, Indo American Education Society, Education USA, Ahmedabad

Statement of Research Interests

a. Broad research area

- Literature and Other Arts, Word and Music Studies, Narratives of the Anthropocene, Digital Humanities, Cinema and Visual Culture, Disability Studies, Indian Theories of Aesthetics and Performance

b. Research Highlights

- *An*.org/) that guides learners through the complex concepts and debates related to the Anthropocene, including climate change, pollution, and environmental justice.
- *Disability in Translation, The Indian Experience* published by Routledge is a major intervention in translation and disability studies; the first of its kind coming out of India.

c. Awards and Achievements

Conference Presentation:

- "Who tells the 'story'? Who' witnesses'? – Storytelling in Digital Humanities- A Reappraisal from South Asia" at The Chicago Colloquium on Digital Humanities and Computer Science (DHCS) held at the University of Chicago, Illinois campus during November 9-10, 2019.

Invited Talks:

- "Why Digital Humanities?" at the University of Kalyani, West Bengal, on July 8, 2019. The talk was jointly organized by the Departments of Mathematics and Bengali.
- "Border Thinking: Children's Literature in Bengal" at the VII Balvant Parekh Memorial Lecture and National Symposium based on the topic "Epistemic Reconstitution(s), Colonial/Imperial Differences and Border Thinking." The Symposium was held during December 13-14, 2019 in Baroda. Walter D Mignolo, William H. Wannamaker Professor of Literature, Duke University, convened the Symposium.
- "On Visual Communication "at the IPS Academy, Institute of Engineering and Science, Indore (Department of Humanities' 'Faculty Enhancement Program' under Industry Institute Interaction (III) Series), *Anthropocene Primer* (book co-authored): An innovative open access, interactive publication (https://anthropoceneprimer December 28, 2019.

Publications (includes journal articles, books, and book chapters)

Book chapters:

"Reading interrupted: translating disability in *Subha*" in *Disability in Translation, The Indian Experience,* Edited by Someswar Sati and GJV Prasad, Taylor and Francis (Routledge), July 2019

Book:

An Anthropocene Primer, Version 2.0
An Open Access Born Digital Book & A Companion Hard Copy
Edited by Jason M. Kelly and Fiona P. McDonald, to be published by IUPUI Arts and Humanities Institute in collaboration with Indiana University Press.

Book Chapter:

"Sounding the Anthropocene," in *Scenes from the Anthropocene*, edited by Jason M. Kelly and Fiona P. McDonald, a University of California Press

Dr. Ashok K. Mocherla
Assistant Professor
ashokmocherla@iiti.ac.in

PhD. - Indian Institute of Technology Bombay

Previous Employment (includes post-doctoral experience)
Assistant Professor, School of Humanities and Social Sciences, Indian Institute of Technology Mandi

Statement of Research Interests

a. Broad research area

- Sociology of Religion, Faith Healing and Public Health.
- Sociology of Education and Youth, Minority Studies.

Publications (includes journal articles, books and book chapters)

- Ashok Kumar Mocherla. 2020. 'We Called Her Peddamma: Caste, Gender, and Missionary Medicine in Guntur 1880 – 1930'. *International Journal of Asian Christianity* (Brill Journal), (3), Pp. 69-84.
- Ashok Kumar Mocherla. 2020. 'Communism and the Cross: A Caste-class Trajectory of Religious Conversion in South India' In: Peter Berger & Sarbeshwar Sahoo (Ed.,) *Godroads*: *Modalities of Religious Conversions in India*. New Delhi: Cambridge University Press. Pp. 68-84.

Projects active during April 2019-March 2020

Title - Minorities on Campus: Discrimination, Equality, and Politics of Nationalism in Indian Higher Education.

Duration - 24 Months (2020 - 2022)

Funding Agency - Arts and Humanities Research Council (AHRC), UK

Brief Description - The research network will examine minority students' lived experiences of discrimination and marginalisation on higher education campuses in India.

Dr. C. Upendra
Associate Professor
cupendra@iiti.ac.in

PhD. - Indian Institute of Technology Bombay

Previous Employment (includes post-doctoral experience)
Academic Fellow at The Forum on Contemporary Theory, Baroda [Sept 2007 – Sept 2009]

Statement of Research Interests

a. Broad research area

- Moral-Political Philosophy, History of Ideas, Radical Philosophy, Philosophy of Film & Music

b. Research Highlights

- Currently, my research focuses on the identification of the *radical* – whether immanent and veiled by certain existential processes or it is a consequent of the conditions under one lives. The focus is on the what kind of grasp we can have about the human condition. Further it investigates the possible ontological nature of equality, justice and freedom – while also admitting to the paradox that they aer mutually irreconcilable.

Publications (includes journal articles, books and book chapters)

- Jasmine Fernandez, C. Upendra & Amarjeet Nayak, *A New Critical Notice of Robin Cook's Medical Thriller 'Coma'* , SOCRATES, vol. 6.3/4, pp. 1-26, 2019

Dr. Neeraj Mishra
Asst. Professor
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PhD. - 2010- Univ. of Bonn ,Germany

Previous Employment (includes post-doctoral experience)
2010-12 Univ. of Amsterdam, The Netherlands.

Academic associations with other institutions (Affiliate/Adjunct/ Visiting posts)
Associate Prof. on Deputation NIRD&PR, Hyderabad. 2019-20.

Statement of Research Interests

a. Broad research area

- Sociology of Development; Water governance; Politics of Inequality, Political Sociology, Tribal Development policies and Laws in India.

Publications (includes journal articles, books and book chapters)

- Mishra, Neeraj. 2020. *Global Governance of COVID-19: Decline of Public Sphere And Transnational Democracy.* (Book chapter, accepted for publication. Springer Nature.)

- Mishra, Neeraj. 2020. *Social Engineering and Sustainability: Revisiting Popper's 'Piecemeal Approach'* . In Rao, Y.S., Zhang, T.C., Goyal, M.K. (eds.) *Sustainability: Fundamentals and Applications.* Oxford. John Wiley & Sons Ltd.
- Mishra, Neeraj. 2020. *Why language matters: Linguistic sensitivity and descriptions of the pandemic COVID-19.* Center for Development Research, Univ. of Bonn. (Available at: https://www.zef.de/2129/blog-language.html)
- Mishra, Neeraj., S. Jyothis. 2020. *In the engine room of MGNREGA- Training on democratization of rural governance processes by NIRD&PR.* Pragati Newsletter, January 2020. No-296. pp. 3-6. Hyderabad: NIRD&PR.

Events/ Seminars organized

- Mishra, Neeraj. 18 June 2020. *Strategies to manage disasters and extreme climatic events- Community engagement and utilization of democratic institutions*. In the training program organized by: IIT Indore & National Institute of Disaster Management, New Delhi

Projects active during April 2019-March 2020

Title - Tribal Development in Madhya Pradesh
Duration - 2019-2020
Funding Agency - GAIL India Ltd. CSR Wing
Brief Description - Study of tribal life and challenges in development of tribal people in Chhindwara and Indore districts.

Dr. Nirmala Menon
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PhD. - The George Washington University USA

Previous Employment (includes post-doctoral experience)

- Assistant Professor, Saint Anselm College (University of New Hampshire), USA

Academic associations with other institutions (Affiliate/Adjunct/ Visiting posts)

- Edith Cowan University, Australia (Research Collaborator)
- Lancastar University (Research Collaborator)

Statement of Research Interests

a. Broad research area

- Digital Humanities and Publishing Studies
- Postcolonial Studies

b. **Research Highlights**

- The Digital Humanities and Publishing Research Group at IIT Indore is a vibrant place for creative research ideas. We are interested in interdisciplinary research that investigates and examines the intersections between technology and the humanities to understand the myriad ways in which technology is transforming and is transformed in the digital age. We are especially committed to developing a research hub that foster collaboration across departments from Humanities, Computer Science and allied departments. Our current projects include developing a digital archive for *Minor Partitions*, developing a multilingual database indexing project, using digital tools for algorithmic lliterary analysis, using visualization techniques for foregrounding gaps in scholarship and so on. The DH research group also has international collaborations with research groups in Australia, Austria, US and other places. Our current major project is KSHIP (Knowledge Sharing in Publishing); an Open Access scholarly publishing project that we hope will initiate a much-needed discussion on the modes and objectives of research publications in India. The Research group is led by Prof Nirmala Menon and currently has five research scholars and a visiting Fulbright scholar in its team.

c. Awards and Achievements

UKEIRI-SPARC Webinar on Artificial Intelligence and Machine Learning, June 26th 2020

http://ukieri.org/announcements/sparc-dissemination-webinars-june-july-2020

ADHO Invited Panelist on Indian Digital Humanities *Towards a Decolonial/Postcolonial Indian Digital Humanities. July 10th 2020 (conducted online)*

Invited Scholar for Academia Europaea's Invited Public Talk series at Wroclow University, Poland. https://acadeuro.wroclaw.pl/event/new-global-trends-in-the-humanities/
Invited Plenary Speaker at Big Data in Culture, Design and Heritage Workshop, Singapore,

- **ASEM-DUO India Student Fellowship Award 2020** at Lancaster University, Lancaster, United Kingdom, 2020.
- **SPARC Visiting Scholar Award** at the Digital Humanities Hub, Department of History at Lancaster University, May- September, 2019.

Publications (includes journal articles, books and book chapters)

- **Nirmala Menon and Dibyadyuti Roy. "**What is Postcolonial DH Pedagogy and what is it doing in Non-Humanities Institutions? Case Studies from India" *Debates in Digital Humanities Pedagogy,* University of Minnesota Press, Minnesota, USA
- **Nirmala Menon and Dibyadyuti Roy "N**o "making", not now: What is Decolonizing Digital Humanities in South Asia?" *Global Debates in Digital Humanities* University of Minnesota Press, 2020
- **T, Shanmugapriya** and **Nirmala Menon**. "First and Second Waves of Indian Electronic Literature." *Journal of Comparative Literature and Aesthetics*, Vol. 42, No. 3, 2019, pp.51-57.

Events/ Seminars organized

- A Workshop on Digitization Workflows & Digital Research Studies Methodologies, at the Indian Institute of Technology Indore in collaboration with British Library, UK. 11-12 February, 2019.
- **T, Shanmugapriya,** Participated in British Library Workshop on Digital Humanities, The Foyle Suite, Centre for Conservation at the British Library, UK. 6 September 2019.
- **T, Shanmugapriya.** Participated in Spatial Humanities Summer School at the Digital Humanities Hub, Department of History at the Lancaster University, UK. 16-19 July, 2019
- **T, Shanmugapriya**, Participated in Digital Humanities Workshop on "Multifaceted engagements with Cultural Heritage" at the Centre for the Study of Developing Society, New Delhi and funded by the Arts and Humanities Research Council (AHRC), UK. 11-12 April, 2019.
- **Arora, Shaifali**. Participated in Digital Humanities Workshop on "Multifaceted engagements with Cultural Heritage" at the Centre for the Study of Developing Society, New Delhi and funded by the Arts and Humanities Research Council (AHRC), UK. 11-12 April, 2019.
- **T, Shanmugapriya**. Presented paper 'Thanner Kuhai, The Water Cave'–A VR Poetry Experience in Tamil and English Languages" at the Languages INTER Networks, Lancaster University, UK, 20-22 June 2019.

Projects active during April 2018-March 2019
Title - *Technology As Literary Artefact In The Narration Of Post-Independence Indian English Novels (1947-2017)*
Duration - 2 years
Funding Agency - SPARC MHRD
Brief Description - This project will examine the technological artefacts (events) and its settings (space) in the selected post-independence Indian English novels published from 1947 to 2017. Studying events and space through digital humanities methodologies offers a new understanding about the impact of technology in the socio-culture settings.

Title - *Grand Challenges in the Humanities*
Duration - 1 year
Funding Agency - SPARC MHRD
Brief Description - The Project aimed to identify Research Challenges in the Humanities that require funding from the Government.

Title - *Samagra Process Documentation (as Co-PI with Dr Pritee Sharma)*
Duration - 1 years
Funding Agency - UNICEF
Brief Description - This project was an evaluation and documentation of the SAMAGRA project of the Govt of Madhya Pradesh in collaboration with UNICEF India.

Title - *Technology As Literary Artefact In The Narration Of Post-Independence Indian English Novels (1947-2017)*
Duration - 2 years
Funding Agency - UKEIRI UK
Brief Description - This project will examine the technological artefacts (events) and its settings (space) in the selected post-independence Indian English novels published from 1947 to 2017. Studying events and space through digital humanities methodologies offers a new understanding about the impact of technology in the socio-culture settings.

Dr. Pritee Sharma
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Ph.D. from Indian Institute of Technology Bombay

Previous Employment (includes post-doctoral experience)

- Worked at Indian Institute of Management Ahmedabad (IIMA) and Gujarat Institute of Development Research (GIDR)

Academic associations with other institutions (Affiliate/Adjunct/ Visiting posts)

- Research Fellow of Earth System Governance International Association based at Utrecht, The Netherlands.

Statement of Research Interests

a. Broad research area

- Agricultural Economics, Environmental Economics

b. Research Highlights

- **Agricultural Economics:** food security, agricultural productivity, rural poverty, and international trade in agriculture sector.
- **Environmental Economics**: stakeholder issues in climate change governance, resilience building, adaptive capacity aspects of climate change; and land and forest degradation from urban and rural poor's perspectives. All my work has been till date pertaining to governance, efficiency and policy in Indian context.

c. Awards and Achievements

- Keynote Speaker on Economic Policy at International Workshop on Nutrition Sensitive Agriculture held at Bhopal (2018); Panel discussant and speaker at the Earth System Governance International Project meeting at University of Lund, Lund, Sweden (2017); Expert in Energy Security Analysis at "The Energy Workshop," at EPFL, Lausanne, Switzerland (2017); Referee for OPSEARCH Journal of Operational Research Society of India (2016-17);
- Invited as speaker at International Lecture Series Programme, Penang, Malaysia (2015); Invited as DRR (Disaster Risk Reduction) expert at International Council for Local Environmental Initiative, ICLEI, Bangkok (2015); Invited as speaker at HINDAS International Workshop, Hiroshima (2014); Invited as speaker at 2014 IDEC Asia Seminar, Hiroshima (2014)

Publications (includes journal articles, books and book chapters)

Chapter in Book:

- Joshi, S., Sharma, P., (2018) Mapping meso-economic impacts of grid connected solar PV deployments in India: A Social Accounting Matrix Approach In K. Mukhopadhyay Ed. Applications of the Input-Output Framework, Publisher Springer Nature, Singapore, ISBN: ISBN:978-981-13-1506-0 (In Press) Publisher: Springer Nature DOI: 10.1007/978-981-13-1507-7

Papers in Refereed Journals:

- Singh, A.K. and P. Sharma (2018). Measuring the Productivity of Food Grain Crops in Different Climate Change Scenarios in India: Evidence from Time Series Investigation. *Climate Change*, Vol. 16, No. 4: 661-673.
- Sharma, P., Karanth, A. and Burvey, M. (2016). Economic Loss from Floods and Waterlogging: A Case Study of Indore. *IIED Working Paper Series* No. 38, 2016 Available at : http://pubs.iied.org/10789IIED.html
- Sofi, Irfan Ahmad and Sharma, P. (2015). Does employment protection legislation matter in dualistic labour market? Panel evidences from Indian manufacturing sector. *Labour Studies Journal*, USA 40 (2): 1-19.Sage Publication.

Events/ Seminars organized

- Dissemination of Report on "**Process Documentation of Samagra Portal: Unifying Social Registry System**" jointly organized by IIT Indore and UNICEF -India on June 10, 2019 at IIT Indore.

Projects active during April 2019-March 2020

Title - Process Documentation of Samagra Portal
Duration - November 2017 to August 2018
Funding Agency - UNICEF
Brief Description - Samagra was launched in 2010 by the Government of Madhya Pradesh, utilizing "in-house expertise" of the Madhya Pradesh Agency for Promotion of Information Technology (MAP-IT) and National Informatics centre (NIC) Unit at Bhopal, Madhya Pradesh. The platform was developed to consolidate, evaluate and deliver welfare benefits to its most marginalized citizenry. Inspired by the initial success of Samagra as a single unifying social registry stem, UNICEF and IIT Indore undertook the "Process Documentation" in consultation with the Department of Social Justice, Government of Madhya Pradesh. The overall objective of the documentation was to examine the potential of the platform to host all social protection entitlement to children and their families in Madhya Pradesh. The report was launched on June 10, 2019 presents the insights from interviews with decision makers at various levels, field visits, discussions with communities and beneficiaries.

Dr. Ruchi Sharma
Associate Professor
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PhD. - IIT Kanpur

Previous Employment (includes post-doctoral experience)

- Associate Professor since June 2016
- Assistant Professor at IIT Indore from 31 January 2014 t o 5 June 2016
- Assistant Professor at IIT Delhi from 5 December 2012 to 30 January 2014
- Assistant Professor at IIT Indore from 15 November 2009 to 4 December 2012
- Economist with Department of Economics and Statistics of Tata Services Limited from 15 July 2008 till 28 October 2009

Academic associations with other institutions (Affiliate/Adjunct/ Visiting posts)

- Visiting Faculty; Indian Institute of Management Indore November 2013-June 2014

Statement of Research Interests

a. Broad research area

- Economics of Innovation; International Economics; Industrial organization

b. Research Highlights

- The research group on Innovation Studies focuses on issues related to R&D and patenting by Indian firms, universities and academic institutions. Specifically, we are analysing the impact of FDI on innovation by Indian firms, product and process innovation, financial issues concerning innovation by firms, patent valuation and foreign patenting. Lastly, we are also studying the impact of patent policy on economic growth through exports and value addition in manufacturing sector.

c. Awards and Achievements

- Received "Best Teacher Award" for large class at IIT Indore in January 2020.
- Member, Drafting Committee for Science, Technology, and Innovation Policy (STIP 2020), DST, GoI.

Publications (includes journal articles, books and book chapters)

- Danish, S., P. Ranjan and Ruchi Sharma. 2020. Valuation of patents in emerging economies: a renewal model based study of Indian patents. *Technology Analysis and Strategic Management*. 32 (4): 457-473.
- Panda, S., Ruchi Sharma and W.G.Park. 2020. Patent protection, technological efforts, and exports: An empirical investigation. *The Journal of Developing Areas*, 54 (2):145-162.
- Jain, A. Ruchi Sharma and, P. Vigneswara Ilavarasan. 2020. Measuring Research Efficiency of Higher Academic Technical Institutions of India: A Malmquist Productivity Index Approach, *International Journal of Intellectual Property Management*. 10 (1): 52-79.

Projects active during April 2019-March 2020
Title - R&D and Patenting by Foreign Firms in India
Duration - 24 Months
Funding Agency - DST
Brief Description - In this project, we propose to widen the definition of foreign firm by including firms using Ministry of Corporate Affairs data. Following we are analysing the R&D and patenting behaviour of such firms.

Dr. Sanjram P. Khanganba
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PhD. IIT Bombay

Previous Employment (includes post-doctoral experience)
PPC Worldwide

Academic associations with other institutions (Affiliate/Adjunct/ Visiting posts)

- Member of Technical Committee of Visual Ergonomics, International Ergonomics Association.
- Founding Member, HCI Professionals Association of India.
- Life Member, Indian Society of Ergonomics.

Statement of Research Interests

a. Broad research area

- Human Factors & Applied Cognition

b. Research Highlights

- Cognitive Ergonomics
- Medical and Healthcare Human Factors
- Automotive and Transport Human Factors
- Smart Environments and Systems
- Virtual/Augmented Reality
- Human Performance
- Human-System Interaction
- Media
- Community Systems
- User Experience

Publications (includes journal articles, books and book chapters)

- Najar, S. A. & Sanjram P. K. (2019). Driving Errors and Gaze Behavior During In-vehicle Object and Spatial Distractions. Journal of Transportation Safety & Security. https://doi.org/10.1080/19439962.2019.1611683

- Najar, S. A. & Sanjram P. K. (2018). Gaze behavior and human error in distracted driving: Unlocking the complexity of articulatory rehearsal mechanism. Transportation Research Part F: Traffic Psychology and Behaviour. 59(A), 12-23. https://doi.org/10.1016/j.trf.2018.08.005
- Najar, S. A. & Sanjram P. K. (2018). Suppressed articulatory rehearshal mechanism and driving errors. Adavances in Intelligent Systems and Computing, Springer Nature 823, 55-61. https://doi.org/10.1007/978-3-319-96074-6_6

Projects active during April 2019-March 2020
Title 6G Connectivity for Sustainable Development Targeted at Rural and Remote Communities
Duration - Two years (Approved, February, 2019), Scheme for Promotion of Academic and Research Collaboration (SPARC)
Funding Agency - MHRD

Brief Description - The vision of the project addresses predominantly the topic of ICT for society to achieve most of the selected sustainability goals defined by the United Nations SDG Goals for 2030, such as healthcare, quality education, gender equality and poverty eradication. The focus of this project is research on affordable wireless broadband Internet backhaul for rural and remote areas, innovative low-cost spectrum regime, useable privacy and cybersecurity, and human-computer interaction (HCI). As Co-PI, Dr. Sanjram P. Khanganbaprimarily investigates user-centric issues.

Dr. Shomik Dasgupta
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shomikdasgupta@iiti.ac.in

PhD. - King's College London, University of London

Statement of Research Interests

a. **Broad research area**

- Shomik's research interests include the intellectual history of the 18th and 19th century, 18th century social history and the everyday histories of work in early-colonial government and administration. At a broader level, he is interested in native responses to colonialism from the point of view of the role of language in the creation of social facts, internationalities, collectivises and institutions.

b. Research Highlights

- Completed his first book on the political thought of the early 19th century thinker and social reformer, Rammohun Roy (1772-1833). Shomik is currently working on his second book.

Publications (includes journal articles, books and book chapters)

- *Ethics, Distance and Accountability: The Political Thought of Rammohun Roy (1772-1833).* (Under contract with Oxford University Press, OUP since January 11, 2019.)

Department of Biosciences and Biomedical Engineering

Research Thrust/Facility

- Fluorescence-Activated Cell Sorting (FACS) Sorter & FACS Analyzer (BD)
- Confocal Microscope
- Atomic Force Microscopy (AFM) & Field Emission Scanning Electron Microscopy (FE-SEM)
- Quad Time-of-Flight (Q-TOF), Liquid Chromatography- Mass Spectrometry (LC-MS) & Gas Chromatography- Mass spectrometry (GC-MS)
- Real Time PCR, Iso Electric Focusing, Photo-luminescence Spectroscopy

Application Areas

- Disease Diagnosis
- Personalised Therapy
- Drug Discovery & Delivery
- Vaccine Development
- Biomedical Signal Processing

From the HoD's Desk

Dr. Sharad Gupta Associate Professor shgupta@iiti.ac.in

Summary and Vision of the Group

The Biosciences and Biomedical Engineering (BSBE) group at the Indian Institute of Technology Indore was founded in July 2012 with a vision of establishing a Centre of Excellence that will focus on human resource development and research in Biosciences, Bioengineering and Biomedical Engineering. The BSBE group aims to be internationally recognized in Bio-related areas and produce the leaders of tomorrow in the field, with the integrated use of training, and career development efforts to improve individual, group and organizational effectiveness.

Our vibrant group of faculty members and research scientists aspire to create an ambience for the smooth pursuit of scholarly activities in research as well as training on the study of life and living organisms, ranging from simple bacteriophage to complex multi-cellular organisms such as humans; with the focus being on structure, function, growth, origin, evolution, distribution, and taxonomy. In addition to basic biology research, the BSBE group seeks to contribute towards applied research on practical problems in the country.

With the application of engineering principles, design concepts of biology, medicine and other sciences, the group hopes to devote its energy and expertise on translational technology innovations to achieve improved longevity, health, and well-being for humans; to pursue research and development activities resulting in discoveries in imaging techniques, diagnostic kits; and novel therapies. Additionally, the group actively engages with physicians and clinicians abroad and in India for undertaking patient-based research. The long-term vision is to pursue cutting-edge research that provides sustainable solutions for public health problems. A methodology is being developed by which active participation with clinicians guides patient-based research. This model must be widely practiced in India to achieve progress in improving the healthcare of its population. The group aims to take these discoveries up to clinical trials.

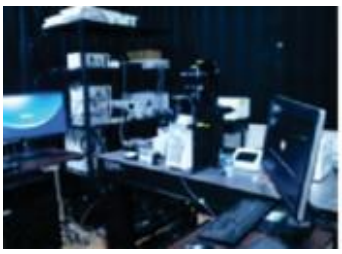
The group seeks to create a unique institutional environment to conduct multi disciplinary research that translates scientific and technological advancements into innovations which will not only improve public health but also contribute immensely in the areas such as agriculture, energy, and environment.
IIT Indore is recognized for its science and technology research and offers many opportunities for interdisciplinary collaborations and involvement with various departments and research centres including the departments of Computer Science and Engineering, Electrical Engineering, Mechanical Engineering, Physics, Chemistry, Mathematics, Humanities, and Social Sciences. Biosciences and Biomedical research will be one of the thrust areas at IIT Indore.

Facilities

IIT Indore has many unique state-of-the-art laboratories in Chemistry, Physics and other Engineering departments. Such laboratories are also being built for Biosciences and Biomedical Engineering research. Additionally, the faculty, postdoctoral fellows, research scholars, and staff have access to the Institute library and e-resources- a combined collection of over 15,500 books and journals. Moreover, the Institute's 'Sophisticated Instrumentation Centre' (SIC) (equipped with Single Crystal X-ray Diffraction, Nuclear Magnetic Resonance, Atomic Force Microscopy, Mass Spectrometry, Elemental Analysis, and Single Molecule Imaging and Spectroscopy facilities) provides a unique opportunity to access these equipments for our research.

Currently, BSBE group have a Cell Culture Facility with Class II A2 bisafety cabinets, florescence microscopes, electroporator, CO_2 incubators, LN2 storage. Additionally, we have wet laboratories for performing Molecular Biology, Biochemistry and Microbiology experiments that includes Real time PCR,
96 well plate reader, gel doc, etc. Moreover, we set up a Sophisticated Instrumentation Centre with the following Sophisticated Instruments:

1. FACS Sorter [BD FACS AriaIII Fusion – 4 laser]
2. FACS Analyser [BD LSRFortess – 5 laser]
3. Confocal Microscope [Olympus including FLIM (fluorescence correlation spectroscopy), FCS (fluorescence correlation spectroscopy), Multi-photon emission imaging, and Mai Tai Femto-second laser]
4. Proteomics facility [AKTA avant, Isoelectric focusing, 2D gel electrophoresis]



Confocal Microscopy

FACS Facility

Isoelectric Focusing

2D Gel Electrophoresis

Gel Doc. System

Discovery Studio

AKTA Avant

Introducing BSBE members

In BSBE there are ten core faculty members along with one other core faculty fellows. Ten more are associated from other departments.

- Dr. Amit Kumar
- Dr. Avinash Sonawane
- Dr. Debasis Nayak
- Dr. Ganti S. Murthy
- Dr. Kiran Bala
- Dr. Prashant Kodgire
- Dr. Rajesh Kumar
- Dr. Shanmugam Dhinakaran
- Dr. Sanjram Premjit Khanganba
- Dr. Shaikh M Mobin
- Dr. Sudeshna Chattopadhyay
- Dr. Sushabhan Sadhukhan
- Dr. Abhijeet Joshi
- Dr. Chelvam Venkatesh
- Dr. Hem Chandra Jha - Head
- Dr. Mirza S Baig
- Dr. Parimal Kar
- Dr. Ram Bilas Pachori
- Dr. Srivathsan Vasudevan
- Dr. Sarika Jalan
- Dr. Sharad Gupta
- Dr. Suman Mukhopadhyay

Key Research Areas

- Bio-sensors and Bio-electronics
- Biomedical Signal Processing
- Biofluid mechanics, CFD and Heat Transfer, Blood flow analysis, Non-Newtonian fluid flows
- Biological Networks
- Biophotonics
- Cancer Biology
- Chromatin structure and gene regulation
- Cytoplasmic flows
- Detection and role of delay in large extended systems
- Disease spreading, co-evolution, and adaptation
- Drug delivery systems, near-infra red fluorescence, nuclear Imaging, and bio-conjugate chemistry
- Human factors
- Molecular Biology
- Molecular Immunology
- Photo-acoustic microscopy for biomedical applications
- Photothermal response and photothermal imaging Design, synthesis and diagnostic applications of new targeting ligands for cancers and inflammatory diseases
- Raman imaging and Spectroscopy
- Systems Biology
- Somatic hypermutation of immunoglobulin genes
- Spectral analysis of gene expression profile of zebra-fish under various toxic/environmental perturbation
- Spectral properties of directed networks
- Synchronization of coupled dynamics on networks and its application to neurosciences
- Synthesis of Inhibitors for drug targets
- Metals in biology

Dr. Prashant Kodgire
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PhD. IIT Bombay

Previous Employment (includes post-doctoral experience)

- Postdoctoral Scholar / Fellow, University of Chicago (2008-2012): Department of Molecular Genetics and Cell Biology, Chicago, IL, USA
- Research Associate, Wockhardt Research Centre (1999-2001): Biotechnology Group, Wockhardt Research Centre, Aurangabad, India

Academic associations with other institutions (Affiliate/Adjunct/ Visiting posts)

- Management Council Member at Kavayitri Bahinabai Chaudhari North Maharashtra University, Jalgaon, Maharashtra
- Academic Committee Member of Vidyarthi Vigyan Manthan (VVM), an initiative of Vijnana Bharati (VIBHA), in collaboration with Vigyan Prasar, an autonomous organization under the Department of Science and Technology, Government of India and National Council of Educational Research and Training (NCERT), an institution under the Ministry of Human Resources and Development.

Statement of Research Interests

a. Broad research area

- Molecular Biology, Molecular Immunology, Somatic hypermutation, Chromatin structure and gene regulation

b. Research Highlights

- Our ongoing research is broadly in the area of Molecular Immunology and Molecular Biology, especially focusing on immunoglobulin gene regulation and understanding the molecular basis of somatic hypermutation (SHM) of immunoglobulin genes. Our group's current efforts are on identifying the molecular mechanisms of action and targeting of activation-induced cytidine deaminase (AID) on the immunoglobulin (Ig) genes.

c. Awards and Achievements

- Excellence in Teaching Award from IIT Indore in 2016.
- Ramanujan fellowship from the Department of Science and Technology, Govt. of India, India
- Irvington Institutes postdoctoral fellowship from the Cancer Research Institute, USA
- International postdoctoral fellowship award from the Lady Tata Memorial Trust, UK, for research in Leukaemia
- Senior Research Fellowship from the Council of Scientific and Industrial Research (CSIR), India
- Junior Research Fellowship from the Council of Scientific and Industrial Research (CSIR), India

Publications (includes journal articles, books and book chapters)

- Jaiswal A, Singh AK, Tamrakar A, and Kodgire P*, Unfolding the role of splicing factors and RNA debranching in AID mediated antibody diversification, Int. Rev. Immunol., 2020, In Press.
- Singh AK, Tamrakar A, Jaiswal A, Kanayama N and Kodgire P*, SRSF1-3, a splicing and somatic hypermutation regulator, controls transcription of IgV genes via chromatin regulators SATB2, UBN1 and histone variant H3.3, Mol. Immunol., 2020, 119:69-82.
- Singh AK, Tamrakar A, Jaiswal , Kanayama N, Agarwal A, Tripathi P and Kodgire P*, Splicing regulator SRSF1-3 that controls somatic hypermutation of IgV genes interacts with Topoisomerase 1 and AID, Mol. Immunol., 2019, 116:63-72

Projects active during April 2019-March 2020

Title - Exploration of cis elements in attracting AID to proto-oncogenes BCL6 and MYC leading to B-lymphoma
Duration - 2017-2020
Funding Agency - SERB_DST

Brief Description - In the proposed study, in addition to understanding the molecular mechanism of action of the cis-regulatory elements in mistargeting of AID in normal and malignant B cells, we will be able to study how various transcriptional regulatory proteins cross talk with each other.

Title - Flourimetric biosensor for detection and quantification of insecticides and pesticides using recombinant organo-phosphorus hydrolase expressed in *E. coli*
Duration - 2017-2020
Funding Agency - DBT
Brief Description - We are working towards the development of reliable, selective, cost-effective, as well as sensitive methods of detection of organophosphates in the environment, because of potentially fatal consequences of hazardous organophosphate pesticide exposure and limitations of the available treatment methods necessitate.

Title - Quantum dot based biosensor for early detection of prostate cancer using multiple biomarkers in biological samples
Duration 0 2018-2021
Funding Agency - DBT_NER Twinning Project
Brief Description - Proposed study is for novel reliable and timely detection of fatal prostate cancer using multiple biomarkers in biological samples.

Dr. Sharad Gupta
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(PhD.: IIT Kanpur, India; Postdoctoral Fellow: Tufts University, MA, USA; Visiting Research Associate: Bio systems, KAIST, Korea; Assistant Project Scientist, Academic Coordinator and Lecturer: University of California, Riverside) focuses on the development of biocompatible nano-carriers for in-vivo molecular imaging. He plans to use these nano-carriers for cancer diagnosis and therapy. He also develops new biomaterials for the development of biologic wound dressings.

Dr. Gupta's research lies at the intersection of Biophotonics, Biology, and Biomaterials with a focus on its application in biomedical science and engineering. is the development of optical techniques for biomedical applications, bio-nanotechnology and biomaterials.

He has recently demonstrated the S2 state mediated two photon excitation of FDA approved dye. Additionally his group has developed near infrared absorbing biocompatible iron-oxide nanoparticles for biomedical applications. These particles have shown photothermal ability and improved contrast in optical coherence tomography (OCT).

Selected Publications:

- Kumari, A., Kumari, K., and Gupta, S., "The effect of nanoencapsulation of ICG on two-photon bioimaging," RSC Advances, 9, 18703-18712, 2019.
- Dutta, S. B., Shrivastava, R., Krishna, H., Khan, K. M., Gupta, S., and Majumder S. K., "Nanotrap- enhanced Raman spectroscopy: An efficient technique for trace detection of bioanalytes," Analytical Chemistry, 91(5), 3555-3560, 2019.
- Kumari, A., and Gupta, S., "Two-photon excitation and direct emission from S2 state of FDA approved NIR dye: Application of anti-Kasha's rule for two-photon fluorescence imaging," Journal of Biophotonics. 12(1), e201800086, 2019.

Patents:

- Non-invasive optical characterization of biomaterial mineralization", Georgakoudi, I., Gupta, S., Hunter, M., and Kaplan, D. L., WO 2009105537, A2, August 27, 2009.
- "Site-targeted nano-liposomal nitroglycerin therapeutics", Ardekani, S., Ghosh, K., Gupta, S., and
- Mohideen, U., US Patent Application No. 15738976.

- "Essential amino acid based biocompatible and biodegradable nanoparticle for disease diagnosis and targeted drug delivery", Gupta, S., and Mishra, A., Patent Application No. 201721027869, 2017.
- "Green synthesis of biocompatible and near infrared active Eugenate (4-allyl-2-methoxyphenolate) capped iron oxide nanoparticles for deep tissue imaging and therapy", Gupta, S., and Kharey, P., US Patent Application No. 16/043901, 2018.

Research Projects:

- Development of a vesicular stomatitis virus glycoprotein-based virus-like nanoparticles platform for targeted drug delivery (Funded by: DST).
- Optically active biocompatible nanoparticles for imaging and photothermal therapy (Funded by: Indian Council of Medical Research).

Dr. Debasis Nayak
Assistant Professor
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Dr. Debasis Nayak (PhD., University of Nebraska-Lincoln, USA in Molecular Virology and Viral Pathogenesis, 2008) conducts research on the studying vesicular stomatitis virus (VSV). He works in the area of viral immunology and infectious viral disease. His current research is on the development of novel viral vector vaccines against human enterovirus and Chikungunya virus infection. His research group is also engaged in the development of a field-based diagnosis kit for viral diseases affecting livestock population. These include bovine ephemeral fever and contagious ecthyma.

The research interest of the group lies in developing a multidisciplinary approach spanning three major departments of life sciences - virology, immunology, and biomedical engineering. The research portfolio comprises of two distinct departments; i. Virology and vaccine development, and ii. Assisted reproductive technology for veterinary and animal husbandry sector. In virology, the group has established the reverse genetic system for Vesicular Stomatitis Virus (VSV) and would like to continue in the direction of viral vaccine development by using this powerful system. Dr. Nayak's group would like to continue on the path of research and translation and are committed to push research through collaborative activities and bring tangible outcomes in the near future.

Selected Publications:

- Giri S, Madani S, Sahu, BP, Nayak D and Sarma T. 2019. AIE active fluorescent organic nanoaggregates for selective detection of phenolic-nitroaromatic explosives and cell imaging. J. Photo Chem and Photo Bio-A, 374:194-205.
- Kundu, BK, Mandal P, Mukhopadhyay BG, Tiwari R, Nayak D, Ganguly R, and Mukhopadhyay S. 2019. Substituent dependent sensing behavior of Schiff base chemosensors in detecting Zn^{2+} and Al^{3+} ions: Drug sample analysis and living cell imaging. 2019 Sensors & Actuators: B. Chemical ,282:347- 358.
- Urata S, Kenyon E, Nayak D, Cubitt E, Kurosaki Y, Yasuda J, Juan C, McGavern DB. 2018. BST-2 controls T cell proliferation and exhaustion by shaping the early distribution of a persistent viral infection. PLOS Pathogens 14 (7), e1007172.

Research Projects:

- Development of chikungunya candidate vaccine in vesicular stomatitis virus (VSV) gene delivery platform (Funded by: DBT).

Dr. Amit Kumar (PhD.: IIT Roorkee, India; Postdoctoral Research Associate: The Scripps Research Institute, U.S.A.; Postdoctoral Fellow: SUNY Buffalo, U.S.A) conducts his research in: Structure Biology, Neurobiology, Chemical Biology, Target Identification, and Drug discovery. His current research intends to advance the diagnostics and therapeutics discovery and also to our understanding of pathogenesis by providing an effective strategy to target various diseases. Additionally, the therapeutic candidate identified, and the cellular target his group validate, may provide an exciting new

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pathways for genetic and pharmacologic approaches to recognize and study further more potent ligands. In view of this, potent natural products and new drug targets were discovered to control cancer, neurological diseases like HD, fragile X-syndrome, SCAs and other infectious diseases that have been highlighted in news and media.

Selected Publications:

- S. K. Mishra, U. Shankar, N. Jain, A. Tawani, K. Sikri, J. S. Tyagi, T. K. Sharma, J.-L. Mergny, Amit Kumar, Characterization of G-quadruplex motifs in espB, espK and cyp51 genes of Mycobacterium tuberculosis as a potential drug targets, Molecular Therapy-Nucleic Acids, P698-706, 2019.
- A. K. Verma, E. Khan, S. K. Mishra, N. Jain and Amit Kumar, Piperine modulates protein mediated toxicity in FXTAS through interacting expanded r(CGG)exp RNA, ACS Chemical Neurosciences, 10(8):3778-3788, 2019.
- A.K. Verma, E. Khan, S. Bhagwat; Amit Kumar, Exploring the potential of small molecules based therapeutic approaches for targeting Trinucleotide repeats Disorders, Molecular Neurobiology, pp1- 19, 2019.

Events/Seminar Organized:

- Workshops on " Modern Spectroscopic Techniques I & II".
- Workshop on " Molecular Characterization Techniques.

Research Projects:

- Recognition of Human G-quadruplex structure by natural product Piperine and its derivative for mechanistic insight of its anti cancer activity (Funded by: DST SERB).

Dr. Abhijeet B. Joshi
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Dr. Abhijeet B. Joshi PhD.: IIT Bombay,

Lecturer: NIPER-Ahmedabad, IYBA Fellow: IIT Bombay) works in the field of Biomedical Engineering; specifically, biosensor development, drug delivery, diagnostics, and theranostics. The main focus of Dr. Joshi's group is the development of nano/micro technologies for diagnostics and therapeutics. His group is involved in the development of biomaterials, nano-materials and using them for biosensors and novel drug delivery systems. His group works towards developing drug-loaded nano- carriers for delivery of drugs at sites which are less accessible.

Patents:

- Saumya Jaiswal, Sharad Gupta, Abhijeet Joshi, Ultrasonic Atomizer based Fabrication of Silk Nano-Particles for Theranostics, 201921031158, 1st August, 2019.
- Abhijeet Joshi, Bhavana Joshi, Gaurav Pandey, Jaspreet Kaur, Ultrasonic Atomizer based method for development of biodegradable anticancer nanoparticles, microspheres and hybrid microparticles< Indian Patent Application 2019101573, Filing date: 19th April 2019.

Selected Publications:

- Sandeep Choudhary Bhavana Joshi, Gaurav Pandey, AbhijeetJoshi, Application of single and dual fluorophore-based pH sensors for determination of milk quality and shelf life using a fibre optic spectrophotometer, Sensors and Actuators B: Chemical, 2019, In press.
- Monika Jain, Priyanka Yadav, Abhijeet Joshi, Prashant Kodgire, Advances in Detection of Hazardous Organophosphorus Compounds Using Organophosphorus Hydrolase Based Biosensors, Critical Reviews in Toxicology, 1-24, 2019.
- Joshi A. B., Chaudhari R, and Srivastava R., pH and Urea Estimation in Urine Samples using Single Fluorophore and Ratiometric Fluorescent Biosensors, Nature Scientific Reports, 7: 5840, 2017.

Events/Seminar Organized:

- TEQIP course on "Modern Tools and Techniques in Drug Design, Discovery and Development", March 4-9, 2019.

Research Projects:

- Nasal delivery of anti-retroviral the ranostic nano-enabled carriers (Funded by: DST INSPIRE).
- Multi-analyte nano-engineered quantum dot based florescent biosensors for clinical quantification of biomarkers in diabetes related kidney diseases (Funded by: SERB).
- Quantum dot based biosensor for early detection of prostate cancer using multiple biomarkers in biological samples (Funded by: DBT).
- Flourimetric biosensor for detection and quantification of insecticides and pesticides using recombinant organo-phosphorus hydrolase expressed in E. Coli (Funded by: DBT).

Dr. Parimal Kar
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parimal@iiti.ac.in

Dr. Parimal Kar PhD from Michigan Technological University. The broad areas of research for Dr. Parimal are Theoretical and Computational Biophysics He works towards Multiscale modeling of kinases implicated in hypertension and autoimmune diseases, understanding protein-drug interactions and mutation- induced drug resistance at the atomic level, and Glycan modeling and structure predictions and elucidating their roles in host-pathogen interactions.

Selected Publications:

- Nisha A. Jonniya, Md Fulbabu Sk, Parimal Kar, Investigating phosphorylation-induced conformational changes in WNK1 kinase by molecular dynamics simulations, ACS Omega, 2019 (In Press).
- Nisha A. Jonniya, Parimal Kar, Investigating specificity of the anti- hypertensive inhibitor WNK463 against With-No-Lysine kinase family isoforms via multiscale simulations, J. Biomol. Struct. Dyn. 2019 (In press).
- Parimal Kar, Michael Feig. Hybrid all-atom/coarse-grained simulations of proteins by direct coupling of CHARMM and PRIMO force fields, J. Chem. Theory Comput, 2017, 13, 11, 5753-5765.

Events/Seminar Organized:

- TEQIP course on "Modern Tools and Techniques in Drug Design, Discovery and Development", March 4-9, 2019.

Research Projects:

- Investigating Conformational Dynamics of N-Glycans and the Effect of Glycosylation on the Structure and Dynamics of Hepatitis C Virus Glycoproteins via Molecular Dynamics Simulations (Funded by: DST-SERB).
- Multiscale Simulations of Protein-Glycan Complexes: Toward Understanding the Molecular Basis of Host-Pathogen Interactions and Immune Response (Funded by: DBT).

Dr. Kiran Bala
Associate Professor
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Dr. Kiran Bala's areas of research are Bioenergy, Bioremediation, Bioplastic production. In Biofuels Research lab, she has been working with various green and blue-green algae species indigenously isolated from contaminated sites. These algae species are being explored for their biomass and lipid profile in context to bio diesel generation, carbon fixation potential, and waste water treatment. Selecting tolerant micro algal strains and further enhancing their ability to tolerate higher concentrations of contaminant by gradually increasing the concentration is very important in making the overall process efficient and economically feasible. Main goal is combining the process of algal.

Selected Publications:

- Kashyap, M., Samadhiya, K., Ghosh, A., Anand, V., Shirage, P.M., Bala, K., 2019. Screening of microalgae for biosynthesis and optimization of Ag/AgCl nano hybrids having antibacterial effect, RSC Advances
- Anand, V., Kashyap, M., Samadhiya, K., Ghosh, A., Kiran, B. (2019). Salinity driven stress to enhance lipid production in Scenedesmus vacuolatus: A biodiesel trigger?. Biomass and Bioenergy, 127, 105252.
- Ghosh, A., Kiran, B., 2017, Carbon concentration in algae: Reducing CO2 from exhaust gas, Trends in Biotechnology, 35 (9), 806-808.

Events/Seminar Organized:

- TEQIP short term course (Co-coordinator)-Recent Advancements in Water Resources and Environment Engineering, April 22-27, 2019.
- TEQIP short term course (Co-coordinator)-Characterization of Materials for Renewable and Sustainable Energy, March 4-9, 2019.
- BSBE symposium (Convener) - Water: Resources, Challenges & Sustainability, 10th March, 2018.
- BSBE conference organizing committee (Member) - 2017-18 (eBBT 5th-6th January, 2018).
- GIAN course on "Biological treatment of metals and metalloids laden wastewater: Microbiology, Process technology and Resource Recovery" from 5th - 9th March, 2018. (Foreign faculty Prof. Eric van D. Hubellsch, IHE-Delft).
- TEQIP Faculty Induction Program (Coordinator) - June 17-21, 2019 (Phase I).
- TEQIP Faculty Induction Program (Coordinator) - June 24-28, 2019 (Phase II).

Research Projects:

- Exchange grant LUH-IIT Indore (Funded by German Academic Exchange Service, DAAD).
- An innovative approach for development of an efficient and integrated algae bioenergy production system using biosynthesized nanoparticles (Funded by: DST SERB).
- Demonstration of sustainable algal biomass production in outdoor environment for cost-effective biofuel production (Funded by: DBT).

Dr. Hem Chandra Jha
Assistant Professor
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PhD. Birla Institute of Technology & Sciences, Pilani, Rajasthan India

Previous Employment(includes post-doctoral experience)
March 2010-15: Post-doctoral fellow at University of Pennsylvania, Philadelphia, PA, USAMarch 2015-June 2016: Research Associate at University of ennsylvania, Philadelphia, PA, USA

Statement of Research Interests

a. Broad research area

- Host Pathogens interactions in cancer, neurodenerative diseases and SARS-CoV2 associations in human.
-

b. Research Highlights

- SARS-CoV2 analysis in comorbidity and other clinical parameters.
- Therapeutic targets for COVID-19.
- Helicobacter pylori and Epstein-Barr virus co- infection in gastric cancer progression.
- Epstein-Barr virus infection in neuro-inflammation and neurodegeneration.
- Malaria and Epstein-Barr virus co-infection and associated disease pathogenesis.

c. Awards and Achievements

- Associate Editor in Frontiers in Microbiology

Publications (includes journal articles, books and book chapters)

- Jakhmola S., Indari O., Baral B., Kashyap D., Varshney N., Das A., Chatterjee S. and **Jha H.C**. Comorbidity assessment is essential during COVID-19 treatment. **Frontiers in Physiology**. doi: 10.3389/fphys.2020.00984
- Pei, Y., Hwang, N., Lang, F., Zhou, L., Wong, J.H.Y., Singh, R.K., **Jha, H.C.,** El-Deiry, W.S., Du, Y. and Robertson, E.S., 2020. Quassinoid analogs with enhanced efficacy for treatment of hematologic malignancies target the PI3Kγ isoform. **Communications Biology**, 3(1), pp.1-13.
- Kashyap D, Baral B, Verma TP, Sonkar C, Chatterji D, Jain AK, **Jha HC**. Oral rinses in growth inhibition and treatment of Helicobacter pylori infection. **BMC microbiology**. 2020 Dec;20(1):1-8.

Events/ Seminars organized

- Organizes workshop on "**Bio entrepreneurship, intellectual property Rights & Technology Management**" from July 23-24, 2019 at IIT Indore.
- Organizes Workshop on "**Analytical methods in Biostatistics"** from 1112th October 2019 at IIT Indore.
- Organizing committee members on "**International Conference on Emerging Areas in Biosciences and Biomedical Technologies"** (eBBT2) 7th-9th February 2020.
- Organizing committee member in QIP course **"Nano-biotechnology in Drug Discovery, Development and Delivery"** from March 11-15, 2020 at IIT Indore.

Projects active during April 2018-March 2019

Title - Role of kinases in Epstein-Barr virus associated cancer progression
Duration - 2016-2021
Funding Agency - DST
Brief Description - EBV associated malignancies like gastric, breast, neuronal in this project

Title - Pathogenesis of Epstein-Barr virus and Chlamydia pneumoniae in Multiple Sclerosis
Duration - 2017-2020
Funding Agency - CSIR
Brief Description - These pathogens have been associated in clinical studies, moreover our study is evaluating the etiology in MS progression.

Title - Role of Helicobacter pylori and Epstein Barr virus in gastric cancer progression
Duration - 2018-2021
Funding Agency - DST
Brief Description - These pathogens co-infection is aggressive in gastric cancer. Hence, our study is aim to investigate the mechanism behind it.

Dr. Mirza S. Baig
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Ph.D. Department of Biochemistry, CSIR-Central Drug Research Institute (CSIR-CDRI), Lucknow

Previous Employment (Includes post-doctoral experience)

- Associate Professor: Indian Institute of Technology Indore (IITI), India (2018-present)
- Assistant Professor: Indian Institute of Technology Indore (IITI), India (2017-2018)
- Ramalingaswami Fellow: Indian Institute of Technology Indore (IITI), India (2015-2017)
- Research Scientist: Mayo Clinic, Rochester, USA
- (2014-2015)
- Postdoctoral Research Scientist: The University of Illinois at Chicago (UIC), USA (2010-2014)
- Research Associate: Indian Institute of Toxicology Research (IITR), Lucknow, India (2009-2010)

Academic associations with other institutions (Affiliate/Adjunct/ Visiting posts)

- Technion-Israel Institute of Technology, Israel- Visiting Professor and Research Collaboration
- University of California, USA-Visiting Professor and Research Collaboration
- Bio-Medico University of Rome, Italy-Visiting Scientist
- SMS Medical College, Rajasthan-Visiting Professor and Research Collaboration
- Technical University Munich (TUM), Germany- Visiting Professor and Research Collaboration
- Cambridge University, United Kingdom- Visiting Professor and Research Collaboration
- Institute of Microbial Chemistry (IMC), Tokyo, Japan- Visiting Professor and Research Collaboration
- Middle East Technical University (METU), Ankara, Turkey-Visiting Professor and Research Collaboration
- KoC University, Istanbul, Turkey-Visiting Professor
- University of Cape Town, Rondebosch, South Africa-Research Collaboration
- University of Illinois at Chicago, USA- Research Collaboration
- Max Planck Institute for Heart and Lung Research, Bad Nauheim, Germany-Research Collaboration
- Osaka University, Osaka, Japan- Visiting Professor and Research Collaboration
- Erasmus University Medical Center, Rotterdam, The Netherlands-Research Collaboration
- All India Institute of Medical Sciences, Bibinagar (AIIMS Bibinagar), India-Research Collaboration
- The National Institute of Animal Biotechnology, Hyderabad, India- Resrch Collaboration
- The University of Cape Town (UCT), Cape Town, South Africa-Research Collaboration
- Rutgers University, New Jersey, USA-Research Collaboration
- 19. Mayo Clinic, Rochester, USA-Research Collaboration

Statement of Research Interests

a. Broad research area

- Cancer and Innate Immunity
- Inflammation and Cell Signaling

b. Research Highlights

A breakthrough research demonstrated the role of Neuronal Nitric Oxide Synthase (NOS1)-derived Nitric Oxide (NO) in turning-on the inflammatory response during chronic inflammatory diseases. This discovery lead investigators across the globe to understand and research macrophage NOS1-derived NO in the context of various chronic inflammatory conditions including some cancers, rheumatoid arthritis, atherosclerosis etc.

Two anti-inflammatory drugs have been identified through drug repurposing/repositioning studies. Thioridazine hydrochloride is a phenothiazine antipsychotic used in the management of psychoses, including schizophrenia, and in the control of severely disturbed or agitated behavior. Our group has shown that Thioridazine hydrochloride has anti-inflammatory activity. Invivo and in-vitro data show that Thioridazine hydrochloride rescues mice from severe sepsis and/or septic shock. 2. Gefitinib is a drug used for certain breast, lung and other cancers. Gefitinib is an EGFR inhibitor, like erlotinib, which interrupts signaling through the epidermal growth factor receptor(EGFR) in target cells. Our group has shown that Thioridazine hydrochloride has anti-inflammatory activity. Invivo and in-vitro data show that Gefitinib rescues mice from severe sepsis and/or septic shock.

c. **Awards and Achievements**

- The Lady Davis International Professorship, Technion-Israel Institute of Technology, Israel (2020)
- ASM-IUSSTF Indo-US Professorship, University of California, USA (2020)
- International Visiting Professorship, Bio-Medico University of Rome, Italy (2020)
- INSA Visiting Scientist Fellowship, SMS Medical College, India (2020)
- Visiting Professor at Technical University Munich (TUM), Germany (2019)
- Visiting Professor at Cambridge University, U.K. (2019)
- Visiting Professor at the Institute of Microbial Chemistry (IMC), Tokyo, Japan (2019)
- TUBITAK International Research Award from The Scientific and Technological Research Council of Turkey to visit Middle East Technical University, Ankara, Turkey (2018)

- INSA-International Bilateral Exchange Fellowship jointly from INSA-TUBA to visit KoC University, Turkey (2018)
- Early Career Research Award from the Department of Science and Technology, Government of India, New Delhi, India (2016)
- Outstanding Scientist Award from the Centre for Advanced Research and Design-CARD of Venus International Foundation, Chennai, India for the contribution in the field of Immunology (2016)
- Ramanujan Fellowship Award from the Department of Science and Technology (DST), India (2015)
- Ramalingaswami Fellowship Award from Department of Biotechnology (DBT), New Delhi, India (2015)

Publications (includes journal articles, books and book chapters)

- **Baig MS**, Zaichick SV, Mao M, de Abreu AL, Bakhshi FR, Hart PC, Saqib U, Deng J, Chatterjee S,Vogel SM, Malik AB, Consolaro ME, Christman JW, Minshall RD, Gantner BN, Bonini MG. NOS1-derived nitric oxide promotes NF-κB transcriptional activity through inhibition of suppressor of cytokine signaling-1. **J Exp Med. 2015;212(10):1725-1738.**
- **Baig MS**, Roy A, Saqib U, Rajpoot S, Srivastava M, Naim A, Liu D, Saluja R, Faisal SM, Pan Q, Turkowski K, Darwhekar GN, Savai R. Repurposing Thioridazine (TDZ) as an anti-inflammatory agent. **Sci Rep. 2018:8(1):12471-12491.**
- Saqib U, Sarkar S, Suk K, Mohammad O, Savai R*, Baig MS*. Phytochemicals as modulators of M1-M2 macrophages in inflammation. **Oncotarget. 2018;9(25):17937-17950.**

Events/ Seminars organized

- Organized workshop on FACS (December 14 th , 2016) at Indian Institute of Technology (IIT) Indore
- Organized Ramanujan Conclave-2015 (December 22-23, 2015) at Indian Institute of Technology (IIT) Indore
- Organized seminars at the BSBE Department, Indian Institute of Technology (IIT) Indore

Projects active during April 2019-March 2020

Title - Neuronal nitric oxide synthase (NOS1) -driven macrophage phenotype polarization
Duration - 5 Years
Funding Agency - Department of Biotechnology (DBT), New Delhi
Brief Description - The study suggests the fundamental role of NOS1-derived NO in regulating TLR4-mediated inflammatory signaling, as well as the intensity and duration of the resulting host immune response.

Title - Role of Neuronal nitric oxide synthase (NOS1) in the TLR4-triggered inflammatory response via the SOCS1-P38-AP1 signalling axis
Duration - 3 Years
Funding Agency - Department of Science and Technology (DST), New Delhi
Brief Description - These studies provide a new mechanism of inflammatory response. Further identification of novel targets and designing the novel small molecule/peptide will serve the new approaches for therapeutic strategy for inflammatory responses.

Dr. Avinash Sonawane
Professor
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Before joining IIT Indore, **Prof. Avinash Sonawane** (PhD. in Molecular Enzymology, at the University of Marburg, Germany) served as a Professor at the School of Biotechnology, KIIT University, Bhubaneshwar. He works in the area of Tuberculosis pathogenesis. The key focus areas of his research is Mycobacterium Glycobiology. His groups studies the molecular mechanisms of Mtb dormancy in bone marrow stem cells and the implications of cross-talk between stem cells, macrophages, and T-cells on the fate of Mtb infection.

Selected Publications:

- Padhi A, Pattanaik K, Biswas M., Jagadev M, Behera A, and Sonawane A (2019). Mycobacterium tuberculosis LprEsuppress TLR-2 dependent cathelicidin and autophagy expression to enhance bacterial survival in macrophages. The Journal of Immunology (Accepted).

- Pati R, Shevtsov M., and Sonawane A. (2018). Nanoparticle Vaccines Against Infectious Diseases. Frontiers in Immunology. 9:2224. doi: 10.3389/fimmu.2018.02224.
- Jagadeb M, Rath SN, Sonawane A (2018).Computational discovery of potent drugs to improve the treatment of pyrazinamide resistant Mycobacterium tuberculosis mutants. Journal Cellular Biochemistry. 119(9):7328-7338.

Patents:

- Venkatesh Chelvam, Premansh Dudhe, Mena Asha Krishnan, and Avinash Sonawane (2019). Metal-free, solvent-free synthesis of fused-pyrido heterocycles: Biological efficacy against cancer and multi-drug resistant pathogens (Filed).

Events/Seminar Organized

- Distinguished Lecture by Prof. Tapas Kundu, Director, CDRI-Lucknow, 22nd April, 2019.

Research Highlights:

- Demonstrated that Mycobacterium tuberculosis modulate peptide synthesis in stem cells to facilitate its survival in bone marrow.
- Demonstrated that M. tuberculosis inhibit calcium ion channel to bipolarize host immunity during tuberculosis disease progression.
- Developed novel asparaginase enzyme that can improve treatment of primary and relapse acute lymphatic leukemia.

Research Projects:

- To study the role of mesenchymal stem cells in the pathogenesis of tuberculosis in bone marrow (Funded by DBT).
- Pharmacological evaluation of a novel asparaginase used for the treatment of acute lymphoblastic leukemia (Funded by BRNS).

Dr. Ganti S. Murthy
Professor
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PhD. **2006, Agricultural and Biological Engineering, University of Illinois at Urbana-Champaign**

Previous Employment (includes post-doctoral experience)

- **2019-Present, Professor,** Department of Biosciences and Biomedical Engineering, Indian Institute of Technology Indore.
- **2017-2019, Professor (tenured),** Biological and Ecological Engineering, Oregon State University, Corvallis, Oregon, USA
- **2013-2017, Associate Professor (tenured),** Biological and Ecological Engineering, Oregon State University, Corvallis, Oregon, USA
- **2007-2013, Assistant Professor (tenure track),** Biological and Ecological Engineering, Oregon State University, Corvallis, Oregon, USA

Academic associations with other institutions (Affiliate/Adjunct/ Visiting posts)

- **2007-2019, Adjunct Professor,** Water resources Graduate Program, Oregon State University, Corvallis, Oregon, USA
- **2007-2019, Adjunct Professor,** Molecular and Cellular Biology Graduate Program, Oregon State University, Corvallis, Oregon, USA

Statement of Research Interests

a. Broad research area

- Technologies for sustainable bioprocessing and Systems analysis for sustainability and resilience

b. Research Highlights

Commercialized Technologies:

- Advanced scale free fermentation controller.
- A novel on-site landfill leachate treatment technology.

Pilot Scale Realizations of Technologies:

- Novel mixed algal-bacterial cultures for treatment of domestic wastewaters.
- High solid hydrolysis and fermentation reactors

Research that influenced industry practice:

- Established that aflatoxin B1, does not affect dry grind ethanol process
- Strategies to overcome stuck fermentations in modified dry grind ethanol processes

Patents

- Issued Patent: A dynamic optimal controller for control of fermentation processes. Office of technology management, University of Illinois at Urbana-Champaign. US Patent No: 7,862,992. Issued 4th January, 2011. This technology has been successfully tested in two commercial dry grind corn plants.

- Filed Patent: Wastewater treatment system and method. Office for Commercialization and Corporate Development, Oregon State University. US Provisional Patent No: 62/738,806. Filed 28th September, 2018. Mr. Steven White, my graduate student is a co-inventor on this application.

- Provisional Patent: A multi-scale control framework for sustainable management of engineered algae production systems. Office for Commercialization and Corporate Development, Oregon State University. US Provisional Patent No: 62/190642. Filed 9th July, 2015. Dr. Ankita Juneja, my former graduate student is a co-inventor on this application.

Publications (includes journal articles, books and book chapters)
(Partial list of 9 peer reviewed publications, 15 proceedings/abstracts, 2 book chapters and 11 invited presentations in 2018-2019)

- Rajendran, K., and Murthy, G.S.* 2019.Techno-economic and life cycle assessments of anaerobic digestion A review. Biocatl. Agric. Biotechnol. 101207.
- Kadhum, H.J., Mahapatra, D.M. and Murthy, G.S.* 2019. A comparative account of glucose yields and bioethanol production from separate and simultaneous saccharication and fermentation processes at high solids loading with variable PEG concentration. Biores. Technol. 283:67-75.
- Kadhum, H.J., Mahapatra, D.M. and Murthy, G.S.* 2019. A novel method for real-time estimation of insoluble solids and glucose concentrations during enzymatic hydrolysis of biomass. Biores. Technol. 275:328-337.

Events/ Seminars organized

- Session Moderator for Energy systems technical community poster session, Annual International Meeting (both 2018 and 2019) American Society of Agricultural and Biological Engineers, St. Joseph, MI.
- Session moderator for Techno-economic Analysis and Life Cycle Assessment, Annual International Meeting (both 2018 and 2019) American Society of Agricultural and Biological Engineers, St. Joseph, MI.

Projects active during April 2019-March 2020
Title -

- Nutrient-Energy-Water Nexus: Emerging Regional and Global Challenges. (2017-2021). Multi State Hatch Funding, USDA $250,000 ($125,000). PI
- INFEWS/T2: Collaborative: iFEWCoordNet - a secure decision support system for coordination of adaptation planning among FEW actors in the Pacific Northwest. Meghna Babbar-Sebens et al. NSF-NIFA - USA. (2017-2021). $1.5 million ($289,873). CoPI

- Scalable and highly-efficient microbial electrochemical reactor for hydrogen generation from lignocellulosic biomass and wastes. Hong Liu et al. US DOE. (2019-2022). $1.0 million ($50,000). CoPI

Brief Description

- In this project we are developing new methods for assessing the nutrient-enery-water nexus at a farm to regional scale using a combination of experimental and modeling studies. Currently second year of field studies are underway at PSU photovoltaic farm conducting agrivoltaic experiments.
- In this project we are developing state of the art systems models for facilitating coordination among stakeholders to address wicked problems in the FEW Nexus in Mid-Columbia river basin. As the technical lead for the systems modeling aspect of the grant, I am leading the team in developing component models for Food-Energy-Water sectors. These models were developed with different levels of granularity and fidelity to aid in both comprehensive and rapid calculation of the expected behaviours of multiple actors across various interacting sectors. These models will be used in the decision framework to identify coordinated adaptation planning scenarios that will be acceptable to all stakeholders. I also lead the education task for this grant and coordinate with other team members in developing various outreach and educational activities.
- In this project, we are developing and scaling up a novel microbial electrochemical reactor for production of hydrogen from biomass. As a co-investigator in project, I am responsible for generation of biomass hydrolyzate at five liter scale for conducting scaleup experiments in the project.

Associate Members

Dr. S. Dhinakaran
Associate Professor
Mechanical Engineering

Dr. Chelvam Venkatesh
Associate Professor
Chemistry

Dr. Srivathsan Vasudevan
Associate Professor
Electrical Engineering

Dr. Premjit K. Sanjram
Associate Professor
Humanities and Social Sciences

Dr. Ram Bilas Pachori
Professor
Electrical Engineering

Dr. Shaikh M. Mobin
Associate Professor
Chemistry

Dr. Rajesh Kumar
Associate Professor
Physics

Dr. Sarika Jalan
Professor
Physics

Dr. Sudeshana Chattopadhyay
Associate Professor, Physics

Dr. Suman Mukhopadhyay
Professor, Chemistry

Department of Astronomy, Astrophysics and Space Engineering (DAASE)

Journal articles published by DAASE in the year 2019-20

- **Suman Majumdar, Mohd Kamran,** Jonathan R. Pritchard, Rajesh Mondal, Arindam Mazumdar, Somnath Bharadwaj, Garrelt Mellema, *Redshifted 21-cm Bispectrum I: Impact of the Redshift Space Distortions on the Signal from the Epoch of Reionization*, Accepted for publication in the Monthly Notices of the Royal Astronomical Society, (2020), arXiv:2007.06584

- Erik Zackrisson, **Suman Majumdar**, Rajesh Mondal, Christian Binggeli, Martin Sahlén, Tirthankar Roy Choudhury, Benedetta Ciardi, **Abhirup Datta**, Kanan K. Datta, Pratika Dayal, Andrea Ferrara, Sambit K. Giri, Umberto Maio, Sangeeta Malhotra, Garrelt Mellema, Andrei Mesinger, James Rhoads, Claes-Erik Rydberg, Ikkoh Shimizu, *Bubble mapping with the Square Kilometer Array -- I. Detecting galaxies with Euclid, JWST, WFIRST and ELT within ionized bubbles in the intergalactic medium at z>6*, Monthly Notices of the Royal Astronomical Society, 493, 1, 855-870 (2020)

- *"A Particle Module for the PLUTO Code. III. Dust"*, Andrea Mignone, Mario Flock, **Bhargav Vaidya**, The Astrophysical Journal Supplement Series, Volume 244, Issue 2, article id. 38, 22 pp. 2019.

- *Modeling Star-Planet Interactions in Far-Out Planetary and Exo-planetary systems:* Srijan Das, Arnab Basak, Dibyendu Nandi, **Bhargav Vaidya**, The Astrophysical Journal, vol. 877, article 80, 2019

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- Eda Vurgun, **Manoneeta Chakraborty,** Tolga Guver and Ersin Gogus, 'Variable Absorption Line of XTE J1810–197', New Astronomy, 67, 45 (2019)

- S. Chakraborty, M. Chakraborty and **S. Das**, "Experimental studies of slant-path rain attenuation over tropical and equatorial regions-A Brief Review", IEEE Antennas and Propagation Magazine, Accepted, 2020.

- **S. Das, S. Datta** and A. K. Shukla, "Detection of Thunderstorm Using Indian Navigation Satellite NavIC," IEEE Transactions on Geoscience and Remote Sensing, *In Press*, 2020, DOI: 10.1109/TGRS.2019.2960035

- **S Bandyopadhyay, S Das, A Datta**, "Fuzzy Energy-Based Dual Contours Model for Automated Coronal Hole Detection in SDO/AIA Solar Disk Images", Advances in Space Research, 2020

- **Chakraborty, A**., Dutta, P., **Datta, A.** and Roy, N., "The study of the angular and spatial distribution of radio selected AGNs and star-forming galaxies in the ELAIS N1 field", 2020, MNRAS, doi:10.1093/mnras/staa945, arXiv:2002.12383v2 [Impact Factor – 5.23]

- **Raja, R., Rahman, M., Datta, A.**, et al., "Diffuse radio emission in the galaxy cluster SPT-CL J2031-4037: a steep spectrum intermediate radio halo?", 2020, MNRAS Letters, 493, L28, Ar-Xiv: 2001.02365 [Impact Factor – 5.23]

- **Raja, R., Rahman, M., Datta, A.**, et al.," Probing the origin of diffuse radio emission in the cool-core of the Phoenix galaxy cluster", 2020, ApJ, 889, 128, arXiv:1912.07853 [Impact Factor – 5.58]

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- **Chakraborty, S.**, Ray, S., Datta, A., Paul, A., "Ionospheric response to Strong Geomagnetic Storms during 2000-2005: An IMF clock angle perspective", 2020, Radio Science (Accepted: in-press).

- **Bandyopadhyay, S., Das, S., and Datta, A.,** "Fuzzy Energy-Based Dual Contours Model for Automated Coronal Hole Detection in SDO/AIA Solar Disk Images", 2020, AdSpR, 65, 10, 2435, doi:10.1016/j.asr.2020.02.012 [Impact Factor – 1.75]

- **Choudhury, M., Datta, A., and Chakraborty, A.,** "Extracting the 21cm Global Signal using Artificial Neural Networks", 2020, MNRAS, 491, 4031 [Impact Factor – 5.23]

- **Ayyagari, D., Chakraborty, S., Das, S.**, Shukla, A., Paul, A., **Datta, A.**, "Performance of NavIC for studying the ionosphere at an EIA region in India", Advances in Space Research, Volume 65, Issue 6, 2020, Pages 1544-1558, ISSN 0273-1177, https://doi.org/10.1016/j.asr.2019.12.019 [Impact Factor – 1.75]

- **Bandyopadhyay, S., Das, S. & Datta, A.**,"Comparative Study and Development of Two Contour Based Image Segmentation Techniques for Coronal Hole Detection in Solar Images", 2020, *Solar Physics*, (**Accepted, in press**).

- **Bandyopadhyay, S., Das, S. & Datta, A**., "A hybrid fuzzy filtering - fuzzy thresholding technique for region of interest detection in noisy images," *Applied Intelligence,* 50, 1112-1132 (2020).

- *"Characterising EoR foregrounds : a study of the Lockman Hole region at 325 MHz"*, **Aishrila Mazumder, Arnab Chakraborty, Abhirup Datta,** Samir Choudhuri, Nirupam Roy, Yogesh Wadadekar and C. H. Ishwara-Chandra, *2020, MNRAS, Volume 495, Issue 4, July 2020* [arXiv : 2005.05205]

- "Characterization of unresolved and unclassified sources detected in radio continuum surveys of the Galactic plane", **Arnab Chakraborty**, Nirupam Roy, Y. Wang, **Abhirup Datta**, H. Beuther and other 2020, MNRAS, Volume 492, Issue 2, February 2020, Pages 2236–2240 [arXiv:2001.02358]

- **Sandhu, Pritpal; Raja, Ramij; Rahaman, Majidul; Malu, Siddharth; Datta, Abhirup**, Study of diffuse emission in cluster MACSJ0417.5-1154 from 76 MHz to 18 GHz, *Journal of Astrophysics and Astronomy*, vol. 40, pp. 17, 2019

- Paul, S., Salunkhe, S., **Datta, A.**, and Intema, H.T., "Low-frequency radio study of MACS clusters at 235 and 610 MHz using the GMRT", 2019, MNRAS, 489, 446P, Ar-XiV: 1903:06799 [Impact Factor – 5.23]

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- Alden, B., Hallman, E.J., Rapetti, D., Burns, J.O., and **Datta, A.**, "The galaxy cluster 'Pypeline' for X-ray temperature maps: ClusterPyXT ", 2019, Astronomy & Computing, 27, 147-155 [Impact Factor – 2.75]

- Chakraborty, S., Ray, S., Sur, D., **Datta, A.,** Paul, A., 2020. Effects of CME and CIR induced geomagnetic storms on low-latitude ionization over Indian longitudes in terms of neutral dynamics. Adv. Space Res. 65 (1), 198–213. https://doi.org/10.1016/j.asr.2019.09.047 [Impact Factor – 1.75]

- **Parimi, V.**, Biring, S., Hao, K. C., **Datta, A., & Sen, S.** (2020). Indium Tin Oxide Based Wideband Dielectric Resonator Antenna for Wireless Communication. *Progress In Electromagnetics Research*, *99*, 77-86.

Courses/conferences/workshops organized 2019-20

- DAASE, IIT Indore organized an International Conference and School on **Observing the First Billion Years of the Universe Using Next Generation Telescopes** (20-31 January 2020). The event was funded by the SPARC project P39 and SKA-India consortium of institutes. There were a t**otal of 90+ participants among which 50+ were international and 40+ were national.**

- The **International Workshop on Recent Advances in Space Science (RASS) was organized by DAASE, November 10-11, 2019.** RASS hosted a broad spectrum of experts from academia and industry, related to remote sensing, Space technology and its applications in a wide variety of fields. The workshop was funded by IEEE, sponsored projects, and industry.

- Workshop organised on PLUTO code in collaboration with University of Free State, Bloemfonstein, South Africa (June 14, 2019).
- DAASE organized two IEEE GRSS Distinguished lectures on Synthetic Aperture Radar on December 11, 2019, funded by IEEE.

- **Data Science and Analytics** - a major Faculty Training Workshop organized under the National Project Implementation Unit (NPIU) / Technical Education Quality Improvement Program (TEQIP) was organized in March 2020, with 70 participants.

Major awards, achievements, recognition 2019-20

- Dr Abhirup Datta is Science Co-Chair of International SKA CD/EoR Science Working Group since January, 2020.

- Dr Bhargav Vaidya was Invited as a Plenary Speaker at the Conference organized by Astronomical Society of India in February 2020.

- Dr Amit Shukla's publication in Nature Communications: **Gamma-ray flares from relativistic magnetic reconnection in the jet of the quasar 3C 279,** Amit Shukla, K. Mannheim, accepted for publication in **Nature Communications**, **17 July 2020** (In press).

- Mr. Soumen Datta, Ph.D. student under Dr. Saurabh Das, has been awarded the prestigious URSI Young Scientist Award in Union Radio Scientifique Internationale (URSI) GASS 2020, Rome, Italy.

- Anchal Saxena, an M.Sc. student from the department has published his M.Sc. project outcome as an article in the Monthly Notices of the Royal Astronomical Society (an impact factor 5.5 journal) titled **Impact of dark matter models on the EoR 21-cm signal bispectrum**, Anchal Saxena, Suman Majumdar, Mohd Kamran, Matteo Viel. DOI: 10.1093/mnras/staa1768 . This is the first journal publication by an M.Sc. student of the department.

Student presentations

- PhD student Mohd Kamran presented his work in the international conference 'SUMMER ALL ZOOM EPOCH OF REIONIZATION ASTRONOMY CONFERENCE (SAZERAC)', organized by the University of Texas, Austin, USA and the University of Sussex, UK. YouTube link to the talk - https://www.youtube.com/watch?v=x_N1VZCGQQc&feature=emb_logo

- PhD student Mohd Kamran presented his work in the international conference 'Observing the First Billion Years of the Universe Using Next Generation Telescopes', at IIT Indore.

- M.Sc. student Anchal Saxena presented his work in the international conference 'SUMMER ALL ZOOM EPOCH OF REIONIZATION ASTRONOMY CONFERENCE (SAZERAC)', organized by the University of Texas, Austin, USA and the University of Sussex, UK. YouTube link to the talk - https://www.youtube.com/watch?v=CzhOvptOdxg&feature=emb_logo

- M.Sc. student Anchal Saxena presented his work in the international conference 'Observing the First Billion Years of the Universe Using Next Generation Telescopes', at IIT Indore.

- M.Sc. student Himanshu Tiwari presented his work in the international conference 'SUMMER ALL ZOOM EPOCH OF REIONIZATION ASTRONOMY CONFERENCE (SAZERAC)', organized by the University of Texas, Austin, USA and the University of Sussex, UK. YouTube link to the talk - https://www.youtube.com/watch?v=9zIBH9uHoFs&feature=emb_logo

- Parul Janagal participated and took part in the discussion in the SpaceGen United conference, held in July 2020.

- Parul Janagal gave a talk titled Space, Time, and Gravity in a webinar series by IEEE NCU Student Branch in June 2020.

- Unnati Kashyap presented a poster titled 'Broadband Spectro-timing Analysis of Neutron Star LMXB 4U 1724-30 Using AstroSat' at 'The 38th Annual Meeting of the Astronomical Society of India' at Indian Institute of Science Education Research (IISER) Tirupati, held during 13 - 17 February 2020.

- Unnati Kashyap presented a poster at The 9th International Conference on Gravitation and Cosmology (ICGC), at IISER Mohali held during 10-13 December 2019.

- Parul Janagal participated in and gave a talk titled Search for Radio Transients using Machine Learning, at the RASS (Recent Advances in Space Sciences) international workshop, held at IIT Indore in November 2019.

From the HoD's Desk

Dr. Abhirup Datta
Associate Professor
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We are what our thoughts have made us" - Swami Vivekananda

The Department of Astronomy, Astrophysics and Space Engineering has expanded significantly from such a thought and expanded significantly from 2015 and in the last academic year. I am happy to report that our strength has grown to seven permanent faculty members, one Ramanujan Faculty Fellow and twenty five PhD research scholars.

The number of external sponsored projects in the department has shown an equally significant growth, with projects ranging from DST-SERB Early Career Research, DST-EMR and CSIR-EMR projects, ISRO-sponsored projects exploring capabilities of NaVIC, to international collaborations supported by two SPARC grants, one ASEM-DUO grant, one MATRICS and one Max-Planck Partner Group funding. This has led to DAASE being involved in major indigenization efforts in Remote Sensing, Space Applications, Machine Learning, simulations, big data analysis and Space communications / radio frequency instrumentation.
This year we saw the graduation of our first M.Sc. Astronomy batch. This is a unique program in India. There are lots of achievements of the seven students who graduated in this first batch. One of them has published his M.Sc. research in a major international journal. A number of graduating M.Sc. students have already been admitted to some of the best International Universities and Institutes which shows the quality of the students as well as the strength of the guidance and mentorship from our faculty members.

The year 2019-2020 also saw a steady rise in our Outreach events. Three skywatch events were organized, as well as two Solar Eclipse events in 2019-20. We continue our strong collaborations with Nehru Planetarium, New Delhi and IUCAA, Pune. IIT Indore also host.

DAASE IIT Indore is now involved in the following major national and international projects:

1. ISRO NaVIC Constellation for Navigation and Atmospheric Studies.
2. Square Kilometre Array (SKA)
3. Cherenkov Telescope Array (CTA)
4. ISRO Astrophysics Space Mission of SEAMS

Faculty members of DAASE are also looking forward to strengthening and advancing their collaborations with other departments within IIT Indore through several new initiatives like Technology Innovation Hub and several focused Centres.

We look forward to the coming year as this will see the first batch of PhD students from our department to graduate. These are exciting times ahead. As always, we wish to continue with and build on our successes from last year.

"Excellence... is not an act, but a habit." —Aristotle

Dr. Abhirup Datta
Associate Professor
Abhirup.Datta@iiti.ac.in

PhD. - New Mexico Tech/National Radio Astronomy Observatory (February, 2011)

Previous Employment (includes post-doctoral experience)

- 2013- 2015 Senior Research Associate at University of Colorado, Boulder, USA
- 2011-2013 NASA Post-Doctoral Fellow at University of Colorado, Boulder, USA

Academic associations with other institutions (Affiliate/Adjunct/ Visiting posts)

- Associate of Inter University Center for Astronomy and Astrophysics (IUCAA) since July, 2016.

Statement of Research Interest

a. Broad research area

- Observational Cosmology and Astrophysics - statistics, machine learning, and simulations.
- Radio and X-ray Astronomy - Observations, Data Analysis and Instrumentation (Square Kilometre Array, GMRT)
- Statistics and Machine Learning related to Space Applications
- Space Weather and Ionosphere: NaVIC and GPS applications
- Space Instrumentation - Payloads and future missions

b. Research Highlights

Exploring the Early Universe using the redshifted HI 21cm signal – pathfinder studies with the uGMRT and future observations with the SKA. Developed a novel methodology power spectrum detection of redshifted 21cm signal using foreground avoidance. Application of Machine Learning techniques to extract faint cosmological signal in presence dominant interfering signals from the foregrounds and instrumental systematics. Demonstrated the need of future Astronomy space missions to pursue low radio frequency astronomy from the space (either orbiting around the Moon or from Lunar farside).

Demonstrated for the first time that NaVIC constellation can be used to probe ionosphere above the Indian subcontinent. Demonstrated that radio interferometer like the GMRT can be used for space weather studies Designed a pipeline to make high fidelity x-ray temperature maps for galaxy clusters and compare them with high fidelity radio maps to study shocks in intra-cluster medium to determine physics behind formation of radio diffuse emission in radio relics and halos. Developing radio instrumentation in IIT Indore using the demonstration array of four element radio interferometer at 1.4 GHz. Ground Based prototype testing for SEAMS project – ISRO approved Astrophysics Mission.

c. Awards and Achievements

- Member of International Astronomical Union (IAU) since 2018
- Early Career Research Award, DST-SERB, India, July, 2017
- Member of Astronomical Society of India (ASI), since 2017
- Visiting Associate at IUCAA, Pune, India since July, 2016
- NASA Post-Doctoral Fellowship, 2011
- Coordinator for the ICARD (IUCAA Centre for Astronomy Research and Development) in IIT Indore, 2019 onwards.
- Co-Investigator on SEAMS Astronomy Space Mission proposal – accepted for funding from ISRO.
- Science team member CMB-Bharat Consortium and the ECHO mission proposal submitted to ISRO, May 2018.
- Scientific Referee for Nature Astronomy, The Astrophysical Journal (ApJ), The Astrophysical Journal Supplement Series (ApJSS), Proceedings of the Astronomical Society of the Pacific (PASP).
- Executive Committee Member of SKA India Consortium, since October 2015.
- Member from India in the Square Kilometer Array (SKA) CD/EoR Science Team Board since January 2017.
- Science Co-Chair of International SKA CD/EoR Science Working Group since January, 2020.

Publications (includes journal articles, books and book chapters)

- Chakraborty, A., Dutta, P., **Datta, A.** and Roy, N., "The study of the angular and spatial distribution of radio selected AGNs and star-forming galaxies in the ELAIS N1 field", 2020, MNRAS, doi:10.1093/mnras/staa945, arXiv:2002.12383v2 [Impact Factor – 5.23]
- Raja, R., Rahman, M., **Datta, A.**, et al., "Diffuse radio emission in the galaxy cluster SPT-CL J2031-4037: a steep spectrum intermediate radio halo?", 2020, MNRAS Letters, 493, L28, Ar-Xiv: 2001.02365 [Impact Factor – 5.23]
- Raja, R., Rahman, M., **Datta, A.**, et al.," Probing the origin of diffuse radio emission in the cool-core of the Phoenix galaxy cluster", 2020, ApJ, 889, 128, arXiv:1912.07853 [Impact Factor – 5.58]

Events/ Seminars organized

- International Conference and School on Observing the First Billion Years of the Universe Using Next Generation Telescopes (20-31 January 2020)
- Organizing chair of "Multi-wavelength Sky Observations – AstroSat and Beyond" workshop and symposium at IIT Indore during February 3-9, 2019 in association with TIFR and IUCAA
- Organizing Chair of International CMNA Conference in IIT Indore, 2018.
- Served in Scientific Organizing Committee of "Universe After First 200 Million Years", December 11-13, 2017, Presidency University, Kolkata, India.
- LOC member in the AP-RaSc Conference (URSI Asia-Pacific Radio Science Conference), March 9-15, 2019.

- Initiated Astronomy Outreach program in the Department of Astronomy, Astrophysics and Space Engineering. We have regular monthly outreach programs as well as dedicated outreach events involving local schools and colleges in and around Indore.
- Initiated a collaboration with Nehru Planetarium, New Delhi for celebration of Bapu Khagol Mela, to commemorate 150 years of Mahatma (a Ministry of Culture, GoI, initiative)

Projects active during April 2018-March 2019

Title - Unveiling Mergers of Galaxy clusters with radio haloes/relics: Using high Fidelity Radio and X-ray observations.
Duration - April 2018 – March 2021 (PI: Dr. Abhirup Datta)
Funding Agency DST-SERB ECRA scheme
Brief Description - This project aims to study a complete sample of merging galaxy clusters in x-ray and radio wavelengths to answer critical questions related to propagation of shocks in the Intra-cluster medium and link to radio halo and relic formation.

Title - Pilot survey of CMB polarized foregrounds using a Single Dish
Duration - April, 2019 – March 2021 (PI- Dr. Abhirup Datta; Co-PI: Dr. Siddharth Malu)
Funding Agency - Scheme for Promotion of Academic and Research Collaboration, MHRD, India
Brief Description - Main aim is to develop high radio frequency expertise and infrastructure in India in order to accelerate scientific progress in future CMB and high-frequency science projects in India. As a first initiative, this proposal aims to establish necessary infrastructure for a pilot study fo CMB polarized foregrounds in India.

Title - Differential NavIC and GAGAN aided Inertial Navigation with applications to Air, Land and Space Vehicles
Duration - April 2017 – March, 2020 (PI: Dr. Abhirup Datta; Co-PI: Prof. H.B.Hablani)
Funding Agency - ISRO GAGAN and NaVIC UP Scheme

Title - 21CM Cosmology with The Square Kilometre Array (SKA)
Duration - July, 2019 – July, 2022 (PI: Dr. Abhirup Datta)
Funding Agency - CSIR-EMR

Title - Imaging Diffuse Emission and Possible SZ signatures in Galaxy Cluster Mergers at High Frequencies
Duration - July, 2019 – July, 2022 (PI: Dr. Siddharth Malu; Co-PI: Dr. Abhirup Datta)
Funding Agency - CSIR-EMR

Title - C and L-Band Interferometer as Galaxy Cluster Observatory Pathfinder
Duration - 36 Months
Funding Agency - DST-SERB EMR Scheme PI: Siddharth Malu, Co-PIs: Abhirup Datta, Somaditya Sen
Brief Description - This project proposes to build a 4-element radio interferometry pathfinder at 1.4 GHz, with at least 100 MHz bandwidth. In order to build this small pathfinder radio array, simple analogue equipment and circuitry is to be used. The correlator would be digital and state-of-the-art, based on a reconfigurable FPGA (Field Programmable Gate Array) architecture. This pathfinder would be capable of detecting bright radio sources in the sky when completed, as well as characterizing their spectra over a 100 MHz bandwidth.

Title - Imaging the first billion years of the universe with next-generation telescopes
Duration - 15/03/2019-14/03/2021 (PI- Dr. Suman Majumdar, Co-PI- Dr. Abhirup Datta)

Funding Agency - Scheme for Promotion of Academic and Research Collaboration, MHRD, India
Brief Description - The project aims at finding novel techniques of analysing upcoming Square Kilometre Array observations of the Cosmic Dawn era (the era of the first sources of light) to quantify the role of galaxies as ionizing sources, taking into account different uncertainties for different future surveys in other wavelengths (other than radio).

Title - Synthetic Observatory for X-shaped Radio Galaxies
Duration - 36 Months (start date: August 16, 2018) (PI: Dr. Bhargav Vaidya, Co-PI- Dr. Abhirup Datta)
Funding Agency - CSIR EMR-II Grant
Brief Description - This project aims to unravel theformation mechanism of very atypical X-shaped radio galaxies using hybrid relativistic magneto-hydrodynamic simulations.

Dr. Saurabh Das
Assistant Professor
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Previous Employment (includes post-doctoral experience)

- Indian Statistical Institute, DST INSPIRE Faculty, 2015-2018
- University of Calcutta, Assistant Professor, 2009-2015
- Space Applications Centre, ISRO, Junior Research Fellow , 2006-2009

Statement of Research Interests

a. Broad research area

- Space and atmospheric science

b. Research Highlights

- Automated detection of coronal holes are important for understanding and prediction of space weather. Fuzzy based segmentation techniques has been developed and applied on solar coronal hole detection. The results indicate better performance than other existing algorithm for such application.
- Thunderstorm detection using Indian NavIC satellite constellation has been attempted and a successful model based on time warping technique has been developed for the same.
- The effect on thunderstorm on rain microphysics has been investigated. The results are useful for improvement of satellite radar based remote sensing studies.

c. Awards and Achievements

- Ph.D. student Mr. Soumen Datta working under my supervision has received Young Scientist award by URSI GASS 2020.

Publications (includes journal articles, books and book chapters).
Total 4. List (best 3):

- S. Chakraborty, M. Chakraborty and S. Das, "Experimental studies of slant-path rain attenuation over tropical and equatorial regions-A Brief Review", IEEE Antennas and Propagation Magazine, Accepted, 2020.
- S. Das, S. Datta and A. K. Shukla, "Detection of Thunderstorm Using Indian Navigation Satellite NavIC," IEEE Transactions on Geoscience and Remote Sensing, *In Press*, 2020, DOI: 10.1109/TGRS.2019.2960035
- S Bandyopadhyay, S Das, A Datta, "Fuzzy Energy-Based Dual Contours Model for Automated Coronal Hole Detection in SDO/AIA Solar Disk Images", Advances in Space Research, 2020.

Projects active during April 2019-March 2020

Title - Retrieval of atmospheric water vapor from NavIC/GAGAN data and prediction of extreme weather events based on machine learning techniques.
Duration - 3 years
Funding Agency - ISRO
Brief Description - **Total budget** Rs. 43.92 Lacs.
Objectives:

- Feasibility study of extracting water vapour information from IRNSS.
- Assessment of tropospheric errors in IRNSS position accuracy and modelling of the same.
- Study of the water vapor estimated from GAGAN data and its relation to the extreme weather events.
- Development of machine learning based algorithms for forecasting extreme events like flash flood and thunderstorm utilizing the real-time water vapour data.

Title - Integrated studies of cloud-aerosol- precipitation system in the Indian region in a climate change scenario.
Duration - 5 years
Funding Agency - DST-INSPIRE
Brief Description - **Total budget** Rs. 35 Lacs.
Objectives:

- Physical understanding of the precipitation formation process, especially the role of collision and coalescence of liquid-phase cloud droplets in convective rain.
- Understanding the role of aerosol concentration and type on microphysical evolution of precipitating system in short and long term scale.
- Characterization of precipitation features for the period 1998-present over India using satellite and ground based data with an emphasis on extreme weather events.
- Study of drop size distribution over Indian region and simulation of multi frequency sensors for improved remote sensing capability for future generation's systems.

Title - Modelling of major weather disturbances, especially cyclones, using Deep Neural Networks
Duration - 3 years
Funding Agency – SERB **Total budget** Rs. 6.6 Lacs.
Objectives: Modelling of tropical cyclones and extreme weather event based on deep learning technique.

Dr. Bhargav Pradeep Vaidya
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PhD. Max Planck Institute for Astronomy, Heidelberg

Previous Employment (includes post-doctoral experience)

- Postdoctoral Fellow, University of Leeds, Leeds UK
- Postdoctoral Researcher, University of Torino, Italy

Academic associations with other institutions (Affiliate/Adjunct/ Visitig posts)

- Affiliate Faculty at the Center of Excellence in Space Sciences India, IISER Kolkata
- Associate of Inter University Center for Astronomy and Astrophysics (IUCAA)

Statement of Research Interests

a. Broad research area

- Computational Astrophysics: Astrophysics and Space Plasma simulations, Numerical Space Weather Modelling.

b. Research Highlights

- Developed a state-of-the-art hybrid module for the PLUTO code for application to study particle acceleration mechanisms at shocks and non-thermal emission from relativistic jets.
- Developed three-dimensional model to study impact of Coronal Mass Ejection (CME) shocks from Sun on Earth's magnetosphere to study the impact of Space Weather as part of the Science Team of ISRO's Aditya L1 mission.
- Part of the development team for the dust module in PLUTO code to study formation of planets in young stellar disks and related applications in planetary science.

c. **Awards and Achievements –**

- Awarded the Max Planck India Partner
- group award from Max Planck Society.
- Appointed as Permanent Member for the
- International Astronomical Union (IAU)
- Awarded EMR-II Grant from CSIR to study
- Synthetic Observations from X-shaped radio galaxies.
- Invited as a Plenary Speaker at the Conference organized by Astronomical Society of India in February 2020.
- Invited for presenting a colloquium at the Department of Physics, University of Free State, Bloemfonstein.

Publications (includes journal articles, books and book chapters)

- ***A Particle Module for the PLUTO Code. III. Dust*** **Andrea Mignone, Mario Flock, Bhargav Vaidya, The Astrophysical Journal Supplement Series, Volume 244, Issue 2, article id. 38, 22 pp. 2019.**
- *Modeling Star-Planet Interactions in Far-Out Planetary and Exo-planetary systems:* Srijan Das, Arnab Basak, Dibyendu Nandi, Bhargav Vaidya, The Astrophysical Journal, vol. 877, article 80, 2019.
- *A Particle Module for the PLUTO code: II – Hybrid Framework for Modeling Non-thermal emission from Relativistic Magnetized flows,* Bhargav Vaidya, Andrea Mignone, Gianluigi Bodo, Paola Rossi, Silvano Massaglia, The Astrophysical Journal, vol. 865, Number 2, article 144, 2018

Events/ Seminars organized

- Part of the Organization team for Astronomy Outreach Activity and Night Sky Observation event: Bapu Khagol Mela in collaboration with Nehru Planetarium, Delhi.
- Workshop on PLUTO code in collaboration with University of Free State, Bloemfonstein, South Africa

Projects active during April 2019-March 2020

Title - Synthetic Observatory for X-shaped Radio Galaxies
Duration - 36 Months (start date: August 16, 2018)
Funding Agency - CSIR EMR-II Grant.
Brief Description - This projects aims to unravel the formation mechanism of very atypical X-shaped radio galaxies using hybrid relativistic magneto-hydrodynamic simulations.

Title - Max Planck Partner Group Grant
Duration - 36 Months (start date : 01 July 2019)
Funding Agency - Max Planck Society, Munich, Germany

Brief Description - The aim of this project is develop a working group at IIT Indore in collaboration with Max Planck Institute for Astronomy, Heidelberg to work on developing state-of-the-art simulation models for studying multi-messenger aspects of AGN jets.

Dr. Suman Majumdar
Assistant Professor
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PhD. - Indian Institute of Technology Kharagpur (April, 2013)

Previous Employment (includes post-doctoral experience)

- Postdoctoral Research Associate, Department of Physics, Imperial College London, UK (December, 2015 - April 2018)
- Postdoctoral Fellow, Department of Astronomy, Stockholm University, Sweden (December, 2012 - November, 2015)

Academic associations with other institutions (Affiliate/Adjunct/ Visiting posts)

- Academic Visitor, Scuola Internazionale Superiore di Studi Avanzati (SISSA), Trieste, Italy (since November, 2019).
- Academic Visitor, International Centre for Theoretical Physics (ICTP), Trieste, Italy (since June, 2019)
- Academic Visitor, Department of Physics, Imperial College London, UK (since May, 2018)

Statement of Research Interests

a. Broad research area

- Cosmology, Large Scale Structure, Cosmic Dawn and Epoch of Reionization, Large Scale Simulations of the Universe, N-body Simulations, Statistical Inference, Machine Learning and Artificial Intelligence, BIG DATA Cosmology.

b. Research Highlights

- The topological distribution of neutral hydrogen during the Cosmic Dawn is non-Gaussian in nature, however this non-Gaussianity cannot be captured through the traditional statistic of 21-cm data e.g. power spectrum. We have proposed and showed that a higher order statistic can quantify this non-Gaussianity in the signal and thus can provide a more comprehensive picture of this early stage of the Universe.
- We have provided an upper limit on the 21-cm bispectrum from the epoch of reionization using the actual observational data from the Murchison Widefield Array in Australia.
- We have shown that using the 21-cm bispectrum one can in principle distinguish between different dark matter candidates and their role in the structure formation.
- In a separate project we have shown that the bispectrum of 21-cm signal from the post-reionization era can help us to put independent constraints on the linear bias parameter and can provide us a measure of the primordial non-Gaussianity.
- We have developed a novel image analysis technique with which one will be able to constrain the role of galaxies and quasars in reionization by combining the future 21-cm observations with the SKA and infrared observations with Euclid, JWST, ELT etc. This will be a major step towards solving one of the fundamental problems related to this era of first dawn.
- We have compared different methods to simulate the 21-cm signal from the epoch of reionization and have shown that the one dimensional radiative radiative transfer methods are optimal in terms of accuracy and computational time.
- We have also shown that the Multi-frequency Angular Power Spectrum can optimally extract the

reionization history from a radio interferometric observation of the early universe.

c. Awards and Achievements

- Fellow of the Royal Astronomical Society, UK (since January, 2017)
- Alva and Lennart Dahlmark Research Grant, Sweden (2014, 2015)
- Jubilee Donation Grant, K & A Wallenberg Foundation, Sweden (2014)
- Member of the "Epoch of Reionization and the Dark Ages" international science working group for the Square Kilometre Array (since February, 2015)
- Member of the "Epoch of Reionization" science working group for the LOFAR International Telescope (since 2015)
- Member of the "Square Kilometre Array - India" collaboration for the "Cosmic Dwan and the Epoch of Reionization" (since 2015)
- Postdoctoral Fellowship, Department of Physics, Imperial College London, UK (December, 2015 - April 2018)
- Postdoctoral Fellowship, Department of Astronomy, Stockholm University, Sweden (December, 2012 - November, 2015)
- Senior Research Fellowship, from the Council of Scientific and Industrial Research, India (2011-2012)
- Senior Research Fellowship, from IIT Kharagpur (2009-2011)
- Junior Research Fellowship, from IIT Kharagpur (2007-2009)
- Best Speaker Award in the Research Scholar Day, Department of Physics, IIT Kharagpur (2009)
- Best Speaker Award in the Young Astronomers Meet, India (2009)

Publications (includes journal articles, books and book chapters)

- Suman Majumdar, Mohd Kamran, Jonathan R. Pritchard, Rajesh Mondal, Arindam Mazumdar, Somnath Bharadwaj, Garrelt Mellema, Redshifted 21-cm Bispectrum I: Impact of the Redshift Space Distortions on the Signal from the Epoch of Reionization, Accepted for publication in the Monthly Notices of the Royal Astronomical Society, (2020), arXiv:2007.06584
- Erik Zackrisson, **Suman Majumdar**, Rajesh Mondal, Christian Binggeli, Martin Sahlén, Tirthankar Roy Choudhury, Benedetta Ciardi, Abhirup Datta, Kanan K. Datta, Pratika Dayal, Andrea Ferrara, Sambit K. Giri, Umberto Maio, Sangeeta Malhotra, Garrelt Mellema, Andrei Mesinger, James Rhoads, Claes-Erik Rydberg, Ikkoh Shimizu, *Bubble mapping with the Square Kilometer Array -- I. Detecting galaxies with Euclid, JWST, WFIRST and ELT within ionized bubbles in the intergalactic medium at z>6*, Monthly Notices of the Royal Astronomical Society, 493, 1, 855-870 (**2020)**
- **Suman Majumdar**, Jonathan R. Pritchard, Rajesh Mondal, Catherine A. Watkinson, Somnath Bharadwaj, Garrelt Mellema, *Quantifying the non-Gaussianity in the EoR 21-cm signal through bispectrum*, Monthly Notices of the Royal Astronomical Society, 476, 3, 4007-4024 (**2018**).

Projects active during April 2019-March 2020

Title - Imaging the first billion years of the universe with next-generation telescopes.
Duration - 15/03/2019-14/03/2021
Funding Agency - Scheme for Promotion of Academic and Research Collaboration (SPARC), MHRD, India.
Brief Description - The project aims at finding novel techniques of analysing upcoming Square Kilometre Array observations of the Cosmic Dawn era (the era of the first sources of light) to quantify the role of galaxies as ionizing sources, taking into account different uncertainties for different future surveys in other wavelengths (other than radio).

Title - Unveiling the Cosmic Dawn: Novel Techniques to Study the Reionization of the Early Universe.
Duration - January 2020 - December 2021
Funding Agency - **ASEM-DUO** http://www.asemduo.org/index.php
Brief Description - The project aims at finding optimal statistics to quantify and interpret the redshifted 21-cm signal coming from the early universe and to be observed by the next generation radio interferometers like the SKA.

Dr. Siddharth Savyasachi Malu
Associate Professor
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Ph.D. Physics (Astrophysics) - University of Wisconsin-Madison, 2007
Previous Employment (includes post-doctoral experience)

- Assistant Professor, Physics, IIT Indore, 2012-15
- Chief Research Officer, Redwood Associates, 2011-12
- Postdoctoral Fellow, Raman Research Institute, 2010-11
- Postdoctoral Fellow, IUCAA, 2007-09

Statement of Research Interests

a. Broad research area

- Radio Astronomy Instrumentation, Galaxy clusters and Cluster Mergers.

b. Research Highlights

- The Centre has received funds from DST-SERB to make a 4-element radio interferometer at L and C bands. The idea is to use reconfigurable hardware that uses FPGAs (Field Programmable Gate Arrays) in order to 'program' a Spectrometer and a Correlator, following CASPER (Collaboration for Advanced Signal Processing and Electronics Research) tools; thus, a simple RF frontend and a sophisticated Digital Backend can be combined to form a working radio telescope.

Publications (includes journal articles, books and book chapters)

- Pritpal Sandhu, Siddharth Malu, Ramij Raja and Abhirup Datta, **The peculiar cluster MACS J0417.5-1154 in the C and X-bands,** *Astrophysics and Space Science,* vol. 361, article 8, 2018
- Paul, Surajit; Datta, Abhirup; Malu, Siddharth; Gupta, Prateek; John, Reju Sam; Colafrancesco, Sergio, **Rings of diffuse radio emission surrounding the Bullet cluster,** *Cornell University Preprint Server* , vol. arXiv:1804.02588, pp. 10, 2018
- Sandhu, Pritpal; Raja, Ramij; Rahaman, Majidul; Malu, Siddharth; Datta, Abhirup, Study of diffuse emission in cluster MACSJ0417.5-1154 from 76 MHz to 18 GHz, Journal of Astrophysics and Astronomy, vol. 40, pp. 17, 2019

Projects active during April 2019-March 2020
Title - C and L-Band Interferometer as Galaxy Cluster Observatory Pathfinder
Duration - 3 years
Funding Agency - DST-SERB Amount: Rs. 84 lacs PI: Siddharth Malu, Co-PIs: Abhirup Datta, Somaditya Sen
Brief Description - This project proposes to build a 4-element radio interferometry pathfinder at 1.4 GHz, with at least 100 MHz bandwidth. In order to build this small pathfinder radio array, simple analogue equipment and circuitry is to be used. The correlator would be digital and state-of-the-art, based on a reconfigurable FPGA (Field Programmable Gate Array) architecture. This pathfinder would be capable of

detecting bright radio sources in the sky when completed, as well as characterizing their spectra over a 100 MHz bandwidth.

Title - Imaging diffuse emission and possible SZ signatures in galaxy cluster mergers at high frequencies.
Duration - 3 years
Funding Agency - CSIR Amount: Rs. 12 lacs PI: Siddharth Malu, Co-PI: Abhirup Datta
Brief Description - The main aim of this project is to conduct a Sunyaev-Zel'dovich Effect (SZE) survey of galaxy cluster mergers, in order to study the pressure sub-structures in cluster mergers, as well as the effect of these sub-structures on the overall SZE power spectrum – this has been studied in simulations, but not through actual SZE measurements [McCarthy et al. MNRAS 440: 3645 (2014)].

Dr. Manoneeta Chakraborty
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Ph.D. - Tata Institute of Fundamental Research, Mumbai, India, 2014
Previous Employment (includes post-doctoral experience)

- DST INSPIRE faculty fellow, Department of Astronomy, Astrophysics and Space Engineering, Indian Institute of Technology Indore, June 2017 – July 2019
- Post-doctoral research fellow, High energy astrophysics group, Sabanci University, January 2015 – April 2017
- Visiting Researcher, Inter-University Centre for Astronomy and Astrophysics and INAF-Brera, October 2014 – December 2014

Statement of Research Interests

a. Broad research area

- Compact Objects, Neutron stars, Black holes, Pulsars and magnetars, X-ray binaries, EM counterparts of Gravitational waves, Transients and Fast Radio Bursts, Multi-wavelength high time-resolution Astronomy.

b. Research Highlights

- Investigated the long-term spectral and timing evolution of a neutron star atoll LMXB source for characterizing the emission mechanism with unprecedented broadband coverage.
- Observations of the simultaneous X-ray/UV data of the ultra-luminous X-ray source Holmberg II X-1 using Astrosat in response to successful proposal.
- X-ray/UV correlation studied to infer about the irradiated disk scenario and the origin of the ultra-luminosity.
- Studied thermonuclear bursts using high time resolution wideband data to probe the ignition mechanism and the evolution of nuclear burning with the radiative behaviour of the source.
- Observations of accretion behaviour of LMXBs carried out using Astrosat and NICER (occasionally simultaneous).
- Multi-frequency single pulse observations of radio pulsars were carried out using MWA and uGMRT giving unprecedented spectral behaviour of the pulse properties like sub-pulse drifting.
- Studied the broadband behaviour of the only Galactic Ultra-luminous X-ray pulsar and the variation of its pulsation properties across the super-critical state transition.
- Comparative study between short gamma-ray bursts (sGRBs) and magnetar giant flares shedding light on one of the possible origins of the sGRBs.
- Application of machine learning techniques for global prediction of nature of compact objects based on its spectral behavior.

Publications (includes journal articles, books and book chapters)

- Jun Yang, Vikas Chand, Bin-Bin Zhang, Yu-Han Yang, Jin-Hang Zou, Yi-Si Yang, Xiao-Hong Zhao, Lang Shao, Shao-Lin Xiong, Qi Luo, Xiao-Bo Li, Shuo Xiao, Cheng-Kui Li, Cong-Zhan Liu, Jagdish C. Joshi, Vidushi Sharma, Manoneeta Chakraborty, and Bing Zhang, 'GRB 200415A: A Short Gamma-Ray Burst from a Magnetar Giant Flare?', Accepted for publication in the Astrophysical Journal (2020)
- Eda Vurgun, Manoneeta Chakraborty, Tolga Guver and Ersin Gogus, Variable Absorption Line of XTE J1810–197, New Astronomy, 67, 45 (2019)
- Manoneeta Chakraborty, Yunus Emre Bahar and Ersin Gogus, 'Time and energy dependent characteristics of thermonuclear burst oscillations', ApJ, 851, 79 (2017)

Events/ Seminars organized

- Organizer of several outreach events as DAASE outreach coordinator involving night sky observations, demonstrations and lectures on astrophysical concepts, solar eclipse observations.
- Co-organizer of National science day events.
- Organizer of an astronomy visitor colloquium by Dr. Ramesh Bhat (Curtin University).

Projects active during April 2019-March 2020

Title - Probing the extreme physics around compact objects in binary and isolated systems through investigations of their burst and outburst behaviour
Duration - 5 years
Funding Agency - DST (Department of Science and Technology)
Brief Description - Under this 5-year INSPIRE project, we plan to investigate the spectral state evolution and transition of compact objects in low-mass X-ray binary systems. The multi-wavelength correlation and variability of the emission in the active and quiescent phase will be studied to reveal the disk-jet connection and the disk topography. We aim to study thermonuclear ignition and flame propagation. Furthermore, pulse, spin evolution of isolated systems will be investigated to probe the magnetic field morphology. For this purpose, we plan to use multi-wavelength from missions like RXTE, Chandra, Swift, XMM-Newton, NuStar, Astrosat, GMRT, VLA, SALT, DOT.

Dr. Rajkumar Hajra
Ramanujan Fellow
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PhD. 2012
Previous Employment (includes post-doctoral experience)

- INPE, Brazil (Postdoctoral Fellow): 2012 August 1 to 2015 September 30
- CNRS, France (Postdoctoral Fellow): 2016 March 7 to 2018 October 31
- NARL, India (Ramanujan Fellow): 2018 November 22 to 2019 October 31

Statement of Research Interests

a. **Broad research area** - Space Science

Publications (includes journal articles, books and book chapters)

- **Hajra, R.**, B. T. Tsurutani, and G. S. Lakhina (2020), The Complex Space Weather Events of 2017 September, The Astrophysical Journal (accepted) (IF = 5.580).
- **Hajra, R.**, P. Henri, X. Vallières, M. Galand, M. Rubin, B. T. Tsurutani, N. Gilet, L. Bucciantini, and Z. Nemeth (2020), Ionospheric total electron content of comet 67P/Churyumov-Gerasimenko, Astronomy & Astrophysics, 635, A51, https://doi.org/10.1051/0004-6361/201937022 (IF = 6.209).

- Tsurutani, B. T., G. S. Lakhina, and **R. Hajra** (2020), The physics of space weather/solar-terrestrial physics (STP): what we know now and what the current and future challenges are, Nonlinear Processes in Geophysics, 27, 75-119, https://doi.org/10.5194/npg-27-75-2020 (IF = 1.699).

Projects active during April 2019-March 2020
Title - Investigation of Space Weather Effects on the Equatorial Ionosphere over Indian Region
Duration - 22 November 2018 – 21 November 2023
Funding Agency - Science & Engineering Research Board (SERB), Department of Science & Technology (DST), Government of India.
Brief Description - To study space weather impacts on ionosphere and magnetosphere of the Earth and other solar system bodies like comets.

Outreach Activities at DAASE 2019-2020

- **Solar Eclipse Observation event, June 21, 2020**
  Despite the lockdown due to Covid-19, faculty members of DAASE, led by Dr. Shukla and Dr. Chakraborty, live-streamed the solar eclipse event for the IIT Indore community

- **National Science Day, February 28, 2020**

- Lectures given by Dr. Datta, Dr. Shukla and Dr. Chakraborty at the **Winter School in Observational Astronomy at the Varahamhir Astronomical Observatory**, Dongla Ujjain held from 29th January to 4th February 2020 organized by MPCST

- Popular talk on astronomy: **Searching for life in outer space** by Erik Zackrisson, Uppsala University, Sweden on 30th January 2020

- Celestial Silhouette [Solar eclipse observation], December 26, 2019

- Astronomy outreach and night skywatch event by the DAASE on October 18, 2019. This was attended by 30 students from The Shishukunj International School alongside many from the IIT Indore community.

- Visit by school students from local villages and government schools under Unnat Bharat Abhiyan, 05, July 2019. Lectures and demonstrations by DAASE members.

- Guest lectures by DAASE faculty members during Astronomical Telescope Making Workshop organized by Vigyan Prasar at Kendriya Vidyalaya-I, Bhopal on 22nd June 2019.

Projects won by DAASE in the year 2019-20

Title - C and L-Band Interferometer as Galaxy Cluster Observatory Pathfinder
Duration - 3 years
Funding Agency - DST-SERB Amount: Rs. 84 lacs PI: Siddharth Malu, Co-PIs: Abhirup Datta, Somaditya Sen
Brief Description - This project proposes to build a 4-element radio interferometry pathfinder at 1.4 GHz, with at least 100 MHz bandwidth. In order to build this small pathfinder radio array, simple analogue equipment and circuitry is to be used. The correlator would be digital and state-of-the-art, based on a reconfigurable FPGA (Field Programmable Gate Array) architecture. This pathfinder would be capable of detecting bright radio sources in the sky when completed, as well as characterizing their spectra over a 100 MHz bandwidth.

Title - Max Planck Partner Group Grant
Duration - 36 Months (start date : 01 July 2019)
Funding Agency - Max Planck Society, Munich, Germany PI: Dr. Bhargav Vaidya
Brief Description - The aim of this project is develop a working group at IIT Indore in collaboration with Max Planck Institute for Astronomy, Heidelberg to work on developing state-of-the-art simulation models for studying multi-messenger aspects of AGN jets.

Title - Investigation of Space Weather Effects on the Equatorial Ionosphere over Indian Region
Duration - 22 November 2018 – 21 November 2023
Funding Agency - Science & Engineering Research Board (SERB), Department of Science & Technology (DST), Government of India PI: Dr. Rajkumar Hajra
Brief Description - To study space weather impacts on ionosphere and magnetosphere of the Earth and other solar system bodies like comets.

Title - Probing the extreme physics around compact objects in binary and isolated systems through investigations of their burst and outburst behaviour
Duration - 01.06.2017 to 31.05.2022
Funding Agency - DST (Department of Science and Technology) PI: Dr. Manoneeta Chakraborty
Brief Description - Under this 5-year INSPIRE project, we plan to investigate the spectral state evolution and transition of compact objects in low-mass X-ray binary systems. The multi-wavelength correlation and variability of the emission in the active and quiescent phase will be studied to reveal the disk-jet connection and the disk topography. We aim to study thermonuclear ignition and flame propagation. Furthermore, pulse, spin evolution of isolated systems will be investigated to probe the magnetic field morphology. For this purpose, we plan to use multi-wavelength from missions like RXTE, Chandra, Swift, XMM-Newton, NuStar, Astrosat, GMRT, VLA, SALT, DOT.

Title - Retrieval of atmospheric water vapor from NavIC/GAGAN data and prediction of extreme weather events based on machine learning techniques
Duration - 3 years
Funding Agency - ISRO PI: Dr. Saurabh Das
Brief Description - **Total budget** Rs. 43.92 Lacs.
Objectives:

- Feasibility study of extracting water vapour information from IRNSS.
- Assessment of tropospheric errors in IRNSS position accuracy and modelling of the same.
- Study of the water vapor estimated from GAGAN data and its relation to the extreme weather events.
- Development of machine learning based algorithms for forecasting extreme events like flash flood and thunderstorm utilizing the real-time water vapour data.

Title - Integrated studies of cloud-aerosol- precipitation system in the Indian region in a climate change scenario.
Duration - 5 years
Funding Agency - DST-INSPIREPI: DR. Saurabh Das
Brief Description - **Total budget** Rs. 35 Lacs.
Objectives:

- Physical understanding of the precipitation formation process, especially the role of collision and coalescence of liquid-phase cloud droplets in convective rain.

- Understanding the role of aerosol concentration and type on microphysical evolution of precipitating system in short and long term scale.
- Characterization of precipitation features for the period 1998-present over India using satellite and ground based data with an emphasis on extreme weather events.
- Study of drop size distribution over Indian region and simulation of multi frequency sensors for improved remote sensing capability for future generation's systems.

Title - Imaging the first billion years of the universe with next-generation telescopes.
Duration - 15/03/2019-14/03/2021
Funding Agency - Scheme for Promotion of Academic and Research Collaboration (SPARC), MHRD, India. PI: Dr. Suman Majumdar, Co-PI: Dr. Abhirup Datta.
Brief Description - The project aims at finding novel techniques of analysing upcoming Square Kilometre Array observations of the Cosmic Dawn era (the era of the first sources of light) to quantify the role of galaxies as ionizing sources, taking into account different uncertainties for different future surveys in other wavelengths (other than radio).

Title - Unveiling the Cosmic Dawn: Novel Techniques to Study the Reionization of the Early Universe.
Duration - January 2020 - December 2021
Funding Agency - **ASEM-DUO** http://www.asemduo.org/index.php PI: Dr. Suman Majumdar
Brief Description - The project aims at finding optimal statistics to quantify and interpret the redshifted 21-cm signal coming from the early universe and to be observed by the next generation radio interferometers like the SKA.

Title - Unveiling Mergers of Galaxy clusters with radio haloes/relics: Using high Fidelity Radio and X-ray observations.
Duration - April 2018 – March 2021 (PI: Dr. Abhirup Datta)
Funding Agency - DST-SERB ECR Award
Brief Description - This project aims to study a complete sample of merging galaxy clusters in x-ray and radio wavelengths to answer critical questions related to propagation of shocks in the Intra-cluster medium and link to radio halo and relic formation.

Title - Pilot survey of CMB polarized foregrounds using a Single Dish
Duration - April, 2019 – March 2021 (PI- Dr. Abhirup Datta; Co-PI: Dr. Siddharth Malu)
Funding Agency - Scheme for Promotion of Academic and Research Collaboration, MHRD, India
Brief Description - Main aim is to develop high radio frequency expertise and infrastructure in India in order to accelerate scientific progress in future CMB and high-frequency science projects in India. As a first initiative, this proposal aims to establish necessary infrastructure for a pilot study for CMB polarized foregrounds in India.

Title - 21CM Cosmology with The Square Kilometre Array (SKA)
Duration - July, 2019 – July, 2022 (PI: Dr. Abhirup Datta)
Funding Agency - CSIR-EMR

Title - Imaging Diffuse Emission and Possible SZ signatures in Galaxy Cluster Mergers at High Frequencies
Duration - July, 2019 – July, 2022 (PI: Dr. Siddharth Malu; Co-PI: Dr. Abhirup Datta)
Funding Agency - CSIR-EMR

Title - Differential NavIC and GAGAN aided Inertial Navigation with applications to Air, Land and Space Vehicles
Duration - **April**, 2017 – March, 2020 (PI: Dr. Abhirup Datta; Co-PI: Prof. H.B.Hablani)
Funding Agency - ISRO GAGAN and NaVIC UP Scheme

Institute Functions

7th Convocation of IIT Indore: It is a moment of pride for Indian Institute of Technology Indore to host its 7th Convocation Ceremony on November 16, 2019, at its sprawling and lush green campus. The Institute is celebrating its 10th Anniversary and has witnessed the consolidation of its position nationally as a top institute in the country and globally as one of the fastest-growing technical institutions.

On this occasion, Prof. Jeffrey S. Kargel a Senior Scientist in Planetary Sciences Institute Tucson, Arizona, USA is the Chief Guest of the event. He is a geologist, glaciologist, and Ph.D. in Planetary Sciences from The University of Arizona. A total of 275 degrees have been awarded to students in various streams and courses at the convocation ceremony, of the graduating students 108 are B.Tech, 29 are M.Tech, 55 are M.Sc., and 83 are Ph.D.

The Director of IIT Indore, Prof. Pradeep Mathur has delivered the keynote address. Prof. Mathur aloud the hard work put in by dedicated scholars of the Institute over the last decade and expressed the steepest growth trajectories of IIT Indore amongst all institutions around the world and, congratulate all our graduates and wish them success in the future. The Chairman, Board of Governors Prof. Deepak B. Phatak in his address to the Graduates has emphasised on to leave up to the high standerds of the IIT Indore in future.

Chief Guest of the ceremony Prof. Jeffrey S. Kargel has conferred the 'President of India Gold Medal' for the best academic performance among all the graduating UG students to Mr. Rahul Choudhary from Computer Science and Engineering. The 'Buti Foundation Gold Medal' for the best academic performance among all the graduating female PG students has been awarded to Ms. Vanitha Reddy Naina from Chemistry.

Besides, 06 Institute Silver Medals have been conferred in various categories to the students for the "best academic performance", "Best All Round Performance" among all the graduating UG students and "best overall performance" among all the graduating PG of a particular program.

IIT Indore has consistently performed well in Institutional rankings. It has been ranked 13th in the Engineering category in the National Institutional Ranking Framework (NIRF) in 2019; IIT Indore has emerged as one of the premier Teaching and Research institutions in the Times Higher Education World University Ranking (THE) and awarded IIT Indore the '2nd best rank in India' and amongst the top 400 universities in the World. Consequently, in 2019, it emerged as the top-ranked IIT in THE's Asia University ranking and secured its place amongst the top 50 Institutions in Asia that same year. The Institute has also secured the 13th rank in the QS India University rankings, 2020.

The Chief Guest has emphasised the importance of higher education and the significance of research and development. Dr. Kargel has appealed graduates to work and have focus on environmental challenges and upkeep the Indian Moral values. He congratulated the researchers and appealed to continue with their ground-breaking research frontiers and technical expertise, as observed in the quality of publications and impressive citations of the institute.

Memories of the 7th Convocation

Celebration of 11th Foundation Day: IIT Indore hosted Padma Bhushan Koppillil Radhakrishnan, ex-Chairman of Space Commission, Secretary of the Department of Space and Chairman of ISRO on February 17, 2020. He had delivered a public address on "Vikram Sarabhai and beyond: Indian into the new Space Age". He inaugurated the new Hall of Residences Vikram Sarabhai and Devi Ahiliya. These Halls of Residence have 490 rooms each housing 490 students and are equipped with modern furniture. Each unit has five rooms with a common kitchen, toilet and living area and have students from different states and semester to promote bonding. Dr. Radhakrishnan also met with the Deans and faculty members during his visit. Students working in the field of space and Head of Department, Discipline of Astronomy, Astrophysics and Space Engineering presented their work to Dr. Radhakrishnan.

Presently, Dr. Radhakrishnan is the Chairperson of the Board of Governors of Indian Institute of Technology (IIT), Kanpur and Chairman of the Standing Committee of the IIT Council besides being Honorary Distinguished Advisor in the Department of Space/ ISRO.

Educational Meet : IIT Indore has taken a lead in conducting an online meet with the Educational Institutes of the city on June 24, 2020 to discuss on the changes brought in the teaching methodologies, new research collaboration, campus & dining facilities, and academic activities owing to COVID 19. The Institutes shared their experiences in handling COVID-19, practices that has been implemented and methodologies adopted for conducting online exams and the preparedness for post COVID19 scenario. The meeting provided a common platform for sharing and evolving a new avenue and common area for greater synergy to work together in the future for Indore city as well. An idea on making of ***Indore Educational Consortium*** was also mooted in the meet which would work towards enriching the education culture of the city and working in sync on common activities.

Prof. Neelesh Kumar Jain, Director (Officiating) along with the Institute officials and the dignitaries of DAVV, SGSITS, IIM Indore, Raja Ramanna Centre for Advanced Technology, MediCaps Institute of Technology and Management, Oriental Institute of Science & Technology, Shri Vaishnav Vidyapeeth, IPS Academy, Sri Aurobindo Institute of Technology, Symbiosis University of Applied Sciences, Shubhdeep Ayurved Medical College & Hospital, Acropolis Institute of Technology and Research, Chamelidevi School of Engineering, Prestige Institute of Engineering Management & Research, SAGE University and Narsee Monjee Institute of Management Studies were participated in the online meet.

आईआईटी ने आयोजित की ऑनलाइन मीटिंग

शिक्षा क्षेत्र में मिलकर काम करने के लिए शहर में बने एजुकेशनल कंसोर्टियम

पत्रिका PLUS रिपोर्टर

इंदौर ◆ कोविड-19 से एजुकेशन क्षेत्र में कई बदलाव हुए हैं। इन पर चर्चा और भविष्य की रणनीति बनाने के लिए आईआईटी इंदौर ने शहर के विभिन्न शिक्षण संस्थानों के साथ ऑनलाइन मीटिंग की। इसमें कोविड-19 से शिक्षण पद्धतियों, छात्रावास, भोजन सुविधाओं में आए बदलावों और शैक्षणिक गतिविधियों पर चर्चा हुई। संस्थानों ने कोविड-19 को नियंत्रित करने के अनुभवों को साझा किया। संस्थानों ने ऑनलाइन परीक्षा के लिए अपनाए तरीकों पर भी चर्चा की।

भविष्य में शिक्षण क्षेत्र में मिलकर काम करने की जरूरत पर जोर दिया और शहर में एजुकेशनल कंसोर्टियम बनाने पर चर्चा की। कंसोर्टियम शहर की शिक्षा संस्कृति को समृद्ध करने और सामान्य गतिविधियों पर एक साथ काम करने की दिशा में काम करेगा। चर्चा में यह तथ्य सामने आया कि एक साथ काम करने, तालमेल के लिए नया एवेन्यू विकसित करने के लिए साझा मंच बनाना चाहिए।

मीटिंग में आईआईटी इंदौर के कार्यवाहक निदेशक प्रो. नीलेश कुमार जैन, डीन ऑफ स्टूडेंट्स अफेयर्स डॉ. एसके विश्वकर्मा, अकादमिक मामलों के डीन डॉ. देवेंद्र देशमुख, डीन ऑफ रिसर्च एंड डवलपमेंट डॉ. आईए पलानी, रजिस्ट्रार प्रभारी एसपी होटा के साथ डीएवीवी की कुलपति डॉ. रेणु जैन, एसजीएसआईटीएस के निदेशक डॉ. आरके सक्सेना, आईआईएम इंदौर के मुख्य प्रशासनिक अधिकारी कर्नल गुरुराज सहित कई शैक्षणिक संस्थानों के पदाधिकारी ऑनलाइन जुड़े और शिक्षा के क्षेत्र में नए बदलावों पर चर्चा की।

International Cell Update 2020

IIT Indore is rapidly expanding globally with an aim to internationalize its teaching and research portfolio. Currently, we are collaborating intensely with counties across North America, Europe, Asia, and Oceania. In continuation to the previous year, this year we had notable progress on three fronts. First, we were successful in recruiting and hosting many international students in our degree programs (from ASEAN and SAARC regions). Second, we secured multiple grants from our Ministry of Education, which is feeding well into our internationalization endeavors. Third, we expanded our footprint further in Europe.

Recruitment of Foreign Students

Continuing the upward trajectory in recruiting foreign students in our degree programs, in 2019-20, we hosted 03 international students who pursued their Master's degrees in various disciplines at IIT Indore. These students were from SAARC nations (Bangladesh and Nepal) and joined us through the Study in India (SII) program.

This year, we also took a leap forward in recruiting 02 international PhD students (from Vietnam) under ASEAN Ph.D. Fellowship program. These students would start their studies in IIT Indore during the upcoming Autumn 2020 semester.

Although IIT Indore has been hosting foreign internship students since its inception, this past year was path breaking because we hosted 06 Thai exchange students who took regular courses as well. This has helped us establish our brand in ASEAN countries, and specifically Thailand

MHRD Initiatives

GIAN, VAJRA, SPARC and ASEM-DUO are the recent Ministry of Education initiatives that aim to improve the research and teaching ecosystem of India's higher education. In the year 2019-20, a substantial number of such projects were awarded to IIT Indore (see below).

1. GIAN Courses - 07
2. VAJRA Fellowships - 02
3. SPARC Projects – 09
4. ASEM-DUO Fellowships - 06

European Collaboration

Our already strong links with Germany were strengthened this year by the successful completion of the first-year of IIT Indore – LU Hannover joint DAAD project (in Chemistry, Physics, Computational Science and Environmental Biotechnology). In this context, two India level events were organized at IIT Indore as well (Seminar on Internationalization of Higher Education and Winter School in Computational Science). We also established new links with University of Konstanz in Germany.

We led all Indian institutes in the Indo-French Knowledge Summit 2, which was organized in Lyon, France in October 2019. Here, we signed an MoU with INP Toulouse as well. Our Italian collaboration kicked off successfully by signing of a MoU with University of Florence.

MoU Signed

In the last one year, IIT Indore signed various MoU with the globally reputed institutes and universities as below.

1. Toulouse Institute of Technology, France (INP Toulouse).
2. University of Florence, Italy.
3. University of Technology Sydney, Australia (UTS).
4. RMUTP, Thailand.
5. Thammasat University, Thailand.

Visit of faculty members from University of Konstanz and LU Hannover, Germany (February 2020)

Visit of International Office team from LU Hannover, Germany (December 2019)

Visit of faculty members from Thammasat University, Thailand (December 2019)

Visit of students from Thammasat University, Thailand (December 2019)

Student Statistics

Student Enrolments and Graduation

Courses Offered	:	**842**
Undergraduate Courses	:	**400**
Postgraduate Courses	:	**332**
Cross Listed Courses	:	**110**

Enrolments								
Academic Year	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**
Doctoral Students Admitted								
PhD (Including Dual Degree)	87	93	118	83	117	89	189	63
Post Graduate Students Admitted								
MTech	5	24	30	31	34	62	41	77
MSc	15	20	24	47	56	69	80	102
MS (Research)	-	-	-	-	-	7	21	24
Under Graduate Students Admitted								
BTech	119	117	111	258	249	265	283	345
Preparatory Course	-	-	-	-	-	-	4	9

Graduation								
Convocation Year	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Doctoral Students Graduated								
PhD	-	6	23	24	38	67	83	58
Post Graduate Students Graduated								
MTech	-	-	5	22	25	26	29	57
MSc	-	-	14	20	22	41	55	58
MS (Research)	-	-	-	-	-	-	-	6
Under Graduate Students Graduated								
BTech	101	117	114	108	118	112	108	233

List of graduating BTech students at the end of 2020-Spring Semester

S. No.	Roll No.	Student's Name	Discipline
1	160004003	ADITYA SINGH	Civil Engineering
2	160004004	AMAN PATEL	Civil Engineering
3	160004005	ANKIT DABGAR	Civil Engineering
4	160004006	ANSHUL SRIVASTAVA	Civil Engineering
5	160004007	ASHOK KUMAR YADAV	Civil Engineering
6	160004008	AYUSH KESARWANI	Civil Engineering
7	160004009	BHASKAR DATTA	Civil Engineering
8	160004010	DAANISH MAHAJAN	Civil Engineering
9	160004011	DEVASHISH SHUKLA	Civil Engineering
10	160004012	DHEERENDRA SINGH	Civil Engineering
11	160004014	DIVYA SHARMA	Civil Engineering
12	160004015	FATHIMA SUHARA. M	Civil Engineering
13	160004016	GANDHI SUYASH SUDHIR	Civil Engineering
14	160004018	HARSHIT MATHUR	Civil Engineering
15	160004019	LOKESH MEENA	Civil Engineering
16	160004020	MAHESHWARI RAHUL	Civil Engineering
17	160004023	P SAI KUSHAL	Civil Engineering
18	160004024	PIYUSH SINGH	Civil Engineering
19	160004025	RAJAT BHATI	Civil Engineering
20	160004026	RAVI JANGID	Civil Engineering
21	160004027	RAVI SHARMA	Civil Engineering
22	160004028	ROHAN AGARWAL	Civil Engineering
23	160004029	SAGAR GOME	Civil Engineering

24	160004030	SATYAJEET MEENA	Civil Engineering
25	160004031	SAURABH JAISWAL	Civil Engineering
26	160004033	SHALAY GUPTA	Civil Engineering
27	160004034	SHASHANK BHARGAVA	Civil Engineering
28	160004035	SHUBHAM KUMAR CHAYLA	Civil Engineering
29	160004036	SHUBHAM SAHU	Civil Engineering
30	160004037	STUTI DUBEY	Civil Engineering
31	160004038	SUDHISH KUMAR MISHRA	Civil Engineering
32	160004039	SUMIT MEENA	Civil Engineering
33	160005021	PARTH PANDEY	Civil Engineering
34	160005024	POTHURAJU DEEKSHITH	Civil Engineering
35	130001002	ABHINAV HARDIA	Computer Science and Engineering
36	140001023	RAHUL KUMAR KESHRI	Computer Science and Engineering
37	150001039	YASH KRISHAN VERMA	Computer Science and Engineering
38	160001001	ABHISHEK MISHRA	Computer Science and Engineering
39	160001003	AMEY KIRAN PATEL	Computer Science and Engineering
40	160001004	AMIT KUMAR MEENA	Computer Science and Engineering
41	160001005	ANURAG VERMA	Computer Science and Engineering
42	160001006	ARAVIND RAVIKUMAR	Computer Science and Engineering
43	160001007	ARJUN SRIVASATAVA	Computer Science and Engineering
44	160001008	ARUSHI JAIN	Computer Science and Engineering
45	160001009	ASHISH ARUN GAWAI	Computer Science and Engineering
46	160001010	ASHISH MANDAL	Computer Science and Engineering
47	160001011	ASHUTOSH BANG	Computer Science and Engineering
48	160001012	AYUSH MANTRI	Computer Science and Engineering

49	160001013	AYUSH PRASAD	Computer Science and Engineering
50	160001014	BANALA ASHISH	Computer Science and Engineering
51	160001016	BITAN PAUL	Computer Science and Engineering
52	160001017	CHAKUNTA VIJAY RISHEEL	Computer Science and Engineering
53	160001018	CHINMAY ANAND	Computer Science and Engineering
54	160001019	DANDE PRAVEEN KUMAR	Computer Science and Engineering
55	160001020	DHAARNA MAHESHWARI	Computer Science and Engineering
56	160001021	G VENKATA SAI AKHIL	Computer Science and Engineering
57	160001022	GHANSHYAM BAIRWA	Computer Science and Engineering
58	160001023	GOEL ISHAN MOHIT	Computer Science and Engineering
59	160001025	HARSH VARDHAN	Computer Science and Engineering
60	160001026	JOSHI NIRANJAN SUHAS	Computer Science and Engineering
61	160001027	K NITHIN KUMAR	Computer Science and Engineering
62	160001028	KANISHKAR J	Computer Science and Engineering
63	160001030	KOVIDH VENGALA	Computer Science and Engineering
64	160001031	KRITIK SHARMA	Computer Science and Engineering
65	160001032	KUMAR ABHINAV	Computer Science and Engineering
66	160001033	MAHESH KUMAR	Computer Science and Engineering
67	160001034	MANDALIKA ANISH SRI CHANDRA	Computer Science and Engineering
68	160001035	MOHIT MALVIYA	Computer Science and Engineering
69	160001036	MUKKAMALLA MOUNIKA	Computer Science and Engineering
70	160001037	NAIK PRATHAMESH UMESH	Computer Science and Engineering
71	160001038	NAMAN SINGHAL	Computer Science and Engineering
72	160001040	NAUKUDKAR GAURAV HARISHCHANDRA	Computer Science and Engineering
73	160001042	NEHA NAGENDRA	Computer Science and Engineering

74	160001043	PEDDHOLLA SAI KUMAR REDDY	Computer Science and Engineering
75	160001045	PRANAY MUNDA	Computer Science and Engineering
76	160001046	PUSHPENDRA KUMAR	Computer Science and Engineering
77	160001047	RAHUL KUMAR	Computer Science and Engineering
78	160001048	RISHABH KUMAR VERMA	Computer Science and Engineering
79	160001049	RISHABH VERMA	Computer Science and Engineering
80	160001051	ROTTE PRIYANKA AJAY	Computer Science and Engineering
81	160001052	SAHAJ KHANDELWAL	Computer Science and Engineering
82	160001053	SANDARBH SAHU	Computer Science and Engineering
83	160001054	SHASHANK GIRI	Computer Science and Engineering
84	160001056	SOMESH PATIL	Computer Science and Engineering
85	160001057	SUNAND AGARWAL	Computer Science and Engineering
86	160001058	TATAVARTHY VENKAT NIKHIL	Computer Science and Engineering
87	160001059	TOGARU SURYA TEJA	Computer Science and Engineering
88	160001060	VARAKANTHAM VANDANA	Computer Science and Engineering
89	160001061	VISHAL MAURYA	Computer Science and Engineering
90	160002052	SAPTARSHI GHOSH	Computer Science and Engineering
91	160002056	SOUVIK MANDAL	Computer Science and Engineering
92	140002026	RISHIKESH MEENA	Electrical Engineering
93	150002004	AMPATI RAJA VISHWANATH	Electrical Engineering
94	160002001	ADITYA LAMBA	Electrical Engineering
95	160002002	ADITYA SANGANERIA	Electrical Engineering
96	160002003	AMAN ATTRISH	Electrical Engineering
97	160002004	AMAN VERMA	Electrical Engineering
98	160002006	ANKIT KUMAR GAJBHIYE	Electrical Engineering

99	160002007	ANMAY KUMAR	Electrical Engineering
100	160002008	ASHISH KUMAR GOUR	Electrical Engineering
101	160002009	AVINASH KUMAR	Electrical Engineering
102	160002010	BHAVIN KUMAR VIRSINH RATHAVA	Electrical Engineering
103	160002011	BHUTARA SUYASH MAHESH	Electrical Engineering
104	160002013	DEEPAK KUMAR	Electrical Engineering
105	160002014	DILIP KUMAR MEENA	Electrical Engineering
106	160002015	DIVYANSHU ARYA	Electrical Engineering
107	160002016	GATKESHWAR SAINOJI NAGA SAI BHARAT	Electrical Engineering
108	160002018	ITY AGRAWAL	Electrical Engineering
109	160002019	K SREEJITH	Electrical Engineering
110	160002020	K SREEVATSANK	Electrical Engineering
111	160002021	KAILASH LIMBA	Electrical Engineering
112	160002022	KANISHKA SHARMA	Electrical Engineering
113	160002023	KHANNA PRANAV PANKAJ	Electrical Engineering
114	160002024	KHUSHBOO AHUJA	Electrical Engineering
115	160002025	KORWATE SHRAYANTI BHARAT	Electrical Engineering
116	160002026	KUNAL YADAV	Electrical Engineering
117	160002027	L SUDHARANI	Electrical Engineering
118	160002029	MANI SANKAR BISWAS	Electrical Engineering
119	160002030	MOHIT NATHRANI	Electrical Engineering
120	160002031	MOHIT YADAV	Electrical Engineering
121	160002032	MOKKAPATI SIDDHARTH	Electrical Engineering
122	160002033	NITYASH AGRAWAL	Electrical Engineering
123	160002034	PANCHAL KEYUR PRAHLAD	Electrical Engineering

124	160002035	PANKAJ VERMA	Electrical Engineering
125	160002036	PARIMI VIVEK MURALIKRISHNA	Electrical Engineering
126	160002037	PATEL PREYAA	Electrical Engineering
127	160002039	PITCHIKA DINESH	Electrical Engineering
128	160002041	PRATIK AHUJA	Electrical Engineering
129	160002042	PREM KUMAR SEETHANABOYINA	Electrical Engineering
130	160002043	PRIYANSHU VARSHNEY	Electrical Engineering
131	160002044	RAGHAV MAHAJAN	Electrical Engineering
132	160002046	RAJAN AGRAWAL	Electrical Engineering
133	160002049	RAVI SHANKAR C	Electrical Engineering
134	160002050	SAFAL BAHARE	Electrical Engineering
135	160002051	SAHIL	Electrical Engineering
136	160002053	SAURABH SHARMA	Electrical Engineering
137	160002054	SHETTY MANISH SHRIDHAR	Electrical Engineering
138	160002055	SHIVANSH DWIVEDI	Electrical Engineering
139	160002057	SUYASH SHAH	Electrical Engineering
140	160002058	VAIBHAV KUMAR	Electrical Engineering
141	160002059	VAMSI BULUSU	Electrical Engineering
142	160002060	VELDANDA PRANAY REDDY	Electrical Engineering
143	160003020	HIMALI SINGH	Electrical Engineering
144	160003051	SINGH GAURAV SUBASHCHAND	Electrical Engineering
145	160003060	VISHAL KUMAR RATHORE	Electrical Engineering
146	160004002	AAKASH YADAV	Electrical Engineering
147	160004013	DIPANKAR S SHRIVASTAVA	Electrical Engineering
148	150003006	BHABEN	Mechanical Engineering

149	150003028	RAHIL	Mechanical Engineering
150	160003001	AASHISH SHARMA	Mechanical Engineering
151	160003002	ABHISHEK KUMAR	Mechanical Engineering
152	160003003	ADARSH DEEP	Mechanical Engineering
153	160003004	ADITYA PANDEY	Mechanical Engineering
154	160003005	AGAM GUPTA	Mechanical Engineering
155	160003006	AKHILESH KUMAR MEENA	Mechanical Engineering
156	160003007	ANMOL KASERA	Mechanical Engineering
157	160003008	ANURAG SHARMA	Mechanical Engineering
158	160003009	APOORV AGRAWAL	Mechanical Engineering
159	160003010	ASHISH MEENA	Mechanical Engineering
160	160003012	BANTE ANIRUDDHA KESHAO	Mechanical Engineering
161	160003013	BOMMINAYUNI MANOJ	Mechanical Engineering
162	160003014	CHETAN SHARMA	Mechanical Engineering
163	160003015	DHOTE SAMIKSHA UMAKANT	Mechanical Engineering
164	160003017	DUBAKULA YESHWANTH	Mechanical Engineering
165	160003018	GAURAV SHUKLA	Mechanical Engineering
166	160003023	KADAM TUSHAR VILAS	Mechanical Engineering
167	160003024	KUSHAGRA SHARMA	Mechanical Engineering
168	160003025	MANDIVARAPU THIKSHAN MADHAV	Mechanical Engineering
169	160003026	MANISH SINGH RATHORE	Mechanical Engineering
170	160003027	MAYANK GUPTA	Mechanical Engineering
171	160003028	MEHTA CHAITANYA	Mechanical Engineering
172	160003029	MEHTA GAURAV KEWALRAI	Mechanical Engineering
173	160003031	NAIK CHINMAY SANDEEP	Mechanical Engineering

174	160003032	NANDA KRISHNA SINDAM	Mechanical Engineering
175	160003033	NARNE VAMSI	Mechanical Engineering
176	160003034	NATH SHUBHANKAR KISHOR	Mechanical Engineering
177	160003035	NUKUL GOYAL	Mechanical Engineering
178	160003036	OCHIRAMANI YASH RAJESHKUMAR	Mechanical Engineering
179	160003038	PATIL AMOD MOHANRAO	Mechanical Engineering
180	160003040	POTALA JAIDEEP	Mechanical Engineering
181	160003041	RADE SAURABH JAIDEEP	Mechanical Engineering
182	160003042	RAJA SHREE PRABHU A	Mechanical Engineering
183	160003043	RAPAKA VINAY KUMAR	Mechanical Engineering
184	160003044	SAURABH KUMAR	Mechanical Engineering
185	160003045	SAURAV KUMAR	Mechanical Engineering
186	160003046	SHAH AAGAM	Mechanical Engineering
187	160003047	SHAILESH KUMAR MEENA	Mechanical Engineering
188	160003048	SHANTANU GUPTA	Mechanical Engineering
189	160003049	SHREYASH SINGH	Mechanical Engineering
190	160003050	SIDDHARTH JAIN	Mechanical Engineering
191	160003052	SINGH PAWANKUMAR VINODKUMAR	Mechanical Engineering
192	160003053	SINKAR AVADHOOT PRASHANT	Mechanical Engineering
193	160003054	SOORYA PRATAP	Mechanical Engineering
194	160003055	UMESH KUMAR LODHI	Mechanical Engineering
195	160003056	VAIDYA RUSHIKESH NAGORAO	Mechanical Engineering
196	160003057	VIJAY SINGH MEENA	Mechanical Engineering
197	160003058	VIKASH KUMAR	Mechanical Engineering
198	160003061	ZANKE SWAROOP DILIP	Mechanical Engineering

199	160004001	A. HARSHITA	Mechanical Engineering
200	160004017	GAUTAM KUMAR	Mechanical Engineering
201	160005006	ANJALI PARASHAR	Mechanical Engineering
202	160005020	NILAY UPADHYAY	Mechanical Engineering
203	160005001	ABDUL WASIM KHAN	Metallurgy Engineering and Materials Science
204	160005002	ABHIJEET SINGH TOMAR	Metallurgy Engineering and Materials Science
205	160005003	ABHISHEK KAMAT	Metallurgy Engineering and Materials Science
206	160005004	AGRAWAL ADITI AMITESH	Metallurgy Engineering and Materials Science
207	160005007	ASHISH SINGHAL	Metallurgy Engineering and Materials Science
208	160005008	ASHUTOSH GUPTA	Metallurgy Engineering and Materials Science
209	160005009	AVIJIT PANDEY	Metallurgy Engineering and Materials Science
210	160005010	DESHPANDE INDRANEEL SUNDEEP	Metallurgy Engineering and Materials Science
211	160005012	EMIN VARGHESE	Metallurgy Engineering and Materials Science
212	160005013	GARVIT SHARMA	Metallurgy Engineering and Materials Science
213	160005014	HARSH LONARE	Metallurgy Engineering and Materials Science
214	160005015	HARSH RANJAN	Metallurgy Engineering and Materials Science
215	160005016	INGALE TIRTHESH RAVINDRA	Metallurgy Engineering and Materials Science
216	160005017	JAY SHUKLA	Metallurgy Engineering and Materials Science
217	160005018	MANISHKUMAR NIRAJ KUMAR	Metallurgy Engineering and Materials Science
218	160005019	MOHAMMED HADHI P P	Metallurgy Engineering and Materials Science
219	160005022	PASWAN SHITAL RAJAN	Metallurgy Engineering and Materials Science
220	160005023	PATIL CHETAN EKNATH	Metallurgy Engineering and Materials Science
221	160005025	RAHUL BHAKRANI	Metallurgy Engineering and Materials Science
222	160005026	RAHUL PC	Metallurgy Engineering and Materials Science
223	160005027	RAJAT AGRAWAL	Metallurgy Engineering and Materials Science

224	160005028	RAJAT UPADHYAY	Metallurgy Engineering and Materials Science
225	160005029	RAMTEKE MRUNMAY SUNIL	Metallurgy Engineering and Materials Science
226	160005030	RAVI MEENA	Metallurgy Engineering and Materials Science
227	160005031	RIJUL BHARAT SAGAR	Metallurgy Engineering and Materials Science
228	160005033	SAGAR GOSWAMI	Metallurgy Engineering and Materials Science
229	160005034	SATYAM KUMAR	Metallurgy Engineering and Materials Science
230	160005035	SHREYAS S S	Metallurgy Engineering and Materials Science
231	160005036	SONAGARA HARSHAL	Metallurgy Engineering and Materials Science
232	160005039	VULLENGALA MANISH CHANDRA	Metallurgy Engineering and Materials Science
233	160005040	YASH RAJESH SHINDE	Metallurgy Engineering and Materials Science

List of MSc graduating students at the end of 2020-Spring Semester

S.No.	Roll Number	Name	Program	Discipline	Ramrk
1	1803121001	Anchal Saxena	M.Sc.	Astronomy, Astrophysics and Space Engineering	Graduated
2	1803121002	Biki Ram	M.Sc.	Astronomy, Astrophysics and Space Engineering	Graduated
3	1803121003	Himanshu Tiwari	M.Sc.	Astronomy, Astrophysics and Space Engineering	Graduated
4	1803121004	Indrendra Sisodiya	M.Sc.	Astronomy, Astrophysics and Space Engineering	Graduated
5	1803121007	Nikhil Sanjay Borse	M.Sc.	Astronomy, Astrophysics and Space Engineering	Graduated
6	1803121009	Samanvith A	M.Sc.	Astronomy, Astrophysics and Space Engineering	Graduated
7	1803121010	Sandeep Kumar	M.Sc.	Astronomy, Astrophysics and Space Engineering	Graduated
8	1803131002	Aishi Chakrabarti	M.Sc.	Chemistry	Graduated
9	1803131003	Amanpreet Kaur	M.Sc.	Chemistry	Graduated
10	1803131004	Chanchal Saini	M.Sc.	Chemistry	Graduated
11	1803131005	Dheeraj Kumar	M.Sc.	Chemistry	Graduated
12	1803131006	Gaurav Kumar	M.Sc.	Chemistry	Graduated

13	1803131007	Hariom Saini	M.Sc.	Chemistry	Graduated
14	1803131008	Hemonta Kumar Saha	M.Sc.	Chemistry	Graduated
15	1803131010	Mamta Kunwar	M.Sc.	Chemistry	Graduated
16	1803131011	Mohammad Junaid	M.Sc.	Chemistry	Graduated
17	1803131012	Mohammad Ateeque	M.Sc.	Chemistry	Graduated
18	1803131013	Mukti Jadon	M.Sc.	Chemistry	Graduated
19	1803131014	Nikita	M.Sc.	Chemistry	Graduated
20	1803131015	Nirupama Sheet	M.Sc.	Chemistry	Graduated
21	1803131016	Nissar Hussain	M.Sc.	Chemistry	Graduated
22	1803131018	Nitin Rajesh	M.Sc.	Chemistry	Graduated
23	1803131019	Sachin Kumar	M.Sc.	Chemistry	Graduated
24	1803131023	Srija Tewari	M.Sc.	Chemistry	Graduated
25	1803131024	Yeshvir Yadav	M.Sc.	Chemistry	Graduated
26	1803131009	Kavana M	M.Sc.	Chemistry	Graduated
27	1803131017	Nitin Kumar	M.Sc.	Chemistry	Graduated
28	1803141001	Aditya Sharma	M.Sc.	Mathematics	Graduated
29	1803141002	Ashok Kumar Mallick	M.Sc.	Mathematics	Graduated
30	1803141003	Avijit Bhattacharjee	M.Sc.	Mathematics	Graduated
31	1803141004	Barna Sarkar	M.Sc.	Mathematics	Graduated
32	1803141005	Harish Kishnani	M.Sc.	Mathematics	Graduated
33	1803141009	Shivani Awasthi	M.Sc.	Mathematics	Graduated
34	1803141010	Tanvir Kaur	M.Sc.	Mathematics	Graduated
35	1803141011	Tanya Chawla	M.Sc.	Mathematics	Graduated
36	1803151001	Amitesh Gihar	M.Sc.	Physics	Graduated
37	1803151002	Ananta Paul	M.Sc.	Physics	Graduated

38	1803151004	Anil Kumar Pradhan	M.Sc.	Physics	Graduated
39	1803151006	Avik Chakraborty	M.Sc.	Physics	Graduated
40	1803151010	Km Neeshu	M.Sc.	Physics	Graduated
41	1803151011	Niraj Kushwaha	M.Sc.	Physics	Graduated
42	1803151012	Prashant Gupta	M.Sc.	Physics	Graduated
43	1803151013	Praveen Bharadwaj	M.Sc.	Physics	Graduated
44	1803151014	Pravesh Chndra Awasthi	M.Sc.	Physics	Graduated
45	1803151015	Rachit Sharma	M.Sc.	Physics	Graduated
46	1803151016	Ritika	M.Sc.	Physics	Graduated
47	1803151018	Shashaank Khanna	M.Sc.	Physics	Graduated
48	1803151019	Sourav Singh Tomar	M.Sc.	Physics	Graduated
49	1803151020	Tarun Kumar	M.Sc.	Physics	Graduated
50	1803151021	Vaibhav Lohia	M.Sc.	Physics	Graduated
51	1803151023	Vikas Yadav	M.Sc.	Physics	Graduated
52	1803151024	Yatharth Bhasin	M.Sc.	Physics	Graduated
53	1803171002	Amit	M.Sc.	Biosciences and Biomedical Engineering	Graduated
54	1803171004	Gayatree Mishra	M.Sc.	Biosciences and Biomedical Engineering	Graduated
55	1803171006	Monjuri Hembram	M.Sc.	Biosciences and Biomedical Engineering	Graduated
56	1803171008	Sheeba Rehman	M.Sc.	Biosciences and Biomedical Engineering	Graduated
57	1803171009	Tarun Prakash Verma	M.Sc.	Biosciences and Biomedical Engineering	Graduated
58	1803171010	Tuhin Sarkar	M.Sc.	Biosciences and Biomedical Engineering	Graduated

List of M.Tech. graduating students at the end of 2020-Spring Semester

S.No.	Roll Number	Name	Program	Discipline	Specialization	Remark
1	1802102001	Gayatri Vijayakumar	M.Tech.	Electrical Engineering	Communication and Signal Processing	Graduated
2	1802102002	Jagdale Mohit Chandrakant	M.Tech.	Electrical Engineering	Communication and Signal Processing	Graduated
3	1802102004	Manoj Tripathi	M.Tech.	Electrical Engineering	Communication and Signal Processing	Graduated
4	1802102005	Rishita Sharma	M.Tech.	Electrical Engineering	Communication and Signal Processing	Graduated
5	1802102007	Somkuwar Palash Bhimrao	M.Tech.	Electrical Engineering	Communication and Signal Processing	Graduated
6	1802102008	Vijay Nagar	M.Tech.	Electrical Engineering	Communication and Signal Processing	Graduated
7	1802102013	Borra Jeevan Teja	M.Tech.	Electrical Engineering	VLSI Design and Nanoelectronics	Graduated
8	1802102014	Jitesh Prasad	M.Tech.	Electrical Engineering	VLSI Design and Nanoelectronics	Graduated
9	1802102015	Jyoti Bhatia	M.Tech.	Electrical Engineering	VLSI Design and Nanoelectronics	Graduated
10	1802102016	K Sai Kiran	M.Tech.	Electrical Engineering	VLSI Design and Nanoelectronics	Graduated
11	1802102017	Muktagucha Naga Viswanath	M.Tech.	Electrical Engineering	VLSI Design and Nanoelectronics	Graduated
12	1802102018	Prashant Puri	M.Tech.	Electrical Engineering	VLSI Design and Nanoelectronics	Graduated
13	1802102019	Rana Sagar Kumar	M.Tech.	Electrical Engineering	VLSI Design and Nanoelectronics	Graduated
14	1802102020	Ruchika Gautam	M.Tech.	Electrical Engineering	VLSI Design and Nanoelectronics	Graduated
15	1802102021	Utkarsh Sharma	M.Tech.	Electrical Engineering	VLSI Design and Nanoelectronics	Graduated
16	1802102023	Pratyush Mishra	M.Tech.	Electrical Engineering	VLSI Design and Nanoelectronics	Graduated

17	1802102024	Sudipta Das	M.Tech.	Electrical Engineering	VLSI Design and Nanoelectronics	Graduated
18	1802105001	Ankit Solanki	M.Tech.	Metallurgy Engineering and Materials Science	Material Science and Engineering	Graduated
19	1802105002	Shadab Ali Ahmed	M.Tech.	Metallurgy Engineering and Materials Science	Material Science and Engineering	Graduated
20	1802105003	Farhan Ali Ahmad	M.Tech.	Metallurgy Engineering and Materials Science	Material Science and Engineering	Graduated
21	1802105005	Rhishikesh Darshan	M.Tech.	Metallurgy Engineering and Materials Science	Material Science and Engineering	Graduated
22	1802105006	Shubham Vasant Gaidhani	M.Tech.	Metallurgy Engineering and Materials Science	Material Science and Engineering	Graduated
23	1802105008	Ekta Majhi	M.Tech.	Metallurgy Engineering and Materials Science	Material Science and Engineering	Graduated
24	1802105009	Sharik Akhtar	M.Tech.	Metallurgy Engineering and Materials Science	Material Science and Engineering	Graduated
25	1802105010	Manish Kumar Tiwari	M.Tech.	Metallurgy Engineering and Materials Science	Material Science and Engineering	Graduated
26	1802105012	Manish Badole	M.Tech.	Metallurgy Engineering and Materials Science	Material Science and Engineering	Graduated
27	1802105007	Shardeshu Pandey	M.Tech.	Metallurgy Engineering and Materials Science	Material Science and Engineering	Graduated
28	1802105013	Akshaya Kumar Jain	M.Tech.	Metallurgy Engineering and Materials Science	Metallurgy Engineering	Graduated
29	1802105014	Ankit Kumar Singh	M.Tech.	Metallurgy Engineering and Materials Science	Metallurgy Engineering	Graduated

30	1802105015	Ashok Kumar	M.Tech.	Metallurgy Engineering and Materials Science	Metallurgy Engineering	Graduated
31	1802105016	Chaitanya Vishwakarma	M.Tech.	Metallurgy Engineering and Materials Science	Metallurgy Engineering	Graduated
32	1802105017	Darshan Dange	M.Tech.	Metallurgy Engineering and Materials Science	Metallurgy Engineering	Graduated
33	1802105018	Dheeraj Kumar	M.Tech.	Metallurgy Engineering and Materials Science	Metallurgy Engineering	Graduated
34	1802105019	Ghadse Pratik Parag	M.Tech.	Metallurgy Engineering and Materials Science	Metallurgy Engineering	Graduated
35	1802105020	Janmejai Sharma	M.Tech.	Metallurgy Engineering and Materials Science	Metallurgy Engineering	Graduated
36	1802105022	Mohammed Mubarak Kottadan	M.Tech.	Metallurgy Engineering and Materials Science	Metallurgy Engineering	Graduated
37	1802105023	Reeturaj Tamuly	M.Tech.	Metallurgy Engineering and Materials Science	Metallurgy Engineering	Graduated
38	1802103001	Balaji Nanda K	M.Tech.	Mechanical Engineering	Production and Industrial Engineering	Graduated
39	1802103002	Pradyumn Kumar Arya	M.Tech.	Mechanical Engineering	Production and Industrial Engineering	Graduated
40	1802103003	Manish Patidar	M.Tech.	Mechanical Engineering	Production and Industrial Engineering	Graduated
41	1802103004	Jaideep Singh	M.Tech.	Mechanical Engineering	Production and Industrial Engineering	Graduated
42	1802103006	Abhay Tiwari	M.Tech.	Mechanical Engineering	Production and Industrial Engineering	Graduated
43	1802103007	Shivam Gupta	M.Tech.	Mechanical Engineering	Production and Industrial Engineering	Graduated
44	1802103008	Menkar Shubham Balmukund	M.Tech.	Mechanical Engineering	Production and Industrial Engineering	Graduated

45	1802103009	Mate Akshay Dnyaneshwar	M.Tech.	Mechanical Engineering	Production and Industrial Engineering	Graduated
46	1802103010	Jitendra Singh Queraly	M.Tech.	Mechanical Engineering	Production and Industrial Engineering	Graduated
47	1702103013	Sandeep Gour	M.Tech.	Mechanical Engineering	Production and Industrial Engineering	Graduated
48	1802103013	Akanksha Chaudhari	M.Tech.	Mechanical Engineering	Mechanical Systems Design	Graduated
49	1802103014	Eklavya Tripathi	M.Tech.	Mechanical Engineering	Mechanical Systems Design	Graduated
50	1802103015	Harshdeep Sharma	M.Tech.	Mechanical Engineering	Mechanical Systems Design	Graduated
51	1802103016	Kushagra Kastwar	M.Tech.	Mechanical Engineering	Mechanical Systems Design	Graduated
52	1802103017	Pavan H Shahapurkar	M.Tech.	Mechanical Engineering	Mechanical Systems Design	Graduated
53	1802103018	Prakash Khatri	M.Tech.	Mechanical Engineering	Mechanical Systems Design	Graduated
54	1802103020	Shahrukh Khan	M.Tech.	Mechanical Engineering	Mechanical Systems Design	Graduated
55	1802103021	Shashank Choudhary	M.Tech.	Mechanical Engineering	Mechanical Systems Design	Graduated
56	1802103022	Shivam Kumar	M.Tech.	Mechanical Engineering	Mechanical Systems Design	Graduated
57	1802103024	Sumit Kumar Gupta	M.Tech.	Mechanical Engineering	Mechanical Systems Design	Graduated

List of graduating MS (Research) students in 2020-Convocation

S.No.	Discipline	Roll Number	Name
1	CSE	1804101001	NEHA SHARMA
2	CSE	1804101002	PRARTHI JAIN
3	CSE	1804101003	PRATIK KUMAR MISHRA
4	CSE	1804101005	SHUBHAM
5	CSE	1804101007	UMAR AALAM
6	CSE	1804101008	ANAGHA RAMESHWARRAO BHOPLE

List of graduating PhD students at the end of 2020-Spring Semester

S.No.	Roll No.	Discipline	Name	Date of PhD Viva	PhD Thesis Title [Thesis supervisor(s)]
1	1401251001	Physics	Alok Yadav	20 Nov 19	Network as (0,1)-embedded system aka unweighted adjacency matrix **(Prof. Sarika Jalan)**
2	1401161002	HSS	Madan Dhanora	26 Nov 19	Innovation and market structure: Exploring the feedback effect, the role of policy regime and types of innovation **(Dr. Ruchi Sharma)**
3	1401161001	HSS	Jasmine Fernandez	2 Dec 19	Organ Heist Medical Thrillers: A Grotesque Perspective **(Dr. C. Upendra and Dr. Amarjeet Nayak)**
4	1501181007	MEMS	Mani Prabhu S.S.	3 Dec 19	Experimental Investigations on Mechanical Properties, Smart Functional Capabilities and Corrosion Behavior of Friction Stir Welded Nitinol Shape Memory Alloys **(Dr. I.A. Palani)**
5	1401102006	EE	Joice G. Philip	16 Dec 19	Identification of Optimal PMU Locations and Synchrophasor Measurements Based Estimation of Electromechanical Modes in Power System **(Dr. Trapti Jain)**
6	1401251008	Physics	Saptarshi Ghosh	8 Jan 20	Chimera State in Multiplex Networks **(Prof. Sarika Jalan)**
7	1501201003	CSE	Ram Prakash Sharma	14 Jan 20	Assessment of Fingerprint Quality with Application in Enhancement and Liveness Detection **(Dr. Somnath Dey)**
8	1301202011	EE	Sidharth Shukla	14 Jan 20	Traffic Scheduling and Grooming of Optical and Wireless Networks **(Prof. Vimal Bhatia)**
9	1401181001	MEMS	Aakash Mathur	15 Jan 20	Interface Effect in Confined Semiconductors: Tunable Optical Properties **(Dr. Sudeshna Chattopadhyay and Dr. Chelvam Venkatesh)**
10	12110101	CSE	Rohit Verma	20 Jan 20	ServiceOrientedArchitectureforConstrainedEnvironments **(Dr. Abhishek Srivastava)**

11	1401203002	ME	Avadhesh Kumar Sharma	21 Jan 20	Thermal and Rewetting Behavior of Hot Stationary and Moving Surfaces **(Dr. Santosh Kumar Sahu)**
12	1401102002	EE	Abhijeet Gorey	31 Jan 20	Development of intensity- modulated continuous wave laser diode based photoacoustic spectral response technique for biomedical applications **(Dr. S. Vasudevan)**
13	1401271003	BSBE	Pratibha Kumari	11 Feb 20	Design and Construction of Fluorescent Bioactive Probes for Bioimaging of Targeted Cellular Organelles **(Dr. Shaikh M Mobin)**
14	1401181002	MEMS	Ajaib Singh	4 Mar 20	Zinc Oxide-Polymer Nanocomposites: Confinement Induced Variation in Structure, Morphology and Optical Properties **(Dr. Sudeshna Chattopadhyay and Dr. Chelvam Venkatesh)**
15	1501102008	EE	Mangal Das	16 Mar 20	Yttria based Memristive System for Neuromorphic Applications **(Dr. Shaibal Mukherjee)**
16	1501181004	MEMS	Swati Mishra	15 May 20	Investigations on Robust Motion Control Designs for Mobile Manipulators **(Dr. S.K. Vishvakarma and Dr. M. Santhakumar (IIT Pallakad))**
17	1301171001	BSBE	Amit Kumar Singh	15 May 20	Role of splicing regulator SRSF1-3 and nucleosome positioning linked with AID mediated somatic hypermutation of Ig genes **(Dr. Prashant Kodgire)**
18	1401102009	EE	Nishant Saxena	18 May 20	Exploring The Ultimate Speed Of Threshold Switching In Phase Change Memory Devices **(Dr. Amod C. Umarikar and Dr. M. Anbarasu [IIT Madras])**
19	1401102007	EE	Mahesh Kumawat	18 May 20	On-Chip Circuit Design Techniques for High-Speed Serial Links **(Dr. Santosh K. Vishvakarma)**
20	1501101001	CSE	Chandan Gautam	18 May 20	Kernel-based Learning in the Absence of Counterexamples: One-class Classi_x000C_cation **(Dr. Aruna Tiwari)**
21	1501101002	CSE	G. Iyyakutti Iyappan	18 May 20	3D Ear Based Human Recognition **(Dr. Surya Prakash)**

22	1501131013	Chemistry	Preeti Bhauriyal	18 May 20	Theoretical Insights into Cathode Designing and Working Mechanism in Aluminium Batteries **(Dr. Biswarup Pathak)**
23	1401202011	EE	Vijay Anand	20 May 20	High-resolution Fingerprint Recognition: Indexing, Feature Extraction, and Comparison **(Dr. Vivek Kanhangad)**
24	1501101006	CSE	Animesh Chaturvedi	20 May 20	System Evolution Analytics: Data Mining and Learning of Complex and Big Evolving System **(Dr. Aruna Tiwari)**
25	1501102009	EE	Md Arif Khan	21 May 20	Design and Fabrication of MgZnO/CdZnO Heterostructures for HFET Application **(Dr. Shaibal Mukherjee, Prof. Abhinav Kranti and Dr. Ajay Agarwal [CEERI-Pilani])**
26	1301271001	BSBE	Anshu Kumari	21 May 20	Free and Nanoencapsulated Indocyanine Green for Nearinfrared and Multiphoton Bioimaging **(Dr. Sharad Gupta)**
27	1401251005	Physics	Mithun Kumar Majee	21 May 20	Correlation of local crystal structure and physical properties of Multifuntional Oxides **(Dr. Preeti A. Bhobe)**
28	1501202004	EE	Nivedita Jaiswal	22 May 20	Design Optimization of Double Gate Junctionless Mosfet for Enhanced Short Channel Immunity **(Prof. Abhinav Kranti)**
29	1501171016	BSBE	Arun Kumar Verma	26 May 20	Structural insight of r(CGG) motif and small molecule based therapeutic development for the expanded CGG repeats associated neurological disorders **(Dr. Amit Kumar)**
30	1501181002	MEMS	Gargee Bhattacharyya	26 May 20	Computational Designing of Main Group Based Low Dimensional Ferromagnetic Half-Metallic Materials for Spintronics Applications **(Dr. Biswarup Pathak Dr. Somaditya Sen)**
31	1401131004	Chemistry	Chinky Binnani	27 May 20	Development of Ruthenium Based Catalytic Systems for C-H Bond Activation/Arylation of Aryl Pyridines **(Dr. Sanjay K. Singh)**
32	1501202007	EE	Vinay Bankey	27 May 20	Performance Analysis of Hybrid Satellite-Terrestrial Networks over Generalized Fading Channels **(Dr. Prabhat Kumar Upadhyay)**

33	11120102	CSE	Dheeraj Rane	28 May 20	SLA Driven Performance Optimization in Cloud Computing **(Dr. Abhishek Srivastava)**
34	12110104	CSE	Mane Pramod Chandrawadan	28 May 20	Game Theoretic Models in Social Cloud **(Dr. Kapil Ahuja Prof. Nagarajan Krishnamurthy (IIM Indore))**
35	1401203004	ME	Dharmendra Kumar Panchariya	28 May 20	Synthesis and Characterisation of Metal-Organic Frameworks Based Hydrogen Storage Materials **(Dr. Sanjay K. Singh Dr. E. Anil Kumar (IIT Tirupati))**
36	1401251009	Physics	Sayan Chaudhuri	28 May 20	Realization of half-metallicity in disorder controlled Full Heusler compound Fe2TiSn **(Dr. Preeti A. Bhobe)**
37	1501102017	EE	Jitesh Agrawal	28 May 20	Investigations on Hydrothermally Grown ZnO Nanostructures Towards Development of UV/Broadband Photodetectors **(Dr. Vipul Singh Dr. I. A. Palani)**
38	1401203005	ME	Nirgude Vishal Vasantrao	29 May 20	Pool Boiling Heat Transfer Characteristics of Structured Surfaces **(Dr. Santosh Kumar Sahu)**
39	1401203007	ME	Saurabh Yadav	29 May 20	Heat Transfer and Fluid Flow Characteristics of Double Pipe Heat Exchanger with Passive Techniques **(Dr. Santosh Kumar Sahu)**
40	1401251003	Physics	Kushal Mazumder	29 May 20	Multifunctional Applications of Single Crystal and Nanomaterials of Topological Insulator Bi2Se3 **(Dr. Parasharam M. Shirage)**
41	1301251002	Physics	Surjendu Bikash Dutta	30 May 20	Optical Spectroscopy Based Urine Analysis for Disease Diagnosis **(Dr. Sharad Gupta and Dr. Shovan Kumar Majumder [RRCAT])**
42	1401202010	EE	Suresh D.	10 Jun 20	Impact of Interfacial Effects, Process Variation and Heavy-Ion Irradiation on the Performance of Scalable Phase Change Memory Devices **(Dr. Amod C. Umarikar and Dr. M. Anbarasu, IIT Madras)**
43	1401251010	Physics	Siddhartha Karmakar	25 Jun 20	E_x000B_ective Route Beyond the Extended Scalar Sectors of the Standard Model **(Prof. Subhendu Rakshit)**

44	1401281001	MEMS	Manojit Pusty	30 Jun 20	Mechanical Energy Harvesting Using Reduced Graphene Oxide Based Nanocomposites **(Dr. Parasharam M. Shirage Dr. Somaditya Sen)**
45	1501271002	BSBE	Richa Agrawal	3 Jul 20	Structural features of C15 and M1 peptidases for recognizing their peptide substrates **(Dr. Amit Kumar Dr. Ravindra D. Makde, RRCAT)**
46	1401231002	Chemistry	Anubha Yadav	10 Jul 20	Development of Catalytic One-Pot Approaches to Heterocycle Fused Coumarins, 2-Oxindoles and Carbocyclic Scaffolds (Dr. Sampak Samanta)
47	1501102003	EE	Shishir Maheshwari	13 Jul 20	Advanced Image Analysis Techniques for Automated Glaucoma Diagnosis using Retinal Fundus Images (**Dr. Vivek Kanhangad Prof. Ram Bilas Pachori)**
48	1401203003	ME	Chaudhari Vasudev Damodhar	20 Jul 20	Spray Characterization and Reactivity Study for Low Temperature Combustion Engine **(Dr. Devendra Deshmukh)**
49	1401103001	ME	Anand Petare	1 Aug 20	Investigations on Finishing of Spur and Straight Bevel Gears by Abrasive Flow Finishing Process **(Prof. N.K. Jain and Dr. I. A. Palani)**
50	1501161005	HSS	Shanmugapriya T	1 Aug 20	The Impact of Technological Devices and Digital Technologies In/On Post-Independence Indian English Literature: Narrative, Publishing and Praxis **(Dr. Nirmala Menon)**
51	1401271002	Physics	Pramod Sukhadev Shinde	4 Aug 20	Analysis of Genomic and Proteomic Networks **(Prof. Sarika Jalan)**
52	1501102012	Electrical Engineering	Ritesh Bhardwaj	5 Aug 20	Development of MgZnO/ZnO Based Ultraviolet Photodetectors **(Dr. Shaibal Mukherjee)**

8th Convocation 2020: Recipients of Medals and Awards

PRESIDENT OF INDIA GOLD MEDAL

For the best academic performance among all the graduating students

Mr. Saptarshi Ghosh
BTech (CSE)
Roll No. 160002052

INSTITUTE SILVER MEDAL

For the best academic performance among all the graduating UG students of a particular Discipline

Ms. Arushi Jain
BTech (CSE)
Roll No. 160001008

Ms. Khushboo Ahuja
BTech (EE)
Roll No.160002024

Mr. Agam Gupta
BTech (ME)
Roll No. 160003005

Mr. Shalay Gupta
BTech (CE)
Roll No. 160004033

Mr. Ashutosh Gupta
BTech (MEMS)
Roll No. 160005008

INSTITUTE SILVER MEDAL

For the best overall performance among all the graduating PG students (MTech./MS and MSc. Programs)

Mr. Manish Badole
M.Tech (MEMS)
Roll No. 1802105012

Mr. Anchal Saxena
MSc (Astronomy)
Roll No. 1803121001

AWARD FOR BEST B.TECH. PROJECT (BTP)

Amongst all the graduating UG students

Mr. Mehta Chaitanya Mukeshkumar
BTech (ME)
Roll No. 160003028

Project Title: "Design and Development of a Tree Climbing Quadruped Robot"

BUTI FOUNDATION GOLD MEDAL

For the best academic performance among all the graduating female PG students

Ms. Srija Tewari
MSc (Chemistry)
Roll No. 1803131023

Research and Development Report

IIT Indore envisages the convergence of traditional disciplines as the key to accomplish the previously unimaginable. With this foresight, IIT Indore has been promoting inter-disciplinary research programmes focusing on basic and applied research, technology development and innovation. This vision has helped the institute to excel in all spheres of science, engineering, and humanities and social sciences.

From academic to outreach programmes, research is at the heart of IIT Indore's vision to accomplish the previously unimaginable. Thus, while focusing on the basic and applied research IIT Indore has been promoting inter-disciplinary research programmes to further stimulate technology development and innovation. This vision has helped the institute to excel in all spheres of science, engineering, and humanities and social sciences.

A key competency of IIT Indore is research driven academic programme as it forms a core component of the undergraduate and postgraduate teaching. IIT Indore has consciously promulgated the idea of involving undergraduate students in forefront research projects. This led to the initiation of a formal undergraduate research scheme, Promotion of Research and Innovation for Undergraduate Students (PRIUS).

Research at IIT Indore has been recognized at both international and national level. Faculty members and scientists are actively involved in several key international projects and joint collaborations with research organizations in Japan, South Korea, Russia , Portugal, France, Germany, UK, USA, and many other countries. The institute has been successful in securing 328 externally sponsored research projects with a sanctioned amount of Rs. 115.94 Crore.

During the year 2019-20, total 17 national and international conferences, workshops, GIAN programs and research-based courses have been organized, total 338 research papers, 48 conference articles have been published in the reputed journal and total 6 Patents have been filed by faculty members from various disciplines.

GIAN Courses during April 2019 - March 2020

S. No.	Course Title	Coordinator	Course Schedule
1	Course on Ultra Clean and Low Pulsation Gas Turbines	Dr. Devendra Deshmukh	November 03 - 07, 2019
2	Lattice Boltzmann Methods for Multi-phase and Multi-Component flows	Dr. Shanmugam Dhinakaran	August 05 - 16, 2019
3	GPU Computing in Computational Biology	Dr. Parimal Kar	July 15-19, 2019
4	Principles of Drug Discovery, Design, and Development: Modern Concepts and Applications	Dr. Venkatesh Chelvam	May 27-June 07, 2019
5	Advanced Combustion Modelling with Computational Fluid Dynamics	Dr. Shanmugam Dhinakaran	April 08 - 12, 2019

Sophisticated Instrumentation Centre (SIC)
A National Facility, IIT Indore

Sophisticated Instrumentation Centre (SIC) was established in September 2011 with institute funding to expedite research programs at IIT Indore. The SIC mission is to support and foster research efforts in Science and Engineering at IIT Indore by providing state-of-the-art instrumentation and ancillary equipment, and expertise in its use and application. The SIC is equipped with Single Crystal X- ray Diffraction, Nuclear Magnetic Resonance, High Resolution Mass Spectrometry, Elemental Analysis, Single Molecule Imaging Spectroscopy and other Spectroscopic facilities together under one roof to provide the highest quality data for analysis to research groups and students. With the existence of excellent facilities and high level of expertise, SIC offers analytical services within the Institute as well as for external organizations.

SIC has now emerged as one of the first centers in central India providing extensive support to users across the country. It is also thriving to become a self-sustained center by generating funds from services provided to users from academia and industry.

A major advantage of SIC is its accessibility to students within the Institute, a very healthy ratio of students to the time availability on instruments.

The SIC instruments strengthens the following research areas: Fundamental Research in Inorganic Chemistry, Organic Chemistry, Organometallic Chemistry, Various aspects of Material Science, Bio Science and Engineering including work on Biosensors, Materials Science and Engineering, and Condensed Matter Physics.

Recently many new facilities *viz.* online form submission and dissemination of data, revamping of safety and security of the center and hands on training of students for equipment like single crystal X-ray crystallography are introduced. Further hands-on training workshop for researchers has been planned which is going to be conducted once the pandemic situation improves.

Some Major Facilities

X-Ray

1. Single Crystal X-ray Diffraction Facility (SCXRD)
2. Powder XRD (PXRD)
3. X-ray Absoption Fine Structure (XAFS)
4. Energy Dispersive X-ray Spectroscopy (EDS/EDX)
5. Wavelength Dispersive Spectroscopy (WDS)

Spectroscopy

1. Nuclear Magnetic Resonance (NMR, 400 MHz & 500 MHz)
2. Fourier Transform Infrared Spectrometer (FT-IR)
3. Time Corelated Single Photon Counting (TCSPC)
4. Circular Dichroism (CD)
5. Photo Luminescence (PL)

6. Raman Spectroscopy
7. UV Visible Spectrometer (UV-VIS)
8. UV VIS NIR Spectrometer
9. Spectrofluorometer (FL)

Microscopy

1. Scanning Electron Microscopy (SEM)
2. Single Molecule Microscopy
3. Confocal Laser Scanning Microscopy (CLSM)
4. Atomic force Microscopy (AFM)

Chromatography

1. Liquid Chromatography and Mass Spectroscopy (LC-MS)
2. Gas Chromatography Mass Spectrometer (GC-MS)
3. High Performance Liquid Chromatography (HPLC- Reversed phase)
4. High Performance Liquid Chromatography (HPLC-Chiral)

Electro-Analytical

1. Cyclic Voltammetry
2. Spectroelectro Chemical Cell (SEC)

Thermal Analysis

1. Thermogravimetric Analyzer (TGA)
2. Differential Scanning Calorimetry (DSC)

Elemental Analyzer

BET Surface Area Analyzer

Liquid Nitrogen Plant

DIBSD

Other Instruments

1. Polarimeter
2. Lyophilizer
3. Rheometer
4. Langmuir-Blodgett film deposition system

Summary of Major Instrument Usage

Instruments	Internal Samples	External Samples
SC-XRD	240	0
NMR	10743	155
LCMS	9342	97
SEM	2273	23
AFM	1735	14
GCMS	1563	13
Confocal Microscopy	872	27

Apart from these the SIC has several other instruments enlisted at

http://www.iiti.ac.in/sic/index.php

Academic Institutions:

1. BARC, Mumbai
2. Raja Ramanna Centre for Advanced Technology (RRCAT), Indore
3. TIFR Hyderabad
4. IIT Bombay
5. IIT Madras
6. IIT Mandi
7. IIT Patna
8. IIT Gandhinagar
9. NIT Rourkela
10. NIT allahbad
11. MA-NIT Bhopal
12. NIPER Mohali
13. Indian Institute of Himalayan Bio-resource Technology (IHBT), palampur
14. Banaras Hindu University, Varanasi
15. Guru Nanak DevUniversity, Punjab
16. GITAM University, Visakhapatnam
17. Jammu University Jammu
18. MS University, Baroda
19. Savitribai Phule Pune University, Pune
20. Pinnacle Biomedical Research Institute (PBRI), Bhopal
21. Devi Ahilya Vishwavidyalaya, Indore
22. Shri Govindram Seksaria Institute of Technology and Science, Indore
23. North Maharashtra University, Jalgaon
24. Vikram University, Ujjain
25. Mewar University, Rajasthan
26. RD University, Jabalpur
27. Central University, Sagar
28. Central University, Rajasthan
29. Guru Ghasidas Vishwavidyalaya Central University, Bilaspur
30. SRM University, Chennai

31. University College, Trivandrum
32. Tumkur University, Karnataka
33. Thapar University, Patiala
34. Punjab University
35. Awadhesh Pratap Singh University, Rewa
36. University of Hyderabad, Telangana
37. Pondicherry University, Puducherry

International Academic Institutes:

1. Universität Stuttgart, Germany
2. Jehangirnagar University, Bangladesh
3. Dhaka University, Bangladesh
4. Taibah University, Medina, KSA

Industries:

1. Gharda Chemicals
2. Glenmark Pharmaceuticals Delhi University
3. Piramal Healthcare Mumbai
4. Jubilant Biosys Ltd.
5. Lupin Pharmaceutical Pvt. Ltd.
6. Mimani Wires Pvt. Ltd.
7. Choksi Labs Ltd.
8. UV Resins Pvt. Ltd.
9. Impress Chemicals Pvt. Ltd.
10. Syntochem Pvt. Ltd.
11. Symbiotec Pharma Lab
12. Medilux Pharma, Indore
13. Emcure. Pune
14. Reliance Industries Ltd.
15. Navin Fluorine International Ltd., Dewas
16. SRF Ltd., Indore
17. M.P. Dye Chem., Indore
18. Rupak Enterprises, Indore
19. Sprint Testing Solutions, Mumbai
20. Rajveer Chemicals, Indore
21. Shree Pacetronix Ltd. Indore
22. Keva, Mumbai
23. IPCA, Ratlam
24. ATUL Ltd., Valsad

Counselling Cell

Counselling cell has been an integral part of IIT Indore since its inception in December 2011. The function of this cell is to offer supportive and conducive environment for students wherein he/she can discuss personal issues or academic challenges and seek help from counselling committee members. With primary focus on prevention of mental health issues - prevention of suicide and chronic mental health problems, counselling cell works for early identification and early intervention for various mental health issues in students.

The team of Counselling Services was initially headed by Dr. Vinod Kumar, Assistant Professor in MEMS till January 22, 2020 and subsequently is headed by Dr. Pavan Kumar Kankar, Associate Professor, Mechanical Engineering. He is assisted by Ms. Monika Gupta, Counselor. In addition, Counselling Cell comprises of a visiting consultant psychiatrist, Dr. Ashutosh Singh (MBBS, DNB Psychiatry). The Institute also has a counselling committee consists of one faculty member from each discipline as faculty counselling coordinators and student representatives from Ph.D, PG and UG as Student Counselling Coordinators. The committee members provide guidance and advise on counselling related matters to the students of the respective discipline.

Counselling cell undertakes various activities as mentioned below:

(a) Individual counselling sessions are carried out by the cell to assist the students in dealing with a wide range of concerns; be it academic, personal, emotional, family or peer related as well as wide range of psychological concerns including clinical depression, anxiety spectrum difficulties, suicidal tendencies, difficult personality traits.

(b) The student mentors and Gymkhana members also help freshers by extending their helping hand both for academic and non-academic concerns. With the aim to foster a healthy stress-free environment for the student community, the Counselling Cell oversees a body of students, who are in the penultimate year of their B. Tech. There are 15 students presently who overlook the working of the Mentorship Group and guide sophomore mentors who in turn guide the freshers on joining IIT Indore and throughout the year.

(c) Creating a good liaison with various departments and services at the Institute to facilitate the implementation of the intervention plan.

(d) Working towards creating a strong referral system as a basis for enhancing mental health services, where students are being referred by academic office, medical unit, faculty advisors, sports and security officers, wardens and hostel office, parents and friends, apart from walk in students who approach the counselor on their own.

(e) Facilitation of a meeting during orientation program involving fresher students and their parents, faculty advisors, student mentors. The faculty advisors regularly interact with the assigned students and guide them for academic concerns. The students are further referred to the student counselor in case of student shows any signs of distress.

(f) Facilitation of various policies for students having academic concerns.

(g) Organise expert talks and activities to create awareness on mental health issues and enhancing positive well-being.

(h) De-stigmatising counselling services to a considerable extent and enhancing the positive perception of the cell.

The events organised by Counselling Cell are as follows:

(a) Interactive Meeting - An interaction of B. Tech. 2019 batch students and their parents with respective faculty advisors and student mentors was facilitated by counselling cell during orientation program on July 24, 2019. The meeting introduced the students with their faculty advisors and mentors who would take care of the students during their stay at the Institute.

(b) Orientation - Orientation of Counselling Cell for 2019 batch UG and PG/ Ph. D students was conducted on August 10, 2019. During the session, Ms. Monika Gupta, Counselor, discussed the functions of counselling cell services and its structure at IIT Indore. The process of counselling was also explained to the students.

(c) Mentorship Training Session - IIT Indore has a student mentorship program, under which volunteers from the second year are assigned a few first-year students to guide and help them get acquainted with the campus environment. Not only does this establish long-lasting friendships, but it also helps the first-year students explore the campus life, more importantly, themselves. The Counselling Cell, organised a training session on mentorship on September 9, 2019 by Dr Satasuryaa, an alumnus of IIM Calcutta and the founder-chairman of the National School of Leadership, India's first school dedicated to higher education in Leadership Sciences, to help the students mentors get acquainted with their duties, responsibilities and their import in the lives of students they mentor. Narrating incidents from his past, he emphasised the significance of mentors in shaping his life.

(d) Mental Health Awareness Programme – Celebrating the 10th Anniversary Year Celebrations of IIT Indore, the 'Mental Health Awareness Programme' was organised by the Counselling Cell on October 19, 2019. The programme was garnered by insightful expert talks of Dr. Alok Bajpai, eminent psychiatrist from Kanpur and Dr. Ashutosh Singh, consultant psychiatrist from Indore along with a multitude of competitions organized by the students. From lectures on training the mind, identifying and curbing depression to the creative flare of posters and essays, no stone was left unturned to break the stigma surrounding mental health. Movie and street play by the students pertaining to the issue further drove the message home.

The Central Library

The Central Library has a collection of 36283 books at present while new books are being added to the collection continuously. These include books on all relevant subjects for teaching and for reference. The Library also boasts of a select collection of fiction, literature, and general interest books such as current events, sports, films, etc. to take care of the leisure and recreation reading needs of the users. Special Collections such as the Gandhian Studies Collection, Hindi Collection and children's books Collection take pride of place in the Library. The Library shifted to its own building, viz. the Learning Resource Centre in March 2020.

IMG: The Learning Resource Center (LRC) building

Library at a Glance:

Collection (As on 31.03.2020):

Books	E Journals	E Books	Print Journals	Magazines	Newspapers
36283	8550+	7600 approx.	01	26	11

Books (Print) added during FY 2019-20: The total volumes of books in print format added during FY 2019-2020 is 946. The subject-wise distribution of the same is presented below.

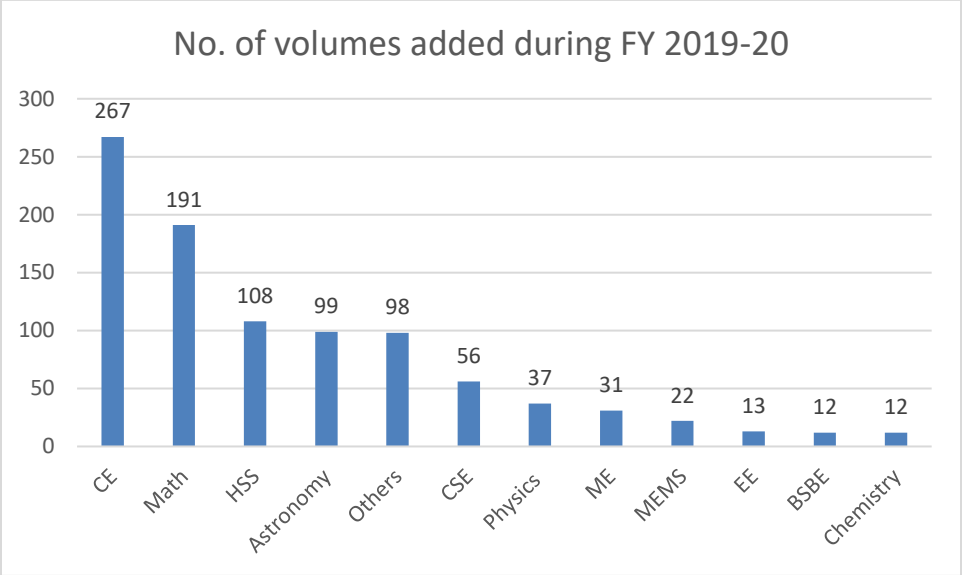


Figure 1. Number of books (print) added in FY 2019-20

e-books added during FY 2019-20

The Library added 1237 e-books to its collection during FY 2019-20. The subject-wise distribution of the same is presented below

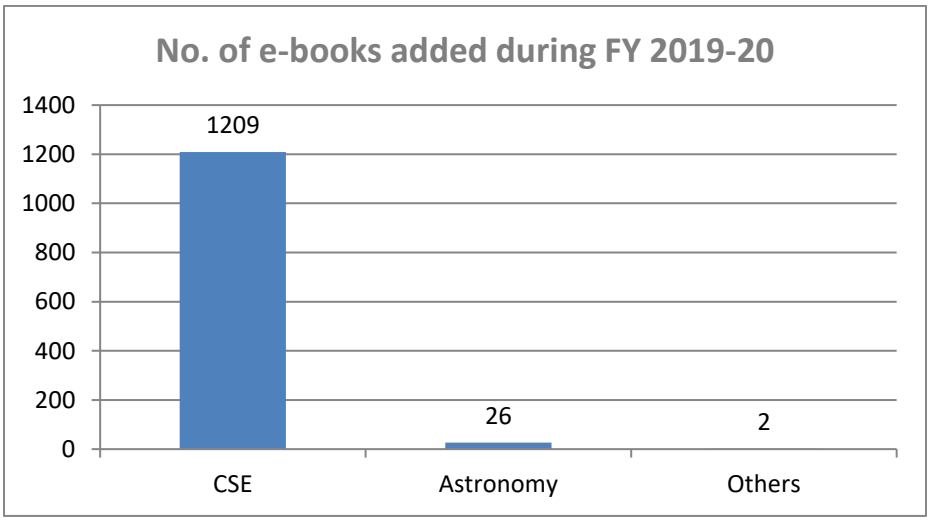


Figure 2. Number of e-books added in FY 2019-20

Library Usage: (April 2019 to March 2020)

Books Issued	Reading Room Usage per month (Average)
27369	4000 users p.m. approx.

User category wise book issue:

The number of books borrowed by various categories of users during the period April 2019 to March 2020 are displayed below.

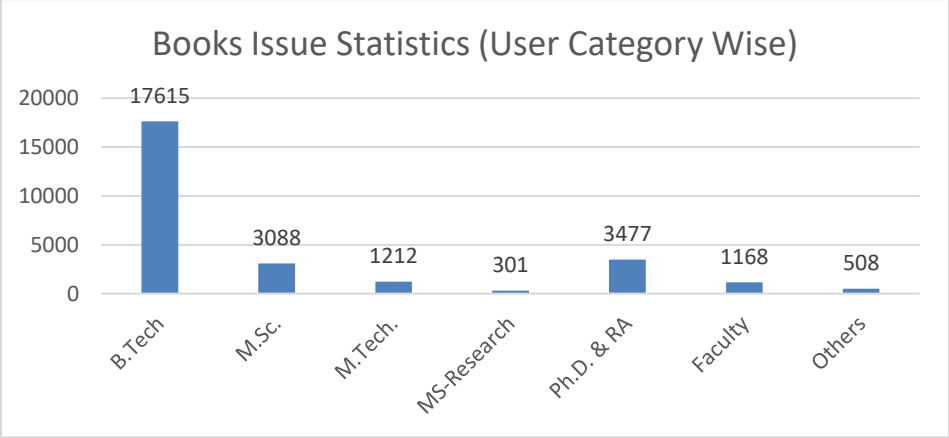


Figure 3. Book Issue Statistics (User Category Wise) (Apr.2019 to Mar.2020)

Department wise book issue: Books borrowed by users belonging to various departments are as displayed below.

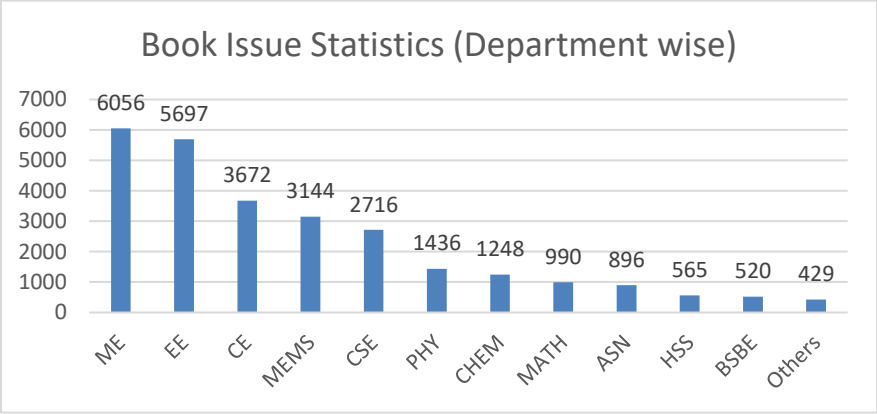


Figure 4. Book Issue Statistics (Department wise) (Apr. 2019-Mar. 2020)

Periodicals and Newspapers (Print Format): At present, the Library subscribes to 01 Journals, 26 Magazines and 11 newspapers.

Electronic Resources: In today's world of Information explosion, access to electronic information resources is essential, particularly in an academic environment. The library has developed a collection of Electronic Resources which includes thousands of journal articles, research papers, e-books, and other resources in the digital format.

E-journals in various disciplines published by reputed societies such as American Mathematical Society, American Chemical Society, American Institute of Physics, Royal Society of Chemistry, IEEE, among others are subscribed by the library. In addition to this, journals published by publishers such as Elsevier, Springer and Taylor & Francis are also available to users of the Library. The E Resource collection also includes 7600+E-Books from various publishers. Apart from this, major databases such as SciFinder Scholar, Scopus and MathSciNet are also made available to users of the Library.

The complete list of e-resources with hyperlinks is available on the Library website for users' convenience, so that users can access the resources from the library website itself.

Library Services:

At present, the Library offers services as described below:

- **Lending facility**: Undergraduate students can borrow up to 08 books for the period of 15 days, whereas M.Sc., M.Tech. and Ph.D. students can borrow up to 08 books for the period of 1 month. Faculty members can borrow up to 40 books for a period of 6 month.
- **Overnight Lending**: Overnight lending facility is provided to students who wish to borrow a book from the reserved section, or have crossed their entitlement limit. Books on overnight issue have to be returned by 9.30 a.m. the next day.
- **Claims/ Reservations**: Users can claim/ reserve books which are issued out. Claimed/ reserved books are kept in the Library for the user for 3 days from the date of return by the previous borrower, before they can be issued to the next claimant.
- **Renewals:** Books can be renewed only if there are no claims.
- **Reading Room**: The Library provides air conditioned and wi-fi enabled Reading Room with a seating capacity of 150 students. In addition to this, several PCs are placed in the reading room for the use of research scholars and faculty members for the purpose of accessing e-resources, and checking the Web OPAC.

- **Inter Library Loan& Document Delivery Services**: The Library has an informal Inter Library Loan and Document Delivery Services arrangement with institutes such as IIM Indore, RRCAT Indore, IIT Bombay and other IITs. Under this facility, access is provided to books or electronic materials which may be needed by users but are not available in our library.
- **Book Bank**: Under the Book Bank scheme, text books are provided to students belonging to the reserved categories for the period of a semester.

- **Reprography Services**: Users are provided Photocopies or Printouts of select portions of library resources as required by them, subject to the provisions of the Copyright Act.
- **Orientation Program**: The Library conducts orientation programs for new students to make them aware of the library resources and services and to help them utilize the library resources optimally.
- **Originality check:** The library provides originality reports to users for their assignments and papers, using Turnitin.
  - **Remote access to library resources:** The Library provides 24x7 access to its digital resources for the users of the library, through RemoteXs.
  - **CCTV Surveillance**: The Library has installed high tech cameras to ensure the safety and security of its users and resources.
  - **Bar Coding:** Bar Code Technology is being used for issue/ return of books at the Circulation Counter.
  - **RFID implementation:** RFID implementation is under process in the library.

- **QR Codes:** The Library is using QR code technology to provide quick access to users to the library website, library OPAC, and recommendation forms for books and journals.

- **Trial Access:** The Library requests trial access to various e-resources from publishers, so that users can get an opportunity to use and evaluate the resource. After the trial is over, the Library Committee discusses the subscription option based on the recommendations/ feedback received from users.
- **Other Activities**: The Library organizes various Author Workshops/ Training Programs/ Informative Sessions for E-Resources and also for Print Resources. The most recent Author Work shops were conducted on August 27th, 2019 jointly with Elsevier and on September 19th, 2019 jointly with Springer.

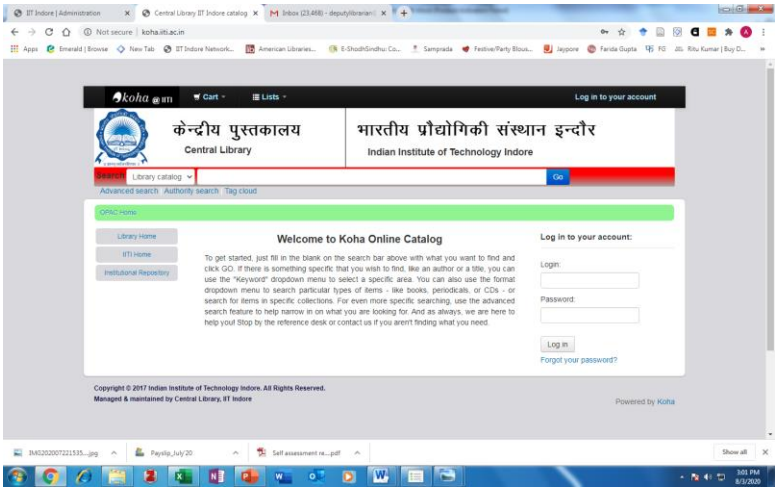
(Springer Author Workshop – September 19, 2019)

- **Children's Collection:** The Central Library started the Children's book collection to support the recreational needs of children of IITI employees and to promote the reading habit among young children. At present, nearly 850 titles are available for children in the age groups ranging from 04 to 14.

Koha: An Open Source Integrated Library Management Software

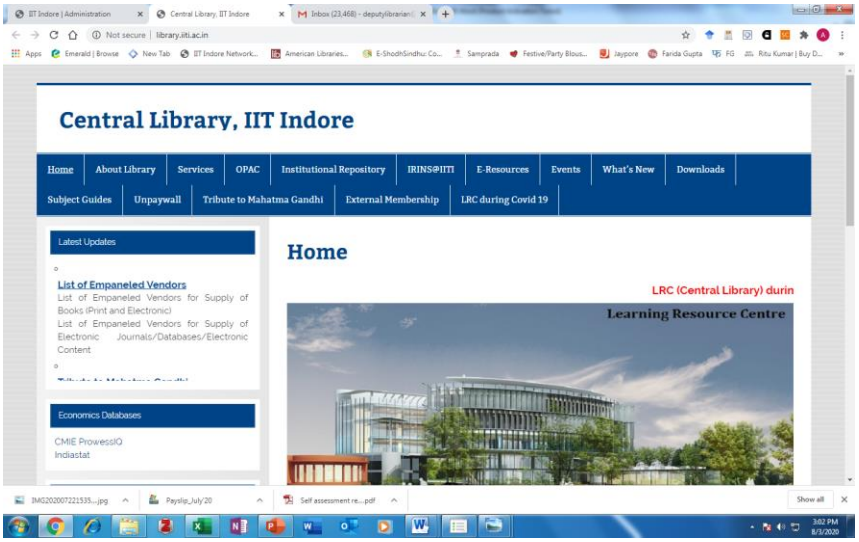
Koha is an Open Source Integrated Library Management Software which provides various user-friendly features and functions such as My Account, Online Reservations, Online Renewals, etc.

Users can browse the Library collection by checking the **Web OPAC** (Online Public Access Catalog) at ***koha.iiti.ac.in.***



(Library Web-OPAC)

- **Library Website**: Detailed information about the Library can be accessed through the Library website at : http://library.iiti.ac.in/



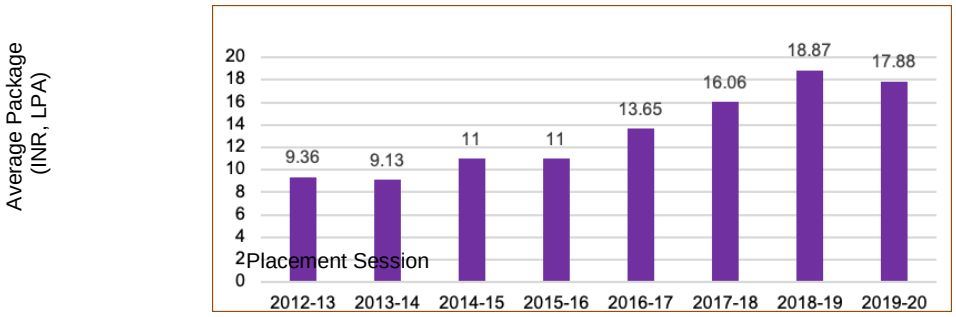
(The Library website)

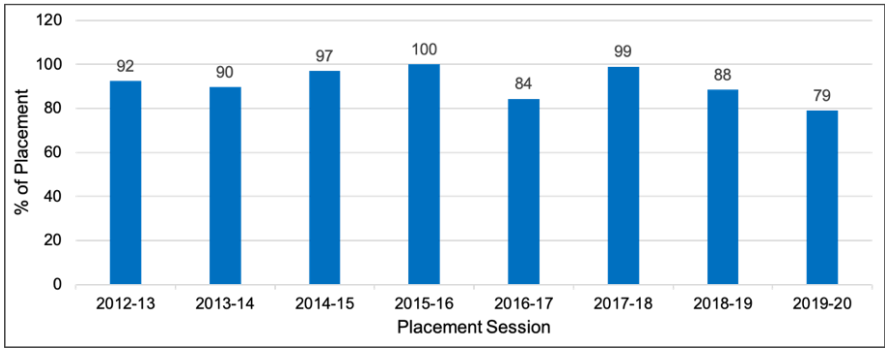
Placement Section

The placement office has always strived to build a strong mutual association with the recruiters and create better opportunities for the students. The section was headed by Dr. Prabhat Kumar Upadhyay till May 2019 and subsequently by Dr. Abhishek Rajput till date, with Ms. Mamta working as an Assistant Placement Officer. Students were offered various job roles in areas/ sectors such as: Automobiles & Steel, Software Engineering & Technology Consulting, Analytics, Graduate Engineering Trainee, Oil & Gas, Communication & Digital, Finance & Banking, Construction, Teaching etc.

Jobs with attractive packages were offered from various companies which mainly included DE- Shaw, Goldman Sachs, Microsoft, Salesforce, AQR Capital, Deloitte, Arcesium, GAIL, IOCL, HPCL, Barclays, CodeNation, Razorpay, Analog Devices, Tata Digital, Microchip, ArcelorMittal, BookMyShow, Fractal Analytics, Dunzo, JIO, Commvault, MAQ Sofware, Clumio, Oyo, PayPal, United Health Group, Accolite, HSBC, Secure Meters, Strand Life Sciences, MathWorks, Cognizant, L&T, Quantile Analytics, Futures First, Maruti Suzuki, NXP Semiconductors, John Deere, Production Modeling India, Mentor Graphics, Tata Steel, NeXHS Renewables, ZS Associates, CGI, Deqode, Raam Group & more.

The average salary package is INR 17.88 lakh p.a. and highest package received is INR 47 lakh p.a. (domestic). Approximately 175 students actively participated in campus placements activities out of which 138 got placed and 156 job offers were received. Many companies offered project/ research work opportunities which includes Texas Instruments, Qualcomm, Clumio, Water Resource Department MP, Strand Life Sciences, Irage Capital & many more. The highest stipend offered was 1.5 lakh per month. Approximately 10% of students opted for higher education at IIMs, IITs, and universities abroad while others are inclined to prepare for competitive exams/other plans.





Administration Report

1. General Administration:

1.1 About the Organization:

IIT Indore is one of the second generation IITs. It was established in 2009 as an autonomous statutory organization functioning within the Institutes of Technology Act, 1961, as amended by The Institute of Technology Act, 2012. The IITs are administered centrally by the Council of IITs, the apex body established by the Government of India (GoI) to coordinate the activities of these Institutes. The Minister of Human Resource Development, GoI is the Chairperson of the Council. Each IIT has a Board of Governors responsible for overall governance, superintendence, and control.

The Senate is the apex body which decides on academic policies and matters of the Institute and approves and administers curricula, courses, examinations, and declaration of results. It also appoints other Committees to look into specific academic matters arising from time to time. The teaching, training, and research activities of various departments at the Institute are constantly under review to improve both facilities and standards. The Director of the Institute is also the Chairman of the Senate.

The BoG is assisted by the Finance Committee on financial matters and by Building and Works Committee for Campus Development matters. The composition of these committees is given separately in Appendix.

1.2 Meetings of the Authorities: -

Board of Governors	Six Meetings held on – 07.06.2019, 05.08.2019, 07.10.2019. 30.10.2019, 14.11.2019, 20.12.2019
Finance Committee:	Six Meetings held on – 07.06.2019, 05.08.2019, 07.10.2019. 30.10.2019, 14.11.2019, 20.12.2019
Building and Works Committee:	Eight Meetings held on - 17.05.2019, 08.06.2019, 28.06.2019, 28.09.2019, 20.11.2019, 12.12.2019, 27.12.2020, 25.02.2020
Senate	Five Meetings held on - 04.06.2019, 02.08.2019, 20.08.2019, 14.11.2019, 19.02.2020

1.3 Staff Position:

As on 31st March 2020, **117** non-teaching staff have been appointed, as per the details given in the table below.
Group 'A' Officers **19**
Technical staff **- 41**
Other Administrative Staff **7**
Number of non-teaching staff members appointed during the year is as under:
Non-teaching staff **- 30**
No. of staff were relieved due to resignation/other reasons **– 05**

1.4 Staff Welfare

The Board of Governors of the Institute in its 31st meeting has approved the creation of a Staff Welfare Association. It will help in introducing academic and administrative reforms in conformity with a true democratic setup, improving academic and administrative efficiency and transparent functioning of the institute. It will also ensure staff participation in the formulation and implementation of policies of the institute and helps in promoting freedom of thought, expression and action in fulfilling administrative and support responsibilities.

Convenience Store (LaFresco) running in the institute under the supervision of IIT Indore Cooperative Society is providing valuable services in delivering daily need items to the IITI community. On request basis specifically demanded items are also made available. In emergency situation the store has also started home delivery of the grocery items for the campus residents.

Institute is committed towards continuous enhancement in facilities inside the campus premises for the benefits of the community members. In the month of September 2019, the salon facility has been inaugurated inside the campus. Hygiene and other standard norms are being ensured and the rates of basic services of are being regulated by the management. In the month of March 2020 an Amul Parlor has been opened at Central Dining Facility of the institute which provides complete range of Amul products inside the campus. Apart from the above materials management team and a dedicated committee are making sincere efforts to start other basic services inside the campus.

In addition to above several food kiosks has also begun operations inside the campus and particularly at Central Dining Facility. These outlets are opened with a view to provide variety of food items as per different tastes of the students and other community members. Operational part and standardization of the items delivered at these kiosks is being closely monitored.

1.5 Human resource development

When an organization develops their employees, they are strengthening their assets and making them more valuable. Under human resource development activities, the Institute plans and implements programs for providing better opportunities to the technical and administrative staff to update and upgrade their knowledge and skills so that their work performance will be more effective and hence, ensuring optimum utilization of the manpower.

Institute has focused on organizing in-house workshops as well as trainings which have the following advantages:

- Allows the trainers to focus on specific areas based on the training requirements of the institute staff.
- A session full of representatives from different departments can encourage greater team work, awareness and understanding of each other's role.
- It fits around the working schedule of the staff and at a location they come every day.

During this financial year the staff members were also sent for training, workshop, seminars etc. in their respective areas. In addition, the institute encourages all its employees to upgrade their educational qualifications and professional skills through voluntary participation in part-time

training/degree/diploma courses. The Institute also enables employees to seek these opportunities through in-house facilities including Library facilities, English language courses and computational facilities. A few staff members have been permitted to pursue higher studies as well without affecting their office duties.

Details of Training Programme (Deputed out of Institutes)

Name	Post Held	Training obtained from	Training/Course	From	To
Mr. Tanmay Harsh Vaishnav	Senior Manager	Institute of Secretariat Training & Management under DoPT	Training Programme on Organizational Behavior in Government	29.04.2019	03.05.2019
Mr. Lala Ram Ahirwar	Senior Manager (Library)	Institute of Secretariat Training & Management under DoPT	Training Programme on Organizational Behavior in Government	29.04.2019	03.05.2019
Mr. Roshan Bhatia	Senior Manager	Institute of Secretariat Training & Management under DoPT	Training Programme on Organizational Behavior in Government	29.04.2019	03.05.2019
Mr. Rajan Thomas	Administrative Officer	Institute of Secretariat Training & Management under DoPT	Training Programme on Organizational Behavior in Government	29.04.2019	03.05.2019
Mr. Kapil Kumar Gupta	Manager (Library)	Biju Patnaik Central Library Nit Rourkela	National Conference on Advanced Automation Technologies for Next-Gen Libraries (ATNL)	20.05.2019	24.05.2019
Mr. Dushyant Pratap	Deputy Manager	National Institute of Financial Management, Faridabad	Management Development Programme on Public Procurement	16.09.2019	21.09.2019
Mr. Pradeep Agarwal	Joint Registrar	National Academy of Human Resource and Development(NAHRD), Goa	Workshop on Goods & Services Tax (GST)	23.09.2019	25.09.2019

Mr. Rajan Thomas	Administrative Officer	Institute of Secretariat Training & Management under DoPT	Training on Communication Skills	03.10.2019	04.10.2019
Mr. Harshraj Singh Chouhan	Deputy Manager	National Institute of Financial Management Faridabad	Workshop on Public Procurement	02.12.2019	07.12.2019
Mr. Sunil R. Chandanshive	Deputy Manager (Grade-I)	Inegrated Training & Policy Research, New Delhi	Workshop on Public Procurement, E-Procurement, Govt. e-Marketplace (GeM)	10.10.2019	12.10.2019
Mr. Swapnil Sonp	Deputy Manager	National Institute of Financial Management, Faridabad	Workshop on Public Procurement	14.10.2019	18.10.2019
Mr. Deepanshu	Manager	Institute of Secretariat Training and Management	Orientation Training Programme on Drafting in Disciplinary Matters	06.01.2020	07.01.2020
Mr. Nilesh Jadhav	Manager	EEPC India (Engineering Export Promotion Council)	How to be successful in Export	31.01.2020	31.01.2020

Details of Training Programme (In-house)

SN	Topics of Training	Trainer/Instructor	Designation	Date	Officials participated in training
1.	Training session on Finance, Accounts & works related issues	Mr. Ajay Prasad	Deputy Registrar, IIT Bombay	16.08.2019	Estate and F&A section
2.	Induction training session for newly joined staff	Mr. Siba Prasad Hota	Registrar I/c, IIT Indore	23.08.2019	40 Staff Participated
3.	Office procedure for lab In-charge and office	Mr. Santosh Kumar Khare	APO, RRCAT	04.09.2019	4 Staff Participated
4.	Training session on issues related to Finance and Estate Section	Mr. Dnyaneswar K. Sawalkar	Deputy Registrar (Estate Section), IIT Bombay	12.09.2019	Estate and F&A section

5.	Lecture on compliance of labour laws and welfare measures	Mr. P. K. Bidua	Regional Labour Commissioner, Central	20.08.2019	Contractors, Service Providers & Administrative Staff Members
6.	Training on Office Procedure	Mr. Santosh Khare	APO, RRCAT	05.10.2019	Group 'B' & 'C' employees
7.	Record Management	Mr. Siba Prasad Hota	Registrar I/c, IIT Indore	05.10.2019	Group 'B' & 'C'
8.	Training session on Employee Provident Fund (EPF).	Shri Amardip Mishra	Regional P.F. Commissioner , Indore	04.11.2019	Group 'B' & 'C' employees
9.	Prevention of Sexual Harassment at Workplace	Mr. K. G. Verma	Former Joint Secretary, Govt. of India	28.02.2020	Teaching, Non-Teaching, Staff and Students
10.	Training session on Purchase Procedures	Mr. Siba Prasad Hota	Registrar I/c	20.02.2020	All Non-Teaching Staff

a. **<u>In-House Enlightening Sessions Organized By Iit Indore</u>**

- **Lecture on compliance of Labour Laws and Welfare Measures**
  Mr. P.K Bidua, Regional Labour Commissioner (Central) was invited in the month of August 2019 to address all the contractors/staff members on Compliance of Labour Laws. He has guided the institute officials and associated contractors about the modalities in labour laws and about the statutory documentations to be maintained as a Contractor and as Principal Employer. Mr. Bidua also answered the basic queries raised by the participants. It was a knowledge enhancing session for all.

- **Training session on Employee Provident Fund**

  Shri Amardip Mishra, Regional P.F. Commissioner (Gr.I) Indore was invited as a speaker for training session in the month of November 2019. Representatives from all the contractors associated with the institute including officials and staff members from Finance, Infrastructure Development and Administration section have attended the same. It covers a brief guidance about the procedures and statutory norms applicable under the EPF Act and the queries raised by the contractors were also resolved.


- **Session on Prevention of Sexual Harassment at Workplace**

  A full day session was organized in the month of February 2020 wherein Mr. KG Verma, former Joint Secretary, Govt. of India was invited as an expert. The session broadly covers the Meaning of Sexual Harassment and other terms used in the Prevention of Sexual Harassment Act, Machinery for Redressal of Complaints- Complaints Committees, Appellate Authorities and Courts and it explains in brief about the Complaints, Conciliation and Action Pending Inquiry it also focuses on procedure for Conduct of enquiry by the complaints committee. Around 80 members have participated in the session.

1.7 Reforms measures undertaken during the year inter-alia include:

- As per Govt. of India guidelines reservation policy for Economically Weaker Sections (EWSs) has been adopted consequent upon approval of Board of Governors.
- In order to streamline the functionality of Administration Section the entire matters related to faculty members has been shifted to the Faculty Affairs Office, which is working under the superintendence of Dean, Faculty Affairs.
- Inclusion of budgetary provision/limit for House Building Advances for each financial year.
- Appointment of Lab Safety Officer to ensure proper management of labs running under various disciplines and to ensure the safety measures.
- Appointment of Residential Medical Officer on short term contract to strengthen the existing Health Centre facilities.
- Efforts have been made for establishment of creche facility and opening of Kendriya Vidhyalaya inside the campus.
- MoU with top hospitals in the city has been renewed timely for providing medical facilities to the institute community members.
- Institute has initiated practice of providing a link on institute website for the vacancies issued through manpower agency to ensure wide publicity and for recruiting better candidates.
- Measures have been initiated to increase transparency in working procedures as per the instructions of Central Information Commission (CIC). All Grievances / RTI have been closed in a timely and hassle- free manner.

1.8 Activities held as per MHRD instructions:

- Celebration of International Yoga Day 2019
- Observing the Birth Anniversary of Sardar Vallabh Bhai Patel on 31stOctober 2019 "Rashtriya Ekta Diwas"
- Unity Run
- Pledge Taking
- Observance of Vigilance Awareness Week 2019
- Celebration of "Constitution Day"

2 Faculty Affairs

2.1 Faculty Affairs Office is a dedicated office for the faculty members to deal with all administrative matters related to them. It maintains administrative records from recruitment to relieving of the faculty members. The office was headed by the Dr. Subhendu Rakshit, Dean of Faculty Affairs (DoFA) till February 20, 2020. Presently, it is headed by Dr. Amod C. Umarikar, Acting DoFA and Associate Dean, who is assisted by Cdr. Sunil Kumar (Retd.) - Deputy Registrar, Mr. Tanmay Vaishnav – Senior Manager, Mr. Amit Mishra – Manager (Technical).

a. This office enables the following tasks:

- Conduct of recruitment drive and Appointment of permanent/contractual/ visiting/emeritus faculty members in various departments.
- Joining Formalities of newly joined faculty member.
- Maintenance of Service Records and Personal File of faculty members.
- Processing of all service matters including pay, promotion, leave, LTC, dependent list, deputation, annual increment, extension of tenure for contractual appointments, confirmation, etc.
- Regular updation of service details.

- Providing responses for MHRD/RTI Queries and Lok Sabha/Rajya Sabha questionnaires.

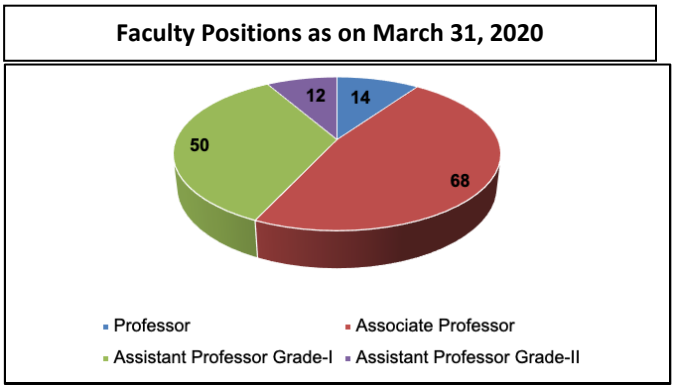
b. Some of the works undertaken during the year 2019-20 are as follows:

- Commencement of procedure of following recruitment drives:
  (i) Special Recruitment Drive for Reserved Category and PWD candidates dated August 26, 2019.
  (ii) Rolling Advertisement for Recruitment of Faculty Members at IIT Indore dated August 30, 2019.

- Digitization of the records maintained by the office.
- Formulation of various policies for standardization of rules and procedures.
- Streamlining the joining formalities to ensure minimal movement and faster adaptation of the newly joined member to the new environment.
- Reduced paperwork and approval through emails.
- Dedicated manpower for faster processing of documents.

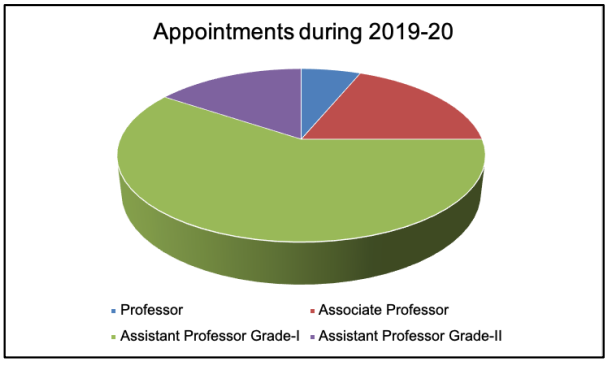
2.4 The faculty positions filled as on March 31, 2020 is as follows:

Designation	No.
Professor	14
Associate Professor	68
Assistant Professor Grade-I	50
Assistant Professor Grade-II	12
Total	**144**



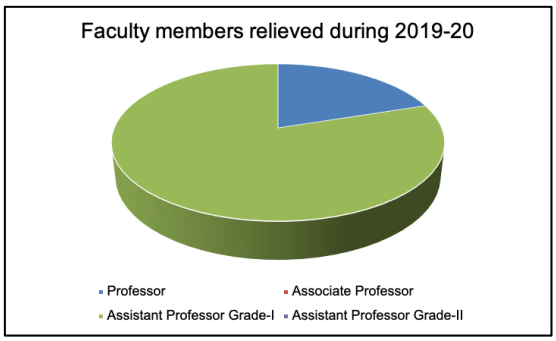
2.5 The number of faculty members joined service at IIT Indore during the year 2019-20 is 32 and details are as follows:

Designation	No.
Professor	02
Associate Professor	06
Assistant Professor Grade-I	19
Assistant Professor Grade-II	05
Total	**32**



2.6 The number of faculty members relieved during the year 2019-20 owing to their resignation or other reasons is 05.

Designation	No.
Professor	01
Associate Professor	00
Assistant Professor Grade-I	04
Assistant Professor Grade-II	00
Total	**05**



2.7: Following faculty members had been relieved on deputation during the year 2019-20:

(a) Dr. Narendra S. Chaudhari, Professor, CSE on Deputation to Uttarakhand Technical University, Dehradun w.e.f. January 28, 2019 for three years.
(b) Dr. Neeraj Mishra, Assistant Professor Grade-I, HSS on Deputation to National Institute of Rural Development & Panchayat Raj (NIRDPR) Hyderabad from January 24, 2019 to February 18, 2020.

Following faculty members have sought sabbatical leave for research activities during the year 2019-20:

(a) Dr. Rajneesh Misra, Professor, Chemistry on sabbatical leave to Alexander von Humboldt Foundation, Germany from June 4, 2019 for one year.
(b) Dr. Sarika Jalan, Professor, Physics on sabbatical leave to Max Planck Institute for Physics of Complex Systems, Dresden, Germany and Institute of Basic Sciences, Daejeon, South Korea from February 1, 2020 for 11 months.

The list of faculty members who joined IIT Indore during the year 2019-20 is as under:

Sl. No.	Name of Faculty Member	Department	Position/ Designation	Date of Joining
1	Dr. Manoneeta Chakraborty	AASE	Assistant Professor (Grade I)	13-Aug-19
2	Dr. Amit Shukla	AASE	Assistant Professor (Grade I)	1-Oct-19
3	Dr. Sharad Gupta	BSBE	Associate Professor	13-Aug-19
4	Dr. Debasis Nayak	BSBE	Associate Professor	19-Aug-19
5	Dr. Avinash Sonavane	BSBE	Professor	13-Aug-19
6	Dr. Ganti S. Murthy	BSBE	Professor	6-Dec-19
7	Dr. Selvakumar Sermadurai	Chemistry	Assistant Professor (Grade I)	3-Sep-19
8	Dr. Umesh A. Kshirsagar	Chemistry	Assistant Professor (Grade I)	12-Sep-19
9	Dr. Surya Prakash	CSE	Associate Professor	13-Aug-19
10	Dr. Somnath Dey	CSE	Associate Professor	13-Aug-19
11	Dr. Swaminathan R.	EE	Assistant Professor (Grade I)	16-Mar-20
12	Dr. Akshaya Kumar	HSS	Assistant Professor (Grade I)	6-Mar-20
13	Dr. Ananya Ghoshal	HSS	Assistant Professor (Grade I)	6-Mar-20
14	Dr. M. Tanveer	Mathematics	Associate Professor	19-Aug-19
15	Dr. Sanjeev Singh	Mathematics	Assistant Professor (Grade I)	19-Mar-20

16	Dr. Bapan Ghosh	Mathematics	Assistant Professor (Grade I)	12-Sep-19
17	Dr Santanu Manna	Mathematics	Assistant Professor (Grade I)	20-Sep-19
18	Dr Vinay Kumar Gupta	Mathematics	Assistant Professor (Grade I)	1-Oct-19
19	Dr. Bibekananda Maji	Mathematics	Assistant Professor (Grade II)	17-Oct-19
20	Dr. Charitha Cherugondi	Mathematics	Assistant Professor (Grade II)	20-Mar-20
21	Dr. Shailesh Kundalwal	ME	Associate Professor	19-Aug-19
22	Dr. Girish Chandra Verma	ME	Assistant Professor (Grade II)	9-Aug-19
23	Dr. Harekrishna Yadav	ME	Assistant Professor (Grade II)	7-Oct-19
24	Dr. Satyanarayan Patel	ME	Assistant Professor (Grade I)	20-Nov-19
25	Dr. Dan Sathiaraj	ME	Assistant Professor (Grade I)	20-Nov-19
26	Dr. Ankur Miglani	ME	Assistant Professor (Grade I)	9-Dec-19
27	Dr Ram Sajeevan Maurya	MEMS	Assistant Professor (Grade II)	19-Sep-19
28	Dr. Dudekula Althaf Basha	MEMS	Assistant Professor (Grade I)	14-Oct-19
29	Dr. Sudip Chakraborty	Physics	Assistant Professor (Grade I)	14-Aug-19
30	Dr. Srimanta Pakhira	Physics	Assistant Professor (Grade I)	14-Aug-19
31	Dr. Dipankar Das	Physics	Assistant Professor (Grade I)	31-Oct-19
32	Dr. Debajyoti Sarkar	Physics	Assistant Professor (Grade I)	11-Nov-19

The list of faculty members relieved from IIT Indore during the year 2019-20 is as under:

Sl. No.	Name of Faculty Member	Department	Position/Designation	Date of Relieving
1	Dr. Sushabhan Sadhukhan	BSBE	Assistant Professor (Grade I)	01-Jul-19
2	Dr. Pramod Ganapathi	CSE	Assistant Professor (Grade I)	15-Jul-19
3	Dr. Anupam Pal Choudhury	Mathematics	Assistant Professor (Grade I)	13-Dec-19
4	Dr. Subbareddy Daggumati	ME	Assistant Professor (Grade I)	11-Dec-19
5	Prof. Pradeep Mathur	Chemistry	Professor (Director)	31-Dec-19

3. Finance and Accounts

3.1 The year 2019–20 is characterized with the following Income and Expenditure:

(` in crores)

S. No.	Particulars	2019-2020 Current Year
1	**INCOME**	
1.1.	**Grants**	93.68
1.2.	Academic Receipts	19.70
1.3.	Income from Investment	6.81
1.4.	Interest Earned	7.83
1.5.	Other Income	4.16
1.6.	**Total of 1**	**132.18**
2	**EXPENDITURE**	
2.1.	Staff Payments & Benefits	59.46
2.2.	Academic Expenses	21.85
2.3.	Administrative & General Expenses	22.00
2.4.	Transportation Expenses	0.47

2.5.	Repairs and Maintenance	3.63
2.6.	Depreciation	31.54
2.7.	Other Expenses	0.50
2.8.	**Total of 2**	**139.46**
3	**Balance being excess of Income over Expenditure**	**-7.28**

3.2 The position relating to creation of capital assets is as under:

(` in crores)

S. No.	Particulars	2019-2020		
		HEFA	Other Purpose	Total
2.1	Opening Balance of Grant-in-Aid Plan	16.39	85.64	102.03
2.2	Grant received during the year	51.41	127.95	179.36
2.3	Interest/Reversal from Corpus Fund	2.21	8.16	10.37
2.4	**Total funds available at the disposal of the Institute**	**70.01**	**221.75**	**291.76**
2.5	Grant utilized for Revenue Expenditure	-	93.68	**93.68**
2.5.1	Interest on Term Loan for HEFA	4.45	-	**4.45**
2.5.2	Repayment of HEFA Loan (75%)	32.78	-	**32.78**
2.6	**Plan Grant after adjusting utilization for Income & Expenditure**	**32.78**	**128.07**	**160.85**
2.7	Utilized for developing infrastructure Buildings & Works 47.49 Utilized for Equipment's and other Assets 29.99	-	77.48	77.48
2.8	Unspent balance as on 31.03.2020	32.78	50.59	83.37

a. Funds availability and status of utilization thereof:

During financial year 2019-20, against sanction of Revised Detailed Project Report (DPR) of ` 1,902 crores, a sum of ` 179.37 crores (For Recurring & non-recurrning Purpose ` 127.95 crores + For HEFA Purpose ` 51.42 crores) were released by Ministry of Human Resource Development and Interest /Reversal from Corpus Fund (related to previous year) credited to Grant-in-Air `10.37 crores. The Internal income of the Institute reckoned during the year was ` 23.86 crores, and after considering the unspent balance as on 01.04.19 of ` 102.03 crores, the total funds available at the disposal of the Institute was of the order of ` 315.63 crores.

A sum of `77.48 crores has been utilized for the creation of Capital assets and a sum of ` 130.91 cores (For Recurring purpose Rs. 93.68 crores + For HEFA purpose `37.23 crores) (which excludes Depreciation of ` 31.54 crores) was incurred on recurring expenditure out of the grant at the disposal with the Institute. Further Internal Revenue Generation for the year amounting to ` 23.86 crores transferred to Corpus Fund.

3.4 Reforms, measures and initiatives undertaken during the year include:

During the year under review the following reforms, measures Initiatives were initiated from Finance & Accounts :

3.4.1 Tuition fees for the undergraduate students joining from Academic Year 2019-20 is revised and subsequently MHRD has introduced Vidyalaxmi scheme vide MHRD letter No. 24-2/2016 TS 1 dated July 14, 2016 for provision of interest free loans to students for first five years to be paid by IIT. 27 students applied for Education loan under Vidyalaxmi scheme through State Bank of India, Nodal Bank for the scheme. Interest implication for Financial Year 2019-20 is Rs. 10,30,320/-.

3.4.2 Public Finance Management System (PFMS) is a platform for all DBT payments.

3.4.3 Institute has developed payment gateway on IIT Indore website with State Bank of India and HDFC Bank Ltd as channel partner bank for the facility.

3.5. Education assistance for children:

During the financial year 2019-2020, the Institute reimbursed a sum of ` 49,13,803/- to 156 faculty and staff members against for education assistance according to Government of India norms.

3.6. Transport facilities for staff members:

Transport facilities to students/ faculty members/ staff members have been provided for the benefit of movement of staff from institute campus to Indore city at subsidized rates as the IITI Campus is located far away from Indore city.

a. **Advances**:

During the reporting year, a total sum of ` 86.24 lakhs was sanctioned as personal advances for the following.

Sl. No.	Nature of Advance	No. of Beneficiaries	Amount Sanctioned	Amount outstanding as on 31.03.2020
			(in Rs.`)	(in Rs.)
1	House Building Advance	06	79,57,400	83,60,080
2	Car Advance	-	-	1,01,000
3	Two-wheeler advance	-	-	1,16,957
4	Personal computer advance	01	50,000	45,800
		Total	**80,07,400**	**86,23,837**

3.8 Insurance:

Group Medical Insurance cover of ` 2.50 lakhs is provided to all students of the Institute for In-Patient treatment. Expenses towards insurance is ` 22,95,543/- during financial year 2019-20. Care of Out-patient treatment is taken care mainly by the Health Centre internally.

3.9 Fellowships/scholarships:

3.9.1. To Research Students:

During financial year 2019-20, Institute has disbursed Fellowships for following category of Students:

S. No.	Category of Students	No. of Student	Fellowship (per month)
01.	Institute Funded through MHRD grant-PHD	366	JRF- Rs. 31,000/- + HRA @ 16% SRF- Rs. 35,000/- + HRA @ 16%
02.	DST Funded (PHD)	28	
03.	CSIR Funded (PHD)	52	
04.	UGC Funded (PHD)	54	
05.	Institute Funded through MHRD grant – M. Tech.	104	**Rs.** 12,400/- + HRA @ 16%
06.	Institute Funded through MHRD grant – M. S. Research	26	Rs. 12,400/- + HRA @ 16%

3.9.2. Merit cum Means Scholarship:

Institute has disbursed Rs. 2,82,67,746/- as Merit cum Means Scholarships to B. Tech & MSc. Students who are meeting the eligibility criteria set by Institute under various categories:

S. No.	Category	Course	No. of Students	Amount of Scholarship
1	General	B. Tech	126	1,60,76,889
		MSc	16	2,75,569
2	General (PD)	B. Tech	2	60,069
		MSc	2	35,766
3	OBC	B. Tech	70	1,06,88,920
		MSc	10	1,43,896
4	SC	B. Tech	25	5,63,654
		MSc	6	1,04,136
5	ST	B. Tech	14	2,78,277
		MSc	1	13,258
6	OBC (PD)	B. Tech	1	27,312
		MSc	-	-
Total			**273**	**2,82,67,746**

3.9.3. Remission of Tuition Fees to Deproved Class of Students:

Institute has Remitted/disbursed Rs. 1,87,66,706/- as Remission of Tuition fees of Under Graduate Students of Depraved Class admitted in Academic Session 2019-20 as per Ministry of HRD letter F. No. 24-2/2016 TS 1 dated April 04, 2016.

Summary of the Balance Sheet and Income & Expenditure is as under:

A. BALANCE SHEET AS AT 31ST MARCH'2020

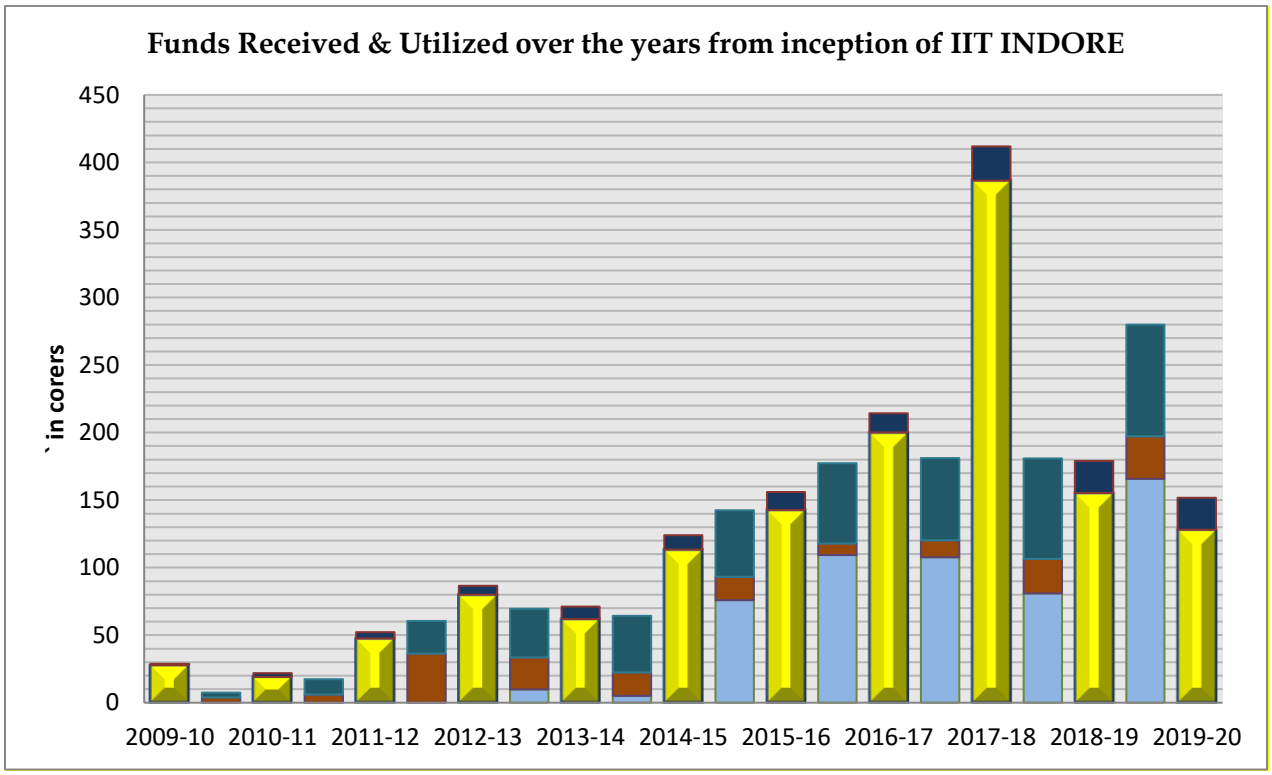
(Amount in Rs.)

SOURCES OF FUNDS	SCHEDULE	AS AT 31-03-2020	AS AT 31-03-2019
Corpus/Capital Fund	1	7,90,01,34,909	7,04,79,42,889
Designated/Earmarked/Endowment Funds	2	9,86,03,056	8,54,03,008
Current Liabilities & Provisions	3	3,59,80,35,528	2,69,46,83,098
TOTAL		**11,59,67,73,494**	**9,82,80,28,995**
APPLICATION OF FUNDS			
FIXED ASSETS	4		
A. Tangible Assets		6,04,86,44,773	4,15,57,94,799
B. Intangible Assets		4,33,10,717	5,23,90,532
C. Capital Work-In-Progress		2,40,54,06,939	2,15,99,09,274
INVESTMENTS FROM EARMARKED/ ENDOWMENT FUNDS	5		
Long Term			
Short Term		5,36,456	5,00,000
INVESTMENTS – OTHERS	6	-	-
CURRENT ASSETS	7	2,33,51,83,486	2,08,34,72,243
LOANS, ADVANCES & DEPOSITS	8	76,36,91,123	1,37,59,62,147
TOTAL		**11,59,67,73,494**	**9,82,80,28,995**

B. INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH'2020

(Amount in `)

PARTICULARS	SCHEDULE	2019-2020	2018-2019
(A) INCOME			
Academic Receipts	9	19,70,49,324	13,77,34,262
Grants & Subsidies	10	93,67,76,363	95,33,00,000
Income from Investments	11	6,80,54,242	-
Interest Earned	12	7,83,51,909	8,15,93,753
Other Income	13	2,38,12,191	1,51,85,044
Prior Period Income	14	1,77,52,447	11,54,968
TOTAL (A)		**1,32,17,96,476**	**1,18,89,68,027**
(B) EXPENDITURE			
Staff Payments & Benefits (Establishment Exp)	15	59,46,44,401	43,65,93,404
Academic Expenses	16	21,85,49,518	17,45,08,815
Administrative and General Expenses	17	22,00,72,502	16,99,79,083
Transportation Expenses	18	46,43,599	48,84,989
Repairs and Maintenance	19	3,63,01,668	3,47,35,858
Finance Costs	20	1,31,277	4,94,676
Depreciation	4	31,54,19,837	26,36,82,026
Other Expenses	21	20,44,537	19,27,758
Prior Period Expenses	22	28,37,604	41,26,878
TOTAL (B)		**1,39,46,44,943**	**1,09,09,33,487**
Balance being excess of Income over Expenditure (A-B)		**-7,28,48,467**	**9,80,34,541**
Less: (i) Interest payable to MHRD		-7,83,51,909	**-**
(ii) Transfer to Corpus fund towards Internal Revenue Generation of 2019-2020 (2018-19) (See Significant Accounting Policies - point no. 8.1)		-30,66,68,204	-23,56,68,027
Total		-45,78,68,580	-13,76,33,487
Add: Amount transfer from Capital Fund			
- Depreciation 31,54,19,837		-	26,36,82,026
- Leave Encashment liability 11,94,99,197		-	-
- Gratuity liability 2,29,49,546		-	-
Balance being Surplus (Deficit) Carried to Capital Fund		-45,78,68,580	12,60,48,539



Sr. No.	Particulars		2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
1	RECEIPT	GRANT	`27.78	`19.15	`47.47	`80.00	`62.00	`113.45	`142.80	`200.00	`386.44	`155.33	`127.95
		IRG	`0.97	`2.65	`4.68	`6.58	`9.10	`10.51	`13.24	`14.37	`25.52	`23.57	`23.86
2	EXPENDITURE	BUILDING	`0.00	`0.00	`0.00	`9.89	`4.98	`75.82	`109.41	`107.77	`80.93	`165.81	`47.49
		EQUIPMENT	`3.99	`5.98	`36.36	`23.54	`17.29	`17.39	`8.46	`12.54	`25.48	`31.45	`29.99
		RECURRING	`3.50	`11.47	`24.06	`36.14	`42.15	`49.32	`59.51	`60.79	`74.54	`82.73	`93.68

5. Safety and Security Department

IIT Indore gives top priority to the safety and security of students, faculty members, scientists, staff members and visitors on its campus and in the laboratories. Periodic orientation programs are conducted for interns, faculty members, scientists and staff members of the Institute.

An Institute level safety and security committee is in place to ensure a safety and security culture in the campus. Currently, comprehensive security services within the campus are being looked after by M/S Central Investigation and Security Services Limited coordinated by our Chief Security Officer. Every discipline has their own safety committee to evolve, adopt and maintain best laboratory practices. To further strengthen our laboratory safety practices, the Institute have appointed a laboratory safety officer.
Lab wise safety guidelines are being developed for each and every lab in the campus for implementation of safety culture in the Institute.

To spread awareness for fire safety, bio-safety and chemical safety, comprehensive safety guidelines for lab users in the Institute have been compiled and made available on the web page of the safety and security department.

Round the clock patrolling unit and emergency control room are operational, for responding to any on- campus/off campus emergency to any community member of IIT Indore.

Regular fire-fighting training and demonstrations are being conducted for security personnel, community members are also encouraged to participate in the practical sessions. On-the-job training by the security agency and training on emergency rescues from lifts have been conducted for security staff by various OEMs.

More usage of technology is being introduced in the security setup of the Institute. A few are listed below:

- All critical areas in the campus are under 24x7 CCTV surveillance.
- A web-based visitors' pass system is in place for facilitating visitors' smooth entry to the campus.
- A web-based labour entry system has been developed in-house for smooth entry of labourers to the campus
- Biometrics/card based access control have been installed in all the laboratories and other facilities of the Institute.
- A centralized security control room has been developed at the Hub Building.
- A portable fire pump and breathing apparatus sets are available to quickly respond to any fire incident in the campus.
- Separate gates for entry have been adopted for material and persons at the Institute in view of the COVID-19. All entries have been made non-touch, the personnel are being given entry to the premises after thorough thermal screening and strict questionnaire.

6. Health Centre

The Health Centre provides dedicated health services to the Institute community. It includes outpatient, daycare, trauma and emergency medical care, and inpatient services for minor ailments.

The medical team comprises of medical officers, specialist consultants and well trained paramedical and supporting staff.

6.1 Facilities:

- OPD
- Inpatient service for minor ailments
- Day care
- Physiotherapy
- Trauma and emergency care
- Investigation facility
- Pharmacy
- 24 X 7 ambulance services

6.2 The investigation facility includes-

- ECG Facility
- Rapid Spot blood investigation
- For higher evaluation- Sample collection facility

6.3 Facility up-gradation-

- Dental facility
- Speciality and super-specialty consultation O.P.D. services
- Tele-consultation facility

6.4 Preparedness to deal with Covid 19 pandemic-

As the global cases of Covid 19 were increasing worldwide in March 2020, medical team planned for various preparatory measures. Training sessions were conducted for medical staff. Preventive measures were implemented as per guidelines of Ministry of Health and Family Welfare, Government of India from time to time. Various awareness posters and online material was communicated to institute community. Training sessions of housekeeping and other support front-line employees were carried out for proper sanitization in the institute as per norms.

Data of services provided during 2019-2020

Sr. No.	OPD cases	Trauma and Emergency cases	ECG done	In-house blood investigations	Admissions including day care
1	18378	605	834	997	198

7. Hostel Facility

7.1 The section is headed by Dr. Lalit Borana, Chief Warden who is assisted by Wardens & Associate Wardens for each Hostel and a Dining Warden. Dr. Ram Sajeevan Maurya is the Dining Warden of the Institute. The Wardens and Associate Wardens are as follows:

S. No.	Name of the Hostel	Warden	Associate Warden
(a)	Devi Ahilya	Dr. Ruchi Sharma	Dr. Ananya Ghosal
(b)	APJ Abdul Kalam	Dr. Guru Prakash	Dr. Harekrishna Yadav
(c)	Vikram Sarabhai	Dr. Ashok Kumar Mocherla	Dr. Vinay Kumar Gupta
(d)	Homi Jehangir Bhabha	Dr. Abhijit Joshi	Dr. Puneet Gupta
(e)	C V Raman	Dr. Jayaprakash Murugesan	Dr. Saptarshi Ghosh

7.2 Hostels: The Institute has 05 hostels which provide students with a homely environment, overseen by a dedicated and professional housekeeping team. Each hostel has 98 units with capacity of accommodating total 490 students. Each unit has five bedrooms with single occupancy for each room. It also has a furnished living area, common kitchen, two toilets and two washrooms. IIT Indore ensures that students from different states, languages and different departments are allotted in a unit to promote inter-disciplinary approach in study and research and national bonding among them.

7.3 Facilities: The basic facilities in each unit include Refrigerator, Sofa, RO water with chiller facility along with hot water in washrooms as well as intercom telephones, discussion tables, study tables, lights, fans, an almirah, and a cot.

7.4 Recreational Facilities: Televisions have been installed in common areas. Sports and Gymnasium facilities are also available. A turf badminton court in the hall quadrangle has been made available for students. Further each hostel has a foosball and table-tennis tables in the common area.

7.5 Dining Facility: Students are served healthy meals wherein the menu is decided by the dining committee and is updated regularly. Flexible options are available to pay as you eat i.e. Meal wise (Breakfast/ Lunch/ Hi-Tea/ Dinner), Day, Monthly and Semester. The payment is done through Smart Card Facility and is cashless only. Other than regular dining services, there are food kiosks which serve delicacies round the clock – Taste Buds, Café Zippy, Shiru Café, Tea Post, Aladeen and Café Zoom.

7.6: Other Facilities. A student facilities center, La' Fresco, serves food items, vegetables, fruits and stationery and daily needs. In addition, Amul outlet is also in the campus which serves dairy products.

Centre for Innovation and Entrepreneurship (CIE)

Centre for Innovation and Entrepreneurship (CIE) was established in 2016. CIE is an umbrella setup at IIT Indore for fostering entrepreneurship and nurturing the start-ups. It administers a business incubator which provides 'Start to scale' support for technology-based entrepreneurship and facilitates the conversion of research activity into entrepreneurial ventures.

CIE Aims to transform knowledge and Innovation into the creation of successful innovative entrepreneurs. Mentoring and developing competitiveness, Innovation, enhancing links between Industry and students to enable them to develop emerging technology and be the best entrepreneurs.
CIE team reports to Prof. Anand Parey, Dean of Resources Generation. Dr. Santosh Kumar Vishwakarma, Convener CIE, CIE Committee, Dr. Kumar Gaurav (AO CIE), Ms. Kavita Enamdar, are managing Incubation and entrepreneurship activities with the joint efforts of students of E-Cell.

Collaborations for Funding: -

- During the year, 12 startups Ideas have been submitted by various students and faculties under the umbrella of Center for Innovation and Entrepreneurship, IIT Indore for the funding of Rs. 2.80 crore from Ministry of Micro, Small & Medium Enterprises.
- Proposal Design Center has been submitted for funding of 1.99 Crore from MSME.
- Institute has allocated funds for students for best innovative ideas.
- Collaboration has been done with Angel Investors for unlimited seed funding based upon the startup's ideas.
- Collaboration has been done with various banks and MSME for loan and startup funding.

Collaborations for the Support and Facilities: -

1. Fully furnished air-conditioned Offices, Board Room, Conference Room.
2. Wi-Fi and IT Support.
3. Mentorship for Innovation, research, testing, prototyping.
4. Financial aids.

Webinar organized during Covid-19 situations

1. Mrs. CA Vanita Rathi has delivered webinar on How to register a new company and start business.
2. Mr. Nilesh Trivedi, Officer, MSME has delivered webinar on Various Government policies for easy setup of startup.
3. Mr. CS Raj Kapadia has delivered webinar on Understanding the forms of Business Entities and procedures for registration.
4. Dr. Abrar Ali Saiyed has delivered webinar on Bright and Dark Side of Entrepreneurship.
5. Professor Sunil Shukla, Director, EDI has delivered webinar on Accelerating Entrepreneurship in New India.
6. More than 25 Webinar organized jointly with Ministry of Micro, Small and Medium Enterprises on various topics.

Events by Entrepreneurship cell: -

- ✓ E- Summit.
- ✓ Crazy Ideas.
- ✓ Smart India Hackathon.
- ✓ Market Simulation.
- ✓ Enrollment of Startups.
- ✓ Entrepreneurship Talk Series under the umbrella of Back to the Institute program.

Startups associated with IIT Indore: -

- ✓ Swaaha Resource Management.
- ✓ Chota Hospital.
- ✓ FundsSMEs.
- ✓ Consult Worrier.
- ✓ Krishakkalyan.
- ✓ Chain Traq.

List of Entrepreneurs of IIT Indore

- ✓ Sandeep Bommireddi, Co-founder of Adonmo.
- ✓ Jwalant Shah Co-Founder of SWAAHA Resource Management Pvt. Ltd .
- ✓ Ankit Goyal, Director of Unacademy Brands-GATE
- ✓ Rohit Nitin Joshi, Co-Founder at Kreatryx
- ✓ Gaurav Parchani, Co-Founder at Turtle Shell Technologies Private Limited.
- ✓ Rohit Agarwal, Co-Founder of SWAAHA Resource Management Pvt. Ltd.
- ✓ Ravi Shankar Founder & Director of Esmartify Private Limited & Boosters Edutech
- ✓ Shikhar Bansal Founder & Director at Boosters Edutech.
- ✓ Anmol Arora CEO- DocVita.
- ✓ Vikram Patel Co-Founder & CTO at DocVita.
- ✓ Venkata Sai Vamsi Penupothu Co-Founder @ Runo.
- ✓ Tushar Rokade Co-Founder at Artpillz.
- ✓ Ravi Shankar, Owner of Juicilicious CAFÉ.

E-Cell Students Team:

- ➢ Sumer Thakur
- ➢ Sudeep Kumar Patra
- ➢ Shreyas Naxatram
- ➢ Shiva Sharma
- ➢ Chirag Kothari
- ➢ Vardhan Palliwal
- ➢ Suyash Jain
- ➢ Samith Damani
- ➢ Sashikanth Gupta
- ➢ Saumya Bharti
- ➢ Likhita Kyatham
- ➢ Sriya Reddy
- ➢ Vinay Kondeti
- ➢ Divyansh Sahu
- ➢ Ismail Malekji
- ➢ Yash Ranjan
- ➢ Yash Survana
- ➢ Nikunj Chhabra
- ➢ Ankit Pandey
- ➢ Anubhav Singh
- ➢ Desa Bipin Chandh
- ➢ Arpit Vyas
- ➢ Prince Jaiswal

V. Lohit

Sai Kumar

Centre for Advanced Electronics (CAE)

Centre for Advanced Electronics (CAE) has been established at IIT Indore as an interdisciplinary research centre which aims to develop materials, devices & technologies for multidisciplinary applications including computing, communication, medical and energy. The CAE has brought some of the academicians at IIT Indore, working in electronics and its allied areas, under one technical roof to enable high quality applied research for the benefit of mankind. We are honored to have on board some of the renowned academicians, in the area of electronics and related areas, across the globe as our advisors. The CAE is committed to come up as a platform for applied research, device development, and skill and manpower development in the nationally important area of electronics.

At present following research laboratories are part of the CAE:

- Nano & Energy Materials Laboratory
- Non-equilibrium Advanced Engineering Laboratory
- Hybrid Nanodevice Research Laboratory
- Nanoscale Devices, VLSI Circuit and System Design Research Laboratory
- Molecular and Nanoelectronics Research Group
- Optoelectronic Nanodevice Research Laboratory
- Materials & Device Research Group
- Oxide Thin Film Electronics Laboratory
- Supramolecular Chemical Nanoscience Group
- Mechanotronics and Instrumentation Laboratory
- Signals and Software Group (SaSg)

Knowledge Incubation for TEQIP (KIT, IITI)

The center's primary goal will be dissemination of knowledge (and know-how) to teachers, researchers and students through short-courses, workshops, and seminars. The center will continuously push forward to incubate new teaching and research methodologies that promotes efficiency and innovation in the areas of science and technology. The center will also promote creation of repositories for various online courses, subjects, manuals, and projects.

Dr. K. Eswara Prasad
KIT-IITI, Coordinator,

Mr. Pankaj Kumar Sahu
KIT-IITI, Technical Officer,

TEQIP: The Project, Third phase of Technical Education Quality Improvement Programme (referred to as TEQIP-III) is fully integrated with the Twelfth Five-year Plan objectives for Technical Education as a key component for improving the quality of Engineering Education in existing institutions with a special consideration for Low Income States and Special Category States (SCS) and support to strengthen few affiliated technical universities to improve their policy, academic and management practices.

Activity under TEQIP III:

- Faculty engagements including summer/winter internships at IITs and other courses.
- Summer/ winter internship (4 weeks) at IIT for UG and PG students from focus states.
- Competitive UG/ PG projects to promote UG research in the focus state TEQIP institutions.
- Credit transfer, collaborative PhD and Master's thesis (with the IIT), for availing academic ambience of IIT from focus and non-focus states.
- Funding for collaborative research for faculty (maximum two years) from mentee institution and 1 faculty from IITs.
- Installing peer review mechanism for assessing faculty performance (a detailed list of teachers of mentee institutions will be mapped with IITs.
- Training of Technical/ Library/ Administrative Staff in 2-3-day workshop.
- Periodic review by IIT faculty and offer consultation to project institution for development of laboratories.
- Organizing International / National conference in the project institution through collaboration with leading role by IIT.
- Gathering feedbacks participants on the activities attended from participating institutes at IITs.
- Organizing GATE sensitization orientation workshops at participating institutes through PG/PhD students / faculty of IITs

List of Activities during April 2019-March 2020:

S. No.	Name of Workshop/FDP/STC	Dates	Total No. of Participants
1	Recent Advancements in Water Resources and Environmental Engineering	April 22-27, 2019	1493
2	Faculty Induction Program 2019, PhaseI: June 17- 21, 2019 Phase II: June 24-28, 2019	June 17-28, 2019	
3	Summer Internship 2019	June-July 2019	
4	Programming for Research Applications using MATLAB	June 29 - July 01 2019	
5	VDAT Conference	July 4-6, 2019	
6	Industrial Application of Control Systems and Signal Processing	August 19-24, 2019	
7	CMA Conference	November 12-14, 2019	
8	STC on Data Analytics	November 30 December 3, 2019	
9	Workshop: Precision, Meso and Nano Engineering	December 9-11, 2019	
10	Workshop: Smart Manufacturing	December 11, 2019	
11	COPEN	December12-14, 2019	
12	STC on Photovoltaic Technology: From Devices towards Systems	December16 -18, 2019	
13	Significance, Securing and sustainability of Externally Funded Research Projects in Higher Education Institutes	December 16 - 21, 2019	

14	Geotechnical Aspects of Earthquake Engineering	December 26-28, 2019	
15	Students Winter Internship Programme	November 2019 - February, 2020	
16	Visiting Researcher Programme	December 2019 -February 2020	
17	Collaborative Research with TEQIP Faculty	2019-2020	
18	Workshop: Electron Microscopy	January 14-15, 2020	
19	Active Learning: Introduction to Scientific Computing in Engineering	January 15-17, 2020	
20	Application of MATLAB in Bio Engineering	January 27- February 01, 2020	
21	International Conference on "Emerging Areas in Biosciences and Biomedical Technologies (eBBT2)"	February 7-9, 2020	
22	Workshop on "Technological Advances and Its Implications on Various Industries"	February 7-9, 2020	
23	Faculty Training on Future Skill Technologies on "Data Science & Data Analytics"	March 02-12, 2020	

Student Activities

The Student Affairs Section is headed by Dr. Santosh Kumar Vishvakarma, Dean of Student Affairs assisted by Dr. Ajay Kumar Kushwaha - Associate Dean of Student Affairs, Cdr. Sunil Kumar (Retd.) - Deputy Registrar Student Affairs and Mr. Sunil Sawle - Manager Student Affairs.

The Student Affairs Section comprises of various sub sections, namely Technical, Cultural, Sports, Placement, Counselling and Hostels. These sections conduct activities to enhance their confidence, leadership qualities, attitude, management, communication and creative skills. The period from April 2019 to March 2020 witnessed a buzz of activity across various domains. It included resumption of Students' Gymkhana, creation of Graduate Students' Forum for PG students, formulation of Constitution of Gymkhana, making of Student Affairs Section webpage.

The Technical, Cultural and Sports section is led by Dr. Indrasen Singh, Dr. Mrigendra Dubey and Dr. Lalit Borana respectively.

Students' Gymkhana, an elected body of the students, was formed comprising of following members:

General Secretary	– Mr. Rhythm
Technical Secretary	– Mr. Jubin Nagpal
Science & Technology Secretary	– Mr. Himanshu Mishra
Sports Secretary	– Mr. Arun Sharma
Academic Secretary	– Mr. Gaurav Khadse
Hostel Affairs Secretary	– Mr. Puneet Krishna Chitkariya

In addition, Graduate Students' Forum was also formed to coordinate activities at the postgraduate level such as invited lectures/ seminars, sports, technical events and any other activity to enhance the participation of postgraduate students. It comprised of following members:

Secretary General	- Mr. Akshay Thakare
Secretary, Mechanical Engg.	- Mr. S. Jaya Chandran
Secretary, Electrical Engg.	- Mr. Vipin Gupta
Secretary, Computer Science & Engg.	- Mr. Akhilesh Mohan Srivastava
Secretary, Civil Engg.	- Mr. Akshay Thakare
Secretary, Metallurgy Engg. & Materials Science	- Mr. Aditya Kumar Litoria
Secretary, Biosciences & Biomedical Engg.	- Ms. Deeksha Tiwari
Secretary, Physics	- Ms. Ekta Yadav
Secretary, Chemistry	- Mr. Sambhu Nath
Secretary, Mathematics	- Mr. Bharat Richhariya
Secretary, Humanities & Social Sciences	- Mr. Salla K. Nithyanth
Secretary, Dept of Astronomy, Astrophysics & Space Engg.	– Ms. Parul Janagal

Technical Section

During the course of events in the last couple of years several interesting findings could be identified. It has been observed that in order to perform well professionally as well as personally, students should not only be knowledgeable, but need to develop civic, social, interpersonal and workplace skills as well. In addition to reinforcing concepts from earlier and concurrent courses, the Technical Clubs conduct frequent workshops which serve as a platform for exposing students to interdisciplinary topics. Also, students mature in areas such as oral and written communication, awareness of professional ethics, and working effectively in a team-based setting. Mixing of students from different disciplines and different grades greatly enhances sense of fellow feeling and team spirit. Such workshops, being conducted by the students themselves, increases the sense of belongingness, inculcates maturity, sensibility, leadership qualities among the organizing students.

Robotics:

The Robotics Club started its electrifying year with the introduction of robotics to the beginners. This session was kept for the beginners to apprise them on the activities done by the Club, importance of robotics in the present generation, and future plans. The Robotics Club has always put more emphasis on hands-on learning and training for fellow students through various workshops and training sessions. Controlling a robot and seeing what goes wrong, students learn what robots can and can't do. They also learn the need for precise instructions. As a part of such activity, workshop session on basics of robots and robotics was conducted this year with the aim to motivate students in design, estimation, fabrication and testing their own ideas of basic controlled robots.

RF Module Workshop (August 09, 2019):

The RF module workshop aimed to explain the making of transmitters & receivers and some basic stuff of robotics. The first part of the workshop was about the components required followed by second part explaining about the circuit diagrams of transmitter and receiver. The concluding part comprised of students using the components and diagrams to wire up the circuit.

Roborace Competition (September 14, 2019):

The RF Module workshop was followed by the students designing their own robots and deploying them for competition. The competition saw a large participation amongst the students and this competition acted as a catalyst to motivate the students to pursue designing of circuits and entering into a robotic era. It helped the students to hone their skills in improving the communication between transmitter and receiver by implanting various obstacles enroute. The students could work on their own design and learn from others too.

Drone Introduction Workshop (September 16, 2019):

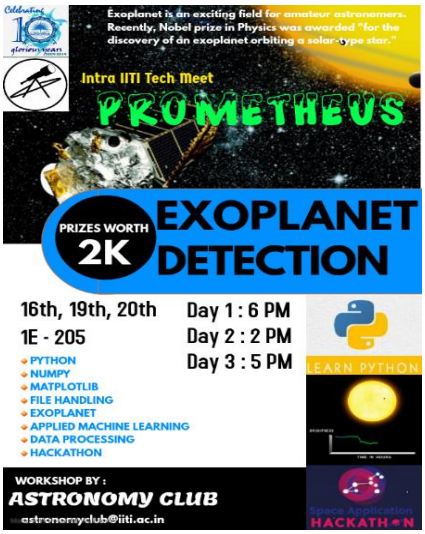
This being an introductory workshop, the participants were introduced to drones including their uses and physics behind drome flight dynamics. The components used in drones and their assembly was also shown followed by demonstrating a mini drone flight. The components that are common to drones and planes were also brought into their knowledge.

AUTOCAD Workshop (August 14, 2019):

The Concreate Club conducted an AUTOCAD workshop for the students entailing basic commands, terminology and basic use. The workshop included the use of AutoCAD in a 2D & 3D computer-aided drafting software application used in architecture, construction, and manufacturing arenas assisting in the preparation of blueprints and other engineering plans. It also included description of zero screen features including templates and other tools, setting scale and drawing basic shapes like circles, lines, rectangles, polylines, arcs, polar arcs, etc. by command keywords as well as panel shortcuts. Handy and smart use of commands emphasizing on time saving were also covered.

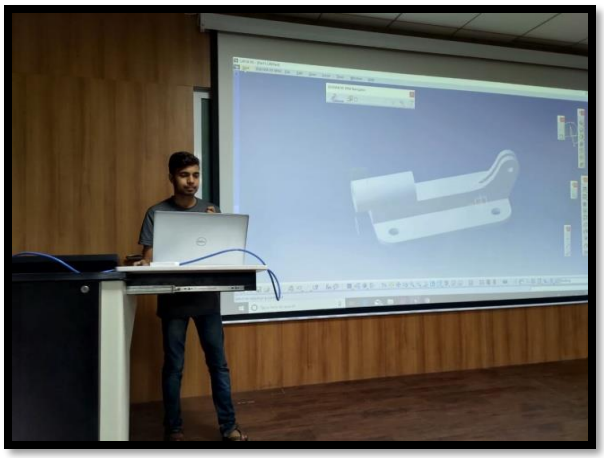
Exoplanet Detection (October 16, 19 & 20, 2019):

The Astronomy Club conducted a 03-day workshop to motivate the students on studying celestial bodies and detecting exoplanets, planets like ours in other solar systems. The first day focused on those who were new to python, from identifiers to functions followed by visual representation in form of different graphs using matplotlib and various array operations in Numpy. The second day provided an insight on what can be done with computers using simple algorithms. From basics to an introduction to neural networks, students learnt the application of ML and how to apply various libraries. The theory of working of Transit Method and its use to find various properties of an exoplanet was also presented. The workshop ended with some insights of the implementation of Exoplanet. The last day saw students using their skills to find the properties of exoplanet right way.



Workshop on Designing with CATIA V5 (October 9 & 10, 2019):

The CAE club conducted two-day CATIA V5 workshop entailing basic commands, terminology and basic use. The first day comprised of a brief introduction of 'Part Design' workbench that assists in designing and developing a 3D model using CATIA. Designing of different components of a 'Toggle Clamp Mechanism' such as cap, connecting rod etc. were also covered. The second day comprised of a brief introduction on 'Assembly Design' workbench that assists in assembling different components and developing feasible mechanism using CATIA. Solidworks, a 2D & 3D computer-aided designing software application used in architecture, construction, and manufacturing was also covered. These workshops acted as a preparatory course to motivate the students to participate in the Intra-IIT event named 'CADathon'.



Model United Nations (October 12 & 13, 2019):

The third edition of Model United Nations aimed to make MUN IITI bigger and better and for the first time ever, five committees, namely **UNGA**, **UNCSW**, **UNEP**, **ICJ** and **AIPPM**, were formed as part of the two-day conference. Debates were contested in all the committees in order to resolve the pressing agendas and reach a consensus. The agendas were vexing issues pertaining to the field of expertise of the particular committee. The most representative of India's diversity was the Indian committee AIPPM, which represented politicians from across the country, who spoke their own mother tongues and the delegates celebrated this freedom by showing up in attires which were characteristic to their state. The lively nature of the debates that followed only goes on to show that the multi-lingual and multi-cultural nature of India.

Cultural Section

The Cultural Clubs welcomed the students with a melodious night on July 29, 2019. Various clubs under the cultural club were introduced.

Dandiya and Garbha (October 7, 2019):

The delightful sight of energetic light-footed young boys and girls swirling in graceful rhythmic traditional Garba music and enthusiastically playing Dandiya on Dandiya numbers along with some peppy Bollywood songs, kept everyone glued to the dance floor all throughout till the very end of the event.

Ganesh Chaturthi, Lohri & Saraswati Puja Celebration:

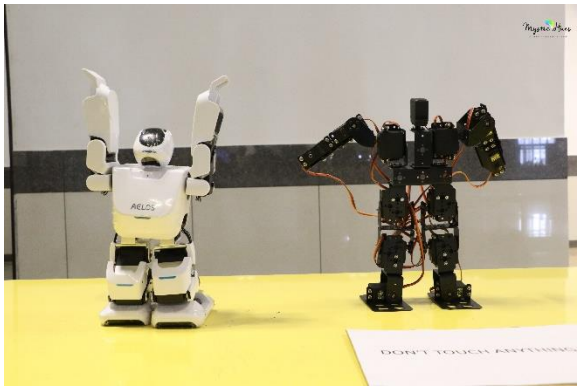
All festivals were celebrated by the students with great fervour and enthusiasm.

Other Celebrations and Activities:

The Student Gymkhana also celebrated Diwali, Friendship Day and New Year Eve. On the occasion of Mental Health Awareness Day, Nukkad Natak was held. Activities included a poster making competition, street act by Dramatics Club and a short movie made by the Cinephiles. Swachhta Pakhwada was also observed which included an essay writing competition, group discussion and a competition regarding cleanest hostel rooms. Various cultural clubs held several other individual competitions and workshops. The Literary Club organized Ransense (a writing competition), a story writing competition, Cache of Lexis and Model United Nations. The Quiz Club organized several quizzes ranging from the Newbie Quiz to Obscura (puzzles), Sports quiz and a Game of Thrones quiz. The Dramatics Club performed a stage play for a residential community of Indore as a part of Navratri celebrations.

Fluxus 2020 (February 6-9, 2020):

The annual Techno- Cultural festival **Fluxus'20** commenced with the performances of SPIC MACAY and Kavyanjali on February 6th. Fluxus organized 15+ Technical Competitions, 30+ Cultural Competitions, Technical Exhibitions, Conclave, CSR Activities, etc. With shows from renowned artists like Zakir Khan, DJ Shaan, and Salim-Sulaiman to up-and-coming performers like The Yellow Diary, Fluxus 2020 witnessed exhilarating performances from both Indian and international artists alike and had the largest footfall till date. Entrepreneurs and leaders such as Dr. Aryama Sanyal, Indore Airport Director, Mr. Farrhad Acidwalla addressed the students and visitors at Fluxus. Fluxus naturally features the most interesting and gripping technical events, from aeromodelling competitions to hackathons to quizzes, exhibitions and our flagship event- the Robo wars. Engineers and technology enthusiasts from all across the region come together to make the technical a huge success of the fest.




THE
YELLOW
DIARY


TribeVibe


SHAAN

Sports Section

The Sports Sections is headed by Dr. Lalit Borana, Sports Convener and is assisted by Mr. Renchu, Sports Officer. Lot of sports and fitness activities are conducted round the year to ensure physical and mental fitness of the students and community. The students showed great potential in various games held throughout the year like Intra IIT, Inter Hostel and matches with other Institutes. Some of the games which witness lot of participation are Athletics, Badminton Basketball, Football, Chess, Kho Kho, Lawn Tennis, Table Tennis and Volleyball.

Inter IIT Student's Sports Meet. The Institute took part in 54th Inter IIT Sports Meet 2019 held at IIT Kharagpur and showed remarkable performance. A total of 35 students participated in Athletics, Basketball, Chess, and Football as part of this event with **Mr. Dheerendra Singh winning Silver Medal in Javelin throw**.

Inter IIT Staff Sports Meet. The Institute took part in 26th Inter IIT Staff Sports Meet 2019 held at IIT Kharagpur and showed remarkable performance. **One of the staff member, Mr. Rameshwar Dohare, won a gold medal in Javelin throw and a Silver Medal in Discus throw.** A total of 15 staff participated in this event. They took part in games like Athletics, Badminton, and Lawn Tennis.

Yoga. The Yoga and Fitness Club organized lot of events to commemorate the International Yoga Day. Run for Yoga was conducted on May 2, 2019 followed by meditation session held on May 4, 2019. The 5th International Yoga Day was celebrated on 21 June 2019, with great enthusiasm and vigor. The event started with an introductory note on Yoga and it's relevance in educational institutes specially like IITs. After an informative address on Yoga Day by Mr. Atul Gabhane from Vivekananda Kendra, Yoga session was held. The participants were introduced to Yogasanas, Kapaalbhati, Pranayama, Dhyana, Sankalpa

and Shanti Patha as per the common protocol issued by Ministry of Ayush, Govt. of India. Later, volunteers from Isha Foundation conducted a 2-hour long Upa Yoga Session which began by an introductory lecture followed by enlightening the participants about its scientific relevance and importance in our life. Benefits on regular practice to reduce stress at work for a healthier body and mind were also told.

Celebration of International Yoga Day 2019

Observing the Birth Anniversary of Sardar Vallabh Bhai Patel on 31st October 2019 "Rashtriya Ekta Diwas"

Observance of Vigilance Awareness Week 2019

Celebration of "Constitution Day"

Campus @ IITI

Abhinandan Bhavan

Lecture Hall Complex

Hostel Unit

Health Center

Dining Hall & Food Court

Research Scholar Home

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