भारतीय प्रौद्योगिकी संस्थान इन्दौर
INDIAN INSTITUTE OF TECHNOLOGY INDORE

2021
ANNUAL REPORT



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Message by the Director



As IIT Indore steps into the 3rd decade of 21st Century, it carries forward the culture of excellence and hard work embedded in its social environment. Our faculty colleagues and research scholars in the last one decade have shown immense perseverance to attain new heights of excellence. Teaching and research climate in the institute has been supported by efficient administration and creation of state-of-art infrastructure. Our graduating students have been engaged with the best national and international corporations across different verticals. Many have chosen the less travelled path of entrepreneurship. It is a proud moment for us when our students contribute to the society by creating jobs and changing lives. IIT Indore maintains high national and international ranking which is evidenced by the fact that IIT Indore achieved its highest ever NIRF ranking of 10th during FY 2020-21. It achieved 55th rank *(3rd among all the Indian Institutes/Universities) in the Asian University Rankings 2020,* 61st rank in the *Emerging Economies Universities Rankings 2020*, and *64th rank (2nd among all the Indian Institutes/Universities) in the Young University Rankings 2020* by the Time Higher Education. Academic year 2020-21 was no ordinary year due to COVID 19 spanning over 2020-21. It has forced redefining the normal in the education sector worldwide in a way that has posed major challenges for the students from KG to PG to PhD. IIT Indore community has responded by innovating in all the domains, across teaching, research, administration, and most importantly infrastructure creation. The institute used asynchronous as well as synchronous modes of teaching, successfully completed 2020 Spring semester, 2021 Autumn, and 2021 Spring semesters in a timely manner and continued with academic activities without any disruptions. Institute impressively conducted its 8th Convocation in online mode on 19th Oct 2020 with the Education Minister Dr. Ramesh Pokhriyal Nishank gracing it as the Chief Guest. Total 412 students were awarded their degrees during this convocation.

We initiated the return of researchers to the Campus in the phased manner from May 2020 onward with all the due precautions securing everyone safety to resume our research activities disrupted by lockdown in March 2020. It ensured that all the research activities including that on much needed COVID-19 related projects continued uninterrupted. The Institute has been granted 2 Patents and 12 Patents were filed during the FY 2020-21. Focus is also to engage with MSMEs, start-ups and transfer technology. Efforts are being done to collaborate with grassroot-level organizations to contribute to the development of our immediate neighborhood through technological innovation. Increasing internationalization is another area of thrust admitting more and more international students and increasing involvement of international faculty members in thesis supervision and teaching. Even during the COVID trying times, our infrastructure team continued to work hard and did not allow any compromise on the high standards the institute has set for itself.

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

Shri Rakesh Ranjan
Additional Secretary (TE), Govt. of India
Ministry of Education

Shri Mukesh Chandra Gupta
Principal Secretary
Department of Technical Education & Skill Development,
Govt. of Madhya Pradesh

Professor Yogesh M. Joshi
Department of Chemical Engineering,
IIT Kanpur

Professor Dhananjay V. Bhatt
Professor (Retd.), Department of Mechanical Engineering
S. V. National Institute of Technology, Ichchhanath, Surat

Shri Manoj Kohli
Executive Chairman
SB Energy (Soft Bank Group) New Delhi

Dr. Krushna R. Mavani (Senate Nominee)
Professor,
Department of Physics,
IIT Indore
Up to February 22, 2021

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
(w.e.f. September 26, 2018 to September 23, 2021)



Dean, Student Affairs
Dr. Srivathsan Vasudevan
w.e.f. September 24, 2021



Dean, Infrastructure Development
Dr. Manish Kumar Goyal



Dean, International Affairs and Outreach
Dr. Kapil Ahuja
(w.e.f. August 29, 2017 to November 26, 2020)



Dean, International Affairs and Outreach
Prof. Avinash Sonwane
(w.e.f. November 27, 2020)



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. Ruchi Sharma
Research and Development- II	:	Dr. Bhargav Vaidya
Administration	:	Dr. Santosh Hosmani
Infrastructure Development-I	:	Dr. Guru Prakash
Student Affairs	:	Dr. Sanjeev Singh
International Affairs and Outreach-I	:	Dr. Raghunath Sahoo
International Affairs and Outreach-II	:	Dr. Sanjay Kumar Singh

Heads of School

Humanities and Social Sciences	:	Dr. Nirmala Menon

Heads of Departments

Computer Science & Engineering	:	Dr. Somnath Dey Dr. Surya Prakash (w.e.f. October 3, 2017 to October 3, 2020)
Electrical Engineering	:	Dr. Vipul Singh
Mechanical Engineering	:	Dr. Santosh Kumar Sahu
Chemistry	:	Dr. Biswarup Pathak
Mathematics	:	Dr. Neeraj Kumar Shukla Dr. Md. Aquil Khas (w.e.f. September 25, 2018 to September 16, 2021)

Physics	:	Dr. Pankaj R. Sagdeo Dr. Krushna R. Mavani (w.e.f November 16, 2017 to November 16, 2020)
Astronomy, Astrophysics and Space Engineering	:	Dr. Abhirup Datta
Biosciences and Biomedical Engineering	:	Dr. Amit Kumar Dr. Debashish Nayak (w.e.f January 8, 2021 to July 21, 2021) Dr. Sharad Gupta w.e.f February 24, 2020 to January 7, 2021)
Metallurgy Engineering and Materials Science	:	Dr. Vinod Kumar
Civil Engineering	:	Dr. Neelima Satyam Devarakonda

Heads of Centers and Services

Center of Advanced Electronics	:	Dr. Mukesh Kumar
Computer and Information Technology Center	:	Dr. Neminath Hubballi
Center of Futuristic Defense and Space Technology	:	Dr. Indrasen Singh
Center of Innovation, Incubation, Entrepreneurship and Industry Relations	:	Dr. Swaminathan R.
Centre for Rural Development and Technology	:	Dr. Sandeep Chaudhary
DST-FIST Center of Excellence in Gear Engineering	:	Prof. Neelesh Kumar Jain
Sophisticated Instrument Centre (SIC)	:	Prof. Suman Mukhopadhayay
Center for Indian Scientific Knowledge Systems	:	Prof. G. S. Murthy
Center for Electric Vehicle and Intelligent Transport Systems	:	Dr Amod C. Umarikar
Counselling Services	:	Dr. Pavan K. Kankar
Training & Placement	:	Dr. Abhishek Rajput
Central Workshop	:	Dr. Dan Sathiaraj

Senate

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

External Experts	
Professor Himanshu Rai Director Indian Institute of Management Indore, Prabandh Shikhar, Rau-Pithampur Road, Indore - 453556, M.P. India **Mr. B Anil Baliga** Ex-Executive Vice President VE Commercial Vehicles Ltd,78-86, Industrial Area No. III, A. B. Road, Dewas - 455001, M.P. India **Prof. Ajay Kumar Jain** Professor (Organization Behaviour)Dean, Executive Graduate Programs & Consultancy, Management Development Institute, Mehrauli Road, Sukhrali,Gurgaon - 122 007, India	**Shri Debashis Das** Director Raja Ramanna Centre for Advanced Technology (RRCAT), Indore - 452013, M.P. India **Prof. Abhiram G. Ranade** Professor Department of Computer Science and Engineering, Indian Institute of Technology Bombay, Powai, Mumbai - 400076, India
Deans	
Dr. Devendra L Deshmukh Dean, Academic Affairs, Associate Professor, Mechanical Engineering **Dr. Manish Kumar Goyal** Dean of Infrastructure Development, Associate Professor, Civil Engineering **Dr. I. A. Palani** Dean, Research and Development, Associate Professor, Mechanical Engineering **Professor Anand Parey** Dean, Resources Generation, Professor, Mechanical Engineering	**Dr. Pritee Sharma** Dean, Administration, Associate Professor, School of Humanities and Social Sciences **Prof. Avinash Sonwane** Dean, International Affairs and Outreach Professor, Department of BSBE **Dr. Srivathsan Vasudevan** Dean, Student Affairs, Associate Professor, Electrical Engineering
Heads	
Dr. Neelima Satyam D HOD, Civil Engineering,	**Dr. Somnath Dey** HOD, Computer Science and Engineering,

Associate Professor, Civil Engineering	Associate 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	**Dr. Amit Kumar** HOD, Biosciences and Biomedical Engineering (BSBE) Associate Professor, BSBE
Dr. Pankaj R. Sagdeo HOD, Physics, Professor, Physics	**Dr. Biswarup Pathak** HOD, Chemistry, Associate Professor, Chemistry
Dr. Neeraj Kumar Shukla HOD, Mathematics, Associate Professor, Mathematics	**Dr. Nirmala Menon** HOD, School of Humanities and Social Sciences (SHSS) Associate Professor, SHSS
Dr. Abhirup Datta HOD, Discipline of Astronomy, Astrophysics and Space Engineering (DAASE), Associate Professor, DAASE	
Head of Centers and Services	
Professor Sandeep Choudhary Head, Center for Rural Development and Technology, Professor, Civil Engineering	**Dr, Mukesh Kumar** Head, Center of Advanced Electronics Associate Professor, Electrical Engineering
Dr. Neminath Hubbali Head, Computer Center Associate Professor, Computer Science and Engineering	**Dr. Pavan Kumar Kankar** Head, Counselling Services Associate Professor, Mechanical Engineering
Dr. Indrasen Singh Head, Center for Futuristic Space and Defense Technologies Assistant Professor, Mechanical Engineering	**Prof. Suman Mukhopadhayay** Head, Sophisticated Instrumentation Center Professor, Chemistry
	Dr. Abhishek Rajput **Head, Training and Placement** Assistant Professor, Civil Engineering
Professors	
Professor Narendra S. Chaudhari Computer Science and Engineering	**Professor Sandeep Chaudhary** Civil Engineering,

Professor Neelesh Kumar Jain **Professor Anand Parey** Mechanical Engineering **Professor Ram Bilas Pachori** **Professor Abhinav Kranti** **Professor Vimal Bhatia** Electrical Engineering **Professor Rajneesh Misra** **Professor Suman Mukhopadhyay** Chemistry	**Professor Avinash Sonawane** **Professor Ganti. S. Murthy** Biosciences and Biomedical Engineering **Professor Subhendu Rakshit** **Professor Krushna R. Mavani** **Professor Sarika Jalan** Physics
Other Authorities	
Deputy Librarian **Ms. Anjali Bandiwadekar** **Convener, Health Center Committee** **Dr. Hemant Borkar** Assistant Professor, Metallurgy Engineering and Materials Science **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** **Alumni Representative** **Academic Secretary, Student Gymkhana** **General Secretary, Student Gymkhana**

About Us

In keeping with India s vision to become a world leader in Science and Technology and to usher in a new revolution, resulting in an unprecedented economic growth, Government of India reassessed the need of technical manpower and decided to set up eight new IITs. Six of them started functioning back from the academic year 2008-09. These were established at Hyderabad, Gandhinagar, Rajasthan, Ropar, Patna and Bhubaneswar. IIT Indore and IIT Mandi started functioning from July 2009.

Indian Institute of Technology Indore located in Madhya Pradesh, known as IIT Indore or IITI, is an institute of national importance established by the Government of India in 2009. It is one of the eight new IITs, started by the Ministry of Human Resource Development (India), Government of India. The institution started functioning from 2009-10 in a temporary campus at Institute of Engineering and Technology of Devi Ahilyabai University under mentorship of IIT Bombay. Shri Arjun Singh, the Union HRD Minister, laid the foundation of the permanent campus, spread over an area of around 501.42-acre (2.1 km2), on 17th February 2009 at Simrol, a location on Khandwa Road about 25 km from the city of Indore.

Since , February 2016, IIT Indore has started functioning from its permanent campus. All the Administrative Offices, Material Management Section, Finance and Account Section, The School of Basic Sciences, The School of Humanities and Social Sciences, The School of Engineering, Basic Science Labs and Engineering Labs are all established in this campus. The Central Library is also situated in this campus.

Mission

The driving force behind the 21st Century is the development of knowledge-intensive societies. It has led to establishment of new Institutes of higher learning in India. Indian Institute of Technology Indore, established in 2009, is part of the initiative that envisages India as a global knowledge and technology leader. Continuing with the tradition of the older IITs, IIT Indore aims to play an active role in propelling India on her growth-trajectory by focusing on research-based education and innovation driven research and entrepreneurship. IIT Indore aims to achieve this mission with humanistic concerns.

Vision

Academics:

- To inculcate and promote an academic community with independence of thought and free expression of research and innovation ideas.
- To provide a balance of continuously updated knowledge with an extensive hands-on training on sophisticated facilities.
- To start new academic programs in the futuristic areas such as data science, electric vehicles, intelligent transport system, space engineering, Indian scientific knowledge, etc.
- To increase internationalization of the Institute by selecting increasing number of international students and engaging distinguished international faculty in teaching and research.
- To increase candidates from Industries, Defense forces, and Engineering Institutions in different PG and PhD programs.
- To increase involvement of adjunct faculty from Industries for teaching, research, and innovation.
- To involve experts from reputed industry and Foreign Universities for curricula design.

Research, Development, and Entrepreneurship:

- Promote inter-disciplinary research in science, engineering, and humanities and social sciences.
- Conduct disruptive and social impacting research some chosen areas such as sustainable development, climate change, food and water security.
- Promote industry-oriented research leading to new products, processes, and technologies.
- Focus on convergence of life sciences, medical sciences, and agricultural sciences with engineering.
- Promote culture of start-ups and entrepreneurship by establishing of Industrial Research Park which will be a focal point in Central India.
- Aggressive patenting and protection of IPR.

Objectives

- Enhancement of academic, technological, and social outreach of the Institute through societal research, education, healthcare, sanitation, and rural development.

- Development of world class research and learning facilities for industries, teaching and research institutions.

- Skill development and scaling up the research and innovation towards the national requirements.

- To contribute to development of world class technological innovation in Engineering and Biomedical instrumentation, Defense, E-vehicles, alternate energy resources, etc.

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 by Research (MS Research), 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 32 Ph.D., 07 MS Research and 395 B. Tech students have graduated from the Department of CSE until July 2021.
2. THE World University Rankings 2021: Indian Institute of Technology Indore ranked 251–300 globally and 2nd in India in Computer Science.
3. Team ByteBandits Vishnunarayan K, Mrigank Krishan, Vaibhav Anand & Sarthak Jain (representing IIT Indore) has secured the 1st place (India) and 8th globally in CSAW CTF (Finals) 2020 held online.
4. Graduating student, Mr. Saptarshi Ghosh, of CSE receives The President of India Gold Medal in the 2020 Convocation of IIT Indore.
5. Graduating student, Ms. Arushi Jain, of CSE receives The Institute Silver Medal in the 2020 Convocation of IIT Indore.
6. 07 PhD, 06 MS and 57 BTech students receive degree in 2020 convocation of IIT Indore held on 19-Oct-2020.
7. 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.
8. Prof. N.S Chaudhari served as Vice Chancellor, Uttarakhand Technical University (UTU), Dehradun (state govt university) since Jan 2019 to Mar.2021.
9. Dr. Aruna Tiwari represented India as an Artificial Intelligence expert in the Internationalist Podcast series on "Impact of the digital revolution on higher education", organized by the Association of Commonwealth Universities, UK on June 8, 2021.
10. Dr. Aruna Tiwari participated in discussions on Genome sequencing/mutation analysis to predict the possibilities of Coronavirus, climate change analysis, and the effect of digital devices on human behaviour.
11. Dr. Aruna Tiwari got access of two Supercomputers under the National Supercomputing Mission (NSM) funds; PARAM SHAKTI from IITK and PARAM SIDHI from CDAC PUNE in May 2021
12. Dr. Aruna Tiwari is collaborating with IIT Delhi as a Rural Technology Action Group (RuTAG) member & working on the problem of “Mobile App development for Ground Water Management”.
13. Dr. Aruna Tiwari is appointed Moderator for MPPSC examination Feb 2021.
14. Dr. Anirban Sengupta is appointed as Chair, IEEE CTSoc Security and Privacy Technical Committee.
15. Dr. Anirban Sengupta is appointed as Board member, IEEE CTSoc Technical Committee
16. Dr. Anirban Sengupta is appointed as Ex-Officio Member, IEEE Consumer Electronics Society Board of Governors, 2020
17. Dr. Anirban Sengupta received 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".

18. Dr. Anirban Sengupta is 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".
19. Dr. Anirban Sengupta is 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.
20. Dr. Anirban Sengupta is awarded / elected Fellow of The Institution of Engineering and Technology (IET) - since 2019.
21. Dr. Anirban Sengupta is awarded/ Elected Fellow of British Computer Society (BCS) - since 2019.
22. Dr. Anirban Sengupta is awarded IEEE Distinguished Visitor by IEEE Computer Society - (2019 - 2021).
23. Dr. Anirban Sengupta is awarded IEEE Distinguished Lecturer by IEEE Consumer Electronics Society - (2017- 2019).
24. Dr. Anirban Sengupta is elected 'Chairman of IEEE Computer Society Technical Committee on VLSI (TC-VLSI)' for a term from Oct 2018 - 2020.
25. Dr. Anirban Sengupta is awarded 'Renowned Alumni Award' by JIS/Techno India, West Bengal in 2020.

Faculty Members: Profiles
From the HoD's Desk



Dr. Somnath Dey
Associate Professor & HOD
somnath@iiti.ac.in

Introducing faculty members of CSE









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

CSE@IIT Indore has strong research groups of around 28 PhD and 17 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 irrespective of caste, creed, gender, and background.
- 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 GPU Server functionality. 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. Narendra S. Chaudhari
Professor
nsc@iiti.ac.in

Dr. Narendra S. Chaudhari is with Indian Institute of Technology, Indore since Aug 2009 as a Professor of Computer Science and Engineering. He was Vice Chancellor of Uttarakhand Technical University (UTU), Dehradun from Jan.2019 to Mar.2021. 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 nurturing 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, which has now shown results in 2018 with IIT Indore surpassing all old IITs in Times Higher Education World University Rankings 2019 as the second-best World University in India (next to IISc, Bangalore). 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. As a Dean, Faculty of Engineering Sciences, Devi Ahilya Vishwavidyalaya (DAVV), Indore, in 1995-1998, he initiated Institute of Engineering and Technology that is now leading Engineering institute in central India.

Narendra has represented India in year 2015 and 2016 as part of six-member academic delegation accompanying with Honourable President of India in Sweden, Belarus and P.R. China. Narendra has represented India for formation of BRICS-Network University (NU) at Yekaterinburg, Russia held on 06-09 April, 2016. He was a member of FICCI's higher education delegation to Germany, France and Netherlands for the duration of 22-27 June 2015.

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 (state govt university) since Jan 2019 to Mar.2021,
(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) Chairman – Central Regional Committee, All India Council for Technical Education (AICTE), MHRD, Govt of India, since March 2016 till June 2017,
(v) Chairman – Board of Governors, Government Engineering College, Chandrapur (M.S.) India since Nov. 2015 till Nov 2018,

Total Publications: 381			
Category	International Level	National Level	Total
(A) Journal Papers	127	32	159
(B) Conference Papers	158	36	194

(vi) Mentor Director, Indian Insitute of Information Technology (IIIT), Nagpur since March 2016 till June 2018,
(vii) Member- Board of Governors of IIIT Nagpur, till June 2018,
(viii) Co-Convenor and Secretary, Standing Committee of Council of NITs: 14 July 2016 – June 2018,
(ix) Member - Board of Governors of IIT Indore (2010-2013),
(x) Member - Executive Council, Devi Ahilya University, Indore,
(xi) Coordinator - International Exchange Program, Nanyang Technological University, Singapore,
(xii) Deputy Director - GameLAB, Nanyang Technological University, Singapore,
(xiii) Dean - Faculty of Engineering Sciences, Devi Ahilya University, Indore,
(xiv) Dean - Research and Development, Indian Institute of Technology (IIT) Indore.

Narendra's significant research contributions are in the areas of Network Security and Mobile Computing, machine learning, game AI, Novel Neural Network Models, Context Free Grammar Parsing, Optimization, 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, (v) novel neural network models for protein secondary structure prediction, (v) specialized binary neural network structures, and (vi) implementation of interior point algorithms. He has delivered invited talks and presented his research results in several countries like America, Australia, Canada, Germany, Hungary, Japan, United Kingdom, etc. A few institutes where he has given talks on his research includes Massachusetts Institute of Technology (MIT) USA, Nagoya Institute of Technology (NIT), Nagoya, Japan, Manchester Metropolitan University (MMU), Manchester (U.K.), Beijing Normal University (BNU), Beijing (P.R. China), etc.
Narendra has supervised more than fourty three doctoral students and published more than 380 papers in Journals and Conferences. He has successfully completed eight R&D Projects funded by DST, UGC, AICTE, MHRD etc. He has been a reviewer for DST and UGC projects. He has also contributed collaborative Research Work on other pilot projects on Computing techniques and Industry Interaction funded by ST-Engg, DSTA and A*STAR etc. in Singapore.

Narendra has supervised more than fourty doctoral students and published more than three hundred eighty 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. Petersburg Mining University where he initiated India's collaborations with that University in Russia. 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

- Number of Books published/under publication: **12**
- Number of Ph.D. guided: Completed: **43**
- Number of M.Tech. dissertations guided : **> 80**

Some Journal papers :

(A) (in years 2020, 2021):

1. Shubham Gupta, Balu L Parne, Narendra S Chaudhari, "ISAG: IoT-enabled and Secrecy Aware Group-based handover scheme for e-health services in M2M communication network", Future Generation Computer Systems, Vol 125, pp. 168-187 North-Holland, Elsevier B.V. https://doi.org/10.1016/j.future.2021.06.038 (available online on 25th June 2021, scheduled for publication in Dec. 2021 issue).
2. Sneha Kanchan, Garima Singh, and Narendra S. Chaudhari, "SPSR-VCP: Secure and Privacy preserving SignRecryption in Vehicular Cyber Physical systems", Journal of Ambient Intelligence and Humanized Computing (Springer Verlag, Berlin Heidelburg) 3 388-411, (published: Mar.02, 2021).
3. Nikhil B. Khandare and Narendra S. Chaudhari, "Secure and Location Privacy in Geographical Data with Electronic Codebook mode-advanced encryption standard," Int. Jour. Vehicle Information and Communication System, Inderscience Publishers, https://doi.org/10.1504/IJVICS.2021.113484, Vol.6, No.1, pp. 22-39 (Online on 08 Mar. 2021).
4. 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 (Mar. 2020).
5. 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. (Springer).https://doi.org/10.1007/s12083-019-00789-1 (Jan. 2020).

(B) Earlier: duration 2009 to 2012, some journal papers with IIT Indore affiliation):

6. 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).

7. Neetesh Saxena, King Hwang Raymond Choo, and Narendra S. Chaudhari, "BAS-VAS: A Novel Secure Protocol for Value Added Service Delivery to Mobile Devices," IEEE Transactions on Information Forensics & Security, Vol 15, pp. 1470-1485 https://ieeexplore.ieee.org/document/8274977 /metrics#metrics (16 pages) (16 Sept. 2019).
8. Balu L. Parne, Shubham Gupta and Narendra S. Chaudhari, "PSE-AKA: Performance and security enhanced authentication key agreement protocol for IoT enabled LTE/LTE-A networks", Peer-to-Peer Netw. Appl. (Springer) (online on 13th July, 2019) 12: 1156. https://doi.org/10.1007/s12083-019-00785, Volume 12, Issue 5, pp1156–1177,(Sept. 2019).
9. Bhosale R. S., and Narendra S. Chaudhari, "Accelerating Speech Recognition System by Adam optimization and CNN for Real Time System using GPU," International Journal of Control and Automation, Vol. 12, No. 4, pp. 11 – 19, http://sersc.org/journals/index.php/IJCA/article/view/231.
10. Robin Sigh Bhadoria, and Narendra S. Chaudhari, "Pragmatic Sensory Data Semantics With Service-Oriented Computing", Journal of Organizational and End User Computing (JOEUC) IGI Global, Vol. 31, No. 2, pp. 22-36, DOI: 10.4018/JOEUC.2019040102 (2019).
11. Shubham Gupta, Balu L. Parne, & Narendra S. Chaudhari, "PSEH: A provably secure and efficient handover AKA protocol in LTE/LTE-A network," Peer-to-Peer Networking and Applications (Springer) ((published online 22 Dec 2018). https://doi.org/10.1007/s12083-018-0703-8, Volume 12, Issue 4, pp 989–1011 pp. 1-23 (July 2019).
12. Shubham Gupta, Balu L. Parne, and Narendra S. Chaudhari, "SRGH: A secure and robust group-based handover AKA protocol for MTC in LTE- A networks", International Journal of Communication Systems, Vol 32, Issue 8 pp. 34-39 (May, 2019).
13. Sneha Kanchan, Garima Singh, Narendra Chaudhari, "SAPSC: SignRecrypting Authentication Protocol using Shareable Clouds in VANET Groups", IET Intelligent Transport Systems, Vol. 13, No. 9, pp. 1447-1460 (May, 2019).
14. Mohit Gupta, and Narendra S. Chaudhari, "Anonymous roaming authentication protocol for wireless network with backward unlinkability and natural revocation", Annals of Telecommunications (Springer), https://doi.org/10.1007/s12243-018-0668-x, Volume 74, Issue 3–4, pp 175–184 (April 2019)
15. Robin Singh Bhadoria, and Narendra S Chaudhari, "Pragmatic sensory data semantics with service-oriented computing", Journal of Organizational and End-User Computing (JOEUC), IGI Global Publishing, PA, USA, Vol 31, No. 2, pp. 22-36 (01 April, 2019).
16. Sheha Kanchan, Narendra S. Chaudhari, "Signcrypting the Group Signature with Non-transitive Proxy Re-encryption in VANET," In: Sa Pankaj Kumar., Bakshi S., Hatzilygeroudis I., Sahoo M. (eds) Recent Findings in Intelligent Computing Techniques. Advances in Intelligent Systems and Computing, (AISC) vol 707 pp. 15-23. DOI https://doi.org/10.1007/978-981-10-8639-7_2, print ISBN 978-981-10-8638-0, Online ISBN 978-981-10-8639-7 Springer Nsture Singapore, (published online 04 Nov. 2018) (2019)
17. Mohit Gupta, Narendra S. Chaudhari, "Anonymous two factor authentication protocol for roaming service in global mobility network with security beyond traditional limit", Ad Hoc Networks, (Elsevier) Vol 84 pp. 56-67 (Mar. 2019).
18. Sneha Kanchan, Narendra S. Chaudhari, "SRCPR: SignReCrypting Proxy Re-signature in secure VANET Groups", IEEE Access, Vol. 6, pp. 59282-59295 (02 Sept 2018)
19. Shubham Gupta, Balu L. Parne and Narendra S. Chaudhari, "A Proxy Signature based Efficient

and Robust Handover AKA Protocol for LTE/LTE-A Networks", Wireless Personal Communications, Vol 103, No. 3 pp. 2317-2352, (SPRINGER, DOI: 10.1007/s11277-018-5912-1 (ISSN: 0929-6212, Impact factor: 1.20) (August, 2018).

20. Shruti Bhilare, Vivek Kanhangad, & Narendra S. Chaudhari, "A study on vulnerability and presentation attack detection in palmprint verification system", Pattern Analysis and Applications (Springer) (2018) 21: 769-782. https://doi.org/10.1007/s10044-017-0606-y (Aug. 2018).
21. Balu L. Parne, Shubham Gupta and Narendra S. Chaudhari, "SEGB-AKA: Security enhanced group based AKA protocol for M2M communication in an IoT enabled LTE/LTE-A network", IEEE Access - the multidisciplinary open access journal, vol. 6, pp. 3668-3684, 2018. (ISSN: 2169-3536, Impact factor: 3.557). Paper Link : https://ieeexplore.ieee.org/abstract/ document/8248639/ (June 2018)
22. Shubham Gupta, Balu L. Parne and Narendra S. Chaudhari, "DGBES: Dynamic Group Based Efficient and Secure Authentication and Key Agreement Protocol for MTC in LTE/LTE-A Networks", (copy available at https://link.springer.com/content/pdf/10.1007%2Fs11277-017-5005-6.pdf) Wireless Personal Communication (Springer Journal DOI 10.1007/s11277-017-5005-6) vol. 98, No. 3 pages 2867-2899 , (ISSN: 0929-6212, Impact factor: 1.20) Paper Link : https://link.springer.com/ article/10.1007/s11277-017-5005-6 (Feb. 2018).
23. Robin Singh Bhadoria, Narendra S Chaudhari, Sovan Samanta, "Uncertainty in sensor data acquisition for SOA system", Neural Computing and Applications (Springer, London), ISSN – 9041-0643, Volume 30, Issue 10, pp 3177–3187 (https://doi.org/10.1007/s00521-017-2910-2) (Nov. 2018).
24. Robin Singh Bhadoria, Narendra S Chaudhari, VGTN Vidanagama, "Analyzing the role of interfaces in enterprise service bus: A middleware epitome for service-oriented systems", Computer Standards & Interfaces (Elsevier) (e-copy: https://www.sciencedirect.com/science/article/pii/S0920548917300521?via%3Dihub , doi: 10.1016/j.csi.2017.08.001), Vol. 55, pp. 146-155 (Jan. 2018).
25. Neetesh Saxena, Hong Shen, Nikos Komninos and Narendra S. Chaudhari, "BVPSMS: A Batch Verification Protocol for End-to-End Secure SMS for Mobile Users", IEEE Transactions on Dependable and Secure Computing, (doi: 10.1109/TDSC.2018.2799223) Vol 17, No. 3, pp. 550-565 (Jan. 2018).
26. Neetu Singh, Narendra S. Chaudhari and Nidhi Singh. "Online URL Classification for Large-scale Streaming Environments", IEEE Intelligent Systems, Vol 32, No. 2, pp. 31-36 (April, 2017).
27. Robin Singh Bhadoria, Narendra S Chaudhari, & Geetam Singh Tomar, "The Performance Metric for Enterprise Service Bus (ESB) in SOA System: theoretical underpinnings and empirical illustrations for information processing", Information Systems (Pargamon: Elsevier) (https://doi.org/10.1016/j.is.2016.12.005) , Vol. 65, pp. 158-171, (April, 2017).
28. Robin Singh Bhadoria, Narendra S Chaudhari, Sovan Samanta, "Uncertainty in Sensor Data Acquisition for SOA System", Neural Computing and Applications (Springer), Vol 30, No. 10, DOI:10.1007/s00521-017-2910-2 (Nov. 2018).
29. Prateek Nahar, Sanjay Tanwani, Narendra S. Chaudhari, "Fingerprint Classification using deep neural network model Resnet 50", International Journal of Research and Analytical Reviews (IJRAR), E-ISSN 2348-1269, P- ISSN 2349-5138, published by Research Foundation, Ahmedabad, Gujarat – open access peer reviewed journal, website: www.ijrar.org, Volume.5, Issue 4, pp. 1521-

1535, Available at : http://www.ijrar.org/IJRAR1944186.pdf (December 2018)

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32. Dipika Rai, Maya Ingle, and Narendra S. Chaudhari, "Polynomial 3-SAT reduction of Sudoku Puzzle", International Journal of Advanced Research in Computer Science, Vol. 9 Issue 3, pp. 194-197. (4 pages) (May/June 2018).
33. Rakesh Sahu and Narendra S. Chaudhari, 'Energy Reduction Multipath Routing Protocol for MANET Using Recoil Technique", Electronics, (Multidisciplinary Digital Publishing Institute) Vol. 7, No. 5, pp.W 56-75, (2018)
34. Balu L. Parne, Shubham Gupta and Narendra S. Chaudhari, "SEGB: Security enhanced group based AKA protocol for M2M communication in an IoT enabled LTE/LTE-A network", IEEE Access - the multidisciplinary open access journal. (ISSN: 2169-3536) (Accepted: 21 Dec. 2017: published: 28 Feb. 2018).
35. Ashish Jain, Narendra S. Chaudhari, "A novel cuckoo search strategy for automated cryptanalysis: a case study on the reduced complex knapsack cryptosystem", (copy available at https://link.springer.com/content/pdf/10.1007%2Fs13198-017-0690-9.pdf), International Jour-nal of System Assurance Engineering and Management, (Springer), (https://doi.org/10.1007 /s13198-017-0690-9), 20 pages, Vol. 9, Issue 4 pp. 942-961 (available online: 21 Nov. 2017: published: 01 Aug. 2018).
36. Kshitij Pathak, Sanjay Silakari, Narendra S Chaudhari, "Investigations in Privacy Preserving Data Mining", (copy of complete paper here), American Scientific Research Journal for Engineering, Vol. 36, No.1, pp. 370-378 (12 Oct. 2017).
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38. Balu L. Parne, Shubham Gupta and Narendra S. Chaudhari, "ESAP: Efficient and secure authentication protocol for mobile communications", Sadhana - Academy Proceedings in Engineering Sciences, (Springer) (ISSN: 0256-2499) Vol 43, No. 6 pp 43-89 (June 2018; Accepted: Sept. 2017).
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40. Neetesh Saxena, Santiago Grijalva and Narendra S. Chaudhari, "Authentication Protocol for IoT-Enabled LTE Network," ACM Transactions on Internet Technology (TOIT), Special Section - Internet of Things (IoT): Secure Service Delivery, Vol. 16, No. 4 (doi: 10.1145/2981547, article no 25, pp. 1-20; (20 pages) (Dec 2016).
41. K.K. Tripthi and Narendra S. Chaudhari, "Mining Association Rules and Differential Priacy Preservation using Randomization," International Journal of Computer Science and Engineering, (ISSN 2347-2693), Vol. 4, No. 7 pp. 30-38 (July, 2016).

42. Nidhi Dahale, Narendra S Chaudhari, and Maya Ingle, "GCP Constraint based SAT Clause generation in Polynomial Time," International Journal of Advanced Research in Computer Science, Vol. 7, No. 2 (March, 2016).
43. Prakash Chandra Sharma and Narendra S. Chaudhari, "Investigation of Satisfiability based Solution Approach for Graph Coloring Problem," International Journal of Engineering and Advanced Technology, Vol. 6 No. 1 pp. 106-112, (Oct. 2016).
44. Rajkumar Jain and Narendra S. Chaudhari, "On Constraint Clustering to Minimize the Sum of Radii", International Journal of Engineering and Advanced Technology, Vol. No. 5 (6). pp. 236-239, (2016).
45. K.K. Tripthi nd Narendra S. Chaudhari, "Discrimination Prevention with Classification and Privacy Preservaation in Data Mining," Procedia Computer Science, (Elsevier), Vol. 79, pp. 244-253 (2016).
46. Jaya Thomas and Narendra S. Chaudhari, "An integrated genetic algorithm approach to 1D-cutting stock problem", International Journal of Operational Research Vol. 2, Nos. 1-2, pp. 23-46 (2016).
47. Neetesh Saxena, Jaya Thomas, and Narendra S. Chaudhari, "ES-AKA: An Efficient and Secure Authentication and Key Agreement Protocol for UMTS Networks", (copy available at: https://link.springer.com/content/pdf/10.1007%2Fs11277-015-2551-7.pdf) Wireless Personal Communications (Springer), Vol. 84, No. 3 pp. 1981-2012 (April, 2015).
48. Pratibha Singh, Ajay Verma and Narendra S Chaudhari, "Feature selection based Classifier combination approach for handwritten Devanagri character recognition," Sadhana - Academy Proceedings in Engineering Science Vol. 40, No. 6 pp. 1701-1714 (01 Sept 2015).
49. Prakash Chandra Sharma and Narendra S Chaudhari, "Maximal independent set based approach for Graph coloring problem," International Journal of Computer Engineering and Applications (IJCEA), Vol. IX, Issue II, pp. 205-214 (Feb. 2015).
50. Neetesh Saxena and Narendra S. Chaudhari, "EasySMS: A Protocol for End-to-End Secure Transmission of SMS," IEEE Transactions on Information Forensics and Security, Vol. 9, No. 7, pp. 1157-1168 (July 2014).
51. Neetesh Saxena, Narendra S. Chaudhari, "Secure-AKA: An Efficient AKA Protocol for UMTS Networks", (copy available at: https://link.springer.com/content/pdf/10.1007%2Fs11277-014-1821-0.pdf) Wireless Personal Communications (Springer), Vol. 78, No. 2, pp. 1345-1373 (2014/9/1).
52. Jaya Thomas, Narendra S. Chaudhari, "Design of Efficient Packing System using Genetic Algorithm based on Hyper Heuristic Approach", Advances in Engineering Software (Elsevier), Vol. 73, pp. 45-52 (July, 2014).
53. Neetesh Saxena, Narendra S. Chaudhari, "SecureSMS: A Secure SMS Protocol for VAS and other Applications", Journal of Systems and Software (JSS) (Elsevier), ISSN: 0164-1212, Vol. 90, pp. 138-150 (April 2014).
54. Jaya Thomas, Narendra S. Chaudhari, "A New Metaheuristic Genetic Based Placement Algorithm for 2-D Strip Packing", International Journal of Industrial Engineering. Springer Verlag, Berlin Heidelberg, Vol. 10, No. 2, pp. 1-16, (February 2014).
55. R. K. Singh, Narendra S. Chaudhari, and K. Saxena, "Probabilistic Selection of QoS Paths for Improving Survivability in MPLS Networks", Communications and Networks, (CN) (Scientific Research Publishing, SCIRP: http://www.scirp.org), vol. 5, no. 4, pp. 328-336, (Nov. 2013).

56. Shukai Li, Ivor W. Tsang and Narendra S. Chaudhari, "Relevance Vector Machine based ensemble learning for Credit Risk Analysis," Expert Systems with Applications, (Elsevier: Science Direct, Pergamon Press), Vol. 39 (5), pp. 4947-4953 (April, 2012).
57. Ravindra Kumar Singh, Narendra S. Chaudhari, Kanak Saxena, "Load Balancing in IP/MPLS Networks: A Survey" Communications and Network (CN) (Scientific Research Publishing, SCIRP: http://www.scirp.org), Vol.04 No.02, (DOI: 10.4236/cn.2012.42020) pp. 151-156 (2012).

(C) some journal papers with affiliation of employer joining prior to IIT Indore, namely, Nanyang Technological University, Singapore - for the duration 2009 till 2003):

58. Narendra S. Chaudhari, X. Wang, "Language Structure using Fuzzy Similarity", IEEE Transactions on Fuzzy Systems, Vol. 17, No. 5, pp. 1011-1024, (Digital Object Identifier 10.1109/TFUZZ.2009.2020155), (Oct. 2009).
59. J. Chen, Narendra S. Chaudhari, "Segmented-Memory Recurrent Neural Networks", IEEE Transactions on Neural Networks, Vol 20, No. 8, pp. 1267-1280, (Aug. 2009). (Digital Object Identifier : 10.1109/TNN.2009.2022980).
60. J. Chen, N.S. Chaudhari, "Cascaded Bidirectional Recurrent Neural Networks for Protein Secondary Structures", IEEE/ACM Transactions on Computational Biology and Bioinformatics, Vol. 4, No. 4, pp. 572-582, (Oct.-Dec. 2007).
61. D. Wang and N.S. Chaudhari, "A Fast modified constructive-covering algorithm for multi-layer Binary Neural Networks", Neurocomputing, Vol 70, Nos. 1-3, pp. 445-461, (Dec. 2006).
62. J.Chen and N.S. Chaudhari, "Bidirectional segmented-memory recurrent neural network for protein secondary structure prediction", Soft Computing, (Springer Verlag), Vol. 10, pp. 315-324 (DOI: 10.1007/s00500-005-0489-5) (2006).
63. J.C. Patra, E.L.Ang, Narendra S. Chaudhari, A.Das, "Neural Network based Smart Sensor framework Operating in a Harsh Environment", EURASIP Journal on Advances in Signal Processing, 2005 (EURASIP JASP), Vol. 4, pp. 1-17 (Dec. 2005).
64. D. Wang, Narendra S. Chaudhari, "A novel training algorithm for Boolean Neural Networks based on multi-level Geometrical Expansion", Neurocomputing, vol. 57, no. 4, pp. 455-461, (March 2004).

D. Wang, Narendra S. Chaudhari, "Binary Neural Network Training Algorithms based on Linear Sequential Learning," International Journal of Neural Systems, vol. 13, no. 5, pp. 333-351, (Sept. 2003).



Dr. Abhishek Srivastava
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PhD : University of Alberta, Canada
Previous Employment: Assistant Professor, Rose-Hulman Institute of Technology, USA).
Statement of Research Interests
Abhishek's group has been involved in research on service-oriented systems most commonly realised through web-services. More recently, the group has been interested in applying these ideas in the realm of Internet of Things. The ideas explored include coming up with technology agnostic solutions for seamlessly linking heterogeneous IoT deployments across domains. Further, the group is also delving into utilising Machine Learning adapted for constrained environments to effectively make sense of the huge amounts of data that emanate from the vast network of IoT deployments.

Broad research area: Web-Services, Ubiquitous Computing, Cyber-Physical Systems

Projects active during April 2020-March 2021:

- **Title:** Transnational Partnership for Excellent Research and Education in Disruptive Technologies for a Resilient Future
  Duration: 2020-23
  Funding Agency: SERB
- **Title:** Use of Hidden Markov Models to Effectively Assess Rumours on Social Networks
  Duration: 2020-23
  Funding Agency: The Research Council of Norway
- **Title:** Use of Machine Learning Techniques for Improved Surveillance of the Melghat Tiger Reserve
  Duration: 2020-22
  Funding Agency: DeFries-Bajpai Foundation, USA
- **Title:** Design and Development of Large-Scale Ambient Energy Harvesting Wireless Networks (LargEWiN)
  Duration: 2019-22
  Funding Agency: BRICS Multilateral Research and Development Projects

Journal articles published:

- Prarthi Jain, Seemandhar Jain, Osmar Zaiane, Abhishek Srivastava, Anomaly Detection in Resource Constrained Environments with Streaming Data. IEEE Transactions on Emerging Topics in Computational Intelligence}, 2021.
- Gyan Prakash Tiwary, Eleni Stroulia, Abhishek Srivastava, Compression of XML and JSON API Responses, IEEE Access, 2021.
- Gyan Prakash Tiwary, Eleni Stroulia, Abhishek Srivastava, Improving Privacy in Data ServiceComposition, IEEE Access, 2021.
- Alok K. Shukla, Prabhat K. Upadhyay, Abhishek Srivastava, Jules M. Moualeu, Enabling Co-Existence of Cognitive Sensor Nodes with Energy Harvesting in Body Area Networks, IEEE Sensors Journal, 2021.



Dr. Aruna Tiwari
Associate Professor
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Dr. Aruna Tiwari (PhD.: RGPV Bhopal) is an Associate Professor. She works in the areas of Artificial Intelligence, machine learning, soft-computing, Data mining and frameworks which are able to perform learning by handling real-life ambiguous situations. Related to several applications to bioinformatics, medical diagnosis. She actively collaborates with other research and academic institutions such as C-DAC Pune, CSIR-CEERI Pilani, Indian Institute of Soybean Research Indore, IIT Delhi and York University UK. Software Industries: Smarg Technologies & SRS ValuTech Ltd.

Previous Employment:

- Assistant Professor, Department of Computer Science and Engineering, IIT Indore (2012-2017)
- Associate Professor in Shri Govindaram Sakseria Instt. Of Technology & Science, Indore (MP) (2008-2012)
- Reader in Shri Govindaram Sakseria Instt. Of Technology & Science, Indore (2005-2008)
- Lecturer in Shri Govindaram Sakseria Instt. Of Technology & Science, Indore (MP) (2001-2005)
- Lecturer in Shri Vaishanav Instt. Of Tech. & Sc., Indore (MP) (1997-2001)

Statement of Research Interests: Soft computing Techniques, Neural Network Learning Algorithms,

Data Mining

Broad research area: Machine Learning, Artificial Intelligence

Research Highlights:

- The research group under Dr. Aruna Tiwari, Associate Professor, Indian Institute of Technology Indore, in collaboration with ICAR-Indian Institute of Soybean Research (IISR), Indore develops the scalable machine learning algorithm for handling huge genome data. For that, the Soybean genome data is collected from ICAR-IISR, Indore. The research lab equipped with Apache Spark clusters.
- Kernel-based Learning in the absence of counterexamples: One Class Classification.
- System Evolution Analytics: Data mining and learning of Complex and Big Evolving Systems.
- Investigations in Quantum based Neural Network Learning Algorithms.
- Optimizing program structures for classifiers using Genetic Programming.
- Investigation in Tree base Genetic Programming for Data Classification.
- Methodologies for Client Oriented Discovery and Mining in Web Service Environment.
- Multilabel Classification using non-iterative and Deep Learning based approaches.
- Action Recognition in Video using Generative Adversarial Network.

Patents (filled and awarded):

- Aruna Tiwari, Ashok Pencily Poothiyat, Kunal Chaudhary, System and method for sign language gesture recognition, India, 1988/MUM/2015, 2015 (Awaiting)

Projects active during April 2020-March 2021:

- **Title:** Development of an Efficient Scalable Clustering Algorithms for Big Data and investigation of Integrated system for Protein Sequence Classification
  Duration: Three Years (Completed Dec 2020).
  Funding Agency: Council of Scientific and Industrial Research (CSIR), Delhi, Govt. of India.
  Brief Description: Development of efficient scalable fuzzy clustering algorithms for huge genome data and investigation of integrated system for Protein Sequence and SNP sequence.
- **Title:** Resource Constrained Artificial Intelligence: Design of Novel Algorithms for Action recognition using Generative Adversarial Networks.
  Duration: Three years (Started in Feb 2020)
  Funding Agency: The Ministry of Electronics and Information Technology (MeitY), Union Government of the Republic of India
  Brief Description: Design of Novel Algorithms for Action recognition using Generative Adversarial Networks.
- **Title:** A novel integrated scalable system for Protein sequence and SNP data analysis using clustering and classification
  Duration: Three Years (Started in March 2021)
  Funding Agency: Council of Scientific and Industrial Research (CSIR), Delhi, Govt. of India.
  Brief Description: Development of scalable system for Protein sequence and SNP data analysis using clustering and classification.
- **Title:** A Novel Scalable High-Performance Machine Learning Algorithms for NGS Analysis of Genomics Data at Exascale Level
  Duration: Two Years (Started in April 2021)
  Funding Agency: National Supercomputing Mission, HPC Applications Development Funded

Research Project by DST in collaboration with the Ministry of Electronics and Information Technology (MeiTY).
Brief Description: Development of a novel scalable High-Performance Machine Learning Algorithms for NGS Analysis of Genomics Data at Exascale Level

- **Title:** Mobility Project
  Duration: Three years (Approved in 2020)
  Funding Agency: Indo-Norwegian collaboration in intelligent offshore mechatronics systems (INMOST), Norwegian Research Council (RCN) under INTPART Scheme

Major awards, achievements, recognitions::

- Represented India as an Artificial Intelligence expert in the Internationalist Podcast series on "Impact of the digital revolution on higher education", organized by the Association of Commonwealth Universities, UK on June 8, 2021.
- (Dr. Tiwari along with Professor Ian Goldin from University of Oxford, UK participated in discussions on Genome sequencing/mutation analysis to predict the possibilities of Coronavirus, climate change analysis, and the effect of digital devices on human behaviour.)
- Got access of two Supercomputers under the National Supercomputing Mission (NSM) funds; PARAM SHAKTI from IITK and PARAM SIDHI from CDAC PUNE in May 2021
- Collaborating with IIT Delhi as a Rural Technology Action Group (RuTAG) member & working on the problem of "Mobile App development for Ground Water Management".
- External expert in RDC for a PhD thesis evaluation, MANIT, Bhopal, July 9, 2021.
- Appointed Moderator for MPPSC examination Feb 2021.
- Conducted Technical Education Quality Improvement Programme (TEQIP-3), MHRD 3-Days Short term Course on Recent Trends in Machine Learning and Soft-Computing from Dec 18 - Dec 20, 2020.
- Appointed examiner: Master Thesis evaluated for University of York UK, PhD Thesis evaluated/defense conducted of IIT, NIT (Nos. 3)
- Two PhDs Awarded, one in the area of one class classification another is in change mining. Scored overall grade A. Defense was over in May 2020.
- Two MS research thesis Awarded.

Courses/conferences/workshops organized:

- Recently organized a Workshop on High Performance Computing (HPC) in the Agriculture Domain under the National Supercomputing Mission (NSM) from Supercomputer Education and Research Centre (SERC) hosted by IIT Indore, ICAR-IISR Indore, and Mahindra University Hyderabad in collaboration with C-DAC Pune, IISC Bangalore, IIT Kharagpur from 14 July 2021 to 16 July 2021 in virtual mode.
- Organized 10th International Conference on Soft Computing for Problem Solving - SocProS 2020 (Unlocking Optimization Tools) jointly with Soft Computing Research Society, Delhi from Dec 18 - Dec 20, 2020 (virtual mode). -Editor of two Springer books for the proceedings of SocProS 2020
- Technical Education Quality Improvement Programme (TEQIP-3), MHRD 3-Days Short term Course on Recent Trends in Machine Learning and Soft-Computing from Dec 18 - Dec 20, 2020.

Journal articles published:

- Vikas Chauhan, Aruna Tiwari, Niranjan Joshi,and Sahaj Khandelwal, Multi-label classifier for protein sequence using heuristic-based deep convolution neural network, Applied Intelligence, Springer, 2021

In Press

- Chandan Gautam, Pratik Kumar Mishra, and Aruna Tiwari, Minimum Variance Embedded Auto-associative Kernel Extreme Learning Machine for One-class Classification, Neural Computing and Applications, 2021 In Press
- Preeti Jha, Aruna Tiwari, Neha Bharill, Milind Ratnaparkhe, Mukkamalla Mounika, and Neha Nagendra, Scalable Incremental Fuzzy Consensus Clustering Algorithm for Handling Big Data, Soft Computing, Springer, 2021 In Press
- Preeti Jha, Aruna Tiwari, Neha Bharill, Milind Ratnaparkhe, Mukkamalla Mounika, and Neha Nagendra, Apache Spark Based Kernelized Fuzzy Clustering Framework for Single Nucleotide Polymorphism Sequence Analysis, Computational Biology and Chemistry, Elsevier, vol. 92, pp. 107454, 2021.
- Suchitra Agrawal, Aruna Tiwari, Prathamesh Naik, and Arjun Srivastava, Improved Differential Evolution based on Multi-Armed Bandit for Multimodal Optimization Problems, Applied Intelligence, Springer, 2021 In Press
- 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, vol. 68, pp. 137-148, 2021.
- Chandan Gautam, Aruna Tiwari, Pratik Kumar Mishra, Suresh Sundaram, Alexandros Iosifidis, and M. Tanveer, Graph-embedded multi-layer kernel ridge regression for one-class classification, Cognitive Computation,vol. 13, pp.552-569, 2021.
- Animesh Chaturvedi, Aruna Tiwari, and Shubhangi Chaturvedi, SysEvoRecomd: Network Reconstruction by Graph Evolution and Change Learning, IEEE Systems Journal, vol. 14(3), pp. 4007-4014, 2020.
- Preeti Jha, Aruna Tiwari, Neha Bharill, Milind Ratnaparkhe, Mukkamalla Mounika, and Neha Nagendra, A Novel Scalable Kernelized Fuzzy Clustering Algorithm Based on In-Memory Computation for Handling Big Data, IEEE Transactions on Emerging Topics in Computational Intelligence, 2020 In Press
- Siddharth Gupta, Salim Ullah, Kapil Ahuja, Aruna Tiwari, and Akash Kumar, ALigN: A Highly Accurate Adaptive Layerwise Log 2 Lead Quantization of Pre-trained Neural Networks, IEEE Access, vol. 8, pp. 118899-118911, 2020.
- 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 and Aruna Tiwari, System Network Complexity: Network Evolution Subgraphs of System State Series , IEEE Transactions on Emerging Topics in Computational Intelligence, vol. 4(2), pp. 130-139, 2020.
- Chandan Gautam, Aruna Tiwari, and M. Tanveer, AEKOC+: Kernel Ridge Regression-based Auto-Encoder for One-class Classification using Privileged Information , Cognitive Computation, Springer, vol. 12, pp. 412-425, 2020.
- Chandan Gautam, Pratik Kumar Mishra, Aruna Tiwari, Bharat Richhariya, H.M. Pandey, S. Wang, and M. Tanveer, Minimum Variance-Embedded Deep Kernel Regularized Least Square Method for One-class Classification and Its Applications to Biomedical Data, Neural Networks, Elsevier, vol. 123, pp. 191-216, 2020.

Any other major events / development etc.:

- Proposed Special Session for the IEEE International Conf. on Fuzzy Systems 2021 (FUZZ-IEEE 2021), Luxembourg, Handling Uncertainty in Interpretable AI on "Scalable Incremental Fuzzy Learning Techniques for Big Data and Genome Sequence Analysis" from Jul 11-14, 2021.
- Two paper presented in IEEE-FUZZ 2021 (virtual mode) on July 14, 2021
- Keynote speaker on "International Conference on Paradigms of Communication, Computing and Data Sciences(PCCDS 2021)", Jointly Organized in Virtual mode with NIT Kurukshetra and Soft Computing Research Society May 7-9, 2021.
- Invited talk on "Virtual International Conference on Soft Computing, Optimization Theory and Applications (SCOTA 2021)" Organized & Sponsored by Department of Mathematics Birla Institute of Technology Mesra, Ranchi Jharkhand, INDIA, March 26-27, 2021.
- Expert talk on "Introduction to Artificial Intelligence and Computational Intelligence" in the Quality Improvement Program (QIP), AICTE on "1st Indian Workshop on Artificial Intelligence" (iWAI 2021), March 19-25, 2021 orgainized by Department of Computer Science & Engineering, IIT Indore.
- Invited keynote speaker on "RTU TEQIP-III Sponsored, 3rd International Conference on Communication and Computational Technologies (ICCCT 2021)", Jointly Organized in Virtual Format by Rajasthan Institute of Engineering and Technology, Jaipur and Rajasthan Technical University Kota in Association with Soft Computing Research Society February 27-28, 2021.
- Invited to deliver a virtual talk as part of the celebration of International Women's Day 2021 on March 8, 2021 at Regional Science Centre, Bhopal.
- Expert talk on "Unsupervised Learning" in the TEQIP course on Machine Learning and Artificial Intelligence on Dec 24, 2020 at IIT Indore.
- Expert talk on "Machine Learning" in the QIP Sponsored Short-Term Course on Computational Methods in Signal Processing and Machine Learning, Dec 14-19, 2020 at IIT Indore.
- Expert talk in the Centre for Advanced Electronics, IIT Indore is organizing an NPIU/TEQIP-III Sponsored Faculty Training on Future Skill Technologies on "Internet of Things" from Dec 07-11, 2020.
- Expert talk on "Design of Kernel based One class classifier", 2020 IEEE Computational Intelligence Society Summer School on "Emerging Research Trends in Computational Intelligence: Theory and Applications" from Nov 26-30, 2020. & Session chair in session: PN Suganthan, NTU Singapore "Differential Evolution: Population Topologies, Ensemble Strategies and Adaptation.
- Expert Talk for FDP on Data Science and Intelligent Computing titled as "Artificial Intelligence: building foundation through data exploration, pre-processing and representation", Nov 21-25, 2020 at IIIT Naya Raipur.
- Expert talk on NPIU/TEQIP-III Sponsored Faculty Training on Future Skill Technologies on "Artificial Intelligence and Machine Learning" organized by the Discipline of Mathematics, Discipline of Computer Science & Engineering, and Discipline of Electrical Engineering, IIT Indore from Nov 20-27, 2020.
- Expert Talk on "Clustering Technique", AICTE Training and Learning (ATAL). And Academy Sponsored "Online Faculty Development Programme (FDP)" on "Artificial Intelligence" from Nov 16-20, 2020 at CSIR Advanced Materials and Processes Research Institute (AMPRI), Bhopal.
- Expert talk on "Introduction to AI and recent challenges" in the TEQIP-III Sponsored Short-Term Course on Artificial intelligence driven biomedical data analysis for disease diagnosis organized by Discipline of Electrical Engineering and Discipline of Mathematics, IIT Indore from Nov 05-10, 2020.
- Expert Talk on "Recent Trends in Data Science and Information Security" on 5 days Virtual Short Term

Training Program from Jun 22-26, 2020 at Ramrao Adik Institute of Technology (RAIT), Navi Mumbai.

- Webinar on "Artificial Intelligence", Title: Computer Vision on Jun 6, 2020 at MCTE MHOW.
- Expert Talk on "Machine Learning in Bioinformatics" on Jan 30, 2020 at Pune University.

COVID related activities:

"Developed scalable algorithms have been tested on COVID-19 protein data"

COVID-19 (Coronavirus Disease-19), a disease caused by the SARS-CoV-2 virus, has been declared a pandemic by the World Health Organization on March 11, 2020. To solve a global problem of clustering of COVID-19 genome, intelligent scalable machine learning techniques need to be developed to process and analyze important COVID-19 genome data by utilizing the super-computing facility. We have proposed a protein feature extraction approach named a Scalable Distributed Co-occurrence-based Probability-Specific Feature extraction approach (SDCPSF). We have built a model to preprocess the massive COVID-19 protein sequences using Apache Spark clusters. The preprocessed COVID-19 protein sequences are used as input to KSRSIO-FCM, a kernelized fuzzy clustering algorithm, which efficiently performs clustering of big data due to its in-memory cluster computing technique. The SDCPSF is applied on COVID-19 protein sequences for preprocessing, and then the KSRSIO-FCM algorithm is used to form the clusters of COVID-19 sequences. The proposed method results are investigated on COVID-19 protein sequences using KSRSIO-FCM in terms of the Silhouette index and Davies-Bouldin index.



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 242 publications including 11 Patents and 4 books. His is Fellow of IET, Fellow of British Computer Society, IEEE Distinguished Lecturer and IEEE Distinguished Visitor.

Dr. Anirban Sengupta
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Major Awards and Honors

- Chair, IEEE CTSoc Security and Privacy Technical Committee
- Board member, IEEE CTSoc Technical Committee
- 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 "Facial Biometric for Securing Hardware Accelerators", IEEE Transactions on Very Large Scale Integration Systems (TVLSI) , Volume: 29, Issue: 1, Jan. 2021, pp. 112 – 123
- Anirban Sengupta, Mahendra Rathor "Securing Hardware Accelerators for CE Systems using Biometric Fingerprinting", IEEE Transactions on Very Large Scale Integration Systems (TVLSI) , Volume: 28, Issue: 9, Sep 2020, pp. 1979-1992
- 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
- Wei Hu, Chip-Hong Chang, Anirban Sengupta, Swarup Bhunia, Ryan Kastner, Hai Li "An Overview of Hardware Oriented Security and Trust: Threats, Countermeasures and Design Tools", IEEE Transactions on Computer Aided Design of Integrated Circuits & Systems (TCAD), Invited Paper, Volume: 40, Issue: 6, June 2021, pp. 1010-1038

- 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. 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, Printer Forensics and Medical Image Processing. 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 templates, particularly for fingerprint based biometric systems. He is also currently working in the domain of printer forensics and exploring its usage of machine learning in securing the interface between the printers and the human. He is also working towards utilization of artificial intelligence and machine learning technologies in the domain of medical image processing and automatic diagnostics.

Research Highlights:

- Biometric template security
- Human recognition using 2D and 3D data of face and ear
- Image quality assessment and enhancement
- Printer forensics
- Medical image processing and automatic diagnostics

Selected Publications:

- Shubham Kumar, **Surya Prakash** and Pramod Ganapathi, An Algorithm for the Sequence Alignment with Gap Penalty Problem using Multiway Divide-and-Conquer and Matrix Transposition, Information Processing Letters, July 2021 (Accepted).
- Vivek Baghel, Syed Sadaf Ali, and **Surya Prakash**, A Non-invertible Transformation based Technique to Protect a Fingerprint Template, IET Image Processing, January 2021. DOI: https://doi.org/10.1049/ipr2.12130
- Akhilesh M Srivastava, Arushi Jain, Priyanka Rotte, **Surya Prakash** and Umarani Jayaraman, A Technique to Match Highly Similar 3D Objects with an Application to Biomedical Security, Multimedia Tools and Applications, January 2021. DOI: https://doi.org/10.1007/s11042-020-10161-8
- Anagha R Bhople and **Surya Prakash**, Learning Similarity and Dissimilarity in 3D Faces with Triplet Network, Multimedia Tools and Applications, November 2020. (Accepted). DOI: https://doi.org/10.1007/s11042-020-10160-9
- Syed Sadaf Ali, Vivek Singh Baghel, Iyyakutti Iyappan Ganapathi and **Surya Prakash**, Robust Biometric Authentication System with a Secure User Template, Image and Vision Computing, August 2020. (Accepted). DOI: https://doi.org/10.1016/j.imavis.2020.104004
- Anagha R Bhople, Akhilesh M Srivastava, and **Surya Prakash**, Point Cloud based Deep Convolutional Neural Network for 3D Face Recognition, Multimedia Tools and Applications, April 2020. (Accepted). DOI: https://doi.org/10.1007/s11042-020-09008-z

Events/Seminars/Conferences Organized:

- Jury member for the 11th edition of Aegis Graham Bell Awards (AGBA), initiated by Aegis School of Data Science, Cyber Security and Telecom, Mumbai. (https://www.aegis.edu.in/), February 08, 2021.
- Appointed as the Chairman of the Project Review Group (PRG) by the Director General, Bureau of Police Research and Development, Ministry of Home Affairs, for evaluation of the R&D project "Detection and Prevention of Forged Obscene Images/Videos in the Social Networks using Machine Learning " under Cyber Crime Prevention against Women & Children (CCPWC), executed by Dr. Masilamani V of IITDM Kancheepuram, April 2020.
- Technical Program Committee Member of 2021 International Conference on Machine Vision and Augmented Intelligence (MAI - 2021), IIITDM Jabalpur, February 11-14, 2021. www.mvai.in
- Technical Program Committee Member of 2021 16th International Conference on Computer Vision Theory and Applications (VISAPP 2021), February 8-10, 2021 (in online mode), Co-Organized by Vienna University of Technology – TU Wien (TUW), Vienna, Austria. http://www.visapp.visigrapp.org
- Technical Program Committee Member of 2020 AICTE sponsored International E-conference on Data Analytics, Intelligent Systems and Information Security (ICDIIS '20), Coimbatore, Tamilnadu, India, December 11-12, 2020. http://mcet.in/conference/ICDIIS-20/.
- Technical Program Committee Member 2020 IDRBT Doctoral Colloquium (IDC 2017), 10th Colloquium, December 7-8, 2020, IDRBT, Hyderabad, India.
- Technical Program Committee and International Advisory Board Member of 2020 5th IAPR International Conference on Computer Vision and Image Processing, December 4-6, 2020, IIIT Allahabad, India. https://cvip2020.iiita.ac.in/index.php
- Session Chair in 2020 International Conference on Intelligent Systems, Data Science and Computing (ICIDC-2020), November 27-28, 2020, ROOEM Nagpur, INDIA. http://icidc.rknec.edu/Default.aspx
- Program Committee member of 2020 16th International Conference on Intelligent Computing (ICIC 2020), October 2-5, 2020, Bari, Italy. http://ic-ic.tongji.edu.cn/2020/
- Member of Preliminary Committee for evaluation of applications for various programmes/fellowships and grants for the year 2020-21 of Shastri Indo-Canadian Institute (SICI), August-September, 2020
- Technical Program Committee member of 2020 12th International Conference on Communication Software and Networks (ICCSN 2020), Chongqing University, Chongqing, China, June 12-15, 2020. http://www.iccsn.org/committee.html



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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:

Fingerprint spoof detection, face presentation attack detection, cancellable biometric security, biometric MasterPrint mitigation.

Broad research area: Biometric security

Research Highlights: Partial fingerprint identification systems recognize an individual when the sensor size has a small form factor in accepting a full fingerprint. These systems also facilitate forensic investigators for latent fingerprint identification collected from a crime scene. However, the distinctive features within a partial fingerprint are significantly less. Hence, the uniqueness of a partial fingerprint cannot be assured, leading to the possibility that a single partial fingerprint may identify multiple enrolled users. A MasterPrint is a partial fingerprint identifying at least 4% distinct individuals from the enrolled template database. An adversary can exploit such a MasterPrint in convicting an innocent in a criminal case. A novel partial fingerprint identification method is proposed to address the vulnerability. The method extracts features from binarized and thinned partial fingerprint over eight axes emerging from a reference minutia. The results for partial datasets cropped from standard bench-marked dataset, showed remarkable performance in terms of higher identification rate while generating fewer MasterPrints using the proposed method.

Projects active during April 2020-March 2021:

- **Title:** Design and Development of Efficient Cancelable Template Generation Methods for Fingerprint and Iris Biometrics
  Duration: 2017-2020
  Funding Agency: SERB-DST
  Brief Description: In this project, two novel techniques are developed for generating cancelable templates for iris and fingerprint biometrics. In addition, a novel fusion scheme is proposed to combine two cancelable templates generated from iris and fingerprint biometrics.

Major awards, achievements, recognitiations:

- Technical Program Committee and International Advisory Board Member of 2020 5th IAPR International Conference on Computer Vision and Image Processing, December 4-6, 2020, IIIT Allahabad, India. https://cvip2020.iiita.ac.in/index.php
- Technical Program Committee Member 2020 IDRBT Doctoral Colloquium (IDC 2017), 10th Colloquium, December 7-8, 2020, IDRBT, Hyderabad, India.
- Program Committee member of 2020 16th International Conference on Intelligent Computing (ICIC 2020), October 2-5, 2020, Bari, Italy. http://ic-ic.tongji.edu.cn/2020/
- Member of Preliminary Committee for evaluation of applications for various programmes/fellowships and grants for the year 2020-21 of Shastri Indo-Canadian Institute (SICI), August-September, 2020

Courses/conferences/workshops organized:

- Organized TEQIP III sponsored Faculty Training Program on Artificial Intelligence and Machine Learning, December 7 - 17, 2020.
- Short-Term Online Training Program on Machine Learning Techniques for Cross-domain Applications December 21 - 26, 2020
-

Journal articles published:

- R. Dwivedi, S. Dey, C, Chakraborty and S. Tiwari, Grape Disease Detection Network based on Multi-task Learning and Attention Features, **IEEE Sensors Journal** ,doi: 10.1109/JSEN.2021.3064060, March, 2021. (IF: 3.073)
- R. P. Sharma and S. Dey, A Comparative Study of Handcrafted Local Texture Descriptors for

Fingerprint Liveness Detection Under Real World Scenarios, Multimedia Tools and Applications, Springer, vol. 80, pp. 9993–10012, 2021. **(IF: 2.313)**

- M. Joshi, B. Mazumdar, S. Dey, A Comprehensive Security Analysis of Match-in-Database Fingerprint Biometric System, Pattern Recognition Letters, Elsevier, vol. 138, pp. 247-266, 2020. **(IF: 3.255)**
- 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, vol. 23 (2), pp.1329–1344, 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), pp. 1495–1509, 2020. **(IF: 4.594)**

Any other major events / development etc.: Book chapter published:

- M. Joshi and B. Mazumdar and S. Dey, Biometric-based Secure Authentication for IoT Enabled Devices and Applications, Book: Security of Internet of Things Nodes: Challenges, Attacks, and Countermeasures, Editors: Chinmay Chakraborty, Sree Ranjani Rajendran, Muhammad Habib Ur Rehman, CRC Press, August, 2021.
- M. Joshi and B. Mazumdar and S. Dey, Advance Security Schemes for Smart Societies, Book: Green Technological Innovation for Sustainable Smart Societies, Editors: Chinmay Chakraborty, August, Springer, 2021.
- M. Joshi and B. Mazumdar and S. Dey, Lightweight Security Protocols for Securing IoT Devices in Smart Cities, Book: Data-Driven Mining, Learning and Analytics for Secured Smart Cities, Editors: Chinmay Chakraborty, Jerry Chun-Wei Lin, Mamoun Alazab, Springer, pp. 89-108, 2021.



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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, Magdeburg, 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 in Mathematics of Data Science and Simulation (MODSS).

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: This year's most important research breakthrough has been development of novel state-of-the art image steganography schemes. We achieved substantially higher embedding capacities than all competing techniques while preserving the visual quality of the stego-image (the image obtained after embedding the secret data into the cover image is called the stego-image). We also ensured that our schemes are resistant to steganographic attacks

Selected Publications:

- R. Agrawal and K. Ahuja. CSIS: Compressed Sensing based Enhanced-Embedding Capacity Image Steganography Scheme. IET Image Processing, WILEY, vol. 15, pp. 1909 - 1925, 2021.
- 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, vol. 51 (3), pp. 1917 – 1932, 2021.
- P. C. Mane, K. Ahuja, and N. Krishnamurthy. Stability, Efficiency, and Contentedness of Social Storage Networks. Annals of Operations Research, Springer, vol. 287, pp. 811 - 842, 2020.

Research Projects:

- IIT Indore and LU Hannover Partnership in Physics, Chemistry, Bio Science & Computational Science (Funded by DAAD, Germany).
- 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, GOI).

a. Broad research area: Dr. Kapil Ahuja works in Mathematics of Data Science and Simulation (MODSS). Specifically in Machine Learning, Network Science, Algorithms, Optimization, Game Theory, and Numerical Methods.

b. Awards and Achievements:

- Dr. Kapil Ahuja's two PhD students and one MS student successfully defended their respective thesis and graduated (Mar 2021, Dec 2020, and May 2020).
- Dr. Kapil Ahuja gave an invited talk at 1st Indian Workshop on Artificial Intelligence under QIP-AICTE Program, IIT Indore (Mar 2021).
- Dr. Kapil Ahuja is appointed Editor for IETE Journal of Research (Taylor & Francis; IF 2.33; Feb 2021).
- Dr. Kapil Ahuja is invited as a panelist for the Indo – German Research Day organized by DWIH, New Delhi (Dec 2020).
- Dr. Kapil Ahuja published 7 journal papers at prestigious places in 2020-2021..

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

- R. Agrawal and K. Ahuja. CSIS: Compressed Sensing based Enhanced-Embedding Capacity Image Steganography Scheme. IET Image Processing, WILEY, vol. 15, pp. 1909 - 1925, 2021.
- 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, vol. 51 (3), pp. 1917 – 1932, 2021.
- P. C. Mane, K. Ahuja, and N. Krishnamurthy. Stability, Efficiency, and Contentedness of Social Storage Networks. Annals of Operations Research, Springer, vol. 287, pp. 811 - 842, 2020.
- S. Gupta, S. Ullah, K. Ahuja, A. Tiwari and A. Kumar. ALigN: A Highly Accurate Adaptive Layerwise Log_2_Lead Quantization of Pre-Trained Neural Networks. IEEE Access, vol. 8, pp. 118899 - 118911, 2020.
- N. P. Singh and K. Ahuja. Preconditioned Linear Solves for Parametric Model Order Reduction. International Journal of Computer Mathematics, Taylor & Francis, vol. 97 (7), pp. 1484 - 1502, 2020.
- P. C. Mane, K. Ahuja and N. Krishnamurthy. Externalities in Endogenous Sharing Economy Networks. Applied Economics Letters, Taylor & Francis, vol. 27 (17), pp. 1404 – 1408, 2020.
- N. P. Singh and K. Ahuja. Reusing Preconditioners in Projection Based Model Order Reduction Algorithms. IEEE Access, vol. 8, pp. 133233 - 133247, 2020.

Events/ Seminars organized:

- 10th International Conference on Soft Computing for Problem Solving (Dec 2020).
- TEQIP-3 short term course on Machine Learning (Dec 2020).
- 3rd All IITs International Relations Conclave (Sep 2020).

Projects active during April 2020-March 2021:

- **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, Germany.
  Brief Description – PI from Indian side; 6 Indian and 9 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 – Originally 2019-2020; Extended up to 2022.
  Funding Agency – SPARC Scheme of Ministry of Education, India.
  Brief Description – Co-PI from Indian side; 2 Indian and 2 UK academicians.



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

Dr. Gourinath Banda
Associate Professor
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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

b. 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: Patent granted in the important area of Electrical Energy conservation "System for Electrical Energy Conservation" applicable to charging infrastructure

Major awards, achievements, recognitions:

- VIGYAN VRITIKA grant awarded for conducting internship on "Satellite control simulation" topic
- Realtime kernel HARSARK-RS released on GitHub
- Certified in Blockchain Tech
- HARSARK-RS v1 multiform released on GitHub.

Projects:

- IMPRINT 2C: "Robotic System for Stealth Surveillance"
- VIGYAN VRITIKA grant awarded for conducting internship on "Satellite control simulation" topic

Courses/conferences/workshops organized:

Delivered a QIP course in "Blockchain Foundations and Solution Architectures " March 2021

Journal articles published:

A Quadruped Robotic System based on PSA with Vertical Wall Climbing Capabilities.



Dr. Neminath Hubballi
Associate Professor
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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 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 Norwegian 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: Hewlet-Packard, Infosys Lab Samsung R&D
Academic associations with other institutions (Affiliate/Adjunct/ Visiting posts) : Visiting Professor at Norwegian University of Science and Technology

Statement of Research Interests

a. **Broad research area:** Network Security, System Security, Fault Detection in Networks, Software Defined Networking

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: Despite 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.
- Routing Management in Software Defined Networking: Software Defined Networks (SDN) separate the control and data planes by implementing the control plane in software. It gives the convenience of effective network management. Our group works in optimizing routing mechanisms in the SDN.

Awards and Achievements:

- DUO-India 2020 fellowship to visit City University of London.
- Pratibha Khandait PhD student received TCS research fellowship 2020-2021

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

- Nikhil Tripathi and Neminath Hubballi, “Application Layer Denial-of-Service (DoS) Attacks and Defense Mechanisms: A Survey”, ACM Computing Surveys, Volume 54, Issue 4, July 2021
- Nikhil Tripathi and Neminath Hubballi,"Preventing Clock Synchronization in NTP Broadcast Mode", Computers & Security Journal, Elsevier, Volume 102, March 2021
- Pratibha Khandait, Namrata Tiwari and Neminath Hubballi, "Who is Trying to Compromise Your SSH Server? An Analysis of Authentication Logs and Detection of Bruteforce Attacks", The 4th International Workshop on Networking Women In Distributed Computing And Networks (NWDCN 2021) held along with ICDCN 2021

Courses/conferences/workshops organized:

- TPC chair of IEEE Advanced Networks and Telecommunication Systems 2021.
- Conducted a TEQIP sponsored course on “Recent Advances in Network Security and Blockchain Technology”, Dec 2020
- Conducted a QIP sponsored course on “Recent Advances in Network Security and Blockchain Technology”, Dec 2020

Projects Active during 2020-2021

- **Title:** Digital Forensic Knowledge Integration and Intelligence (DIREKT-Intel) Sponsoring Agency: SPARC **Period**:2019-2022

- **Brief Description**: In this project we propose techniques for digital evidence collection from different sources which are admissible in a court of law. The work also involves correlating the evidence collected for coherent view.
- **Title:** DPIAccelerator: Hardware Implementation of Deep Packet Inspection
- **Sponsoring Agency:** CSIR
- **Period:**2020-2023
- **Brief Description:** In this project we propose methods to perform Deep Packet Inspection using hardware for custom applications like network traffic classification, QoS, and security monitoring.



Dr. Bodhisatwa Mazumdar
Assistant Professor
bodhisatwa@iiti.ac.in

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 and lightweight cryptographic primitives that have increased vulnerabilities against fault analysis based attacks. The work is based on developing the entropy reduction model and persistent fault based models 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 AsianHOST and Springer SPACE conference and its extensive analysis is under consideration as a publication to Springer journal of Electronic testing. Prior to this work, we pinpointed side-channel vulnerabilities and removal attacks on conventional logic locking techniques.

Achievements:

- Elected as Working Group Member (WGM) in IEEE Standard 1413.1 for Selecting and Using Reliability Predictions Based on IEEE 1413, which provides a standard framework for the reliability prediction of hardware.
- Promoted to Voting Cum Working Group Member in IEEE Standard 1413.1 for Selecting and Using Reliability Predictions Based on IEEE 1413.
- Elected as Working Group Member (WGM) in IEEE 1624 Standard for Organizational Reliability and Capability.

Selected Publications

- Mahesh Joshi, Bodhisatwa Mazumdar, Somnath Dey, "A comprehensive security analysis of match-in-database fingerprint biometric system", Pattern Recognition Letters, 138: 247-266 (2020).
- Muhammad Yasin, Bodhisatwa Mazumdar, Ozgur Sinanoglu, Jeyavijayan Rajendran, "Removal Attacks on Logic Locking and Camouflaging Techniques", IEEE Transactions on Emerging Topics in Computing, 8(2): 517-532 (2020).

- Priyanka Joshi, Bodhisatwa Mazumdar, "ExtPFA: Extended Persistent Fault Analysis for Deeper Rounds of Bit Permutation Based Ciphers with a Case Study on GIFT", SPACE 2020: 101-122.
- Arjit Arora, Kalpit Kothari, Priyanka Joshi, Bodhisatwa Mazumdar, "Revisiting Persistent Fault Analysis: Assessing Weak Keys and Strong Keys in GIFT-64 Lightweight Cipher", IEEE AsianHOST 2020, 1-6.



Dr. Puneet Gupta
Assistant Professor
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PhD: 2016, Department of Computer Science & Engineering,
Indian Institute of Technology Kanpur, Kanpur,
UP, INDIA.

Previous Employment:

- Assistant Professor, Indian Institute of Technology Indore, Indore, MP, INDIA. [March 2019-Currently]
- 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:

- Face anti-spoofing and Deep-fake detection using human vital parameters
- Adversarial attacks and defences on well established Deep Learning systems pertaining to images, videos, biomedical applications, audio and text modalities.
- Currently supervising two PhD and three MS (Research) scholars. Also supervising several B.Tech projects.

Awards and Achievements:

- Served as session chair in MAI 2021.
- Reviewer of several reputed journals like IEEE transactions on cybernetics, Pattern Recognition, Digital Signal Processing, and so on.

Project approved:

- **Title:** Heart rate monitoring from non-contact face videos using Deep Learning
  Project Investigator: Dr. Puneet Gupta
  Sponsoring Agency: Science & Engineering Research Board (SERB)
  Duration: 2020-2022
  Funding Amount: INR 30,33,840

Patents: K Maurya, R Hebbalaguppe, P Gupta, "Systems and methods for performing hand segmentation", US Patent App. 16/534,998, 2020

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

- 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.

- Puneet Gupta, "MERASTC: Micro-expression Recognition using Effective Feature Encodings and 2D Convolutional Neural network." IEEE Transactions on Affective Computing, 2021, IEEE (In-Press).

Events/ Seminars organized:

- A TEQIP-III course entitled, "Deep Dive in Deep Vision" was organized in December 2020.
- A NPIU course on "Machine Learning" was organized in December 2020.



Dr. Nagendra Kumar
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PhD : IIT Hyderabad, 2019
Previous Employment (includes post-doctoral experience) :
Infocomm Research (I2R), Agency for Science, Technology and Research (A*STAR), Singapore

Statement of Research Interests

Dr. Nagendra Kumar is an Assistant Professor in the Department of Computer Science and Engineering at IIT Indore, India. His research interests are in Natural Language Processing, Social Network Analysis, Deep Learning, Artificial Intelligence, and Data Mining. He is currently working on a problem of Information Diffusion and Information Summarization in Social Networks.

Broad research area:

- Natural Language Processing
- Social Network Analysis
- Machine Learning
- Deep Learning
- Data Mining

Research Highlights:

- Hashtag Recommendation
- Question-Answering Systems
- Fake News Detection
- Semantic Text Matching.

Courses/conferences/workshops organized:

1st Indian Workshop on Artificial Intelligence (iWAI 2021) During 19th to 25th March 2021 Under Quality Improvement Program (QIP), AICTE

Journal/conference articles published:

- Nagendra Kumar, Eshwanth Baskaran, Anand Konjengban, Manish Singh,Hashtag recommendation for short social media texts using word-embeddings and external knowledge, In Knowledge and Information Systems (KAIS), pp. 175-198, Springer, 2021.
- Nagendra Kumar, Jung-jae Kim, Shubhi Bansal, Semantic Text Matching using Transfer Learning and Deep Learning, In 17th International Conference on Machine Learning and Data Mining (MLDM), Springer, 2021



Dr. Ranveer Singh
Assistant Professor
ranveer@iiti.ac.in

PhD : IIT Jodhpur
Previous Employment: Visiting Assistant Prof. IIT Dhanbad

Statement of Research Interests:

- Algorithmic Graph Theory
- Expanders and Ramanujan graphs

Broad research area: Spectral Graph Theory
Research Highlights: Expanders and Ramanujan graphs

Projects active during April 2020-March 2021:

- **Title:** Parametrized complexity of Matrix determinant and permanent
  Duration: 5 Years
  Funding Agency: DST
  Brief Description: By definition, matrix determinant and permanent are two very similar quantities of a square matrix, but computationally they are extremely different. Matrix determinant is a polynomial-time solvable problem; that is, it is in class P. Whereas matrix permanent is a #P-complete problem. The question we will be mostly focusing on is to find some classes of matrices whose permanent can be expressed as the determinant of some polynomial-size matrix.

Courses/conferences/workshops organized: Advanced Agorithms, Automata Theory and Logic
Journal articles published:

- Pradumn Kumar Pandey, Ranveer Singh. "Fast Average-consensus on Networks using Heterogeneous Diffusion." IEEE Transactions on Circuits and Systems–II: Express Briefs (2021)
- Ranveer Singh, Cheng Zheng, Naomi Shaked-Monderer, and Abraham Berman. "Nonsingular (vertex-weighted) block graphs." Linear Algebra and its Applications 602 (2020): 138-156
- Ranveer Singh. "Parameterized complexity of determinant and permanent." Theoretical Computer Science 845 (2020) 50-58
- Ranveer Singh. "Permanent, determinant, and rank of bi-block graphs." Aequationes mathematicae 94, no. 1 (2020): 1-12.
- Ranveer Singh, Naomi Shaked-Monderer, and Avi Berman. "A linear time algorithm for the nullity of vertex-weighted block graphs." Discrete Applied Mathematics 2021.



Dr. Chandresh Kumar Maurya
Assistant Professor
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PhD : IIT Roorkee, 2016

Previous Employment (includes post-doctoral experience) :

- Assistant professor at NIT Delhi, Feb 2020-July 2020
- Research Assistant professor at ELTE University Hungary, March 2019-Feb 2020
- Research Scientist, IBM Research Bangalore, Jan 2017-Jan 2019

Statement of Research Interests
Machine learning, Natural language processing, Information retrieval, Data Mining, Deep learning, Artificial intelligence.

Broad research area: Machine learning, Natural language processing, Information retrieval, Data Mining, Deep learning, Artificial intelligence.

Research Highlights:
- Worked on anomaly detection in nuclear power plant data
- Automation of invoice payment process
- Creative tagline generation for product advertising
- Multimodal sarcasm detection

Patents (filled and awarded):
- 1 awarded with USPTO
- 1 filed with IPO

Projects active during April 2020-March 2021:
- **Title:** Multimodal incident similarity inference for improving ticket resolution
  Duration: 2 years
  Funding Agency: NA
  Brief Description: In this project, we develop model for multimodal ticket similarity learning

Courses/conferences/workshops organized:
- CS 307/357 parallel computing theory+lab
- CS 204/254 Design and analysis of algorithms theory+lab

Workshops:
- Organized 1 week FDP program under QIP scheme from March 19-25, 2021

Any other major events / development etc.:
- Coordinated the development of Madad platform for Covid 19 infected peoples.
- https://madad-covid.in/home
- Serving as faculty coordinator for the Technical club of IIT Indore
- Coordinating the development of "Buy n sell" platform for IIT Indore users.

COVID related activities:
- Coordinated the development of Madad platform for Covid 19 infected peoples. https://madad-covid.in/home.
- Large Scale Contact Tracing for Covid-19

Department of Electrical Engineering



Introducing faculty members of Discipline of Electrical Engineering

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

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 centre 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 discipline has grown significantly in terms of faculty strength with diversified specializations, state of the art research facilities and undergraduate and postgraduate students' strength.

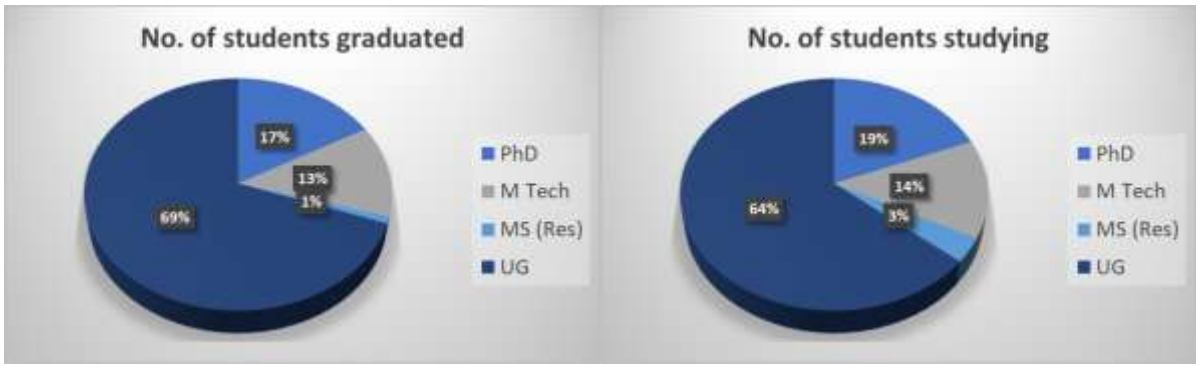
The academic programs offered by the discipline include B. Tech., M. Tech., M. S. (Research) and Ph. D. Two M. Tech. programs namely (i) Communication and Signal Processing and (ii) VLSI Design and Nanoelectronics are currently being offered. The discipline also hosts many Post-Doctoral Fellows and Scientists from time to time. In July-2021, the department faculty members contributed into the amalgamation of interdisciplinary center on Electric Vehicles, leading to a new M. Tech. program started in this area, keeping upbeat with the changing landscape of the automobile sector in the country. Pithampur auto cluster being one of the hubs of ancillary units is likely to benefit from this program and may lead to increased participation from the industry in coming times.

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
- Nanoscale Devices, VLSI 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 24 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 2020-21 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-Nano mission having a net worth of ~ INR 1.4 Crore. The strong footing of Discipline of EE is further proven by the number of Ph.D. students graduated. A total of 15 students successfully completed their Ph.D. from the Discipline in the AY 2020-21 alone, which is nearly one-sixth of the total number of Ph.D. students graduated till date since the inception of the Department. The Department has published eighteen patents till date and one of the patents was awarded in the recent past, all this is an indication of the quality of R & D activities carried out in 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 appreciation of their work in industries. In the AY 2020-21, department of Electrical Engineering graduated its first batch of MS (Res) scholars as well. A total of five students have graduated out of MS (Res) this year.

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 discipline 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. Through our industry outreach activities, the department has been instrumental in getting some consultancy

projects as well. More recently department has also been taking lead in its international outreach activities, several international students have been selected for their admission into our PG programs.

Some of the notable achievements by the faculty members of the Department during the AY 2020-21, 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.
- Dr. Saptarshi Ghosh has been appointed as the Associate Editor in IEEE Antennas and Wireless Propagation Letters since January 2021.
- One of the research papers from Dr. Vipul Singh's research group MNRG was selected for the cover page of IEEE EDL.



Professor Abhinav Kranti
Professor
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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 junction less transistor along with an associated negative value of total gate capacitance. Logic and memory functionality of vertically stacked bi-directional junction less 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 - 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) –

- Junctionless Device Cross-Section: A Key Aspect for Overcoming Boltzmann Tyranny, A. Kranti and M. Gupta, 237th ECS Meeting – Advanced CMOS-Compatible Semiconductor Devices (Invited Talk), 237th Meeting of Electrochemical Society, Montreal, Canada, ECS Transactions, vol. 95, pp. 39-44, 2020.
- Limits on hysteresis-free sub-60 mV/decade operation of MFIS nanowire transistor, S. Semwal, V.P. Reddy, N. Jaiswal and A. Kranti, IEEE Trans. Electron Devices, vol. 67, pp. 3868-3875, 2020.

Events/ Seminars organized - Contributed to the QIP sponsored short term course (Coordinator: Dr. Vipul Singh) on Photovoltaic Devices & Systems: Challenges & Scope at IIT Indore from 8th to 13th March 2021.

Projects active during April 2020-March 2021

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

My research group is currently working on developing advanced nonlinear estimation and filtering

algorithms for handling several irregularities in measurements. In this regard, we are broadly focusing on the following problems: i) delay in measurements, ii) missing measurements, and iii) non-Gaussian measurement noises. We are also working on introducing new technologies or advancing the existing technologies of particular domains by applying advanced nonlinear estimation and filtering. In this regard, our focusing is currently on the power system domain.

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 2020 to March 2021.

Three best publications: Journals

- **Abhinoy Kumar Singh,** "Szego Quadrature Kalman Filter for Oscillatory Systems", *IEEE Access (IF: 3.745)*, vol. 8, pp. 194700-194708, Oct. 2020.
- **Abhinoy Kumar Singh**, "Exponentially Fitted Cubature Kalman Filter With Application to Oscillatory Dynamical Systems", *IEEE Transactions on Circuit and Systems I (IF: 3.60)*, vol. 67, no. 8, pp. 2739 – 2752, Aug. 2020.
- **Abhinoy Kumar Singh**, Mihailo V. Rebec and Ahmad Haidar, "Kalman-Based Calibration Algorithm for AgaMatrix Continuous Glucose Monitoring System", *IEEE Transactions on Control Systems Technology (IF: 5.31)*, vol. 29, no. 3, pp. 1257-1267, May 2021.

Conferences

- Sumanta Kumar Nanda, Vimal Bhatia, **Abhinoy Kumar Singh**, "Performance analysis of Cubature rule based Kalman filter for target tracking'', INDICON, Delhi, India, pp. 1-6, 11-13 Dec. 2020.

Events/ Seminars organized - Short term courses:
Conference organizing committee:
Projects active during April 2020-March 2021

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
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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

- Application of power electronics in renewable energy systems.
- Modelling and simulation of power electronic systems.
- 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

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 2020-March 2021
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 modeled for different control strategy and these will be verified in Real Time Digital Simulator (RTDS).



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

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

Academic associations with other institutions (Affiliate / Adjunct / Visiting posts) - Adjunct Faculty in Purdue School of Engineering & Technology, IUPUI, USA.

Statement of Research Interests

a. Broad research area

- 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.

Patents - M. Kumar, Sulabh, L. Singh, S. Jain, S. Rajput, V. Kaushik, H. C. Jha, "A biochemical sensor with engineered nanophotonic structure, the process of preparation and use thereof", Indian patent, No. 202121008991; Published in March 2021.

Publications (includes journal articles, books and book chapters)

- 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).
- 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).
- 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 2020-March 2021

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 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.



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PhD. - Department of Electrical Engineering, Indian Institute of Technology Delhi,
Previous Employment Assistant Professor, Department of Electrical Engineering, IIT Indore, Indore, Madhya Pradesh, May 2012- December 2017
Assistant Professor, Department of Electronics & Communication Engineering, BIT Mesra, Ranchi, July 2011-April 2012
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.
- Associate Editor in IEEE Access.
- Technical Program Committee (TPC) Member
- IEEE International Conference on Communications (ICC), 2020, 2021 - SAC-08 SSC Track.
- IEEE Global Communications Conference (Globecom), 2020, 2021.
- IEEE 5G World Forum (WF-5G), 2020, 2021 - Track 1: 5G Technologies.

- IEEE Vehicular Technology Conference (VTC), 2020-Fall.
- IEEE Vehicular Technology Conference (VTC), 2020-Spring.
- National Conference on Communications (NCC), 2020, 2021.
- International Symposium on Wireless Communication Systems (ISWCS), 2020.
- PhD student (Vibhum Singh) awarded Student Travel Grant for the IEEE Wireless Communications and Networking Conference, Seoul, South Korea, in 2020.

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

Journal Articles:
- 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.
- 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.
- 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:
- 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
- Program Committee Member, International Workshop on Big data driven Edge Cloud Services (BECS 2021), 21st International Conference on Web Engineering (ICWE), Biarritz, France, 18-21 May 2021.
- Steering Committee Member, First International Symposium on Molecular and Biological Communications (MBCom)-2021, VNIT Nagpur, 1-5 February 2021.
- International Advisory Committee Member, IEEE International Conference on Advanced Communication Technologies and Signal Processing (IEEE ACTS-2020), NIT Silchar, 4-6 December 2020.
- Advisory Committee Member, 5th IEEE International Conference on Computing, Communication and Security (ICCCS-2020), IIT Patna, 14-16 October 2020.
- Track Co-Chair, Radio Access and Softwarisation (RAS), European Conference on Communications and Networking (EuCNC) 2020, Dubrovnik, Croatia, 15-18 June, 2020.

Projects active during April 2020-March 2021
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.



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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 2020-March 2021

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, and 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.



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PhD. - Department of Electrical Engineering Indian Institute of Technology Delhi, New Delhi

Previous Employment- Assistant Professor, Department of Electrical Engineering, IIT Indore
Post-Doctoral Fellow, UNIK, Norway
Lecturer, College of Engineering Roorkee, India
Broad research area - Energy-Efficient and Reliable SRAM Memory Design Enhancing Performance and Configurable Architecture for DNN Accelerators

a. **Research Highlights**

- SRAM based In-Memory Computing Architecture for Edge AI
- Reliable, Secure Design for IoT Application
- Design for Reliability

b. Awards and Achievements

Nanoscale Devices, VLSI Circuit and System Design (NSDCS) Research Group, led by Dr. Santosh Kumar Vishvakarma, is actively involved in cutting-edge research and development to in-memory computing for edge AI applications, efficient and reliable memory chip design, efficient and configurable hardware accelerator for DNN accelerators. It has developed and analyzed various efficient and reconfigurable architecture for hardware accelerator algorithms. Various activation functions are developed for DNN applications. He has been supervising many research projects and dissertations toward PhD (16 completed & 6 ongoing), MTech (19 completed & 2 ongoing), and BTech (32 completed & 7 ongoing) degrees. The research work has contributed a significant number of publications in IEEE journals and conferences.

Review Editor, Editorial Board of Integrated Circuits and VLSI (specialty section of Frontiers in Electronics)

- IEEE, Circuit and System Society
- Elsevier, Integration, the VLSI Journal
- IEEE Transaction on VLSI Integration System
- Springer, Analog Integrated Circuits and Signal Processing
- Springer, Circuits, Systems & Signal Processing (CSSP)
- IEEE Transaction on Electron Devices
- IEEE Transaction on Electron Devices Letters
- IEEE Transaction on Circuits and System-I
- IEEE Transaction on Nanotechnology
- IEEE Transaction on VLSI Integration System.
- Elsevier, Microelectronics Journal
- Elsevier, Solid State Electronics
- Taylor Francis International Journal of Electronics
- Journal of Nanoelectronics and Optoelectronics (JNO)

PhD Thesis: 02 Awarded, 03 Submitted
Placements: Students from my research group were placed in MNC like Samsung, Global Foundries, Bajaj Automobile, Ceromorphic, Texas Instruments, and Analog Devices.
Higher Studies: One BTP student gets selected for MS at Georgia Tech, USA.

Patent Awarded:

- Vishal Sharma and Santosh Kumar Vishvakarma, "An Ultra Low Power, Read Decoupled-Differential Write 10T SRAM Cell with Higher Read/Write Noise Margin", Patent Application no. 201621033995, Filed: 4th October 2016, Published: 6th April 2018, Patent no. 358866, Granted: 19th February 2021.

Publications During April 2020-March 2021 - there are 10 publications in Journals, 3 publications in Conference proceedings.

Journal Articles:

- Gopal Raut, Shubham Rai, Santosh Kumar Vishvakarma, and Akash Kumar. "RECON: Resource-efficient CORDIC-based neuron architecture", IEEE Open Journal of Circuits and Systems, Page no. 170-181, February 2021.
- Neha Gupta, Ambika Prasad Shah, and Santosh Kumar Vishvakarma. "BTI and Soft-Error Tolerant Voltage Bootstrapped Schmitt Trigger Circuit", IEEE Transactions on Device and Materials Reliability, Volume 21, Issue 1, March 2021.
- Vishal Sharma, Neha Gupta, Ambika Prasad Shah, Santosh Kumar Vishvakarma & Shailesh Singh Chouhan, "A reliable, multi-bit error tolerant 11T SRAM memory design for wireless sensor nodes", Analog Integrated Circuits and Signal Processing, 107, pages 339–352(2021).

Events:

One team from my research group has been qualified for the quarter-finals and selected in the top 100 teams across India for the Semi-Finals of Swadeshi Microprocessor Challenge under the flagship of MeitY-GoI, CDAC and IITM with 1,00,000 INR seed money.
Team Members:

- Dr. Santosh Kumar Vishvakarma (Team Supervisor)
- Gopal Raut (Team Leader)
- Saurabh Karkun (Team Member)
- Shavez Malick (Team Member)
- Mukula Jogesh Kumar (Team Member)
- Sudheer Reddy (Team Member)

Projects active during April 2020-March 2021
Title Indo-South Korea Joint Network Center for Environmental Cyber-Physical Systems
Duration 3 Years (2021-2024)
Funding Agency Department of Science and Technology (DST), Government of India
Brief Description The main objectives of the JNC would be to establish an internationally renowned centre to address the various aspects of Cyber Physical System. The team of interdisciplinary experts in both nations is working in collaboration with industry and research institutes across the globe to design and develop E-CPS products, generate skilled manpower, startup ecosystems and establish a centre with international collaborators. The objectives of the JNC are:

Human Resource Development through:

- Joint Workshops for students, faculty and industry personals across the country.
- Joint PhD between the institutions.
- Development of UG/PG level courses and its adoption in partnering institutions in both the countries.

International Collaborations through:

- Technology and product development.
- Trained and skilled manpower development.
- An ecosystem to submit the IP, copyright, publications and patents.

Prototype/Product Development through:

- To develop the workable and field-tested prototype/products.
- To publish patents/publications from each institution.

Start-Up Ecosystem in ECSP:

- A start-up ecosystem is expected to be developed in both countries to bridge the lab to commercialization for the development of Environment Cyber Physical System (E-CPS).
- The JNC is expecting to develop low cost devices for rural empowerment.



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PhD. - University of Oklahoma, USA in 2009

Previous Employment –

- Assistant Professor, Electrical Engineering, Indian Institute of Technology Indore September 2010-June 2016
- Post-Doctoral Research Scientist - Center of Quantum Devices (CQD), Electrical Engineering and Computer Science, Northwestern University, Illinois, USA, June 2009-July 2010

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 **2021 Japan Society for the Promotion of Science (JSPS) Invitational Fellowship Award**
- Recipient of **2020 DUO-India Professor Fellowship Award** to visit Linköping University under Bilateral Exchange of Academics Program
- **Symposium Committee Member** in the domain of Emerging Logic, Memories and Neuromorphic Devices in 5th International Conference on Emerging Electronics (ICEE), IIT Delhi, November 26-28, 2020
- **Executive Committee (Execom) Member** of IEEE Bombay Section for 2020
- **Chapter Counselor** for IEEE Nanotechnology Council (NTC) Student Branch Chapter at IIT Indore
- **Technical Evaluation Expert** for Leading Research Program (LRP), National Research Foundation (NRF), Korea; Science and Engineering Research Board (SERB), DST, Government of India; Gandhian Young Technological Innovation (GYTI) Award, Society for Research and Initiatives for Sustainable Technologies and Institutions (SRISTI)
- **Panel Expert** for 2020 Vaishvik Bhartiya Vaigyanik (VAIBHAV) Global Summit, PMO, Government of India

Patents -

- **Silicon compatible yttria-based memristive crossbar array and a method of fabrication thereof**
  Inventors: Shaibal Mukherjee, Sanjay Kumar, Mangal Das, Kumari Jyoti
  Patent Application No. 202121013663, PUBLISHED, March 27, 2021.
- **Ultrasensitive NO_2 sensor based on S and N doped carbon dot functionalized tungsten oxide**
  Inventors: Shaibal Mukherjee, Apurba K Das, Chandrabhan Patel, Biswajit Mandal, Rohit Gajanan Jadhav
  Patent Application No. 202021041967, PUBLISHED, September 28, 2020.
- **Organo-acidified zinc oxide carbon monoxide sensor**
  Inventors: Shaibal Mukherjee, Apurba K Das, Ajay Agarwal, Biswajit Mandal, Aaryashree, Sayan Maiti
  Patent Application No. 201921026594, PUBLISHED, July 31, 2020.
- **Hybrid mesoporous composites gas sensors**
  Inventors: Shaibal Mukherjee, Apurba K Das, Ajay Agarwal, Aaryashree, Biswajit Mandal, Ankan Biswas
  Patent Application No. 201921026576, PUBLISHED, July 31, 2020.

Publications

Summary of Publication (April 2020 to March 2021)

Journal papers: 10

Proceedings in international conference: 7

Patents Published: 4

Book/Book Chapter: 2

Best 3 journal publications (April 2020 to March 2021)

- Gaurav Siddharth, Ruchi Singh, Vivek Garg, Brajendra S. Sengar, Mangal Das, Biswajit Mandal, Myo Than Htay, Mukul Gupta, and Shaibal Mukherjee, *Investigation of DIBS-deposited CdZnO/ZnO-based multiple quantum well for large-area photovoltaic application*, **IEEE Transactions on Electron**

Devices, vol. 67, no. 12, pp. 5587-5592, November 2020. (**Impact factor: 2.704**)

- Md Arif Khan, Pawan Kumar, Mangal Das, Myo Than Htay, Ajay Agarwal, and Shaibal Mukherjee, *Drain Current Optimization in DIBS-grown MgZnO/CdZnO HFET*, **IEEE Transactions on Electron Devices**, vol. 67, no. 6, pp. 2276-2281, June 2020. (**Impact factor: 2.704**)
- Mangal Das, Amitesh Kumar, Sanjay Kumar, Biswajit Mandal, Gaurav Siddharth, Pawan Kumar, Myo than Htay, and Shaibal Mukherjee, *Impact of interfacial SiO_2 on dual ion beam sputtered Y_2O_3-based memristive system*, **IEEE Transactions on Nanotechnology**, vol. 19, no. 153134, pp. 332-337, May 1, 2020. (**Impact factor: 2.292**)

Events/ Seminars organized –

Faculty Development Program (FDP)

- **Course Instructor** for QIP-Sponsored Faculty Development Program (FDP) on "Nanomaterials for Next Generation Applications", IIT Indore, March 22-27, 2021
- **Course Instructor** for QIP-Sponsored Faculty Development Program (FDP) on "Materials Characterization Techniques", IIT Indore, March 22-27, 2021
- **Course Coordinator** and **Instructor** for QIP-Sponsored Faculty Development Program (FDP) on "Emerging Trends in VLSI and Nanoelectronics for Building Atmanirbhar Bharat", IIT Indore, February 15-20, 2021
- **Course Instructor** for QIP-Sponsored Faculty Development Program (FDP) on "Advanced Technology for Materials Engineering", IIT Indore, January 19-24, 2021
- **Invited Lecture** for AICTE Training and Learning (ATAL) Faculty Development Program (FDP) on "Photonics", Central University of Jharkhand, January 18-22, 2021
- **Course Instructor** for TEQIP-III Sponsored Faculty Development Program (FDP) on "Emerging ICT Trends Towards Atmanirbhar Bharat", IIT Indore, December 28-30, 2020
- **Course Instructor** for TEQIP-III Sponsored Faculty Development Program (FDP) on "Internet of Things", IIT Indore, December 7-11, 2020
- **Course Instructor** for TEQIP-III Sponsored Faculty Development Program (FDP) on "AI, Blockchain and IoT for 6G Communications", IIT Indore, December 3-5, 2020
- **Course Instructor** for TEQIP-III Sponsored Faculty Development Program (FDP) on "Fundamentals of Effective Manuscript Writing", IIT Indore, December 2-4, 2020
- **Course Instructor** for TEQIP-III Sponsored Faculty Development Program (FDP) on "Advances in Electronic and Photonic Devices for Optical Fibre Communication and Bio-chemical Sensing", IIT Indore, November 25-27, 2020.

Course Instructor for TEQIP-III Sponsored Faculty Development Program (FDP) on "Advanced Technology for Materials Physics and Engineering", IIT Indore, November 16-20, 2020

Projects active during April 2020-March 2021 (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.

Title - Memristive Devices and Systems for Neuromorphic Computation (Role: PI)**Duration** - 2019-2022
Funding Agency - CSIR
Brief Description - Development of memristive system for neuromorphic computation
Duration - 2021-2023

Title Special Manpower Development Program for Chip to System Design (SMDP-C2SD) (Role: Co-CI)
Funding Agency - Ministry of Electronics and Information Technology (Meity)
Brief Description - Manpower development in the domain of the project
Duration - 2015-2021

Title Fabrication of Silicon Photonic Nanostructured Devices for Optical Communication and Interconnects (Role: Co-PI)
Funding Agency - DST Nano Mission
Duration 2019-2022
Brief Description - Development of optical interconnects



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 2020-March 2021

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 computational 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
- 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)

Journals:

- Aditi Sharma, **Saptarshi Ghosh**, and Kumar Vaibhav Srivastava, "A Polarization-Insensitive Band-Notched Absorber for Radar Cross Section Reduction," *IEEE Antennas and Wireless Propagation Letters*, vol. 20, no. 2, pp. 259-263, Feb. 2021.
- Gaurav Singh, Aditi Sharma, and **Saptarshi Ghosh**, "A Broadband Multi-layer Circuit Analog Absorber using Resistive Ink," *Microwave and Optical Technology Letters*, vol. 63, no. 1, pp. 322-328, 2021.
- **Saptarshi Ghosh**, and Kumar Vaibhav Srivastava, "A Dual-band Tunable Frequency Selective Surface with Independent Wideband Tuning," *IEEE Antennas and Wireless Propagation Letters*, vol. 19, no. 10, pp. 1808-1812, 2020.

Projects active during April 20-March 2021

Title - Design and Development of Cost-Effective Compact Millimeter-Wave Antennas for 5G Wireless Communication (Role: PI)

Duration -2 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, "Performance optimization for dual-hop hybrid FSO/RF system with selection combining", *IET Optoelectronics*, vol. 14, no. 6, pp. 422-433, Sep. 2020.
- M. Siddharth, S. Shah, N. Vishwakarma, and Swaminathan R, "Performance analysis of adaptive combining based hybrid FSO/RF terrestrial communication", *IET Communications*, vol. 14, no. 22, pp. 4057- 4068, Dec. 2020.

- Swaminathan R, S. Sharma, N. Vishwakarma, and A.S. Madhukumar, "HAPS-based relaying for integrated space-air-ground networks with hybrid FSO/RF communication: A performance analysis", *IEEE Transactions on Aerospace and Electronic System*, vol. 57, no. 3, pp. 1581 - 1599, Jan 2021

Events/ Seminars organized - Organized a TEQIP III online Short Term Course (STC) on **5G and Beyond Wireless Technologies: Modelling and Simulations using MATLAB** from Dec 24 to 26, 2020 **Role:** Course Coordinator and Instructor, **Budget:** Rs. 6,00,000, **No. of Registered Participants : 80**

Projects active during April 2020-March 2021
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)

Title- Development of Landslide Early Warning System and Real Time Monitoring, Uttarakhand (Role : Co-PI)
Duration- 2020 – 2023
Funding Agency DST-NRDMS
Brief Description - The project is aimed to perform the following objectives: (a) To design efficient WSNs for landslide monitoring using the above-mentioned communication techniques. (b) To investigate the performance of the proposed networks by deriving theoretical expressions for the performance parameters and validating the same using Monte-Carlo simulations and real-time hardware testbeds.



PhD. - IIT Kanpur

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

Dr. Trapti Jain
Associate Professor
traptij@iiti.ac.in

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
1 Journal publication, 1 Conference publication, 1 book chapter
Vinay K Tiwari, Amod C Umarikar and **Trapti Jain**, "Measurement of Instantaneous Power Quality Parameters Using UWPT and Hilbert Transform and its FPGA Implementation", *IEEE Transactions on Instrumentation and Measurement,* Vol. 70, pp. 1-13, 2021

Projects active during April 2020-March 2021

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

- 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 2020-March 2021

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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& Head of
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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 10 papers published in peer reviewed Sci indexed journals during 01/04/2020 to 31/03/2021.

- Manikandan Muthu, Rajagopalan Pandey, Xiaozhi Wang, Arun Kumar Chandrashekhar, I A Palani and **Vipul Singh**, "Enhancement of Triboelectric Nanogenerator Output Performance by LASER 3D Surface Pattern Method for Energy Harvesting Application"; *Nanoenergy*, vol. 78 **(2020)** 105205.
- Tejendra Dixit, Akash Tripathi, Swanand V Solanke, K L Ganapathi, M S Ramachandra Rao and **Vipul Singh**, "Ultrawide Bandgap Copper Oxide: High Performance Solar Blind Photodetection"; ***IEEE Electron Device Letters***, vol. 41 **(2020)** 1790.
- Jitesh Agrawal, Tejendra Dixit, I A Palani and **Vipul Singh**, "Highly Visible Blind ZnO Photodetector by Customizing Nanostructures with Controlled Defects"; ***IEEE Photonics Technology Letters***, vol. 32 **(2020)** 1439.

Events/ Seminars organized

- Member organizing team of 30th Annual meeting of MRS-Japan, Symposium L: Organic Ionotronics for sustainable future, December 09-11, 2020.
- Gave Invited lecture under a G2E2 program of Government of Japan, on the topic "Solution Processable Optoelectronic Devices: Current Trends and Future Prospects" on December 23, 2020.
- QIP sponsored short-term course on "*Photovoltaic Devices and Systems: Challenges and Scope*", held at IIT Indore from March 08-13, 2021.

Projects active during April 2020-March 2021

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.

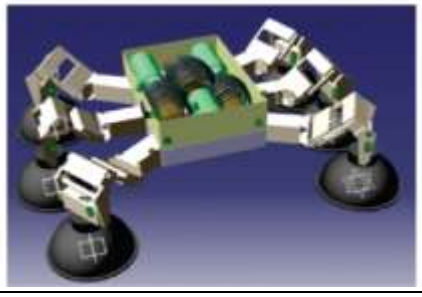
Publications (includes journal articles, books and book chapters)

- 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	Application Areas
• 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, Multiscale modelling • Laser and Additive manufacturing, Smart Manufacturing • Mechatronic and Control • Acoustics of ducts, electromagnetic crimping	• 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
Associate Professor
sksahu@iiti.ac.in



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 in the cutting edge areas. It comprises of 22 regular faculty members.



Achievement of the Department in the current reporting year (2020-2021)

- 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 through outreach programmes
- The research work in various areas has been recognized by the scientific community in the form of patents, book chapters, international peer-reviewed publications, lectures in national and international conferences
- Department has built strong linkage in terms of consultancies and man power training with industries such as Vovlo Eicher, 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

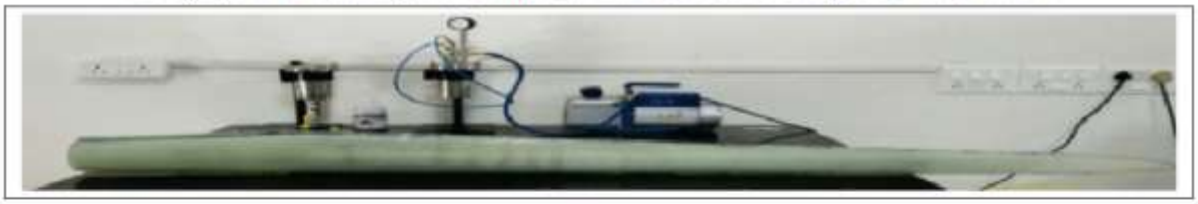


Real-time scaled down prototype of ANKUR-LL 2

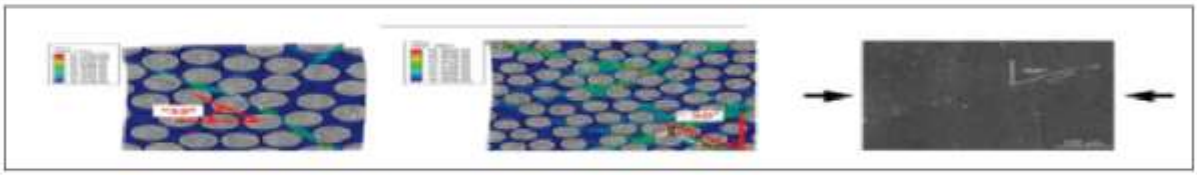


Design of Hybrid Underwater Vehicle with fin propulsion

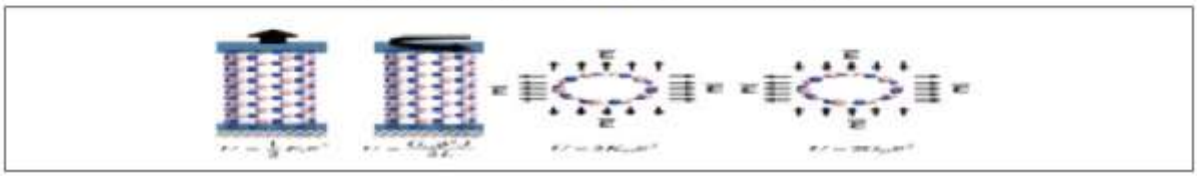
Design, manufacturing and computational research @ composite materials lab



Continuum simulations @ composite meterials lab



Molecular dynamic studies at ATOM lab





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)

Prof. Neelesh Kumar Jain
Professor,
Department of Mechanical Engineering
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Statement of Research Interests:

a. 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

- **Surya Gaurav National Award 2021**
- **Best Researcher Award 2020**
- **Corona Warrior Certificate 2020**
- **Indian Panelist**, VAIBHAV Summit on Advanced Mfg organized by the Ministry of Education on 23 Oct 2020
- **Chief Guest**, online inauguration of 72 FDP by ATAL Academy of AICTE, 5th July 2021
- **Chief Guest**, webinar on "Reliability of Complex Engineering Systems" organized by SRESA's Indian Institute of Risk and Reliability, 29th May 2021

Chief Guest, valedictory function of "*International Conference on "Innovations in Product, Process and System Design*" organized by SVVV Indore, **6th March 2021.**

- **Special Guest**, "2nd Winter School on Observational Astronomy" jointly organized by MPSCT Bhopal, IIA Bangalore and IIT Indore, **1st Feb 2021**
- **Guest of Honor,** *"11th International Conference on Material Processing and Characterization"* jointly organized by SCRS New Delhi and IIT Indore, **15-17 Dec 2020**
- **Guest of Honor,** "*10th International Conference on Soft Computing for Problem Solving (SocProS 2020)"*,jointly organized by SCRS New Delhi and IIT Indore**, 18-20 Dec 2020**
- **Guest of Honor,** FDP under TEQIP-III on *"Fundamentals and Advances in Powder Metallurgy"* 8 Dec 2021.
- **Patron,** international e-conference on*"Ecosystem Restoration for Resilience and Sustainability: Living with Nature"* organized by NIDM New Delhi and IIT Indore, **5-7 June 2021**
- **Patron,** *Workshop on "High Performance Computing in the Agriculture Domain"* SERC under NSM, **14-16 July 2021**
- **Patron,** international e-conference on*"Ecosystem Restoration for Resilience and Sustainability: Living with Nature"* organized by NIDM New Delhi and IIT Indore, **5-7 June 2021**
- **Panelist**, **"*Role of IITs in Imbibing Entrepreneurial Zeal to Young Minds*"** in National Skill and Entrepreneurship Innovation Conclave, **25th Feb 2021**
- **Panelist**, "***Industry-Academia Meet 2020"*** organized by RGPV Bhopal, **24 Sep 2020**
- **Panelist**, MPCST Consultation on ***Science, Technology and Innovation Policy (STIP) 2020*** on **17 Sep 2020**
- **Panelist, "Re-engineering from within"** Engineer's Day Celebration, **15th Sep 2020**
- **Panelist**, ***"AtmaNirbhar, Madhya Pradesh: Entrepreneurship and Self-Employment and Increasing Employability"***organized by Department of Technical Education and Skill Development MP Govt. on **10th Aug 2020**.

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; First Examination Report submitted.

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

- Pankaj Kumar, Mayur S Sawant, **Neelesh Kumar Jain (2021)** "Optimization of process parameters in micro-plasma transferred deposition process for cobalt-based alloy" **Materials Today: Proceedings**, 44(1), 1681-1686, DOI: 10.1016/j.matpr.2020.11.840.
- Pankaj Kumar, **Neelesh Kumar Jain (2021)** "Finite element analysis of femoral prosthesis using Ti-6Al-4 V alloy and TiNbZrTaFe high entropy alloy" **Materials Today: Proceedings**, 44(1), 1195-1201, DOI: 10.1016/j.matpr.2020.11.239
- Sunil Pathak, Gobinda C. Saha, Musfirah Binti Abdul Hadi, **Neelesh Kumar Jain (2021)** "Engineered nanomaterials for aviation industry in COVID-19 context: a time-sensitive review" **Coatings,** 11(4), 382-401, DOI: 10.3390/coatings11040382 (March 2021) (**Impact Factor: 2.44**)
- Vishal Kharka, **Neelesh Kumar Jain**, Kapil Gupta **(2020),** "Influence of MQL and hobbing parameters on microgeometry deviations and flank roughness of spur gears manufactured by MQL assisted hobbing", **Journal of Materials Research and Technology,** 9(5),9646-9656, DOI: 10.1016/j.jmrt.2020.06.085 (Sep-Oct 2020) (**Impact Factor: 5.29**)
- Anand Petare, Gaurav Deshwal, I.A. Palani, **Neelesh Kumar Jain**, (2020) "Laser texturing of helical and straight bevels gears to enhance finishing performance of AFF process" **The International Journal of Advanced Manufacturing Technology,** 110(7), 2221-2238 DOI:10.1007/s00170-020-06007-0(September 2020) (**Impact factor: 2.63**)

- Pravin Kumar, **Neelesh Kumar Jain(2020),** "Effect of Material Form on Deposition Characteristics in Micro-

Plasma Transferred Arc Additive Manufacturing Process" **CIRP Journal of Manufacturing Science and Technology**, 30, 195-205, DOI: 10.1016/j.cirpj.2020.05.008 (Aug 2020) **(Impact Factor: 2.99)**

- Vishal Kharka, **Neelesh Kumar Jain**, Kapil Gupta **(2020),** "Predictive modelling and parametric optimization of minimum quantity lubrication assisted hobbing process" **The International Journal of Advanced Manufacturing Technology,** 109(5)1681-1694, DOI:10.1007/s00170-020-05757-1(July 2020) (**Impact factor: 2.63**)
- Pravin Kumar, **Neelesh Kumar Jain,** Mayur S. Sawant **(2020)**, "Modeling of dimensions and investigations on geometrical deviations of metallic components manufactured by μ-plasma transferred arc additive manufacturing process" **The International Journal of Advanced Manufacturing Technology,** 107(7), 3155-3168,DOI:10.1007/s00170-020-05218-9(April 2020) (**Impact factor: 2.63**)

Book authored (2)

- Title: **Spark Erosion Machining: MEMS to Aerospace** (300 pages)
  Editors:Neelesh Kumar Jain and Kapil Gupta
  Publisher and Year of Publication: **CRC Press, Boca Raton (Florida) USA, June 2020**
  ISBN (13): 978-1-4987-8793-2
  DOI:https://doi.org/10.1201/9780429085758
  Weblink:https://www.crcpress.com/Spark-Erosion-Machining-MEMS-to-Aerospace/Jain-Gupta/p/book/9781498787932

- Title: **Finishing of Conical Gears by Pulsed Electrochemical Honing** (228 pages)
  Authors: Sunil Pathak, **Neelesh Kumar Jain** and I.A. Palani
  Publisher and Year of Publication: **Cambridge Scholars Publishing, UK, 2019**
  ISBN (13): 978-1-5275-3366-0; ISBN (10): 1-5275-3366-2
  Weblink: https://www.cambridgescholars.com/finishing-of-conical-gears-by-pulsed-electrochemical-honing

Book Chapters (2)

- Vishal Kharka, **Neelesh Kumar Jain(2021)** "**Achieving Sustainability in Machining of Cylindrical Gears"** Chapter 15 in*Handbook-IV on Sustainable Manufacturing* (Editors: Kapil Gupta and Konstantinos Salonitis,), Elsevier, Netherlands, pp 391-426, ISBN: 978-0-12-818115-7, **DOI:** 10.1016/B978-0-12-818115-7.00002-X
- Anand Petare, **Neelesh Kumar Jain**, I A Palani **(2021)"On Abrasive Flow Finishing of Straight Bevel Gear"***Recent Advances in Mechanical Infrastructure:* Proceedings of ICRAM 2020(Editors: A K Parwani, PL Ramkumar, K Abhishek, S K Yadav) Springer Nature Singapore Pvt. Ltd. pp 95-104, eBook ISBN: 978-981-33-4176-0, Hardcover ISBN: 978-981-33-4175-3, **DOI:** 10.1007/978-981-33-4176-0_8

Events/ Seminars organized

- Deliveredwebinar on **Sustainable Development Through Information Technology and Environment** organized by *Centre for Environment Protection, Research and Development (CEPRD) India* on **14th March 2021**
- Deliveredexpert lecture on "***Thermal Type Micromachining: Electron Beam Machining***" in TEQIP-III course at **IIT Indore** on **5th Oct 2020.**

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.

COVID related activities (Research, Academic and/or any other news) April 2020-March 2021.
Sunil Pathak, Gobinda C. Saha, Musfirah Binti Abdul Hadi, **Neelesh Kumar Jain (2021)** "Engineered nanomaterials for aviation industry in COVID-19 context: a time-sensitive review" **Coatings,** 11(4), 382-401, DOI: 10.3390/coatings11040382 (March 2021) (**Impact Factor: 2.88**).



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

Previous Employment :(includes post-doctoral experience)
2002-2005 TVS Motors Company
2005-2007 General Motors Technical Center India Bangalore

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)
Upto a selection of best three

- 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.PeterLindstedt in collaboration 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.



Anand Parey
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PhD. :Indian Institute of Technology Delhi

Previous Employment :(includes post-doctoral experience)

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

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)

Upto a selection of best three

- 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
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Statement of Research Interests

a. Broad research area

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

b. Research Highlights

- Lead Free Triboelectric Nanogenerators has been developed to harvest energy from vibration
- SMA integrated jellyfish soft robotic structure for underwater robotic systems
- laser nitriding of Engine blocks in collaboration with industry.
- Indigenously developed wire arc additive manufacturing has been deployed in manufacturing tailor made Shape memory alloy porous structures for intelligent filters
- Shape memory thin film bi-morphs has been developed to cater the energy harvesting from waste heat
- Shape memory alloy coated optical fibers are developed for condition monitoring and temperature sensing.

c. Awards and achievements

- Mr.Karthick and Mr.Manikandan from Our Research Group got selected for SERB OVDF fellowship for the year 2020, to pursue their research in purdue university
- Ms.ShalinisinghPh.D research scholar from our group has received DORA student exchange fellowship to pursue part of their Ph.D Thesis work in Estonia
- Mr.Jayachandran from our research group has received MP you scientist award for the year 2021

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)

- Manikandan Muthu, Rajagopalan Pandey, Xiaozhi Wang, Arunkumar Chandrasekhar, IA Palani, Vipul Singh, Enhancement of triboelectric nanogenerator output performance by laser 3D-Surface pattern method for energy harvesting application,Nano Energy, 78,105205, 2020 **(Impact Factor- 16.7)**
- Pravin Karna, SS Mani Prabu, SC Karthikeyan, R Mithun, S Jayachandran, N Resnina, S Belyaev, IA Palani, Investigations on laser actuation and life cycle characteristics of NiTi shape memory alloy bimorph for non-contact functional applications, Sensors and Actuators A: Physical,321, 112411,2021 (**Impact factor-3.4)**
- Shalini Singh, N Resnina, S Belyaev, AN Jinoop, Ashish Shukla, IA Palani, CP Paul, KS BindraInvestigations on NiTi shape memory alloy thin wall structures through laser marking assisted wire arc based additive manufacturing,66,70,2021 **(Impact factor- 5)**

Events/ Seminars organized

- Coordinator for the TEQIP sponsored Short term course on Micro Mechatronics and Soft Robotics, December 2020.
- Coordinator for the ACITE sponsored course on Micro and Precision Manufatcuring, October 2020
- Coordinator for the course on Laser Micro manufacturing surface and Material processing, July 2020

Projects active during March 2020- April 2021

Title: Design and Development of deflecting micromirrors and micromanipulators using laser micromachined Shape Memory Alloy bimorph for optomechatronics applications

Duration: 3 years (2021- 2024)

Funding Agency :SERB Core Research Grant (Rs 62,70,429)

Brief Description: The main objective of the project is to develop high precision Shape memory alloy actuated intelligent mirrors for different optomechatronics.

Title :DESIGN AND FABRICATION OF SHAPE MEMORY ALLOY (SMA) BASED ACTUATORS FOR SOFT ROBOTIC APPLICATIONS

Duration :2 years (2021-2023)

Funding Agency :DRDO CARS Scheme(Rs 24,33,600)

Brief Description : The objective of the project is to develop high frequency Smart Shape memory alloy actuators for aerial robots.

Title: Design and development of Laser Decal Transfer based Micro 3D Printer for printing micro devices.

Duration: 2 years (2019-2021)

FundingAgency: 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: Development of thick and thin NiTi shape memory alloy porous structures using laser and wire arc additive manufacturing

Duration: 3 years (2019- 2022)

FundingAgency: 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.



Dr. Shanmugam Dhinakaran
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PhD. IIT Kharagpur (2008)

Previous Employment

(includes post-doctoral experience)

- **Assistant Professor, IIT Indore (2012 - 2016)**
- **Post Doctoral Research Experience (2006 - 2012)**
- 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 & Heat transfer;
- Heat Transfer in Porous Media;
- Biofluid Mechanics and Bioheat Transfer

b. Research highlights

Almost everything around us, at some visual resolution, is porous. We have used the underlying theory of porous media modelling in studying both fundamental and real-time problems. We proposed a technique for improving the design of a conventional Flat Plate Solar Collector (FPSC). We believe that this technique, published in Renewable Energy (Elsevier), can considerably enhance the thermal performance of FPSC.

These days, there is increasing interest in miniaturized technologies in diagnostics, therapeutic testing, and biomedicinal fundamental research. The same is true for the dermal studies in topical drug development, dermatological disease pathology testing, and cosmetic science. Myself and my research collaborators in India and Hungary published an article on the recent scientific literature and knowledge about the application of skin-on-a-chip technology in drug diffusion studies. In future, we plan to perform numerical and as well as experimental study on skin-on-a-chip devices.

Publications(includes journal articles, books and book chapters)

- J. Ponmozhi, S. Dhinakaran, Z. Varga-Medveczky, K. Fónagy, L.A. Bors, K. Iván and F. Erdő. (2021). **Development of Skin-On-A-Chip Platforms for Different Utilizations: Factors to Be Considered**. Micromachines,12, 294.
- K. Anirudh, and S. Dhinakaran (2021). **Numerical analysis of the performance improvement of a flat-plate solar collector using conjugated porous blocks**. Renewable Energy (Elsevier), 172, 382-391
- R.S. Rajpoot, K. Anirudh and S. Dhinakaran. **Numerical investigation of unsteady flow across tandem square cylinders near a moving wall at Re = 100**. Case Studies in Thermal Engineering (Elsevier), 26, 101042..

Events/ Seminars organized

- TEQIP-III Sponsored short term course on "Introduction to Computational Fluid Dynamics", Dec 28-30, 2021 at IIT Indore (**Role**: Coordinator)
- AICTE sponsored short term course on "Computational Fluid Dynamics for Scientists and Engineers", March 26-31, 2021 at IIT Indore (**Role**: Coordinator).

Title: On the efficiency of Lattice Boltzmann Methods for non-Newtonian Fluid Flows
Duration: 3 Years
Funding Agency: Science and Engineering Research Board (SERB), DST
Brief Description: This project deals with the development of CFD codes based on the Lattice Boltzmann Method for non-Newtonian fluid flows.



SANTOSH K. SAHU
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PhD. Indian Institute of Technology Kharagpur, India

Previous Employment

- Assistant Professor, (March 2008 - October 2009), Discipline of Mechanical Engineering, National Institute of Technology Rourkela, India
- Assistant Professor, (October 2009-June 2016), Discipline of Mechanical Engineering, Indian Institute of Technology, Indore.

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

- Visiting Scholar, (September 2011 - January 2012), School of Nuclear Engineering, Purdue University, USA
- Visiting Researcher (October 2, 2019-October 21, 2019), School of Nuclear Engineering, Purdue University, USA

Statement of Research Interests

Broad research area

- Thermal Engineering and Fluid Flow

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 Materials3

Awards and Achievements

- Research article selected as qualified student award winner of the student paper competition for 28th Conference on Nuclear Engineering Joint with the ASME 2020 Power Conference (ICONE28-POWER2020-6524), California, USA, 2020.
- Research article selected as Best Presentation Award in Asia region in 28th Conference on Nuclear Engineering Joint with the ASME 2020 Power Conference (ICONE28-POWER2020-6524), California, USA, 2020. ·
- Member, American Society of Mechanical Engineering (ASME).
- Life Member, Indian Society for Heat and Mass Transfer (ISHMT).
- Track Session Chair for International Conference on Fluid Mechanics and Fluid Power (FMFP-2020) (IIT Guwahati).

Publications (includes journal articles, books and book chapters)

- Modak M., Sahu S. K., Park H. S.,2021, An experimental study on heat transfer of different aqueous surfactant solutions horizontal impinging jet using infrared thermography, Applied Thermal Engineering,188,116668
- R. Kothari, S. K. Sahu, S. I. Kundalwal, and S. Sahoo, 2021 Experimental investigation of the effect of inclination angle on the performance of phase change material based finned heat sink, Journal of Energy Storage,37, 102462
- 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.

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)
- A novel thermal management system for electric vehicle batteries using phase change composite (ongoing).

Duration: 3-years, 5-Years, 3-years

FundingAgency: DST India, DST India, SERB India, CSIR India

BriefDescription

- DST/TMD/MES/2K17/65 (G)
- DST/INSPIRE/03/2017/000041
- CSIR/22(0807)/19/EMR-II



PhD. In ME from IIT Kharagpur (2010)

Previous Employment

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

Dr.KaziSabiruddin
Associate Professor,
skazi@iiti.ac.in

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

- Vishal Sharma, KaziSabiruddin, An investigation on D-gun sprayed Al2O3-SiC coatings, Surface & Coatings Technology, Volume 375, 2019, pp 303-314
- BalmukundDhakar, KaziSabiruddin, "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
Associate Professor
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PhD. Indian Institute of Technology Roorkee
Previous Employment

- 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

c. Awards and Achievements

- Panelist in Session on Health and Usage Monitoring Systems (V8H1S3), Vertical: Aerospace Technologies, Vaishwik Bhartiya Vaigyanik Summit, October 05, 2020.

Publications (includes journal articles, books and book chapters)

- Singhal A, Shukla R, Kankar PK, Dubey S, Singh S, Pachori RB. Comparing the capabilities of transfer learning models to detect skin lesion in humans. Proceedings of the Institution of Mechanical Engineers, Part H: Journal of Engineering in Medicine. 2020;234(10):1083-1093. doi:10.1177/0954411920939829
- Prakash J, Gupta SK, Kankar P. An analytical approach to evaluate the maximum load carrying capacity for pin-mounted telescopic hydraulic cylinder. Proceedings of the Institution of Mechanical Engineers, Part C: Journal of Mechanical Engineering Science. 2020;234(19):3919-3934. doi:10.1177/0954406220916524
- Amrinder Singh Minhas, P.K. Kankar, Navin Kumar, Sukhjeet Singh, Bearing fault detection and recognition methodology based on weighted multiscale entropy approach, Mechanical Systems and Signal Processing, Volume 147, 2021, 107073, ISSN 0888-3270, https://doi.org/10.1016/j.ymssp.2020.107073.

Projects active during April 2020-March 2021

Title: Force and vibration analysis in biomechanical preparation of root canals using endodontic file system: In-vitro study

Duration: 3 Years

Funding Agency: Core Research Grant (CRG) of SCIENCE & ENGINEERING RESEARCH BOARD (SERB), DST

Brief Description: At present, real-time measurement of the vibration and force signals in the in-vitro RCT operation has not been much focused. Thus, as of now, it is very hard for a practitioner to predict the failure or fracture of the endodontic file during operation. This study aims to examine the force and vibration in root canal treatment during biomechanical preparation of teeth to predict the failure of the file. Time-domain data acquisition and signal processing techniques will be used for real-time condition monitoring of endodontics file.



Dr. Bhupesh Kumar Lad
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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

Statement of Research Interests

a. Broad research area

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

b. Research Highlights

Globally, the manufacturing industry is gearing up for the next level of industrial revolution and it is called Smart Manufacturing or Industry 4.0. Smart manufacturing is where manufacturing machines and systems are self-aware, can communicate with each other, and are able to make decisions that will improve system performance. Smart manufacturing requires machines to have the ability to gather (and share) data about its condition and operation, ability to perform data analytics to understand how its condition and operation affects system performance, and decision-making ability to take actions that will improve/optimize system performance based on the gathered data. In line with this, my research aims to investigate various aspects of smart manufacturing and its application in industries.

c. Awards and Achievements

Distinguished International Associate (DIA) award by Royal Academy of Engineering, London, 2021.

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 alloy rings, Priya Chouhan, Shiva Sekar, I.A. Palani, and B. K. Lad, Indian Patent Office, No.: 201721007136 (Filled on February 28, 2017)

Publications

- Lad B.K., Performability considerations for next-generation manufacturing systems, In: Misra K.B. (ed.) Handbook of Advanced Performability Engineering, Springer Nature, Switzerland AG, pp. 41-59, 2021.
- 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, (2020), Integrated yet distributed operations planning approach: A next generation manufacturing planning system, Journal of Manufacturing Systems. 54, 103-122.

Events/ Seminars organized

- A workshop on Smart Manufacturing, March 2021

Projects active during April 2019-March 2020

Title: Industry-Academia Consortium for Digitization in Small and Medium Enterprises (SMEs)
Duration: April 2019 to February 2021
FundingAgency: 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

Title: Industry Academia Consortium on Smart Manufacturing (InDAC-SM)
Duration: June 2020 onwards
FundingAgency: Flavorite Technologies Private Limited, Indore
Brief Description: The consortium aims at developing pathways for digital engagement that the industries can consider transforming themselves into highly efficient digitally-enabled and intelligent manufacturing businesses. The consortium provides a platform for industries and academia to share thoughts and learning; identify problems and develop solutions for realization of smart manufacturing or Industry 4.0.

Title: Digital Twin Development for Torque Tool
Duration: September 2020 (ongoing)
FundingAgency: John Deere, Pune
Brief Description

- Digital twin will identify the current assembly process (product and job), selected torque and applied torque.
- Digital twin will show basic analytics (mainly Cp/Cpk values) and associated alerts/recommendation.



RITUNESH KUMAR
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PhD. Indian Institute of Technology Delhi, India
Previous Employment

- Assistant Professor, (Oct 2009–June 2016) Discipline of Mechanical Engineering,IIT, India.
- Senior Design Engineer (Sep. 2008 – Sep. 2019) Tata Consulting Engineers Limited, Vikroli, Mumbai.
- Academic associations with other institutions (Affiliate/Adjunct/ Visiting posts)
- Delivered two weeks lecture at Gdansk Politechnika, Poland as Adjunct faculty.

Statement of Research Interests

a. Broad research area

- Thermal Engineering

b. Research Highlights

- Desiccant Cooling System.
- Heat Transfer at Microscale
- Renewable fuels.
- BIogas generation and purification

c. Awards and Achievements

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

Publications

- Bubble dynamics in microchannel: An overview of the state-of-the-art: ST Kadam, I Hassan, R Kumar, MA Rahman, *Meccanica*, 56,481–513 (2021).
- Effect of Flow Normalization in Micro-Pin-Finned Heat Sink: Numerical Study: Singh, G., **Kumar, R.***, Mikielewicz, D., J of Thermophysics and Heat Transfer, 35, 1-10 (2020).
- New approach of Triumphing Temperature Nonuniformity and Heat Transfer Performance Augmentation in Micro Pin Fin Heat Sink: **Kumar, R.***, Abiev, R., Ribatski, G., Abdullah, S., Vasilev, M., ASME Journal of Heat Transfer, 142, 062501 (2020).

Projects active during April 2019-March 2020

Title:

- Heat transfer intensification in novel design micro-pin-fin heat sink for microprocessor cooling with improved temperature uniformity (Indo-Russian DST)
- Research and education partnership for development of innovative flow-boiling and thermal-systems - enabling critically needed science and technology developments for waste heat removal and recovery with emphasis on data-centers and power-plants. (VAJRA- SERB)

Duration: 2-years, 1-Years.
FundingAgency: Department of Science and Technology (DST), India
BriefDescription:

- DST/INT/RUS/350.
- VJR/2017/000197 (Renewed)



PhD. :Mechanical Engineering, IIT Kharagpur

Statement of Research Interests

a. Broad research area

- Surface Technology
- Coatings Tribology
- Solid Lubrication

Dr. Satyajit Chatterjee
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satyajit@iiti.ac.in

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.



PhD. Awarding Institute: IIT Kharagpur

Previous Employment

- 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

Dr. Shailesh I. Kundalwal
Associate Professor
kundalwal@iiti.ac.in

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 (Certificate Awarded by DRDO)
- **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).

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

FundingAgency: 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
Assistant Professor
indrasen@iiti.ac.in

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. manufacturing process

Publications
(includes journal articles, books and book chapters)

Upto a selection of best three

1. S.S. Hirmukhe, K. Eswar Prasad, I. Singh Finite element analysis of deformation and failure mechanisms in nanoscale hexagonal cellular structures of metallic glasses. Mechanics of Materials 160 (2021) 103946.
2. S.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.
3. 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

4. SS Hirmukhe, KE Prasad, I Singh (2019) Finite element analysis of tensile deformation of nanoglassmetallic glass laminate composites. Computational Material Science 161, 83-92.

Events/ Seminars organized

Organised one day Workshop on Opportunities in Research and Developments in Armament Establishments (ARMREB-2020)" on 26th August 2020.

Projects active during April 2019-March 2020

Title: Experimental and numerical studies of fracture in Nanoglasses

Duration: Two Years

Funding Agency: SERB

SRG/2019/000034

Brief Description: This project aims to understand the fracture behaviour of nanoglasses.



Dr. YuvrajK. Madhukar
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PhD (2016)
Department of Mechanical Engineering
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

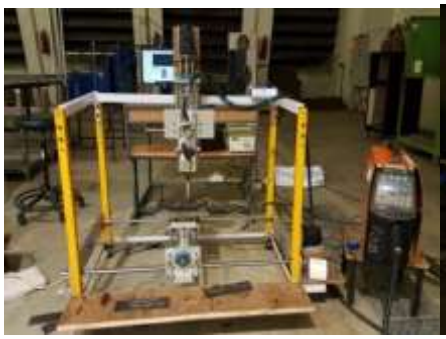
Statement of Research Interests

a. Broad research area

- Advanced Manufacturing Processes
- Laser Material Processing
- Wire Arc Additive Manufacturing

b. Research Highlights

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





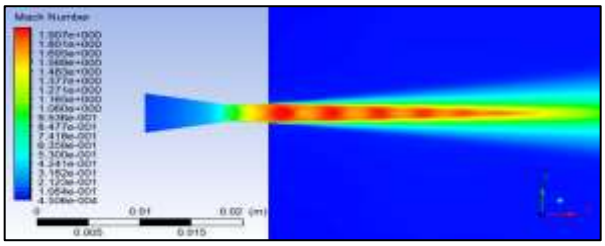


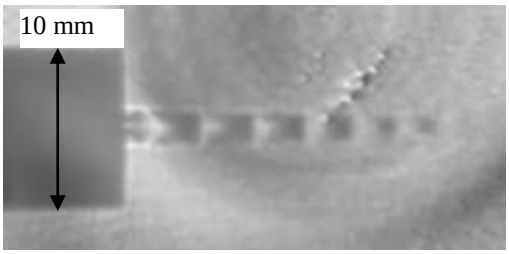






Development of supersonic nozzle for manufacturing applications





c. Awards and achievements

Best Technology Development Award 2020, IIT Indore

Publications

(includes journal articles, books and book chapters)

Upto a selection of best three

- Anas Ullah Khan, Yuvraj K. Madhukar, Effects of Pillar‐Based Substrate on the Wire Arc Additive Manufacturing Process, International Journal of Precision Engineering and Manufacturing (2021) 22:1311–1321, IF: 2.1
- Anas Ullah Khan, Yuvraj K. Madhukar, An Economic Design and Development of the Wire Arc Additive Manufacturing Setup, Procedia CIRP 91 (2020) 182–187
- AU Khan, M Patidar, A C Petare, R Chouhan, P Chouhan, B Vishwakarma, U Sharma, S Kaushal, D Dhepte, Y K Madhukar, Development of Barrel Finishing Machine to Improve Surface Finish of the Wire Arc Additive Manufactured Parts, Procedia CIRP 91 (2020) 330–335

Events/ Seminars organized

- Coordinators: Dr. Yuvraj K Madhukar &Dr. I.A. Palani, Short term online course on LASER MICRO MANUFACTURING, SURFACE & MATERIAL PROCESSING, 15th -17th July 2020
  Coordinators: Dr. I.A. Palani &Dr. Yuvraj Madhukar, AICTE Sponsored Quality Improvement Program online course on Micro and Precision Manufacturing, 5th-10th October 2020



Dr. Ankur Miglani
Assistant Professor
(Grade 1)
amiglani@iiti.ac.in

PhD.
Indian Institute of Science (IISc) Department of Mechanical Engineering2015
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 Interest

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 fuels and 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**

- Invited article for the Special issue of ASME Journal of Electronic Packaging titled "A tribute to Prof. Avaram Bar-Cohen" (2021)
- Invited book chapter for Elsevier book entitled "Smart Electrical and Mechanical systems" (2021)
- Invited book chapter of CRC Book entitled "Intelligent Prognostics for Engineering Systems with Machine Learning Techniques" (2021)
- Academic representative for the BOS: Sanjivani College of Engineering (2021)
- Invited talk by Intel: Thermal management of Power Dense Electronics
- Faculty mentor RoboCon 2021: Team qualified for Stage II with a score of 100/100
- Research work on low-cost, Colored Bi-layered bricks featured at several media platform including Times of India, Free Press Journal, Dainik Bhaskar, Nai Dunia and Expert News
- Session Chair for Thermal modelling and Analysis II for ITherm 2021

Publications
(includes journal articles, books and book chapters)

Three recent publications

- V. Gupta, Pathak, D. K., Kumar, R., **A. Miglani,** Siddique, S., & Chaudhary, S. Production of colored bi-layered bricks from stone processing wastes: Structural and spectroscopic characterization. ***Construction and Building Materials,*** *278*, 122339 (2021).
- J. Prakash, Pavan Kankar and **A. Miglani**, Monitoring the degradation in the Switching behavior of a Hydraulic Valve using Recurrence Quantification Analysis and Fractal Dimensions. **ASME *Journal of Computing and Information Science in Engineering, accepted*** (2021).
- **A. Miglani**, J.A. Weibel and S.V. Garimella. Measurement of flow maldistribution induced by the Ledinegg instability during boiling in thermally isolated microchannels. ***International Journal of Multiphase Flow,*** 139, 103644 (2021)

Projects active during April 2020-March 2021

Title: Proof checking of the design and drawing of different components for Moradabad Sewerage Scheme, Phase-2 (Zone -2)
Duration: --
Funding Agency: KK Spun India Limited
Brief Description:Proof checking of the design and drawing of different components for Moradabad Sewerage Scheme
Title: Proof checking of various structure design and hydraulic design of water supply scheme NaigarhiRewa M.P.
Duration: Completed
Funding Agency: ATLC InfraconsultantsPvt. Ltd.
Brief Description: Proof checking of various structure design and hydraulic design of water supply scheme



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 Thermal/Mechanical 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

- Keynote speaker in the online short term course on "**Emerging Trends in Mechanical Engineering**" from 8-12th June 2020 on "Solid-state Refrigeration and Energy Storage" at Dr. K.N. Modi University Newai, Rajasthan.
- Expert talk in the online Faculty Development Programme on "**Recent Advances In Renewable Energy Technologies For Sustainable Development**" from 21-22th August 2020 on "Not-in-kind Cooling Technologies" Organizsed by Rajasthan Technical University, Kota and Jaipur Engineering College Jaipur
- Session speaker in the online AICTE Training And Learning (ATAL) FDP on "**Environment Friendly Refrigerants & Cycles for Refrigeration and Air-Conditioning Applications**" from 7-11th September 2020, on "Solid-State Refrigeration Technologies" Organized by Department of Mechanical Engineering, St. Joseph's College of Engineering, OMR, Chennai. (https://www.youtube.com/watch?v=dps0Msz-dpU)

Publications
(includes journal articles, books and book chapters)

Upto a selection of best three

1. **S. Patel** andN. Novak "The pyroelectric energy harvesting and storage performance around the ferroelectric/antiferroelectric transition in PNZST", *J. Mater. Sci.* 56, 1133–1146 (2021).
2. **S. Patel** "Flexo/elasto-caloric effects in 0.66Pb($Mg_{1/3}Nb_{2/3}$)O_3-0.34$PbTiO_3$ single crystal"
Mater. Lett. 287, 129301 (2021).
3. **S Patel,** A Chauhan and R Vaish "Flexo/electro-caloric performance of $BaTi_{0.87}Sn_{0.13}O_3$ ceramics" Appl. Phys. Lett. 117 (9), 092904 (2020).

Projects active during April 2020-March 2021

Title: "Development of Porous Lead-Free Ceramics for Temperature-Independent Pyroelectric Performance and Waste Energy Harvesting".

Duration : 2 Year

Funding Agency: Science and Engineering Research Board (SERB)

SRG/2020/000188

Brief Description: The broad aim of this project is to fabricate the porous lead-free pyroelectric ceramics to enhance energy harvesting and sensing properties. For this purpose various doping and pores controlling strategies will be used.



Dr. Dan Sathiaraj
Assistant Professor
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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, India from July 2016 to April 2017
- Worked as Senior Research Fellow from Jan 2016 – June 2016 at IIT Hyderabad, India in MSME department.

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.



Dr. Harekrishna Yadav
Assistant Professor
krishnpme@iiti.ac.in

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)

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 the coaxial jet, pulse jet and synthetic jet for the mixing, heat transfer and enhancement.
- The role of surface texturing on the behavior of boundary layer separation of wind turbine
-
- Reviewer of various international reputed Journals
- Speaker in the online course on " Recent Advances in Fluids and Thermal Engineering (RAFT-2021)" from 15 March 2021 - 20 March 2021

Publications

(includes journal articles, books and book chapters)

Upto a selection of best three

- Agarwal, S., Nandal, V., Yadav, H., & Kumar, K. (2021). Antimony chalcogenide-based thin film solar cells: Device engineering routes to boost the performance. *Journal of Applied Physics*, *129*(20), 203101.
- Patel, S., & Yadav, H. (2020). Electrical conduction properties of the BZT–BST ceramics. *Journal of Advanced Dielectrics*, *10*(06), 2050026.

Patel, S., Venkataraman, L. K., & Yadav, H. (2021). Impedance and modulus analysis of barium calcium titanate ferroelectric ceramics. *Journal of the Korean Ceramic Society*, *58*(3), 337-350.



Dr. Girish Chandra Verma

Assistant Professor

girish.verma@iiti.ac.in

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

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)

Upto a selection of best three

- AkankshaChaudhari, Pavan K Kankar, Girish C Verma, Experimental Study for the Health Monitoring of Milling Tool Using Statistical Features, Advances in Manufacturing and Industrial Engineering, 1189-1198, 2021.
- G. C. Verma, P. M. Pandey, and U. S. Dixit, Experimental Investigations into Ultrasonic-Assisted Magnetic Abrasive Finishing of Freeform Surface, Advances in Unconventional Machining and Composites, 141, 2020
- AK Singh, GC Verma, VC Shukla, PM Pandey, Experimental Investigations into Ultrasonic-Assisted Magnetic Abrasive Finishing of Freeform Surface, Advances in Unconventional Machining and Composites, 269-286, 2020

Events/ Seminars organized:

Organized a 3 day short-term course on 'Advanced Manufacturing And Materials; under TEQIP-III during 18th to 20th Dec, 2020.



Dr. Ashish Rajak
Assistant Professor
a.rajak@iiti.ac.in

PhD.
Indian Institute of Technology Guwahati (03/2018)
Previous Employment
(includes post-doctoral experience)

- Assistant Prof. IIIT Jabalpur, MP, 03/2020-09/2020
- Assistant Prof. NIT Delhi, 08/2019-03/2020
- Post Doctorate, Ohio State University, USA, 04/2018-07/2019

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

- Materials Science and Engineering, the Ohio State University, USA (Project Collaboration)

a. Broad research area

- Electromagnetic Welding, Forming, Crimping, Cladding & Hemming
- Explosive welding
- Conventional forming
- Additive manufacturing
- Numerical analysis of high strain rate processes

b. Research Highlights

- My research area spans from materials science to manufacturing applications, focusing on numerical modelling and simulation on high strain rate metal forming and joining techniques. My research vision is to understand the material behaviour at high strain rate forming techniques and working on metal crimping, clinching, forming, and welding using the Electromagnetic and Vaporizing Foil Actuator System.

c. Awards and Achievements

- National Science Foundation Post Doctorate Fellowship, USA 2019
- Best Research Poster, Research Conclave IIT Guwahati 2018
- Best Research Paper Award, DRDO & DRDL 2016
- University Bronze Medallist 2013
- Autodesk Indore Awardee 2012

Patents

Multi-Slot Filedshaper design for electromagnetic crimping; Reference No: 331351-001 (Indian Patent Office)

Publications

(includes journal articles, books and book chapters)

Upto a selection of best three

- A. K. Rajak and S. D. Kore, "Application of electromagnetic forming in terminal crimping using different types of field shapers," Journal of Mechanical Science and Technology, vol. 32, no. 9, 2018, pp. 4291–4297.
- A. K. Rajak and S. D. Kore, "Comparison of different types of coil in Electromagnetic terminal - wire crimping process : Numerical and experimental analysis," Journal of Manufacturing Processes, vol. 34, 2018, pp. 329–338.
- A. K. Rajak and S. D. Kore, "Numerical simulation and experimental study on electromagnetic crimping of aluminium terminal to copper wire strands," Electric Power Systems Research, vol. 163, 2018, pp. 744–753.



Dr. Krishna Mohan Kumar
Assistant Professor
kmkumar@iiti.ac.in

PhD.
Indian Institute of Science, Bangalore
Previous Employment
(includes post-doctoral experience)

- ·Assistant Professor, National Institute of Technology Tiruchirappalli. (July 1, 2020-October7, 2020)
- ·Assistant Professor, Maulana Azad National Institute of Technology, Bhopal. (February26, 2020-June26, 2020)
- ·Post-Doctoral Fellow, Indian Institute of Science, Bangalore.

(May 18, 2019-February 25, 2020)

Statement of Research Interests

a. Broad research area

- Acoustics of Ducts and Mufflers
- Industrial Noise and Vibration Control
- Automotive Noise and Vibration Control
- Designing for Quietness

b. Research Highlights

Integration of the design and analysis of a reciprocating internal combustion (RIC) engine and the exhaust muffler can be done if reasonably well estimation of the acoustic source characteristics of the RIC exhaust system is available before the inception of the engine. I have worked in past few years on two aspects related to the RIC engine exhaust system: estimation of the acoustic source characteristics of the RIC engines; and acoustic analysis of complex muffler configurations. Apart from the acoustic analysis of complex muffler configurations, I have also investigated the simple extended inlet-outlet and muffler configurations which gives wide -band noise attenuation characteristics.

Publications

(includes journal articles, books and book chapters)

Upto a selection of best three

·C. D. Gaonkar, D. R. Rao, K. M. Kumar and M. L. Munjal,End Corrections for Double-Tuning of the Same-End Inlet-Outlet Muffler,Applied Acoustics, 159, 1-10, 2020. (Impact Factor: 2.639)



Dr. Sandeep Singh
Assistant Professor
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PhD.
Awarding Institute: IIT Kharagpur
Previous Employment
(includes post-doctoral experience)

- ●17/12/2020–Till Date: Assistant Professor, Department of Mechanical Engineering, Indian Institute of Technology Indore, Indore, India.
- ●05/06/2017–14/12/2020: Assistant Professor, Department of Mechanical Engineering, Birla Institute of Science and Technology Pilani, Goa Campus, Goa, India.
- ●18/01/2017–02/06/2017: Visiting Faculty, Department of Mechanical Engineering, Thapar University, Patiala, India.
- ●04/07/2011–14/07/2012: Senior Engineer, Division of Compressor Design, LG Electronics Private Limited, Greater Noida, India.
- ●04/08/2008–31/05/2009:Lecturer, Department of Mechanical Engineering, Patiala Institute of Engineering and Technology, Patiala, India.

Statement of Research Interests

a. Broad research area

- Solid mechanics and design,
- Finite element method,
- Theory of plates and shells,
- Computational material science,
- Multiscale modelling of nanomaterials

b. Research Highlights- Nil

c. Awards and Achievements

- Recipient of Ministry of Human Resource Development, Govt. of India Fellowship for Ph.D. / M. Tech. programs.
- Recipient of Gold Medal for securing First position in M. Tech. program among Applied Mechanics students at MNNIT Allahabad in 2011.
- Recipient of Cash Award of Rs. 25000 and Appreciation Certificate for qualifying 3D CAD Master Belt Examination organized by Head Quarters of LG Electronics, South Korea in 2011.
- Reviewer to International Journals: Journal of Engineering, Design and Technology (Emerald), Applied Mathematics and Computation (Elsevier), Journal of Molecular Graphics and Modelling (Elsevier), International Journal of Mechanical Sciences (Elsevier), Computers and Structures (Elsevier).

Publications

- G. Watts, R. Kumar, S. N. Patel and S. Singh (2021). Dynamic instability of trapezoidal composite plates under non-uniform compression using moving kriging-based meshfree method. Thin Walled Structures 164, pn. 107766. (SCI, IF: 4.03)
- S. Singh (2021). Comparing different multibody reactive potentials for the elastic properties and nonlinear mechanics of the carbon nanostructures. Mechanics of Materials 158, pn. 103858. (SCI, IF: 2.99)
- S. Singh, B. M. Raviraj, K. D. Mali and G. Watts (2021). Elastic properties and nonlinear elasticity of noncarbon hexagonal lattice structured nanomaterials based on the multiscale modelling. ASME Journal of Engineering Materials and Technology 143 (2), pn. 021006. (SCI, IF: 1.14)

Projects active during Academic Year 2020-2021

Title: Multiscale modelling of noncarbon nanomaterials and their reinforced polymer composite materials and structures

Duration: 2019-22

Funding Agency: SERB

Brief Description

The goal of the project is tp study nonlinear static and dynamic response of the noncarbon nanomaterials and their composites using multiscale modelling.

Title: Continuum finite element models for the mechanical behaviour of the nanostructures considering surface energy effects

Duration: 2021-23

Funding Agency: CSIR

Brief Description:

The goal of the project is to study nonlinear mechanics of nanostructures including surface effects in the continuum models.

Department of Civil Engineering



Research Thrust/Facility

- Concrete Technology
- Earthquake Engineering
- Environmental Engineering
- Geotechnical Engineering
- Hydrology & Water Resource Engineering
- Structural Engineering

Application Areas

- Disaster Management
- Smartcities, Urbanplanning
- Municipal Solid Waste Management
- Structural Health Monitoring
- Sustainable Construction
- Water-Energy-Foodnexus
- Himalayan Glaciology

From the HoD's Desk



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The Department of Civil Engineering has been functioning since 2016 with a focus on basic and applied research to solve real world problems. The Department offers a four-year course leading to the Bachelor's Degree in Civil Engineering and Ph.D. in Civil Engineering. The CE faculty and students are actively involved in sponsored research projects funded by the Government of India as well as in industry/consultancy projects throughout the country and abroad. The Department has an active and dynamic faculty with international exposure having expertise in diverse field so civil engineering. The CE faculty has been recognized at different platforms across the world as committee chairs/members, outstanding reviewers, editorial board members. Our Department looks forward to establishing itself, nationally and globally, as a premier academic centre with active industry interaction and national/international collaborations.



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PhD : Indian Institute of Technology Delhi

Previous Employment: (includes post-doctoral experience) –

- Visiting Researcher, Indian Institute of Technology Indore [June 2018 – July 2018]
- Assistant Professor, Earthquake Engineering Research Centre, IIIT Hyderabad [Feb 2009 – November 2017]
- Visiting Scientist, JSPS Fellow, University of Tokyo [January 2013 – March 2013]

Statement of Research Interests

Broad research area:

- Geotechnical Earthquake Engineering
- Dynamic Soil Structure Interaction Analysis
- Environmental Geotechnics
- Landslide Research
- Rock Mechanics and Underground Structures

Research Highlights:

- Seismic microzonation
- Landslide hazard assessment and early warning
- Liquefaction Hazard and Mitigation
- Biomediated soil improvement

- Sustainable pavement geotechnics

Patents (filled and awarded):

- Neelima Satyam and NitinTiwari: Patent application No. 202021057003 (Filling date: 29/12/2020)
- Neelima Satyam and Meghna Sharma: Patent application No. 202021051658 (Filling date: 21/11/2020)

Projects active during April 2020-March 2021:

Title: Landslide hazard assessment and monitoring at ChiboPashyar, Kalimpong: Duration: Three years
Funding Agency: NRDMS, DST
Brief Description: Landslide hazard assessment and real time monitoring for ChiboPashyor region.

Title : Geospatial numerical modelling of debris flow for quantitative landslide risk assessment considering the entrainment
Duration: Three years
Funding Agency: ISRO
Brief Description: Development of a new numerical model, considering shallow water flow and bed entrainment.

Title: Development of Landslide Early Warning System and Real Time Monitoring, Uttarakhand
Duration: Three years
Funding Agency: NRDMS, DST
Brief Description: Development of LEWS for Uttarakhand, integrating rainfall and seismic conditions.

Title: Performance analysis of recycled plastic waste for bitumen roads
Duration: Two years
Funding Agency: GOI MP
Brief Description: Conducting field and laboratory test for evaluating the performance of recycled plastic waste in bituminous pavements.

Title: Sustainable and Innovative construction technique for rural roads on BC soil using local material and industrial waste
Duration: One year
Funding Agency: GOI MP
Brief Description: Providing guidelines for sustainable practices in road constructions using industrial waste in expansive soils.

Title: Preventing Damage from Earthquakes: Emerging Innovative Techniques for Liquefaction Mitigation of Soils
Funding Agency: DST (Vajra Scheme)
Brief Description: MICP and EICP techniques for ground improvement and liquefaction mitigation.

Major awards, achievements

- CIDC Vishwakarma Academician Award 2021, from Construction Industry Development Council (Established by Planning Commission, Government of India and the Construction Industry)
- Overseas famous scientist project (Grant no. 2020A1414010268) from Ministry of Science and Technology, Guangdong, China for visiting Shantou University, 2020- 2021
- Member, Technical committee 220 (Field Monitoring in Geomechanics) of International Society of Soil Mechanics and Geotechnical Engineering (2019- till date)
- Editor of Special issue on "Landslide: Forecasting, Assessment and Mitigation", Indian Geotechnical Journal, Springer 2020
- Member, Fact finding committee of Seogni bridge collapse, MPRRDA, Govt. of MP, 2020
- Executive Council member (Elected), Indian Geotechnical Society since 2019

- Executive member, Indian Society of Engineering Geology (Indian National group of the International Association for Engineering Geology and Environment) for the term 2020-2021
- 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
- Chairperson for MONBUKAGAKUSHO: MEXT Scholarships of Japanese Government in Earthquake/Civil Enggstream(Since Feb 2018)
- Member (CPD), Engineering Council of India for Telangana and Andhra Pradesh States (Since Feb 2017)
- Honorable Director, Institute and Industry Interaction: Professional Development Council, Association of Consulting Civil Engineers, India (2018-till date)
- Member, Expert committee for AEE 2016, AP Public service commission, Hyderabad

Courses/conferences/workshops organized:

- Organizing Committee member for First Indo- Brazilian Geotechnical Webinar, Indian Geotechnical Society 16-18 June 2021

Journal articles published:

- NitinTiwari and Neelima Satyam (2021), "Evaluation of Strength and Water Susceptibility Performance of Polypropylene Fiber Reinforced and Silica Fume Modified Hot Mix Asphalt", Advances in Civil Engineering Materials, ASTM, (I.F./C.S. 2.0) (Accepted).
- NitinTiwari, Neelima Satyam and Meghna Sharma (2021), "Micro-Mechanical Performance Evaluation of Expansive Soil BiotreatedWith Indigenous Bacteria Using MICP Method", Scientific Reports, Nature, 11, 10324, https://doi.org/10.1038/s41598-021-89687-2, (I.F. 4.379).
- AbdoullahNamdar and Neelima Satyam (2021) "Characterization displacement of multilayered soils using smoothing seismic data, numerical analysis and probabilistically statistics analysis" SN Applied Sciences, Springer, 3, 621, https://doi.org/10.1007/s42452-021-04611-7 (I.F./C.S. 1.0).
- Meghna Sharma, Neelima Satyam, NitinTiwari, ShubhamSahu, and Krishna R. Reddy (2021) "Simplified biogeochemical numerical model to predict pore fluid chemistry and calcite precipitation during biocementation of soil" Arabian Journal of Geosciences, Springer, 14, 807, https://doi.org/10.1007/s12517-021-07151-x, (I.F. 1.827).
- NitinTiwari, Neelima Satyam and Anand J Puppala (2021) "Strength and Durability Assessment of Expansive Soil Stabilized with Recycled Ash and Natural Fibers" Journal of Transportation Geotechnics, Elsevier, 29, 100556, https://doi.org/10.1016/j.trgeo.2021.100556 (I.F. 3.293).
- NitinTiwari and Neelima Satyam (2021) "The Coupling Effect of Pond-Ash and Polypropylene Fiber on Strength and durability attributes of Expansive Subgrades: An Integrated Experimental and Machine Learning Approach", Journal of Rock Mechanics and Geotechnical Engineering, Elsevier, https://doi.org/10.1016/j.jrmge.2021.03.010, (I.F. 4.338).
- Ritu Raj Nath, Nani Das and Neelima Satyam (2021) "Impact of Main Boundary Thrust (MBT) on Landslide Susceptibility in Garhwal Himalaya: A Case Study" Indian Geotechnical Journal, Springer, https://doi.org/10.1007/s40098-021-00522-x) (I.F./C.S. 1.7).
- NitinTiwari, Neelima Satyam and Anand J Puppala (2021) "Effect of Synthetic Geotextile on Stabilization of Expansive Subgrades: An Experimental Study" Journal of Materials in Civil Engineering, ASCE https://doi.org/10.1061/(ASCE)MT.1943-5533.0003901, (I.F. 3.266).
- MinuTreesa Abraham, Neelima Satyam and BiswajeetPradhan (2021) "Forecasting landslides using mobility functions: A case study from Idukki district, India" Indian Geotechnical Journal, Springer https://doi.org/10.1007/s40098-020-00490-8 (I.F./C.S. 1.7).
- Meghna Sharma, Neelima Satyam and Krishna R. Reddy (2021) "Effect of Freeze-Thaw Cycles on

Engineering Properties of Biocemented Sand under Different Treatment Conditions", Engineering Geology, Elsevier, 284, 106022, https://doi.org/10.1016/j.enggeo.2021.106022, (I.F. 6.755).

- MinuTreesa Abraham, Neelima Satyam, NakshatramShreyas, BiswajeetPradhan, SamueleSegoni, KhairulNizam Abdul Maulud, Abdullah M. Alamri (2021) Forecasting landslides using SIGMA model: a case study from Idukki, India. Geomatics, Natural Hazards and Risk,Taylor& Francis, 12(1), 540-559, https://doi.org/10.1080/19475705.2021.1884610, (I.F. 3.528).
- Meghna Sharma, Neelima Satyam and Krishna R. Reddy (2021) "Hybrid Bacteria Mediated Cemented Sand: Microcharacterization, Permeability, Strength, Shear Wave Velocity, Stress-Strain, and Durability", International Journal of Damage Mechanics, SAGE Publication, 30(4), 618-645, https://doi.org/10.1177/1056789521991196, (I.F. 5.029).
- MinuTreesa Abraham, NeelimaSatyam ,AscanioRosi, BiswajeetPradhan and SamueleSegoni (2021), "Usage of antecedent soil moisture for improving the performance of rainfall thresholds for landslide early warning" Catena, Elsevier, 200, 105147, https://doi.org/10.1016/j.catena.2021.105147, (I.F. 5.198).
- Neelima Satyam and Putti SwathiPriyadarsini (2021), "Seismic Site characterization and dynamic analysis of pile supported Wharf structure", Indian Geotechnical Journal, Springer, 51(1), 211-224,https://doi.org/10.1007/s40098-020-00482-8 (I.F./C.S. 1.7).
- Meghna Sharma, Neelima Satyam and Krishna R. Reddy (2021) "Rock-like Behavior of Biocemented Sand Treated under Non-Sterile Environment and Various Treatment Conditions", Journal of Rock Mechanics and Geotechnical Engineering, Elsevier, 13(3), 705-716 https://doi.org/10.1016/j.jrmge.2020.11.006, (I.F. 4.338).
- Meghna Sharma, Neelima Satyam and Krishna R. Reddy (2021) "Comparison of Improved Shear Strength of Biotreated Sand using Different Ureolytic Strains and Sterile Conditions", Soil Use and Management, Wiley. https://doi.org/10.1111/sum.12690, (I.F. 2.950)
- Binh Thai P, Abolfazl J., T. Nguyen-Thoi, T.V. Phong, H. D. Nguyen, NeelimaSatyam ,MdMasroor, S. Rehman, H. Sajjad, M. Sahana, H. V. Le & I. Prakash (2020): "Ensemble machine learning models based on Reduced Error Pruning Tree for prediction of rainfall-induced landslides", International Journal of Digital Earth, Taylor & Francis, 14(5). 575-596, DOI:10.1080/17538947.2020.1860145, (I.F. 3.538).
- MinuTreesa Abraham, Neelima Satyam, Maria Alexandra Bulzinetti, BiswajeetPradhan, Binh Thai Pham and SamueleSegoni (2020) "Using Field-Based Monitoring to Enhance the Performance of Rainfall Thresholds for Landslide Warning", Water, 12(12), 3453;https://doi.org/10.3390/w12123453, (I.F. 3.103).
- Mehebub S, Binh Thai P, Manas S, Romulus C, Do Xuan T, Rabin C, NeelimaSatyam ,HuuDuy N, Tran Van P, Hiep Van L, Subodh C, G Areendran, Kashif I and Indra P.(2020): Rainfall Induced Landslide Susceptibility Mapping Using Novel Hybrid Soft Computing Methods Based on Multi-layer Perceptron Neural Network Classifier, Geocarto International, Taylor and Francis, https://doi.org/10.1080/10106049.2020.1837262, (I.F. 4.889).
- MinuTreesa Abraham, NeelimaSatyam ,Sai Kumar Peddholla Reddy, BiswajeetPradhan (2020) "Runout modelling and calibration of friction parameters of Kurichermala debris flow, India", Landslides, Springer, 18, 737-754, https://doi.org/10.1007/s10346-020-01540-1, (I.F. 6.578).
- Meghna Sharma, NeelimaSatyam , 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, 25(1), 03120001, https://doi.org/10.1061/(ASCE)HZ.2153-5515.0000557, (I.F./C.S. 2.5).
- NitinTiwari, 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, 10, 7624, https://doi.org/10.1038/s41598-020-64658-1, (I.F. 4.379).
- MinuTreesa Abraham, NeelimaSatyam ,BiswajeetPradhan, 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. 3.576).

- Meghna Sharma, Neelima Satyam and Krishna R. Reddy (2020), "Strength Enhancement and Lead Immobilization of Sand using Consortia of Bacteria and Blue-Green Algae", Journal of Hazardous, Toxic, and Radioactive Waste, ASCE, 24(4), https://doi.org/10.1061/(ASCE)HZ.2153-5515.0000548, (I.F./C.S. 2.5).
- Putti SwathiPriyadarsini and NeelimaSatyam (2020), "Evaluation of site effects using HVSR microtremor measurements in Vishakhapatnam (India)", Earth Systems and Environment, Springer, 4(2), https://doi.org/10.1007/s41748-020-00158-6, (I.F./C.S 3.7).
- MinuTreesa Abraham, NeelimaSatyam ,SaiKushal, AscanioRosi, BiswajeetPradhan and SamueleSegoni (2020), "Rainfall Threshold Estimationand Landslide Forecasting for Kalimpong, India Using SIGMA Model". Water 12(4), 1195. https://doi.org/10.3390/w12041195, (I.F. 3.103).
- NitinTiwari, Neelima Satyam and JasminPatva (2020), "Engineering Characteristics and Performance of Polypropylene Fiber and Silica Fume Treated Expansive Soil Subgrade", International Journal of Geosynthetics and Ground Engineering, Springer, 6, 18, https://doi.org/10.1007/s40891-020-00199-x, (I.F./ C.S. 2.1).
- MinuTreesaAbraham ,Neelima Satyam , AscanioRosiBiswajeetPradhan and SamueleSegoni (2020) " The Selection of Rain Gauges and Rainfall Parameters in Estimating Intensity-Duration Thresholds for Landslide Occurrence: Case Study from Wayanad (India) ", Water, 2020, 12, 1000, https://doi.org/doi:10.3390/w12041000, (I.F. 3.103).
- NitinTiwari, Neelima Satyam and Sanjay Kumar Shukla (2020) "An experimental study on micro-structural and geotechnical characteristics of expansive clay mixed with EPS granules", Soils and Foundations, Elsevier, 60(3), 705-715, https://doi.org/10.1016/j.sandf.2020.03.012, (I.F. 2.436).
- MinuTreesa Abraham, NeelimaSatyam ,BiswajeetPradhan and Abdullah M. Alamri (2020) "Forecasting of Landslides Using Rainfall Severity and Soil Wetness: A Probabilistic Approach for Darjeeling Himalayas", Water, 12(3), 804, https://doi.org/10.3390/w12030804, (I.F. 3.103).
- AmbikaSrivastav and Neelima Satyam (2020), "Understanding the impact of the earthquake on circular tunnels in different rock mass: A numerical approach", Innovative Infrastructure Solutions, Springer, 5(1), 1-9, https://doi.org/10.1007/s41062-020-0278-0, (I.F./C.S. 2.0).
- AbhirupDikshit, NeelimaSatyam ,BiswajeetPradhan and SaiKushal (2020), "Estimating rainfall threshold and temporal probability for landslide occurrences in Darjeeling Himalayas", Geosciences, Springer, https://doi.org/10.1007/s12303-020-0001, (I.F. 2.076).



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Professor
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PhD : Indian Institute of Technology 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
Broad research area:

- Structural Engineering
- Sustainable Construction Practices
- Composite Bridges
- Novel Bricks and Blocks
- Microstructure and Durability of Concrete

- Advanced Characterisation Techniques
- Waste management in building construction materials

Research Highlights:
- Development of Sustainable Building Products from the locally available waste.

Patents (filled and awarded):
Awarded:
- Gupta, Trilok; Sharma, Ravi Kumar; Chaudhary, Sandeep and Siddique, Salman(2021). "METHOD OF PREPARATION OF PAVER BLOCK INCORPORATION OF RUBBER WASTE.", Australian Patent number: 2020104280, Dated 24/02/2021
- .Gupta, Trilok; Chaudhary, Sandeep; Sharma, Ravi Kumar and Jain, Sudhir(2020). "METHOD OF PREPARATION OF PAVER BLOCK INCORPORATION OF RUBBER WASTE.", Australian Patent number: 2020102838, Dated 02/12/2020

Filed:
- Gupta, T., Sharma, R. K., Chaudhary, S., and Siddique, S. (2020). "Composition for preparation of Paver Block utilizing rubber waste.", Application No. 202011018399 A, The Patent Office Journal No. 25/2020 Dated 19/06/2020

Projects active during April 2020-March 2021:
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-January 2021
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-September 2021
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.

Title -A comprehensive rheology based thixotropic fluid flow model for improved control on 3D printing of concrete
Duration -March 2021-March 2024
Funding Agency -DST, GOI
Brief Description –A comprehensive model will be developed for efficient 3D printing of Concrete Structures, considering the rheology.

Major awards, 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
- Key Note Speaker in number of training programs and Conferences

Courses/conferences/workshops organized:
- Coordinator of "QIP Short Term Course on Sustainable Construction Practices", organised from 12-10-2020 to 18-10-2020 at IIT Indore, Indore.

Journal articles published:

- Vasic, V. M., Pezo, L., Gupta, V., Chaudhary, S., and Radozevic, Z. (2021). "An artificial neural network-based prediction model for utilization of coal ash in production of fired clay bricks: A review." Science of Sintering, 53, 37-53. DOI:10.2298/SOS2101037V (I.F. 1.41)
- Gupta, T., Siddique, S., Sharma, R. K., and Chaudhary, S. (2021). "Investigating mechanical properties and durability of concrete containing recycled rubber ash and fibers." Journal of Material Cycles and Waste Management, 1-13. DOI:10.1007/s10163-021-01192-w (I.F. 2.86)
- Kumar, S., Patel, K. A., Chaudhary, S., and Nagpal, A. K. (2021). "Rapid prediction of long-term deflections in steel-concrete composite bridges through a neural network model." International Journal of Steel Structures. DOI:10.1007/s13296-021-00458-1 (I.F. 1.35)
- Gupta, V., Pathak, D. K., Kumar, R., Miglani, A., Siddique, S., and Chaudhary, S. (2021). "Production of colored bi-layered bricks from stone processing waste : structural and spectroscopic characterization." Construction and Building Materials, 278, 122339. (I.F. 6.14)
- Singh, G.K., Patel, K. A., Chaudhary, S., and Nagpal, A. K. (2021). "A methodology for rapid estimation of deflections in two-way reinforced concrete slabs considering cracking." Prac. Periodical on Structural Design and Construction, ASCE. DOI:10.1061/(ASCE)SC.1943-5576.0000568 (I.F. 0.64)
- Thakare, A. A., Singh, A., Gupta, V., Siddique, S., and Chaudhary, S. (2020). "Sustainable development of self-compacting cementitious mixes using waste originated fibers: A review." Resources, Conservation and Recycling, 105250. DOI:10.1016/j.resconrec.2020.105250 (I.F. 10.20)
- Gupta, V., Siddique, S., and Chaudhary, S. (2020). "Optimum mixing sequence and moisture content for hydrated lime fly ash bricks." Journal of Cleaner Production. DOI:10.1016/j.jclepro.2020.124859 (I.F. 9.30)
- Bhardwaj, A., Matsagar, V., Nagpal, A. K., and Chaudhary, S. (2020). "Bond Behavior in Flexural Members: Numerical Studies." International Journal of Steel Structures. DOI:10.1007/s13296-020-00432-3 (I.F. 1.35)
- Thakare, A. A., Siddique, S., Sarode, S. N., Deewan, R., Gupta, V., Gupta, S., and Chaudhary, S. (2020). "A study on rheological properties of rubber fiber dosed self-compacting mortar." Construction and Building Materials, 262, 120745. DOI:10.1016/j.conbuildmat.2020.120745 (I.F. 6.14)
- Jain, A., Gupta, R., and Chaudhary, S. (2020). "Sustainable development of self compacting concrete by using granite waste and fly ash ." Construction and Building Materials, 262, 120516. DOI:10.1016/j.conbuildmat.2020.120516 (I.F. 6.14)
- Jain, A., Gupta, R., and Chaudhary, S. (2020). "Influence of granite waste aggregate on properties of binary blend self-compacting concrete." Advances in Concrete Construction, 10, 127-140. DOI:10.12989/acc.2020.10.2.127 (I.F. 3.21)
- Gupta, V., Pathak, D. K., Chaudhary, S., and Kumar, R. (2020). "Raman Imaging for Measuring Homogeneity of Dry Binary Blend: Combining Microscopy with Spectroscopy for Technologists." Analytical Science Advances. DOI:10.1002/ansa.202000029
- Gupta, T., Siddique, S., Sharma, R. K., and Chaudhary, S. (2020). "Effect of aggressive environment on durability of concrete containing fibrous rubber shreds and silica fume." Structural Concrete, 1-13. DOI:10.1002/suco.202000043 (I.F. 3.13)
- Gupta, V., Chai, H. K., Lu, Y., and Chaudhary, S. (2020). "A state of the art review to enhance the industrial scale waste utilization in sustainable unfired bricks." Construction and Building Materials, 254, 119220. DOI:10.1016/j.conbuildmat.2020.119220 (I.F. 6.14)

COVID related activities:

Fluorescent bricks and coatings with self-illuminating properties for applications in UV disinfection building chambers

Abstract: - Passenger luggage in public transportation can be a potential source of disease spread, for which large number of UV disinfection chambers will be required. For such a purpose, existing concrete buildings can be converted into the closed UV chambers or the new UV disinfection rooms

can also be constructed for disinfection of public luggage at mass scale. Research studies are being carried out to develop the sustainable construction materials with self-illuminating properties for existing as well as for new UV disinfection building chambers. These materials will give the visible fluorescence under UV light and can illuminate the goods inside the chamber without any additional visible light source. For existing buildings, coatings are being developed whereas for new construction, functionally graded bricks are being developed for the required applications. These materials will be helpful for enhancing the visibility and monitoring the operations in UV disinfection rooms using normal visible range cameras without any additional visible light source in the existing as well as in the new infrastructure.



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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

Statement of Research Interests

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

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

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

Projects active during April 2020-March 2021:

- Identification hydropower sites and critical glacial lakes for sustainable water resources management in Himachal Pradesh
- An integral assessment of groundwater and surface water using stable isotopes of water

Major awards, achievements:

- Ranked in **Top 2% scientist** in list prepared by **Sandford University** and among the top 500 of the world's more than 42000 researchers in the in the sub-area "environmental engineering (Meteorology and Atmospheric Sciences)- 2020

- Prof S N Gupta Memorial Lecture Award, Indian Society of Hydraulics, 2021
- Editor- PLOS Climate
- Associate Editor-International Journal of Cloud Applications and Computing
- Best Researcher of the Year Award 2020 by Institution of Engineers (India)
- Prof R J Garde Research Award

Courses/conferences/workshops organized:

- Three days online International Conference on "Ecosystem Restoration for Resilience and Sustainability: Living with nature" jointly organized by Department of Civil Engineering, Indian Institute of Technology Indore and National Institute of Disaster Management, Delhi during June 05-07, 2021.
- TEQIP Short term course on "Advancements in Civil Engineering (with emphasis on water resources, environment engineering and climate change) Nov 02-07, 2020, IIT Indore,
- Three weeks online certificate program on Hydrometeorological and Extreme Events Disaster Risk Management jointly organized by Department of Civil Engineering, Indian Institute of Technology Indore and National Institute of Disaster Management, Delhi during 1-21 June, 2020.

Journal articles published:

- Jha, S., Manish Kumar Goyal, Gupta, B.B., Hsu, C.H., Gilleland, E., Das, J. (2021), A methodological framework for extreme climate risk assessment integrating satellite and location-based datasets in Intelligent Systems, In Press, International Journal of Intelligent Systems, *Impact factor:10.312*
- Poonia, V., Manish Kumar Goyal, Gupta, B.B., Gupta, A.K., Jha, S., Das, J. (2021), Drought Occurrence in Different River Basins of India and Blockchain Technology based Framework for Disaster Management, In Press, Journal of Cleaner Production, *Impact factor: 7.246*
- Hinge, G., Surampalli, R.Y., Manish Kumar Goyal, Gupta, B.B., Chang, X. (2021), Soil Carbon and its Associate Resilience using Big Data Analytics: For food Security and Environmental Management, Technological forecasting and social change,169, 120823,*Impact factor:5.846*
- Hazra, B., Bhargav, Manish Kumar Goyal (2021), Generation of multivariate synthetic hydrological series using blind source separation techniques and copula functions, In Press, Journal of Environmental Informatics, *Impact Factor: 4.604*
- Dubey, S, Sharma, A., Panchariya, V.K., Manish Kumar Goyal, Surampalli, R.Y., Zhang, T. C. (2021), Regional Sustainable Development of Renewable Natural Resources using Net Primary Productivity on a Global Scale, Ecological Indicators, 127, 107768, *Impact factor:4.229*
- Gupta, S., Manish Kumar Goyal, Sarma, A.K. Assessment of hydro-climatological changes in eastern Himalayan river catchment of North-East India, ASCE-Journal of Hydrologic Engineering, *Impact factor:1.594*
- Goswami, U.P. and Manish Kumar Goyal, (2021), Assessment of Glacial Lake Development and Downstream Flood Impacts of Critical Glacial Lake, In Press, Natural Hazards, *Impact factor:2.427*
- Dubey, S., Gupta, H., Goyal Manish Kumar, and Joshi, N. (2021), Evaluation of precipitation datasets available on Google earth engine over India. Int. J. Climatol. 1–20.https://doi.org/10.1002/joc.7102, *Impact factor:3.928*
- Kumar, N., Goyal Manish Kumar, Gupta, A.K., Jha, S., Das, J., Madramootoo, C.A. (2021), Joint Behaviour of Climate Extremes across India: Past and Future, Journal of Hydrology, 597, 126185. 10.1016/j.jhydrol.2021.126185, *Impact factor:4.5*
- Poonia, V., Jha, S., Goyal Manish Kumar (2021), Copula based analysis of meteorological, hydrological and agricultural drought characteristics across Indian river basins. Int. J. Climatol. 1–16. https://doi.org/10.1002/joc.7091, *Impact factor:3.928*
- Jha, S., Goyal Manish Kumar, Gupta, B., Gupta, A.K. (2021), A novel analysis of COVID 19 risk in India incorporating climatic and socioeconomic Factors. Technol. Forecast. Soc. Change 167, 120679. https://doi.org/10.1016/j.techfore.2021.120679, *Impact factor:5.846*

- Singh, V., Jain, S.K., Goyal Manish Kumar (2021), An assessment of snow-glacier melt runoff under climate change scenarios in the Himalayan basin. Stoch. Environ. Res. Risk Assess. 1. https://doi.org/10.1007/s00477-021-01987-1, *Impact factor:2.351*
- Poonia, V., Das, J., Goyal Manish Kumar (2021), Impact of climate change on crop water and irrigation requirements over eastern Himalayan region. Stoch. Environ. Res. Risk Assess. 6. https://doi.org/10.1007/s00477-020-01942-6, *Impact factor:2.351*
- Kumar, N., Poonia, V., Gupta, B.B., Goyal Manish Kumar (2021), A novel framework for risk assessment and resilience of critical infrastructure towards climate change. Technol. Forecast. Soc. Change 165, 120532. https://doi.org/10.1016/j.techfore.2020.120532, *Impact factor:5.846*
- Kumar, N., Sinha, J., Madramootoo, C.A., Goyal Manish Kumar (2020), Quantifying groundwater sensitivity and resilience over peninsular India. Hydrol. Process. 34, 5327–5339. https://doi.org/10.1002/hyp.13945, *Impact factor:3.256*
- Jha, S., Das, J., Goyal Manish Kumar (2021), Low frequency global-scale modes and its influence on rainfall extremes over India: Nonstationary and uncertainty analysis. Int. J. Climatol. 41, 1873–1888. https://doi.org/10.1002/joc.6935, *Impact factor:3.928*
- Grenon, G., Singh, B., de Sena, A., Madramootoo, C.A., von Sperber, C., Goyal Manish Kumar, Zhang, T. (2021), Phosphorus fate, transport and management on subsurface drained agricultural organic soils: A review. Environ. Res. Lett. 16. https://doi.org/10.1088/1748-9326/abce81, *Impact factor: 6.096*
- Das, J., Poonia, V., Jha, S., Manish Kumar Goyal (2020), Understanding the climate change impact on crop yield over Eastern Himalayan Region: ascertaining GCM and scenario uncertainty. *TheorApplClimatol* (2020).https://doi.org/10.1007/s00704-020-03332-y, *Impact factor: 2.882*
- Ashutosh Sharma and Manish Kumar Goyal (2020), Assessment of drought trend and variability in India using wavelet transform, Hydrological Sciences Journal, 65:9, 1539-1554, DOI: 10.1080/02626667.2020.1754422, *Impact factor: 2.186*
- Das J, SrinidhiJha, Manish Kumar Goyal (2020), On the relationship of climatic and monsoon teleconnections with monthly precipitation over meteorologically homogenous regions in India: Wavelet & global coherence approaches, Atmospheric Research, Volume 238, 2020,104889, ISSN 0169-8095, https://doi.org/10.1016/j.atmosres.2020.104889. *Impact factor: 4.676*
- 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. https://doi.org/10.1029/2019WR026533, *Impact factor: 4.31*
- 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: 4.5*
- 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: 4.5*
- Sharma, A. and **Goyal Manish Kumar** (2020). Assessment of the changes in precipitation and temperature in Teesta River basin in Indian Himalayan Region under climate change. Atmospheric Research, 231, p.104670.*Impact factor: 4.676.*

COVID related activities: Goyal Manish Kumar and Anil K Gupta, Integrated Risk of Pandemic: Covid-19 Impacts, Resilience and Recommendations, DOI https://doi.org/10.1007/978-981-15-7679-9, Springer, Print ISBN 978-981-15-7678-2



Dr. Saikat Sarkar
Assistant Professor
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PhD : Indian Institute of Science Bangalore

Statement of Research Interests: Failure of structures, Metamaterials, Inverse problems, Large scale computation in mechanics.

Previous Employment (includes post-doctoral experience) –

- Indian Institute of Technology Indore, India (Dec 2018 – Present)
- National Institute of Technology Rourkela, India (Jul 2018- Dec 2018)
- Indian Institute of Technology Bhubaneswar, India (Jul 2017-Jun 2018)
- Technion, Israel (Mar 2017- May 2017)
- Texas A&M University, USA (Mar 2015- Feb 2017)

Broad research area: Structural Mechanics

Research Highlights:

- We have developed a coarse-grained formulation for polymer-based metamaterials, which turns out to be very effective as backing material of protective armors.
- We have designed a novel architecture for seismic material, which is effective in stopping a earthquake from damaging a structure.
- We have developed a novel formulation protective armors.

Projects active during April 2020-March 2021:
Title: A peridynamics-like framework to predict failure of concrete structures.
Duration: Mar 2019-Mar 2022.
Funding Agency: SERB, ECR (Government of India).
Brief Description: I am the sole Investigator of this project. A PhD student (FA) has been recruited from this project. We are developing derivative-free mechanics theory and computer programs for studying the crack propagation and failure of concrete structures for different strain rates.

Title: Safeguarding heritage structures using seismic metamaterials.
Duration: (Mar 2019-Mar 2021)
Funding Agency: SPARC (Government of India)
Brief Description: I am a co-PI in this project in which we have collaborators from India, France, and UK. We are developing large-scale metamaterials for designing safeguard structures against earthquake.
Courses/conferences/workshops organized:

- I am the convenor of the prestigious 8th International Congress on Computational Mechanics and Simulation (ICCMS2021), which is scheduled to be held at IIT Indore in December 2021.

Journal articles published:

- **Varma, T. V.,**Ungureanu, B., **Sarkar, S.**, Craster, R., Guenneau, S. R. L., &Brûlé, S. (2021). The influence of clamping, structure geometry and material on seismic metamaterial performance. Frontiers in Materials, 8, 106.
- **Varma, T. V.**, &**Sarkar, S.** (2021). Designing polymer metamaterial for protective armor: a coarse-grained formulation. Meccanica, 56(2), 383-392.
- **Varma T. V.**, **Sarkar, S.**, Mondal G. (2020), Buckling restrained sizing and layout optimization of truss structures, Journal of Structural Engineering, 146 (5), 04020048.
  Varma T. V. is my PhD student.



Dr. Lalit Borana
Assistant Professor
lalitborana@iiti.ac.in

PhD : Yes

Previous Employment (post-doctoral at Hongkong)
Statement of Research Interests: My research focusses on the behaviour of soil and optical sensors for geotechnical applications.

Broad research area: Geotechnical Engineering
Research Highlights: Soil; Optical Sensors; Consolidation
Projects active during April 2020-March 2021:
Title: Performance improvement of the clay soil using rock quarry dust.
Duration: 12-14 months
Funding Agency: TEQIP
Brief Description: Major awards, achievements, recognitiations of the faculty / students / scientists /staff of your department:
Young CEE award 2020 - Hongkong
Courses/conferences/workshops organized: Recent Advancement Geotechnical and structural engineering" March 2021, at IIT Indore.
Journal articles published: 2



Dr. Mohd. Farooq Azam
Assistant Professor
farooqazam@iiti.ac.in

PhD : Earth, Universe and Environment, University of Grenoble, France.

Previous Employment (includes post-doctoral experience) –

INSPIRE Faculty at National Institute of Hydrology, Roorkee, India (March 2015 to November 2017)

Statement of Research Interests: Dr. Mohd. FarooqAzam is a glacio-hydrologists. His main research activities include Glacier mass balance, Watershed hydrology, glacier and snow energy balance, black carbon impacts on glaciers in the Himalayan region.

Broad research area: Glacio-hydrology
Research Highlights: Published 2 papers in Science (one as first author) in 2021.

Projects active during April 2020-March 2021:
Title: Listening to Ice - Learning from Glaciers and Glacial Communities
Duration: 1 year
Funding Agency: British Council
Brief Description: This India-UK joint project focuses the impact of climate change on glacier water resources in the Zanskar Basin and the local communities.

Title: Mass Balance and Dynamics investigations on DrangDrung Glacier in Zanskar Himalaya
Duration: 3 year
Funding Agency: DST-SERB
Brief Description: The project focuses on dynamic and mass balance studies on DrangDrung Glacier in Zanskar Basin under changing climate.

Title: Glacier Studies on DrangDrung Glacier
Duration: 3 year

Funding Agency: Space Application Centre-ISRO
Brief Description: The project focuses on geodetic mass balance, glacier dynamics and high altitude meteorology.

Major awards, achievements, recognitiations of the faculty / students / scientists /staff of your department:
The research work done by Azam's lab have been covered by more than 200 national and international media houses through newspapers, magazines, Radio Podcasts and TV interviews including Sky News London, NDTV etc.

Journal articles published: 5 paper with an aggregate impact factor of 105.



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

PhD : University of Waterloo, Canada (2013-2017)

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

Statement of Research Interests
Broad research area:

- Structural Health Monitoring
- Reliability Assessment
- Impact Loading

Research Highlights:

- Ballistic performance of quasi-isotropic CFRP laminates under low velocity impact.
- 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.

Major awards, achievements:

- Best paper award for conference paper: Patnaik, G., Kaushik, A., Rajput, A., Prakash, G., "Numerical study on perforation characteristics of carbon-fiber reinforced composite laminates subjected to impact loading". 5th International Conference on Structural Engineering and Construction Management 2021 (virtual conference).

- Certificate for best paper presentation award for conference paper: Kaushik, A., Patnaik, G., Rajput, A., &Prakash, G., 2021, "Quantification of C&D waste and its future application in Indian Scenario, India", *International conference on ecosystem restoration for resilience and sustainability: Living with nature*, jointly organised by IIT Indore and National institute of disaster management, India, June 05-June 07, India. (Virtual conference).

- Certificate of Appreciation for Keynote speaker at the webinar on "Reliability and Safety of Complex Engineering Systems", organized by SRESA's Indian Institute of Risk and Reliability (IIRR) and Safety Critical Systems Lab, IIT Madras, May 29, 2021, (virtual conference).

Courses/conferences/workshops organized:

- Co-coordinator, TEQIP III Sponsored short-term course on Recent Advancement in Structural Engineering, October 7-11, 2020.
- Co-coordinator, TEQIP III Sponsored short-term course on Recent Advancement in Civil Engineering, October 8-10, 2020.
- Co-coordinator, QIP sponsored short term course on Recent advancement in Structural and Geotechnical Engineering, March 8-13, 2021.

- Session Organiser, Session Stochastic Degradation Modelling for Risk-Informed Asset Management, *7th International Symposium on Reliability Engineering and Risk Management,* Jun. 5-8, 2020, Beijing, China.

Journal articles published:

- Prakash, G., Yuan, X. X., Hazra, B., & Mizutani, D. (2020). Toward a Big Data-Based Approach: A Review on Degradation Models for Prognosis of Critical Infrastructure. *Journal of Nondestructive Evaluation, Diagnostics and Prognostics of Engineering Systems*, *4*(2).
- Prakash, G. (2021). A deflection-based practicable method for health monitoring of in-service bridges. *Measurement Science and Technology*, *32*(7), 075108.
- Patnaik, G., Kaushik, A., Rajput, A., Prakash, G., &Velmurugan, R. (2021). Ballistic performance of quasi-isotropic CFRP laminates under low velocity impact. *Journal of Composite Materials*, 00219983211023869.

Any other major events / development: Honorary Faculty in SRESA's Indian Institute of Risk and Reliability (IIRR), Society for Reliability & Safety (SRESA), Mumbai; *www.sresa.org.in*



Dr. Kaustav Bakshi
Assistant Professor
Kaustav.bakshi@iiti.ac.in

PhD: Jadavpur University Kolkata 2017
Previous Employment: (includes post-doctoral experience) –

- Assistant Professor Grade II, Indian Institute of Technology Indore [December 2018 – May 2021]
- Assistant Professor, Heritage Institute of Technology Kolkata [July 2013 – December 2018]
- Guest Faculty, Jadavpur University Kolkata [July 2010 – December 2015]

Statement of Research Interests
Broad research area:

- Structural Engineering
- Structural dynamics
- Failure predictions
- Composite Structures
- Numerical simulations
- Stability of thin walled structures
- Plates and shells

Research Highlights:

- Static bending of composite shell roofs
- Stiffened laminated composite shell roofs
- First and progressive ply failure predictions
- Free and forced vibration analysis
- Geometrically nonlinear analysis
- Buckling analysis of composite shells

Projects active during April 2020-March 2021:
Title: Structural health assessment of Old Bus Stand Building at Dhamnod, Madhya Pradesh.
Duration: One month
Funding Agency: Nagar Panchayat Dhamnod.
Brief Description: The health assessment of an old building was carried out using NDTs like rebound

hammer test, UPV test and alkali test. The proposed floor extension of that building was checked using the commercial package Staad.Pro.

Major awards, achievements:

- Acted as a reviewer for the Journal of Strain Analysis for Engineering Design.
- Invited as an Editor for International Research Journal of Modernization in Engineering Technology and Science.

Courses/conferences/workshops organized:

- Short Course on "Recent Advances in Structural Engineering" from 8th - 10th October 2020 sponsored by TEQIP III, IIT Indore.

Journal articles published:

- K. Bakshi and D. Chakravorty (2020), A Finite Element Prediction of First Ply Failure and Delamination in Composite Conoidal Shells Using Geometric Nonlinearity, *Sadhana* (Impact Factor: 1.188), vol. 45, pp. 218.
- K. Bakshi (2020), A Numerical Study on Nonlinear Bending Performance of Transversely Loaded Composite Singly Curved Stiffened Surfaces, *Journal of Strain Analysis for Engineering Design* (Impact factor: 1.541), pp. 0309324720977415.



Dr. Abhishek Rajput
Assistant Professor
abhishekrajput@iiti.ac.in

PhD: Indian Institute of Technology Roorkee, 2017

Previous Employment (post-doctoral at South Korea in 2017-18)

- Statement of Research Interests: My research area focusses on the behaviour of various construction materials under low, medium, and high strain, rates.

Broad research area: Structural and Impact Mechanics
Research Highlights: Prestressed concrete; CFRP; Corrosion

Projects active during April 2020-March 2021:
Title: Nonlinear finite element analysis of concrete damage due to impact loading
Duration: 12-14 months
Funding Agency: TEQIP

Major awards, achievements: Best Paper Award to my Ph.D. student Mr. GyaneshPatnaik in Secon 21 International conference of structural engineering and construction management held on May 12-15, 202, FISSAT Kerela, India.

Courses/conferences/workshops organized:
Advances in Civil Engineering" from 7th-11th October 2020, at IIT Indore
Journal articles published: 2

Any other major events / development etc.:
Panelist in the Vaishwik Bharatiya Vaigyanik Summit **"VAIBHAV 2020".**



Dr. Priyansh Singh
Assistant Professor
priyansh@iiti.ac.in

PhD : Indian Institute of Technology Delhi, 2019

Previous Employment (includes post-doctoral experience) –

- Assistant Professor, Birla Institute of Technology and Sciences Pilani, Pilani Campus (Feb 2019 -June 2020)
- Visiting Faculty, Birla Institute of Technology and Sciences Pilani, Pilani Campus (July 2018 -Feb 2019)

Statement of Research Interests
Broad research area: Pavement Materials
Research Highlights:

- Probabilistic approach to characterise laboratory rutting and fatigue behaviour
- Incorporation of waste plastic in asphalt mixture
- Effect of compaction energy on aggregate degradation
- Characterisation of permanent deformation of asphalt mixture.
- Back-calculation methods for prediction of pavement layer moduli.

Journal articles published:

Priyansh Singh &Aravind Krishna Swamy (2020) Probabilistic approach to characterise laboratory rutting behaviour of asphalt concrete mixtures, International Journal of Pavement Engineering, 21:3, 384-396, DOI: 10.1080/10298436.2018.1480780



Dr. Gourab Sil
Assistant Professor
gourabsil@iiti.ac.in

PhD : Indian Institute of Technology Bombay, 2019

Previous Employment (includes post-doctoral experience) -

- Visiting Faculty in Dept. of Civil Engineering, BITS Pilani, Pilani, Rajasthan: 333031. (September 2019 to June 2020)
- Research Associate in Dept. of Civil Engineering, Indian Institute of Technology Bombay, Mumbai. (May 2019 to September 2019)

Assistant Professor in Dept. of Civil Engineering, Techno India College of Technology, Rajarhat, Kolkata. (July, 2014 to June, 2015)

Broad research area: Traffic Engineering and Geometric Deign of Highways

Research Highlights:

- Driver Behaviour Analysis and Modelling.
- Performance Based Geometric Design of Highways.
- Influence of Road Geometric Design on Safety.

Major awards, achievements:

- National Associate Member of Technical Committee of Transportation Research Group of India: Transportation Safety and Security (TCT-F).
- Most Cited Work at Journal of Transportation Engineering Part-A, ASCE in March 2021.

Journal articles published:

- **Sil, G.**; Nama, S. Maji, A.; and Maurya, A. (2020). "Modeling 85th Percentile Speed Using Spatially Evaluated Free-Flow Vehicles for Consistency-Based Geometric Design" Journal of Transportation Engineering Part A: Systems (ASCE), 146 (2).
- **Sil, G.,**Nama, S., Maji, A. and Maurya, A.K. (2020). "Effects of Inter-Vehicle Interaction on Speed and Lateral Position for Reviewing Free-Flow Condition". *European Transport\TrasportiEuropei,* 78, pp. 1-16.

COVID related activities: Research initiative on travel mode preferences of university students considering the impact of COVID-19 in India

Department of Chemistry

Department of Chemistry at IIT Indore, which comes in the School of Basic Sciences, aims to provide exceptional training to all the students interested in cutting-edge research and education. The strength of the department has been and continues to be excellence in research and teaching. Started in August 2009 our department is rapidly growing every semester in terms of size, research diversity, external funding and number of publications. At present we have 17 faculty members and approximately 100 Ph.D. students with research interests ranging from traditional areas (organic, inorganic, physical, and theoretical/computational) to highly interdisciplinary and collaborative research areas such as nanotechnology, polymers, biochemical, materials and analytical.

The faculty of the department is extremely well qualified, and motivated with a strong commitment to teaching and research. Our department is well equipped with state-of-art sophisticated instrumentation facilities to facilitate research in almost all areas of chemistry and interdisciplinary research. The main source of external funding comes from CSIR (Council of Scientific and Industrial Research) and DST (Department of Science and Technology).

The alumni base of the department is slowly increasing, in which, many of them have occupied research (postdoctoral) positions in academia, in India and abroad. Their accomplishments have been outstanding and reflect on the quality training imparted at the undergraduate and graduate level.

We have M.Sc (Master of Science) degree program in Chemistry from the academic year of 2013. We suggest all prospective students and other visitors to explore our website to learn more about our department

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.

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.

Faculty Profile:



Ph.D (2007) in Chemical Sciences. IITK, 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)

Prof. Rajneesh Misra
Professor
rajneeshmisra@iiti.ac.in

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)

- Title- "Pyridine Bridging Diphenylamine-Carbazole with Linking Topology as Rational Hole Transporter for Perovskite Solar Cells Fabrication"Author- Peng Huang, Manju, Samrana Kazim, Gangala Sivakumar, Manuel Salado, Rajneesh Misra,*and Shahzada Ahmad* Journal – ACS Applied Materials And Interfaces, Year-2020, Volume-12, Page -22881-22890,
- Title- "Carbazole-Based Spiro[fluorene-9,9′-xanthene] as an Efficient HoleTransporting Material for Perovskite Solar Cells" Author - Do Yoon Lee, Gangala Sivakumar, Manju, Rajneesh Misra,* and Sang Seok* Journal- ACS Applied Materials And Interfaces, Year- 2020, Volume-12, Page-28246-28252,
- Title- "White hyperelectrofluorescence from solution-processable OLEDs based on phenothiazine substituted tetraphenylethylene derivatives" Author - Faizal Khan, Ervinas Urbonas, Dmytro Volyniuk,* Juozas V. Grazulevicius, Shaikh M. Mobin and Rajneesh Misra *Journal- Journal of Material Chemistry C, Year-2020, Volume-8, Page-13375
- Title:- "Recent advances of BODIPY based derivatives for optoelectronic applications" Author- Madhurima Poddar, Rajneesh Misra Journal Name- Coordination Chemistry, Year-2020, Volume-421 ,Page- 213462

- Title- "Excited State Electron Transfer in 1,1,4,4-Tetracyanobuta-1,3-Diene (TCBD)- and Cyclohexa-2,5-Diene-1,4-Diylidene-Expanded TCBD–Substituted BODIPY Phenothiazines Donor-Acceptor Conjugates" Author -Madhurima Poddar, Youngwoo Jang, Rajneesh Misra,* Francis D'Souza*. Journal- Chemistry A European Journal,Year-2020,Volume-26, Page-6869-6878
- Title- "Multiple Intramolecular Charge Transfers in Multimodular Donor− Acceptor Chromophores with Large Two-Photon Absorption" Author - Yogajivan Rout, Alessio Cesaretti,§ Elena Ferraguzzi, Benedetta Carlotti,* and Rajneesh Misra* Journal - The Journal of Physical Chemistry C, Year-2020, Volume-124, Page-24631-24643,
- Title- "Electron Donor Ferrocenyl Phenothiazine: Counter Ion for Improving All-Organic Electrochromism" Author - Anjali Chaudhary,Madhurima Poddar, Devesh K. Pathak, Rajneesh Misra,* and Rajesh Kumar* Journal - ACS Applied Electronic Materials, Year-2020, Volume-2, Page-2994-3000
- Title- "Singlet and Triplet Excited-State Dynamics of 3,7- Bis(arylethynyl)phenothiazines: Intramolecular Charge Transfer and Reverse Intersystem Crossing" Author - Madhurima Poddar, Alessio Cesaretti, Elena Ferraguzzi, Benedetta Carlotti,* and Rajneesh Misra* Journal- Journal of Physical Chemistry C, Year-2020, Volume-124,Page-17864-17878,
- Title- " Charge stabilization via electron exchange: excited charge separation in symmetric, central triphenylamine derived, dimethylaminophenyl– tetracyanobutadiene donor–acceptor conjugates" Author - Indresh S. Yadav, Ajyal Z. Alsaleh, Rajneesh Misra * and Francis D'Souza * Journal- Chemical Science, Year-2021, Volume-12, Page-1109
- Title- "Synthesis and Characterization of Isoindigo-Based Push−Pull Chromophores" Author - Yogajivan Rout, Vivek Chauhan, and Rajneesh Misra* Journal- The Journal of Organic Chemistry,Year- 2020, Volume-85, Page-4611-4618
- Title- " Design and synthesis of 1,8-naphthalimide functionalized benzothiadiazoles" Author - Yogajivan Rout and Rajneesh Misra * Journal-New Journal of Chemistry, Year-2021, Volume-5, Page-9838-9845, Impact Factor-3.591
- Title- "Formation of Highly Efficient, Long-Lived Charge Separated States in Star-Shaped Ferrocene-DiketopyrrolopyrroleTriphenylamine Donor-Acceptor-Donor Conjugates" Author - Charu Popli, Youngwoo Jang, Yuvraj Patil, Rajneesh Misra and Francis D'Souza* Journal - Chemsitry A European Journal, Year-2020,Volume-26(66), Page-.15109-15115.
- Title- "Thioether linked meso functionalized BODIPY DYEmer" Author - Bhausaheb Dhokale, Indresh Singh Yadav, Shaikh M. Mobin and Rajneesh Misra Journal- Journal of Porphyrins and Phthalocyanines, Year-2021,Volume- 25, Page- 428-435
- Title- "Pentafluorophenyl substituted fulleropyrrolidine: a molecule enabling the most efficient flexible electrochromic device with fast switching"Author - Anjali Chaudhary, Gangala Sivakumar, Devesh K. Pathak a, Manushree Tanwar a, Rajneesh Misra* and Rajesh Kumar *.Journal- Journal of Material Chemistry C, Year-2021, Volume-9, Page-3462-3469
- Title-"Mechanochromism and Aggregation-Induced Emission in Phenanthroimidazole Derivatives: Role of Positional Change of Different Donors in a Multichromophoric Assembly" Author - Faizal Khan, Anupama Ekbote, Shaikh M. Mobin, and Rajneesh Misra* Journal Name- Journal of Organic Chemistry, Year-2021, Volume-86, Page-1560-1574

Projects active during April 2020-March 2021

Title : Donor-Acceptor NIR absorbing TCBD and expanded TCBD derivatives of ferrocenyl functionalized BODIPYs
Duration : March 19 – March 22
Funding Agency : SERB
Brief Description : Synthesis of BODIPYs and applications

Title : Tuning the HOMO-LUMO gap of Donor-acceptor benzothiadiazoles

Duration : September2018-August 2021
Funding Agency : CSIR
Brief Description : Functionalization of BTD derivatives

Title : New Iron Based Catalysts for C-H Activation
Duration : 2019-2023
Funding Agency : DAAD
Brief Description : Synthesis of ferrocene based molecules



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

Previous Employment (includes post-doctoral experience)

2017-till date - Professor, IIT Indore, India
2013- Associate Professor, IIT Indore, India
2010- Assistant Professor , IIT Indore, India
2009- EPFL in Lausanne (Switzerland) as a Marie-Curie International Incoming Fellow.
2006- FCT Post-doctoral Fellow, Institute Superior Técnico in Portugal, Lisbon.
Post-doctoral Fellow, National University of Singapore.

Prof. Suman Mukhopadhyay
Professor
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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

Publications (includes journal articles, books and book chapters)

- Effect of hBN and SiC addition on laser assisted processing of ceramic matrix composite coatings, Debjit Mishra, Vaibhav Nemane, Suman Mukhopadhyay, Satyajit Chatterjee, Ceramics International, 2020, 46, 5758.
- Coligand driven efficiency of catecholase activity and proteins binding study of redox active copper complexes, Vaishali Chhabra, Bidyut Kumar Kundu, Rishi Ranjan, Pragti, Shaikh M Mobin, Suman Mukhopadhyay, Inorg Chim Acta, 2020, 502, 119389 (invited article).
- Arene-ruthenium(II)-phosphine complexes: Green catalysts for hydration of nitriles under mild conditions, Komal M Vyas, Poulami Mandal, Rinky Singh, Shaikh M Mobin, Suman Mukhopadhyay, Inorg Chem Commun, 2020, 112, 107698
- Ruthenium(II)-arene complexes containing ferrocenamide ligands: Synthesis, characterisation and antiproliferative activity against cancer cell lines, Poulami Mandal, Chanchal Sonkar, Sandeep Singh Dhankar, C. M. Nagaraja, Suman Mukhopadhyay, J Organomet. Chem., 2020, 916, 121247

- Role of zeolite encapsulated Cu(II) complexes in electron transfer as well as peroxy radical intermediates formation during oxidation of thioanisole, Bidyut Kumar Kundu, Mriganka Das, Rakesh Ganguly, Preeti A Bhobe, Suman Mukhopadhyay, J Catal., 2020, 389, 305.
- Mechanistic Insight for Targeting Biomolecules by Ruthenium(II) NSAID Complexes, Chanchal Sonkar, Novina Malviya, Rishi Ranjan, Srimanta Pakhira, Suman Mukhopadhyay, ACS Appl. Bio Mater., 2020, 3, 7, 4600.
- Amino Acid Derived Emerging Sensor for Detection of S2- Ion and MeOH Percentage in MeOH-H2O Mixture, Novina Malviya, Mahima Rajput, Shaikh M Mobin, Suman Mukhopadhyay, ChemistrySelect, 2020, 5, 12835
- Studies on influence of nuclearity of zinc(II) hemi-salen complexes on some pivotal biological applications, Bidyut Kumar Kundu, Pragti, Shaikh M Mobin, Suman Mukhopadhyay, Dalton Transactions, 2020, 49, 15481.
- Specific Loading and In Vitro Controlled Release of Ru-Based Hydrophobically Encapsulated Model Anticancer Drug Inside Nano-Assemblies toward Stimuli-Responsive Drug Delivery, Bhawna Saini, Rinky Singh, Suman Mukhopadhyay, Tushar Mukherjee, ACS Appl. Nano Mater, 2021, 4, 2, 2037.
- Unveiling the Urease Like Intrinsic Catalytic Activities of Two Dinuclear Nickel Complexes towards Green Syntheses of Aminocyanopyridines, Bidyut Kumar Kundu, Pragti, Soumen Biswas, Abhijit Mondal, Shyamalava Mazumdar, Shaikh M Mobin, Suman Mukhopadhyay, Dalton Trans., 2021, 49, 15481.
- In vitro evaluation of cytotoxicity and antimetastatic properties of novel arene ruthenium(II)-tetrazolato compounds on human cancer cell lines, Komal Vyas, Deepu Sharma, Sri Krishna Jayadev Magani, Shaikh M Mobin, Suman Mukhopadhyay, Appl. Organomet. Chem. 2021, 35, 5, e6187

Projects active during April 2020-March 2021

Title : Exploring ruthenium based metallodendrimers for improved anticancer activity and mode of action
Duration : Three years (2019-2022)
Funding Agency : DST
Brief Description : It is a bilateral joint cooperation project under Indo-Bulgaria Scheme



Dr. Apurba K Das
Associate Professor
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)
Associate Professor (2016 onwards) in Chemistry, Indian Institute of Technology Indore, India
Assistant Professor (2009-2016) in Chemistry, Indian Institute of Technology Indore, Indore, India
Postdoctoral Research Fellow (2008-2009), University of Strathclyde, Glasgow, UK
Postdoctoral Research Associate (2006-2008), University of Manchester, Manchester, 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. Major Awards, recognitions and Achievements

- 2020 International Research Fellowship awarded to Dr. Apurba K Das by Kyoto University, Japan

Patents- Filled & Awarded

- Ultrasensitive nitrogen dioxide sensor based on S N doped carbon dot functionalized tungsten oxideInventors: S. Mukherjee, A. K Das, C. Patel, B. Mandal, R. G. Jadhav Patent No. 202021041967, Published, September 28, 2020.

Publications (includes journal articles, books and book chapters)

- Pt Nanoparticles Supported on a Dynamic Boronate Ester-Based G-quadruplex Hydrogel as a NanoreactorT. Ghosh, A. Biswas, S. Bhowmik, A. K. Das*, Chemistry An Asian Journal, 2021, 16, 215-223.
- Mesoporous Tyrosine Functionalized BTCZnO Composite for Highly Selective Capacitive CO Sensor Aaryashree, B. Mandal, A. Biswas, R, Bhardwaj, A, Agarwal, A. K Das, S, Mukherjee IEEE Sensors Journal, 2021, 21, 2610-2617.
- Valorization of Parthenium hysterophorus Weed for Cellulose Extraction and its Application for Bioplastic Preparation S. Nigama, A. K. Das, M. K. Patidar, Journal of Environmental Chemical Engineering, 2021, 9, 105424.
- A. K. Das*, P. K Gavel, Low Molecular Weight Self-assembling Peptide-based Materials for Cell Culture, Antimicrobial, Anti-inflammatory, Wound Healing, Anticancer, Drug Delivery, Bioimaging and 3D Bioprinting Applications, Soft Matter, 2020, 16, 10065-10095. (Invited Review Article).
- 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.
- S. Biswas, S. Samui, A. K. Das, S. Pasadi, K. Muniyappa, J. Naskar, Targeting G-quadruplex DNA with Synthetic Dendritic Peptide: Modulation of the Proliferation of Human Cancer Cells, RSC Advances, 2020, 10, 26388-26396.
- A. Roy Chowdhury, S. Maiti, A. Mondal, A. K Das*, Picolinohydrazide Based Covalent Organic Polymer for Metal Free Catalysis and Removal of Heavy Metals from Waste Water, Journal of Physical Chemistry C, 2020, 124, 7835-7843.
- S. Maiti, B. Mandal, M. Sharma, S. Mukherjee**,** A. K. Das*, Covalent Organic Polymer as an Efficient Chemosensor for Highly Selective H_2S Detection Through Proton Conduction, Chemical Communications, 2020, 56, 9348-9351.
- B. Mandal, S. Maiti, Aaryashree, G. Siddharth, M. Das, A. Agarwal, A. K. Das, S. Mukherjee, Organo-Di-Benzoic Acidified ZnO Nanohybrids for Highly Selective Detection of CO Gas at Low Temperature, Journal of Physical Chemistry C, 2020, 124, 7307-7316.
- R. G. Jadhav, A. K. Das*, Pulsed Electrodeposited Morphology Controlled Organic-Inorganic Nanohybrids as Bifunctional Electrocatalyst for Urea Oxidation, Nanoscale, 2020, 12, 23596-23606.
- R. G. Jadhav, D. Singh, P. V. Krivoshapkin, A. K. Das*, Electrodeposited Organic-inorganic Nanohybrid as Robust Bifunctional Electrocatalyst for Water Splitting, Inorganic Chemistry, 2020, 59, 7469-7478.
- Engineering of Electrodeposited Binder-free Organic -Nickel Hydroxide Based Nanohybrids for Energy Storage and Electrocatalytic Alkaline Water Splitting, Sustainable Energy & Fuels, 2020, 4, 1320-1331.

- 15. S. Maiti, A. Roy Chowdhury, A. K. Das*, Electrochemically Facile Hydrogen Evolution using Ruthenium Encapsulated Two Dimensional Covalent Organic Framework, ChemNanoMat, 2020, 6, 99-106.

Courses/conferences/workshops organized

- Organized AICTE QIP-sponsored Faculty Development Program on ''Nanomaterials for Next Generation Applications'' at Indian Institute of Technology Indore during March 22-27, 2021. (Role: Course Coordinator)
- Organized TEQIP sponsored short-term course on ''Fundamentals of Effective Manuscript Writing'' at Indian Institute of Technology Indore during December 2-4, 2020. (Role: Course Coordinator)
- Two days international conference on ''Global Challenges in Nanomaterials Research for Environmental and Healthcare Applications (NREHA 2020)'', at CSIR-Institute of Minerals & Materials Technology, Bhubaneswar during August 27-28, 2020. (Role: Scientific Advisory Committee)

Projects active during April 2020-March 2021

Title : UCL-IITI Partnership: Development of 3D Printable Biomimetic Hydrogels (Bio-inks) (Role: Indian PI) Sponsor: DST-UKIERI, New Delhi, India.
Duration : 2018-2020
Funding Agency : DST-UKIERI, New Delhi, India.

Title : Development of Cation-Switchable Functionalized Nucleobase based Metallohydrogels for Drug Delivery (Role: PI)
Duration : 2018-2021
Funding Agency : CSIR, New Delhi, India.

Title : Effect of Mitochondrial Targeted Peptides and Modulators of Mitochondrial Activity on Tumor Cells In Vitro and In Vivo (Role: Indian Co-PI)
Duration : 2019-2021
Funding Agency : DST-Belarus, New Delhi, India.

Title : 2D-TMD and Carbon Dot Embedded Metal-oxide Nanomaterials for Ultrasensitive and Ultraselective H_2S Detection (Role: Co-PI)
Duration : 2020-2022
Funding Agency : MHRD-STARS, IISc Bangalore, India

Title : Complex Cu-containing Semiconductors and Layered Structures for Economically-Viable, Environmentally-benign, and High Performance Ultrathin Solar Cells (Role: Indian Co-PI)
Duration : 2019-2021
Funding Agency : DST-RSF Project under India-Russia Programme of Cooperation in Science and Technology.



PhD, Indian Institute of Technology Kharagpur (2007)

Previous Employment (includes post-doctoral experience)

2016 : Associate Professor, IIT Indore, India
October 2009- Assistant Professor, IIT Indore, India
2009 - 2009 September: Postdoctoral fellow, Kobe University, Japan
2008 - 2009: Postdoctoral Fellow, Florida State University, USA
2007 - 2008: Postdoctoral Fellow, Penn State University, USA

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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)

- N. Kanwa, S. K. De, A. Maity, A. Chakraborty, Interaction of aliphatic amino acids with zwitterionic and charged lipid membranes: hydration and dehydration phenomena. Phys. Chem. Chem. Phys., 2020, 22, 3234.
- N. Kanwa, Kavana. M, A. Chakraborty, Discriminatory Interaction Behavior of Lipid Vesicles toward Diversely Emissive Carbon Dots Synthesized from Ortho, Meta, and Para Isomeric Carbon Precursors. Langmuir 2020, 36, 10628
- A. Maity, S. K. De, A. Chakraborty, Interaction of Aromatic Amino Acid-Functionalized Gold Nanoparticles with Lipid Bilayers: Insight into the Emergence of Novel Lipid Corona Formation. J. Phys. Chem. B 2021, 125, 8, 2113–
- 4. S. K. De, A. Maity, A. Chakraborty, Underlying Mechanisms for the Modulation of Self-Assembly and the Intrinsic Fluorescent Properties of Amino Acid-Functionalized Gold Nanoparticles. Langmuir 2021, 37, 16, 5022–5033



Ph.D. (Fluorescence Spectroscopy) 2007: IIT Bombay, Mumbai

Previous Employment (includes post-doctoral experience)

Associate Professor (May, 2016-Till Date): IIT Indore, Indore, M.P.
Assistant Professor (December, 2010- May, 2016): IIT Indore, Indore, M.P.
Postdoctoral Scientist (2007-2010): Columbia University Medical Center, New York, USA

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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)

- Saini, B; Singh, R.; Mukhopadhyay*, S.; Mukherjee*, T. K. "Specific Loading and In Vitro Controlled Release of Ru-Based Hydrophobically Encapsulated Model Anticancer Drug Inside Nano-Assemblies toward Stimuli-Responsive Drug Delivery" ACS Applied Nano Materials 2021, 4, 2037-2051.
- Vaishnav, J. K.; Mukherjee*, T. K. "Selective uptake and modulation of nanometal surface energy transfer from quantum dot to Au nanoparticle across lipid bilayer of liposomes" J. Photochem. Photobiol. A 2020, 401, 112773.
- Saini, Bhawna; Singh, Ravi Raj; Nayak, Debasis; Mukherjee*, T. K. "Biocompatible pH-Responsive Luminescent Coacervate Nanodroplets from Carbon Dots and Poly(diallyldimethylammonium chloride) Toward Theranostic Applications" ACS Applied Nano Materials 2020, 3, 5826-5837.



Ph.D. (Theoretical Chemistry): Hyderabad Central University, December 2007

Previous Employment (includes post-doctoral experience)

June, 2016- Present: Associate Professor (Chemistry), IIT Indore
May, 2012- June, 2016: Assistant Professor (Chemistry), IIT Indore
September 2009 - May 2012: Postdoctoral fellow, Uppsala University, Sweden
January 2008 - July 2009: Postdoctoral fellow, Jackson State University, USA
August 2007 - December 2007: Research Associate, Indian Institute of Science (IISc) Bangalore

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Statement of Research Interests

a. Broad research area

Computational Material Science

b. Research Highlights

- Total 175 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. Major Awards, recognitions and Achievements

- Top 5% of highly cited authors in Physical portfolio of Royal Society of Chemistry journals, 2020
- 2020 DUO-India Professor Fellowship Award
- Featured in Journal of Physical Chemistry Young Scientist Special Issue, 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)

- Organic Cation (DMPI) Intercalated Graphite Anode for High Voltage Next Generation Dual-Ion Battery, Surya Sekhar Manna, Sandeep Das, Arunendu Das and Biswarup Pathak, Materials Advances, 2021.

- High-Performance Water Harvester Framework for Triphasic and Synchronous Detection of Assorted Organotoxins with Site-Memory-Reliant Security Encryption via pH-Triggered Fluoroswitching, Ranadip Goswami, Sandeep Das, Nilanjan Seal, Biswarup Pathak*, and Subhadip Neogi*, ACS Applied Materials & Interfaces, 2021.
- Identifying the preferential pathways of CO2 capture and hydrogenation to methanol over Mn(I)-PNP catalyst: A computational study, Shyama Charan Mandal and Biswarup Pathak, Dalton Transactions, 2021.
- Current Density Calculations of an Octahedral Fe Nanocluster for Selective Electrocatalytic for Nitrogen Reduction, Arunendu Das, Akhil S. Nair, Shyama Charan Mandal, and Biswarup Pathak, ACS Applied Nano Materials, 2021. |Front Cover Page Article
- Synthesis of 1-Indolyl-3,5,8-Substituted ɣ-Carbolines: One Pot Metal-Solvent Free Protocol and Biological Evaluation, P. Dudhe, M. A. Krishnan, K. Yadav, Diptendu Roy, K. Venkatasubbaiah, Biswarup Pathak and C. Venkatesh, Beilstein Journal of Organic Chemistry, 2021.
- Electronic and Transport Properties of Bilayer Phosphorene Nanojunction: Effect of Paired Substitution Doping, V. Shukla, Rameshwar L. Kumawat, N. K. Jena, Biswarup Pathak, R. Ahuja, ACS Applied Electronic Materials, 3, 733-742, 2021.
- Identifying DNA Nucleotides via Transverse Electronic Transport in Atomically Thin Topologically Defected Graphene Electrodes, Rameshwar Kumawat, Biswarup Pathak, ACS Applied Bio materials, 4, 2, 1403-1412, 2021.|Front Cover Page Article
- Computational Strategies to Address the Catalytic Activity of Nanoclusters, Akhil S. Nair, Biswarup Pathak, WIREs Computational Molecular Science , 1508, 1-19, 2021. [Impact Factor: 25.11]
- Computational Insights into Electrocatalytic CO2 Reduction Facilitated by Mn(I) Half Sandwich-based Catalysts: Role of Substitution and Solvent, Shyama Charan Mandal, Biswarup Pathak, Electrochimica Acta , 366, 137463, 2021.
- Recent Trends in Electrode and Electrolyte Designing for Aluminium Battery, Sandeep Das, Surya S. Manna,Biswarup Pathak, ACS Omega (Minireview | Invited), 6, 1043-1053, 2021.|Front Cover Page Article
- Dual-functionalization actuated trimodal attribute in ultra-robust MOF: exceptionally selective capture and effectual fixation of CO2 with fast-responsive, nanomolar detection of assorted organo-contaminants in water, N. Seal, M. Singh, Sandeep Das, R. Goswami, Biswarup Pathak, Subhadip Neogi, Materials Chemistry Frontiers, 5, 979-994, 2021.
- Unraveling the Catalytically Preferential Pathway between Direct and Indirect Hydrogenation of CO2 to CH3OH using N-heterocyclic Carbene-based Mn(I) Catalysts: A Theoretical Approach, Amitabha Das, Shyama C. Mandal, Biswarup Pathak, Catalysis Science & Technology, 11, 1375-1385, 2021.
- Polycyclic Aromatic Hydrocarbons as Prospective Cathodes for Aluminium Organic Batteries, Sandeep Das, Preeti Bhauriyal, Biswarup Pathak, Journal of Physical Chemistry C, 125, 49-57, 2021.
- Defects Engineering on Ceria and C-C Coupling Reactions Using [Au11(PPh3)7I3] Nanocluster: A Combined Experimental and Theoretical Study, A. Das, S. Mukherjee, R. Sreehari, Akhil Nair, S, Bhandary, D. Chopra, D. Sanyal, Biswarup Pathak, S. Mandal, ACS Nano, 12, 16681-16688, 2020.
- Individual Identification of Amino Acids on Atomically Thin Hydrogen Boride System using the Electronic Transport Calculations, Rameshwar Kumawat, Milan Jena,Biswarup Pathak, Journal of Physical Chemistry C, 124, 27194-27202, 2020.
- Superior Anchoring Effect of Cu-Benzenehexathial MOF as Aluminium-Sulfur Battery Cathode Host, Preeti Bhauriyal, Biswarup Pathak, Materials Advances , 1, 3572-3581, 2020.
- Synergistic Effect of Bridging Thiolate and Hub Atoms for the Aro-maticity Driven Symmetry Breaking in Atom Precise Gold Nanocluster, M. P. Maman,$ Akhil S. Nair,$ A. Mohammad, Biswarup Pathak*, S. Mandal,* Journal of Physical Chemistry Letters, 11, 10052-10059, 2020. [$Authors contributed equally]
- Extended Topological Line Defects in Graphene for Individual Identification of DNA Nucleobases, Rameshwar L. Kumawat, Biswarup Pathak*, Materials Advances, 1, 2908-2916, 2020.
- Symmetry Protection and Giant Fermi Arcs from Multifold Fermions in Binary, Ternary, and Quaternary Compounds, C. K. Barman,$ Chiranjit Mondal,$ S. Pujari, Biswarup Pathak*, A. Alam,* Physical Review B, 102, 155147, 2020.[$Authors contributed equally]

- BCN Monolayer for High Capacity Al based Dual-Ion Batteries, Hariom Saini, Sandeep Das, Biswarup Pathak, Materials Advances, 1, 2418-2425, 2020.
- Au-Seeded Ag-Nanorod Networks for Electrocatalytic Sensing, Sandip Kumar De, Sourabh Kumar, S. Ray, S. Mondal, A. Roy, G. Bhattacharjee, A. Nandy, A. Roy, Biswarup Pathak*, D. Senapati,* ACS Applied Nano Materials, 10, 9969-9983, 2020.
- Elucidating Mechanistic Origin of Catalytic Activity of Fe(111) Surface and Nanocluster Towards Electrochemical Nitrogen Reduction Reaction, Arunendu Das, Akhil S. Nair, Biswarup Pathak, Journal of Physical Chemistry C, 124, 20193-20202, 2020.
- Computational Insights into Selective CO2 Hydrogenation to CH3OH Catalysed by ZnO Based Nanocages, Shyama C. Mandal, Biswarup Pathak, Materials Advances, 1, 2300-2309, 2020.
- Symmetry Driven Topological Phases in XAgBi (X=Ba,Sr): An ab-initio Hhybrid Functional Calculation, Chanchal KBarman,$ Chiranjit Mondal,$ Biswarup Pathak*, A. Alam* Physical Review Materials, 4, 084201, 2020.[$Authors contributed equally]
- Functionalized Carbon Nanotube Electrodes for Controlled DNA Sequencing, Rameshwar L Kumawat, Biswarup Pathak, Nanoscale Advances, 2, 4041-4050, 2020.
- Identifying the Suitable Ionic Liquid Electrolytes in Al Dual-Ion Batteries: Role of Electrochemical Window, Conductivity and Voltage, Surya S. Manna, Preeti Bhauriyal, Biswarup Pathak, Materials Advances, 1, 1354-1363, 2020.
- Porphyrin Nanoribbon Based Spin Filtering Device, Gargee Bhattacharyya, Rameshwar L Kumawat, Biswarup Pathak, Physical Chemistry Chemical Physics, 22, 16368-16377, 2020.
- Theoretical Insights into the Charge and Discharge Processes in Aluminium-Sulfur Batteries, Preeti Bhauriyal, Sandeep Das, Biswarup Pathak, Journal of Physical Chemistry C, 124, 11317-11324, 2020.
- Unravelling Single Atom Electrocatalytic Activity of Transition Metal Doped Phosphorene, Akhil S. Nair, R. Ahuja, Biswarup Pathak, Nanoscale Advances, 2, 2410-2421, 2020. (This article is part of the themed collection of Hot Article)
- Electronic Transport through DNA Nucleotides in a BC3 Nanogap for Rapid DNA Sequencing, Rameshwar L Kumawat Priyanka Garg, Gargee Bhattacharyya, Biswarup Pathak, ACS Applied Electronic Materials, 2, 1218-1225, 2020.
- Theoretical Insights into Solid Electrolyte Interphase (SEI) Formation in Al Anode Dual-Ion Battery, Sandeep Das, Preeti Bhauriyal, Biswarup Pathak, Journal of Physical Chemistry C, 124, 7634-7643, 2020.
- Unusual demetalation of iron from [2]ferrocenophane skeleton of dinuclear ferracycle carbonyl complex, R.S., M.T., A.S., B. Pathak,M.M.S., PM, Applied Organometallic Chemistry, 34, 4, 2020.
- Prospects of Black Phosphorus Nanoribbon for Explosive Sensing: A Computational Approach, Rameshwar L. Kumawat, Biswarup Pathak, Applied Surface Science, 529, 147094, 2020.
- Unique Dirac and Triple Point Fermiology in Simple Transition Metals and their Binary Alloys, Chiranjit Mondal,$ C. K. Barman,$ S. Sarkar, S. R. Barman, A. Alam,* Biswarup Pathak*, Physical Review B, 101, 155108, 2020.[$Authors contributed equally]
- Size Evolution Dynamics of Gold Nanoclusters at an Atom-Precision Level: Ligand Exchange, Growth Mechanism, Electrochemical, and Photophysical Properties, M. P. Maman,$ Akhil S. Nair,$ H. Cheraparambil, Biswarup Pathak*, S. Mandal*, Journal of Physical Chemistry Letters, 11, 1781-1788, 2020.[$Authors contributed equally]
- First Principles Investigation on Applicability of Ruthenium as a Potential ORR Catalyst, Surajit Nandi, Akhil S. Nair, Biswarup Pathak, Journal of Chemical Sciences, 132, 2, 2020.
- Temperature-induced crystallinity and vibrational properties in samarium orthovanadate, Emin Varghese, Sourabh Kumar, Biswarup Pathak, S. Sen, Physical Review B, 101, 174112, 2020.
- Serendipitous base catalysed condensation-heteroannulation of iminoesters: a regioselective route to the synthesis of 4,6-disubstituted 5-azaindoles, P. Dudhe, K. Venkatasubbaiah, Biswarup Pathak, Chelvam Venkatesh, Organic & Biomolecular Chemistry, 18, 1582-1587, 2020.
- Novel BCN-Phosphorene Bilayer: Dependence of Carbon Doping on Band Offsets for Potential Photovoltaic Applications, L. Ngamwongwan, P. Moontragoon, W. Jarernboon, Chiranjit Mondal, Biswarup Pathak, T. Kaewmaraya, Applied Surface Sicence, 504, 144327, 2020.
- Type-II Dirac States in Full Heusler Compounds XInPd2 (X = Ti, Zr, and Hf), Chiranjit Mondal,$ C. K. Barman,$ Biswarup Pathak*, A. Alam,* Physical Review B, 100, 245151, 2019.[$Authors contributed equally]
- Zone-Specific Crystallization and a Porosity-Directed Scaling Marker for the Catalytic Efficacy of Au-Ag Alloy Nanoparticles, S. K. De, S. Mondal, A. Roy, Sourabh Kumar, M. Mukherjee, S. D.

Chakraborty, P. Sen, Biswarup Pathak, B. Satpati, M. Mukhopadhyay, D. Senapati, ACS Applied Nano Materials, 2, 7669-7685, 2019.

- Hexagonal Cu(111) Monolayers for Selective CO2 Hydrogenation to CH3OH: Insights from Density Functional Theory, Shyama Charan Mandal, Kuber Singh Rawat, Priyanka Garg, Biswarup Pathak, ACS Applied Nano Materials, 2, 7686-7695, 2019.

Courses/conferences/workshops organized

- QIP on "Computationally Designing of Materials for Materials Genome", March 01-6, 2021

Projects active during April 2020-March 2021 : 04 projects active

Title : Designing of Mn-Based Catalysts for Conversion of Ethanol to Butanol: A Biofuel Alternative to Gasoline
Duration : 2021-2024
Funding Agency : SERB

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



PhD, University of Mumbai

Previous Employment (includes post-doctoral experience)
Nov. 2016 onwards, Associate Professor, Discipline of Chemistry, IIT Indore
Feb. 2012- Oct. 2016, Assistant Professor, Discipline of Chemistry, IIT Indore
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

Dr. Shaikh M. Mobin
Associate Professor
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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

- The group endeavors to venture into path-breaking research in the field of solar assisted water splitting and Pb Free Perovskite Solar Cells.

c. Major Awards, recognitions and Achievements

- Fellow of Maharashtra Academy of Sciences.

Publications (includes journal articles, books and book chapters)

- Chandra, P., Ghosh, T., Choudhary, N., Mohammad, A., Mobin, S. M. Recent advancement in oxidation or acceptorless dehydrogenation of alcohols to valorised products using manganese-based catalysts. Coordination Chemistry Reviews 2020, 411, 213241.
- Rajak, R.; Kumar, R., Ansari, S. N., Saraf, M.; Mobin, S. M. Recent highlights and future prospects on mixed-metal MOFs as emerging supercapacitor candidates. Dalton Trans., 2020, 49, 11792–11818.
- Kaur, N., Tiwari, P., Kapoor, K. S., Saini, A. K., Sharma, V., Mobin, S. M. Metal–organic framework based antibiotic release and antimicrobial response: an overview. CrystEngComm, 2020, 22, 7513–7527.
- Ahmad, K., Mobin, S. M. Recent Progress and Challenges in A3Sb2X9-Based Perovskite Solar Cells. ACS Omega, 2020, 5, 44, 28404–28412.
- Ahmad, K., Kumar, P., Mobin, S. M. Inorganic Pb-Free Perovskite Light Absorbers for Efficient Perovskite Solar Cells with Enhanced Performance. Chem. Asian J., 2020, 15, 18, 2859–2863.
- Natarajan, K., Saraf, M., Gupta, A. K., Mobin, S. M. Nanostructured δ-MnO2/Cd(OH)2 Heterojunction Constructed under Ambient Conditions as a Sustainable Cathode for Photocatalytic Hydrogen Production. Ind. Eng. Chem. Res. 2020, 59, 16, 7584–7593.
- Ahmad, K., Kumar, P., Mobin, S. M. Hydrothermally grown novel pyramids of the CaTiO3 perovskite as an efficient electrode modifier for sensing applications. Mater. Adv., 2020, 1, 2003–2009.
- Tiwari, P., Kaur, N., Sharma, V., Mobin, S. M. A spectroscopic investigation of Carbon dots and its reduced state towards fluorescence performance. Journal of Photochemistry and Photobiology A: Chemistry, 2020, 403, 112847.
- Gosh, T., Choudhary, N., Mobin, S. M. Design and Synthesis of Silver Decorated Fe3O4 @ Fe Doped CeO2 Core-Shell Ternary Composite as Highly Efficient Nanocatalyst for Selective Oxidation of Alkenes. ChemistrySelect, 2020, 5, 31, 9601–9606.
- Gosh, T., Natarajan, K., Kumar, P., Mobin, S. M. Nitrogen-Doped Mixed-Phase Cobalt Nanocatalyst Derived from a Trinuclear Mixed-Valence Cobalt(III)/Cobalt(II) Complex for High-Performance Oxygen Evolution Reaction. Inorg. Chem. 2021, 60, 4, 2333–2346.
- Ahmad, K., Mobin, S. M. Design and fabrication of cost-effective and sensitive non-enzymatic hydrogen peroxide sensor using Co-doped δ-MnO2 flowers as electrode modifier. Analytical and Bioanalytical Chemistry, 2021, 413, 789–798.
- Singh, A., Chudhary, N., Mobin, S. M., Mathur, P. Cubane Ru4(CO)8 cluster containing 4 pyridine-methanol ligands as a highly efficient photoelectrocatalyst for oxygen evolution reaction from water. Journal of Organometallic Chemistry, 2021, 940, 121769.

As a special case we also request you to share a separate report on COVID related activities (Research, Academic and/or any other news) during this period conducted by the Department so that it can be compiled.

- Project is under review submitted to Ministry of Textiles on Covid Research.

Projects active during April 2020-March 2021

Title : "Catalytic applications of Nanocatalysts derived from single source molecular precursor (SSMPs)".
Duration : 36 months (2021-2023)
Funding Agency : Science and Engineering Research Board (SERB), New Delhi
Brief Description : The SERB project consists of flexible energy storage devices to be developed.

Title : MOFs@Graphene hybrid smart textured nanofibers for flexible energy storage devices
Duration : 36 months (2020-2023)
Funding Agency : BRNS DAE, BARC-Mumbai
Brief Description : In BRNS project we will design and synthesis state of the art nano-materials derived from Single Source Molecular Precutsors (SSMPs) for various catalysis and energy applications.



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

Previous Employment (includes post-doctoral experience)

June 2016-continuing: Associate Professor at IIT Indore.

October 2010-June 2016: Assistant Professor at IIT Indore.

July 2010-October 2010: Senior Research Scientist, Daiichi Sankyo Research Centre in India, Medicinal Chemistry, Gurgaon.

Dr. Sampak Samanta
Associate Professor
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June 2009-June 2010: Senior Research Scientist, Ranbaxy Laboratories Limited, NDDR, R&D-III, Medicinal Chemistry, Guragon.

June 2007-May 2009: JSPS Post-doctoral Fellow, Tokyo University of Science, Tokyo, Japan.

Dec. 2004-May 2007: Post-doctoral Fellow, The University of Texas at San Antonio, Texas. USA.

Feb. 2004-Nov.2004: Post-doctoral Fellow, The University Missouri at Rolla, Missouri, USA.

Statement of Research Interests

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

- S. K. Gudimella, A. Kaur, R. Kumar, Sampak Samanta CuCl2-catalyzed N-O bond cleavage of oxime esters:approach to imidazoheterocycles and furo[3,2-c]chromenyl fused imidazoles Tetrahedron Letters 2020 61,152147 2.415
- S. Guin, H. Saha, A. K. Patel, S. K. Gudimella, S. Biswas and Sampak Samanta 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 Tetrahedron 2020 76, 131338, 2.233
- M. Ahuja, S. Das, P. Sharma, A. Kumar, A. Srivastava, Sampak Samanta Facile access to furo[2',3':4,5]pyrido[3,2,1-jk]carbazol-5-ones as blue emitters: photophysical, electrochemical, thermal and DFT studies J. Mol. Struc. 2021 1233, 130044 3.196

Projects active during April 2020-March 2021

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 : Science and Engineering Research Board (SERB)



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

Previous Employment (includes post-doctoral experience)

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

Statement of Research Interests

a. Broad research area

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

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), CO2 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 H2 gas, metal-organic frameworks for H2 and CO2 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 ACS Catal., 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 on the transforming lab waste to CO2 capture material and hydrogen generation from methanol 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.

c Major Awards, recognitions and Achievements

Inducted as International Advisory Board member for ChemCatChem, Wiley-VCH (2020)

Patents- Filled & Awarded

- Sanjay Kumar Singh, Nirupama Sheet, Mahendra Kumar Awasthi, Catalytic process for hydrogen production from polyethylene terpthalate (PET) waste, India Patent, Application No. 202021020639 date: May 15, 2020

Publications (includes journal articles, books and book chapters)

- Vanitha R. Naina, Sheng Wang, Dmitry I. Sharapa, Michael Zimmermann, Martin Hahsler, Lukas Niebl-Eibenstein, Junjun Wang, Christof Woll, Yuemin Wang, Sanjay K. Singh, Felix Studt, and Silke Behrens*, Shape-Selective Synthesis of Intermetallic Pd3Pb Nanocrystals and Enhanced Catalytic Properties in the Direct Synthesis of Hydrogen Peroxide, ACS Catal., 2021, 11, 2288-2301 (IF 12.35)

- Mahendra K. Awasthi and Sanjay K. Singh*, Ruthenium catalyzed hydrogen production from formaldehyde-water solution, Sustain. Energy Fuels, 2021, 5, 549-555 (IF 3.998)
  3. Mahendra K. Awasthi, Rohit K. Rai, Silke Behrens and Sanjay K. Singh*, Low-temperature hydrogen production from methanol over ruthenium catalyst in water, Catal. Sci. Technol., 2020, 11, 136-142 (IF 5.726)
- Debashis Panda, Chanchal Saini, E. Anil Kumar and Sanjay K. Singh*, In situ casting of rice husk ash in metal organic frameworks induces enhanced CO2 capture performance, Sci. Rep., 2020, 20219 (IF 3.998)
- Rohit K. Rai, Mahendra K. Awasthi, Vipin K. Singh, Sudipta R. Barman, Silke Behrens and Sanjay K. Singh*, Aqueous Phase Semihydrogenation of Alkynes over Ni-Fe Bimetallic Catalysts, Catal. Sci. Technol., 2020, 10, 4968-4980 (IF 5.726)
- Debashis Panda, E. Anil Kumar, and Sanjay K. Singh*, Introducing Mesoporosity in Zeolite 4A bodies for Rapid CO2 Capture, J. CO2 Util., 2020, 40, 101223 (IF 5.189)

Major Events/ Seminars organized & Developments

- Involved in the organization of the National Science Day program (through International Affairs and Outreach)

Courses/conferences/workshops organized

- Organizing team of Chemistry Talks, Feb. 2021 wherein four distinguished speakers (Prof. Braunschweig, Prof. Brasholz, Prof. Halet, and Dr. Behrens, Dr. from the reputed institutions of Germany and France discussed various aspects of chemistry.

As a special case we also request you to share a separate report on COVID related activities (Research, Academic and / or any other news) during this period conducted by the Department so that it can be compiled

- With the association of team Avana, IIT Indore, prepared several liters of hand sanitizers as per the formulation of WHO.

Projects active during April 2020-March 2021

Title : A synergistic experimental and computational approach to develop novel catalytic processes for upgrading agri-waste biomass/bio-oil to biofuel

Duration : 02 years (2020-2022)

Funding Agency : Shastri Institutional Collaborative Research Grant (SICRG), (MHRD through Shastri Indo-Canadian Institute)

Brief Description : This project is to develop efficient protocols with the joint experimental and computational approach for the transformation of pyrolysis oil as derived from biomass waste to value added chemicals.



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

Previous Employment (includes post-doctoral experience)

August 2009-: Assistant Professor at IIT Indore.

April 2007-June 2009: JSPS Post-doctoral Fellow, University of Tokyo, Tokyo, Japan.

June 2005-December 2006: Alexander-von-Humboldt Post-doctoral Fellow, The University of Heidelberg, Heidelberg, Germany.
August 2004-May 2005: Post-doctoral Fellow, The University Heidelberg, Heidelberg, Germany.

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 (includes journal articles, books and book chapters)

- Ion Conductive Phytic Acid-G Quadruplex Hydrogel as Electrolyte for Flexible Electrochromic Device, Neha Thakur, Anjali Chaudhary, Amrita Chakraborty, Rajesh Kumar, Tridib K. Sarma, ChemNanoMat, 2021, 7, 613-619 (IF 3.384)
- Photoinduced Enhanced Decomposition of TBHP: A Convenient and Greener Pathway for Aqueous Domino Synthesis of Quinazolinones and Quinoxalines, Daisy Sarma, Biju Majumdar, Barsha Deori, Siddarth Jain and Tridib K. Sarma* ACS Omega, 2021, 6, 11902–11910 (IF 3,512)
- Copper Pyrovanadate Nanoribbons as Efficient Multienzyme Mimicking Nanozyme for Biosensing Applications, Siddarth Jain, Bhagwati Sharma, Neha Thakur, Suryakant Mishra, Tridib K. Sarma* ACS Appl. Nano Mater. 2020, 3, 8, 7917–7929 (IF 5.097)
- Cationic Organic Nanoaggregates as AIE Luminogens for Wash-Free Imaging of Bacteria and Broad-Spectrum Antimicrobial Application, Abhiram Panigrahi, Venkata N. Are, Siddarth Jain, Debasis Nayak, Santanab Giri, Tridib K. Sarma* ACS Appl. Mater. Interfaces 2020, 12, 5, 5389–5402 (IF 9.229).



Dr. Satya S. Bulusu
Associate Professor
sbulusu@iiti.ac.in

PhD, University of Nebraska (2006)

Previous Employment (includes post-doctoral experience)

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

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.

Publications (includes journal articles, books and book chapters)

- Structural evolution in gold nanoparticles using artificial neural network based interatomic potentialsJ. Chem. Phys.152, 154302 (2020);https://doi.org/10.1063/1.5142903 Shweta Jindal and Satya S. Bulusu

Courses/conferences/workshops organized

- TEQIP course on Artificial Intelligence and Machine Learning was organized as a part of Faculty Development Program

Projects active during April 2020-March 2021

- **Title :** Reducing computational complexity using FPGA to study structure and dynamical properties of nanoparticles EMR/2016/006579
- **Duration :** August 2017 to December 2020
- **Funding Agency :** DST
- **Brief Description :** Molecular dynamics (MD) simulations involve computations of forces between atoms and the total energy of the chemical systems. The scientific community is dependent on high-end servers for such computations that are generally sequential and highly power hungry, thereby restricting these computations in reaching experimentally relevant large systems. This work explores the concept of parallelization of the code and accelerating them by exploring the usage of High Level Synthesis (HLS) based Field Programmable Gate Array (FPGA). This work proposes a hardware and software based interface to implement parallel algorithms in an FPGA framework and communication between the software and hardware interface is implemented. The forces of Au 147 obtained through the ANN based interatomic potentials in the proposed model shows an acceleration of 1.5 times compared with an expensive server with several nodes. Taking this work forward can result in a lab on-a-chip application and this would potentially be applied onto several large experimentally relevant chemical systems.



Ph.D., Department of Chemistry, IIT Kanpur, Kanpur India, (2005)
Previous Employment (includes post-doctoral experience)
Associate Professor Dec. 2018-till date, IIT Indore
Assistant Professor June 2012-Dec. 2018, IIT Indore
Postdoctoral Research Associate, Department of Chemistry, Purdue University, WestLafayette, USA (August 1, 2008 to May 30, 2012).

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

Alexander von Humboldt Research Fellow, Institut fur Chemie und Biochemie Organische Chemie,Freie Universitat Berlin, Germany(October 1, 2006 to May 31, 2008).
Postdoctoral Research Fellow, Institut fur Chemie und Biochemie-Organische Chemie, Freie Universitat Berlin,Berlin, Germany(May 1, 2006 to September 30, 2006).

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

- Visiting Faculty, Purdue University, USA, March 2020
- Visiting Faculty, Leibniz University of Hannover, Germany, 2019-2023

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. Major Awards, recognitions and Achievements

- SERB-DST-Purdue sponsored "Overseas Visiting Doctoral Fellowship Award" as Visiting Faculty to Purdue University, West Lafayette, USA, April 2019- March 2020 for collaborative research on "Cancer and Neurodegenerative Diseases".
- Department of Biotechnology sponsored Bio-Ignition Grant (BIG) by BIRAC for a Startup from Aug.2021-Feb. 2022.
- Founder Director of a company named "RONCOV Diagnostics and Therapeutics Pvt. Ltd., from the research outcome at IIT Indore to treat Cancer and Inflammatory Diseases.

Patents- Filed & Awarded

- Third generation tubulysin analogues and process of preparation thereof, Chelvam V., Pandit A., Reddy R.B., Yadav K., Pathak B., Roy, D. 2020, Indian Patent, Application No.202021036140.
- Metal-free solvent-free synthesis of fused-pyrido heterocycles and biomedical applications. Venkatesh C., Dudhe P., Krishnan M. A., Sonawane, A. 2020, USA patent, Application no. 16931838 (published).
- Third generation tubulysin analogues and process of preparation thereof, Chelvam V., Pandit A., Reddy R.B., Yadav K., Pathak B., Roy, D. 2021, USA Patent, Application No.17/198,918.
- Method and system for metal-free solvent-free synthesis of fused-pyrido heterocycles; Venkatesh Chelvam, Premansh Dudhe, Mena Asha Krishnan, Avinash Sonawane; Indian Patent (366986), 2019 (Granted).

Publications (includes journal articles, books and book chapters)

- Agarose micro-well platform for rapid generation of homogenous 3D tumour spheroids, Krishnan, M.A., Yadav, K., Venkatesh, C., Curr. Protoc. Chem. Biol. 000, (2021) (in press).
- Optimizing affinity to prostate specific membrane antigen by spacer modifications in a tumor spheroid model, Krishnan, M.A.,Pandit, A., Sharma, R., Venkatesh, C., J. Biomol. Struct. Dyn., 27, 1-22, (2021).
- Synthesis of 1-indolyl-3,5,8-substituted γ-carbolines: One-pot solvent-free protocol and biological evaluation, Dudhe, P., Krishnan, M.A., Yadav, K., Roy, D., Venkatasubbaih, K., Pathak, B., Venkatesh, C., Beilstein J. Org. Chem., 18, 1582–1587 (2021).
- Folate-targeted verrucarin A reduces the number of activated macrophages in a mouse model of acute peritonitis, Venkatesh, C., Doorneweerd, D.D., Xia, W., Putt, K.S., Low, P.S., Bioorg. Med. Chem. Lett., 42,128091, (2021).
- Developing MicroSpherePlatform using a commercial hair brush: An agarose 3D culture platform for deep-tissue imaging of prostate cancer, Krishnan, M.A., Venkatesh, C., ACS Appl. Bio. Mater. 4, 4254–4270, (2021).
- A targeted near-infrared nanoprobe for deep-tissue penetration and imaging of prostate cancer, Krishnan, M.A., Yadav, K., Roach, P., Venkatesh, C., Biomater. Sci. 9, 2295-2312, (2021).
- Evaluation of the reducing potential of PSMA-containing endosomes by FRET imaging, Venkatesh, C., Shen, J., Putt, K.S., Low, P.S., Cancer Drug Resist., 4, 223-232, (2021).
- Revolutionising medical diagnosis with SPECT imaging: Clinical applications of a nuclear imaging technology. Biomedical Imaging Instrumentation, Elsevier Science Publishing Company, Inc. Chapter 6, Krishnan, M.A., Cherukumudi A., Oommen S., Malapure S.S., Venkatesh C. (2021).
- Serendipitous base catalysed condensation-heteroannulation of iminoesters: A regioselective route to synthesis of 4,6-disubstituted 5-azaindoles, Dudhe, P., Venkatasubbaih, K., Pathak, B., Chelvam, V., Org. Biomol. Chem., 18, 1582-1587, (2020).

- Synthesis of tubuvaline (Tuv) fragment of tubulysin via asymmetric dihydroxylation of homoallylamine, Reddy, B. R., Vijay, M, Krishnan, M.A., Venkatesh, C., Synth. Commun., 51, 797-809, (2020).

Projects active during April 2020-March 2021

- **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
- **Brief Description:** In this project, we 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 and N-Benzyl-N-methyl-2-(N-phenylsulfamoyl) pyrimidine-5-carboxamide 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 drug-like molecule with a protein.

Projects active during April 2020-March 2021

- **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 :** DAAD, Germany
- **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.



Dr. Amrendra K. Singh
Assistant Professor
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Ph.D., IIT Bombay, July 2003 – April 2009.

Previous Employment (includes post-doctoral experience)

- June 2016 – Present: Assistant Professor, IIT Indore, India.
- October 2015 – May 2016: Research Scientist, IIT Indore, India.
- May 2012 – July 2015: Research Associate, Michigan State University, USA.

- March 2010 – February 2012: Postdoctoral Fellow, Lund University, Sweden.
- December 2008 – February 2010: Research Associate, IIT Bombay, India

Statement of Research Interests

a. Broad research area

- Inorganic and Organometallic Chemistry, Catalysis

b. Research Highlights

- Transition metal-NHC Pincer Complexes and their applications in catalysis.
- Multidentate N-heterocyclic carbene (NHC) ligands.
- Cooperative metal-metal interactions for the multi-electron reduction of small molecules.
- Transition metal complexes with metal-ligand multiple bonds (MLMB).

Publications (includes journal articles, books and book chapters)

- Yadav, D.; Misra, S.; Kumar, D.; Singh, S.; Singh, A. K. Cationic Ruthenium (II)-NHC Pincer Complexes: Synthesis, Characterisation and Catalytic Activity for Transfer Hydrogenation of Ketones. Appl. Organomet. Chem. 2021 (DOI: 10.1002/aoc.6287).
- Lichchhavi; Lee, H.; Ohshita, Y.; Singh, A. K.; Shirage, P. M. Transformation of Battery to High Performance Pseudocapacitor by the Hybridization of W18O49 with RuO2 Nanostructures. Langmuir 2021, 37, 1141–1151.

Projects active during April 2020-March 2021

- **Title :** Designing Bimetallic Complexes with Cooperative Metal-Metal Interactions for the Multi-electron Reduction of Small Molecules**.**
- **Duration :** 2017-2020
- **Funding Agency :** Science and Engineering Research Board (SERB)
- **Brief Description:** The development of bis-pincer based hetero-bimetallic systems can, potentially, lead to the discovery of homogeneous catalysts for ammonia synthesis from dinitrogen and dihydrogen gases and bring us one step closer to the long-standing goal of a more energy efficient route than the Haber-Bosch process.



PhD, IIT Bombay, 2009 – 2014

Previous Employment (includes post-doctoral experience)

2018: Joined IIT Indore as Assistant Professor

2016 - 2018: Postdoc fellow (N-PDF), IIT Indore

2015 - 2016: Postdoc fellow, University of Franch-Comte, Besancon, France

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)

- Ji, R. S.; Raghuvanshi, A.; Jha, B.; Mathur, P. J. Organomet. Chem. 2021, 938, 121755. Reactions of [Ru6(μ6-C)(C6H5CH3)(CO)14]: Synthesis of some new Ru-Pt carbonyl clusters and diphosphine substitution.
- Raghuvanshi, A.; Krupp, A.; Viau, L; Knorr, M.; Strohmann, C. Acta Cryst. 2021, E77, 718. Crystal structures of 9-[bis (benzylsulfanyl) methyl] anthracene and of cyclo-dodecakis (μ2-phenylmethanethiolato-κ2S: S) hexapalladium (6 Pd—Pd)–anthracene-9, 10-dione (1/1)



PhD- Institute: Indian Institute of Technology Madras Year: 2015

Previous Employment (includes post-doctoral experience)

Joined IIT Indore, Assistant Prof (Feb 2019)

SERB Postdoctoral Fellow at Julius-Maximilians-Universität Würzburg, Germany (January 2018-January 2019)

Postdoctoral Fellow at Julius-Maximilians-Universität Würzburg, Germany (February 2016-December 2017)

Postdoctoral Associate at IIT Madras, India (July 2015-December 2015)

Dr. Dipak Kumar Roy
Assistant Professor
dipak.roy@iiti.ac.in

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. Major Awards, recognitions and Achievements

- Start-up Research Grant (SRG) from SERB, Dept. of Science and Technology, Govt. of India

Publications (includes journal articles, books and book chapters)

- D. K., Roy, T. Troester, F. Fantuzzi, R. D. Dewhurst, C. Lenczyk, K. Radacki, C. Pranckevicius, B. Engels, H. Braunschweig, Isolation and Reactivity of an s-Block Metal Antiaromatic. *Angew. Chem. Int. Ed.* 2021, 60, 3812. (IF 15.33)
- 2. K. Saha, D. K. Roy, R. D. Dewhurst, S. Ghosh, H. Braunschweig, Recent Advances in the Synthesis and Reactivity of Transition Metal σ-Borane/Borate Complexes. *Acc. Chem. Res.* 2021, 54, 1260. (IF 22.38)

Major Events/ Seminars organized & Developments

- Organized National Science Day 2020
- Organized "Chemistry Talks" to mark the National Science Day 2020 in the Department of Chemistry.

Projects active during April 2020-March 2021

- **Title :** s-Block Metal Aromatics and Anti-aromatics.
- **Duration :** Two years (2020-2022)
- **Funding Agency:** SERB
- **Brief Description** : Synthesis of group 2 metal containing five membered antiaromatic compounds stabilized via N-heterocyclic carbenes



Ph.D. (Chemistry), Indian Institute of Technology Kanpur, U.P., India 2009

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

Dr. Selvakumar Sermadurai
Assistant Professor
selva@iiti.ac.in

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. Major Awards, recognitions and Achievements

- Early Career Research Award from SERB -2019-2022

Projects active during April 2020-March 2021

- **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.



PhD- CSIR-National Chemical Laboratory, Pune, Year: 2011

Previous Employment (includes post-doctoral experience)
Joined IIT Indore, as Assistant Professor (Sep. 2019).
Assistant Professor: Savitribai Phule Pune University, Pune. (Jan 2019 - Sep 2019).

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

DST-INSPIRE Faculty: Savitribai Phule Pune University, Pune. (May 2014 - Jan 2019).
DST-INSPIRE Faculty: CSIR-IICT, Hyderabad. (June 2013 - May 2014).

Postdoctoral Research Fellow: Ben-Gurion University, ISRAEL. (Oct. 2011- June 2013).
Research Assistant: CSIR-National Chemical Laboratory, Pune. (May Jan 2011).
Senior Research Fellow (Ph.D. work) - National Chemical Laboratory, Pune, INDIA (May 2007 to April 2010)
Junior Research Fellow (Ph.D. work) - National Chemical Laboratory, Pune, INDIA (April 2005 to April 2007)

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 and Oxidative coupling
- Total Synthesis of Natural Products
- Green Chemistry

Publications (includes journal articles, books and book chapters)

- Pd-Catalyzed Decarboxylative Ortho-Aroylation of 2-Aryl-quinazolinone Comprising Intrinsic Directing Group with α-Oxocarboxylic Acids D. S. Waghmare, S. D. Tambe, **U. A. Kshirsagar*** Asian J. Org. Chem., 2020, *9*, 2095,
- Regioselective Coupling of 2-Arylquinazolinone C-H with Aldehyde and Benzyl Alcohol under Oxidative Condition **U. A. Kshirsagar***, D. S. Waghmare, S. D. Tambe. New J. Chem., 2020, 44, 16697.

Department of Mathematics

The department of Mathematics at IIT Indore has been a major centre for academic and research programs in various branches of Mathematics. The department has been constantly engaged in frontier research areas 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 department is also working on a proposal of a B.Tech. program in the department.

The discipline faculty is exceptionally well qualified and motivated with a strong commitment to teaching and research. This is reflected through

1. various academic events of national and international importance conducted in the discipline,
2. ongoing research projects sponsored by several funding agencies such as NBHM, SERB, DST, CSIR, and
3. 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 regularly conducts lectures by eminent mathematicians from reputed institutes around the world.



Dr. Md. Aquil Khan
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Ph.D 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

Journal articles published.

Khan, M. A. and Patel. V. S.: Knowledge and approximations: A formal study under the perspective of information systems and rough set theory. Information Sciences, 524, 97-115. Elsevier.

Patel. V. S. and Khan, M. A. and M. K. Chakraborty: Modal systems for covering semantics and boundary operator. International Journal of Approximate Reasoning, 135, 110-126. Elsevier.



Dr. Sk. Safique Ahmad
Associate Professor
safique@iiti.ac.in

PhD. IIT Guwahati
Previous Employment (Includes post-doctoral experience)
Technical University Berlin
Academic associations with other institutions (Affiliate/Adjunct/ Visiting posts)

Indian Institute of Technology Indore

Major awards, achievements: Awarded PhD degree: Prince Kanhya

Thesis Title: **"Backward Error Analysis of Specified Eigenpairs and Its Application in Solving Inverse Eigenvalue Problems"**

Projects won by the faculty:

- On inverse eigenvalue problems for structured matrix pencils Funding Agency: DST, New Delhi, SERC, Under the scheme MATRICS

Courses/conferences/workshops organized.

- Matrix Computation and its applications in systems, signal and control problems during Feb 16-21 2021
- Wavelet via Matrices and its Applications in signals and image processing

Journal articles published.

- Backward error analysis and inverse eigenvalue problems for Hankel and Symmetric-Toeplitz structures, S. S. Ahmad and P. Kanhya, Appl. Math. Comput., 406: 126-288, 2021.
- Perturbation analysis of matrices over a quaternion division algebra, S. S. Ahmad, I . Ali, and I. Slapnicar, Electr. Trans. Num. Anal., 54: 128–149, 2021
- Perturbation analysis on matrix pencils for two specified eigenpairs of a semisimple eigenvalue with multiplicity two, S. S. Ahmad and P. Kanhya, Electr. Trans. Num. Anal., 52:370–390, 2020.
- Structured perturbation analysis of sparse matrix pencils with s-specified eigenpairs,, S. S. Ahmad and P. Kanhya, Linear Algebra Appl., 602: 93–119, 2020.

Short term courses organized:

- Matrix Computations and its application in systems, signal and control problems, during February 16-21, 2021 under QIP Organized by Dr. Sk. Safique Ahmad and Dr. Niraj K. Shukla
- Wavelet via Matrices and its Applications in signals and image processing, during November 16-21, 2020 under QIP Organized by Dr. Niraj K. Shukla and Dr. Sk. Safique Ahmad



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

Previous Employment (Includes post-doctoral experience)

- Post-Doc at the Indian Institute of Technology Madras (2008-2010)
- Academic associations with other institutions (Affiliate/Adjunct/ Visiting posts)
- Visiting Researcher at the - University of Turku, Finland (October-December 2008 and August-September 2009)

Major awards, achievements:

PhD Degree Awarded:

- Dr. Vibhuti Arora
  Thesis Title: Analytic and geometric properties of certain univalent functions

PhD Thesis Submitted:

- Mr. Arstu
  Thesis Title: Metrics associated with the Hurwitz metric
- Mr. Shankey Kumar

Thesis Title: Properties of certain complex integral operators

Projects won by the faculty/department.
Title: The Hurwitz metric and univalent functions
Funding Agency: DST-SERB, Under the scheme of MATRICS

Courses/conferences/workshops organized.
Convener: Ramanujan Mathematical Society (RMS) pre-conference symposium on Complex Analysis held on December 27, 2020 (virtual mode) hosted by Central University of Rajasthan
Journal articles published.

- Shankey Kumar and S. K. Sahoo, Properties of beta-Cesaro operators on alpha-Bloch space, Rocky Mountain Journal of Mathematics, 50 (2020), No. 5, 1723 - 1743.
- Arstu and S. K. Sahoo, A generalized Hurwitz metric, Bull. Korean Math. Soc. 57 (2020), No. 5, 1127 - 1142.
- S. Maharana and S. K. Sahoo, Inclusion properties of planar harmonic mappings associated with the Wright function, Complex Variables and Elliptic Equations (2020), DOI: 10.1080/17476933.2020.1772765.
- Arstu and S. K. Sahoo, Caratheodory density of the Hurwitz metric on plane domains, Bull. Malaysian Math. Sci. Soc., 43 (2020), 4457 – 4467.
- Shankey Kumar and S. K. Sahoo, Preserving properties and pre-Schwarzian norms of nonlinear integral transforms, Acta Mathematica Hungarica, 162 (2020), 84 – 97.



Dr. V. Antony Vijesh
Associate Professor
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PhD. IIT Madras

Previous Employment (Includes post-doctoral experience)
Indian Institute of Space Sciences and Technology Trivandrum

Major awards, achievements:
Awarded PhD degree: Nitin Bisht
Thesis Title``A study on generalized Marcum Q-function of second kind.”

Projects won by the faculty/department.

- Higher Order Compact Finite Difference Methods and Monotone Iterative Algorithms For Nonlinear Partial Differential Equations. Funding Agency : DST-SERB (MATRICS)

Courses/conferences/workshops organized.

- Organized a Symposium on Iterative methods and differential equations under the auspices of the 28th FIM conference from 23rd November 2020 to 27th November 2020 held at Stella Maris College & SSN college of engineering, Chennai.

Journal articles published.

- A. Baricz, B. Nitin, S. Singh and V. Antony Vijesh, Bounds for the generalized Marcum function of the second kind, The Ramanujan Journal (Springer), to appear. https://doi.org/10.1007/s11139-021-

00440-9

- A. Baricz, B. Nitin, S. Singh and V. Antony Vijesh, Functional inequalities and bounds for the generalized Marcum function of the second kind, Results in Mathematics(Springer), Vol.76, 35, 2021. https://doi.org/10.1007/s00025-021-01343-3
- A. Baricz, B. Nitin, S. Singh and V. Antony Vijesh, The generalized Marcum function of the second kind: monotonicity patterns and tight bounds, Journal of Computational and Applied Mathematics (Elsevier), Vol. 382, Article ID. 113093, 2021. https://doi.org/10.1016/j.cam.2020.113093



PhD. IIT Kanpur

Previous Employment (Includes post-doctoral experience)

- Visiting Faculty, IISER Bhopal
- Lecturer, LNMIIT, Jaipur

Dr. Anand Parkash
Assistant Professor
anandparkash@iiti.ac.in



PhD. - University of Allahabad

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.

Dr. Niraj Kumar Shukla
Associate Professor
Nirajshukla@iiti.ac.in

Courses/conferences/workshops organized.

- QIP Course: Matrix Computations and its application in systems, signal and control problems, Feb 16-21, 2021
- QIP Course: Wavelet via Matrices and its Applications in signals and image processing, Nov 16-21, 2020

Journal articles published.

- Microlocal analysis and characterization of Sobolev wavefront sets using shearlets, Constructive Approximation, 2021. (with Bin Han and Swaraj Paul)



PhD. IIT Kanpur (2010)

Previous Employment (Includes post-doctoral experience)
IISC Bangalore

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



PhD. - HRI Allahabad

Previous Employment (Includes post-doctoral experience)
NBHM Post doc at IISc Bangalore

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

Projects won by the faculty/department.

- "Some problems on Nonlinear Schrodinger equation (NLS) and Hardy- Sobolev inequality for the twisted Laplacian" by Science and Engineering Research Board (SERB) (Mathematical Research Impact Centric Support (MATRICS))

Journal articles published.

- Dispersion Estimates for the Discrete Hermite Operator (Jointly with Devendra Tiwari), Indian J. Pure Appl. Math.
  https://doi.org/10.1007/s13226-021-00137-1



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.

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

Major awards, achievements:

- Information Fusion, Elsevier (IF: 12.97) - Guest Editor (2021 - Present)
- IEEE Journal of Biomedical Health and Informatics (IF: 5.22) - Guest Editor (2021 - Present)
- International Journal of Machine Learning and Cybernetics (IF: 4.012) – Associate Editor (2021 - Present)
- Applied Soft Computing, Elsevier (IF: 6.72) - Guest Editor (2019 - Present)
- ACM Transactions on Multimedia (IF: 3.72) - (July 2021 - Present)
- IEEE Transactions on Emerging Topics in Computational Intelligence (2020 - Present)
- Annals of Operations Research, Springer (IF: 4.85) - Guest Editor (2020 - Present)
- Frontiers in Applied Mathematics and Statistics - Associate Editor (2020 - Present)
- Applied Intelligence, Springer - Board Member (2016 - Present)
- Associate Editor – IEEE SMC 2021

Projects won by the faculty/department.

- **Classification and prediction of Alzheimer disease using multimodal imaging data**
  Sponsoring Agency : Science and Engineering Research Board (SERB), New Delhi, INDIA under Ramanujan Scheme
  Period : 2016-2021
  Role : Principal Investigator
  Sanctioned Amount : INR 89 Lakhs

Diagnosis of Alzheimer's disease using brain imaging data
Sponsoring Agency : National Supercomputing Mission under DST and Miety, Govt of India
Period : 2021-2023
Role : Principal Investigator
Sanctioned Amount : INR 19.06 Lakhs

- **Development of novel machine learning algorithms for automated detection of seizure using EEG signals**
  Sponsoring Agency : Department of Science and Technology (DST) research project under ICPS - Data Science Research Initiative Scheme
  Period : 2019-2022
  Role : Principal Investigator
  Sanctioned Amount : INR 15 Lakhs

- **Optimization models and algorithms for non-parallel support vector machines**
  Sponsoring Agency : Science and Engineering Research Board (SERB), New Delhi, INDIA under Ramanujan Scheme
  Period : 2017-2020
  Role : Principal Investigator
  Sanctioned Amount : INR 26 Lakhs

- **Detection of human brain disorders using novel machine learning approaches**
  Sponsoring Agency : Council of Scientific & Industrial Research (CSIR), New Delhi, INDIA under Extra Mural Research (EMR) Scheme
  Period : 2018-2021
  Role : Principal Investigator
  Sanctioned Amount : INR 31 Lakhs

- **Digital forensic knowledge integration and intelligence (DIREKT-Intel)**
  Sponsoring Agency : MHRD under SPARC scheme
  Period : 2019-2021
  Role : Co-Principal Investigator
  Sanctioned Amount : INR 65 Lakhs

Journal articles published.

- Ye Shi, L. Zhang, Z. Cao, M. Tanveer, Chin-Teng Lin (2021). Distributed Semi-supervised Fuzzy Regres- sion with Interpolation Consistency Regularization, IEEE Transactions on Fuzzy Systems. **[SCI Indexed with Impact Factor: 12.029]**
- A. Qayyum, I. Razzak, M. Tanveer, A. Kumar (2021). Depth-Wise Multilevel Convolutional Neural Network for Automatic COVID19 Infection Detection, Annals of Operations Research, Springer. **[SCI Indexed with Impact Factor: 4.85]**
- Iman Beheshti, M.A. Ganaie, Vardhan Paliwal, Aryan Rastogi, Imran Razzak, M. Tanveer (2021). Predicting brain age using machine learning algorithms: A comprehensive evaluation, IEEE Journal of Biomedical and Health Informatics. **[SCI Indexed with Impact Factor: 5.22]**
- M. Tanveer, A. Rashid, M.A. Ganaie, M. Reza, I. Razzak, K.L. Hua (2021). Classification of Alzheimer's disease using ensemble of deep neural networks trained through transfer learning, IEEE Journal of Biomedical and Health Informatics. **[SCI Indexed with Impact Factor: 5.22]**

- Q Shi, R Katuwal, PN Suganthan, M Tanveer (2021). Random Vector Functional Link Neural Network based Ensemble Deep Learning, Pattern Recognition, Elsevier.
  [SCI Indexed with Impact Factor: 7.19]
- J.J. Virtusio, J.J.M. Ople, D.S. Tan,M. Tanveer, N. Kumar, Kai-Lung Hua (2021). Neural Style Palette: a multimodal and interactive style transfer from a single style image, IEEE Transactions on Multimedia.
  [SCI Indexed with Impact Factor: 6.05]
- AK Sahu, S. Sharma, M. Tanveer, R. Raja (2021). Internet of Things Attack Detection Using Hybrid Deep Learning Model, Computer Communications, Elsevier
  [SCI Indexed with Impact Factor: 2.82]
- FAF-DRVFL: Fuzzy Activation function based Deep Random Vector Functional Links Network for Early Diagnosis of Alzheimer Disease, Applied Soft Computing, Elsevier.
  [SCI Indexed with Impact Factor: 5.47]
- M. Tanveer, M.A. Ganaie, P.N. Suganthan (2021). Ensemble of classification models with weighted functional link network, Applied Soft Computing, Elsevier.
  [SCI Indexed with Impact Factor: 5.47]
- M. Tanveer, Tarun Gupta, Miten Shah, Bharat Richhariya (2021). Sparse Twin Support Vector Clustering using Pinball Loss, IEEE Journal of Biomedical and Health Informatics.
  [SCI Indexed with Impact Factor: 5.22]
- Hossein Moosaei, Saeed Ketabchi, Mohamad Razzaghi, M Tanveer (2021). Generalized Twin Support Vector Machines, Neural Processing Letters (NEPL), Springer.
  [SCI Indexed with Impact Factor: 2.89]
- M Khan, MS Obaidat, T Hussain, J Del Ser, N Kumar, M Tanveer, F Doctor (2021). Fuzzy Logic in Surveillance Big Video Data: Comprehensive Review, Challenges and Research Directions, ACM Computing Surveys.
  [SCI Indexed with Impact Factor: 7.99]
- Bharat Richhariya and M. Tanveer (2021). A fuzzy universum least squares twin support vector machine (FULSTSVM), Neural Computing and Applications, Springer.
  [SCI Indexed with Impact Factor: 4.77]
- K. Jha, S. Saha, M. Tanveer(2021). Prediction of protein-protein interactions using stacked auto-encoder, Transactions on Emerging Telecommunications Technologies, e4256.
  [SCI Indexed with Impact Factor: 1.59]
- C. Gautam, A. Tiwari, P.K. Mishra, S. Suresh, Alexandros Iosifidis, M. Tanveer (2021). Graph-embedded multi-layer kernel ridge regression for one-class classification, Cognitive Computation, Springer.
  [SCI Indexed with Impact Factor: 4.30]

1. **2020**

- A. Gupta, R.U. Khan, V.K. Singh, M. Tanveer, D. Kumar, A. Chakraborti, R.B. Pachori (2020). A novel approach for classification of mental tasks using multiview ensemble learning (MEL), Neurocomputing, Elsevier, 417(5): 558-584.
  [SCI Indexed with Impact Factor: 4.43]
- 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]
- J.J. Virtusio, D.S. Tan, W.H. Cheng, M. Tanveer, and K.L. Hua (2020). Enabling Artistic Control Over Pattern Density and Stroke Strength, IEEE Transactions on Multimedia.
  [SCI Indexed with Impact Factor: 6.05]
- L. Fang, C. Yin, J. Zhu, C. Ge, M. Tanveer, A. Jolfaei, Z. Cao (2020). Privacy Protection for Medical

Data Sharing in Smart Healthcare, ACM Transactions on Multimedia Computing, Communications, and Applications (TOMM), 16(3s), doi = 10.1145/3408322.
[SCI Indexed with Impact Factor: 3.27]

- M.A. Ganaie, S. Ghosh, N. Mendola, M. Tanveer, S. Jalan (2020). Identification of Chimera using Machine Learning, Chaos: An Interdisciplinary Journal of Nonlinear Science, 30(6): 063128.
[SCI Indexed with Impact Factor: 2.83]
- M. Tanveer, S. Sharma, K. Muhammad (2020). Large scale least squares twin SVMs, ACM Transactions on Internet Technology.
[SCI Indexed with Impact Factor: 2.38]
- Bharat Richhariya and M. Tanveer (2020). Least squares projection twin support vector clustering (LSPTSVC), Information Sciences, Elsevier, 533, 1-23.
[SCI Indexed with Impact Factor: 5.91]
- B. Cao, S. Fan, J. Zhao, P. Yang, K. Muhammad, M. Tanveer (2020). Quantum-enhanced multiobjective large-Scale optimization via parallelism, Swarm and Evolutionary Computation, Elsevier, 57, 100697.
[SCI Indexed with Impact Factor: 6.91]
- M.A. Ganaie and M. Tanveer (2020). LSTSVM classifier with enhanced features from pre-trained functional link network, Applied Soft Computing, Elsevier, 93, 106305.
[SCI Indexed with Impact Factor: 5.47]
- M. Tanveer, P. Khanna, M. Prasad, C.T. Lin (2020). Introduction to the Special Issue on Computational Intelligence for Biomedical Data and Imaging, ACM Transactions on Multimedia Computing, Communications, and Applications (TOMM), 16 (1s): 1-4.
[SCI Indexed with Impact Factor: 3.27]
- R.U. Khan, M. Tanveer and R.B. Pachori (2020). A novel method for the classification of Alzheimer's disease from normal controls using MRI images, Expert Systems, Wiley, https://doi.org/10.1111/exsy.12566.
[SCI Indexed with Impact Factor: 1.54]
- M. Tanveer, A. Sharma, P.N. Suganthan (2020). Least squares K-nearest neighbor-based weighted multi-class twin SVM, Neurocomputing, Elsevier.
[SCI Indexed with Impact Factor: 4.43]
- B. Richhariya, M. Tanveer (2020). An efficient angle based universum least squares twin support vector machine for pattern classification, ACM Transactions on Internet Technology (TOIT), https://doi.org/10.1145/3387131.
[SCI Indexed with Impact Factor: 2.38]
- Z. Yue, S. Ding, L. Zhao, Y. Zhang, Z. Cao, M. Tanveer, A. Jolfaei, X.Zheng (2020). Privacy-preserving time series medical images analysis using a hybrid deep learning frame-work, ACM Transactions on Internet Technology (TOIT), https://doi.org/10.1145/3383779.
[SCI Indexed with Impact Factor: 2.38]
- B. Richhariya, M. Tanveer, A.H. Rashid (2020). Diagnosis of Alzheimer's disease using universum support vector machine based recursive feature elimination (USVM-RFE), Biomedical Signal Processing Control, Elsevier, 59: 101903.
[SCI Indexed with Impact Factor: 3.13]
- C. Gautam, P.K. Mishra, A. Tiwari, B. Richhariya, H.M. Pandey, S. Wang, M. Tanveer (2020). Minimum variance-embedded deep kernel regularized least square method for one-class classification and its applications to biomedical data, Neural Networks, Elsevier, 123: 191-216 .
[SCI Indexed with Impact Factor: 5.53]
- B. Richhariya, M. Tanveer (2020). A reduced universum twin support vector machine for class imbalance learning, Pattern Recognition, Elsevier, 102, 107150.

[SCI Indexed with Impact Factor: 7.19]

- S. Alam, S.K. Sonbhadra, S. Agarwal, P. Nagabhushan, M. Tanveer (2020). Sample reduction using Farthest Boundary Point Estimation (FBPE) for Support Vector Data Description (SVDD), Pattern Recognition Letters, Elsevier, 131: 268-276
  [SCI Indexed with Impact Factor: 3.25]
- 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]
- C. Gautam, A. Tiwari, M. Tanveer (2020). Kernel ridge regression-based auto-encoder for one-class classification using privileged information, Cognitive Computation, Springer, 12:412-425.
  [SCI Indexed with Impact Factor: 4.30]
- Qi Li, Z. Cao, M. Tanveer, H.M. Pandey, C. Wang (2020). A semantic collaboration method based on uniform knowledge graph, IEEE Internet of Things Journal, 7(5): 4473-4484.
  [SCI Indexed with Impact Factor: 9.93]
- Q Li, Z Cao, M Tanveer, HM Pandey, C Wang (2020). An effective reliability evaluation method for power communication network based on community structure, IEEE Transactions on Industry Applications, 56(4): 4489-4500.
  [SCI Indexed with Impact Factor: 3.48]
- 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]
- L Fang, Y Li, X Yun, Z Wen, S Ji, W Meng, Z Cao, M Tanveer (2020). THP: An SDN-based authentication scheme resistant to multiple attacks in IoT, IEEE Internet of Things Journal, 7(7): 5745-5759.
  [SCI Indexed with Impact Factor: 9.93]
- M. Tanveer, S. Sharma, R. Rastogi, P. Anand (2020). Sparse support vector machine with pinball loss, Wiley Transactions on Emerging Telecommunications Technologies, https://doi.org/10.1002/ett.3820.
  [SCI Indexed with Impact Factor: 1.59]
- M. Tanveer, B. Richhariya, R.U. Khan, A.H. Rashid, M. Prasad, P. Khanna, C.T. Lin (2020). Machine learning techniques for the diagnosis of Alzheimer's disease: A review, ACM Transactions on Multimedia Computing, Communications, and Applications (TOMM), 16(1s): 1-35.
  [SCI Indexed with Impact Factor: 3.27]

COVID related activities

- Qayyum, I. Razzak, M. Tanveer, A. Kumar (2021). Depth-Wise Multilevel Convolutional Neural Network for Automatic COVID19 Infection Detection, Annals of Operations Research, Springer.
  [SCI Indexed with Impact Factor: 4.85]



Dr Sanjeev Singh
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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

Projects won by the faculty/department.
Project Title: Study of Marcum function of the second kind Project Ref. No.: CRG/2020/002875
Funding Agency: Science & Engineering Research Board (SERB)
Funding Amount: □ 2046264
Duration: 2021 – 2024

Journal articles published.

- A. Baricz, N. Bisht, S. Singh,V. A. Vijesh, Functional Inequalities and Bounds for the Generalized Marcum Function of the Second Kind, Results in Mathematics , 76 (2021) Art. 35.
- A. Baricz, N. Bisht, S. Singh,V. A. Vijesh, The generalized Marcum function of the second kind: Monotonicity patterns and tight bounds, Journal of Computational and Applied Mathematics, 382 (2021) Art. 113093.



PhD. Indian Institute of Engineering Science and Technology, Shibpur

Previous Employment (Includes post-doctoral experience)
Assistant Professor - NIT Meghalaya (January 2015-Septermebr 2019)

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

Projects won by the faculty/department
Project: Delay Differential Equation Models in Population Dynamics: Theory, Methods and Computations, Funding Agency: SERB, Govt. of India, Duration: 3-year (2021-24)

Journal articles published.

- N. Bajeux, B Ghosh, Stability switching and hydra effect in a predator–prey metapopulation model. BioSystems, 198 Article Number-1040255, 2020.



PhD. IIT (ISM) Dhanbad

Previous Employment (Includes post-doctoral experience)

- Royal Society-SERB Newton International Fellow, School of Computing and Mathematics, Keele University, Staffordshire, United Kingdom

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

- IISER Kolkata as Post-Doctoral Fellow
- IIT Indore as Visiting Assistant Professor

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

Major awards, achievements:

- Selected for a special talk in "The Indian Science Congress Association" (108th) to be held January 3-7, 2021, Pune.

Projects won by the faculty/department.

- The dynamic behaviour of material due to torsional wave propagation in porous media at Taif University, Saudi Arabia (TURSP-2020/57)

Courses/conferences/workshops organized.

- Convener of six days TEQIP-III FDP program on Mathematics with Matlab and Mathematica during November 23-28, 2020, Sponsored by NPIU (http://shorturl.at/ajnSZ)
- Convener of six days TEQIP-III FDP program on Mathematical approaches in Mechanics during December 24-31, 2020, Sponsored by NPIU (http://shorturl.at/blHM6)

Journal articles published.

- 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), vol. 83, pp. 590-613, July 2020, (SCI, IF: 3.633)
- Manna, S. and Kumar, A., Dynamic behavior of multi-layer heterogeneous composite magneto-elastic structures for surface wave scattering, Applied Mathematics and Computation (Elsevier), 2021, vol. 397, pp. 125922 (SCI, IF: 3.472)
- Mukherjee, S., Datta, A., Manna, S., and Sahoo S.K., (Eds.), Computational Mathematics, Nanoelectronics and Astrophysics, Springer-Nature, published in 2020. (Book)
- Manna, S., Datta, B.D. and Ahmad S. (Eds), Mathematical Model with Scientific Computing with Applications, Springer-Nature Book in Mathematics & Statistics, 2020, vol. 308, 10.1007/978-981-15-1338-1
- Sudha, T., Umadevi, C., Dhange, M., Manna, S. and Misra J.C., Effects of Stenosis and Dilatation on Flow of Blood Mixed with Suspended Nanoparticles: A Study Using Homotopy Technique, International Journal of Applied Mechanics and Engineering, 2021, vol. 26(1), pp. 251-265.

Any other major events / development etc.

- We are developing an Applied Mathematics and Geomechanics lab for theoretical & Computational research in Seismology at IIT Indore. My plan is to give the best facilities to the researchers, those are working in mathematical modelling and simulation in wave propagation fields. We have already deployed a high configuration workstation and three more mini workstations. For more instruments/equipment, I have submitted some research projects to the external funding agencies.



Vinay Kumar Gupta
Assistant Professor
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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)

Projects won by the faculty/department.

- Projects active during April 2020-March 2021
  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 gas mixtures analytically and/or numerically with the developed Grad and

regularized moment models.

Courses/conferences/workshops organized.

- TEQIP-III (NIPU) sponsored six-days online course on "Mathematical Approaches in Mechanics" during December 24-31, 2020 under the Faculty development programme (FDP) [with Dr. Santanu Manna].
- TEQIP-III (NIPU) sponsored six-days online course on "Mathematics with MATLAB and Mathematica" during November 23-28, 2020 under the Faculty development programme (FDP) [with Dr. Santanu Manna].

Journal articles published.

- Rana, A. S., Gupta, V. K., Sprittles, J. E. and Torrilhon, M. (2021) H-theorem and boundary conditions for the linear R26 equations: application to flow past an evaporating droplet, Journal of Fluid Mechanics (accepted) [arXiv preprint].

Any other major events / development etc.

- Invited talk on Moment methods in kinetic theory, TEQIP-III sponsored e-Short Term Course on Advanced Mathematical Techniques for Engineers Scientists-AMTES20 during 28-30 September 2020, National Institute of Technology Rourkela, India, September 30, 2020.



PhD. Harish-Chandra Research Institute, Allahabad.

Previous Employment (Includes post-doctoral experience)
NPDF at IIT Gandhinagar (Dec 2016-Oct 2019).

Dr. Bibekananda Maji
Assistant Professor
bibekanandamaji@iiti.ac.in

Projects won by the faculty/department.

Project Title: An investigation on asymptotic expansion of Lambert series and Ramanujan's formula for odd zeta Values.
Funding Agency: Start-up Research Grant (SRG), SERB.
Duration: 2020-2022.

Journal articles published.

- Pramod Eyyunni, Bibekananda Maji, and Garima Sood, An inequality between finite analogues of rank and crank moments, Int. J. Number Theory (In a special issue- in honor of Prof. Bruce Berndt, 17, 405-423 (2021).
- Abhishek Juyal, Bibekananda Maji, Sumukha Sathyanarayana, An exact formula for a Lambert series associated to cusp form and the Mobius function, Ramanujan J. (2021).



PhD. IIT Kanpur

Previous Employment (Includes post-doctoral experience)

- Assistant Professor , NIT Calicut, Dec 2009 -Sep 2011
- Postdoctoral Researcher , University of Goettingen, , Nov 2011- July 2015
- Visiting Assistant Professor, IIT Indore, July 2016- Dec 2019.

Dr. Charitha
Cherugondi
Assistant Professor
charithac@iiti.ac.in

Courses/conferences/workshops organized.

- Short term course "Mathematical Optimization and Applications" under QIP Programme, March 22nd -March 27th, 2021.

Journal articles published.

- Book Chapter D. Russell Luke, C. Charitha, Ron Shefi and Yura Malitsky, Efficient, Quantitative Numerical Methods for Statistical Image Deconvolution and Denoising, Nanoscale Photonic Imaging, Springer, June 2020.



PhD. - Indian Institute of Technology Kanpur

Previous Employment (Includes post-doctoral experience)

- Assistant Professor, Aligarh Muslim University from March 2014 to July 2020.

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

- Aligarh Muslim University

Dr. Mohd. Arshad
Assistant Professor
arshad@iiti.ac.in

Major awards, achievements

- Associate Editor, Aligarh Journal of Statistics

Projects won by the faculty/department.

Project Title: Improved Estimation Based on Records.
Funding Agency: Science and Engineering Research Board, DST, Govt. of India
Project Scheme: Mathematical Research Impact-Centric Support (MATRICS)

Courses/conferences/workshops organized.

- Organizing committee member in 2020 IEEE CIS Summer School on Emerging Research Trends in Computational Intelligence: Theory and Applications, organized at IIT Indore (November 26-30, 2020).

Journal articles published.

- Modibbo, U. M., Arshad, M., Abdalghani, O. and Ali, I. (2021). Optimization and estimation in system reliability allocation problem. Reliability Engineering and System Safety, Vol 212, Elsevier. DOI: 10.1016/j.ress.2021.107620
- Jodra, P. and Arshad, M. (2021). An intermediate Muth distribution with increasing failure rate. Communications in Statistics- Theory and Methods, Taylor & Francis. DOI:

10.1080/03610926.2021.1892133

- Azhad, Q. J., Arshad, M., and Khandelwal, N. (2021). Statistical inference of reliability in multicomponent stress strength model for Pareto distribution based on upper record values. International Journal of Modelling and Simulation, Taylor & Francis.
  DOI: 10.1080/02286203.2021.1891496
- Abdalghani, O., Arshad, M., Meena, K. R., and Pathak, A. K (2021). Adjusted Bias and Risk for Estimating Treatment Effect after Selection with an Application in Idiopathic Osteoporosis, published in the book entitled "Optimal Decision Making in Operations Research and Statistics: Methodologies and Applications," CRC Press, Taylor & Francis, Page 370-377.
  ISBN: 9780367618759

Any other major events / development etc.

- Two invited lectures in the "First Indian Workshop on Artificial Intelligence 2021" organized by the Department of Computer Science and Engineering, IIT Indore (March 19- 25, 2021).

Department of Physics

Welcome to the Department of Physics at the Indian Institute of Technology Indore. The Department of Physics is committed to serve the nation through the ongoing innovation in teaching and cutting-edge research as per the new education policy of government of India.

The department is offering M.Sc. and Ph.D. programs in Physics and more than 200 students are already graduated and placed at reputed institutes across the globe. The department is in the process of establishing new academic programs such as 2-year MS program in Physics and 4-year BS program in Physics. The department is working in close collaboration with various industries to developed the technologies to support research and academic sectors of country and aimed to establish the center of scientific instrumentation in near future which will be first of its kind in the India.

The Department is highly collaborative and have close interaction between the different research groups withing the department, within IIT Indore and with various national and international institutions, including DAE, ISRO, DRDO, CERN and many more.

Our faculty conducts advanced research in condensed matter physics, high energy physics, statistical mechanics, complex systems, artificial intelligence etc. Our state-of-the-art facilities provide unique research opportunities for students across all levels of educational programs such as undergraduate, graduate, postgraduate and Ph.D. We consider research experience as a vital part in the education and nurturing the students to take up advance courses and providing practical experience across various field of Physics. The department of Physics has already established more than 10 advance research laboratories working on the various branches of Physics.

I invite you to further explore our department by visiting us in person or virtually through www.physics.iiti.ac.in



Pankaj R. Sagdeo
Associate Professor & Head
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Dr. Pankaj R. Sagdeo has completed B.Sc. from Nagpur University, M.Sc. from the department of Physics University of Pune and Ph.D. from UGC-DAE Consortium for scientific research Indore. During his doctoral work Dr. Sagdeo demonstrated the importance of local strain on the for the various electronic and magnetic phases and their coexistence observed in Perovskite Oxides. During post-doctoral work Dr. Sagdeo designed the XMCD beamline for INDUS-2 Synchrotron x-ray source and studied the electronic structure of Ca-doped $LaMnO_3$ using PES beamline (BL-2) on INDUS-1 Synchrotron x-ray source.

Dr. Sagdeo joined Bhabha Atomic Research Centre (BARC) in 2008 as a Scientific Officer-D and developed optics and thin film lab at BARC Visakhapatnam and worked on highly specified DAE projects. In June 2012, Dr. Sagdeo joined the Indian Institute of Technology and working on the material characterization and established Material Research Laboratory at IIT Indore. Currently, Dr. Sagdeo is serving as a Head of the department at IIT Indore and exploring the physics of highly correlated system such as Manganite, High T_C superconductors, titanates, solar cells etc. Dr. Sagdeo has strong collaborations with DAE Govt. of India and STFC Rutherford Appleton Laboratory of United Kingdom.

Major awards, achievements, recognitions of the faculty / students / scientists /staff of department.

- Dr. Anil Kumar Ph.D. student working under the guidance of Dr. Sagdeo has been selected as a post-doctoral research staff at Weizmann institute in Israel.
- Dr. Aanchal Sati working under the guidance of Dr. Sagdeo has been selected as a Assistant professor at government post-graduate college Uttarakhand through Uttarakhand public service commission.

Projects won by the faculty - Title of Project: Exploring new methodology to estimate the values of onsite coulombic repulsive energy and charge transfer energy in transition metal oxides through combined optical and structural studies.

- **Sponsoring Agency:** DST-SERB
- **Period:** 3 years
- **Status:** Ongoing

Courses/conferences/workshops organized:

Dr. Sagdeo is providing online research internship and research training to the under-graduate and postgraduate students of various discipline and helping the students to understand the physics of solar cell.

Journal articles published (2021)

- "Origin of natural and magnetic field induced polar order in orthorhombic $PrFe_{1/2}Cr_{1/2}O_3$" Anil Kumar, M Kamal Warshi, Archna Sagdeo, Matthew Krzystyniak, Svemir Rudić, DT Adroja, Ivan da Silva, PR Sagdeo, **Phys. Rev. B**, 104, 035101 (2021). [Impact Factor: 4.036]
- Distorted octahedra induced anisotropic strain and local disorder in delafossite $CuCrO_2$, P Pokhriyal, A Kumar, MN Singh, P Sagdeo, AK Sinha, A Sagdeo, **Solid State Sci.**, 117, 106602, (2021). [Impact Factor: 2.434]
- "Origin of ferroelectricity in cubic phase of Hf substituted $BaTiO_3$" Aanchal Sati, Preeti Pokhriyal, Anil Kumar, Shahid Anwar, Archna Sagdeo2, N P Lalla and P R Sagdeo, *J. Phys.: Condens. Matter,* 33, 165403, (2021). [Impact Factor: 2.707]
- Structural, optical and dielectric properties of Bi substituted polycrystalline praseodymium chromate", R Late, KV Wagaskar, PB Shelke, PR Sagdeo, **Mater. Chem. Phys.**, 262, 124313, (2021). [Impact Factor: 3.408]
- Investigations on the Electronic Structure of the Strongly Correlated Electron System Cr-Doped $PrFeO_3$,A Kumar, MK Warshi, A Sagdeo, PR Sagdeo, **J. Phys. Chem. C**, 125(25), 14048–14055, (2021). [Impact Factor: 4.126]
- "New route to estimate the Mott-Hubbard and charge transfer parameters: An optical and x-ray absorption studies" Anil Kumar, M. Kamal Warshi, Archna Sagdeo, Mukul Gupta, P.R.Sagdeo, **Solid State Sci.**, 115, 106582, (2021). [Impact Factor: 2.434]
- "Unorthodox Approach to Realize the Correlation between the Dielectric Constant and Electronic Disorder in Cr-Doped $PrFeO_3$", **J. Phys. Chem. C**, 125(13), 7378–7383, (2021). [Impact Factor: 4.126]
- "Electronic and optical properties of Y-doped $BaBiO_3$",M Bharath, P Sharma, J Brar, PR Sagdeo, R Bindu, **Eur Phys J B,** 94 (2), 1-8, (2021). [Impact Factor: 1.440]
- "Possibility of relaxor-type ferroelectricity in delafossite CuCrO2 near room temperature" P Pokhriyal, A Bhakar, MN Singh, H Srivastava, P Rajput, P Sagdeo, **Solid State Sci.**, 112, 106509, (2021). [Impact Factor: 2.434]
- "Doping-Induced Combined Fano and Phonon Confinement Effect in La-Doped CeO2: Raman Spectroscopy Analysis", Minal Gupta, Anil Kumar, Archna Sagdeo, and Pankaj R. Sagdeo, **J. Phys. Chem. C**, 125(4), 2648-2658, (2021). [Impact Factor: 4.126]
- "Temperature-dependent dielectric loss in BaTiO3: Competition between tunnelling probability and

electron-phonon interaction"A Sati, A Kumar, V Mishra, K Warshi, P Pokhriyal, A Sagdeo, PR Sagdeo, **Mater. Chem. Phys.**, 257, 123792, (2021). [Impact Factor: 3.408]

Any other major events / development etc.
Design and development of UV based sanitization system to disinfect Covid-19 virus: developed for IG office Indore. This work is listed on India Science, Technology and Innovation which is a government of India initiative for details please visit:
https://www.indiascienceandtechnology.gov.in/research/development-uv-based-set-deactivate-covid19-virus

Report on COVID related activities (Research, Academic and / or any other news) :
Dr. Sagdeo proposed the importance of light-based technologies in disinfecting the novel COVID-19, present on the surface of phone, plastic surfaces, wallets, watches, cloths. The benefits of ultraviolet light-based strategies to combat the emergence of COVID-19 pandemic. This research work in published as a "Possibility of using ultraviolet radiation for disinfecting the novel COVID-19", **Photo-diagnosis Photodynamic Therapy**, 34, 102234, (2021). [Impact Factor: 2.894]]



Prof. Subhendu Rakshit
Professor
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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

Projects won by the faculty/department:
- 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).

Any other major events / development etc.: Undertaken a book writing project ``High Energy Astrophysical Neutrinos" with Springers Nature Switzerland AG.



Dr. Krushna R. Mavani
Professor

Prof. Krushna R. Mavani is working as a Professor in the Discipline 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 Tata Institute of Fundamental Research (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

krushna@iiti.ac.in Thin Films.

Prof. Mavani has also taken several administrative positions.

Presently she is chosen as an expert member of the committee for start-up research grant and national postdoctoral fellowship (NPDF) by SERB, India, in the area of Physical Sciences.

In the past, she has been Head, Discipline of Physics, IIT Indore, from Nov. 2017 to Oct. 2020; a member of Board of Governors, IIT Indore, from March 2019 to March 2021; The convener, Discipline Postgraduate Committee of Physics, IIT Indore from April 2014 to November 2017; Hostel warden of Girls' Hostel IIT Indore from July 2009 to August 2010.

Three selected publications from IIT Indore

- 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).
- 2.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).
- 3.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 Interests:

Prof. Mavani works in 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 five PhD. students. Six PhD. and three M.Sc. students have been graduated under her guidance.

Presently the group's research focuses on:

- Development of terahertz spectroscopy.
- Growth of high quality crystalline thin films and study of physical properties
- Growth of nanostructures using PLD
- Study of Structure-Property correlations
- Functional Oxides and Devices.

Awards/Recognitions:

- Editorial Board Member of 'Heliyon'-An international science journal by Elsevier (2016 onwards).
- Best poster presentation award in the international symposium on "Advances in Superconductivity & Magnetism: Materials, Mechanism & Devices (ASMM2D)" at Mangalore University, Mangalore, India (September 25-28, 2001).
- Young Scientist project received from JSPS, Japan, during the postdoctoral tenure in Kyoto University (details in another column).
- Multiple travel grants were awarded by DST, CSIR, INSA for attending international conferences during postdoctoral tenure in TIFR, Mumbai.

Event organized:

Summer workshop for aspiring schoolgirls in science for three weeks under Vigyan Jyoti project (DST Initiative) at IIT Indore, June-July 2018.

Invited Talks:

"Temperature Dependent Effects of Mn-doping on Charge-Transport of NdNiO3 Thin Films" in an international conference on "Pulsed Laser Deposition" at Indian Institute of Technology Kharagpur, India, during November 2013.

"Terahertz Technologies for Condensed Matter Physics"
Conference on Condensed Matter Physics and Biological Systems, Banaras Hindu University, Varansi, India, during January 2013.

Research Projects:

- "Exploring Structure-Property Correlations and Low-Energy Charge dynamics of Doped RNiO3 (R = Rare earth ion) Thin Films by Terahertz Time-Domain Spectroscopy" as Principal investigator (no Co-PI),
- Amount: Approx. Rs. 43 Lakhs, sanctioned by DST in April 2018 (Project going on)
- "Knowledge, personality and skill Development activities for aspiring girl students"-Workshop for 30 girls and 03 weeks duration approved by DST in March 2018.
- Amount: Approx. 16.0 lakhs, Sanctioned by DST In March 2018. (Project going on)
- "Influence of Strain and Carrier Injection on Electrical and Magnetic Properties of RNi1-xDxO3 (R=Rare earth metal, D = Dopant) Thin Films and Multilayers" in collaboration with Dr. S. Prabhu, TIFR, Mumbai,
- Amount: Approx. Rs. 35.0 Lakhs, Sanctioned by BRNS in Nov. 2017. (Completed)
- "Investigations on ferroelectric, magnetic and structural correlations in RMnO3 (R = Rare earth ions) multiferroic thin films", as single investigator, supported by Department of Science and Technology India, May 2011 – April 2014. (Completed)
- Amount: Approx. Rs. 21.0 Lakhs.
- Grant-in-Aid for young scientist award for the project: "Time-resolved spectroscopic study of exotic multiferroic oxides" supported by Japanese Society for Promotion of Science, Japan, Oct. 2007-March 2009, during postdoctoral tenure at Kyoto University, Japan. (Completed)
- Amount received: JPY 26,00,000/-.



Prof. Sarika Jalan
Professor
sarika@iiti.ac.in

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. She is editor-in -chief of the Journal of Computational Science.

Achievements:

Editor-in-Chief of the Journal of Computational Science (http://www.elsevier.com/locate/jocs)

Elected Executive Member: Complex Systems Society (https://cssociety.org/home)
Area of Research: Complex Systems, Computational Biology and Nonlinear Dynamics

Selected Publications:

- Catalytic feed-forward explosive synchronization in multilayer networks, Vasundhara Rathore and

Sarika Jalan (Submitted)

- Explosive Synchronization in Inter-pinned Multilayer and Multiplex Networks, Ajaydeep Kacchvah and Sarika Jalan, arXiv:2106.02912 (2021)
- Explosive synchronization in interlayer phase-shifted Kuramoto oscillators on multiplex networks, Anil Kumar and Sarika Jalan*, Chaos (Fast Track) 3, 041103 (2021)
- Machine learning assisted network classification using symbolic time-series, Atish Pandey, Woo Soek Lee, Subha Sanket Dutta, and Sarika Jalan*, Chaos (Fast Track) 31, 031106 (2021)
- Impact of modular mitochondrial epistatic interactions on the evolution of human subpopulations, Pramod Shinde*, Harry J. Whitwell, Rahul Kumar Verma, Mikhail Ivanchenko, Alexey Zaikin, and Sarika Jalan*, Mitochondrion 58, 111 (2021)
- Multifractal Analysis of small-world networks, Ankit Mishra, J. N. Bandyopadhyay and Sarika Jalan*, Chaos, Solitons & Fractals 144, 110745 (2021)
- Machine Learning assisted Chimera and Solitary states in Networks, N Kushwaha, NK Mendola, S Ghosh, AD Kachhvah, S Jalan*, Frontiers in Physics 9, 513969 (2021). doi: 10.3389/fphy.2021.51396
- Analysis of human mitochondrial genome co-occurrence networks of Asian population at varying altitudes, Rahul K Verma, A. Kalyakuina, C. Giuliani, P. Shinde, A. D. Kachhvah, M. Ivanchenko and S. Jalan*, Scientific Reports 11 (1) 16 (2021)
- Interlayer Hebbian Plasticity Induces First-Order Transition in Multiplex Networks, A. D. Kachhvah, X Dai, S. Boccaletti, S. Jalan*, New Journal of Physics (Fast Track) 22, 122001 (2020)
- From Spectra to Localized Networks: A Reverse Engineering Approach, P Pradhan, Sarika Jalan*, IEEE Transactions on Network Science and Engineering, DOI: 10.1109/TNSE.2020.3008999 (2020)
- Investigating mitonuclear genetic interactions through machine learning: a case study on cold adaptation genes in human populations from different European climate regions, A Kalyakulina, V Iannuzzi, M Sazzini, P Garagnani, S Jalan, et.al. ..., Frontiers in Physiology 11, 1434 (2020)
- Inter-layer adaptation induced explosive synchronization in multiplex networks, Anil Kumar, Sarika Jalan* and Ajay Deep Kachhvah, Phys. Rev. Res. 2 (2) 023259 (2020)
- Explosive Synchronization in Multilayer Dynamically Dissimilar Networks, Sarika Jalan*, AD Kachhvah, H Jeong, Journal of Computational Science, 46, 101177 (2020)
- Identification of chimera using machine learning, MA Ganaie, S Ghosh, N Mendola, M Tanveer, S Jalan*, Chaos: An Interdisciplinary Journal of Nonlinear Science 30 (6), 063128 (2020)

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.

Visiting Positions:

- Visiting scientist at Physics of Complex Systems, IBS, Daejeon South Korea. January 2020-December 2020

Events and Seminars Organized:

- Satellite on "Dynamical systems on networks: Stability and applications" during SIAM DS21, May 23-27, 2021
- Organizing Committee: Workshop on "Learning and Reasoning with Complex Graphs" during 35th AAAI conference on artificial intelligence, 02-09 Feb 2021

- Satellite on "Machine learning perspectives to Complex Networks" during CCS 2020, 9 - 11 December 2020.
- Organizing committee member, International conference of Complex systems (CCS), annual conference organized by Complex systems society, December 7-12, 2020

Invited Talks and Colloquia:

- Invited Speaker, Mini-sympoisum on " Networks of coupled oscillators and maps: chimera states and beyond" during Dynamics Day Europe, Nice 23-27 August 2021.
- Invited Plenary Speaker, Dynamics Days Asia Pacific, Singapore 16-19 November 2020
- Invited Speaker at Satellite conference "Multilayer Networks" during Net Sci 2020, 21-25 September 2020
- Invited Speaker for focus session on "Topological Networks" organized at KPS annual meet, July 13-15, 2020
- 4th International Conference on Computational Intelligence and Networks (CINE 2020), 27- 29 February 2020 held at ISI Kolkata.

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).



Dr. Ankhi Roy
Associate Professor
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Dr. Ankhi Roy has done her PhD. from IIT Bombay. Her research interest lies in Heavy Flavour Charm and Beauty) Physics, Heavy Flavour being heavy, produced at the very early stages of the heavy on collisions and can be used as a probe to study different phases of the collisions. Her group is involved to study different properties of Quark Gluon Plasma through heavy flavours in proton-proton and Pb-Pb collisions with ALICE Experiment at CERN. Her group is also working in the upcoming Compressed Baryonic Matter (CBM) experiment at GSI, Germany. Presently, in this experiment, her group is contributing in the development of different tools for data analysis.

Recently, her group has joined Athena (A Totally Hermetic Electron-Nucleus Apparatus) at Electron Ion Collider (EIC) experiment at BNL, USA. This experiment is aiming at the precise understanding of the internal structure of proton and neutron. In this experiment, her group is currently engaged to develop the software and in the detector simulation. Her group is also working in the different phenomenological aspects of proton-proton and heavy ion collisions. Recently, her group has started some activity to implement Classical and Quantum Machine Learning in the High Energy Physics data analysis.

Research Highlights:

- Semi-leptonic decays of Heavy Flavour Hadrons using ALICE data.
- Electron-Hadron Correlation of Heavy Flavour hadrons study with ALICE data.
- Self-normalized yield of D^0 meson with ALICE
- Development of Cooling system of Muon Chamber (MuCH) Detector of CBM experiment
- Simulation of Electromagnetic and Hadronic Calorimeters of Athena Experiment in EIC at BNL,USA
- Application of Classical and Quantum Machine Learning in the HEP data analysis

Publications:

- S. P. Rode, P. P. Bhaduri, A. Jaiswal and A. Roy, "Hierarchy of kinetic freeze out
- parameters in low energy heavy-ion collisions", Phys. Rev. C 102, 054912 (2020),
- DOI: 10.1103/PhysRevC. 102.054912 (https://arxiv.org/abs/2004.04703)

- Sumit Kumar Kundu, Yoshini Bailung, Sudhir Pandurang Rode, Partha Pratim Bhaduri, and Ankhi Roy, "Beam energy and nuclear equation of state dependence of anisotropic flow and particle production in low energy heavy-ion collisions" , Accepted in Physical Review C (PRC) - Physical Review Journals on 2nd august 2021, (https://arxiv.org/abs/2102.05967)
- Co-author of 34 papers published by the ALICE Collaboration in 2020-2021
- Major achievements, recognitions of the faculty / students / scientists /staff of your department**:**
- PhD student Sudhir Rode awarded PhD in 2020 and two ALICE papers from his thesis work are in collaboration under IRC reviews. Currently, he has joined as Scientific Researcher in Veksler and Baldin Laboratory of High Energy Physics, Joint Institute for Nuclear Research (JINR), Dubna, Moscow.
- PhD student Yoshini Bailung presented talk titled "Measurements of heavy flavor production as a function of multiplicity with ALICE at the LHC " in International Symposium on Multi-particle Dynamics (ISMD) 2021, 16 July 2021
- PhD student Yoshini Bailung presented poster titled "Measurement of D-meson production as a function charged-particle multiplicity in pp collisions at sqrt{s} = 13 TeV with ALICE at the LHC" in Large Hadron Collider Physics (LHCP) Conference, Paris (Online) 10 June 2021
- PhD student Ravindra Singh presented poster titled "Azimuthal correlations between heavy flavour decay electrons and charged particles in pp collisions at sqrt(s) = 5.02 TeV" at LHCP conference, Paris (Online) 10 June 2021
- Analysis by Yoshini Bailung titled "Measurement of D-meson production as a function charged-particle multiplicity in pp collisions at sqrt{s} = 13 TeV with ALICE" approved in ALICE Physics Forum in April 26, 2021
- Ravindra Singh got preliminary on the topic of "Azimuthal correlations between heavy flavour decay electrons and charged particles in pp collisions at sqrt(s) = 5.02 TeV "in May 2021.
- Paper proposal by Ravindra Singh was accepted by the ALICE Physics Forum in July 2021 on the topic of "Azimuthal correlations between heavy flavour decay electrons and charged particles in pp and p-Pb collisions at sqrt(s_NN) = 5.02 TeV".
- Dr. Ankhi Roy gave an expert talk for five days Online Short Term Course on 'Software Tools & Techniques for Scientific Publications: ROOT, GNU Plot, GeoGebra' (sponsored by TEQIP-III) at Malaviya National Institute of Technology Jaipur during September 4-September 8, 2020.



Dr. Manavendra N. Mahato
Associate Professor
manav@iiti.ac.in

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. These modes play an important role in the thermalization of any perturbation in the black hole background. His research work also involves looking into many other aspects of black hole physics.

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. We are also looking at the dynamical evolution of black holes and its entropy. Studying formation of quantum extremal surfaces and their

evolution are part of the investigation towards learning black hole physics.



Dr. Raghunath Sahoo,
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Dr. Raghunath Sahoo has earned his Ph.D from Institute of Physics, Bhubaneswar and has worked as a Postdoctoral fellow in Subatech, France and 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, respectively. Dr. Sahoo was 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** and currently, he is a **CERN scientific associate at CERN**, Geneva, Switzerland. He is shouldering the responsibility of **Deputy Spokesperson of ALICE-India Collaboration**, a high-energy physics collaboration of 14-Indian universities and intuitions comprising of almost 100 scientists and engineers.

Dr. Sahoo heads the experimental high-energy physics group at IIT Indore while working in the ALICE experiment at CERN and CBM experiment at GSI, Germany, as the team leader. He is an active researcher at the Ooty Cosmic Ray Physics laboratory, a TIFR-founded laboratory. Dr. Sahoo's research interest focuses on the search for the primordial matter of Quark-Gluon Plasma, a section of high-energy nuclear physics at the energy and luminosity frontiers. He is an expert on applications of statistical mechanics and machine learning in high-energy nuclear physics, event topology studies in particle production including the light and heavy-flavor sectors.

Awards and achievements:

- Dr. Raghunath Sahoo has been elected as a **Fellow of Institute of Physics, United Kingdom (FInstP)-2020.**
- **Awarded CERN Scientific Associateship at CERN, Geneva, Switzerland-2021**
- **Member of Editorial board, Physics, MDPI, Switzerland (2020-present)**
- **Deputy Spokesperson**, ALICE-India Collaboration (2021-continuing)
- **Guest Editor, Advances in High Energy Physics, Hindawi (UK)**

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)]

Journal articles published [58]:

- Study of QCD dynamics using small systems. Suman Deb, Golam Sarwar, **Raghunath Sahoo**, and Jan-e Alam, **arXiv:1909.02837, Eur. Phys. J. A 57, 195 (2021) [Impact Factor: 3.043].**
- Estimation of Impact Parameter and Transverse Spherocity in heavy-ion collisions at the LHC energies using Machine Learning. Neelkamal Mallick, Sushanta Tripathy, Aditya Nath Mishra, Suman Deb, and **Raghunath Sahoo, arXiv:2103.01736, Phys. Rev. D 103, 094031 (2021) [Impact Factor: 5.296].**
- Bose-Einstein Condensation of pions in Proton-Proton collisions at the Large Hadron Collider using non-extensive Tsallis statistics. Suman Deb, Dushmanta Sahu, **Raghunath Sahoo,** and Anil Kumar Pradhan, **arXiv:2101.01675, Eur. Phys. J. A 57, 158 (2021) [Impact Factor: 3.043].**
- Characterizing Proton-Proton Collisions at the Large Hadron Collider using Thermal Properties. Dushmanta Sahu and **Raghunath Sahoo, arXiv:2005.12176, MDPI Physics 3, 207 (2021).**
- Study of Transverse Spherocity and Azimuthal Anisotropy in Pb-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV

using A Multi-Phase Transport Model. Neelkamal Mallick, Sushanta Tripathy, **Raghunath Sahoo,** and Antonio Ortiz, **arXiv:2008.13616, Journal of Physics G: Nuclear and Particle Physics 48, 045104 (2021) [Impact Factor: 3.534].**

- Event shape and Multiplicity dependence of Freeze-out Scenario and System Thermodynamics in Proton+Proton Collisions at √s = 13 TeV using PYTHIA8. Sushanta Tripathy, Ashish Bisht, **Raghunath Sahoo**, Arvind Khuntia, and Malavika P S **arXiv:1905.07418, Adv. in High Energy Physics Volume 2021, Article ID 8822524 (2021) [Impact Factor: 1.953].**
- Centrality dependence of Electrical and Hall conductivity at RHIC and LHC energies for a Conformal System. Bhaswar Chatterjee, Rutuparna Rath, Golam Sarwar, and **Raghunath Sahoo**, **arXiv:1908.01121, Eur. Phys. J. A 57, 45 (2021) [Impact Factor: 3.043].**
- Event Shape Engineering and Multiplicity dependent Study of Identified Particle Production in proton+proton Collisions at √s = 13 TeV using PYTHIA8. Arvind Khuntia, Sushanta Tripathy, Ashish Bisht, and **Raghunath Sahoo**, **arXiv: 1811.04213, Journal of Physics G: Nuclear and Particle Physics 48, 035102 (2021) [Impact Factor: 3.534].**
- A Baseline Study of Event-shape and Multiplicity dependence of Chemical freeze-out Parameters in Proton+Proton Collisions at √s = 13 TeV using PYTHIA8. Rutuparna Rath, Arvind Khuntia, Sushanta Tripathy and **Raghunath Sahoo**, **arXiv:1906.04047, MDPI Physics 2, 679 (2020).**
- Deciphering QCD dynamics in small collision systems using event shape and final state multiplicity at the Large Hadron Collider. Suman Deb, Sushanta Tripathy, Golam Sarwar, **Raghunath Sahoo,** and Jan-e Alam, **arXiv:2007.04194, Eur. Phys. J. A 56, 252 (2020) [Impact Factor: 3.043].**
- A New Description of Transverse Momentum Spectra of Identified Particles Produced in Proton-Proton Collisions at High Energies. Pei-Pin Yang, Fu-Hu Liu, and **Raghunath Sahoo**, **arXiv:1909.13235, Adv. in High Energy Physics, Volume 2020, Article ID 6742578, (2020) [Impact Factor: 1.953].**
- Multiplicity Dependence of Shear Viscosity, Isothermal Compressibility and Speed of Sound in pp collisions at √s = 7 TeV. Dushmanta Sahu, Sushanta Tripathy, **Raghunath Sahoo**, and Archita Rani Dash, **arXiv:2002.05054, Eur. Phys. J A 56, 187 (2020) [Impact Factor: 3.043].**
- Properties of Particle Production and System Evolution in BES-Wide Energy Range. Fu-Hu Liu, Sakina Fakhraddin, **Raghunath Sahoo**, Edward K. Sarkisyan-Grinbaum, and Bhartendu K. Singh, **Editorial (3 pages), Advances in High Energy Physics, Article ID 4206957, Volume 2020 (2020).**
- Multiplicity Dependence of J/**ψ** Production and QCD Dynamics in p+p Collisions at √s = 13 TeV. Suman Deb, Dhananjaya Thakur, Sudipan De, and **Raghunath Sahoo**, **arXiv:1808.01841, Eur. Phys. J A 56, 134 (2020) [Impact Factor: 3.043].**
- Event multiplicity, transverse momentum and energy dependence of charged particle production, and system thermodynamics in pp collisions at the Large Hadron Collider. Rutuparna Rath, Arvind Khuntia, **Raghunath Sahoo**, and Jean Cleymans, **arXiv:1908.04208, Journal of Physics G: Nuclear and Particle Physics 47, 055111 (2020) [Impact Factor: 3.534].**
- J/**ψ** Production Dynamics: Event shape, Multiplicity and Rapidity dependence in Proton+Proton Collisions at LHC energies using PYTHIA8. Anisa Khatun, Dhananjaya Thakur, Suman Deb, and **Raghunath Sahoo**, **arXiv:1909.03911, Journal of Physics G: Nuclear and Particle Physics 47, 055110 (2020) [Impact Factor: 3.534].**
- Inclusive heavy-flavour production at central and forward rapidity in Xe-Xe collisions at $\sqrt{s_{NN}}$ =5.44 TeV. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:2011.06970, Phys. Lett. B 819 (2021) 136437 [Impact Factor: 6.131].

- Pion-kaon femtoscopy and the lifetime of the hadronic phase in Pb-Pb collisions at $\sqrt{s_{NN}}$ = 2.76 TeV. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:2007.08315, Phys. Lett. B 813 (2021) 136030 [Impact Factor: 6.131].
- Centrality dependence of J/**ψ** and (2S) production and nuclear modification in p-Pb collisions at $\sqrt{s_{NN}}$ = 8.16 TeV. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:2008.04806, Journ. of High Eng. Phys. 02 (2021) 002 [Impact Factor: 5.831].
- Transverse-momentum and event-shape dependence of D-meson flow harmonics in Pb-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:2005.11131, Phys. Lett. B 813 (2021) 136054 [Impact Factor: 6.131].
- Elliptic flow of electrons from beauty-hadron decays in Pb-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:2005.11130, Phys. Rev. Lett. 126 (2021) 162001 [Impact Factor: 9.161].
- First measurement of quarkonium polarization in nuclear collisions at the LHC. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:2005.11128, Phys. Lett. B 815 (2021) 136146 [Impact Factor: 6.131].
- Elliptic and triangular flow of (anti)deuterons in Pb-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV. S. Acharya,.....,**R. Sahoo** et al., ALICE Collaboration, arXiv:2005.14639, Phys. Rev. C 102 (2020) 055203 [Impact Factor: 3.308].
- Production of ω mesons in pp collisions at $\sqrt{s}$ = 7 TeV. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:2007.02208, Eur. Phys. J. C 80 (2020) 1130 [Impact Factor: 5.436].
- Measurement of the low-energy antideuteron inelastic cross section. S. Acharya,.....,**R. Sahoo** et al., ALICE Collaboration, arXiv:2005.11122, Phys. Rev. Lett. 125 (2020) 162001 [Impact Factor: 9.161].
- Multiplicity dependence of π, K, and p production in pp collisions at $\sqrt{s}$ = 13 TeV. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:2003.02394, Eur. Phys.J. C 80 (2020) 693 [Impact Factor: 5.436].
- J/**ψ** elliptic and triangular flow in Pb-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:2005.14518, Journ. of High Eng. Phys. 10 (2020) 141 [Impact Factor: 5.831].
- Z-boson production in p-Pb collisions at $\sqrt{s_{NN}}$ = 8.16 TeV and Pb-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:2005.11126, Journ. of High Eng. Phys. 09 (2020) 076 [Impact Factor: 5.831].
- Multiplicity dependence of J/**ψ** production at midrapidity in pp collisions at $\sqrt{s}$ = 13 TeV. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:2005.11123, Phys. Lett. B 810 (2020) 135758 [Impact Factor: 6.131].
- Search for a common baryon source in high-multiplicity pp collisions at the LHC. S. Acharya,.....,**R. Sahoo** et al., ALICE Collaboration, arXiv:2004.08018, Phys. Lett. B 811 (2020) 135849 [Impact Factor: 6.131].
- Measurement of nuclear effects on $\psi\rm{(2S)}$ production in p-Pb collisions at $\sqrt{s_{NN}}$ = 8.16 TeV. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:2003.06053, Journ. of High Eng. Phys. 07 (2020) 237 [Impact Factor: 5.831].
- Probing the effects of strong electromagnetic fields with charge-dependent directed flow in Pb-Pb collisions at the LHC. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:1910.14406, Phys. Rev. Lett. 125 (2020) 022301 [Impact Factor: 9.161].
- Global baryon number conservation encoded in net-proton fluctuations measured in Pb-Pb collisions at $\sqrt{s_{NN}}$ = 2.76 TeV. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:1910.14396, Phys. Lett. B 807 (2020) 135564 [Impact Factor: 6.131].
- (Anti-)Deuteron production in pp collisions at $\sqrt{s_{NN}}$ =13 TeV. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:2003.03184, Eur. Phys.J. C 80 (2020) 889 [Impact Factor: 5.436].
- $\rm{K}^{*}(\rm{892})^{0}$ and $\phi(1020)$ production at midrapidity in pp collisions at $\sqrt{s}$ = 8

TeV. S. Acharya,.....,**R. Sahoo** et al., ALICE Collaboration, arXiv:1910.14410, Phys. Rev. C 102 (2020) 024912 [Impact Factor: 3.308].

- Non-linear flow modes of identified particles in Pb-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:1912.00740, Journ. of High Eng. Phys. 06 (2020) 147 [Impact Factor: 5.831].
- Jet-hadron correlations measured relative to the second order event plane in Pb-Pb collisions at $\sqrt{s_{NN}}$ = 2.76 TeV. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:1910.14398, Phys. Rev. C 101 (2020) 064901 [Impact Factor: 3.308].
- Coherent photoproduction of ρ^{0} vector mesons in ultra-peripheral Pb-Pb collisions at $\sqrt{s_{NN}}$ = 5.02$ TeV. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:2002.10897, Journ. of High Eng. Phys. 06 (2020) 035 [Impact Factor: 5.831].
- Υ production in p-Pb collisions at $\sqrt{s_{NN}}$ = 8.16 TeV. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:1910.14405, Phys. Lett. B 806 (2020) 135486 [Impact Factor: 6.131].
- Measurement of electrons from heavy-flavour hadron decays as a function of multiplicity in p-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:1910.14399, Journ. of High Eng. Phys. 02 (2020) 077 [Impact Factor: 5.831].
- Evidence of rescattering effect in Pb-Pb collisions at the LHC through production of $\rm{K}^{*}(892)^{0}$ and $\phi(1020)$ mesons. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:1910.14419, Phys. Lett. B 802 (2020) 135225 [Impact Factor: 6.131].
- Longitudinal and azimuthal evolution of two-particle transverse momentum correlations in Pb-Pb collisions at $\sqrt{s_{NN}}$ = 2.76 TeV. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:1910.14393, Phys. Lett. B 804 (2020) 135375 [Impact Factor: 6.131]}.
- Measurement of the (anti-)^{3}He elliptic flow in Pb-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:1910.09718, Phys. Lett. B 805 (2020) 135414 [Impact Factor: 6.131].
- Global polarization of Λ and $\overline{\Lambda}$ hyperons in Pb-Pb collisions at the LHC. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:1909.01281, Phys. Rev. C 101 (2020) 044611 [Impact Factor: 3.308].
- Measurement of prompt D^0, D$^+$, D^{*+}, and D^+_s production in p$-$Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV. S. Acharya,.....,**R. Sahoo** et al., ALICE Collaboration, arXiv:1906.03425, Journ. of High Eng. Phys. 12 (2019) 092 [Impact Factor: 5.831].
- Measurement of strange baryon-antibaryon interactions with femtoscopic correlations. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:1903.06149, Phys. Lett. B 802 (2020) 135223 [Impact Factor: 6.131].
- Centrality and transverse momentum dependence of inclusive J/**ψ** production at midrapidity in Pb-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV. S. Acharya,.....,**R. Sahoo** et al., ALICE Collaboration, arXiv:1910.14404, Phys. Lett. B 805 (2020) 135434 [Impact Factor: 6.131].
- Production of (anti-)^{3}He and (anti-)^{3}H in p-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:1910.14401, Phys. Rev. C 101 (2020) 044906 [Impact Factor: 3.308].
- Underlying Event properties in pp collisions at $\sqrt{s}$ = 13 TeV. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:1910.14400, Journ. of High Eng. Phys. 04 (2020) 192 [Impact Factor: 5.831].
- Production of charged pions, kaons and (anti-)protons in Pb-Pb and inelastic pp collisions at $\sqrt{s_{NN}}$ = 5.02 TeV. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:1910.07678, Phys. Rev. C 101 (2020) 044907 [Impact Factor: 3.308].
- Measurement of Λ(1520) production in pp collisions at $\sqrt{s}$ = 7 TeV and p-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:1909.00486, Eur. Phys.J. C 80 (2020) 160 [Impact Factor: 5.436].
- Scattering studies with low-energy kaon-proton femtoscopy in proton-proton collisions at the LHC.

S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:1905.13470, Phys. Rev. Lett. 124 (2020) 092301 [Impact Factor: 9.161].

- Exploration of jet substructure using iterative declustering in pp and Pb-Pb collisions at LHC energies. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:1905.02512, Phys. Lett. B 802 (2020) 135227 [Impact Factor: 6.131].
- Higher harmonic non-linear flow modes of charged hadrons in Pb-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:2002.00633, Journ. of High Eng. Phys. 05 (2020) 085 [Impact Factor: 5.831].
- Investigation of the p-Σ^{0} interaction via femtoscopy in pp collisions. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:1910.14407, Phys. Lett. B 805 (2020) 135419 [Impact Factor: 6.131].
- Measurement of electrons from semileptonic heavy-flavour hadron decays at midrapidity in pp and Pb-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:1910.09110, Phys. Lett. B 804 (2020) 135377 [Impact Factor: 6.131].
- Multiplicity dependence of (multi-)strange hadron production in proton-proton collisions at $\sqrt{s}$ = 13 TeV. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:1908.01861, Eur. Phys.J. C 80 (2020) 167 [Impact Factor: 5.436].
- Studies of J/ψ production at forward rapidity in Pb-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV. S. Acharya,....., **R. Sahoo** et al., ALICE Collaboration, arXiv:1909.03158, Journ. of High Eng. Phys. 2002 (2020) 041 [Impact Factor: 5.831].

Any other major events / development:

- Deputy Spokesperson, ALICE-India Experimental Collaboration [@CERN, Geneva, Switzerland] (2021-continuing).
- Associate Dean, International Affairs and Outreach, IIT Indore (27 Nov. 2020-continuing).
- Member, Expert Committee for Kishore Vaigyanik Protsahan Yojana (KVPY), IISER Bhopal- 2020.

COVID related activities:

- A new logistic growth model applied to COVID-19 fatality data.
  S. Triambak, D.P. Mahapatra, N. Mallick and **Raghunath Sahoo, (Epidemics: Under Review).**
- Given several national and international webinars during Covid-19 time for popularization of science.



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:

- S. Chaudhuri, D. Salas, V. Srihari, E. Welter, I. Karaman, and **P. A. Bhobe**, "Half metallicity in Cr substituted Fe_2TiSn", Nature Sci. Rep. Vol. 11, pp. 524 (2021)

- S. Gowthamaraju, U. P. Deshpande, and **P. A. Bhobe**, "Augmentation of the thermoelectric

properties of polycrystalline Tin Selenides via formation of SnSe/$SnSe_2$ composites" J. Mater. Sci.: Mater. Electron. Vol. 32, pp. 11781 (2021)

- S. Gowthamaraju, U. P. Deshpande, and **P. A. Bhobe**, "Understanding the role of defects in influencing thermoelectric properties of SnSe", Curr. Appl. Phys. Vol. 24, 19 (2021)

Research Highlights:

Over the past one year, Dr. Bhobe's research group carried out a thorough study of the magnetic and structural properties of Heulser alloys from the point of view of is application into spintronic technology, and demonstrated the presence of half-metallic ground state in one such composition prepared in her laboratory. Thermoelectric application of composite Chalcogenides and engineering of such materials with an aim to reduce its thermal conductivity, was also explored. In another study, the defects formed in Chalcogenides was investigated and a fundamental understanding of role played by them in controlling the figure – of – merit of the thermoelectrics was understood. This work led to submission of two PhD thesis and one Masters thesis at IIT Indore.

Research Projects:

- Half- Metallic Heusler Alloys for Spintronics Applications (P.I. funded by SERB, GOI).
- DST-DAAD IIT Indore – LUH, Germany joint project (Co-P.I. funded by DAAD)

Talks / Webinars during COVID related lockdown:

- Faculty Development Program on Current Trends on Physical Sciences on July 24, 2020 organized by IAPT Lucknow chapter and Christ Church College, Kanpur.
- Science Lecture Series on August 29, 2020 organized by Dept. of Physics, South Bihar Central University, Gaya.
- Spintronics Workshop on September 9, 2020 organized by Mepco Schlenk Engineering College, Sivakasi.
- Physics Fest on Friday June 4, 2021 organized by SICA College, Indore.



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.

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Selected Publications:

- Manushree Tanwar, Devesh K. Pathak, Anjali Chaudhary, Alexander S. Krylov, Herbert Pfnür, Ashutosh Sharma, Byungmin Ahn, Sangyeob Lee and Rajesh Kumar, Pseudo-Anomalous Size-Dependent Electron–Phonon Interaction in Graded Energy Band: Solving the Fano Paradox, J. Phys. Chem. Lett. 12, 2044 (2021).
- Rajesh Kumar, Devesh Kumar Pathak and Anjali Chaudhary, Current status of some electrochromic materials and devices: A brief review, J. Phys. D, 2021 (In Press)
- Chanchal Rani, Manushree Tanwar, Suchita Kandpal, Tanushree Ghosh, Devesh K. Pathak, Anjali

Chaudhary, Rajesh Kumar Predicting Raman line shapes from amorphous silicon clusters for estimating short-range order, J. Raman. Spectroscopy-2021

- Devesh K. Pathak, Anjali Chaudhary, Manushree Tanwar, Suchita Kandpal, Tanushree Ghosh, Chanchal Rani and Rajesh Kumar "Low voltage color modulation in hy- drothermally grown Ni-Co nanoneedles for electrochromic application" IET Nanodi- electrics (Wiley), In Press (2021)
- Anjali Chaudhary, Devesh K. Pathak, Manushree Tanwar, Suchita Kandpal, Tanushree Ghosh, Chanchal Rani and Rajesh Kumar "Improved Ionic Solid/ Viologen Hybrid Electrochromic Device Using Pre-bleached Prussian-Blue Electrode" IET Nanodi- electrics (Wiley), In Press (2021)
- Devesh K. Pathak, Anjali Chaudhary, Manushree Tanwar, U.K. Goutam, Puspen Mon- dal and Rajesh Kumar, "Nickel Cobalt Oxide Nanoneedles for Electrochromic Glucose Sensors" ACS Appl. Nano Mater., 04, 2143 (2021)
- Suchita Kandpal, Tanushree Ghosh, Meenu Sharma, Devesh K. Pathak, Manushree Tanwar,Chanchal Rani, Ravi Bhatia, I. Sameera Anjali Chaudhary andRajesh Kumar,"Multi-walled carbon nanotubes doping for fast and efficient hybrid solid state electrochromic device"Appl. Phys. Lett. In Press (2021)119.
- Tanushree Ghosh, Suchita Kandpal, Devesh K. Pathak, Manushree Tanwar, Chanchal Rani,Anjali Chaudhary andRajesh Kumar,"Aloe-Vera Flower Extract as Botanical ResistiveMemory Element: A Natural Memristor!"ACS Appl. Electron. Mater., In Press (2021)

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.

His recent interest includes addressing science and technological problems through Indian Knowledge System. As a pert of this he devotes research towards identifying natural components in herbs for fabricating electronic and optical devices.

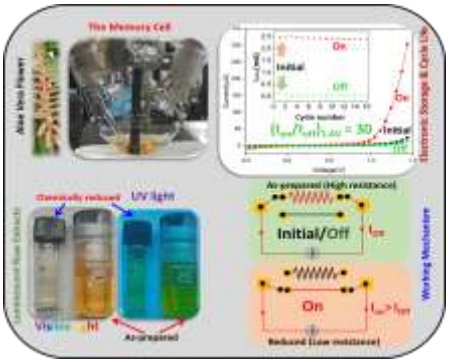
Events and Seminars Organized:

- Demonstration in outreach activity on Science Day-2021.
- Popular Science lecture-Rashtriya Aavishkar Abhiyan-2021

Research Projects/Achievements:

- **Subject Editor-IET Nanodielectrics (Wiley)-(2020-2022)**
- **Fabrication and Investigation of Electrochromic Electrodes for Improving Device Performance** (Funded ~ 30Lakhs INR by SERB, GOI). (2020-2022)

Covid19 Related activity: Published review article, on the origin of COVID Spread, in collaboration with Dr H.C. Jha (BSBE-IIT Indore) and got pan-India media coverage.



Research highlighting "Herbal Electronics"

- **Figure:** Aloe Vera Flower and its raw extract under natural and UV lights along with the "memory cell". Right panel shows the performance of the cell along with the operation mechanism.
- **Other details:** Due to its importance the above work got wide pan-India electronic, digital and print media coverage.



Mention by Honorable Minister of Education:
Glimpse of Electronic Media Coverage (DD News-MP)



TIMES CITY

Aloe vera 'herbal memory' can store electronic data

घृतकुमारी के फूल में होती है इलेक्ट्रानिक मेमोरी, आइआइटी इंदौर में हुआ शोध

शोध: एलोवेरा के फूलों में मिले खास रसायन हर्बल मेमोरी चिप में कर सकते हैं मदद

Indore News: एलोवेरा के फूलों में मिले खास रसायन, 'हर्बल मेमोरी चिप' की खुल सकती है राह

Glimpse of print media Coverage



Dr. Sudeshna Chattopadhyay
Associate Professor
sudeshna@iiti.ac.in

Dr. Sudeshna Chattopadhyay (Bandyopadhyay) is an Associate Professor in Discipline 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 (2020-2021):

- "Recent Progress in Al, K and Zn-ion Batteries: Experimental and Theoretical Viewpoints"
- Dipayan Pal, Sudip Chakraborty,* and **Sudeshna Chattopadhyay***, ***Energy Technology*, 2100382** (pg.1-22) (2021) .
- Book chapter: "Surface and Interface Effects: Properties of Nanostructured ZnO" by Dipayan Pal and **Sudeshna Chattopadhyay*** (of book "Nanostructured Zinc Oxide: Synthesis, Properties and Applications"), ***Elsevier***, 2021 (accepted), **Paperback ISBN:** 9780128189009, Published date: August 13, 2021 (or expected release date: August 13, 2021).
- "Target-Specific Superparamagnetic Hydrogel with Excellent pH Sensitivity and Reversibility: A Promising Platform for Biomedical Applications"
- Rinki Singh, Dipayan Pal, and **Sudeshna Chattopadhyay***, ***ACS Omega*, 5**, 21768−21780 (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).
- "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).

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, Wastewater treatment and Environmental Remediation.

Events and Seminars Organized:

- **Invited Talk** in the *Science and Technology for the New Age: Acquisition, Analyses and Adaptation,* March 4-5, 2021. The Agri-Tech conference is jointly being organized by IIT Delhi with University of Alberta and is funded by Ministry of Education, Govt of India and the Shastri Indo-Canadian Institute (SICI) as part of its Indo-Canada bilateral programs; Title: "Effect of Interface Engineering - Rechargeable Thin Film Batteries".
- **Lectures** in AICTE sponsored Faculty Quality Improvement Program (QIP), a short-term course on *Computationally Designing of Materials for Materials Genome,* March 1-6, 2021, IIT Indore, India.
- **Lectures** in AICTE sponsored Faculty Quality Improvement Program (QIP), a short-term course on *Advanced Technology for Materials Engineering"*, Jan 19- 24, 2021, IIT Indore, India.
- **Coordinator and Lecturer** of TEQIP-III Sponsored Faculty Development Program (FDP), A Short-Term Course on *Advanced Energy Science and Technology,* Dec 7-9, 2020, IIT Indore, India.
- **Invited Talk** in the *4th International Conference on Soft Materials, ICSM-2020, Dec13-18, 2020,* Title: "Soft-matter Nanocomposites and its Applications: Effect of interface to tune structure-properties", India.
- **Lectures** in TEQIP-III Sponsored Faculty Development Program (FDP), A Short-Term Course on course on *Advanced Technology for Materials Physics and Engineering*, Nov 16- 20, 2020, IIT Indore, India.
- **Invited Talk** in the *2nd Indian Materials Conclave and 31st Annual General Meeting of MRSI", Feb 11-14, 2020, Kolkata, India.* Title: "Effect of Surface and Interfaces: Tailoring Structural and Electronic Properties of Semiconductors and its Applications".

Research Projects:

- "Solid-state thin-film rechargeable batteries with solid electrolyte to achieve a wider electrochemical/thermal stability, better safety and long cycle lives with good capacity retention". Funding agency: Science and Engineering Research Board (SERB). Dec 2020-Dec 2023.
- IIT Indore and LU Hannover Partnership in Physics, Chemistry, Bio Science & Computational Science. Funding agency: 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. Dr. Sudeshna Chattopadhyay is one of the Investigators from Indian side among 6 Indian and 10 German academicians.
- "Structural orientation effects of new low dimensional hybrid perovskites on their physical properties", as Co-PI in collaboration with TIFR, India. Funding agency: Science and Engineering

Research Board (SERB). Jan 2020- Dec 2022.

- DST-FIST grant proposal for Raman Spectrophotometer from Department of Physics, IIT Indore, as a contributor from the Department. Funding agency: DST-FIST. SR/FST/PSI-225/2016



Dr. Somaditya Sen
Associate Professor
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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 Electro communications. 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 **Indian Institute of Technology Indore ll 127 ll**
- **Annual Report 2020**
- 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 Srimanta Pakhira
Assistant Professor
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Dr. Srimanta Pakhira is working as a Ramanujan Fellow in the Discipline 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, Calcutta, 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.

Selected Publications (2020-2021, 3 publications):

- **Pakhira, Srimanta,**† Dharmarwardana, M.,† Welch, R. P., Narvaez, C. C., Luzuriaga, M. A., Arimilli, B. S., McCandless, G. T., Fahimi, B., Mendoza-Cortes, J. L., Gassensmith, J. J. **2021** Rapidly Reversibly Organic Crystalline Switch for Conversion of Heat into Mechanical Energy**.** ***Journal of The American Chemical Society (JACS)*****,** 143, pp 5951–5957**, Impact Factor: 15.419.** https://doi.org/10.1021/jacs.1c01549; **†Equal Contribution: First Authorship.**
- Sinha, N., **Pakhira, Srimanta,** 2021** Tunability of the Electronic Properties of Covalent Organic Frameworks. ***ACS Applied Electronic Materials*****, 3, pp. 720-732.** https://doi.org/10.1021/acsaelm.0c00867**. ** Corresponding Author**
- Puttaswamy, R., Nagaraj, R., Kulkarni, P., Beere, H.K., Upadhyay, S.N., Balakrishna, R.G., Sanna Kotrappanavar, N., **Pakhira, S.**** and Ghosh, D.,** **2021.** Constructing a High-Performance Aqueous Rechargeable Zinc-Ion Battery Cathode with Self-Assembled Mat-like Packing of Intertwined Ag (I) Pre-Inserted V3O7· H2O Microbelts with Reduced Graphene Oxide Core. ***ACS Sustainable Chemistry & Engineering*****. 9, 3985-3995, Impact Factor: 7.632.**

Research Highlights:

Dr. Pakhira's research group is active in Computational Materials Science and Engineering, Condensed Matter Theory, Electronic Structure Theory, Semi-conductor Physics, Magnetism, Physics of Novel Solar Cells, Renewable Energy Technology, Perovskite, 2D TMDs, H_2 evolution, Electrocatalysis, O_2 Reduction, Porous Materials and Their Applications, CNT, Alkali-ion Battery, H_2-Storage, CO_2 capture,

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.

Active Research Projects (2020-2021):

S.No	PI (& Co-PI, if any)	Title of the Project	Funding Agency & Duration	Project's cost (in rupees)
1	PI	***Construction of Porous Metal-Organic Frameworks (MOFs) and Covalent-Organic Frameworks (COFs) and Its Applications***	DST-SERB, Govt. of India, 2018-2023	135 Lakhs
2	PI	***Development of New Two Dimensional Layer Structure Materials and Technique for Water Splitting: Applications in Hydrogen and Oxygen Evolution Reactions***	DST-SERB, Govt. of India, 2019-2022	53.14 Lakhs

Theoretical Condensed Matter Physics And Advanced Computational Materials Science Laboratory

- **Dr Pakhira organised a Five Day Online Faculty Development Program through the TQIOP-III sponsored Short-Term Course on "Advanced Technology for Materials Physics and Engineering" during 16th to 20th November 2021.**
- **Dr Pakhira organised a Six Day Online Faculty Development Program through the AICTE sponsored Quality Improvement Program (QIP) Short-Term Course on "Advanced Technology for Materials Engineering" during 19th to 24th January 2021.**

Achievements/Accomplishments (affiliated to IIT Indore): ***(April 2020-March 2021 at IIT Indore)***

- Total No. of Short term courses: 02
- Total No. of Active Projects: 02
- Total No. of Journal articles: 09
- Total No. of Books (edited): 02 (Book Chapter)



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.

Dr. Dipankar Das
Assistant Professor
d.das@iiti.ac.in

Selected Publications (Year 2020)

- 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

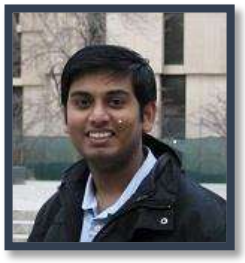
symmetries that can produce predictive textures for the neutrino Majorana mass matrix and thus can provide correlated LFV signals. Apart from this, he also works on the extensions of the Scotogenic model that can provide a coherent connection between the neutrino mass and Dark Matter.

Funded Project(s):

- "Exploring flavor models in the light of the Higgs precision data" funded by DST SERB (Nov, 2020 to Oct, 2022).

Short term course(s):

- QIP course on "Statistical Methods in Physical Science and Engineering" (Dec 7-12, 2020). (Co-instructor).



Dr. Debajyoti Sarkar obtained his PhD. from the City University of New York (CUNY), USA and completed his first postdoc jointly from the Ludwig Maximilians University (LMU) and from the Max Planck Institute (MPI) in Munich, Germany. He did his second postdoc from the University of Bern in Switzerland. Before joining IIT Indore he was a visiting scholar at the Institute for Advanced Study (IAS), Tsinghua University in Beijing, China.

Dr. Debajyoti Sarkar
Assistant Professor
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Research highlights:

Dr. Debajyoti Sarkar's current 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 hole physics, condensed matter and quantum information theory.

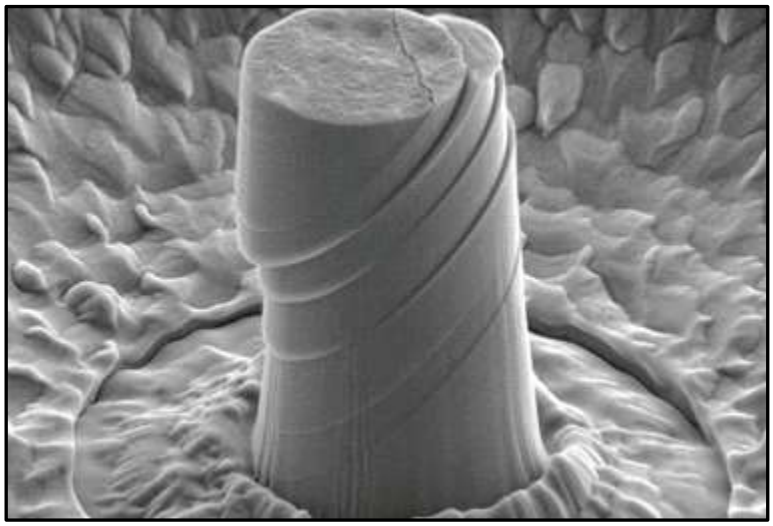
Latest publications from last year:

- Daniel Kabat, Gilad Lifschytz, Phuc Nguyen and Debajyoti Sarkar.
  ``Light-ray moments as endpoint contributions to modular Hamiltonians,''
  Accepted for publications in JHEP.
- Debajyoti Sarkar and Manus Visser
  ``The first law of differential entropy and holographic complexity''
  JHEP **11** 004 (2020)
- Daniel Kabat, Gilad Lifschytz, Phuc Nguyen and Debajyoti Sarkar.
  ``Endpoint contributions to excited-state modular Hamiltonians,''
  JHEP **12** 128 (2020).

Covid-19 related activities:

- Member of departmental level committee to provide specific and detailed guidelines for restarting the activities after the lockdown. Committee formed on June 2nd, 2020.

Department of Metallurgy Engineering and Materials Science



From the HOD's Desk:



Dr. Vinod Kumar
Assistant Professor

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 and 1 Ramanujan fellow. 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 discipline 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



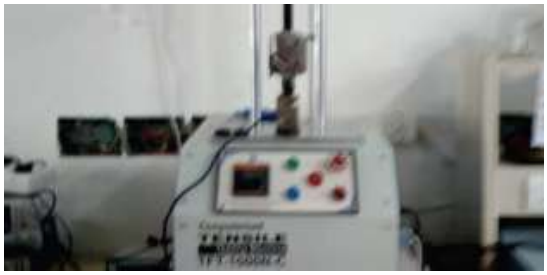
- Arc Melting



- Pulsed Laser Deposition



- GMAW based Wire Arc Additive Manufacturing



- Straining Setup for SMA

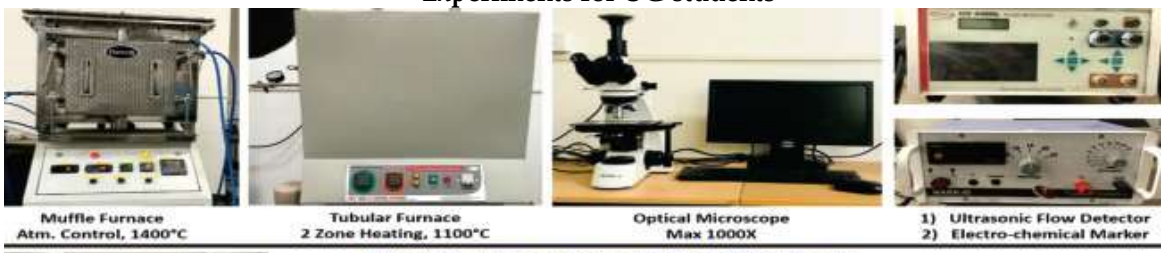


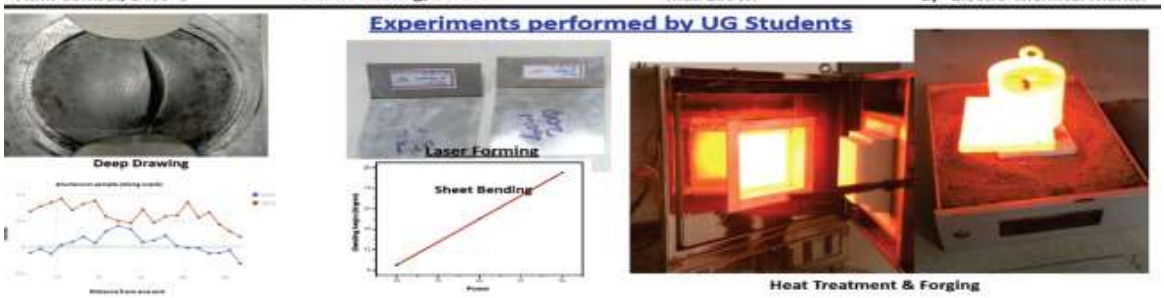
- Thermal Evaporation



- Optical Microscope

Experiments for UG students







- Tube Furnace

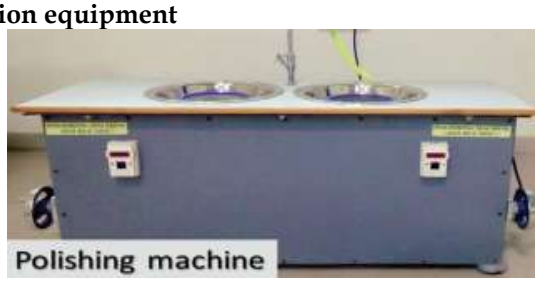


Polishing Machine

Specimen preparation equipment



- High speed saw



- Polishing machine

Mechanical testing equipment



- Automatic Ball Indenter



- Tensile testing m/c



- Impact testing m/c

Metallurgy Engineering & Materials Science (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 discipline 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:

- Short term courses: 15
- Workshops: 2
- Active Projects: 24
- Awards: 8
- Journal articles: 90
- Book (edited): 3

Awards and Recognitions:

- 'Chinese Journal of Physics' Elsevier publishers -- **Recent Impact Factor = 3.237** (Editor**: Dr. Rupesh Devan,** MEMS faculty)

- **Dr. Rupesh Devan** was honored as Guest Editor --'*Proceeding of International Conference on Materials & Environmental Science*' in *Materials Today: Proceedings, Elsevier, (2020).*

- **Dr. S.S. Hosmani was invited Resource Person** for Online Lecture on "*Boronizing of Steels*" organized by ASM International India Chapter, India. (April 03, 2021).

- **Dr. S.S. Hosmani was invited Resource Person** for Online 5 Days Short Term Course (STC) on *Advances in Materials Manufacturing Processes and Properties*, Malaviya National Institute of Technology, Jaipur, India. (July 10, 2020).

- **Dr. Eswar Prasad's group received Best presentation award**: SICE 2020 (December 11-13 & 18-20, IIT Bombay) (K. P. Raineesh, K. Sairam, K. Rajesh, K. Eswar Prasad, Understanding deformation response of Mg underneath the indentation)

- **Dr. Ajay Kushwaha's group received Best paper Award:** 5NANO-2021; Organized by IEEE Photonics Society Student Chapter, Mangalam College of Engineering, Kerala.

Faculty Profile : Department of Metallurgy Engineering and Materials Science



Dr. Parasharam M. Shirage
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Dr. Parasharam M. Shirage did his PhD. from Shivaji University, Kolhapur, India; and 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

Publications (2020-2021):

Sr. No.	Author(s)	Title	Name of the Journal	Year, Vol., Page	Impact Factor	DOI	Status (Published /Accepted)
1	Manikandan Palanisamy, Boddu Reddy, Rami Venkata, **Parasharam Shirage**, Vilas Pol	Discharge State of Layered P2-Type Cathode Reveals Unsafe than Charge Condition in Thermal Runaway Event for Sodium-ion Batteries	**ACS Applied Materials and Interfaces**	**2021**	**8.758**		**Just Accepted**
2	Mahesh Verma, Lichchhavi, **Parasharam M. Shirage***	"Electrodeposited Nanostructured Flakes of Cobalt, Manganese and Nickel based Sulfide (CoMnNiS) for Electrocatalytic Alkaline Oxygen Evolution Reaction (OER)	**Journal of Materials Science: Materials in Electronics**	2021	2.220	10.1007/s 10854-021-05860-3	Accepted
3	Asha Panghal, Yogendra Kumar, PK Kulriya, **Parasharam M Shirage,** NL Singh	Structural assessment and irradiation response of $La_2Zr_2O_7$ pyrochlore: Impact of irradiation temperature and ion fluence	**Journal of Alloys and Compounds**	2021, 862, (158556)	4.650	doi.org/10.1016/j.jallcom.2020.158556 https://doi.org/10.1016/j.jallcom.2020.158556	Published
4	Lichchhavi, Hyunju Lee,	Transformation of Battery to High	**Langmuir**	2021, 37(3),	3.557	doi.org/10.1021/ac	Published

	Yoshio Ohshita, Amrendra K Singh, **Parasharam M Shirage**	Performance Pseudocapacitor by the Hybridization of $W_{18}O_{49}$ with RuO_2 Nanostructures		1141-1151		s.langmuir.0c03056	
5	Parameshwar R Chikate, Alfa Sharma, Sachin R Rondiya, Russell W Cross, Nelson Y Dzade, **Parasharam M Shirage,** Rupesh S Devan	Hierarchically interconnected ZnO nanowires for low-temperature-operated reducing gas sensors: experimental and DFT studies	**New Journal of Chemistry**	2021, 45(3), 1404-1414	3.288	doi.org/10.1039/D0NJ05231K	Published
6	Yogendra Kumar, Alfa Sharma, Kushal Mazumder, **Parasharam M Shirage**	Engineering the opticaland magnetic properties of Zn doped $CoFe_2O_4$ nanoparticles	**AIP Conference Proceedings**	2020, 2265(1), 030103	0.415	doi.org/10.1063/5.0016840	Published
7	Rukshana Pervin, Manikandan Krishnan, Sonachalam Arumugam, **Parasharam M Shirage**	Disordering Induced Second Magnetization Peak Effect and the Vortex Pinning Mechanism in $V_{0.0007}NbSe_2$ Single Crystal	**Journal of Superconductivity and Novel Magnetism**	2020, 33, 2679-2689	1.244	DOI:10.1007/s10948-020-05542-x	Published
8	N Kitchamsetti, YR Ma, **PM Shirage,** RS Devan	Mesoporous perovskite of interlocked nickel titanate nanoparticles for efficient electrochemical supercapacitor electrode	**Journal of Alloys and compounds**	2020, 833, 155134	4.650	doi.org/10.1016/j.jallcom.2020.155134	Published
9	Rukshana Pervin, Manikandan Krishnan, Sonachalam	Second magnetization peak effect and the vortex phase diagram of V0.	**Journal of Magnetism and Magnetic Materials**	2020, 507, 166817(1-8)	2.717	doi.org/10.1016/j.jmmm.2020.166817	Published

	Arumugam, **Parasharam M Shirage**	0015NbSe2 single crystal					
10	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**	2020, 6(4), 1909-1919	4.152	doi.org/10.1021/acsbiomaterials.9b01791	Published
11	Kushal Mazumder, M.K.Chattopadhyay & **Parasharam M. Shirage***	Electrical and Magnetic Properties of Copper-Intercalated Topological Insulator Bi2Se3 Single Crystal	**Journal of Superconductivity and Novel Magnetism**	2020, 33, 847–857	1.244	DOI:10.1007/s10948-019-05271-w	Published
12	K. Manikandan, Rukshana Pervin, C. Saravanan, M. Sathiskumar, Nirman Chakraborty, **Parasharam M. Shirage**, Swastik Mondal, Velaga Srihari, Himanshu Kumar Poswal and S. Arumugam	Influence of pressure on the transport, magnetic, and structural properties of superconducting Cr0.0009NbSe2 single crystal	**RSC Advances**	2020, 10, 13112-13125	3.119	doi.org/10.1039/C9RA09603E	Published
13	Manojit Pusty and **Parasharam M. Shirage***	Gold nanoparticle–cellulose/PDMS nanocomposite: a flexible dielectric material for harvesting mechanical energy	**RSC Advances**	2020, 10, 10097-10112	3.119	doi.org/10.1039/C9RA10811D	Published
14	Rukshana Pervin, Abyay	Study of transport properties in Se-deficient and Fe-	**Journal of Materials Science**	2020, 55, 250-262	3.553	https://doi.org/10.1007/s108	Published

	Ghosh, Haranath Ghosh, **Parasharam M Shirage***	intercalated $NbSe_2$ single crystals: experiment and theory				53-019-04002-9	
15	Rukshana Pervin, Manikandan Krishnan, Sonachalam Arumugam, **Parasharam M. Shirage***	Disordering induced second magnetization peak effect and the vortex pinning mechanism in $V_{0.0007}NbSe_2$ single crystal	**Journal of Superconductivity and Novel Magnetism**	2020, 33, 2679–2689	1.244	DOI:10.1007/s10948-020-05542-x	Published

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 TI'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.

He has delivered many invited talks at national and international level during AY 2020-21. He has successfully guided 6 PhD and 3 master students to complete their degree in AY 2020-21.

Sl. No.	**Name of the student**	**Title of the thesis**	**Year and Month of completion**
1	Dr. Kushal Muzumder	Multifunctional Applications of Single Crystaland Nanomaterials of Topological Insulator Bi2Se3	Completed in May 2020
2	Dr. Manojit Pusty	Mechanical Energy Harvesting Using Reduced Graphene Oxide Based Nanocomposites	Completed in June 2020
3	Dr. Ms. Ruksana Pervin	Single Crystal Growth And Physical Properties Characterization of NbSe2Superconductor	Completed in September2020
4	Dr. Ms. Lichchhavi	Electrochemical energy storage and glucosesensing applications of transition metal oxidenano materials	Completed in January 2021
5	Dr. Alfa Sharma	Synthesis and characterization of binary and ternary metal oxide nanostructures for gas and humidity sensing applications	Completed in January 2021
6	Mr. Ramewshar Lal Kumawat	Na Pure Based Electrodes for Molecular Electronics	Submitted thesis April2021

Research Projects (2021):
Incubated a company to manufacture "Sustainable, Engineered Sodium-ion Batteries for Renewable Energy Storage" MEMS Govt of India grant 18 Lakh INR.



Dr. Rupesh S. Devan
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Dr. Rupesh S. Devan is an Associate Professor (since Dec. 2018) in the Department of Metallurgy Engineering and Materials Science, Indian Institute of Technology Indore, India. He has joined IIT Indore as Assistant Professor in Mar. 2017. He post-graduated in Physics (Materials Science) and received his 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 Dong 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). After that, he moved to the Central University of Punjab (2016) as Associate Professor. He is the Editor of the 'Chinese Journal of Physics (Elsevier, Since Jan. 2018).

He has published a book on 'Application of one-dimensional nanomaterials (Am. Scientific Publishers)'. 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 and conversion, and photo-active materials. In his research field, he has published 1 book, 2 book chapters, and 105 research articles in SIC journals (Citation: > 4575, h index: 41, and i10-index: 76).

Selected Publications (2020-2021, 3 publications):

- N. Kitchamsetti, M. S. Ramteke, S. R. Rondiya, S. R. Mulani, M. S. Patil, R. W. Cross, N. Y. Dzade, and **R. S. Devan***, "DFT and experimental investigations on the photocatalytic activities of NiO nanobelts for removal of organic pollutants" ***(J. Alloys and Compounds 855 (2021) 157337).*** (**DOI:** 10.1016/j.jallcom.2020.157337)
- M. S. Patil, N. Kitchamsetti, S. R. Mulani, S. R. Rondiya, N. G. Deshpande, R. A. Patil, R. W. Cross, N. Y. Dzade, K. K. Sharma, P. S. Patil, Y. R. Ma, H. K. Cho, and **R. S. Devan**,* "Photocatalytic behavior of $Ba(Sb/Ta)_2O_6$ perovskite for reduction of organic pollutants: Experimental and DFT correlation ***(J. of the Taiwan Institute of Chemical Engineers 122 (2021) 201-209).*** (**DOI:** 10.1016/j.jtice.2021.04.032)
- 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)

Research Highlights:

Our group has explored metal oxides for applications in water remediations, energy storage, and conversion. The major research highlights of our group are,

- Perovskite material (i.e., $Ba(Sb/Ta)_2O_6$) and metal oxide (i.e., NiO) have been introduced as excellent photoactive materials for the removal of organic pollutants.
- The supercapacitor consisting of mesoporous ABO_3 material had delivered excellent stability and power density.
- The inverted planner perovskite solar cell fabricated at ambient atmosphere had delivered efficiency of 9.7 %.

Active Research Projects (2020-2021):

S. No	PI (& Co-PI, if any)	Title of the Project	Funding Agency & Duration	Project's cost (in rupees)

1	Dr. Rupesh S. Devan (PI) Dr. Parvez Shaikh (Co-PI)	Solar thermal steam generation for water desalination utilizing hybrid perovskite solar cells	SERB, DST (20190-2022)	18,30,000 /-
2	Dr. Rupesh S. Devan (PI)	Nano-hetero-architectures of mesoporous ABO_3 compounds for photocatalytic applications	MST, DST (2018-2023)	24,24,640 /-
3	Dr. Rupesh S. Devan (PI) Dr. Rajendra S. Dhayal (Co-PI)	Role of Boron passivated 1D NiO nanostructures in the next generation charge/energy storage devices.	UGC-DAE, CSR (2017-2021)	17,20,000 /-

Research Facilities:

- X-ray diffraction (Departmental facility)
- Electrochemical workstation
- Contact Angle Meter
- UV-Vis Spectrometer
- Photo-reactor
- Hot-Filament CVD
- Thermal Evaporator
- Electrospinning
- Rotary Evaporator
- Spin Coater
- High-Temperature Oven
- High-Temperature Furnace
- Ultra Sonicator
- FESEM-EDS-EBSD (Departmental facility)

Research Lab Name: Polymer and Nano-architectures Research Lab.

Awards and Recognitions (2020-2021):

- *DUO-India Professor Fellowship Award* from ASEM-DUO, S. Korea. (2020)
- ***Editor,*** 'Chinese Journal of Physics' Elsevier publishers (Impact Factor = 3.237).
- ***Guest Editor***, *'Proceeding of International Conference on Materials & Environmental Science'* in *Materials Today: Proceedings, Elsevier, (2020).*
- **Most Downloaded Article**: *ChemistrySelect 3 (2018) 7891-7899* is among the top 10 % most downloaded (Wiley - 2020)



Dr. Santosh S. Hosmani
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Dr. Hosmani joined IIT Indore on 17-4-2017. He did his B.E. in Metallurgical Engineering from REC (currently NIT) - Nagpur and M.Tech. in Process Metallurgy from IIT-Bombay. 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 15 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 also gained industrial experience as a Senior Manager at Bharat Forge Ltd, Pune.

Dr. Hosmani is leading the 'Surface Engineering and Heat Treatment (SEHt)' research group in the Department of MEMS at IITI. The research interests of his group are surface engineering, tribology, physical metallurgy, and microstructure-properties correlation.

Selected Publications (2020-2021, 3 publications):

- Digvijay Singh, Dudekula A. Basha, Lars Wadsö, Dmytro Orlov, Yoshitaka Matsushita, Alok Singh, and **S.S. Hosmani**, "Evolution of Gradient Structured Layer on AZ91D Magnesium Alloy and Its Corrosion Behaviour", ***Journal of Alloys and Compounds***, Vol. 882, 15 November 2021, Pages 160659-1 to 160659-14 (2021). DOI: 10.1016/j.jallcom.2021.160659
- A. K. Litoria, M. D. Joshi, V. Antunes, D. Singh, C. A. Figueroa, F. Alvarez, and **S.S. Hosmani**, "The Response of Boronized 34CrAlMo5-10 (EN41B) Steel to Nanoindentation, Oxidation, and Wear", ***Philosophical Magazine***, Vol. 101, No. 7, Pages 777-818 (2021). DOI: 10.1080/14786435.2020.1866221
- Manoj D. Joshi, Vikesh Kumar, Indrasen Singh, and **S.S. Hosmani**, "Tribological Response of Mechanical Attrition Treated Surface of AISI 316L Steel: The Role of Velocity of Colliding Balls," ***Journal of Tribology***, Vol. 143, March 2021, Pages 031701-1 to 031701-15 (2021). DOI: 10.1115/1.4047950

Research Highlights:

There are various engineering applications where the 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 automobiles, petrochemical, food processing, nuclear, etc. Dr. Hosmani's SEHt group is currently working on the novel and promising approach of severe plastic deformation (SPD) of surfaces to manipulate the microstructure and the properties of ferrous and non-ferrous alloys. The group also focuses on the scientific aspects of surface-alloying and coatings.

The effect of surface mechanical attrition treatment (SMAT) and subsequent treatments (like plasma nitriding) on the microstructure and properties of stainless steels is investigated by this group. SMAT processing of Mg-alloy is also successfully studied. SMAT improved the corrosion resistance and nitriding kinetics of AISI 304L SS. Mg-alloy responds very well to the SMAT treatment. A thick layer (about 0.5 mm) with improved surface hardness (more than two times the as-received alloy) is successfully obtained on the AZ91D alloy surface. SMAT process has induced compressive residual stress in the SMATed layer. Nanoscale grains in the near-surface region and multiple deformation twin-modes are observed in the SMATed layer.

Recently, this group has also investigated the boronizing behaviour of low alloy steels. The critical role of alloying elements in the steel is explored in terms of their migration behaviour during the growth of

the boride front and, consequently, in understanding their role in the formation of boride, matrix, and transition region within the boronized layer. Synthesis of multilayer architecture by producing a DLC/CrN layer over the boronized surface effectively enhances the tribological performance of the steel.

Active Research Projects (2020-2021):

- "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 – September 2021).

Research Facilities:

- Metal forming, Heat-treatment, Tribology

Research Lab Name:

- Metal Forming and Surface Engineering & Heat Treatment Lab

Awards and Recognitions (2020-21):

- **Resource Person (Invited)** for Online Lecture on "*Boronizing of Steels*" organized by ASM International India Chapter, India. (April 03, 2021).
- **Resource Person (Invited)** for Online 5 Days Short Term Course (STC) on *Advances in Materials Manufacturing Processes and Properties*, Malaviya National Institute of Technology, Jaipur, India. (July 10, 2020).
- **External Examiner/Reviewer of PhD Thesis:** 04 nos.
- **Invitation as an expert** for the online *Curriculum Development Workshop*, Dept. of Metallurgical & Materials Engineering, Malaviya National Institute of Technology, Jaipur, India. (July 02, 2021).



Dr. Mrigendra Dubey
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Dr. Mrigendra Dubey working as Assistant Professor at Indian Institute of Technology Indore in the area of synthesis of Soft Materials particularly Metallogels with an objective to achieve conductance, catalysis, superabsorbent, morphology, rheological and optical properties for various kind of applications

He received M.Sc. degree in Chemistry with merit from University of Allahabad, Allahabad in year 2005 and Ph.D. degree with Prof. Manabendra Ray from Indian Institute of Technology Guwahati in year 2011. After PhD, he joined Prof. S. S. Sun group, supramolecular materials at Institute of Chemistry, Academia Sinica, Taiwan as post-doctoral fellow in 2011 followed by Prof. D. S. Pandey group at Department of Chemistry, Banaras Hindu University as DS Kothari Post Doc Fellow in 2012.

His one of paper has been selected for Vice Chancellor Award for Excellence in Research at BHU Varanasi. Further, Dr. Dubey has been awarded prestigious DST-INSPIRE Faculty award and joined Indian Institute of Technology (BHU) Varanasi in 2015, started his independent research carrier. In May 2017, he joined IIT Indore as Assistant Professor in Discipline of Metallurgy Engineering and Materials Science and established laboratory for synthesis of Soft Materials.

He is the recipient of Young Scientist Award, International Academy of Physical Sciences, Allahabad, India- 2017. He has been invited to France at various institutes (ENS Lyon, University of Rennes, Grenoble, Paris VI University and Burgundy) in the year 2015, 2016, 2017 and 2019 as invited research visitor. He established collaboration at ENS Lyon and University of Rennes, France and published

quality papers. Dr. Dubey is life-member of Society for Materials Chemistry, Bhabha Atomic Research Centre, Mumbai, Soft Materials Research Society, Jaipur and International Academy of Physical Sciences, Allahabad.

Selected Publications (2020-2021, 3 publications):

- *D-(+)-Glucose-Triggered Metallogel to Metallogel Transition*
  C. Mahendar, Manish K. Dixit, Yeeshu Kumar and **Mrigendra Dubey***
  Journal of Materials Chemistry C, 2020, 8, 11008-11012**; Impact factor: 7.393.**
- **2.** *Nanofabrication of Au nanoparticles over conductive metallohydrogel nanofibers for nanocatalysis application* M. K. Dixit, D. Chery, C. Mahendar, C. Bucher and **Mrigendra Dubey***
  Inorg. Chem. Front., 2020; 7, 991-1002**; Impact Factor: 6.569**
- *Li^{+}-Zn^{2+} tailored nanostructured metallohydrogel based mixed ionic-electronic conductor*
  Yeeshu Kumar, Chinthakuntla Mahendar, A Kalam and **Mrigendra Dubey***
  Sustainable Energy Fuels, 2021, 5, 1708-1713**; Impact factor: 6.367**

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. Thus, I am actively involved in development of various kinds of soft materials (particularly gel materials) with special attention to - (i) Superabsorbent for agriculture application, (ii) Conductive, (iii) Charge transfer, (iv) Aggregation induced emission, (v) Chiro-optical, (vi) photophysical, (vii) morphological, (viii) Rheological and (ix) crystal engineering importance.

Active Research Projects (2020-2021):

S.No	PI (& Co-PI, if any)	Title of the Project	Funding Agency & Duration	Project's cost (in rupees)
1.	Mrigendra Dubey	***DST-INSPIRE Faculty Award***	DST New Delhi, 5 Years	35 Lacks
2.	Manish Kumar Dixit and Mrigendra Dubey	***National Post-Doctoral Fellowship***	SERB New Delhi	15 Lacks

Research Lab Name: Soft Materials Research Laboratory and Corrosion Engineering

Events and Seminars Organized (2020-2021):

- Lecture series Rastriya Aawiskar Abhiyan, EBSB January- March 2021.
- TEQIP FDP (Advances in Corrosion Science and Engineering) at IIT Indore- 2020.
- TEQIP FDP (Advanced Technology for Integrated Computational Materials Engineering Education) at IIT Indore- 2020.
- QIP STC (Advanced Technology in Materials Engineering) at IIT Indore- 2021.
- QIP STC (Fundamentals and Applications of Nano and Soft- Materials) at IIT Indore- 2021.

- QIP STC (Fundamentals of Corrosion Science and Technology) at IIT Indore- 2020.
- Workshop on Corrosion Science and Engineering- 2020.
- Fluxus as Cultural Coordinator- 2020.

Delivered Invited Lectures (2020-2021):

- Invited Lecture, Emerging Technologies in Chemistry, CMP Degree College, Allahabad- March 2021
- Recent advancement in Structural and Geotechnical Engineering, IIT Indore- March 2021
- GYAN GANGA PROGRAMME at Department of Chemistry Government College Kota- Feb 2021
- Invited Lecture, 'Materials Characterization Techniques' at IIT Indore, 22nd-27th March 2021
- Invited Lecture, Short Term Training Program, NIT Raipur- January 2021
- Lecture at Quality Improvement Programme (Advanced Materials Science) at IIT Indore- 2020
- Lecture at Quality Improvement Programme (Failure Analysis) at IIT Indore- 2020
- Lecture at Quality Improvement Programme (Corrosion Engineering) at IIT Indore- 2020.
- Webinar for Don Bosco College Tura, Meghalaya- 2020.



Dr. K. Eswara Prasad
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Dr. Eswara Prasad Korimilli earned his ME and PhD from the Department of Materials Engineering, Indian Institute of Science, Bangalore. Prior to joining IIT Indore, he worked as an Assistant Professor at the School of Engineering, Mahindra Ecole Centrale, Hyderabad and Postdoctoral fellow at Hopkins Extreme Materials Institute and the Department of Mechanical Engineering, Johns Hopkins University, Baltimore, USA and. 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 (April 2020 – March 2021):

- A Sharma, Sree Harsha Nandam, Horst Hahn, K. Eswar Prasad, Effect of structural relaxation on the indentation size effect and deformation behavior of Cu-Zr based nanoglasses, Frontiers in Materials 8 (2021) 676764
- V.S. Kathavate, B. Praveen Kumar, I. Singh, K. Eswar Prasad, Analysis of Indentation Size Effect (ISE) in nanoindentation hardness in polycrystalline PMN-PT piezoceramics with different domain configurations, Ceramics International 47, (2021) 11870-11877
- A. Sharma, Sree Harsha Nandam, H. Hahn, K. Eswar Prasad, On the differences in shear band characteristics between a binary Pd-Si metallic and nanoglass, Scripta Materialia 191 (2021) 17-22
- V.S. Kathavate, H. Sonagara, B. Praveen Kumar, I. Singh, K. Eswar Prasad, Role of domain configurations on the Mechanistic Modelling of Indentation Size Effects (ISEs) in nano hardness of Hard and Soft PZT Piezoceramics, International Journal of Advances in Engineering Sciences and Applied Mathematics 13 (2021) 63–78

Research lab name: Mechanics of Materials Lab

Research facilities: Metallographic samples preparation unit, Miniature Kolsky bar, Hardness testers (Brinell and Rockwell testers), High temperature tensile testing machine, Impact tester

Research Highlights:

- Understanding the deformation mechanisms in nanoglasses.
- Role of ferroelectric domain configurations on the deformation response of Piezoelectric materials using nanoindentation.
- Investigating the effect of processing parameters (e.g. scan strategy, scan rotation, and powder layer thickness) on the deformation response of additively manufactured Ti6Al4V alloys
- Effect of crystallographic orientation on the single crystal Magnesium.
- Development of miniature Kolsky bar for investigating the ultrahigh strain rate deformation response of materials

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)
- Coordinator for Faculty development program, Finite element analysis and introduction to materials modeling, Dec 9-16, 2020

Invited talks/Lecture delivered:

- Invited talk on "**Understanding deformation twinning in Magnesium using In-situ experiments**" at the symposium on Mechanical testing at small length scales organized by Bruckers and IIT Delhi, October 20-21, 2020
- Lecture on **Materials Characterization using Nanoindentation,** QIP Faculty development program, March 2021, IIT Indore
- Lecture on **Metals and alloys for AM**, TEQIP FDP workshop on 3D printing & Design, December 2020, IIT Hyderabad
- Lecture on **Introduction to continuum mechanics** as a part of TEQIP FDP course on Finite element methods and Introduction to Materials Modeling, December 2020, IIT Indore
- Lecture on **High strain rate deformation and failure mechanisms** TEQIP course on advances in Fatigue, fracture, creep and failure analysis, December 2020, IIT Indore
- Lecture on **Role of microstructural features on corrosion behavior of engineering materials** TEQIP course on Corrosion, November 2020, IIT Indore
- Lecture on **Advanced materials for armour applications**, QIP Faculty development program Advanced materials October 2020, IIT Indore
- Invited talk on **Understanding deformation twinning in Mg using in-situ experiments,** Small scale testing workshop, October 2020, IIT Delhi
- Lecture on **Material mechanics under extreme conditions**, QIP course on Micro and Precision Manufacturing, October 2020, IIT Indore
- Lecture on **Metallurgical/microstructural aspects of Welding and failure** as a part of QIP Faculty development program on Welding and failure, September 2020, IIT Indore
- Lecture on **Role of microstructural features on corrosion behavior of engineering materials** QIP course on Corrosion September 2020, IIT Indore

Awards and recognitions:

- Best presentation, SICE 2020 (December 11-13 & 18-20, IIT Bombay)

- K. P. Raineesh, K. Sairam, K. Rajesh, K. Eswar Prasad, Understanding deformation response of Mg underneath the indentation
- Best Oral presentation, NMD ATM February 2020
- V.S. Kathavate and K. Eswar prasad, "Role of ferroelectric domains on the indentation behavior of Piezoelectric materials"

Research Projects (on going) :

"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



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Educational background

- Ph.D. (First Class), Materials Science and Engineering, Indian Institute of Technology Kanpur, India, May 21, 2012.
- M. Tech. (First Class), Metallurgical and Materials Engineering, Indian Institute of Technology Kanpur, India, December 07, 2007.
- B. Tech. (First Class), Metallurgy and Materials Engineering, National Institute of Foundry and Forge Technology, Ranchi, India, August 10, 2004.

- **Assistant Professor** in the Discipline 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*).

Research interests

- Structure-Property Correlation in High Entropy Alloys
- Phase Transformation
- Corrosion Engineering
- Structural Nanomaterials
- Thermomechanical Processing of Magnesium Alloys and Steels
- Failure Analysis

Selected Publications (2020-2021, 3 publications):

- Sheetal Kumar Dewangan, Priyanka Sahu, V. K. Sharma, Vinod Kumar, **Synthesis and Characterization of Hydrogenated Novel AlCrFeMnNiW High Entropy Alloy** , International Journal of Hydrogen Energy, 2020.
- Sheetal Kumar Dewangan, Sumanta Samal, Vinod Kumar, **Microstructure exploration and an artificial neural network approach for hardness prediction in AlCrFeMnNiWx High-Entropy Alloys**, Journal of Alloys and Compounds, 2020.
- Akshay Kumar; Vinayaka R. Kiragi; Saurav Kumar; Amar Patnaik; Vinod Kumar, & M. K. Banerjee , **Synthesis and Characterization of Metallic Iron Reduced from Low-grade Coal in Rajasthan**, Mining, Metallurgy & Exploration, 2020.

Research Highlights: Powder Metallurgy and Physical Metallurgy

Active Research Projects (2020-2021):

S.No	PI (& Co-PI, if any)	Title of the Project	Funding Agency & Duration	Project's cost (in rupees)
1	PI	***Design and development of equiatomic multicomponent FeCoNiAx (A= Nil, Al/Ti/Mg, Cr, Si/Cu) alloys for electromagnetic applications (sanctioned on March 01, 2021)***	Indo-Poland Joint Project; DST, GoI	624000 (2 Years)

Research Facilities: Inverted microscope, TGA, Planetary Ball mill, High-temperature furnace, abrasive cutter, polishing machine

Research Lab Name: Non-equilibrium Advanced Materials Engineering (NAME) Lab

Events and Seminars Organized (2020-2021):

- Six-days AICTE sponsored Online Short-term Course (QIP) on "Fundamentals and Advances in Powder Metallurgy"during 15-20 march, 2021.
- Five-days TEQIP sponsored online course on "**Research Methodology in Science & Engineering" during Dec. 26-30, 2020.**



Jayaprakash Murugesan
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PhD : 2010 (Nagaoka University of Technology, Japan)
Materials science and Engineering
Master : IIT Madras (Metallurgical and Materials Engineering)
UG : Govt College of Engg Salem (Metallurgical Engineering)
Post PhD Research experience : 11 Years

Selected Publications (3 publications):

- Kulkarni Achyuth Rao, Manikandan M, Ashish Kumar Shukla, Shanmugham Subramaniam, Balaji V. P, I.A.Palani, **M. Jayaprakash**, Investigations on enhancing the surface mechanical and tribological properties of A356 Al alloy using pulsed laser-assisted nitriding, Applied Surface Science, 540, 148361 (2021).
- Kulkarni Achyuth Rao, Manikandan M, Ashish Kumar Shukla, Shanmugham Subramaniam, Balaji V. P, I.A.Palani, **M. Jayaprakash,** Influence of laser-nitriding on mechanical and elevated temperature fretting wear behavior of A356-alloy, Surface and Coatings Technology,127072, (2021).
- 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)

Research Highlights:
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

Active Research Projects (2020-2021):

S.No	PI (& Co-PI, if any)	Title of the Project	Funding Agency & Duration	Project's cost (in rupees)
1	PI	Effect of hydrogen environment on fatigue behavior of FSW Al- stainless steel joint	SERB-SRG Dec 2019 – Dec 2021	28 lakhs
2	PI	Development of Al based MMC through FSP route, TEQIP	TEQIP III Sep 2019- March 2021	1.15 Lakhs
3	Co-PI & Mentor	Fretting fatigue and fretting wear behavior of Titanium Foam under simulated body fluid environment	TEQIP III Collaborator research project Sep 2019- March 2021	19 Lakhs

Research Facilities:

- Fusion welding facilty (Gas welding, Arc welding, TIG< MIG welding)
- CMT welding, 3. Friction stir welding 4. Diffusion Bonding 4. Wear tester

Research Lab Name: Welding Engineering Lab, Advanced Materials Joining and Materials Testing Lab.

Events and Seminars Organized (2020-2021):

- Organized (convener) 5 days TEQIP-STC on "Fatigue Fracture , Creep and Failure analysis of materials", at IIT Indore, Dec 7 -11, 2020
- Organized (convener) 6 days QIP-STC on "Advances in welding technologies and failure analy Indore, Aug, 2020
- Organized (convener) 6 days QIP-STC on "Advances Materials", at IIT Indore, Sep, 2020.



Dr. Sumanta Samal
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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 (2020-2021, 3 publications):

- Reliance Jain, Sheetal K. Dewangan, Vinod Kumar, Sumanta Samal, Artificial neural network approach for hardness prediction of eight component FeCoNiCrMnVAlNb eutectic high entropy alloys, Materials Science and Engineering A, Vol. 797, pp. 140059, 2020.
- Reliance Jain, Avi Jain, Rahul M.R., Ashok Kumar, Ramakrushna Sabat, Mrigendra Dubey, Sumanta Samal, Gandham Phanikumar Development of ultrahigh strength novel Fe-Co-Ni-Cr-Zr quasi-peritectic high entropy alloy by integrated approach using experiment and simulation, Materialia, Vol. 14, pp. 100896, 2020.
- 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

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
- Processing-Structure-Property Correlations in Multicomponent/High Entropy Alloys
- 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
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Dr. Kushwaha is a materials scientist, working in the area of design and synthesis of nanomaterials for energy devices. He received M.Sc. degree in Physics (Electronics) from C.S.J.M. University, Kanpur, India, in year 2006 and Ph.D. degree in Physics (Nanomaterials) from IIT Bombay in year 2014. He joined IIT Indore as Assistant Professor in Discipline 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 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.

Selected Publications (2020-2021):

- Nagaraju Mukurala, Krishnaiah Mokurala, Siddhartha Suman, Ajay K Kushwaha Synthesis of porous Cu2FeSnS4 particles via solvothermal process for removal of organic acid fuchsin dye pollutant from wastewater, **Nano-Structures & Nano-Objects** 26 (2021) 100697.
- Mukurala Nagaraju, Siddhartha Suman, Aditya Bhardwaj, Krishnaiah Mokurala, Sung Hun Jin, Ajay K Kushwaha, Cu2FeSnS4 decorated Ni-TiO2 nanorods heterostructured photoanode for enhancing water splitting performance, **Applied Surface Science** 551 (2021) 149377.
- Siddhartha Suman, Nagaraju Mukurala, Ajay K. Kushwaha, Annealing induced surface restructuring in hydrothermally synthesized gallium oxide nano-cuboids, **Journal of Crystal Growth** 554 (2021) 125946.
- Siddhartha Suman, Nagaraju Mukurala, Ajay Kumar Kushwaha, Water and oxygen environment induced surface cracks healing in solution processed gallium oxide thin films, **Materials Chemistry and Physics**, 271, 2021, 124958.
- Mukurala Nagaraju, Mokurala Krishnaiah, Ajit Kumar, Ajay K Kushwaha, Sung Hun Jin, Synthesis process dependent physico-chemical and opto-electronic properties of Cu2FeSnS4 nanoparticle films, **Ceramics International**, Available online 2 July 2021.

Awards and Achievements:

***Best paper Award*:** 5NANO-2021; Organized by IEEE Photonics Society Student Chapter, Mangalam College of Engineering, Kerala.

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.

Title: "Indo-South Korea Joint network Centre for Environmental Cyber Physical Systems
Duration: 2021-2024
Funding Agency : DST

Brief Description : Enhance collaboration between the Indian and South Korean academic institutions. • Prepare a workforce that is in synchronize with the international developments in environmental cyber-physical systems • Design and development of various components of the proposed cyber-physical systems. • Development of low-cost environmental monitoring cyber-physical systems for rural empowerment.

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
Graduated M.Tech. Students	▪ Abhishek Kumar Jaiswal
Graduated B.Tech. Students	▪ Mayank Garg ▪ Vishvesh Jain



Dr. Dhirendra Kumar Rai Assistant Professor
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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 (Academic year Apr. 2020-Mar. 2021):

- Krishnan, S.; Chatterjee, S.; Solanki, A.; Guha, N.; Singh, M. K.; Gupta, A. K.; Rai, D. K. Aminotetrazole-Functionalized SiO_2 Coated MgO Nanoparticle Composites for Removal of Acid Fuchsin Dye and Detection of Heavy Metal Ions. *ACS Appl. Nano Mater.* **2020**, *3* (11), 11203–11216. https://doi.org/10.1021/acsanm.0c02351.

Research Highlights:

Dr. Rai's research group works on Environmental Remediation and Sustainable energy conversion and storage. The rapid increase in CO_2 level due to the burning of fossil fuels (Coal, Petroleum oil and Natural gas) to meet the energy demand of the present days is leading to serious environmental issues such as global warming. To mitigate the rampant CO_2 emission, it is imperative to address the problem not only by CO_2 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 CO_2 into valuable feedstock and can also be used for storage of electrochemical energy.



Dr. Abhijit Ghosh
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Ph.D., Metallurgical and Materials Engineering, Indian Institute of Technology Kharagpur, India, 2016.

- M. Tech., Metallurgical and Materials Engineering, Indian Institute of Technology Kharagpur, India, 2011.
- B. E., Metallurgy and Materials Engineering, Bengal Engineering and Science University, Shibpur, India, 2009.

Dr. Abhijit Ghosh Joined IIT Indore on 01st November, 2017 as an Assistant Professor. He worked as a post-doctoral fellow at Indian Institute of Science, Bangalore before joining IIT Indore. His broad field of expertise is in 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 (2020-2021, 3 publications):

- Barik, R.K., **Ghosh, A**., BasiruddinSk, M., Biswal, S., Dutta, A. and Chakrabarti, D., 2021. Bridging microstructure and crystallography with the micromechanics of cleavage fracture in a lamellar pearlitic steel. *Acta Materialia*, p.116988. doi: 10.1016/j.actamat.2021.116988
- Jain, V., Chatterjee, A., Patra, S., Chakrabarti, D. and **Ghosh, A**., 2020. Effect of tilt and twist angles on the cleavage crack propagation in ferritic steel. *International Journal of Fracture*, *225*(1), pp.115-121.
- Hasan, S.M., **Ghosh, A.**, Chakrabarti, D. and Singh, S.B., 2020. Orientation Dependence of Deformation-Induced Martensite Transformation During Uniaxial Tensile Deformation of Carbide-Free Bainitic Steel. *Metallurgical and Materials Transactions A*, *51*(5), pp.2053-2063.

Research Highlights:

- Developing Cold Rolled Grain Orientated (CRGO) electrical steel.
- (c) Understanding the cleavage crack deviation at grain boundaries.

Active Research Projects (2020-2021):

S.No	PI (& Co-PI, if any)	Title of the Project	Funding Agency & Duration	Project's cost (in rupees)
1	Abhijit Ghosh	Development of Cold Rolled Grain Oriented Electrical steel with high Si Content	DST Inspire	35 Lakh

Research Facilities: Creep testing facility, Polishing facility, Computer Server.
Research Lab Name: Microstructure and Texture Engineering Lab



Dr. Hemant Borkar
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Dr. Hemant Borkar has been working at IIT Indore since Dec 2017. He has completed his doctoral studies in Materials Engineering from McGill University, Canada. Subsequently, he had 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):

- Effect of Squeeze Casting on Microstructure and Wear Properties of Aluminium Al–Si Alloy R Tamuly, A Behl, H Borkar - Advances in Lightweight Materials and Structures, 2020
- Microstructure, texture and mechanical properties of Al Alloy A380 prepared by directional solidification method, H Borkar, S Seifeddine, AEW Jarfors - Solid State Phenomena, 2019
- In-situ EBSD study of deformation behavior of Al–Si–Cu alloys during tensile testing H Borkar, S Seifeddine, AEW Jarfors - Materials & Design, 2015.

Research Highlights:

- Materials and manufacturing
- Process-structure-property relationships in metals
- Lightweight components for transport applications
- Casting of light metals (Al and Mg)
- Deformation processing
- Electron back scattered diffraction, in-situ deformation studies, crystallographic texture

Research Facilities:

- Electropolishing machine
- Vibratory polisher
- Muffle furnace
- Semi automatic polishing machine
- Hot extrusion machine

Research Lab Name: Advanced Mechanical and Physical Metallurgy Laboratory

Events and Seminars Organized (2020-2021):

- Teaching Faculty, QIP Short Term Course on Fatigue, Creep, Fracture and Failure Analysis of Advanced Materials" Dec 7-11, 2020.
- Teaching Faculty, QIP short-term course (STC) on "Advanced materials for structural applications Sept 29 – Oct 4, 2020.



Dr. Sunil Kumar
Assistant Professor
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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 (2020-2021, 3 publications):

- S. Dwivedi, M. Badole, T. Pareek, and S. Kumar | *Multifunctional Lead-Free $K_{0.5}Bi_{0.5}TiO_3$-based Ceramic Reinforced PVDF Matrix Composites,* ***Journal of Alloys and Compounds,*** 871 ***(2021)*** 159616
- T Pareek, S Dwivedi, M Badole, S Kumar | *On processing structure–conductivity relations in NASICON-type $LiSn_2(PO_4)_3$,* ***Bulletin of Materials Science***, 44 **(2021)** 177
- M. Badole, S. Dwivedi, T. Pareek, S. Ali Ahmed, and S. Kumar |*Significantly improved dielectric and piezoelectric properties of $BiAlO_3$ modified potassium bismuth titanate lead-free ceramics,* ***Materials Science and Engineering: B*** 262 **(2020)** 114749

Research Highlights:

- The lead-free composite PVDF/KBT-5BA with different volume fraction of ceramic filler was obtained *via* hot-pressing and have shown a significant improvement in the dielectric and piezoelectric properties. The dielectric permittivity of the composite with respect to filler volume was found to be well fitted by the *Yamada model, and a noticeable change in shape parameter was observed for the higher volume fraction of filler.*
- The *polymer-in-ceramic* type composite electrolyte with $LiSn_2(PO_4)_3$ as ceramic, PEO as polymer, and $LiClO_4$ as salt at room temperature was fabricated via hot press method. The addition of PEO+$LiClO_4$ to LSP results in an improvement in Li^+ conductivity, and CCE-70 showed the highest room temperature conductivity (~ 3.48×10^{-5} Scm^{-1}) among all compositions investigated in this work. All-solid-state Li|CCE-70|$LiMn_2O_4$ cell delivered a specific discharge capacity of ~ 103.3 $mAhg^{-1}$ at a current density of 0.1 $mAcm^{-2}$, which decreased to 76.7 $mAhg^{-1}$ after 10 cycles with Coulombic efficiency improving to 97.7% from 87.7% for the 1st cycle.

- $(1-x)(K_{0.5}Bi_{0.5})TiO_3$-$xBiAlO_3$ solid-solution were synthesized and systematically investigated for variation in the crystal structure, microstructure, dielectric, and piezoelectric properties with increase in x. T_m was found to increase from 351 °C for pure KBT to 372 °C (at 1 MHz) for 1% BA doped sample. Moreover, the diffuse dielectric anomaly with strong frequency dispersion reflects the strengthening of relaxor behaviour in the present system with the increase in BA content. The 5% $BiAlO_3$ doped sample showed 80 % increment in the piezoelectric charge coefficient with (d_{33}) ~ 109 pC/N.

Active Research Projects (2020-2021):

S.No	PI (& Co-PI, if any)	Title of the Project	Funding Agency & Duration	Project's cost (in rupees)
1	Dr. Sunil Kumar	*Development of Solid Electrolyte for All-Solid-State Rechargeable Lithium Batteries*	Department of Science and Technology (**DST**); 5 years (2015-2020)	35,00,000 (research grant component)
2	Dr. Sunil Kumar	*Compositionally and Microstructurally Engineered Lead-Free Ceramics for Piezoelectric Applications*	Science and Engineering Research Board (**SERB**), 3 years (2017-2020)	47,36,200

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 Lab

Awards and Recognitions (2020-2021):

- **Early Career Research Award** (year 2017-2020), **Science and Engineering Research Board (SERB)**, Government of India.
- **DST- INSPIRE Faculty Award** (year 2015-2020).



Dr Ram Sajeevan Maurya
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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 started with a B.Tech Degree in the Metallurgical and Materials Engineering department at NIT Durgapur in 2011, followed by 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 approx. one and half year, followed by joining IIT Indore. His field of interest are Bulk Metallic Glasses, High Entropy Alloys, ODS Alloys, WHA Alloys, Powder Metallurgy, Sintering etc.

Selected Publications (2020-2021, 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:

- Development of Tungsten Heavy Alloys for defense application
- Development of Light Weight Eutectic High entropy alloys (HEAs)

Research Facilities: Abrasive Cutter, Optical Microscope, Polishing Machine etc.

Research Lab Name: Advanced Powder Technology Laboratory

Active Research Projects (2020-2021):

S.No	PI (& Co-PI, if any)	Title of the Project	**Funding Agency & Duration**	**Project's cost (in rupees)**
1	PI	Development of Light Weight Eutectic High Entropy Alloys	SERB, June 2019-June 2022, 3 Years	~ 18 lacs
2	PI	Development of oxide dispersion	CSIR, March	~ 14 lacs

		strengthened-tungsten heavy alloys (ODS-WHA) for defense application	2021-March 2024, 3 Years	

Events and Seminars Organized (2020-2021):

- QIP-TEQIP-III Sponsored Three-days Short-term Course (Faculty Development Program) on "Fundamentals and Advances in Powder Metallurgy" at IIT Indore, during March 15-20, 2021, Role: Course Coordinator.
- QIP-AICTE Sponsored Six-days Short-term Course (Faculty Development Program) on "Fundamentals and Advances in Powder Metallurgy" at IIT Indore, during March 15-20, 2021, Role: Course Coordinator.
- QIP-AICTE sponsored Six-days Short-term Course (Faculty Development Program) on "Materials Characterization Techniques" at IIT Indore, during March 22-27, 2021, Role: Course Co-Coordinator 4. Conducted an online ThermoCalc software and database training programme on 8th and 15th December 2020 at IIT Indore.



Dr. Dudekula Althaf Basha Assistant Professor
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Dudekula Althaf Basha is working as 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.

Selected Publications (2020-2021, 3 publications):

- H Somekawa, **DA Basha**, , Change in damping capacity due to twin boundary segregation in solid solution magnesium alloys. **Philosophical Magazine Letters**, (2020) 1-12.
- Digvijay Singh, **DA Basha**, Alok Singh, Rupesh S. Devan, and S.S. Hosmani**,** "Microstructural and Passivation Response of Severely Deformed AISI 304 Steel Surface: The Role of Surface Mechanical Attrition Treatment," ***Journal of Materials Engineering and Performance***, Vol. 29, No. 10, October 2020, Pages 6898 to 6911 (2020).
- Digvijay Singh, **DA Basha**, Lars Wadsö, Dmytro Orlov, Yoshitaka Matsushita, Alok Singh, and S.S. Hosmani**,** "Evolution of Gradient Structured Layer on AZ91D Magnesium Alloy and Its Corrosion Behaviour", ***Journal of Alloys and Compounds***, Vol. 882, 15 November 2021, Pages 160659-1 to 160659-14 (2021).

Research Highlights:

- Change in damping capacity due to twin boundary segregation
- Segregation of Zn element to various boundaries in ultrafine grain sized magnesium alloys
- Y segregation at grain boundaries leads to the change in crack propagation in Mg-Y alloys

Events and Seminars Organized:

- QIP-AICTE sponsored Six-days Short-term Course (Faculty Development Program) on "Materials Characterization Techniques" at IIT Indore, during March 22-27, 2021.

- Organized expert lecture on "TEM imaging and EELS" on 14th September 2020. (Speaker: Dr. Paolo Longo, GATAN Company Global Director, California, USA)

Research Lab Name: Severe Plastic Deformation Processing Lab



Dr Srimanta Pakhira
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Dr. Srimanta Pakhira is working as a Ramanujan Fellow in the Discipline 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, Calcutta, 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.

Selected Publications (2020-2021, 3 publications):

- **Pakhira, Srimanta,**† Dharmarwardana, M.,† Welch, R. P., Narvaez, C. C., Luzuriaga, M. A., Arimilli, B. S., McCandless, G. T., Fahimi, B., Mendoza-Cortes, J. L., Gassensmith, J. J. **2021** Rapidly Reversibly Organic Crystalline Switch for Conversion of Heat into Mechanical Energy**.** ***Journal of The American Chemical Society (JACS),*** 143, pp 5951–5957**, Impact Factor: 15.419.** https://doi.org/10.1021/jacs.1c01549; **†Equal Contribution: First Authorship.**
- Sinha, N., **Pakhira, Srimanta,** 2021** Tunability of the Electronic Properties of Covalent Organic Frameworks. ***ACS Applied Electronic Materials*****, 3, pp. 720-732.** https://doi.org/10.1021/acsaelm.0c00867**. ** Corresponding Author**
- Puttaswamy, R., Nagaraj, R., Kulkarni, P., Beere, H.K., Upadhyay, S.N., Balakrishna, R.G., Sanna Kotrappanavar, N., **Pakhira, S.**** and Ghosh, D.,** **2021.** Constructing a High-Performance Aqueous Rechargeable Zinc-Ion Battery Cathode with Self-Assembled Mat-like Packing of Intertwined Ag (I) Pre-Inserted V3O7 · H2O Microbelts with Reduced Graphene Oxide Core. ***ACS Sustainable Chemistry & Engineering*****. 9, 3985-3995, Impact Factor: 7.632. http://dx.doi.org/10.1021/acssuschemeng.0c06147**

Research Highlights:

Dr. Pakhira's research group is active in Computational Materials Science and Engineering, Condensed Matter Theory, Electronic Structure Theory, Semi-conductor Physics, Magnetism, Physics of Novel Solar Cells, Renewable Energy Technology, Perovskite, 2D TMDs, H_2 evolution, Electrocatalysis, O_2 Reduction, Porous Materials and Their Applications, CNT, Alkali-ion Battery, H_2-Storage, CO_2 capture, 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.

Active Research Projects (2020-2021):

S.No	PI (& Co-PI, if any)	Title of the Project	Funding Agency	Project's cost (in rupees)

			& Duration	
1	PI	***Construction of Porous Metal-Organic Frameworks (MOFs) and Covalent- Organic Frameworks (COFs) and Its Applications***	DST-SERB, Govt. of India, 2018-2023	135 Lakhs
2	PI	***Development of New Two Dimensional Layer Structure Materials and Technique for Water Splitting: Applications in Hydrogen and Oxygen Evolution Reactions***	DST-SERB, Govt. of India, 2019-2022	53.14 Lakhs

Research Lab Name: Theoretical Condensed Matter Physics And Advanced Computational Materials Science Laboratory

Events and Seminars Organized (2020-2021): NIL

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1. Dr Pakhira organised a Five Day Online Faculty Development Program through the TQIOP-III sponsored Short-Term Course on "Advanced Technology for Materials Physics and Engineering" during 16th to 20th November 2021.
2. Dr Pakhira organised a Six Day Online Faculty Development Program through the AICTE sponsored Quality Improvement Program (QIP) Short-Term Course on "Advanced Technology for Materials Engineering" during 19th to 24th January 2021.

List of active Projects during April 2020 – March 2021 :

S.No	PI (& Co-PI, if any)	Title of the Project	Funding Agency & Duration	Project's cost (in rupees)
1.	Dr. P. M. Shirage	Incubated a company to manufacture "Sustainable, Engineered Sodium-ion Batteries for Renewable Energy Storage"	MEMS, Govt of India	18,00,000
2.	Dr. S S Hosmani	Wear Behavior and Microstructural Studies of Surface Mechanical Attrition Treated (SMAT) and Post-Treated Stainless Steels	DST-SERB (March 2018 – September 2021)	50,85,520
3.	Dr. Rupesh S. Devan (PI)	Role of Boron passivated 1D NiO nanostructures in the next generation charge/energy storage devices.	UGC-DAE, CSR 4 years 2017-2021	17,20,000
4.	Dr. Rupesh S. Devan (PI)	Solar thermal steam generation for water desalination utilizing hybrid perovskite solar cells.	SERB, DST 3 years 2019-2022	18,30,000
5.	Dr. Rupesh S. Devan (PI)	Nano-hetero-architectures of mesoporous ABO_3 compounds for photocatalytic applications	MST, DST, 5 years 2018-2023	24,24,640
6.	Dr. Mrigendra Dubey (PI)	Novel Homochiral Metal-Organic Framework for Chiral, Achiral	DST-INSPIRE Faculty	35,00000/-

		molecules inclusion and Reversible Gas Storage Applications	Award	
7.	Manish Kumar Dixit and Dr. Mrigendra Dubey	National Post-Doctoral Fellowship	SERB New Delhi	15,00,000
8.	K. Eswara Prasad	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	31,00,000
9.	Dr. Vinod Kumar (PI)	*Design and development of equiatomic multicomponent FeCoNiAx (A= Nil, Al/Ti/Mg, Cr, Si/Cu) alloys for electromagnetic applications (sanctioned on March 01, 2021)*	Indo-Poland Joint Project; DST, GoI	624000 (2 Years)
10.	Dr. Jaya Prakash (PI)	Fatigue behavior of FSW Al-Stainless steel joint under hydrogen atmosphere.	SERB-SRG, Dec 2019-Dec 2021	28,00,000
11.	Dr. Jaya Prakash (PI), Co PI: (Dr. Lakhan Patidar, MBM Engg. College, Jodhpur)	Development if Al MMC through FSP route	TEQIP III, Sep 2019-Aug 2020	1,25,000
12.	Dr. Jaya Prakash (As a mentor & Co-PI) PI (Ram.S. Yadav, SGITIS, Indore)	Fretting wear behaviour of porous Ti alloy	TEQIP III, Colloboratory research Sep 2019- Sep 2020	19,00,000
13.	Dr. Sumanta Samal (PI)	Development of novel eutectic high entropy alloys for high-temperature applications	BRNS, GOI & 2020-21 to 2022-23	22,46,450
14.	Dr. Ajay K Kushwaha(PI)	Wet-chemical approach to fabricate visible-near infrared light harvesting photoelectrodes	DST (2016-2021)	85,00,000
15.	Dr. Ajay K Kushwaha(PI)	Lead Free Inorganic Halide Perovskite Nanostructures for Solution-Processable Photovoltaic cell	SERB (2018-2021)	31,50,000

16.	Dr. Ajay K Kushwaha(PI)	Development of All Earth Abundant Elements based Nano-heterostructures for Solar Driven Water Splitting	CSIR (2019-2022)	13,50,000
17.	Dr. Ajay K Kushwaha(PI)	"Indo-South Korea Joint network Centre for Environmental Cyber Physical Systems	DST (2021-2024)	
18.	PI: Dr. Abhijit Ghosh	Development of cold rolled grain orientated electrical steel with high Si content	DST Inspire	35,00,000
19.	Dr. Sunil Kumar (PI)	*Development of Solid Electrolyte for All-Solid-State Rechargeable Lithium Batteries*	Department of Science and Technology (DST) under INSPIRE Faculty Scheme. 5 years (2015-2020)	(35,00,000 Research Grant component) Total: 89,00,000
20.	Dr. Sunil Kumar (PI)	*Compositionally and Microstructurally Engineered Lead-Free Ceramics for Piezoelectric Applications*	Science and Engineering Research Board (SERB), under Early Career Research Award. 3 years (2017-2020)	46,37,600
21.	Dr. R.S. Maurya (PI)	Development of Light Weight Eutectic High Entropy Alloys	SERB-DST June 2019-June 2022	18,00,000
22.	Dr. R.S. Maurya (PI)	Development of oxide dispersion strengthened-tungsten heavy alloys (ODS-WHA) for defense application	CSIR, March 2021-March 2024, 3 Years	14,00,000
23.	Dr Srimanta Pakhira, PI	*Construction of Porous Metal-Organic Frameworks (MOFs) and Covalent-Organic Frameworks (COFs) and Its Applications*	SERB-DST & 2018-2023	1,35,00,000 (Including Ramanujan Fellowship)
24.	Dr Srimanta Pakhira, PI	*Development of New Two Dimensional Layer Structure Materials and Technique for Water Splitting: Applications in Hydrogen and Oxygen Evolution Reactions*	SERB-DST & 2019-2022	54,18,000

Biosciences and Biomedical Engineering (BSBE)

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. Amit Kumar
Associate Professor
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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.

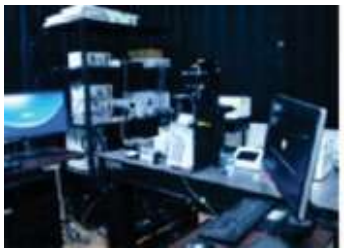
The group seeks to create a unique institutional environment to conduct multi disciplinary research that translates scientific and technological advancements into innovations which will not only improve public health but also contribute immensely in the areas such as agriculture, energy, and environment.
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 - Head
- 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. Abhijeet Joshi
- Dr. Chelvam Venkatesh
- Dr. Hem Chandra Jha
- Dr. Mirza S Baig
- Dr. Parimal Kar
- Dr. Ram Bilas Pachori
- Dr. Srivathsan Vasudevan
- Dr. Sarika Jalan
- Dr. Sharad Gupta (On Lien)
- Dr. Suman Mukhopadhya



Dr. Ganti S. Murthy
Professor
ganti.murthy@iiti.ac.in

Dr. Ganti S. Murthy (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 -

- Development of disinfection systems for the prevention and spread of CoVID-19 through indoor air. BIRAC, DST. (2021). Rs. 2,965,760. PI
- Design and evaluation of multi-objective controller for a continuous biocrude reactor. SERB, DST. (2021-2024). Rs. 5,180,164. PI
- Hours to Milliseconds: Leveraging machine learning methods to reduce the computation time for crop yield prediction. National Supercomputing Mission/High Performance Computing. (2021-2023). Rs. 1,258,000. PI
- India-Korea Joint Network Centre for Environmental Cyber Physical Systems
- Technology Innovation Hub DRISHTI (Investigator)

Duration :

- 2021-2021
- 2021-2024
- 2021-2023
- 2020-2024
- 2020-2025

Funding Agency :

- BIRAC, DST
- SER, DST
- NSM/HPC, DST
- DST
- DST

Brief Description

- In this project we are developing disinfection devices for use in crowded areas to remove the viruses, bacteria and fungus.
- In this project we are developing a state-of-the-art model predictive controller for a unique continuous hydrothermal liquefaction reactor.
- In this project we are developing new machine learning models to reduce the computation time of crop models and develop capability to analyse thousands of potential cropping scenarios.
- In this project we are collaborating with various Indian and South Korean institutions to develop integrated sensor and physical systems for applications in agricultural domain.
- In this project we are developing various products targeted at multiple stakeholders for de-risking agriculture through greater understanding of the factors that contribute to resiliency in agro-ecosystems at the regional and farm level through systems-level modelling.



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Dr. Avinash Sonawane (PhD. in Molecular Enzymology, at the University of Marburg, Germany)

Previous Employment (includes post-doctoral experience)

2019-Present, Professor, Department of Biosciences and Biomedical Engineering, Indian Institute of Technology Indore, M.P

2018-2019, Associate Professor, Department of Biosciences and Biomedical Engineering, Indian Institute of Technology Indore M.P.

2015-2018 Professor, School of Biotechnology, KIIT University, Bhubaneswar, India

2010-14 Associate Professor, School of Biotechnology, KIIT University, Bhubaneswar

2009 – 2010 Assistant Professor, School of Biotechnology, KIIT University, Bhubaneswar

2007-2008 Post-doctoral Fellow, European Molecular Biology Laboratory (EMBL), Heidelberg, Germany

2006 – 2007 Post-doctoral Fellow, Max-Planck Institute for Infection Biology, Berlin, Germany

2004 – 2006 Post-doctoral Fellow, Department of Medicine, Infectious Diseases, University of Florida, Florida, USA

INTERNATIONAL FELLOW:

- **Humboldt Fellow (Experienced Researcher)**, Leibniz Center for Medicine & Biosciences, Research Centre Borstel, Borstel, Germany
- **EMBO Fellow**, Therapeutic Immunology Group, Karolinska Institute, Stockholm, Sweden,
- **Swiss National Science Fellow,** Institute for Medical Microbiology, University of Zurich, Zurich, Switzerland
- **EMBO Fellow**, Institute for Medical Microbiology and Hygiene, University of Ulm, Ulm, Germany
- **Swedish Institute Fellow,** Department of Clinical Sciences, University of Lund, Sweden
- **JSPS Fellow**, NARA Institute for Science and Technology, Takayama, Japan
- **Academic associations with other institutions (Affiliate/Adjunct/ Visiting posts)**
- **Humboldt Visiting Professor,** Leibniz Lung Center, Borstel, Germany

Statement of Research Interests

a. Broad research area

- Tuberculosis pathogenesis
- Acute lymphatic Leukemia therapy

b. 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

c. Awards and Achievements

- Elected as Fellow of Royal Society of Biology, UK
- Elected as Fellow of Maharashtra Academy of Sciences

Patents : Granted

- **Avinash Sonawane** and Ranjit Mehta (418/KOL/2013). Novel Asparaginase Mutant. Patent Grant No. 365651

- Chelvam Venkatesh, Premansh Dudhe, Meena Asha Krishnan and **Avinash Sonawane (201921029311).** Metal-free, solvent-free synthesis of fused-pyrido heterocycles: Biological efficacy against cancer and multi-drug resistant pathogens. Patent Grant No. 366986.

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

- **Srabasti Sengupta, Barsa Nayak, Avinash Padhi and Avinash Sonawane (2021). Mycobacterium tuberculosis phosphoribosyltransferase promotes bacterial survival in macrophages by inducing histone hypermethylation in autophagy-related genes. *Frontiers Cellular and Infection Microbiology* (In Press).**
- **Klionsky Daniel et al., (2021). Guidelines for the use and interpretation of assays for monitoring autophagy (4th edition). *Autophagy.* Feb 8:1-382. doi: 10.1080/15548627.2020.1797280.**
- Srikanth Karnati, Michael Seimetz, Florian Kleefeldt, **Avinash Sonawane**, Madhusudhan Thati, Djuro Kosanovic, Norbert Weissmann, Karsten Krüger, Süleyman Ergün (2021). Chronic obstructive pulmonary disease (COPD) and the cardiovascular system: vascular repair and regeneration as a therapeutic target. ***Frontiers in Cardiovascular Medicine*** 8:649512. doi: 10.3389/fcvm.2021.649512. eCollection 2021.
- Natalia Mikhailovna Yudintceva, Natalia Arkadievna Mikhailova, Danila Evhenjevich Bobkov, Liudmila Yakovleva, Boris Nikolaev, Alexandr Muraviov, Tatiana Vinogradova, Petr Yablonskiy, Igor Samusenko, Vyacheslav Ryzhov, Vladimir Deriglazov, Gabriele Multhoff, Alexander Klapproth, Wei Bo Li, Barsha Nayak, **Avinash Sonawane**, Maxim Shevtsov (2021). Evaluation of the biodistribution of mesenchymal stem cells in a preclinical renal tuberculosis model by nonlinear magnetic response measurements. ***Frontiers in Physics*** (In Press).
- Jagadeb M, Pattanaik KP, Rath SN, **Sonawane A. (2021).** Identification and evaluation of immunogenic MHC-I and MHC-II binding peptides from *Mycobacterium tuberculosis.* ***Comput Biol Med.*** 130:104203. doi: 10.1016/j.compbiomed.2020.104203.
- Pattanaik KP, Ganguli G, Naik SK, **Sonawane A** (2021).Mycobacterium tuberculosis EsxL induces TNF-α secretion through activation of TLR2 dependent MAPK and NF-κB pathways. ***Mol Immunol.*** ;130:133-141. doi10.1016/j.molimm.2020.11.020
- Sumanta Kumar Naik, Kaliprasad Pattanaik, Jacqueline Eich, Vivien Sparr, Matthias Hauptmann, Barbara Kalsdorf, Nobert Reiling, Wolfgang Liedtke, Wolfgang M. Kuebler, Ulrich E. Schaible and **Avinash Sonawane.** (2020). Differential roles of the ion channel TRPV4 in host responses to *Mycobacterium tuberculosis* early and late in infection. ***iScience*** 23(6):101206. doi: 10.1016/j.isci.2020.101206
- Satyam Singh, Md Fulbabu Sk, **Avinash Sonawane**, Parimal Kar, Sushabhan Sadhukhan (2020). Plant-derived natural polyphenols as potential antiviral drugs against SARS-CoV-2 *via* RNA- dependent RNA polymerase (RdRp) inhibition: An *in-silico* analysis. ***Journal of Biomolecular Structure and Dynamics.*** (In Press).
- Geetanjali Ganguli, Kali Prasad Pattanaik, Manaswini Jagadeb and **Avinash Sonawane** (2020). *Mycobacterium tuberculosis* Rv3034c regulates mTORC1 and PPAR-γ dependant pexophagy mechanism to control redox levels in macrophages. ***Cellular Microbiology*** (In Press) e13214. doi: 10.1111/cmi.13214

Events/ Seminars organized

- Distinguished Lecture by Prof. Anil Sahasrabudhe, Chairman, AICTE, January 13, 2020
- Distinguished Lecture by Prof. J. B. Joshi, February 5, 2020
- Distinguished Lecture by Prof. N. K. Ganguly, Former DG, ICMR, February 17, 2020

Projects active during April 2020-March 2021

Title : Phase I/II Clinical trial of a novel asparaginase mutant for the treatment of primary and relapse acute lymphatic leukemia

- Development of Novel Benzo Fused Heterocycles to Improve the Treatment of Drug Resistant Tuberculosis.

- To study the role of mesenchymal stem cells in the pathogenesis of tuberculosis in bone marrow.
- Pharmacological evaluation of a novel asparaginase used for the treatment of acute lymphoblastic leukemia (ALL).
- Development of theranostic targeted magnetic nanoparticles for diagnostics and treatment of tuberculosis.
- Chemical modification of novel asparaginase mutants to improve the treatment of acute lymphatic leukemia.



Dr. Prashant Kodgire
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Dr. Prashant Kodgire (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 Achievement

- 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)

- Jain M, Yadav P, Joshi B, Joshi A, Kodgire P*., Recombinant organophosphorus hydrolase (OPH) expression in *E. coli* for the effective detection of organophosphate pesticides, Protein Expr Purif. 2021,

186:105929.

- Jain M, Yadav P, Joshi B, Joshi A, Kodgire P*. A novel biosensor for the detection of organophosphorus (OP)-based pesticides using organophosphorus acid anhydrolase (OPAA)-FL variant, Appl Microbiol Biotechnol. 2021, 105(1):389-400.
- 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., 2021, 40(4):289-306.
- Shankar U, Jain N, Majee P, Kodgire P, Sharma TK, Kumar A., Exploring Computational and Biophysical Tools to Study the Presence of G-Quadruplex Structures: A Promising Therapeutic Solution for Drug-Resistant *Vibrio cholerae*, Front Genet. 2020, 11:935.
- Jain N, Mishra SK, Shankar U, Jaiswal A, Sharma TK, Kodgire P, Kumar A., G-quadruplex stabilization in the ions and maltose transporters gene inhibit *Salmonella enterica* growth and virulence, Genomics, 2020, 112(6):4863-4874.
- 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.

Events / Seminars organized

- Non-genetic heterogeneity in *Saccharomyces cerevisiae*: Causes and consequences. Prof. P.J. Bhat, Professor, Department of Biosciences and Bioengineering, IIT Bombay, Mumbai.
- Biopharma: 222 & Road-ahead, Mr. Bedadyuti Chakraborty, Associate Director – Training, Dr. Reddy's Laboratories, Hyderabad.

Projects active during April 2020-March 2021

Title - Splicing, chromatin and somatic hypermutation of immunoglobulin genes
Duration - 2021-2024
Funding Agency - SERB_DST
Brief Description - In the proposed study, in addition to understanding whether the process of splicing and splicing factors involved in SHM, we are interested to study the role of chromatin modulator UBN1 in somatic hypermutation, as well as potential interactions of UBN1 with AID.

Title - Structural Insights of Outer Membrane Proteins(OMPs): Combating Gram-negative Bacterial Pathogens
Duration - 2021-2024
Funding Agency - ICMR
Brief Description - In this proposal, we are studying OMPs of pathogens associated with clinical cases using various biophysical, imaging and molecular approaches. These studies will be beneficial for the development of synthetic inhibitors, antagonist and recombinant vaccines.

Title - Flourimetric biosensor for detection and quantification of insecticides and pesticides using recombinant organo-phosphorus hydrolase expressed in *E. coli*
Duration 0 2017-2021
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. Amit Kumar
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Dr. Amit Kumar (PhD.: Structural studies of Flavonoids and their interaction with duplex and quadruplex DNA, IIT-Roorkee

Previous Employment (includes post-doctoral experience)
Assistant Professor, IIT Indore
Research Scientist IIT Indore
Post Doctoral Research Associate The Scripps Research Institute USA
Post Doctoral Fellow SUNY Buffalo USA

Statement of Research Interests

a. Broad research area

- Drug Discovery, Target Identification for Cancer and Neurological Diseases, NMR Spectroscopy, Structural Biology.

b. Research Highlights

We basically work on nucleic acid repeats that form stable non-canonical secondary structures in various neurological disorders, cancers, and human pathogens including bacteria and viruses. We are the first in India working for targeting tri-nucleotide repeats disorders, one of the major cause of Huntington disease, myotonic dystrophy, spinocerebellar ataxias (SCAs), and Fragile-X-syndrome by using various small molecules including natural compounds like Myricetin, Piperine, Curcumin, etc., that have received good response from the scientific community Similarly, another class of secondary structure present in the Guanine rich nucleic acids; G-quadruplex motifs, and are used as drug targets in various cancers and pathogenic bacteria.

c. Awards and Achievements

- Associate Editor Scientific Reports 2016
- Brand Ambassador Bentham Publishers 2017
- Best Paper Award IIT Indore 2016
- Young Scientist DST 2013

Publications

- G-quadruplex stabilization in the ions and maltose transporters inhibit Salmonella enterica growth and virulence, Genomics, 2020
- N. Jain, S. K. Mishra, U. Shankar, A. Jaiswal, T. K. Sharma, P. Kodgire and Amit Kumar*
- Inhibition of Zika Virus Replication by G-Quadruplex Binding Ligands. Molecular Therapy nucleic acid, 2020
- P. Majee, A. Pattnaik, B. R. Sahoo, U. Shankar, A. K. Pattnaik*, Amit Kumar* and D. Nayak*
- Curcumin regulates the r(CGG)exp RNA hairpin structure and ameliorates defects in fragile X-associated tremor ataxia syndrome. Frontiers in Neuroscience. 2020
- K. Verma, E. Khan, S. K. Mishra, A. Mishra, N. Charlet-Berguerand and Amit Kumar*



Dr. Debasis Nayak
Associate Professor
nayakdn@iiti.ac.in

Dr. Debasis Nayak (PhD., University of Nebraska-Lincoln, USA in Molecular Virology and Viral Pathogenesis, 2008)

Previous Employment (includes post-doctoral experience)

Visiting Research Fellow: 2009-2014
National Instituted of Health (NIH), Bethesda, MD, USA

Statement of Research Interests

a. Broad research area

Molecular virology and viral immunology. Our laboratory works on the molecular aspects of host pathogen interaction. In this context we study pathogenesis of Zika Virus, Kyasanur forest disease virus (KFDV), and Chikungunya virus in animal cell culture system.

b. Research Highlights

In NCCS Pune using a pseudovirus approach, we recently completed project to develop a candidate vaccine against SARS-CoV2. In all practical sense pseudoviruses structurally and immunologically resemble parent viruses. But lacks the required genes to cause the disease. In our research, we are using vesicular stomatitis virus (VSV) backbone to create pseudotypes with SARS-CoV-2 Spike proteins. Basically, these pseudotypes have spike protein of SARS-CoV-2, but the genetic material will be of VSV. Currently we completed animal experiments and got positive results showing that our candidate induced robust neutralizing antibody response in mice.

c. Awards and Achievements

During this period, we have established a milestone making canine pregnancy diagnosis feasible a molecular level. Basically, we have found the suitable biomarkers in the serum of animal indicative of pregnancy. Based on lateral flow assay techniques, we have produced point of care diagnostic kits for pregnancy detection at filed level. Currently, the prototype is being validated at various veterinary clinics.

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 Zn2+and Al3+ 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.

Projects active during April 2020-March 2021

Title : Development of chikungunya candidate vaccine in vesicular stomatitis virus (VSV) gene delivery platform

Duration : 3 years

Funding Agency : Department of Biotechnology, Govt. of India

Brief Description: Chikungunya fever (CHIKF) is a major global threat across Indian oceanic regions including India. The disease caused by chikungunya virus (CHIKV) fall in the category of emerging and re-emerging mosquito-borne viral diseases of serious health concern particularly in tropical, sub-tropical and part of the temperate world. Recently, their geographical distribution is spreading to other non-endemic zones. Clinical manifestation of both CHIKF follow a similar pattern to dengue, where fever comes sharply one week after exposure and symptom persist for a week before resolving, however, manifestation of severe arthralgia that often persists even after viral clearance. As CHIKV replicates in fibroblast cells, thus explained to affect muscle, joints, and skin connective tissues symptomatically. Currently no efficacious vaccine is available in the market against CHIKV although few clinical trials are ongoing. This necessitates the development of suitable candidate vaccine and in this context; recombinant vesicular stomatitis virus (rVSV) based platform offers a safe and effective mean to achieve delivery of multiple antigens. In this proposal, we aim to utilize VSV reverse genetic system to create a novel CHIKV vaccine candidate in VSV glycoprotein deleted (VSVΔG) platform capable of expressing immuno-dominant domain CHIKV envelope glycoprotein, E2. Additionally we will incorporate endoplasmic reticulum signal processing peptides for

better expression and subsequent MHC presentation of antigen for efficient humoral response. Following generation of viral vector, we aim to study the humoral immune response of vaccine candidates to validate and augment desirable neutralizing antibody production in suitable murine models.



Dr. Kiran Bala
Associate Professor
kiranb@iiti.ac.in

Dr. Kiran Bala (PhD. 2007)

Previous Employment (includes post-doctoral experience)

- Associate Professor-Discipline of Biosciences & Biomedical Engg., Indian Institute of Technology Indore (Dec., 2018 – till date)
- Assistant Professor-Discipline of Biosciences & Biomedical Engg., Indian Institute of Technology Indore (Feb., 2017 – Dec., 2018)
- INSPIRE – Faculty, Indian Institute of Technology Indore (Nov., 2012 – Feb., 2017)
- DBT scientist DAVV, Indore (July, 2012 – Oct., 2012)
- UGC Post Doctoral Fellow Anna University, Chennai (Feb., 2009- Feb., 2011)
- Research Associate-TERI, Delhi (Nov., 2007 – Feb., 2009)

Statement of Research Interests

a. Broad research area

- Bioenergy, Bioremediation, Bioplastic production.

b. Research Highlights

- Nanoparticle biosynthesis and induction of biodiesel precursors simultaneously in the microalgal cells. Main focus of the study is to use unicellular eukaryotes (microalgae) as source of multiple products simultaneously.

c. Awards and Achievements

- Kashyap, M., et. al. (2021). Synthesis, Characterization and application of intracellular Ag/AgCl nanohybrids biosynthesized in *Scenedesmus* sp. as neutral lipid inducer and antibacterial agent, Environmental Research (Impact Factor – 6.498).
- Distinguished Alumni Award - 2021
- SERB Early Career Research Award - 2018.
- International Travel Support by DST, Delhi to attend 11th International Phycological Congress, held at Szczecin, Poland from 13th – 19th August, 2017.
- Fellowship under "Netherlands Fellowship Programmes (NFP) - NUFFIC" funded by Netherland govt. for refresher course in Bandung, Indonesia, 2015.
- International Travel Support by DST, Delhi to attend 4th International Conference on Algal Biomass, Biofuels and Bioproducts 2014, held at Santa Fe, New Mexico, USA.
- INSPIRE FACULTY Award - 2012 by DST, Ministry of Science & Technology, Delhi.
- Women Scientist Award by DBT under Bio- CARe Programme.
- Awarded UGC- Dr. D. S. Kothari Post Doctoral Fellowship sponsored by University Grants Commission.
- Awarded scholarship for Laboratory Capacity Training Program on "Air nicotine monitoring and analysis" at Johns Hopkins Bloomberg School of Public Health (JHSPH), Baltimore, MD, USA in 2008 funded by Institute of Global Tobacco Control, JHSPH.
- Awarded Fellowship under "Netherlands Fellowship Programmes (NFP) 08" for short course on "Water Treatment Processes and Plants" at UNESCO-IHE Institute for Water Education in Delft, The Netherlands.

Publications

- International Journals: 44
- Research papers in Proceedings of conferences: 02
- Book chapters: 07

Three publications:

- Kashyap, M., Samadhiya, K., Ghosh, A., Anand, V., Lee, H., Sawamoto, N., Ogura, A., Ohshita, Y., Shirage, P.M., Bala, K. (2021). Synthesis, Characterization and application of intracellular Ag/AgCl nanohybrids biosynthesized in *Scenedesmus* sp. as neutral lipid inducer and antibacterial agent, Environmental Research (Impact Factor – 6.498).
- Meda, A., Sangwan, P., Bala, K., (2021). In-Vessel composting of RDX and HMX contaminated sludge using microbes isolated from contaminated site, Environmental Pollution (Impact Factor – 8.071).
- Ghosh, A., Sangtani, R., Anand, V., Kashyap, M., Kiran, B. (2021). Synergistic dynamics of critical cofactors effectuates fuel relevant metabolic profile of *Scenedesmus* sp.: Targeting cleaner energy production, Journal of Cleaner Production, 297: 126640 (Impact Factor: 9.297).

Projects active during April 2020-March 2021

Title : Mobility grant LUH-IIT Indore Partnership under the "A New Passage to India Program"
Duration : 2019-2023 (4 years)
Funding Agency : German Academic Exchange Service (DAAD) funded project for LUH-IIT Indore Partnership under the "A New Passage to India Program"
Brief Description : Exchange grant to develop joint publications, and research work in the area of algae-bacteria consortia for biopolymer production.

Title : Innovative and efficient algae based system to reduce carbon dioxide emissions: A possible remedy to climate change
Duration : 2018-21 (3 years)
Funding Agency : Ministry of Earth Sciences, GOI
Brief Description : Usage of algae for carbon dioxide fixation has numerous benefits such as mitigation of carbon dioxide with simultaneous production of biofuels and other secondary metabolites. Carbon dioxide is fixed by green algae and cyanobacteria into sugar using light and water as source of energy and electron, respectively. This multistep photosynthetic reaction is main hypothesis behind current research plan.

Title : An innovative approach for development of an efficient and integrated algae bioenergy production system using biosynthesized nanoparticles
Duration : 2018-21 (3 Years)
Funding Agency : DST-SERB
Brief Description: Proposed research plan would help in development of an integrated solution for energy source and wastewater treatment using algae. Successful development of technology can lead and help authorities to take decision and implement this at centralized /decentralized level for treatment of wastewater simultaneously generating energy.

Title : Isolation, purification and therapeutic evaluation of novel peptides and bioactive compounds as DPP-IV inhibitors from magneto-primed soybean seeds and microalgae for diabetes treatment
Duration : 2021-2024 (3 years)
Funding Agency : DST-SERB (TARE scheme)
Brief Description: This project would explore potential of magnetic field to target enhanced in protein synthesis and novel peptides in soybean seeds and algae, which might act as effective inhibitors for DPP-IV.



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) (2018-present)

Dr. Mirza S. Baig
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- **Assistant Professor:** Indian Institute of Technology Indore (IITI) (2015-2018)
- **Research Scientist**: Mayo Clinic, Rochester, USA (2014-2015)
- **Postdoctoral Research Scientist:** The University of Illinois at Chicago, USA (2010-2014)
- **Research Associate**: Indian Institute of Toxicology Research, Lucknow (2009-2010)

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

- International Visiting Professorship, Bio-Medico University of Rome, Italy
- The Lady Davis International Professorship, Technion-Israel Institute of Technology, Israel
- IUBMB Mid-Career Research Fellowship, the University of Illinois at Chicago, USA
- ASM-IUSSTF Indo-US Professorship, University of California, USA
- INSA Visiting Scientist Fellowship, SMS Medical College, India
- Technical University Munich (TUM), Germany- Visiting Professor
- Cambridge University, United Kingdom- Visiting Professor and Research Collaboration
- Institute of Microbial Chemistry (IMC), Tokyo, Japan- Reserch 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- Reserch Collaboration
- Max Planck Institute for Heart and Lung Research, , Bad Nauheim, Germany-Reserch Collaboration
  University of Miami, Miami, USA-Research Collaboration

Statement of Research Interests

a. Broad research area

- Innate Immunity and Inflammation
- Drug discovery and development for inflammatory diseases

b. Research Highlights

- Inflammation and cancer- Our research focuses on the understanding of cell signaling pathways and transcriptional mechanisms that regulate the activation of macrophages in inflammation and cancer. Macrophage activation by microbial pattern recognition receptors, such as Toll-like receptors (TLRs), is critical for innate and adaptive immunity and has been extensively studied. However, these cells also play essential roles in resolving inflammation, maintaining tissue homeostasis and immune tolerance. We understand relatively little about the signaling pathways and molecular mechanisms that control the functions of macrophages in the context of their role in various chronic inflammatory conditions, including some cancers, rheumatoid arthritis, atherosclerosis, etc.

c. **Awards and Achievements**

- Virtual drug screening and repositioning- We utilize virtual or computer-aided drug design methods to model new compounds complementary to a target protein's shape and charge against inflammation and cancer. These virtually designed lead-like compounds could later be synthesized for biochemical and cellular testing. Drug repositioning can provide a safer alternative to developing new compounds as the repurposed drugs are clinically approved, have proven bio-availabilities, and well-characterized side-effect profiles.
- International Visiting Professorship (2020), Bio-Medico University of Rome, Italy
- The Lady Davis International Professorship (2020), Technion-Israel Institute of Technology, Israel
- IUBMB Mid-Career Research Fellowship (2020), the University of Illinois at Chicago, USA
- ASM-IUSSTF Indo-US Professorship (2020), University of California, USA
- INSA Visiting Scientist Fellowship(2020), SMS Medical College, India

Publications:

- Rajpoot S, Manikandan A, Baig MS. Dual Targeting of 3CLpro and PLpro of SARS-CoV-2: A Novel Structure-Based Design Approach to treat COVID19.
  Current Research in Structural Biology :2020: doi.org/10.1007/s12195-020-00658-5.
- Manikandan A, Rajpoot S, Baig MS. Structure-Based Design of Novel Peptidomimetics Targeting the SARS-CoV-2 Spike Protein.
  Cellular and Molecular Bioengineering :2020: 1-9: doi.org/10.1007/s12195-020-00658-5.
- Baig MS, Manikandan A, Rajpoot S, Saqib U. Identification of a potential peptide inhibitor of SARS-CoV-2 targeting its entry into the host cells.
  Drugs in RND:2020: 20, 161–169.
- Sajjan Rajpoot1, Tomokazu Ohishi2, Ashutosh Kumar, Qiuwei Pan, Sreeparna Banerjee, Kam Y J Zhang, Mirza S Baig. A Novel therapeutic peptide blocks SARS-CoV-2 spike protein binding with host cell ACE2 receptor.
  Drugs in R&D, 2021, doi: 10.1007/s40268-021-00357-0.
- Sajjan Rajpoot, Tomokazu Ohishi, Ashutosh Kumar, Qiuwei Pan, Sreeparna Banerjee, Kam Y. J. Zhang, Baig MS. A Novel Therapeutic Peptide Blocks SARS-CoV-2 Spike Protein Binding with Host Cell ACE2 Receptor.
  Drugs in R&D, 2021, doi: 10.1007/s40268-021-00357-0.
- Sajjan Rajpoot, Kishore K. Wary, Rachel Ibbott, Dongfang Liu, Uzma Saqib, Teresa L. M. Thurston , Baig MS. TIRAP in the Mechanism of Inflammation.
  Frontiers in Immunology , 2021, 12; doi:10.3389/fimmu.2021.697588
- Dabravolski, S.A.; Bezsonov, E.E.; Baig, M.S.; Popkova, T.V.; Nedosugova, L.V.; Starodubova, A.V.; Orekhov, A.N. Mitochondrial Mutations and Genetic Factors Determining NAFLD Risk.
  Int. J. Mol. Sci. 2021, 22, 4459.
- Mezentsev, A.; Bezsonov, E.; Kashirskikh, D.; Baig, M.S.; Eid, A.H.; Orekhov, A. Proatherogenic Sialidases and Desialylated Lipoproteins: 35 Years of Research and Current State from Bench to Bedside.
  Biomedicines 2021, 9, 600.
- Dabravolski, S.A.; Orekhova, V.A.; Baig, M.S.; Bezsonov, E.E.; Starodubova, A.V.; Popkova, T.V.; Orekhov, A.N. The Role of Mitochondrial Mutations and Chronic Inflammation in Diabetes.
  Int. J. Mol. Sci. 2021, 22, 6733.
- Dabravolski, S.A.; Bezsonov, E.E.; Baig, M.S.; Popkova, T.V.; Orekhov, A.N. Mitochondrial Lipid Homeostasis at the Crossroads of Liver and Heart Diseases.
  Int. J. Mol. Sci. 2021, 22, 6949.
- Roy A, Saqib U, Baig MS. NOS1-mediated macrophage and endothelial cell interaction in the progression of atherosclerosis.
  Cell Biology International: 2021
- Saqib U., Masood A. Khan, Manikandan Alagumuthu, Suraj P. Parihar, Baig MS. Natural compounds as antiatherogenic agents.
  Cellular and Molecular Biology: 2021: http://dx.doi.org/10.14715/cmb/2021.67.1.27.
- Roy A, Saqib U, Wary KK, Baig MS. Macrophage neuronal nitric oxide synthase (NOS1) controls the inflammatory response and foam cell formation in atherosclerosis.
  International Immunopharmacology:2020: 83: 06382.
- Baig MS, Roy A, Rajpoot S, Liu D, Savai R, Banerjee S, Kawada M, Faisal SM, Saluja R, Saqib U, Ohishi T, Wary KK. Tumor-derived exosomes in the regulation of macrophage polarization.
  Inflamm Res. 2020: doi: 10.1007/s00011-020-01318-0.
- Naim A, Baig MS. Matrix metalloproteinase-8 (MMP-8) regulates the activation of hepatic stellate cells

(HSCs) through the ERK-mediated pathway.
Mol Cell Biochem. 2020: doi: 10.1007/s11010-020-03705-x.

- Ohishi T, Abe H, Sakashita C, Saqib U, Baig MS, Ohba SI, Inoue H, Watanabe T, Shibasaki M, Kawada M. Inhibition of mitochondria ATP synthase suppresses prostate cancer growth through reduced insulin-like growth factor-1 secretion by prostate stromal cells.
Int. J. Cancer. 2020: doi: 10.1002/ijc.32959.

Projects active during April 2020-March 2021

Title - Role of neuronal nitric oxide synthase (NOS1) in the TLR4-triggered inflammatory response via the SOCS1-P38-AP1 signalling axis.

Duration - 3Years

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. Hem Chandra Jha
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PhD. Birla Institute of Technology & Sciences, Pilani, Rajasthan India

Previous Employment(includes post-doctoral experience)

- PDF and RA from University of Pennsylvania,
- Philadelphia, USA (March 2010- June 2016)

Statement of Research Interests

a. Broad research area

- Pathogens like virus (Epstein Barr Virus and
- SARS-CoV-2), bacteria (Helicobacter pylori) and
- parasite (Plasmodium Falciparum) associated disease
- pathogenesis

Research Highlights

- Our research articles on SARS-CoV-2 have been highlighted by honourable Minister of Education, DD News, Outlook, The Week magazines and various national and e-portals.
- Virus infection cycle and pathogenesis mapping has been highlighted by DST, India.
  - Several key points-
    - Worldwide SARS-CoV-2 structure proteins mutation analysis from Jan 2020 to July 2020.
    - Possible medicinal plants therapeutics for SARS-CoV-2 Spike and Nucleocapsid proteins.
    - Possible drug repurposing for COVID-19
    - Wastewater treatment and environmental factors analysis in ongoing COVID-19 pandemic.
    - Comorbidities such as neural and gastric system in COVID-19.
    - Various age group and sex based understanding in COVID-19
    - Case studies in Indian COVID-19 patients with Malaria infection, Neurological complications and cancer patients.
    - First time Epstein - Barr virus infection demonstration in glial cells and their consequences at cellular levels.
    - In Gastric cancer- Establishment of co-infection model from Helicobacter pylori and EBV for the analysis of early markers from Kinases and other oncogenes.
    - First time demonstration of co-infection models for Plasmodium falciparum and Epstein Barr Virus in cerebral malaria model.

Patents :

- Kumar M, Sulabh, Singh L, Jain S, Rajput S, Kaushik V, **Jha HC**. Engineered nanophotonic structure based on electrically controlled composite materials for biochemical sensing. Submitted to IIT Indore, July 25, 2020.
- **Jha HC**, Tiwari D. Peptides for the treatment of Neurodegenerative disorders. Patent Application No. 202121032715, Filing Date- July 20, 2021.

Publications

Best three:

- Jakhmola S, Jonniya A, Sk MF, Rani A, Kar P*, **Jha HC***. Identification of Potential Inhibitors against Epstein–Barr Virus Nuclear Antigen 1 (EBNA1):
  An Insight from Docking and Molecular Dynamic Simulations**.** ***ACS Chem. Neurosci***. 2021, doi.org/10.1021/acschemneuro.1c00350.
- Pei Y, Hwang N, Lang F, Zhou L, Wong JH, Singh RK, **Jha HC**, Wafik S. Deiry E, Du Y, Robertson ES. Quassinoid analogs with enhanced efficacy for
  treatment of hematologic malignancies target the PI3Kγ isoform. ***Communication Biology***, 2020, 3 (1), 1-13.
- Tiwari D, Jakhmola S, Pathak D, Kumar R*, **Jha HC***.
  Temporal In-vitro Raman Spectroscopy for Monitoring
  Replication Kinetics of Epstein-Barr virus Infection in Glial Cells. ***ACS Omega***. 2020. doi.org/10.1021/acsomega.0c04525.

Projects active during April 2020-March 2021

Title :

- Identifying the Biomarkers and Mechanism of Immunomodulators like Cytokines and Chemokines in Epstein-Barr virus and Helicobacter pylori
  co-infected gastric cancer
- Immunopathogenesis of Multiple Sclerosis from Epstein
  Barr Virus and Chlamydia pneumonia infection
- Role of Kinases in Epstein Barr Virus mediated cancer

Duration :

- 2018-2021 (October).
- 2017-2020 (October)
- 2016-2021 (July)

Funding Agency :

- SERB
- CSIR
- SERB

Total publication: Journal article: 28



Dr. Primal Kar
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Dr. Parimal Kar PhD from Michigan Technological University.

Previous Employment (includes post-doctoral experience)

- Visiting Research Associate, Michigan State University, USA (June 2012- February 2016)
- Postdoctoral Fellow, Max Planck Institute of Colloids and Interfaces, Potsdam, Germany (January 2010 – May 2012)
- Graduate Intern, Los Alamos National Laboratory, USA (June 2009- December 2009)
- Visiting Research Fellow, Research Center Juelich, Germany (February 2008 – July 2008)

Statement of Research Interests

a. Broad research area

- Computational Biophysics

b. Research Highlights

- Computational modelling of PTM (post-translational modification) in proteins
- Multiscale modeling of biomolecular recognitions, including protein-protein, protein-nucleic acids, and protein-ligand interactions.
- Computer Aided Drug Discovery
- Free energy simulations and enhanced sampling methods.
- Computational modeling of host-pathogen interactions
- Interaction of carbohydrates (glycans) with proteins and membrane.

c. Awards and Achievements

- Early Career Research Award, DST-SERB, Govt of India (2017)
- Ramalingaswami Re-entry Fellowship, Department of Biotechnology, Govt. of India (2015) Postdoctoral Independent Career Potential Award, Michigan State University (2014).

Publications:

For complete publication: https://iitibsbeparimalkar.wixsite.com/biophysics/publications

https://scholar.google.com/citations?user=w81u9lMAAAAJ&hl=en

- Jonniya, N. A., Sk, M. F., **Kar, P**. (2021). Characterizing allosteric inhibitor-induced inactive state in With-No-Lysine kinase 1 using Gaussian accelerated molecular dynamics simulations. ***Physical Chemistry Chemical Physics***, 23, 7343-7358.
- Roy, R., Ghosh, B., **Kar, P**. (2020). Investigating Conformational Dynamics of Lewis Y Oligosaccharides and Elucidating Blood Group Dependency of Cholera Using Molecular Dynamics. ***ACS Omega***, 5(8), 3932-3942.
- Sk, M.F., Jonniya, N. A., Roy, R., Poddar, S., & **Kar, P**. (2020). Computational Investigation of Structural Dynamics of SARS-CoV-2 Methyltransferase-Stimulatory Factor Heterodimer Nsp16/nsp10 Bound to the Cofactor SAM. ***Frontiers in Molecular Biosciences***, 7, 590165.

Events/ Seminars organized

- Cloud-based 2-days hands-on workshop on drug discovery, June 1-2, 2021.
- Faculty Training Program on : Data Science & Analytics, March 2-12, 2020
- QIP-sponsored 5-days course on Nano-biotechnology in Drug Discovery, Development and Delivery March 11-15, 2020.
- TEQIP-sponsored 3-days course on: Introduction to Scientific Computing in Engineering January 15-17, 2020.

Projects active during April 2020-March 2021

Title : Redesigning of antibody and finding novel inhibitors for dengue virus using computational approaches

Duration : 23rd March 2021 – 22nd March 2023

Funding Agency : DST

Brief Description: The goal of the project is to find novel inhibitors against target proteins of dengue virus using computational approaches as well as optimize the already available antibody for antibody therapy against dengue.

Title : Multiscale Simulations of Protein-Glycan Complexes: Toward Understanding the Molecular Basis of Host-Pathogen Interactions and Immune Response

Duration : March 2016 – February 2021

Funding Agency : DBT
Brief Description: The goal of the project is to elucidate the biophysical basis of recognition of glycans by proteins using atomistic molecular dynamics simulations in conjunction with the free energy calculations

Title : 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
Duration : September 2017 – September 2020
Funding Agency : DST-SERB
Brief Description: The goal of the project is to investigate the effect of covalently linked glycans on the structural dynamics of HCV glycoproteins E1 and E2 via all-atom molecular dynamics simulations.



Dr. Abhijeet B. Joshi
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Dr. Abhijeet B. Joshi PhD.: IIT Bombay,

Previous Employment (Includes post-doctoral experience)

- Assistant Professor, Discipline of Biosciences and Biomedical Engineering, IIT Indore (2018-Till Date)
- INSPIRE Faculty, Centre for Biosciences and Biomedical Engineering, IIT Indore (2015-2018)
- IYBA Fellow, Department of Biosciences and Bioengineering, IIT Bombay, Mumbai (2012-2015)
- Lecturer, Department of Pharmaceutics, NIPER-Ahmedabad, Gujarat (2011-12)

Statement of Research Interests

a. Broad research area

- Biomedical Engineering

b. Research Highlights

- Interdisciplinary areas of biosensors, drug delivery, novel materials for biomedical applications, nano-biotechnology and theragnostic.
- Fabricating novel materials and methods to develop them to enable advances in healthcare and environmental areas.

Patents:

- Indian Patent Application No.: 201921015731; Abhijeet Joshi, Jaspreet Kaur, Bhavana Joshi, Gaurav Pandey, (2019), "Ultrasonic Atomizer Based Method For Development Of Biodegradable Anticancer Nanoparticles, Microspheres And Hybrid Micro-particles.

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

- Riboflavin as an internal marker for spoilage and adulteration detection in milk, G Pandey, A Joshi Food Chemistry 357, 129742, 2021
- Kaur, J., Jakhmola, S., Singh, R. R., Joshi, B., Jha, H. C., & Joshi, A. (2021). Ultrasonic Atomizer-Driven Development of Biocompatible and Biodegradable Poly(d,l-lactide-co-glycolide) Nanocarrier-Encapsulated Suberoylanilide Hydroxamic Acid to Combat Brain Cancer. *ACS Applied Bio Materials*. doi:10.1021/acsabm.1c00430.
- Recombinant organophosphorus hydrolase (OPH) expression in E. coli for the effective detection of organophosphate pesticides, M Jain, P Yadav, B Joshi, A Joshi, P Kodgire, Protein Expression and Purification, 105929, 2021
- Translation of Carbon Dot Biosensors into an Embedded Optical Setup for Spoilage and Adulteration Detection S Choudhary, B Joshi, A Joshi, ACS Food Science & Technology, 2021
- M Jain, P Yadav, B Joshi, A Joshi*, P Kodgire*, A novel biosensor for the detection of rganophosphorus (OP)-based pesticides using organophosphorus acid anhydrolase (OPAA)-FL variant, Applied Microbiology and Biotechnology, 1-12, 2021

- Sree-Pooja Varahachalam, Jaspreet Kaur, Minitha Jacob, Behnaz Lahooti, Tanya Chhibber, Alexis Hyman, Abhijeet Joshi* and Rahul Dev Jayant*, (2021) An Introduction to Glycoprotein, P-gp Pathophysiology: Post-Translational Modification And Affecting Signalling Cascades, Nova Science Publishers, ISBN: 978-1-53619-488-3.

Projects active during April 2020-March 2021
Title: Nasal delivery of anti-retroviral theranostic nano-enabled carriers
Duration: 2015 - 2020 (ongoing)
Funding Agency: Science & Engineering Research Board (SERB)
Brief Description: Synthesis and delivery of nano carriers containing HIV drugs, nanocarriers enabled targeted delivery as therapeutics against brain cancer, co-delivery of chemotherapeutic drugs against solid tumors.

Title: Multi-analyte nano-engineered quantum dot based fluorescent biosensors for clinical quantification of biomarkers in diabetes related kidney diseases
Duration: 2017 - 2020 (ongoing)
Funding Agency: Science & Engineering Research Board (SERB)
Brief Description: Development of biosensors for kidney diseases using nanomaterials.

Title: Flourimetric biosensor for detection and quantification of insecticides and pesticides using recombinant organo-
phosphorus hydrolase expressed in E. Coli
Duration: 2017 - 2020 (ongoing)
Funding Agency: Department of Biotechnology (DBT)
Brief Description: Detection of organophosphate pesticees usig
recombinant OPH expressed in E. coli

Title: Quantum dot based biosensor for early detection of prostate cancer using multiple biomarkers in biological samples
Duration: 2018 - 2020 (ongoing)
Funding Agency: Department of Biotechnology (DBT)
Brief Description: Detection of prostate cancer using quantum dots and sensing method development.

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

School of Humanities and Social Sciences

From the Head's Desk

The School of Humanities and Social Sciences at IIT Indore is an exciting and vibrant place of Research and pedagogy. We have 14 faculty members and more than 40 PhD research students working in exciting projects and problems. The faculty members of the School are an eclectic mix of researchers from varied disciplines of Economics, English, History, Philosophy, Psychology and Sociology. Apart from their disciplinary affiliations each of the faculty members are engaged in their specialised areas of research and write, publish and speak about their work. The interdisciplinary nature of the research within the school is reflected in two ways:

1. By the established research groups and their works that span different disciplines and areas of intellectual discourse. The following focused research groups are active within the School:

- Digital Humanities and Publishing Lab
- Human Factors & Applied Cognition Lab
- Innovation Studies and Econometrics Lab
- Linguistics
- Performance Studies in Literature and other Arts
- Philosophy of Ethics Studies
- Sustainability Studies Lab
- Sociology of Religion
- Sociology of Film and Media Studies
- Water Governance and Policy Studies

2. The research collaborations of the faculty members across these areas both within the school, across other Engineering and Science disciplines in the Institute as well as with other colleagues both nationally and internationally demonstrate the truly interdisciplinary nature of the research of the faculty members of the school. We therefore have a vibrant PhD programme that comprises course work and a rigorous dissertation and project work. Our students have won prestigious national and international scholarships, fellowships and awards and we are very proud of their achievements when they are part of the school and all of our graduating students have gone on to excel themselves in their chosen careers too. In this last year with the pandemic, the School has continued to innovate ideas, graduate Ph.D students and develop courses and programmes. We are proud of our students and faculty members who kept the wheel turning not losing sight of our commitment to our research and academics. This included, apart from regular academic work, hosting online seminars, conferences, invited talks and lectures and our students have been actively involved in every one of those events, often leading from the front in organizing and facilitating them.

We are particularly excited to announce that the School of HSS at IIT Indore inaugurated its first master programme a MS (Research) with the same interdisciplinary focus with new courses and projects for the incoming students. The first batch will commence from Autumn 2021.



Dr. Nirmala Menon
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Dr. Nirmala Menon is an Associate Professor in the School of Humanities and Social Sciences (HSS), Discipline of English, IIT Indore. She leads the **Digital Humanities and Publishing Research Group** at the Indian Institute of Technology (IIT), Indore, India. Dr. Menon is the author of *Migrant Identities of Creole Cosmopolitans: Transcultural Narratives of Contemporary Postcoloniality* (Peter Lang Publishing, Germany, 2014) and *Remapping the Postcolonial Canon: Remap, Reimagine, Retranslate* (Palgrave Macmillan, UK 2017). She is the Co-Editor of the first multilingual Volume of E-literature to be published from India. Apart from the books, she has published more than 50 research papers in numerous international journals (Oxford University Press, Taylor and Francis, Sage among others) and speaks, writes and publishes about Postcolonial studies, Digital Humanities and scholarly publishing.

She mentors research scholars and runs DH projects from the research lab at IIT Indore. Her research group works on Digital Projects relating to Cultural Heritage through both creation and curation of Archives and Databases. She is the Project Director for KSHIP (Knowledge Sharing in Publishing), an Open Access Publishing platform. While her primary area of research is Postcolonial studies and Digital Humanities; Globalization and Translation studies are additional areas of research. Dr. Menon has received various national and international grants and awards (MHRD, SPARC, UKEIRI, Academia Europaea among others). She has also hosted Fulbright Scholars in her lab and she along with her students have received international awards such as Charles Wallace Fellowship, Zubaan Saaskawa Publishing prize and ASEM-DUO fellowship. She has given more than 50 lectures and keynotes at various national and international forums and lead or facilitated workshops in Digital Humanities in India and internationally. As Vice President of CenterNet (Consortium of Digital Humanities Research Groups globally), Dr. Menon has put DH in India on the global map. She is also on the Advisory Board of the Open Library of Humanities (OLH), Advisory Board member of Ubiquity Press, UK and Advisory Board Member, Open Access India and Chair, (2016-17) CLCS Global South Forum, Modern Language Association (MLA). Dr. Menon is one the founder members and current President of Digital Humanities Alliance in Research and Teaching Innovation (DHARTI).

Awards and Recognitions

Students:
ASEM-DUO fellowship for PhD scholar, Ms Shaifali Arora
Postdoctoral Fellowship, Lancaster University, Ms Shanmugapriya T
Postdoctoral Fellowship, University of Toronto, Ms Shanmugapriya T

Projects sanctioned between April 1, 2020-March 31,2021

1 project shortlisted by ICCSSR and presentation over: 17 lacs

Courses taught :

HS 159: English Language and Communication
HS 745: Post-Colonial Theory and Criticism
HS 618/418: Sustainability Studies
HS 601: Research Methods in Social Sciences

Conferences and Workshops organized

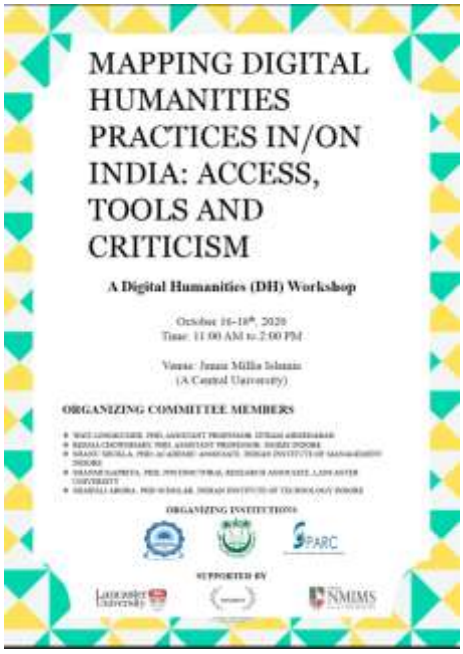
- SPARC Workshop: Mapping Digital Humanities Practices in/on India: Access Tools and Criticism: October 2020
- UKEIRI SPARC Workshop: Digital Heritage Workshops: March 2021

Publications

4 journal articles have been published during the year. Additionally, a monograph is also under progress.

Select Keynote addresses

- **Menon, Nirmala** Keynote Speaker, Japanese Association of Digital Humanities (JADH) Annual Conference, December 2020
- **Menon, Nirmala** Panelist, ADHO Conference at Ontario, Canada (held online due to pandemic) Towards and Indian Decolonial/Postcolonial DH https://www.youtube.com/watch?v=pLJgOsC-8ds&t=842s
- **Menon, Nirmala** Electronic Literature as DH: perspectives from Ghana and India https://www.youtube.com/watch?v=vlJPu_ZFjsE
- **Menon, Nirmala** Invited panelist on UKEIRI lectures series "Artificial Intelligence and Machine Learning" June 2020
- **Menon, Nirmala** DHARTI Speaks series Beyond Defaults: Multilingual DH meets Cultural Analytics https://www.youtube.com/watch?v=rxJTFsvvTC8
- **Menon, Nirmala** Digital and Humanities: Fellow Travelers or Inconvenient Bedfellows? Interview with Thilini Prasadika, Who is Afraid of the Humanities? A Lankan Podcast September 2020 https://www.youtube.com/watch?v=DUXvYFWIFyY&t=19s
- **Menon, Nirmala** Keynote Speaker, University of Pondicherry conference on Digital Humanities SPARC-Australia Conference 2020
- **Menon, Nirmala** Keynote Speaker, Midnapore College, West Bengal Conference on Literature and Recent Developments
- **Menon, Nirmala** Presiding Expert, 'Imagining Digital Humanities in India', with panelists from IIT Jodhpur, IIT Delhi, Australia and others
- **Menon, Nirmala** Keynote Speaker, Digital Humanities Lecture series, East West University, Bangladesh 2021
- **Menon, Nirmala** Keynote, Annual Conference on Communications and Publishing Electronic Literature in India: Does it exist? Amity University, 2021.







Dr. C. Upendra
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Dr. C. Upendra is an Associate Professor in the School of Humanities and Social Sciences (HSS), Discipline of Philosophy. He received his doctoral degree in Philosophy from the Department of Humanities & Social Sciences, Indian Institute of Technology Bombay. His doctoral work is in the area of Moral Philosophy with some linkages to Political Philosophy. The focus of the work was on the logic of reasoning about morality and good. Prior to joining IIT Indore as Assistant Professor, he served the Ford- Foundation funded research library; Forum on Contemporary Theory at Baroda in Gujarat. His broad research area is on Moral-Political Philosophy, History of Ideas, Radical Philosophy, Philosophy of Film & Music.

Currently, Dr. Upendra's 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 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 are mutually irreconcilable.

Courses taught

UG

HS 206: Paradigms and Turning Points
HS 313: History of Early Cinema
HS 402: Twentieth Century World History: Critical Perspectives

PG

HS 603: Epistemology
HS 605: Social and Political Philosophy
HS 606: Moral Philosophy



Dr. Ruchi Sharma
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Dr. Ruchi Sharma finished her PhD from Indian Institute of Technology Kanpur in 2009 and worked as an Assistant Professor at IITs Indore and Delhi and has held Visiting Faculty position at IIM Indore. She has been an Associate Professor at IIT Indore from 2016. She has published in Journals like *Research Policy*, *Economics of Innovation and New Technology*, *Economic Modeling*, *Journal of Policy Modeling*, *Technology Analysis and Strategic Management*, among others. She was a recipient of Kusuma Young Faculty Incentive Fellowship from IIT Delhi. She has presented research papers in various national as well as international conferences. She has received best paper awards during MIPS conferences at IIT Bombay and other conferences. She also won the award of Best Teacher at IIT Indore in 2020 for the large class. She organized GIAN courses with the broad theme of Economics of Innovation. She has been working on various research projects in the areas of intellectual property rights and innovation sponsored by agencies like ICSSR and DST. She was a member Member, Drafting Committee for Science, Technology, and Innovation Policy (STIP 2020), DST, GoI.

Awards

Best Teacher at IIT Indore in 2020 for the large class.

Courses Taught

UG

HS 108: Fundamentals of Economics
HS 210: Indian Economy
HS 323: International Economics

PG

HS 426: Economics of Innovation

Workshops and Conferences

- Workshop on Educational Dynamics on Real & Virtual Platforms….Copyright Implications on October 10, 2020. Speakers: Professor Prabuddha Ganguli, CEO Vision-IPR and Adjunct Faculty, IIT Jodhpur, Co-Principal Investigator, National Digital Library of India, IIT Kharagpur and Mr Jagdish Sagar (IAS retired) Advocate, Delhi (IAS Retired)
- Budget 2021: Panel Discussion along with Dr. K.C. Pradhan on 4 February 2021. Speakers: Prof. N.R Bhanumurthy (Vice-Chancellor of Bengaluru Dr. B.R. Ambedkar School of Economics University (BASE University). Prof. Neeraj Hatekar (Prof. at University of Mumbai)

Publications : 12 (from April 1, 2020-March 31, 2021); 39 in total



Dr. Pritee Sharma
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Dr. Pritee Sharma is an Associate Professor in the Discipline of Economics of the School of Humanities and Social Sciences (HSS). She obtained her PhD. from IIT Bombay on, 'Implications of Input Subsidies on Agricultural Productivity and Rural Poverty in India'. Her research is concerned with food security, agricultural productivity, rural poverty, and international trade in agriculture sector. Her main research interests are in the areas of Environmental Economics and Development Economics. She previously worked at Indian Institute of Management Ahmedabad (IIMA) and Gujarat Institute of Development Research (GIDR). She was also a team member for research assignments undertaken for the Ministry of Agriculture (MoA), Ministry of Statistics, Planning and Implementation (MoSPI), Ministry of Environment and Forests (MoEF), Government of India. She has also done research assignments for the Rockefeller Foundation and the World Bank and is a Research Fellow of Earth System Governance International Association based at Utrecht, The Netherlands. Her research assignments and the supervision of doctoral research work mainly consist of understanding and analysing food security, agricultural productivity, rural poverty and international trade concerns for India. Her research group includes PhD. students and external honorary members working on Sustainability Issues from various perspectives. She also teaches undergraduate and post graduate level courses in environmental economics, sustainability studies and institutional economics. Dr. Pritee also researches on 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 her work has been till date pertaining to governance, efficiency and policy in Indian context.

Awards

- 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

Journal Articles

- Sharma, P. and SN Kumar (2020) The global governance of water, energy, and food nexus: allocation and access for competing demands, International Environmental Agreements (Springer Nature) Vol.20: 377-391
- Joshi, S., and Sharma, P. and K. Mishra (2020) Green growth & Trade restrictions: Assessing socio economic impacts of local content requirements in Indian solar policy, Journal of Developing Areas, Vol. 54 (1): 149-162 Published by Tennessee State University College of Business.
- Praveen, B. and P Sharma, (2020) Climate variability and its impacts on agriculture production and future prediction using autoregressive integrated moving average method (ARIMA), Journal of Public Affairs, 20 (2) Available at https://doi.org/10.1002/pa.2016
- Praveen, B., Talukdar, S., Shahfahad, Mahato, S., Mondal, J., Sharma, P., Towfiqul Islam, ARM and A. Rahman (2020) Analyzing trend and forecasting of rainfall changes in India using non-parametrical and machine learning approaches, Scientific Reports 10, (10342) Available at https://doi.org/10.1038/s41598-020-67228-7
- Kumar, A., Singh, B.J. and Sharma P. (2020) Assessing the climate change impact on rice and wheat production in Uttar Pradesh and Haryana States of India, Climate Change Vol.6 (21): 74-93.
- Bairwa, A.K., Chakradhar, J. and P. Sharma (2020) Employment Discrimination in Indian Manufacturing Industries: A Logit Analysis, The Singapore Economic Review Vol. 65 (01): 233-259.
- Barik, R. and Sharma, P. (2020). What Constraints Financial Inclusion for the Transgender Community? Field Based Evidence from Odisha (India). Contemporary Voice of Dalit, Sage Publication

Book chapters

- Sharma, P., Enechi O. and S.N. Kumar (2020) Agency in the Allocation of and Access to Natural Resources, In: M. Betsill, T. Benney and A. Gerlak "Agency in Earth System Governance.", Cambridge University Press.
- Gerlak, A., Mill-Novoa M., Elder, A., Enechi, O., Sharma P., Singh, K. (2020) Issues and Geography in Earth System Governance, In: M. Betsill, T. Benney and A. Gerlak "Agency in Earth System Governance.", Cambridge University Press.

Courses Taught

UG

HS 108: Fundamentals of Economics
HS 210: Indian Economy
HS 323: International Economics

PG
HS 418/618: Sustainability Studies
HS 628: Institutional Economics



Dr. Sanjram Premjit Khanganba
Associate Professor
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Dr. Sanjram Premjit Khanganba works as a human factors research practitioner. His scientific research revolves around investigating aspects of applied cognition in system development, design, and evaluation. He has strong dedication towards addressing issues related to human-system interaction in the pursuit of technological innovation, improvement, and optimal utilization of human capabilities. He emphasizes on community level intervention in addressing real-world problems. He engages local community members in conducting user testing and conceptualizing services. His research contexts range from road safety and complex technological environments to social design. He employs experimental investigation in the laboratory as well as field-testing involving analysis of gaze and electrophysiological data.

His research group is actively involved in constantly promoting research activities related to ICT in Community Systems primarily connected with remote areas of India's Northeast Region (NER). His social-centric research activities are aligned with schemes promoted by the Government of India in critical thrust areas of national importance, such as- Technology Interventions for Disabled and Elderly (TIDE), Equity Empowerment and Development (SEED), Department of Science and Technology and R & D in Convergence Communications & Broadband Technologies (CC&BT) Group, Ministry of Electronics and Information Technology (MeitY). At present, his research at 'Human Factors & Applied Cognition Lab' concentrates on broad domains of- Automotive & Transport UX, Community Systems, Interactive Systems, Smart Environments & Automated Systems, Medical & Healthcare UI, Assistive Systems for Rehabilitation, and Performance. He is a founding member of HCI Professional Association of India and is actively associated with Indian Society of Ergonomics. He is currently a member of the Technical Committee of Visual Ergonomics, International Ergonomics Association.

Major awards and recognitions

Sajad Ahmad Najar's doctoral work "Visuospatial Working Memory and Distracted Driving: Deciphering Gaze Behavior, Cognitive Workload, and Driving Errors" featured in Visual Ergonomics Technical Committee Newsletter (April 2020), International Ergonomics Association.

Courses taught

- HS 203: Psychology (U.G.)
- HS 671: Human Factors and Higher Cognitive Processes (P.G.)
- Swayam Course, Introduction to Human Factors and Ergonomics (Course Category: Design Engineering, Host: IDC School of Design, IIT Bombay)
- "Eye movement and visual cognition" EQIP-III STC on "Artificial intelligence driven biomedical data analysis for disease diagnosis", 05-10 November, 2020.
- "Human-System Interaction: Challenges and Opportunities" QIP Sponsored Short Term Course (STC) on "Computational Methods in Signal Processing and Machine Learning" 14-19 December, 2020.

Conferences and workshops organized

- Conference (One of the General Chairs)

IndiaHCI2020, Emerging Trends in Technology Design, 5-8 November, 2020. https://www.indiahci.org/2020/conference/

- Workshop (One of the Organizers and Expert Speaker)
  IEEE International Conference on Advanced Networks and Telecommunications Systems, 14–17 December, 2020, Workshop on Transformation through Rural Connectivity: the Role of 5G and B5G Technologies.
- HCI in Rural Contexts: Distinctions, Opportunities, and Possibilities. https://ants2020.ieee-comsoc-ants.org/transformation-through-rural-connectivity-the-role-of-5g-and-b5g-technologies/

Journal articles published

Najar, S. & Sanjram, P. K. (2021). Suppressed Articulatory Rehearsal Mechanism, Gaze Behavior, and Direction Following in Distracted Driving. In Muzammil, M., Khan, A. A., Hasan, F. (Eds.), *Ergonomics for Improved Productivity, Design Science and Innovation* (pp. 263-269), Springer Nature, https://doi.org/10.1007/978-981-15-9054-2_30.



Dr. Neeraj Mishra
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Dr. Neeraj Mishra is an Assistant Professor in Sociology in the School of Humanities and Social Sciences (HSS), Discipline of Sociology, IIT Indore. He has received his Ph.D. from the University of Bonn, Germany and his Postdoc from the University of Amsterdam. Working in the field of democracy, public sphere and development, Dr. Mishra's research interests include rural and tribal development studies, sociological theory, Adivasi development in Jharkhand, Sociology of Development, Environmental Sociology, Politics of Water Governance and Computer Assisted Qualitative Data Analysis (CAQDA).

Courses taught

HS 302: Environmental Studies: Social Aspects

Selected Publications

- Mishra, Neeraj. 2020. Global Governance of COVID-19: Decline of Public Sphere And Transnational Democracy. In Goyal, M.K., Gupta, A.K. (eds.). Integrated Risk of Pandemic: COVID-19 Impacts, Resilience and Recommendations. Singapore. Springer Nature. 978-9811576782

- 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. 978-1119433965

- Kumar, V., & Mishra, N. (2021). Sustainable Watering of the Watershed: A Qualitative Analysis of Choral River Revival Project in Narmada Basin, India, Development in Practice, Taylor and Francis (Accepted for publication).

COVID-19 initiatives

Research initiative(s): *Book chapter*

- Mishra, Neeraj. 2020. *Global Governance of COVID-19: Decline of Public Sphere And Transnational Democracy.* In Goyal, M.K., Gupta, A.K. (eds.). *Integrated Risk of Pandemic: COVID-19 Impacts, Resilience and Recommendations.* Singapore. Springer Nature. 978-9811576782.



Dr. Ashok Kumar Mocherla
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Dr. Ashok Kumar Mocherla is an Assistant Professor of Sociology in the School of Humanities and Social Sciences, Discipline of Sociology, IIT Indore. He received his doctorate from the Indian Institute of Technology Bombay. Before joining IIT Indore in March 2018, he was a faculty member in the School of Humanities and Social Sciences at IIT Mandi. His areas of academic interest are Sociology of Religion, Caste, and Indian Christianity, Sociology of Faith Healing and Public Health. He also has a keen interest in Sociology of Education (with reference to the growing transnational migration and commodification of engineering education in India).

Courses taught

HS 302: Environmental Studies: Social Aspects
IHS 482: Introduction to International Development & Area Studies
HS 616: Advanced Sociological Theory
HS 205: Understanding Sociology

Selected Publications

Book : Dalit Christians in South India: Caste, Ideology and Lived Religion (Routledge, 2021).



Dr. Akshaya Kumar
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Dr. Akshaya Kumar is an Assistant Professor of Sociology in the School of Humanities and Social Sciences (HSS), Discipline of Sociology, IIT Indore. He received his doctorate from the University of Glasgow. His research in Film, Media and Cultural Studies revolves around South Asian Film and Media. He has published extensively on News Media, Crime and Reality Television, Hindi Cinema, Stardom, Language Politics and the question of provinciality in Regional Cinema. Most of his work, drawing upon his Ph.D. dissertation, discusses the explosive growth of Bhojpuri Cinema and its attendant complexities with respect to labour, gender, urban resettlement, and region-formation. He also spent two months as an exchange fellow at Columbia University, New York. Prior to joining at IIT Indore, he taught for a year at Ambedkar University, Delhi.

Courses taught

HS 302: Environmental Studies: Social Aspects
IHS 482: Introduction to International Development & Area Studies
HS 616: Advanced Sociological Theory
HS 205: Understanding Sociology

Publications

Journal Articles

- Kumar, Akshaya. (2021) 'The Libidinal Economy of Vernacularisation: Modernity, Sexuality and Bhojpuri Media.' Media, Culture & Society 43 (4): 776-784. Doi: 10.1177/0163443721994543
- Kumar, Akshaya. (2021) 'Cinema and its Spatial Predicates: Landscapes of Debt in Search of Justice.' Jump Cut 60. URL: http://www.ejumpcut.org/currentissue/AkshayaKumar-Place/index.html
- Kumar, Akshaya. (2020) 'Standing the Provincial Ground: Childhood and Parental Authority in Dangal (2016).' Studies in South Asian Film & Media 11 (1): 41-55.

- Kumar, Akshaya. (2020) 'The Popular Aesthetics of Social Mobility.' Economic and Political Weekly 55 (31): 46-52.
- Kumar, Akshaya. (2020) 'Deriving a Tangible Promotional Calculus: Platform Monopolies and Political Advertising.' Media International Australia 176 (1): 52-65.

Book Chapters

- Kumar, Akshaya. (2020) 'Celluloid Visions in a Video Frame: Bhojpuri Cinema between Insurrections and Catharsis.' In Madhuja Mukherjee and Monika Mehta (eds) Industrial Networks and Cinemas of India: Shooting Stars, Shifting Geographies and Multiplying Media. London: Routledge, 181-193.
- Kumar, Akshaya. (2020) 'Informality in the time of Platformization.' In Adrian Athique and Vibodh Parthasarathi (eds) Platform Capitalism in India. London: Palgrave MacMillan, 261-279.
- Kumar, Akshaya. (2020) 'The Derivative Values of Platform Capitalism.' In Adrian Athique and Vibodh Parthasarathi (eds) Platform Capitalism in India. London: Palgrave MacMillan, 67-84.



Dr. Ananya Ghoshal
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Dr. Ananya Ghoshal is an Assistant Professor of English in the School of Humanities and Social Sciences (HSS), Discipline of English, IIT Indore. She received her doctorate from the Department of English Literature at the English and Foreign Languages University (formerly CIEFL), Hyderabad, on the influence of music in literature (2016). Her pre-doctoral research was conducted in the Department of English at the University of California, Berkeley, on a Fulbright-Nehru Fellowship. Her primary areas of interest include Word and Music Studies, Narratives of the Anthropocene, Performance Studies, Digital Humanities and Visual Culture. Ananya is also an Official Alumni Ambassador of UC Berkeley and represents her alma matter in outreach and mentoring events across India and the USA.

Ananya has previously taught at the English and Foreign Languages University and Forum on Contemporary Theory, Baroda (as an academic fellow). She has lectured and presented her work in various universities, at Oxford, Chicago, Berkeley, MIT; and most recently, at Stanford. At IIT Indore, she guides the **'Literature, Performance, and Other Arts' Research Group**. The members of the group study the distinct yet deeply interconnected ways of understanding literature and the other arts. Working at the intersections of texts and the social, historical, and cultural contexts that produced them, the group examines the meaning, form, and style of literary and artistic works while exploring their imaginative and creative potential on a performance stage/screen.

Courses taught

Autumn 2020: **HS 159**: *English Language and Communication* (co-instructor), **IHS 444**: *Literature of the Twentieth Century* (Coordinator and sole instructor), **HS 641**: *English Communication Skills* (Coordinator and co-instructor), **HS 743**: *Indian English Fiction* (Coordinator and sole instructor)

Spring 2021: **HS 159**: *English Language and Communication* (co-instructor), **HS 641**: *English Communication Skills* (Coordinator and co-instructor), **HS 742**: *Twentieth Century and the European Novel* (Coordinator and sole instructor)

Selected Publications

Book chapter- "Reading Interrupted: Translating Disability in 'Subha" in *Disability in Translation: The Indian Experience,* edited by Someshwar Sati and G. J. V. Prasad. Abingdon, Oxon ; New York,

NY : Routledge, Taylor & Francis Group, 2020.

Invited talks/lecture:

- '*Of Luminous Presence: the portrayal of women in Satyajit Ray's Devi/Goddess (1960), Mahanagar/The Big City (1963), and Agantuk/The Stranger (1991)*' at the Women's Studies Research Centre, the Maharaja Sayajirao University of Baroda, on April 8, 2021.

- '*Ekphrasis in Literature'* for *Intersections: Where Ideas Meet* under the aegis of Arts faculty, Banaras Hindu University, on December 21, 2020.

- *"The 'Short Story'- A Reappraisal"* for the inaugural Webinar Series of DOT Talks organized by Tetso College, Dimapur, Nagaland. Press Report on the talk is available on *Nagaland Page* of April 25, 2020.

COVID-19 Initiatives: Outreach and Research

Outreach initiative:

As the Convener of the Swachh Bharat Abhiyan, Ananya initiated and coordinated a project on "Visual content as an aid to spreading awareness against the spread of COVID- 19" in May 2020.
Project Description: As the COVID-19 outbreak continues to spread in India, awareness and dissemination of information are the need of the hour. During the first wave, most information concerning spreading awareness of the pandemic was disseminated through text-heavy posters, documents, and bulletins, even though a significant number of our countrymen and women cannot read. While ordinarily, this would not have been a problem as the information would have eventually circulated through word-of-mouth, the new norm of social distancing restricted the scope of such interactions. Ananya conceptualised a unique digital and social media-based project where all information would be exclusively disseminated through art and visual cues. She worked alongside the Swachh Bharat Team, Avana as well as students across disciplines to design new innovative posters aimed at raising awareness of COVID-19 as well as busting common myths/false information regarding the pandemic. On completion, the posters were submitted to the Government of India's Swachh Bharat Mission digital repository for pan-India circulation. At a more localised level, two posters created by the student members have also been published by the Indore daily English newspaper, *Free Press* (dated May 13 & May 22, 2020). This is also a dynamic project as the situation regarding COVID-19 continues to be fluid.

Research initiative(s):

Ananya also delivered two invited talks:

- '*Art in the Times of the Coronavirus'* for the Online Faculty Development Program sponsored by AICTE at the Department of Electronics & Communication Engineering, Acropolis Institute of Technology & Research, Indore on September 5, 2020.
- An invited Plenary lecture titled '*Revisiting The Seventh Seal (1957): Black Death in Europe and A Game of Chess'* at the International Webinar on 'Epidemics, Body, and Medicine: Inquiries through Literary and Cultural Texts' organized by the Department of English, Gokhale Memorial Girls' College, University of Calcutta, on June 14, 2020.



Dr. Shomik Dasgupta
Assistant Professor
shomikdasgupta@iiti.ac.in

Dr. Shomik Dasgupta is an Assistant Professor of History in the School of Humanities and Social Sciences. His work pertains to the study of South Asian History. His 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 Indian responses to colonialism from the point of view of the role of language in the creation of social facts, intentionalities, collectivities, and institutions. He completed his PhD. from King's College, the University of London. His book, *Ethics, Distance and Accountability: The Political Thought and Intellectual Context of Rammohun Roy, c.1772-1833*, is scheduled to be published by the Oxford University Press (India) in September 2021.

Courses Taught

UG
HS 214: History of Indian Culture and Civilization
HS 311: Life and Thought of Gandhi

PG
HS 412/612: Contemporary Indian Thought

Publications

Vivek Kumar Yadav, Shomik Dasgupta, Bharath Kumar, 'All Human Beings are of Equal Status Since Birth: Caste, Inequality and B.R. Ambedkar's Universal Claim for Human Equality', *Indian Journal of Human Development*, 14, no.3 (December 2020): 481-92. https://doi.org/10.1177%2F0973703020974442



Dr. Kalandi Charan Pradhan
Assistant Professor
kcpradhan@iiti.ac.in

Dr Kalandi Charan Pradhan is an Assistant Professor in the School of Humanities and Social Sciences (HSS), Discipline of Economics. He received his doctorate from the Indian Institute of Technology Bombay. His research interests include: Development Economics, Sustainable Development. Applied Econometrics, Migration Studies, Labour Economics and Socio-Economic impacts of Climate Change.

Awards

Dr. Kalandi received the Excellence in PhD Research Award from IIT Bombay in August 2020 for his doctoral thesis and associated publications.

Publications

KC Pradhan and K Narayan, 'Does climate change induce labour migration ? Evidence from Semi Arid Tropics region of India', *Journal of Public Affairs* (August 2020), 1-15. DOI:10.1002/pa.2323
Wiley Publisher, listed in Scopus and B Index in ABDC list

Accepted for publication: KC Pradhan and Priyabrata Sahoo, 'Poverty reduction among Social and Religious groups in undivided Andhra Pradesh of India: An Analysis of inclusiveness during the Post

Reform Period', *The Indian Economic Journal*, Sage Publisher.
Listed in B index in ABDC list and UGC-Care list.

Courses Taught

Autumn Semester 2020-21

Fundamentals of Economics (HS 108) for UG
International Economics (HS 323) for UG
Sustainability Studies (HS 618/HS 418) for UG and PG

Spring Semester 2020-21

Fundamentals of Economics (HS 108) for UG

Conferences and workshops organised

Dr. Kalandi coordinated invited talks on **"Budget 2021: A Panel Discussion, India"** on 4th February 2021. Resource Persons Invited: Prof. Neeraj Hatekar, Mumbai School of Economics and Policy, University of Mumbai, Maharashtra, and Prof. N. R. Bhanumurthy, National Institute of Public Finance and Policy, New Delhi.

COVID-19 related initiatives on research and outreach

Dr. Kalandi initiated the construction of an COVID-19 spread index and COVOD-19 Active case index and their determinants across Indian states by geographical regions and by income level along with one of his internship students.



Dr. Mohanasundari Thangavel
Assistant Professor
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Dr. Mohanasundari Thangavel has joined as Assistant Professor in the Discipline of Economics, School of Humanities & Social Sciences in Feb 2021. She completed her Ph.D. in Agricultural Economics with a Specialization in Natural Resource and Environmental Economics from Tamil Nadu Agricultural University, Coimbatore. Her research interests include Agricultural Economics, Resource Economics: Energy, Water and Agroforestry, Environmental Economics, Climate Change Adaption and Impact Studies, Consumption Pattern, Farmer Producer Organizations. Before joining IIT, she was working as the CEO of Karur Velaan Farmer Producer Company in Tamil Nadu. In addition, she also has worked on international projects such as AVRDC-World Vegetable Centre and IWMI-TATA Tank Irrigation Project. She was working as an Assistant Professor at PGP College of Agriculture Science, Tamil Nadu where she was teaching various undergraduate courses in the Department of Agricultural Economics.

Awards and Recognitions

Young Women Educator & Scholar Award given by National Foundation for Entrepreneurship Development (NFED) in the year 2017

Publications

K. Palanisami, and Mohanasundari T. (2020). Sustaining tank irrigation in south India through time-tested measures. In K. Fujita and T. Mizushim (Eds.), Sustainable Development in India. Taylor & Francis group. Pg. 88-108.



Ambassador Gurjit Singh
Honorary Professor, International Relations

The School of Humanities and Social Sciences (HSS) is also proud to host the Honorary Professor of International Relations Studies, **Ambassador Gurjit Singh**. Appointed to the Indian Foreign Service in 1980, Ambassador Gurjit Singh has served in Indian Missions in Tokyo (twice), Colombo, Nairobi, Rome and was the Ambassador of India to Ethiopia (2005-2009), Indonesia (2012-2015), Germany (2012-2015), Djibouti, Timor-Leste, ASEAN, and the Representative of India to the African Union, the Economic Commission for Africa and IGAD. He was also the Deputy Permanent Representative of India to UNEP and UNHABITAT.

Ambassador Singh chairs the CII Task Force on the Asia Africa Growth Corridor and comments on current issues pertaining to International affairs, development, and investment promotion in India and abroad. He frequently contributes essays and articles to journals and books on issues related to economic development and trade. Currently, he is an Honorary Professor in the School of Humanities and Social Sciences at IIT Indore.

Ambassador Singh has published *The Abalone Factor: An overview of India-Japan Business Relations* in 1997, which won him the Bimal Sanyal Award for Research by a Foreign Service officer. His subsequent books included *The Injera and the Parantha: Enhancing the Ethio-India Relationship* (2009) and *Masala Bumbu* (2015). Ambassador Singh is also the author of an Amar Chitra Katha comic book on the legacy of the India -Indonesia relationship. His edited book *Opportunity Beckons: Adding Momentum to the Indo-German Partnership* was released in January 2017 in Berlin. He is presently working on his next book on Africa.

Ambassador Gurjit Singh has contributed to several journals and news papers as well as appeared on TV and academic discussions. On TV he is frequently on Rajya Sabha TV explaining international matters. Recently he chaired a session on Revitalizing Africa's Healthcare at 16th CII Africa Conclave. With health ministers Dr Dikoloti of Botswana, Dr DVN Milang of Equatorial Guinea, Dr Rashid Aman from Kenya and Dr.Mangwiro of Zimbabwe. In February he Chaired a session for the Sankalp Africa Summit on **Building Africa's Industry to Global Competitive Levels with Ethiopian Senior Minister Arkebe, President Trade Development Bank Admassu Tadesse, and VP EBID(ECOWAS Bank) Dr Diagne.** https://www.youtube.com/watch?v=RErElctbr8I

Achievements

- He gave the keynote address at the National Defense College on India as a Net Security Provider in the Indian Ocean in June and Governance Challenges in Africa in May.
- He is a regular contributor to newspapers like Hindu Business lIne, Indian express, and Tribune. Some of his writings in these are:
  - https://www.tribuneindia.com/news/punjab/stronger-us-japan-ties-augur-well-for-india-239665
  - https://indianexpress.com/article/opinion/trouble-returns-to-ethiopia-7107544/
  - https://www.thehindubusinessline.com/opinion/theres-room-for-more-fdi-from-japan/article34369088.ece
- He also contributes regularly to think tanks like Observer Research Foundation, Vivekananda International Foundation, Gateway House and Chanakya Forum. A sample of this, is at:
  - https://www.orfonline.org/expert-speak/india-germany-at-70-four-big-ideas/
  - https://www.vifindia.org/2021/may/10/india-supports-asean-in-its-myanmar-initiative

- https://www.gatewayhouse.in/uk-pivots-to-asia/
- https://chanakyaforum.com/return-of-the-samurai-spirit-japan-defense-white-paper-2021/

Courses taught

He has taken lectures for the courses of Economics, International Affairs and Cultural Studies.



Dr. Sanchita Verma
Visiting Assistant Professor
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Dr. Sanchita Verma is a Visiting Faculty in the School of Humanities and Social Sciences (HSS), Discipline of English, IIT Indore. She was awarded her Ph.D. in 2017 from the Indian Institute of Technology Delhi. Dr. Verma was previously employed as a Consultant in the National Institute of Educational Planning and Administration, New Delhi (NIEPA) from 2017-2020. She is also a Resource Person with NIEPA. Her current research interest is to work further on her Ph.D. topic (The Discourse of Silence in Multilingual and Multicultural Classrooms) and develop a robust spectrum and typology of silence in Indian classrooms. Her broad research area is in Discourse Studies, Pragmatics, Language and Communication and Ethnographical Studies. She is also a reviewer for Springer Nature Social Sciences.

Courses taught

Autumn 2020: **HS 442/642**: Language and Mind, **HS 641**: English Communication Skills, **HS 159**: English Language and Communication

Spring 2021: **HS 641**: English Communication Skills, **HS 159**: English Language and Communication (Coordinator)

Publications

02 journal articles have been communicated, one by invitation, for the inaugural issue of the journal ***Children First- A Journal on Children's Lives***, published by Delhi Commission on Protection of Child Rights (DCPCR), Delhi.

Invited talks/lecture

- **'Appreciating Field Methods: An Ethnomethodological Perspective'** at National Institute of Educational Planning and Administration (NIEPA), New Delhi in February 2021.
- **'Emerging Trends in Field Methods'** by National Institute of Educational Planning and Administration (NIEPA), New Delhi in March 2021.

Any other major events/development: development of new courses

Two PG courses (Applied Linguistics and Advanced Discourse Studies) have been recommended by the SPGC to the Senate IITI.

COVID-19 Initiatives: Outreach and Research

Research initiative(s): *Journal Article*

Dr. Verma has written a research paper titled ***'Mapping Children's Silence Through the Discourse of Pandemic Covid-19'*** which is concerned with the impact of the pandemic on the lives of children; on invitation, by DCPCR (Delhi Commission for Protection of Child Rights) for the inaugural issue of their journal.

Department of Astronomy, Astrophysics and Space Engineering

From the HoD's Desk



Dr. Abhirup Datta
Associate Professor
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"Post hoc ergo propter hoc - after this therefore because of this"

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 regular faculty members, one Ramanujan Faculty Fellow and thirty one PhD research scholars.

The number of external sponsored projects in the discipline 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 second 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. Our first batch of Ph.D. students are graduating in 2021. Most of them are already offered postdoctoral positions abroad or from ISRO.

Over the year 2020-21, we organized one Solar Eclipse event, the annual meeting of Astronomical Society of India, winter school on Observational Astronomy for Central India. We have extended our strong collaborations with M.P. Council of Science and Technology, NCRA-TIFR, IUCAA, etc.

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 focussed Centres. 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



Abhirup Datta
Associate Professor
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Ph.D : 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

- Associate of Inter University Center for Astronomy and Astrophysics (IUCAA) since July, 2016.

Statement of Research Interests

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), Topic editor in Galaxies, Proceedings of the Astronomical Society of the Pacific (PASP).
- Executive Committee Member of SKA India Consortium
- 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.
- Senior Member of IEEE

Publications (includes journal articles, books and book chapters)

- Chakraborty, A., **Datta, A.** et al. "First Multi-redshift Limits on Post-Epoch of Reionization 21 cm Signal from z = 1.96-3.58 Using uGMRT", 2021, ApJ Letters, 907L, 7C, [Impact Factor – 8.19]
- Choudhury, M., Chatterjee, A., **Datta, A.** and Choudhury, T.R., "Using artificial neural networks to extract the 21-cm global signal from the EDGES data", 2021, 502, 2, 2851 [Impact Factor – 5.36]
- 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, 55, 9, e07061. [Impact Factor – 1.31]

Events/ Seminars organized

- Coordinator for one Faculty Development Program in Artificial Intelligence and Machine Learning held in December 2020 and supported by TEQIP.
- Co-Coordinator for a Short-Term Course on Applications of Machine Learning held in December 2020 and supported by TEQIP.
- Organized Winter School on Observational Astronomy in collaboration with MPCST (Madhya Pradesh Council for Science and Technology) in 1- 12 February, 2021 for undergraduate and graduate students from colleges and Universities of M.P. and other states of Central India.
- Organizing Chair and SOC/LOC member of international conference on "The First Billion Years of the Universe Using Next Generation Telescopes", January, 2020.
- VOC Co-Chair of Annual Meeting of Astronomical Society of India, February, 2021.
- SOC member of conference on "SAZERAC sip: The 21-cm Signal from Cosmic Dawn and the Epoch of Reionisation", January, 2021
- Co-organized RASS, DAASE Colloquium Series (August-December, 2020)

Projects active during April 2020-March 2021

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 2022 (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 – December, 2020 (PI: Dr. Abhirup Datta; Co-PI: Prof. H.B.Hablani)
Funding Agency ISRO GAGAN and NaVIC UP Scheme
Brief Description : Main aim is to develop capabilities with the India's NavIC constellation with respect to navigation in land, air and sea. Also, one of the aim is to study space weather using the NavIC satellite constellation.

Title : 21CM Cosmology with The Square Kilometre Array (SKA)
Duration : July, 2019 – July, 2022 (PI: Dr. Abhirup Datta)
Funding Agency : CSIR-EMR
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: Imaging the first billion years of the universe with next-generation telescopes
Duration: 15/03/2019-14/03/2022 (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: 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 : March 2017 – December 2020
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.



Amit Shukla
Assistant Professor
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PhD.
Indian Institute of Astrophysics, Bangalore
Previous Employment
(includes post-doctoral experience)

1) University of Würzburg, Gemany (16-03-2016 to 30-09-2018)
2) ETH, Zurich (12-11-2014 to 11-11-2015)
3) Tata Institute of Fundamental Research (20-05-2013 to 11-11-2014)

Statement of Research Interests

My primary research interest is to study gamma-ray Astronomy, Active galactic nuclei, Blazars, High Energy Astrophysics using Multi-wavelength & multi-messenger observations. In particular, my research interests include the study of astrophysical jets Active Galactic Nuclei (AGN), GRBs.

a. Broad research area :

- High Energy Astrophysics

b. Research Highlights

Particle acceleration in astrophysical sources:

Using a multi-waveband analysis of blazars, we have found supporting evidence of Fermi II order particle acceleration in a few quasars.

- Magnetic reconnection drives mini-jets in blazar : Powerful magnetized jets are common features of the spinning supermassive black holes that occupy the centres of large galaxies. A gamma ray flare originating from a distant blazar was likely generated by magnetic reconnection within a black hole's relativistic jet. This magnetic reconnection is triggered by instabilities disrupting the collimated jet flow.

Plenary Talk: at 39th Annual Meeting of Astronomical Society of India

Invited Talk : at Jets Facilities 2021, 05-09 April 2021, ARIES

Publications (includes journal articles, books and book chapters)

- **Gamma-ray flares from relativistic magnetic reconnection in the jet of the quasar 3C 279, Shukla A., Mannheim K., 2020, NatCo, 11, 4176.**
- **An intermittent extreme BL Lac: MWL study of 1ES 2344+514 in an enhanced state.MAGIC Collaboration, Acciari V.~A., Ansoldi S., Antonelli L.~A., Arbet Engels A., Babi{\'c} A., Banerjee B., et al., 2020, MNRAS, 496, 3912.**
- **X-ray and Gamma-ray Variability of NGC 1275, Chitnis V., Shukla A., Singh K.~P., Roy J., Bhattacharyya S., Chandra S., Stewart G., 2020, Galax, 8, 63.**

Events/ Seminars organized
Title : Science with CTA (workshop)
Date: 19 February 2021
Speakers: Dr. D. Bose, Dr. V. R. Chitnis, Dr. A. Shukla, Dr. S. Chandra, Dr. E. Lindfors, Dr. M. Theshima, Dr. R. Moharana, Dr. L. Tibaldo, Dr. S. Schlenstedt, Dr. A. Sjinha, Dr. N. Mankuzhiyil.



Dr. Anjali Rao
DST INSPIRE Faculty Fellow
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PhD. 2016
Previous Employment (includes post-doctoral experience)

- University of Southampton, UK (Commonwealth Rutherford Fellow): 2018 March to 2020 February
- IUCAA, Pune (Postdoctoral Fellow): 2016 September to 2018 March
- PRL, India (Postdoctoral Fellow): 2015 September to 2016 September

Statement of Research Interests

a. Broad research area

- Black hole binaries, Accretion Physics, Advanced timing analysis, Astrometry, Globular Cluster, Distribution of X-ray binaries in Milky Way, OB associations, Kinematic properties of star clusters.

b. Research Highlights

- We have measured peculiar velocity of 7 black hole binaries for the first time using astrometry data from Gaia
- We estimated distances to 11 black hole binaries using optical parallaxes from Gaia
- Our work revealed the distribution of black hole binaries as a function of orbital period in the Galaxy
- We revisited the membership of the high mass black hole binary Cyg X-1 and found that its astrometric solution suggests that the binary is a member of the Cyg OB3 association.
- We estimated mass, spin, distance and inclination of the black hole candidate IGR J17091-3624 using its heartbeat oscillations.
- We studied the high mass black hole binary LMC X-1 using AstroSat which is India's first dedicated multi-wavelength observatory in space.

Awards and Achievements

- 2020: DST INSPIRE Faculty Fellowship, Department of Science & Technology (DST), Government of India, India (September 2020 – August 2025)
- 2018: Commonwealth Rutherford Fellowship, University of Southampton, United Kingdom (March 2018 – February 2020)
- Former member of Royal Astronomical Society, United Kingdom (February 2019 - March 2020)

Publications

- **Anjali Rao** and Santosh V. Vadawale (2012), Why is IGR J17091-3624 so faint? Constraints on distance, mass, and spin from 'phase-resolved' spectroscopy of the 'heartbeat' oscillations, *Astrophysical Journal, 757,* L12, https://doi.org/10.1088/2041-8205/757/1/L12 (Impact Factor = 7.413)
- **Anjali Rao**, Poshak Gandhi, Christian Knigge, John A. Paice, Nathan W. C. Leigh, Douglas Boubert (2020), Kinematic study of the association Cyg OB3 with Gaia DR2, *MNRAS*, 495, 1, 1491-1500,

https://doi.org/10.1093/mnras/staa1217 (Impact Factor = 5.287)

- Poshak Gandhi, **Anjali Rao**, Michael A. C. Johnson, John A. Paice, Thomas J. Maccarone (2019), Gaia Data Release 2 distances and peculiar velocities for Galactic black hole transients, *MNRAS*, 485, 2, 2642-2665, https://doi.org/10.1093/mnras/stz438 (Impact Factor = 5.287)

Projects active during April 2020- March 2021

Title: Exploiting the new astrophysical frontiers for study of accretion, space distribution, and origin of X-ray binaries and their mapping in Globular Clusters
Duration: September 2020 – August 2025
Funding Agency: Department of Science & Technology (DST), Government of India
Brief Description: To study distribution of X-ray binaries in the galaxy, their origin and accretion properties. The project also aims to study Globular Clusters and their X-ray binary population.



Dr. Bhargav Pradeep Vaidya
Assistant Professor
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PhD. Max Planck Institute for Astronomy, Heidelberg

Previous Employment

- Postdoctoral Fellow, University of Leeds, Leeds UK
- Postdoctoral Researcher, University of Torino, Italy

Academic associations with other institutions

- 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: Astrophysical and Space Plasma simulations, Numerical Space Weather Modelling.

b. Research Highlights

- A full fledged model for launching of jets from accretion disks around black hole was developed to demonstrate for the first time interaction between jets and disk winds using general relativistic magneto-hydrodynamics.
- Applied a state-of-the-art hybrid module of the PLUTO code for application to study particle acceleration mechanisms at shocks and non-thermal emission from relativistic jets at kilo-parsec scales
- Developed a pilot numerical model for understanding and prediction of solar wind properties at L1 point. This will serve as an integral framework towards the scientific contribution for Space Weather Framework as part of the Science Team of ISRO's Aditya L1 mission.
- Involvement and participation as part of various International Collaborations like : LSST, CTA.

c. Awards and Achievements

- Student from the research group (Mr. Gourab Giri) was awarded the Prime Minister's Research Fellowship (PMRF).
- Both M.Sc. students within the research group published their thesis work in reputed journals and have been placed at reputed institutions at national and international level for higher studies.
- Awarded the Max Planck India Partner group award from Max Planck Society.

Publications

- Dihingia, Indu K., Vaidya, Bhargav, and Fendt, Christian, *Jets, disc-winds, and oscillations in general relativistic, magnetically driven flows around black hole,* Monthly Notices of the Royal Astronomical Society, (2021), 505, 3596
- Nikhil Borse, Acharya, Sriyasriti, Vaidya, Bhargav, Mukherjee, Dipanjan, Bodo, Gianluigi, Rossi, Paola, and Mignone, Andrea, *Numerical study of the Kelvin-Helmholtz instability and its effect on synthetic emission from magnetized jets*, Astronomy and Astrophysics, (2021), 649, A150
- Kumar, Sandeep, Paul, Arghyadeep, and Vaidya, Bhargav, *A comparison study of extrapolation models and empirical relations in forecasting solar wind*, Frontiers in Astronomy and Space Sciences, (2020), 7, 92

Events/ Seminars organized

- Virtual Workshop on Computational Astrophysics as part of the 39th Astronomical Society of India Meeting
- International Online Conference on "Extragalactic jets at all scales : Launching, Propagation and Termination" with Max Planck Institute of Astronomy as part of the Partner Group at IIT Indore.

Projects active during April 2020-March 2021

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. Manoneeta Chakraborty
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PhD. : Tata Institute of Fundamental Research, Mumbai, India, Mumbai, India, December 2014 Supervisor: Sudip Bhattacharyya

Previous Employment

- DST INSPIRE faculty fellow, Discipline 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

Academic associations with other institutions

- Life member of the Astronomical Society of India (ASI)

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 multi-peaked burst behavior of the neutron star LMXB 4U 1608-52 using NICER
- 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.

c. Awards and Achievements

- Life member of the Astronomical Society of India (ASI)

Publications :

- Guver, Tolga; Boztepe, Tugba; Gogus, Ersin; **Chakraborty, Manoneeta**; Strohmayer, Tod E.; Bult, Peter; Altamirano, Diego; Jaisawal, Gaurava K.; Kocabiyik, Tugce; Malacaria, Christian; Kashyap, Unnati; Gendreau, Keith C.; Arzoumanian, Zaven; and Chakrabarty, Deepto, "Thermonuclear X-ray Bursts with late secondary peaks observed from 4U 1608-52", ApJ, 910, 37 (2021)
- Pattnaik, R.; Sharma, K.; Alabarta, K.; Altamirano, D.; **Chakraborty, M**.; Kembhavi, A.; Méndez, M.; and Orwat-Kapola, J. K., 'A machine-learning approach for classifying low-mass X-ray binaries based on their compact object nature', MNRAS, 501, 3457 (2021)
- 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?', ApJ, 899, 106 (2020)

Events/ Seminars organized

- Organizer of several outreach events as DAASE outreach coordinator involving lectures on astrophysical concepts.

- Co-organizer of National science day events
- Volunteer Member of organization of Winter school on Observational Astronomy 2021 at IIT Indore

Projects active during April 2020-March 2021

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)
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: Study of Accretion and Outflow Mechanisms in Compact Objects in X-ray Binaries
Duration: 3 years (starting April 2021).
Funding Agency : ISRO, Department of Space PI: Dr. Manoneeta Chakraborty
Brief Description: This project is granted by ISRO under the "AstroSat Data Utilization project". The aim is to study unprecedented simultaneous broadband correlated spectro-timing behavior of LMXBs with the goal of understanding the accretion mechanism and binary geometry, using Astrosat Archival data.



Dr. Rajkumar Hajra
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PhD. 2012

Previous Employment
- 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

a. Broad research area

- Space Science; Space Weather; Heliospheric research; Cometary plasma dynamics; Solar wind interaction with planets and comets; Solar wind-magnetosphere-ionosphere coupling; Radiation belt dynamics and prediction; Ionospheric variability; Ionospheric irregularity; Ionospheric modeling

b. **Research Highlights**

- **Ionospheric (regional) modeling**: Developed ionospheric regional model using TEC – applicable for Indian GPS navigation
- **How topside ionosphere is affected by HSS? – first study**: For the first time studied the impacts of HSSs on topside (~250-1300 km) ionosphere using Incoherent Scatter Radar at Arecibo Observatory. Although the HSS did not lead to any significant geomagnetic storm, the ionosphere became hotter and expanded significantly in altitude as compared to a non-HSS interval
- **What in severe magnetic storms lead to power outage? Super substorms – first study**: Studied extremely intense substorms or super substorms (SSSs). Extremely rapid auroral electrojet currents during SSSs at ~100 km altitude may cause geomagnetically induced currents (GICs) on the ground

that are the major danger for power grids

- **Complex space weather – first study**: For the complex and multiple space weather events occurring during 2017 September, presented a complete study on the impacts of solar flares, CMEs, CIRs, HSSs on magnetosphere in forms of interplanetary fast shocks, waves, geomagnetic storms, substorms, SSSs and HILDCAAs
- **Cometary TEC – first study**: Developed a technique to estimate cometary altitude-integrated electron density or TEC from singe point in-situ plasma measurement by Rosetta spacecraft. This was utilized to study the cometary plasma dynamics dependence of solar activity and heliocentric distance for the first time.

c. Awards and Achievements

- 2019: A grant by *National Science Foundation (NSF), USA*
- 2018: *Ramanujan Fellowship* by *Science & Engineering Research Board (SERB)*, Department of Science & Technology (DST), Government of India, India (22 November 2018 – 21 November 2023)
- 2018: A grant by *National Science Foundation (NSF), USA*
- 2017: *Postdoctoral Research Fellowship* by *Centre National d'Etudes Spatials (CNES), France* for research activities at Laboratoire de Physique et Chimie de l'Environnement et de l'Espace (LPC2E), Centre National de la Recherche Scientifique (CNRS), Orléans, France (1 December 2017 – 31 October 2018)
- 2016: *Postdoctoral Research Fellowship* by *Agence Nationale de la Recherche (ANR), France*, for research activities at Laboratoire de Physique et Chimie de l'Environnement et de l'Espace (LPC2E), Centre National de la Recherche Scientifique (CNRS), Orléans, France (7 March 2016 – 30 November 2017)
- 2015: *Bolsa Estágio de Pesquisa no Exterior (BEPE)* by *Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP), Brazil* for research activities at *Jet Propulsion Laboratory (JPL), Pasadena, California, USA* (1 June 2015 – 31 March 2016)
- 2014: *Bolsa Estágio de Pesquisa no Exterior (BEPE)* by *Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP), Brazil* for research activities at *Arecibo Observatory/AO, Arecibo, Puerto Rico* (1 December 2014 – 31 March 2015)
- 2012: *Postdoctoral Research Fellowship* by *Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP), Brazil* for research activities at *Instituto Nacional de Pesquisas Espaciais/INPE, Brazil* (1 August 2012 – 25 January 2015 and 26 March 2015 – 30 September 2015).

Publications

- **Hajra, R.**, A. M. de Souza Franco, E. Echer, and M. J. A. Bolzan (2021), Long- Term Variations of the Geomagnetic Activity: A Comparison Between the Strong and Weak Solar Activity Cycles and Implications for the Space Climate, *Journal of Geophysical Research: Space Physics, 126*, e2020JA028695, https://doi.org/10.1029/2020JA028695 (Impact Factor = 2.810).
- **Hajra, R.**, B. T. Tsurutani, and G. S. Lakhina (2020), The Complex Space Weather Events of 2017 September, *The Astrophysical Journal, 899*: 3, https://doi.org/10.3847/1538-4357/aba2c5 (IF = 5.874).
- **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 = 5.802).

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.



Dr Saurabh Das
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PhD. Yes

Previous Employment

- Indian Institute of Technology Indore, DST INSPIRE Faculty, 2018-2019
- 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

- Investigated atmospheric effect of Ka-band satellite communication link and channel model for the same.
- Developed a model for site diversity gain prediction using copula based Bayesian approach. This will be helpful for mitigating the excess fade and maintaining the link.
- Investigated precipitation microphysics over India using satellite, radar and ground sensor. The study improves the understanding of rain formation process and radar retrieval of rainfall estimation.
- Working on machine learning based forecasting of space weather. A deep learning based model for solar wind prediction has already been developed.
- Working on machine learning and deep learning in atmospheric prediction, particularly cyclone and thunderstorm prediction. A new approach for identification of homogenous rain region of India is proposed using machine learning technique.
- 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 of thunderstorms 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 the Young Scientist award by URSI GASS 2020.
- Young Scientist Award, URSI Asia-Pacific Radio Science Conference, Seoul, South Korea, 2016
- DST-INSPIRE Faculty Award, Department of Science and Technology, Govt. of India, 2014
- Young Scientist Award by International Union of Radio Science (URSI) GASS 2014, Beijing, China, 2014
- First prize in 'Young Scientist award competition' organized by Indian committee of URSI in Regional conference in Radio Science (RCRS), Pune, India, 2014
- Best paper award in Satellite communication session in ICMARS 2010, Jodhpur, India, 2009.

Publications

- K. Chakravarty, R. Bhangale, S. Das, P. Yadav, B.A.M. Kannan, G. Pandithurai, Unraveling the characteristics of precipitation microphysics in summer and winter monsoon over Mumbai and Chennai – the two urban-coastal cities of Indian sub-continent, Atmospheric Research, Volume 249, 105313, 2021
- C. Chatterjee and S. Das, "On The Association Between Lightning and Precipitation Microphysics", *Journal of Atmospheric and Solar-Terrestrial Physics*, 207, 105350, 2020
- Bandyopadhyay, S., Das, S. & Datta, A. , "Comparative Study and Development of Two Contour-Based Image Segmentation Techniques for Coronal Hole Detection in Solar Images. *Solar Phys,* 295, 110 (2020).

Events/ Seminars organized

- Young Professional Chair, IEEE International India Geoscience and Remote Sensing Symposium 2020, Ahmedabad India
- Coordinator, QIP Sponsored Short-Term Course on Satellite Based Navigation System, November 23-28, 2020, IIT Indore
- Coordinator, QIP Sponsored Short-Term Course on GNSS and Space Weather, September 14-19, 2020, IIT Indore
- Technical Program Committee member, 2nd International Conference on Soft Computing and its Engineering Applications (icSoftComp202)

Past Projects

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 the 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.

Project active during April 2020-March 2021
Title : Modelling of major weather disturbances, especially cyclones, using Deep Neural Networks
Duration 3 years
Funding Agency – SERB
Brief Description
Total budget Rs. 6.6 Lacs.
Objectives:

- Modelling of tropical cyclones and extreme weather event based on deep learning techniques.



Dr. Siddharth
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PhD. - Physics (Astrophysics) - University of Wisconsin-Madison, 2007

Previous Employment

- 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

- 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 2020-March 2021
Title: C and L-Band Interferometer as Galaxy Cluster Observatory Pathfinder

Duration: 3 years + extension upto 31 December 2020
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. Suman Majumdar
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PhD. - Indian Institute of Technology Kharagpur (April, 2013)
Previous Employment

- 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

- 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 demonstrated 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.
- We have developed a new simulation for CII line emission from the early galaxies. This line can be used for intensity mapping experiments e.g. CONCERTO, CCAT-p etc to map the galaxies from Cosmic Dawn.
- We have developed an Artificial Neural Network based 21-cm signal statistic e.g. bispectrum emulator, which helps in speeding up the parameter inference from the Cosmic Dawn observations.
- 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

- Mohd Kamran, Raghunath Ghara, **Suman Majumdar**, Rajesh Mondal, Garrelt Mellema, Somnath Bharadwaj, Jonathan R. Pritchard, Ilian T. Iliev, *Redshifted 21-cm Bispectrum I: Impact of the Redshift Space Distortions on the Signal from the Epoch of Reionization, Redshifted 21-cm Bispectrum II: Impact of the Spin Temperature Fluctuations and Redshift Space Distortions on the Signal from the Cosmic Dawn*,

Monthly Notices of the Royal Astronomical Society, 502, 3, 3800-3813, (**2021**), arXiv:2012.11616.

- **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*, Monthly Notices of the Royal Astronomical Society, 499, 4, 5090-5106, (**2020**), arXiv:2007.06584.
- **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**)

Events/ Seminars organized

- International Conference and School on **Observing the First Billion Years of the Universe Using Next Generation Telescopes** (20-31 January 2020). An event funded by SPARC and SKA-India. **Total participants: 90+, International: 50+, National: 40+**.
  Website: http://www.iiti.ac.in/people/~firstbillion/
- Main Organizer and Chair of the Scientific Organizing Committee of the International Conference '**SAZERAC-SIP on The 21-cm Signal from Cosmic Dawn and the Epoch of Reionization**', (**29 January 2021**), jointly hosted by the University of Texas, Austin, USA and the Sussex University, UK. **Total participants: 150+, International: 140+, National: 10+**.
  Webpage: http://sazerac-conference.org/SIPS2021/3.html
- Member of the Virtual Organizing Committee of the '39th Annual Meeting of the Astronomical Society of India (ASI)'
  Webpage: https://astron-soc.in/asi2021/
- Organized two seminars under the series '**Recent Advances in Astronomy and Space Sciences**'. Two seminars were delivered by: **Prof. Matteo Viel**, Scuola Internazionale Superiore di Studi Avanzati (SISSA), Trieste, **Italy**
  and
  Dr. Pratika Dayal, Kapteyn Institute, Groningen University, **the Netherlands**.

Projects active during April 2020-March 2021

Title: Imaging the first billion years of the universe with next-generation telescopes.
Duration 15/03/2019 - 31/03/2022
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.

Courses/conferences/workshops organized in 2020-21

- 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.**
- **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. Resource Person: Dr. Abhirup Datta
- TEQIP-3 sponsored Faculty Development Program on AI-ML on December 7-17, 2020 with about 36 participants. Coordinators: Dr. Abhirup Datta, Dr. Somnath Dey
- TEQIP-3 sponsored Short Term Course on Applications of AI-ML on December 21-26, 2021 with about 35 participants. Coordinators: Dr. Somnath Dey and Dr. Abhirup Datta
- Dr. Suman Majumdar organized an international conference as the Chair of the Scientific Organizing Committee titled '**SAZERAC-SIP on The 21-cm Signal from Cosmic Dawn and the Epoch of Reionization'**, (**29 January 2021**), jointly hosted by the University of Texas, Austin, USA and the Sussex University, UK. Conference webpage: http://sazerac-conference.org/SIPS2021/3.html
- DAASE organized '39th Annual Meeting of the Astronomical Society of India (ASI)'. https://astron-soc.in/asi2021/ . LoC Co-Chair: Dr. Abhirup Datta. Member of Technical Committee: Dr. Suman Majiumdar.
- Organized the Winter School on Observational Astronomy in February 1-12, 2021 in collaboration with IIA and MPCST. Coordinator: Dr. Abhirup Datta, Dr. Bhupesh Saxena and Prof. P. Parihar.
- TEQIP-3 sponsored Faculty Development Program on AI-ML on June 16-26, 2021. Resource Person: Dr. Abhirup Datta.

Journal articles published by DAASE in the year 2020-21

- Guver, Tolga; Boztepe, Tugba; Gogus, Ersin; Chakraborty, Manoneeta; Strohmayer, Tod E.; Bult, Peter; Altamirano, Diego; Jaisawal, Gaurava K.; Kocabiyik, Tugce; Malacaria, Christian; Kashyap, Unnati; Gendreau, Keith C.; Arzoumanian, Zaven; and Chakrabarty, Deepto, Thermonuclear X-ray Bursts with late secondary peaks observed from 4U 1608-52, ApJ, 910, 37 (2021)

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Major awards, achievements, recognition 2020-21

- Dr Abhirup Datta is Science Co-Chair of International SKA CD/EoR Science Working Group since January, 2020.
- Dr. Abhirup Datta is now Senior Member, IEEE.
- Mr. Arnab Chakraborty and Mr. Sumanjit Chakraborty, PhD students of Dr. Abhirup Datta have been selected as URSI Young Scientist Award in Union Radio Scientifique Internationale (URSI) GASS 2021, Rome, Italy.
- 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.
- Dr. Manoneeta Chakraborty became a lifetime member of the Astronomical Society of India (ASI)
- Mr. Gourab Giri, PhD student of Dr. Bhargav Vaidya has been awarded with the Prime Minister's Research Fellowship (PMRF).
- Dr Bhargav Vaidya was awarded the Max Planck India Partner group award from Max Planck Society.
- Dr. Suman Majumdar organized an international conference as the Chair of the Scientific Organizing Committee titled 'SAZERAC-SIP on The 21-cm Signal from Cosmic Dawn and the Epoch of Reionization', (29 January 2021), jointly hosted by the University of Texas, Austin, USA and the Sussex University, UK. Conference webpage: http://sazerac-conference.org/SIPS2021/3.html
- Dr. Suman Majumdar gave an invited talk at the 'SKA-India Workshop on 21-cm Cosmology and Reionization', (19-23 April 2021). The video of the talk can be found here -- https://www.youtube.com/watch?v=MySYiF6O1MM
- Dr. Suman Majumdar gave an invited seminar at the South Western Institute for Astronomy Research, Yunnan University, (China) -- http://www.swifar.ynu.edu.cn/index.htm .

Student presentations

- M.Sc. student Aadarsh Pathak supervised by Dr. Suman Majumdar gave an oral presentation on his M.Sc. project work in the international conference 'A Precursor View of the SKA Sky' (15-19 March 2021) organized at the SKA Office Manchester, UK. Video of his talk is available here -- https://youtu.be/NyVBVof8hrc
- PhD student Mohd Kamran supervised by Dr. Suman Majumdar gave an oral presentation on his work in the international conference 'A Precursor View of the SKA Sky' (15-19 March 2021) organized at the SKA Office Manchester, UK.
- PhD student Chandra Shekhar Murmu supervised by Dr. Suman Majumdar presented a poster on his work in the international conference 'A Precursor View of the SKA Sky' (15-19 March 2021) organized at the SKA Office Manchester, UK.
- M.Sc. student Aadarsh Pathak supervised by Dr. Suman Majumdar presented a poster on his M.Sc. project work in the international conference 'SAZERAC-SIP on The 21-cm Signal from Cosmic Dawn and the Epoch of Reionization (29 January 2021)', organized by University of Texas, Austin, USA and the Sussex University, UK.
- PhD student Mohd Kamran supervised by Dr. Suman Majumdar gave an oral presentation on his work in the international conference 'SAZERAC-SIP on The 21-cm Signal from Cosmic Dawn and the Epoch of Reionization (29 January 2021)', organized by University of Texas, Austin, USA and the Sussex University, UK. Video of his talk is available at -- https://www.youtube.com/watch?v=HjFNYiamSjg
- PhD student Chandra Shekhar Murmu supervised by Dr. Suman Majumdar gave an oral presentation on his work in the international conference 'SAZERAC-SIP on The 21-cm Signal from Cosmic Dawn and the Epoch of Reionization (29 January 2021)', organized by University of Texas, Austin, USA and the Sussex University, UK.

- M.Sc. student Aadarsh Pathak, PhD students Mohd Kamran and Chandra Shekhar Murmu, all supervised by Dr. Suman Majumdar, gave oral presentations on their works in the SKA-India Workshop on 21-cm Cosmology and Reionization (19-23 April 2021). Video links to their talks can be found here -- https://www.youtube.com/channel/UCqchYLf6OY6yjV6nwdiVycw
- M.Sc. student Aadarsh Pathak and PhD student Chandra Shekhar Murmu, both supervised by Dr. Suman Majumdar, presented posters on their work in the Astronomical Society of India Meeting 2021 (18-23 February 2021). https://astron-soc.in/asi2021/
- 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.

Outreach Activities at DAASE 2020-2021

- **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, 2021**
- Lectures given by DAASE faculty members at the **Winter School in Observational Astronomy 2021 organized by DAASE, IIT Indore in association with IIA, MPCST** held from 1-12 February 2021
- Rashtriya Avishkar Abhiyan (RAA) - lectures given by Dr. Siddharth Malu, Dr. Amit Shukla
- Lecture by Dr. Manoneeta Chakraborty at Astro adda organized by Nehru Planetarium, Delhi
- Lecture by Dr. Manoneeta Chakraborty, Dr. Amit Shukla, Mr. Kishlay Singh at IIT Indore's first Astronomy fest Nakshatra in June 2021
- Colloquium series: "Recent Advances in Astronomy and Space Science", 2020
- 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.

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 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, skill & manpower development in the nationally important area of electronics.

Faculty Members

Mukesh Kumar, Associate Professor and Head
Shaibal Mukherjee Associate Professor
Vimal Bhatia Professor
Santosh Kumar Vishvakarma Associate Professor
Ajay Kumar Kushwaha Assistant Professor
Vinod Kumar Assistant Professor
Apurba K. Das Associate Professor
Rajesh Kumar Associate Professor
Srimanta Pakhira Assistant Professor
Ram Bilas Pachori Professor

Research Areas

Nanoelectronics/Microelectronics
Integrated photonics/Optoelectronics
Advanced Materials and Devices
Advanced Porous Organic Electronics
Computational Electronics and Materials
2D Electronic Materials

Research Laboratories

Optoelectronic Nanodevice Research Laboratory
Non-equilibrium Advanced Engineering Laboratory
Hybrid Nanodevice Research Laboratory
Nanoscale Devices, VLSI Circuit and System Design Research and Development Laboratory
Supramolecular Chemical Nanoscience Group
Materials & Device Research Group
Signals and Software Group (SaSg)
Theoretical Condensed Matter Physics And Advanced Computational Materials Science Laboratory

Ongoing Projects

On-chip biochemical sensors for healthcare applications

Integrated silicon photonic devices: optical modulators, photodetectors and optical switches

Patents

1. A biochemical sensor with engineered nanophotonic structure, the process of preparation and use thereof; Inventors: Mukesh Kumar, Sulabh, L. Singh, S. Jain, S. Rajput, V. Kaushik, H. C. Jha, Patent No. 202121008991, PUBLISHED, March 2021.

   Ultrasensitive NO2 sensor based on S and N doped carbon dot functionalized tungsten oxide Inventors: Shaibal Mukherjee, Apurba K Das, Chandrabhan Patel, Biswajit Mandal, Rohit Gajanan Jadhav Patent No. 202021041967, PUBLISHED, September 28, 2020.

Book Chapter

1. Ritesh Bhardwaj, Ruchi Singh, and Shaibal Mukherjee, Advances in ZnO-material based UV photodetectors, Invited by Saleem Hashmi (editor-in-chief), Reference Module in Materials Science and Materials Engineering, Oxford: Elsevier, accepted, September 2020.

Events

- ***Speaker: Prof. Rajeev Ram, Massachusetts Institute of Technology (MIT), USA***
  Title: Nanoscale Foundries: Electronics, Photonics, Ionics, Fluidics
  August 14, 2020

- ***peaker: Prof. Navakanta Bhat, CeNSE, IISc Bangalore***
  Title: Chemiresistive Gas Sensors : Towards Electronic Nose
  Date: August 4, 2020

Computer and Information Technology Center

The Computer and Information Technology Center is solely responsible for keeping the Information and Communication Technology & Computation related facilities available to each and every member of IIT Indore.

These facilities are constantly upgraded to meet the evolving standards of IIT. The Computer Labs remain open for twelve hours (8:00 AM to 8:00PM) in a day and the students visit the labs for their general and routine computing tasks. Many departments use the facilities of the Computer Lab to conduct their practical classes & examinations. The campus LAN will be extending to all the hostels and residences. New hardware and software are procured on a regular basis so as to provide a state of the art computing facility to the IIT Indore family.

The Centre is also engaged in designing and facilitates the NKN Project with NIC in the Simrol Campus. National Knowledge Network (NKN) project is aimed at establishing a strong and robust internal Indian network which will be capable of providing secure and reliable connectivity. Using NKN, all vibrant institutions with vision and passion will be able to transcend space and time limitations in accessing

information and knowledge and derive the associated benefits for themselves and for the society towards ushering in a knowledge revolution in the country. NKN is intended to connect all the knowledge and research institutions in the country using high bandwidth / low latency network.

The services provided by the Computer and Information Technology Center include:

- Installation & Maintenance of Servers for:
  - ✓ Internet access.
  - ✓ E-mail facilities.
  - ✓ Samba sharing facility.
  - ✓ Proxy based authentication access.
  - ✓ Computation facilities.
  - ✓ VPN facilities for accessing Journals and E-contents from outside of the Institute.
- Management and upkeep of the Official IIT Indore website.
- Management of the Institute wide Wi-Fi enabled environment.
- Management of the Centralized Computer Lab accessible to all the students of the institute as well as all researcher/ project students.
- Maintaining 1 Gbps NKN Internet Leased Line, 16 Mbps stand-by Internet Leased Line, seamlessly connected about 900 nodes.
- Providing technical assistance to the Academic and Administrative Staff of the Institute.
- Providing facilities to the Students who come from various academic institutes from all over the India for their short-term courses, mini project work and summer training etc.
- Provides and maintains different machines having Windows, Linux and Mac Operating Systems of the Faculty & Staff members.

Members
Dr. Neminath Hubballi Head
Mr. Yogendra Singh Deputy IT Officer
Mr. Dhiraj Vijayvargiya Manager, Technical
Mr. Jitendra Gupta Senior Manager, Technical

Center for Electric Vehicle and Intelligent Transport Systems

Name of Faculty or Fellow	Area of contribution to CEVITS
Dr. Gourinath Banda (CSE)	(a) Autonomous Vehicular (AV) Systems: Fundamentals, I2, LoA, V & V (b) RAES for AV and Electric Vehicles (EV); (c) SSE plus FS in AV; (d) AV/EV Testing: (Non-mechanical) Scenarios and Languages (e) E/S-based industry qualification of AV/Ev; (f) Trust frameworks for AV in frames (S/NS)
Dr. Gourab Sil (CE)	Traffic Engineering, Traffic Flow Theory
Dr. Amod C. Umarikar (EE)	Power Electronics for Electric Vehicles

Dr. Abhinoy Kumar Singh (EE) (*DST-INSPIRE Faculty*)	Speed Control of Electric Vehicles
Prof. Anand Parey (ME)	Noise and Vibrations of Electric Vehicles
Dr. Devendra Deshmukh (ME)	Hybrid Vehicles, Dynamics and Simulation of Electric Vehicles
Dr. I.A. Palani (ME)	Autotronics System Design
Dr. S. Dhinakaran (ME)	Fuel Cells; CFD
Dr. S.I. Kundalwal (ME)	Vehicle Dynamics, Composite Materials for Electric Vehicle Applications
Dr. Harekrishna Yadav (ME)	Thermal Management of Electric Vehicle
K. Eswara Prasad (MEMS)	Materials and Crashworthiness for Electric Vehicles
Dr. J.P. Murugesan (MEMS)	Light-weight Materials for Electric Vehicles, Mechanical Testing, Design of Materials for Electric Vehicles
Dr. Rupesh S. Devan (MEMS)	Electrochemical Energy Storage for Electric Vehicles
Dr. Sunil Kumar (MEMS)	Electrochemical Energy Storage for Electric Vehicles
Dr. Sumanta Samal (MEMS)	Advanced Materials and Processes for Electric Vehicles
Dr. Somaditya Sen (Physics)	Energy related Materials and Futuristic Battery Materials
Dr. Pankaj R. Sagdeo (Physics)	Triboelectric and Nano-generator
Dr. P.K. Sanjram (HSS)	Human Factors in Automobiles

Center for Indian Scientific Knowledge Systems (CISKS)

The centre will focus on understanding, preserving, teaching and adapting the science and technology heritage of India. The center will focus exclusively on the scientific and technology heritage of India and its relevance to modern world. The focus is on hard sciences such as mathematics, astronomy, metallurgy, biology, agriculture, engineering and medicine among others. This center will not focus on the language studies or humanities or social science aspects of Indian knowledge systems.

In this resource constrained world, it is essential to balance the needs of development, sustainability and equitable development. For example, the nuanced view of Intellectual properties in Indian civilization could be a model for the world that balances the common societal good with the need for providing incentives to individuals for knowledge creation.

A few specific examples are provided as illustration:
1. Understanding some of the techniques in metallurgy could help us in developing new materials with unique properties (metal mirrors, rust proof iron, high strength steel alloys).
2. Knowledge from agricultural treatises such as vrikshayurveda, Krishi Parashara, viswa vallabha, kashyapiya krushi sukti among others would help us in developing sustainable technologies for watershed management, sustainable agriculture and pest management.
3. Textile Industry could benefit from some of the techniques used for animalizing cotton and it could

have commercial implications. For example, please see a patent for Animalizing Cotton that was filed by a US company that found uses for such techniques in textile dyeing (https://patents.google.com/patent/US2947594A/en)

VISION: The grand vision of the Center for Indian Scientific Knowledge Systems is to train generations of scholars who will show the 'Indian way' to the world.

Mission: This center will focus exclusively on the research and education of the Indian scientific heritage by studying original texts in all Indian languages and understanding their relevance to address current technological challenges to sustainable societal development. This center will focus on developing specific courses for various engineering disciplines in Samskrit aimed at undergraduate/graduate students, research into texts and identifying their relevance in modern context and serve as a center for dissemination of knowledge and training the teachers and students in the engineering colleges of India.

Objective of Center
The objectives of Center for Indian Scientific Knowledge Systems (CISKS) are to:

1. research classic scientific texts of India
2. educate students about the scientific texts of India
3. nurture scholarship in Indian scientific Knowledge Systems
4. preserve classic scientific texts of India
5. collaborate with other HEIs of India in the field of Indian Scientific Knowledge Systems

Focus Areas
1. Knowledge Paradigms;
2. Sustainable Agriculture;
3. Novel Materials;
4. Holistic Medicine;
5. Preserving Traditional knowledge

Ongoing Projects

S. No	Project Title
1	Positional Astronomy with the Ancient Ved-shala in Ujjain
2	Traditional liquid fertilizer as a substituent to conventional inorganic chemical fertilizers and solid manure
3	Investigating 'Panchgavya' (cow dung, urine, milk, ghee, curd) for synthesizing graphene and carbon quantum dots
4	Identification and purification of Phytochemicals derived from Indian medicinal plants as Cancer therapeutics

Center of Innovation, Incubation, Entrepreneurship, and Industry Relations (CIIEIR)

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. Later it was renamed as **Center of Innovation, Incubation, Entrepreneurship, and Industry Relations (CIIEIR)** and was established in September 2020 at IIT Indore by the Director (Officiating) Professor Neelesh Kumar Jain. 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.

Vision and Mission: CIIEIR aims to transform knowledge and innovation into the creation of successful innovative entrepreneurs. Our main vision is to develop competitiveness and inculcate innovation among IIT Indore community members as well as enhance links between industry and students for developing useful products based on emerging technologies.

CIIEIR team reports to **Professor Anand Parey, Dean of Resources Generation.**

Dr. Swaminathan R. (Head CIIEIR), CIIEIR Committee, Dr. Kumar Gaurav (AO CIIEIR), Ms. Kavita Enamdar, are managing incubation and entrepreneurship activities with the joint efforts of students of Entrepreneurship Cell (E-Cell).

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.

Collaborations for Funding with Ministry of MSME:

- MoUs have been signed with Ministry of MSME for various Government of India funding schemes.
- Design Expertise to Manufacturing MSME Sector (**Design scheme)**
- Support for Entrepreneurial and Managerial Development of MSMEs through Incubators (**Incubation Scheme**)

Collaborations for Funding with Organization/Angel Investors:

- MoU has been signed with *FICCI FLO* for Women Entrepreneurship.
- MoU has been signed with *Digital Futuristic Angels Network* Private Limited for unlimited seed funding.
- MoU has been signed with *NNM Next Gen (CoKaCo)* Angels Investor.
- MoU has been signed with *Inocorn Angels Network Private Limited*.

Major Achievements:

- 16 start-ups have been Incubated at CIIEIR
- One of our previous incubatee Swaaha Resource Management Pvt. Ltd. (Swaaha) was awarded as the "Best Start-up Initiative by Smart Cities" by ET Global Smart City Forum 2020

- 5 ideas were approved by Ministry of MSME for funding of **Rs. 90 Lakhs** under **Incubation scheme**

Webinar /Major Event/Awareness Programs Organized During COVID 19 Pandemic:

Webinars:

- Mrs. CA Vanita Rathi delivered webinar on **How to Register a New Company and Start Business.**
- Mr. Nilesh Trivedi, Assistant Director, Ministry of MSME, delivered webinar **on Various Government Policies for Easy Setup of Startup.**
- Mr. CS Raj Kapadia delivered webinar on **Understanding the Forms of Business Entities and Procedures for Registration.**
- Dr. Abrar Ali Saiyed delivered webinar on **Bright and Dark Side of Entrepreneurship**.
- Professor Sunil Shukla, Director, EDI delivered webinar on **Accelerating Entrepreneurship in New India.**
- Mr. Sandeep Bommireddi, Co-founder of Adonmo, IIT Indore Alumnus, delivered webinar on **Incredible Journey in Entrepreneurship**
- Dr. Pankaj Borkar, Head-RGNIIPM delivered webinar on **Intellectual Property Rights**
- Mr. Tarun Sharma, CGM-EXIM Bank, delivered webinar on **Supporting Sustainable Enterprises and Export Development.**
- Professor Thillai Rajan A, Department of Management studies IIT Madras, delivered webinar on **Incubation and Venture Funding: Implication of the evolving trends for the startup founders**.

Major Event:

- **E-Summit 20-21** with the theme **A Virtual Forum of Excogitation** was organized by E-cell, IIT Indore

Awareness Programs:

1. Awareness program was conducted in association with MSME Development Institute (DI), Indore on Establishment of Toy Cluster in Budhni and training was given to various Toy artisans at Nasrullaganj, Sehore in the month of Feb-2021.



2. Awareness program on **Safety & Standards Related to Toy** was organized in association with MSME DI Indore for Toy industrialists, manufacturers, and artisans at Indore in the month of Feb-2021.



Startups associated with IIT Indore: -

- FundsSMEs.
- Spark Green Venture & Innovation
- InnovationOne.com
- Freebird Aerospace
- Seashell Services
- MiBi Services Private Limited
- Smart I -Fab Technology Private Limited
- OTomator Technologies Private Limited
- THINK -VLSI
- InterviewPrep
- IRIS Heath Care
- Green ECHO
- WasteHai
- VLAB4U
- Padmapriya Technovat Private Limited
- Scas Technology

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:

- Vishwas Raj Batham
- Harsh Jha
- Devesh Jindal
- Soham Roy
- Rishu Pal
- Aditi Mishra
- Utkarsh Khairnar
- Anushka Paul
- Devendra Ahirwar
- Anadita Prasad
- Anubhav Singh
- Khushi Verma
- Saikumar Erumalla
- Abhijit Panda
- K Madhumitha
- Abhinav Yadav
- Rajkumar Thomas
- Abhishek k
- Yash Suvarna
- V S V V Lohit
- Anadita Prasad
- Anupama Sureshbabu
- Anupama Sureshbabu
- Surapu Praveen
- Arpit Vyas
- Sharvari Kulkarni
- Abhishek k
- Sanket Vinayak Muthal

Centre of Futuristic Defence and Space Technology (CFDST)

From Head of Center's Desk: The center of futuristic defence and space technology is committed to provide a platform to the students and researchers for their contribution in "Nation-Building" through developing various forefront and futuristic technologies for Defense and Space Sectors towards "Aatmanirbhar Bharat". The canter is contributing in providing technological solutions to some of the research problems of the premier laboratories of defense institutions of country such as the Defense Research and Development Organization (DRDO). The center is also planning to offer specialized and dedicated M.Tech./MS (research) and Ph.D. programs in the broad area of defence and space in near future.

Members in CFDST:

- Professor Neelesh Kumar Jain
- Professor Rajneesh Misra
- Professor Ram Bilas Pachori
- Professor Vimal Bhatia
- Dr. Abhinoy Kumar Singh
- Dr. Abhirup Datta
- Dr. Abhishek Rajput
- Dr. Avinash Sonawane
- Dr. Ajay Kumar Kushwaha
- Dr. I A Palani
- Dr. Lalit Borana
- Dr. Mrigendra Dubey
- Dr. Neelima Satyam
- Dr. Pankaj Sagdeo
- Dr. Puneet Gupta
- Dr. fvan Maurya
- Dr. Sanjay Kumar Singh
- Dr. Saurabh Das
- Dr. Shaibal Mukherjee
- Dr. Vinod Kumar
- Dr. Vivek Kanhangad
- Dr. Hem Chandra Jha
- Dr. Jayaprakash Murugesan
- Dr. Mukesh Kumar
- Dr. Nirmala Menon
- Dr. Ruchi Sharma
- Dr. Somaditya Sen
- Dr. Sumanta Samal
- Dr. Surya Prakash
- Dr. Swaminathan Ramabadran

Major Achievements: Webinar Organized During COVID 19 Pandemic

- Expert Talk Dr. Ajay Kumar IAS Defence Secretary Ministry of Defence, Govt. of India webinar on Indian Defence Industry The Sunrise Sector.
- Expert Talk Maj Gen A K. Channan, PVSM, SM Additional Director General Army Design Bureau webinar on Technology as a disruptive influence on military warfare.
- Expert Talk Lt. Gen VG Khandare PVSM, AVSM, SM (Retd.) Military Adviser, National Security Council Secretariat webinar on Role of technology in national security and comprehensive national power.
- One day Workshop on Opportunities in Research and Developments in Armament Establishments (ARMREB-2020)" on 26th August 2020.

CENTRE FOR RURAL DEVELOPMENT, IIT INDORE



Prof. Sandeep Chaudhary
Head, CRDT
Professor, Civil Engineering Department

Message from Head

IIT Indore is the premier technology institute in Central India. Located in a historically backward state (as per HDI index and other government parameters), the institute has undertaken various activities during a decade of its establishment to support and facilitate the improvement of the various indices. Different research projects across various disciplines have focused on the challenges and problems of a largely rural population and worked with agencies to develop solutions to improve people's quality of living. Apart from adopting two villages located adjacent to the institute, research projects in Water, sanitation, solid waste management, Right to education, Governance has addressed some major issues with some success. Additionally, student groups such as Avana have collaborated with Government projects as Unnat Bharat Abhiyan (UBA) to develop innovative directions and strategies. The institute has now established The Centre for Rural Development (CRDT) to harness and coalesce all the efforts mentioned above with specific aims and objectives. The Centre will become a nodal hub for researchers, volunteers, practitioners, educators, and others to collaborate and facilitate rural empowerment and progress solutions.

Vision of CRDT:

CRDT shall strive to facilitate empowering and enabling the Rural population to improve their living conditions by development and application of appropriate and people-friendly technologies adopting participatory, sustainable, democratic, transparent and gender-sensitive processes.

Objectives of CRDT:

The Centre for Rural Development, IIT Indore, aims to work into the following broad areas:

- Skill development and training programs for various trades
- Small scale entrepreneurship, sustainable cottage industries, development of value added products
- Access and Opportunities for Gender justice
- Developing user-friendly interfaces for launching e-platforms for various rural activities that require outreach to larger communities
- Evaluation and policy recommendations for government welfare schemes.
- Harnessing Forest products and helping rural entrepreneurs to develop and sell their products with easy access to technology
- Identifying gaps between skills and outreach and facilitating in filling that gap
- Outreach to NGOs, Govt organizations, International bodies such as UNICEF to have a broad-based approach
- Right to Education (RTE) Act- Efficacy and Outcomes

- Technology Development in Food Processing, Food Packaging and Food Storage

Our Team

- Prof. Sandeep Chaudhary (Head)
- Dr. Pritee Sharma
- Dr. Neeraj Mishra
- Dr. Neelima Satyam D.
- Dr. Santosh Kumar Vishvakarma
- HOD, Computer Science and Engineering
- HOD, Electrical Engineering
- HOD, Mechanical Engineering
- Associate Dean-II, Infrastructure Development
- Associate Dean-III, Infrastructure Development
- Dr. Shaibal Mukherjee

CRDT: COVID RELATED ACTIVITY

Fluorescent bricks and coatings with self-illuminating properties for applications in UV disinfection building chambers

Prof. Sandeep Chaudhary, Dr. Rajesh Kumar and Mr. Vivek Gupta

Passenger luggage in public transportation can be a potential source of disease spread, for which large number of UV disinfection chambers will be required. For such a purpose, existing concrete buildings can be converted into the closed UV chambers or the new UV disinfection rooms can also be constructed for disinfection of public luggage at mass scale. Research studies are being carried out to develop the sustainable construction materials with self-illuminating properties for existing as well as for new UV disinfection building chambers. These materials will give the visible fluorescence under UV light and can illuminate the goods inside the chamber without any additional visible light source. For existing buildings, coatings are being developed whereas for new construction, functionally graded bricks are being developed for the required applications. These materials will be helpful for enhancing the visibility and monitoring the operations in UV disinfection rooms using normal visible range cameras without any additional visible light source in the existing as well as in the new infrastructure.

After relaxation of lockdown, public transports will be at high risk of becoming hotspot due to the movement of passengers, and their luggage. Thermal screening of passenger are being carried out and sanitization measures are being taken at regular interval as a preventive measure. However, passenger luggage can be a potential source of spreading the disease for which disinfection measures are to taken to break the chain. To disinfect the passenger goods, large number of UV disinfection chambers will be required. For such a purpose, existing concrete buildings can be converted into the closed UV chambers by completely packing the openings (doors, windows, and ventilators) to avoid the exposure of UV light. Besides these, the new UV rooms or chambers can also be constructed at the entrance of mass public transportation places (i. e. bus stand/railway station/airport) for disinfection of public luggage at mass scale. Both the converted and newly constructed UV chambers can be used for disinfection of goods by keeping the goods for sufficient time before handing over to the passenger. For higher efficiency of system, automatic transfer of goods inside and outside the chamber can be implemented. Robotic appliances can also be used for performing the operations in these room considering the human safety

against the disease as well as the exposure of UV radiations. In such rooms, visibility for performing and monitoring the operations under UV light will be a key concern which is being worked out by a group of civil engineers and physicists at IIT Indore.



(a)



(b)

Fig. 1 (a) Fluorescent cementitious material prepared using hydrated lime, and (b) visible florescence in UV light

To develop the low cost bricks for such applications, two layered functionally graded bricks are being conceptualized, and as of now, manufacturing feasibility has been assessed through monolithic casting of two layered bricks taking the two different brick mixes. Only a thin layer of the developed fluorescent material will be used as top coating (3 – 5 mm), and for remaining thickness (85-87 mm) of brick (size: $90 \times 90 \times 190$), normal brick mix can be used. The trials for producing such bricks are in progress along with the development of fluorescent materials using hydrated lime and other ingredients.

Sophisticated Instrumentation Centre (SIC) A National Facility, IIT Indore

The Sophisticated Instrumentation Centre (SIC)–A National Facility was established in September 2011 with institute backing to expedite research programs at IIT Indore. The SIC mission is to upkeep 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.



500 Mhz NMR with Super Sensitive I-probe & TXI probe



PSA Based Liquid Nitrogen Generation system



FESEM with EDS & WDS



Single Crysta XRD

List of some other instruments available with the facility ;

X-Ray

- Single Crystal X-ray Diffraction Facility (SCXRD)
- Powder XRD (PXRD)
- X-ray Absorption Fine Structure (XAFS)
- Energy Dispersive X-ray Spectroscopy (EDS/EDX)
- Wavelength Dispersive Spectroscopy (WDS)

Spectroscopy

- Nuclear Magnetic Resonance (NMR 400 MHz & 500 MHz)
- Fourier Transform Infrared Spectrometer (FT-IR)
- Time Correlated Single Photon Counting (TCSPC)
- Circular Dichroism (CD)
- Photo Luminescence (PL)
- Raman Spectroscopy
- UV Visible Spectrometer (UV-VIS)
- UV VIS NIR Spectrometer
- Spectrofluorometer (FL)

Microscopy

- Field Emission Scanning Electron Microscopy (FE-SEM)
- Single Molecule Microscopy
- Atomic force Microscopy (AFM)
- Confocal Laser Scanning Microscope (CLSM)

Chromatography

- Liquid Chromatography and Mass Spectroscopy (LC-MS)
- Gas Chromatography Mass Spectrometer (GC-MS)
- High Performance Liquid Chromatography (HPLC- Reversed phase)
- High Performance Liquid Chromatography (HPLC-Chiral

Electro-Analytical

- Cyclic Voltammetry
- Spectroelectro Chemical Cell (SEC)

Thermal Analysis

- Thermogravimetric Analyzer (TGA)
- Differential Scanning Calorimetry (DSC)

Elemental Analyzer
BET Surface Area Analyzer
DIBSD

Other Instruments

- Rheometer
- Langmuir-Blodgett film deposition system

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.

SIC has also started supporting research initiative by the SIC staffs. A recent publication with SIC affiliation reflects this new endeavor from the SIC community.

Publications in international Journal: 563
Conferences approx.: 105
International Patents: 08

Summary of Major Instrument Usage (2020 -2021)

Instruments	Internal Samples	External Samples
NMR	9216	58
LCMS	6342	43
FE-SEM	3865	38
AFM	2516	08
GCMS	2098	15
Confocal Microscopy	924	03

Apart from these the SIC has several other instruments enlisted at http://www.iiti.ac.in/sic/index.php

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 not only across India but also International users.

Academic Institutions:

- BARC, Mumbai
- Raja Ramanna Centre for Advanced Technology (RRCAT), Indore
- TIFR Hyderabad
- IIT Bombay
- IIT Madras
- IIT Mandi
- IIT Patna
- IIT Gandhinagar
- NIT Rourkela
- NIT Allahabad
- MA-NIT Bhopal
- NIPER Mohali
- Indian Institute of Himalayan Bio-resource Technology (IHBT), Palampur
- Banaras Hindu University, Varanasi
- Guru Nanak Dev University, Punjab
- GITAM University, Visakhapatnam
- Jammu University Jammu
- MS University, Baroda
- Savitribai Phule Pune University, Pune
- Pinnacle Biomedical Research Institute (PBRI), Bhopal
- Devi Ahilya Vishwavidyalaya, Indore
- Shri Govindram Seksaria Institute of Technology and Science, Indore
- North Maharashtra University, Jalgaon
- Vikram University, Ujjain
- Mewar University, Rajasthan
- Delhi University, Delhi
- RD University, Jabalpur
- Central University, Sagar
- Central University of Rajasthan
- Guru Ghasidas Vishwavidyalaya Central University, Bilaspur
- SRM University, Chennai
- University College, Trivandrum
- Tumkur University, Karnataka
- Thapar University, Patiala
- Punjab University
- Awadhesh Pratap Singh University, Rewa
- University of Hyderabad, Telangana
- Pondicherry University, Puducherry
- R.R. Govt. College, Alwar, Rajasthan
- R.D.V.V. Jabalpur, MP
- Rabindranath Tagore University, Bhopal
- Gujrat University, Ahmedabad
- IGNT University, Amarkantak, M.P.

International Academic Institutes:

- Universität Stuttgart, Germany
- Jehangirnagar University, Bangladesh
- Dhaka University, Bangladesh
- Taibah University, Medina, KSA

Industries:

- Gharda Chemicals
- Glenmark Pharmaceuticals
- Piramal Healthcare Mumbai
- Jubilant Biosys Ltd.
- Lupin Pharmaceutical Pvt. Ltd.
- Mimani Wires Pvt. Ltd.
- Choksi Labs Ltd.
- UV Resins Pvt. Ltd.
- Impress Chemicals Pvt. Ltd.
- Syntochem Pvt. Ltd.
- Symbiotec Pharma, Indore
- Medilux Pharma, Indore
- Emcure, Pune
- Reliance Industries Ltd.
- Navin Fluorine International Ltd., Dewas
- SRF Ltd., Indore
- M.P. Dye Chem., Indore
- Rupak Enterprises, Indore
- Sprint Testing Solutions, Mumbai
- Rajveer Chemicals, Indore
- Shree Pacetronix Ltd. Indore
- Keva, Mumbai
- IPCA, Ratlam
- ATUL Ltd., Valsad
- Piramal Pharma Solutions, Ahmedabad
- Integral Bio-Science, Noida, UP
- Macsen Laboratories, Rajasthan

COUNSELLING SERVICES

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 intervention for various mental health issues in students.

The team of Counselling Services is headed by Dr. Pavan Kumar Kankar, Associate Professor, Mechanical Engineering. In addition, the Counselling Cell comprises of a professional counselor Ms. Monika Gupta and 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. Psychological interventions are also provided for students undergoing treatment for COVID-19 infection at the campus.

(b) In view of COVID 19 pandemic, an online counselling facility (tele-counselling, via googlemeet or skype) was made available to the students and their parents.

(c) In person-counselling sessions were also conducted for those students who were residing inside the campus by following the COVID -19 protocols.
(d) During the re-entry of the students in campus post lockdown, the psychological concerns of the students were assessed by administering an online questionnaire. This has helped in prevention and early identification and intervention of emotional concerns of the students.
(e) With the aim to foster a healthy stress-free environment for the student community, the Counselling Cell with the support of gymkhana general secretary counselling and outreach, oversees a student mentorship Programme. The student mentors help freshers by extending their helping hand both for academic and non-academic concerns.
(f) The counselling cell prepares the list of faculty advisors for the new students of B.Tech and masters Programme. The faculty advisors regularly interact with the delegated 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.
(g) Creating a good liaison with various departments and services at the Institute to facilitate the implementation of the intervention plan.
(h) Working towards creating a strong referral system as a basis for enhancing mental health services, where students are being referred by academic office, health center, faculty advisors, sports and security officers, wardens and hostel office, parents and friends, apart from walk- in students who approach the counselling cell on their own.

(i) To Organise webinars and expert talks to create awareness on mental health issues and enhancing positive well-being.
(j) 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) e- Orientation – e -Orientation of Introduction to Counselling Cell for 2020 batch for PG and Ph. D students was conducted on August 29, 2020. During the session, Head counselling services, Dr. Pavan Kumar Kankar and institute Counselor , Ms. Monika Gupta, discussed the functions of counselling cell services and its structure at IIT Indore. The process of counselling was also explained to the students.

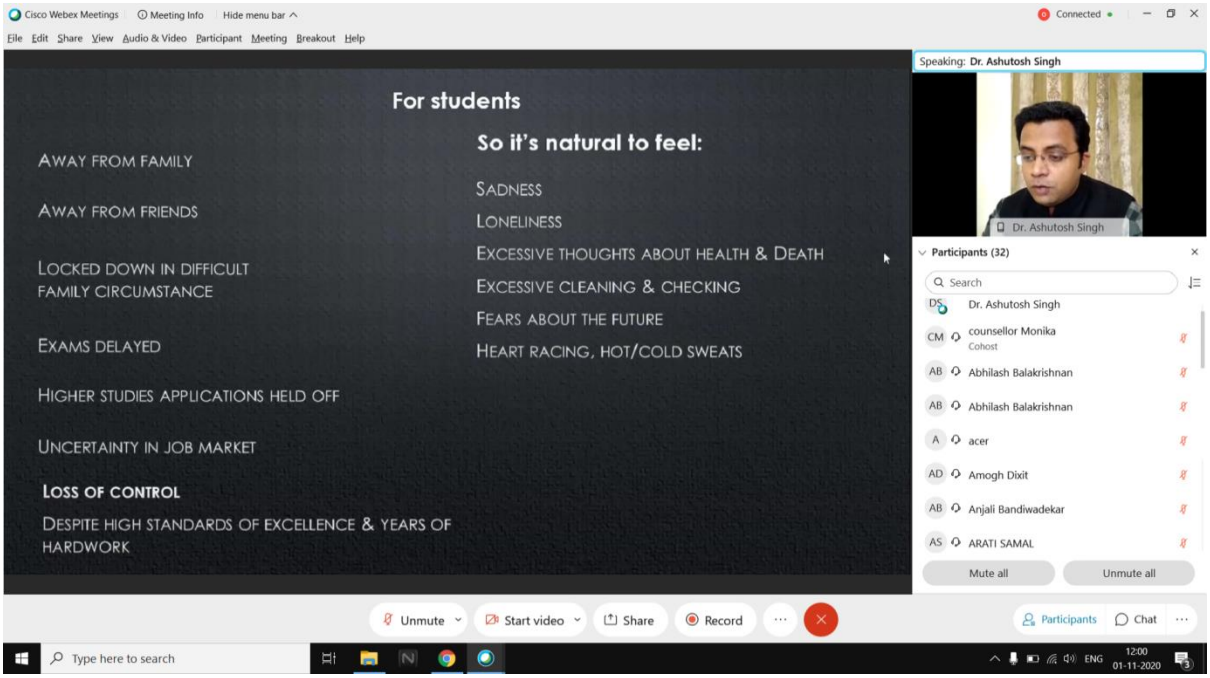
(B) Online group motivational sessions on "dealing with new normal and stress management" were conducted by the institute counselor for students in quarantine at the campus.

(C) A webinar on "**Enhancing concentration and overcoming distractions during online learning" was** organized by Counselling cell , on September 13, 2020. **Mr. Amal M. Das - Entrepreneur, Motivational Speaker, Author, Educationalist, Mentor and alumnus of BTECH (Hons.), IIT Kharagpur was the expert speaker.**

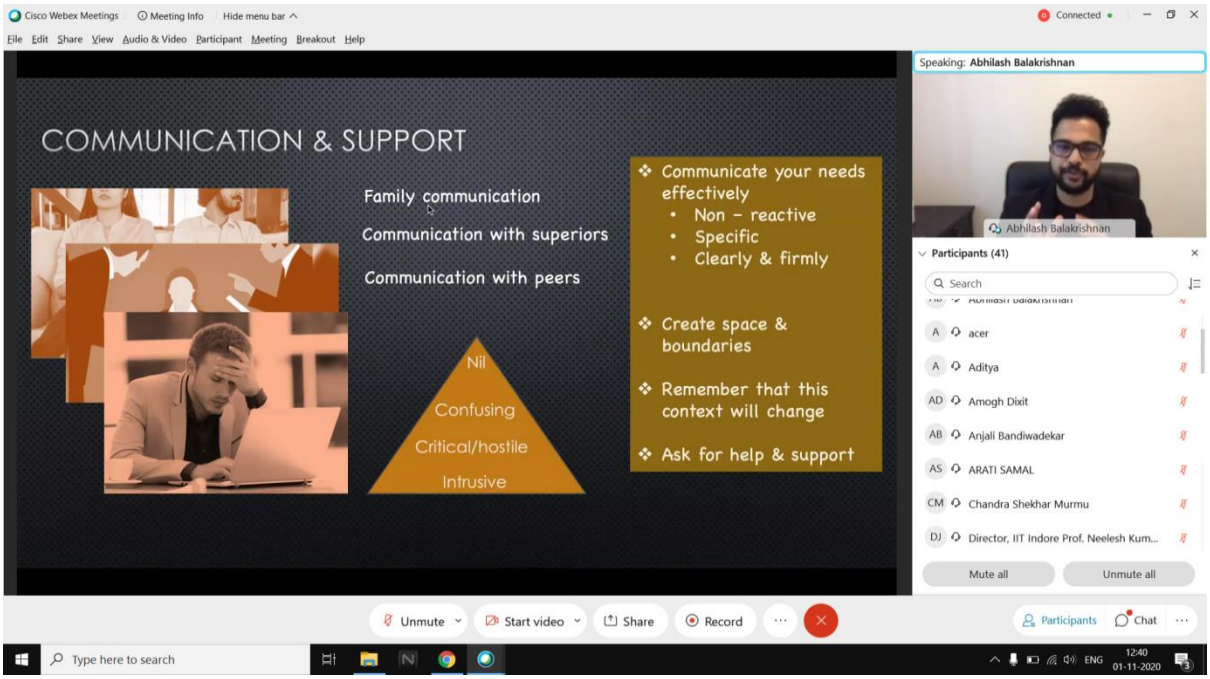
(D) **Mental Health Awareness Programme –** On the occasion of World Mental Health Day observed every year on October 10, IIT Indore counselling cell, had organised a webinar on November 01, 2020 on the theme **"Mental Health Awareness During Pandemic and Beyond"** for the IIT Indore community. **The Expert Speakers Dr. Abhilash Balakrishnan Consultant Psychiatrist, Forensicare, Melbourne, Australia** and **Dr. Ashutosh Singh, Visiting Consultant Psychiatrist**

Apollo Hospital and IIT Indore focused on the impact of pandemic on our mental health and how we can take care of the specific emotional health concerns, build resilience and make the most of the circumstances emerged during COVID-19.

Expert Speaker: Dr. Ashutosh Singh, Visiting Consultant Psychiatrist Apollo Hospital and IIT Indore during the webinar on October 10th,2020



Expert Speaker: Dr. Abhilash Balakrishnan Consultant Psychiatrist, Forensicare, Melbourne, Australia during the webinar on October 10th, 2020

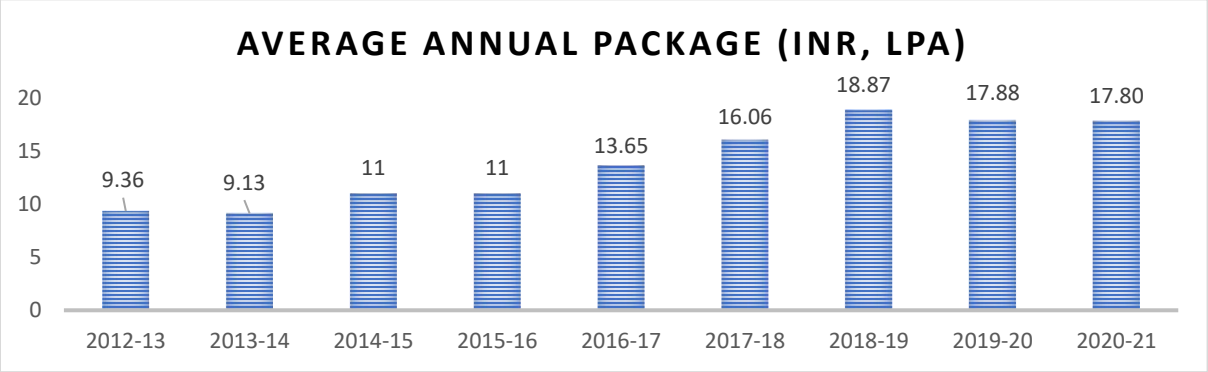


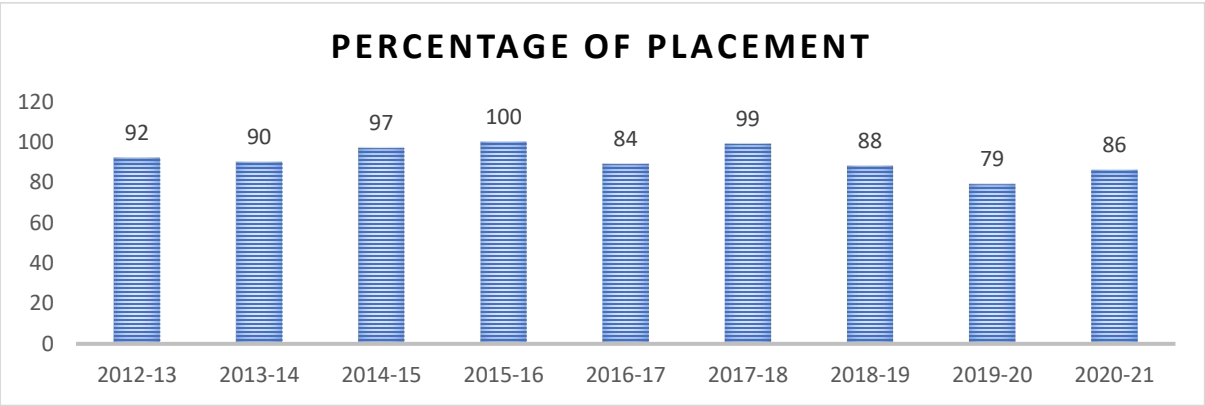
PLACEMENT SECTION

The Placement Office has been committed to expand the horizons at global level and facilitate value-driven mutual association between recruiters and our students. The section is headed by Dr. Abhishek Rajput with Ms. Mamta an Assistant Placement Officer till March 2021 and with Ms. Urvashi (w.e.f. May 2021) as Manager. Students were offered various job roles in areas/ sectors such as: Automobiles & Steel, Software Engineering & Technology Consulting, Analytics, Oil & Gas, Tele-communication & Digital, Finance & Banking, Construction, E-Commerce etc.

Despite the difficult time of pandemic, Placement Office succeeded to get various companies with attractive packages for our students. The prominent recruiters were- Amazon, DE- Shaw, Goldman Sachs, Salesforce, Deloitte, Arcesium, DBS Bank, GAIL, Barclays, Razorpay, Analog Devices, Tata Digital, E-Ring, ArcelorMittal, BookMyShow, Fractal Analytics, JIO, Commvault, Clumio, Oyo, PayPal, United Health Group, Accolite, Strand Life Sciences, MathWorks, Cognizant, L&T, Quantile Analytics, ZS Associates, Jaguar Land Rover, L&T, Bajaj Auto, Cognizant, Adani Total Gas, Hero MotoCorp Ltd. & more.

The average salary package is INR 17.80 lakh p.a. and highest package received is INR 47.25 lakh p.a. (domestic). Approximately 175 students actively participated in campus placements activities out of which 150 got placed and 155 job offers were received. 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.





Central Workshop

The IITI Central Workshop (CW) is equipped with modern state-of-the-art instruments. Currently, the workshop is having seven shops: Machining, Welding, Forming, Foundry, Injection Molding, Fitting and Carpentry. It is supported by a team of extremely skilled operators. Apart from industrial manufacturing work it also provides hands-on-training to students/operators involved in research and development of industry or academics in production and fabrication of mechanical components. The projects and manufacturing divisions satisfy industrial standards and requirements and also bridge the gap between industry and academia. Completion of a project in a time-bound, cost-effective framework maintaining high quality of products is the aim. The workshop provides excellence and problem specific solutions to industries and research organization, apart from teaching students on handling the facilities.

ACTIVITIES

Laboratory classes CW initiated its role of transforming students to engineers capable of thinking, designing and executing new ideas and has already achieved considerable success. CW undertakes Basic Manufacturing Technique Lab (IC-156) common to all branches, Manufacturing Processes Lab (ME-258), Machining Science and Metrology Lab (ME-355) laboratory classes are regularly being held in the Central Workshop.

Research fabrication and manufacturing CW has provided infrastructure and service to the faculty members/research scholars to fabricate experimental setup for research purposes and helping the UG/PG students in designing their B.Tech/M.Tech projects. Central workshop is equipped with modern state-of- art facilities to fabricate research projects and experimental apparatus of research scholars and students.

FACILITIES

Carpentry Shop

- Wooden cutter : Capacity 75 mm
- Jig Saw : Capacity 25 mm
- Hand Drilling : Capacity 12 mm

Forming Shop

- Sheet Shearing : Sheet size 1200 x 1.5 mm
- Sheet Bending: Capacity : 1200 x 2 mm
- Wire drawing : Inlet wire diameter: 3-6 mm, Outlet wire diameter: 1-2 mm
- Pipe bender : Capacity : 75 mm
- Deep drawing : Capacity 200 ton hydraulic press,

Foundry Shop

- Pit type furnace: Max Temp.: 800 °C
- Induction furnace: Max Temp.: 1100 °C

Fitting shop

- Drill Machine : Capacity : 50 mm

- Pedestal Grinder : Wheel size 450 mm

Machine Shop

- Lathe Machine : Swing over bed: 500 mm, Distance between centre: 1500 mm.
- Vertical Milling Machine : Longitudinal travel: 762 mm, Cross travel: 305 mm, Max. job weight on the table: 300 kg.
- Horizontal Milling Machine : Longitudinal axis travel: 600 mm; Cross axis travel: 230 mm, Vertical axis travel: 400 mm Max. job weight on the table: 200 kg.
- Radial Drilling: Max. drilling diameter: 50 mm, Max. spindle travel: 200 mm.
- Tool and cutter grinder: Max. dia. of cutter: 250 mm, Max. distance between centres: 300 mm.
- Surface Grinding : Max. job that can be ground: 600 x 300 mm.
- Slotter : Max. stroke of ram: 250 mm, Rotary table area: 375 mm.
- Power Hacksaw : Max. size of job: 300 mm
- Drill Machine : Max. drill diameter: 50 mm.

Plastic parts manufacturing shop

- Injection moulding machine: Max. Mould weight Moving Plate: 277 Kg, Stationary Plate;143 kg. Min. Mould area: 22 cm x 21 cm

Welding

- Arc welding machine: Operating arc voltage 20-40 V, Welding current range 50-400 A
- MIG/MAG machine: Welding current and voltage range 10-450 A Max. welding voltage 53 V, Filler wire range 0.8 ,1.2,1.6
- Spot welding machine: Work Capacity :3.25 mm
- Oxy-Acetylene gas welding

PEOPLE

In charge, Central Workshop

Dr. Dan Sathiaraj Assistant Professor,

Associated Faculty

Dr. Neelesh Kumar Jain, Professor
Dr. I. A. Palani, Associate Professor
Dr. Kazi Sabiruddin, Associate Professor
Dr. Satyajit Chatterjee, Assistant Professor
Dr.Yuvraj K Madhukar, Assistant Professor
Dr. Girish Chandra Verma, Assistant Professor
Dr. Ashish Rajak, Assistant Professor
Dr. Anand Petare DGM (Workshop)

Institute Functions

Celebration of 74th Independence Day at IIT Indore

IIT Indore celebrated the 74th Independence Day with great zeal and fervor. The occasion was marked by hoisting of the national tricolor by Professor Neelesh Kumar Jain, Director (Officiating). In the prevalent pandemic situation, the physical presence of the guests was limited, and the event was webcasted live on institute website for the community. Prof Neelesh Kumar Jain, Director Officiating addressed the community and appreciated the efforts of the Institute during the pandemic situation. He said "The pandemic situation has affected all the students globally and every academic Institute is finding out innovative ways to connect to the students. IIT Indore has ensured that the student do not suffer any academic loss and the academic and research activities are being conducted in a time bound manner. The Institute has ensured that all lab and research facilities are functional with all safety precautions so the students can continue with their academics."

This Independence Day saw addition of three major facilities within the campus. CV Raman Hall of Residence is the fifth Hall of Residence inaugurated having 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. Vindhyachal Guest House was also inaugurated which has 18 Executive Rooms and 01 Suite for the guests of the Institute. All the rooms are well furnished with centralized air conditioning. It also has its own kitchen & dining facilities and hi speed internet facility. The Nursery School and creche facilities were also inaugurated which has play equipment, sleeping facilities for the kids, kitchen and washing facilities. All the inaugurations were done by Prof. Neelesh Kumar Jain, Director Officiating with Professor Deepak B. Phatak, Chairman BoG IIT Indore joining online as the Guest of Honour.





Hindi Diwas:

IIT Indore celebrated Hindi Diwas on 14 September 2020 with full joy and gaiety. IIT Indore has always given prominence to Hindi. We have a Rajbhasha Hindi Samiti which ensures that all the sections of the institute increase their Hindi working capacity. We have ensured that all the stamps and name boards used in the institute are printed in Hindi also. IIT Indore is also promoting correspondence in Hindi.

IIT Indore has decided that every day a Hindi word will be added to the website which can be a technical term or any other. In addition, to promote Hindi, all the communities are urged to It has been suggested that they learn and use at least one Hindi word every day.

According to the previous years, this year also Hindi Pakhwada was organized in the institute. Some competitions are being organized under Hindi Pakhwada-2020, in which there is essay writing competition and self-written poetry writing competition. Mr. S.P. Hota, Registrar and Dr. Rajnish Mishra inaugurated the program by lighting the lamp.









Mahatma Gandhi and Lal Bahadur Shastri Jayanti :

The day of Mahatma Gandhi and Lal Bahadur Shastri Jayanti was a plethora of activities for IIT Indore. Unique course on studying classical scientific texts in their original form and converse about them in Sanskrit was concluded on Oct 2, 2020. The culmination of the course was done through online mode and many eminent guests attended the function. Prof. Deepak B. Phatak Chairman, BOG-IIT Indore, Prof. Neelesh Kumar Jain, Officiating Director-IIT Indore, Prof. Himanshu Rai, Director-IIM Indore, Shri Shreesh Deopujari, All India General Secretary, Sanskrit Bharati, Hon. Justice (Retd.) BN Shrikrishna, Prof. Anil

Shasrabudhe, Chairman-AICTE attended the program. The course was scheduled from August 22 to October 2, 2020 and divided into two parts. The main goal of the first part of the course was to enable participants to develop skills and confidence to converse in simple Sanskrit having no prior knowledge of Sanskrit. The objective of the second part of the course was to enable participants to discuss technical subjects in Sanskrit. This part consisted of lectures on classical mathematical text Bhaskaracharya's Lilavati by well-known experts in the field.

As part of an outreach programme for local development in line with the Atmanirbhar programme of the Government of India, Centre for Rural Development (CRDT), IIT Indore organized special Atmanirbhar stalls in the Takshila Lecture Hall Complex. These stalls were used for display and sale of organic and handmade products by the local tribal villagers of Simrol-Choral area, Kasturba Gandhi National Memorial Trust and Khadi & Village Industries. A special display of books on the Life and Teachings of Mahatma Gandhi was also organized in the Learning Resource Centre of the Institute.

Professor Neelesh Kumar Jain, Officiating Director planted a memorial tree sapling in the campus to mark the occasion of 150 years of the Mahatma and addressed the gathering on the relevance of life and teachings of Mahatma Gandhi and Lal Bahadur Shastri in the current context. Two new buildings were inaugurated. Employees who had significantly carried their official work in Hindi were also awarded.

A webinar was also conducted at IIT Indore as part of the celebration of the 150th birth anniversary of Mahatma Gandhi. Prof. Sumati Ramaswamy, James B Duke Distinguished Professor of History, Duke University, US was one of the speaker and spoke on "Gandhi in the art of the child in modern India". Prof. Lakshmi Subramaniam, Professor in History, centre for Studies in Social Sciences, Kolkata was the second speaker and spoke on "Singing Gandhi's India: Uncovering Gandhi and Music in India".









8th Convocation : IIT Indore hosted the 8th Convocation on October 19, 2020 through online mode. A total of 400 degrees would be awarded to students in various streams and courses at the convocation ceremony. Of the graduating students, 233 are B.Tech, 58 are M.Sc., 57 are M.Tech. and 52 are Ph.D.

Hon'ble Union Education Minister Dr. Ramesh Pokhriyal 'Nishank' was the Chief Guest and Minister of State for Education, Govt. of India, Shri Sanjay Dhotre will be the Special Guest. The Chairman, Board of Governors, Prof. Deepak B. Phatak and Officiating Director Prof. Neelesh Kumar Jain attended the function. The President of India Gold Medal for the best academic performance among all the graduating UG students were awarded to Mr. Saptarshi Ghosh from Computer Science and Engineering. Arushi Jain of Computer Science and Engineering, Khushboo Ahuja of Electrical Engineering, Agam Gupta of Mechanical Engineering, Shalay Gupta of Civil Engineering and Ashutosh Gupta of Metallurgy Engineering & Materials Science would be the recipients of the Institute Silver medals for the best academic performance among all the graduating UG students of a particular Discipline. Manish Badole of M.Tech and Anchal Saxena of M.Sc program were received the Institute Silver medals. Chaitanya Mehta received the award for the best B.Tech Project for "Design and Development of a Tree Climbing Quadruped Robot". Whilst all the students were joined the function through online mode, the award winners were physically present to receive the degree and awards.

In addition, the Education Minister inaugurated the buildings of Kendriya Vidyalaya, Computer & Information Technology Center, Central Workshop, Abhinandan Bhavan and Takshshila Lecture Hall Complex.









Vigilance Awareness Week 2020 : On the occasion of concluding ceremony of Vigilance Awareness Week 2020 Shri Harinarayanchari Mishra, Deputy Inspector General of Police (DIG), Indore was invited in the IITI campus. He highlighted the key contribution of information technology in making the country more vigilant by bringing transparency in various fields. He also pointed out that technical institutes, such as IIT shall focus their research on reducing the online frauds and misuse of technology.

Shri Mishra inaugurated the Souvenir Volume-I published by the institute wherein all the best practices followed by different sections of the institute were compiled. On this occasion, Professor Neelesh Kumar Jain the Director (Officiating), IIT Indore, launched the online indent module of Material Management Section to bring in more transparency in the work, especially during the pandemic like situation to tide over the physical barrier.

HIGHLIGHTS





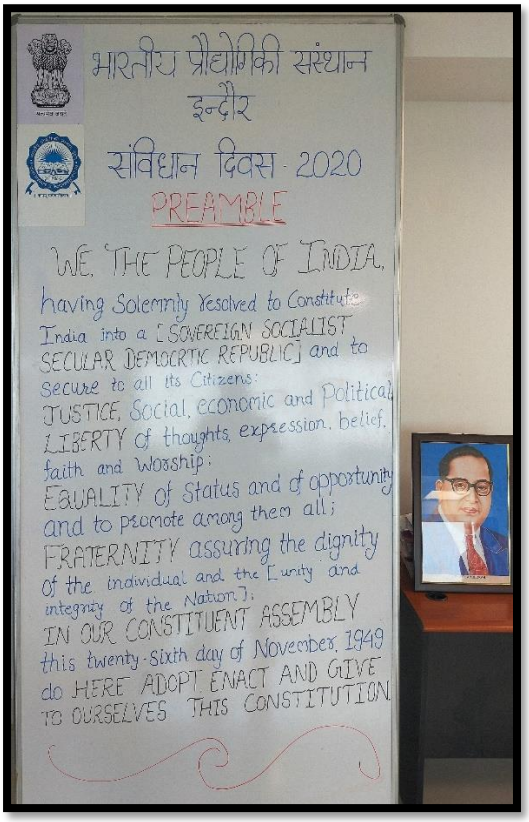




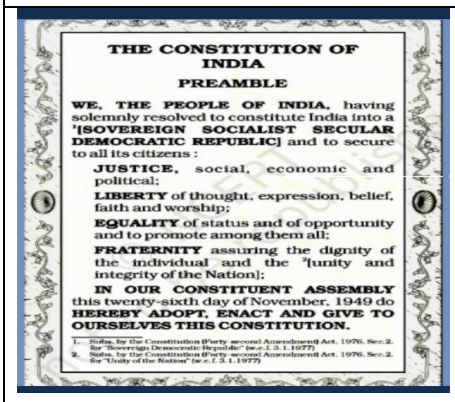
Celebration of Constitution Day

IIT Indore celebrated the Constitution Day, following activities have been done in IIT Indore-

- Preamble to the Constitution of India was read out by the gathering of Faculty, staff and students under the leadership of the Director.
- Preamble to the Constitution of India has been displayed on the landing page of the website of the institute.
- The photos of preamble reading ceremony is tweeted using #SamvidhanDiwas from the official twitter handle of the institute.







Celebration of 72nd Republic Day at IIT Indore

IIT Indore celebrated the 72nd Republic Day with great zeal and fervour. The occasion was marked by hoisting of the national tricolor by Professor Neelesh Kumar Jain, Director (Officiating). In the prevalent pandemic situation, the physical presence of the guests was limited, and the event was webcasted live on institute website for the community. The event marked the inauguration of parking facility at the Health Centre and Institute's name plaque at Gate No.2. The inaugurations were done by Prof. Neelesh Kumar Jain, with Professor Deepak B. Phatak, Chairman BoG IIT Indore joining online as the Guest of Honour.

Prof. Jain addressed the community and appreciated the efforts of the Institute during the pandemic situation.

In the last one year, IIT Indore has grown in terms of academics, research and infrastructure. Whilst it has made a place into the top 10 engineering Institutes of the country, the Institute was sanctioned 100 crores by DST to establish Technology Innovation Hub in the vertical of System Simulation, Modeling and Visualisation under the National Mission on Interdisciplinary Cyber Physical Systems (NMICPS). 36 projects out of total of 356 projects were undertaken and 396 research papers out of 3943 papers were published since January 2020. 01 patent was granted to Dr. Gourinath Banda, faculty at IITI, for his novel invention entitled 'System and Method for Electrical Energy Conservation' last year. 25 new start-ups have been empaneled by the Institute with 12 startups to be funded by MSME. A collaboration with Federation of Indian Chambers of Commerce and Industry (FICCI) has been done for female entrepreneurship.

Many new facilities have come up in the last one year, which has augmented the rise of the Institute in the global arena. With 02 New Hostels, Vindhyachal Guest House, Vikramshila Seminar Hall Complex, Kendriya Vidyalaya, Nursery School & creche facilities, Library, Computer & Information Technology Center, Abhinandan Administrative Building, Takshila Lecture Hall complex, Central Workshop, the sprawling 501 acres campus of IIT Indore houses world class facilities. Many more buildings are coming up soon which includes housing facilities for the faculty members.

Celebration of 12th Foundation Day:

Indian Institute of Technology Indore celebrated the 12th Foundation Day of the Institute through online mode on February 17, 2021. A series of event was planned during the day. Professor William Daniel Phillips, Nobel Laureate in Physics (1997) was the Chief Guest. He has pioneering contribution to Physics in laser-cooling and ion trapping. Prof. Deepak B. Phatak, Chairman, Board of Governors was the Guest of Honour and Prof. Neelesh Kumar Jain, Director (Officiating), inaugurated the event.

Prof. William D. Phillips delivered a talk on "A new measure: The revolutionary quantum reform of the international metric system". The talk provided information on new reforms of international metric system of measurement. The history of the metric system began during the Age of Enlightenment with measures of length and weight derived from nature, along with their decimal multiples and fractions. The system became the standard of France and Europe within half a century. Other measures with unity ratios were added, and the system went on to be adopted across the world.

Prof. N. K. Ganguly, Padma Bhushan and Former Director General, Indian Council of Medical Research (ICMR), Government of India also delivered a talk on "The current Challenges in the COVID vaccination and how do we choose a vaccine?" He is elected fellow of FISC, Indian Science Congress Association, 2019. He is also a visiting Professor of Eminence, Translational Health Science & Technology Institute, Faridabad; President of the Gut Microbiota and Probiotic Science Foundation and President, Indian Society of Translational Research. Also, he is Chairman of Immunology Foundation, Asian Institute of Public Health.

As part of the growing infrastructure, 02 new additions were made on this day by Prof. Neelesh Kumar Jain. Kshipra Residential Unit comprising of 27 nos each 3 & 2 BHK residences for faculty and staff of the Institute. This will lead to the shifting of the faculty members and staff inside the campus thus saving them

the time and efforts for commuting. Heating, Ventilation, and Airconditioning (HVAC) plant, with 2 nos water cooled centrifugal chillers, each having 650 TR capacity, will facilitate air conditioning to Abhinandan Bhavan, Takshashila Lecture Hall Complex and Learning Resource Center was also inaugurated. This facility will reduce the requirement of individual ACs.

A faculty handbook, comprising of abridged version of rules and regulations, was released by Prof. Jain. Welcome kit was also given to the Deans, Associate Deans and faculty members who joined during the pandemic time.









IIT in News

IIT-I HANDS OVER DEVICE TO MGM FOR CORONAVIRUS TESTING

Indian Institute of Technology (IIT), Indore on Wednesday gave a device to MGM Medical College to conduct testing of multiple coronavirus. The institute gave a centrifuge from Biosciences and Biomedical Engineering lab to the medical college that can be used for testing oropharnygeal or nasal swabs samples from suspected patients of coronavirus. The institute said that the machine was temperature-controlled and would be used for processing biological samples.

• डीआरडीओ व इसरो को मिलेगी इससे मदद

रक्षा, अंतरिक्ष में तकनीक सुझाएंगे आईआईटी छात्र

भास्कर संवाददाता | इंदौर

आईआईटी इंदौर में सेंटर फॉर फ्यूचरिस्टिक डिफेंस एंड स्पेस टेक्नोलॉजी (सीएफडीएसटी) बनने जा रहा है। डीआरडीओ और इसरो सहित डिफेंस और स्पेस के लिए काम करने वाली सरकारी संस्थाओं के साथ कोलाबरेशन के बाद आईआईटी का यह सेंटर उन्हें तकनीकी मदद उपलब्ध करवाएगा। खास बात यह होगी कि वर्तमान में उपयोग की जा रही तकनीकों के साथ ही भविष्य में क्या तकनीक उपयोग की जा सकेंगी, इसके लिए भी यह सेंटर काम करेगा। दोनों ही क्षेत्रों के स्टार्टअप इकोसिस्टम को तैयार करने में भी सेंटर मदद करेगा। सेंटर के जरिए संस्थान दो महत्वपूर्ण क्षेत्रों में अपनी मौजूदगी दर्ज करवाएगा ही, इसके अलावा डीआरडीओ और इसरो जैसी संस्थाओं में रिसर्च के नए आयाम भी आईआईटी के छात्रों को पता लगेंगे। आईआईटी से मिली जानकारी के अनुसार सेंटर तैयार करने के पीछे एक मुख्य उद्देश्य छात्रों और फैकल्टी मेंबर्स में डिफेंस और स्पेस में अपने योगदान देने की जागरूकता लाना भी है।

संस्थान में तैयार होगा सेंटर फॉर फ्यूचरिस्टिक डिफेंस एंड स्पेस टेक्नोलॉजी

IIT, IIM set new college norms for 'post-Covid era'

TIMES NEWS NETWORK



Indore: A self-declaration form with every minute detail on travel history of at least past 20 days, restricted entry and scattered lunch breaks are the new normal in educational institutes to stem the spread of Covid-19.

Educational institutes will no longer remain the same as they used to be before the pandemic due to slew of safety measures and re-engineering of campus to ensure safe environment to students and staff.

Top institutes like Indian Institute of Management (IIM) and Indian Institute of Technology (IIT) at Indore have introduced a lot of changes for entering the campus amid corona scare.

IIM Indore director Prof Himanshu Rai said, "The institute has prepared an exhaustive protocol detailing the standard operating procedure to be followed when students come in as well as what to do in classrooms and offices. This includes thermal screening not only for every person entering the campus but also at regular intervals for the people on campus."

IIM has made it mandatory for the people entering the campus to fill a self-declaration form with details of their travel history in the past 20 days. Cafeteria will bear a new look with only two people at opposite sides on a table of six and waiters wearing masks and gloves.

The institute has allowed only 33 per cent of administrative staff to come to office on a particular day. IIT Indore has prepared a comprehensive plan to resume its academic and research activities in a phased manner ahead of the completion of lockdown 4.0.

IIT Indore acting director Prof Neelesh Kumar Jain said, "The institute has constituted a high-level Covid-19 task force to evolve the best and safe office/lab practices, accommodation and dining arrangements for the students, ensuring social distancing in classrooms, library, health centre and other workplaces."

Jain said accommodation and dining facilities have been strategically modified and special arrangements have been made to ensure social distancing and safety norms. The institute has mandated students to go for a quarantine period of two weeks before commencement of any academic and research activity upon their return to the campus while hostels will accommodate only 40 per cent of its capacity to ensure social distancing.

IIT Indore develops first-ever herbal UV filtering device

TIMES NEWS NETWORK

Indore: Indian Institute of Technology (IIT), Indore has developed an ecofriendly device to filter ultraviolet (UV) rays from the sunlight by using extracts from hibiscus flowers.

In a first, the herbal ultraviolet filtering device, as claimed by the institute, has the potential to restrict entry of ultraviolet rays by using a mere 2V.

Dr Rajesh Kumar, associate professor of Physics at IIT-Indore and group leader for the research team, said, "For the very first time, herbal ultraviolet filtering devices has been made by using extracts of a flower. It is a film which, when coated on any smart window and supplied with 2V, will restrict UV rays and in normal condition will let sunlight pass through."

The main active component of the device is raw hibiscus flower extract, a component used in red tea, which shows capabilities of switching between two coloured states, magenta and transparent yellow, using 2V.

The team of researchers was working on an indigenous technology for fabricating an electrochromic device that can protect us from dangerous UV light. Anjali Chaudhary, a PhD scholar from Discipline of Physics, is the leading author of the paper while other co-authors are Suchita Kandpal, Tanushree Ghosh, Devesh Pathak, Manushree Tanwar and Chanchal Rani.

The work, carried out on funding received from Science and Engineering Research Board (SERB), Government of India, will have a long-term implication on developing novel materials for future smart buildings, said the institute.

The research has been done in a joint venture of interdisciplinary research centres of Rural Development Technology and Advanced Electronics at IIT Indore.

पराबैंगनी किरणों से बचाएगा गुड़हल के फूल से बना यंत्र

आईआईटी इंदौर ने तैयार किया उपकरण

इंदौर • डीबी स्टार

आईआईटी इंदौर ने प्राकृतिक चीजों से एक इलेक्ट्रॉनिक उपकरण बनाया है, जो पराबैंगनी (यूवी) किरणों से बचाव करेगा। संस्थान के फिजिक्स विभाग के एसोसिएट प्रोफेसर डॉ. राजेश कुमार और उनकी टीम द्वारा तैयार किए गए इस उपकरण में गुड़हल के फूल का उपयोग किया गया है। आईआईटी द्वारा दी गई जानकारी के अनुसार गुड़हल के एक्सट्रेक्ट को दो वॉल्ट के करंट की सहायता से मैजेंटा और पीले कलर में बदला जा सकता है।

संस्थान के अनुसार अपनी तरह का यह पहला हर्बल स्मार्ट डिवाइस है। आईआईटी की यह रिसर्च अंतरराष्ट्रीय जरनल सोलर एनर्जी मेटेरियल्स एंड सोलर सेल्स में प्रकाशित हो चुकी है। पीएचडी छात्रा अंजलि चौधरी सहित शुचिता, तनुश्री, देवेश, मनुश्री और चंचल ने सहयोग किया।

₹100cr Tech Innovation Hub To Come Up At IIT-Indore

Institute Secures Highest-Ever Research Grant

TIMES NEWS NETWORK

Indore: Indian Institute of Technology (IIT), Indore has secured its highest-ever single grant of Rs 100 crore from department of science and technology for setting up a Technology Innovation Hub (TIH) aimed at creating an ecosystem for development and commercialisation. The upcoming technology hub will be based on system simulation, modelling and visualization aspects of Cyber-Physical Systems (CPS). The TIH will work on extending knowledge and support for research and development projects, patenting, licencing and commercialisation besides holding training sessions and online courses.

Dr. Pavan Kumar Kankar, faculty IIT, Indore said "Through TIH, we plan to lead in skill enhancement, technology development, and product commercialization in the domain of Cyber Physical Systems (CPS). The objective is to create an ecosystem that supports the development and commercialization of technologies facilitating modelling, simulation, and visualization of CPS."

Talking about future objective of the hub, Kankar said, "The objective will be achieved in the true sense when a self-sustaining system is created over a period of time to support R&D projects, patenting, licencing and commercialisation, incubation of startup companies and spin-offs, and initiation of joint projects with the industry."

The externally funded grant, maximum in 11 years of existence of IIT-Indore, was an outcome of a rigorous evaluation of the proposals under National Mission on Interdisciplinary Cyber Physical Systems (NM-ICPS), the institute said.

Kankar said, "A proposal on a technology hub based on CPS was put together by a core interdisciplinary team of 8 faculty members and was sent to NM ICPS with detailed objectives. The core team was ably supported by domain experts both within and outside the Institute."

The proposal was named "Driving Innovation through Simulation Hub for Technologies in Interdisciplinary cyber physical system (DRISHTI)".

The panel included Dr Pavan Kumar Kankar, Dr Bhupesh Kumar Lad, Prof Abhinav Kranti, Dr Abhishek Srivastava, Prof Sandeep Chaudhary, Dr Ankur Miglani, Dr Bhargav Vaidya and Dr Kiran Bala.

Highlighting the reach of CPS, Kankar said, "Most modern systems today have a digital presence, in addition to being extensively interconnected via Internet of Things (IoT) deployments. Such systems, popularly known as CPS, are capable of taking autonomous decisions using data analytics and artificial intelligence. There has been a rapid proliferation of CPS in lives of human beings."

Members of the board of governors (BoG) of IIT Indore, BoG chairman Prof Deepak B Phatak and officiating director Prof Neelesh Kumar Jain have lauded the efforts of the core team and other faculty members involved in preparing the highly competitive project proposal for NM-ICPS and ensured full support of the institute for its implementation in BoG meeting.

CRADLE FOR EXCELLENCE

- TIH will work on system simulation, modelling and visualization aspects of Cyber-Physical Systems (CPS)
- TIH will work on the development of skilled human resources by organizing knowledge sharing and training activities, hands-on training, webinars, events,workshops, grand challenges, conferences, hackathons, online courses andtinkering activities
- TIH will support the flagship initiatives of the Government of India such as Skillindia (SI), Make in India (MII), Prime Minister's Employment Generation Program(PMEGP), Start-up India and the recently coined Atmanirbhar Bharat

IIT-Indore

IIT Indore celebrated the day with great zeal and fervour. The tricolour was hoisted by director (officiating) Neelesh Kumar Jain. Physical presence of the guests was limited, and the event was webcast live on institute's website. Three facilities were added to the campus on the day - CV Raman Hall of Residence, Vindhyachal Guest House and The Nursery School and creche facilities.



IIT holds online orientatio for new PG & PhD student

TIMES NEWS NETWORK

Indore: Indian Institute of Technology (IIT), Indore on Saturday conducted a virtual orientation programme for students of postgraduate and PhD courses.

The institute is conducting online classes for students amid outbreak of pandemic though laboratory work has resumed in presence of selected students. For the new session, around 208 and 53 students have taken admission in postgraduate and PhD courses respectively in the new academic session.

Addressing the students on the occasion, Prof Neelesh Kumar Jain, director officiating, IIT, Indore said, "The institute is forced to have an online orientation owing to the pandemic situation but will leave no stone unturned to ensure that the students do not suffer any academic loss and the academic and research activities are being conducted in a time bound manner."

THE NEW NORMAL

Stressing on the importance of knowledge Jain said, "It is vital to focus more on gaining knowledge on a subject rather than receiving information from someone and not reading about it. I urge the students to focus on their performance as your potential has already been judged and that is how you have secure seat here. IIT Indore ha search-oriented teachir riculum, hence the st should go beyond their to reach the zenith."

The students were a ented on the academic arch and developmen dent affairs, training a cement, safety and se hostels, medical and l facilities by the respect ads of the section. In th academic session, IIT- has enrolled students in us courses including Ph disciplines, MTech + Ph al degree in 2 disciplines + PhD dual degree in 5 plines, MTech in 6 disci MSc in 5 disciplines ar (research) in 3 disciplin

IIT-Indore to teach ancient Indian science in Sanskrit

750+ Sign For First Edition Of Course

Meenakshi.Sharma
@timesgroup.com

Indore: IIT-Indore has introduced a one-of-its-kind course to teach classical scientific texts to students in Sanskrit, starting with Bhaskarachar-arya's mathematical treatise 'Lilavati' of almost a thousand years ago.

More than 750 people from across the globe have signed up for the course that started on August 22. The first edition will end on October 2, Gandhi Jayanti.

The institute has lined up fortnightly programmes to teach metallurgy, astronomy, medicines and plant sciences in Sanskrit. Students can study classical Indian scientific texts in their original forms and converse about them in the ancient language.

IIT-Indore director (officiating) professor Neelesh Kumar Jain inaugurated the course on Friday and said: "Sanskrit, an ancient language, is finding its place in artificial intelligence and will become the language of future. I am very happy that we have taken this initiative to reconnect people with this language, not just as a hobby but as a necessity as it comes with a blend of technology."

Course coordinator Dr Ganti S Murthy, professor of biosciences and biomedical engineering at the institute, pointed out how discussions on ancient Indian scientific treatises earlier always needed to have a translator, and very often significant aspects or nuances were lost in translation.

The IIT-Indore programme will first help students grasp enough Sanskrit to converse in the language, after which they will move to the second phase where they can discuss technical subjects in Sanskrit, facilitated by experts in the same language.

A qualifying exam will be held to evaluate the preparedness of participants for level-2. Those already well versed in Sanskrit and with a technical background can go directly to the second stage.

BACK TO THE FUTURE

Ancient Indian treatises in maths, sciences, metallurgy, astronomy, medicine and plant sciences will be taught in Sanskrit

Step 1 | Sanskrit lessons to help students converse

Step 2 | Test to judge grasp of Sanskrit

Step 3 | Those who pass test will move on to discussing ancient treatises in Sanskrit. Those who can't participate in these discussions won't get completion certificate

> Sanskrit is finding its place in AI and will become the language of future. We have taken this initiative to reconnect people with Sanskrit, not just as a hobby but as a necessity as it comes with a blend of technology
> **Neelesh Kumar Jain,** IIT-Indore director (officiating)

▶Continued on P 5

Covid-19 can mess with brain too: IIT-I study

TIMES NEWS NETWORK

Indore: Other than lungs, Coronavirus may do more harm to the brain of infected person and long term consequences can be scary causing multiple neurological damages, claimed a study by Indian Institute of Technology, Indore.

A study based on clinical diagnosis of Covid-19 patients by team of researchers at IIT-Indore stressed on the need to address increasing incidents of neural dysfunctions in infected individuals.

Dr Hem Chandra Jha, corresponding author of the research and faculty at Biosciences and Biomedical Engineering at IIT, Indore said, "The long term consequences of SARS-CoV-2 are very harmful as the virus



may enter the brain and cause neurological damages. As the virus primarily attacks lungs and stomach, much attention is not paid on variable neurological manifestations displayed by Covid-19 patients."



The long term consequences of SARS-CoV-2 are very harmful as the virus may enter the brain and cause neurological damages, research revealed

The patients display inflammation of brain and membranes (meninges) surrounding the brain, pointed the study by Dr Hem Chandra Jha, PhD scholars Shweta Jakhmola, Omkar Indari and intern Sayantani Chatterjee.

Researchers said other than meningitis and encephalitis, patients display variable neurological manifestations like reduced ability to taste, smell, vertigo, impaired consciousness, seizures, headache and dizziness.

Based on past reports of virus-associated studies concerning neuronal damage, the authors of the research presented the plausible modes of SARS-CoV-2 entry into the nervous system through the nose, blood stream or through facial or intestinal nerves connected to the brain.

The research also showed that acute necrotizing hemorrhagic encephalopathy observed in Covid-19 brain is a rare central nervous system complication associated with intracranial cytokine storms.

A cytokine storm is an overproduction of activating compounds (cytokines) produced by the immune cells which in a flu infection often associated with a surge of activated immune cells into the lungs.

8वां दीक्षांत समारोह • आईआईटी के प्रभारी निदेशक ने कहा- सूडो वायरस की मदद से बनाई वैक्सीन, इसी तकनीक से इबोला की वैक्सीन बनी

आईआईटी इंदौर की कोरोना वैक्सीन का पुणे में ट्रायल शुरू

भास्कर संवाददाता | इंदौर

आईआईटी इंदौर के प्रभारी निदेशक ने दावा किया है कि संस्थान में कोरोना की वैक्सीन बना ली गई है। सूडो वायरस, यानी कोरोना जैसे वायरस की मदद से तैयार इस वैक्सीन का नेशनल सेंटर फॉर सेल साइंस पुणे में क्लिनिकल ट्रायल शुरू हो गया है। जानवरों पर इसका प्रयोग किया जा रहा है। सब ठीक रहता है तो जल्द मनुष्यों पर भी प्रयोग किया जाएगा। तय नहीं है कि कब तक यह वैक्सीन उपलब्ध हो जाएगी। सोमवार को आईआईटी के दीक्षांत समारोह में प्रभारी निदेशक प्रो. नीलेश जैन ने कहा कि संस्थान ने वैक्सीन के लिए सूडो वायरस पार्टिकल यानी कोरोना वायरस जैसा छद्म वायरस तैयार किया। इसकी संरचना और गुणधर्म कोरोना वायरस जैसे हैं, लेकिन ये सुरक्षित है। आईआईटी इंदौर के बायोसाइंस और बायोमेडिकल इंजीनियरिंग विभाग के प्रोफेसर, पीएचडी स्कॉलर और पोस्ट डॉक्टरल छात्र इस प्रोजेक्ट पर काम कर रहे हैं। उन्होंने बताया कि सूडो वायरस को तैयार करने के लिए जानवरों में पाए जाने वाले वेस्कुलर स्टोमेटिटिस वायरस (वीएसवी) के जेनेटिक मटेरियल और सार्स-कोव-2 वायरस के स्पाइक प्रोटीन्स का उपयोग किया गया है। इसी तरह की प्रक्रिया के जरिए इबोला की वैक्सीन तैयार करने में भी सफलता हासिल हुई थी। सूडो वायरस पार्टिकल के लिए जेनेटिक्स, मॉलिक्यूलर बायोलॉजी, एनिमल सेल कल्चर के अलावा एनिमल मॉडल्स पर भी रिसर्च की जा रही है। इस प्रोजेक्ट पर आईआईटी के साथ पुणे की नेशनल सेंटर फॉर सेल साइंस संस्था भी काम कर रही है।

हम दुनिया को बाजार नहीं परिवार मानते हैं : पोखरियाल

सफलता की उड़ान... दीक्षांत समारोह में 412 छात्र हुए शामिल

इंदौर | देश के सबसे स्वच्छ शहर में और आईआईटी जैसे संस्थान में वर्षों की मेहनत के बाद आज आप निर्माण क्षेत्र में कदम रख रहे हैं। वैसे शिक्षा का कभी अंत नहीं होता। पढ़ाई पूरी करने के बाद असली परीक्षा शुरू होती है। आपके जीवन की परीक्षा अब शुरू होगी। ना सिर्फ आपके परिवार, संस्थान और प्रदेश को आपसे उम्मीदें हैं बल्कि पूरा देश और विश्व आपकी ओर उम्मीद से देखेगा। हम दुनिया को बाजार नहीं परिवार मानते हैं।

ये बातें केंद्रीय शिक्षा मंत्री रमेश पोखरियाल निशंक ने आईआईटी इंदौर के आठवें दीक्षांत समारोह में कही। ऑनलाइन हुए इस कार्यक्रम में आईआईटी इंदौर के बोर्ड चेयरमैन डॉ. दीपक भास्कर फाटक, अपर सचिव, तकनीकी शिक्षा राकेश रंजन सहित अन्य लोग मौजूद थे।मैडल हासिल करने वाले छात्रों को आईआईटी निदेशक ने इसी दौरान सम्मानित किया। पोखरियाल ने कहा दुनिया के सबसे बड़े लोकतंत्र वाले हमारे देश में एक हजार से ज्यादा विश्वविद्यालय, 45 हजार से ज्यादा डिग्री कॉलेज, पंद्रह लाख से ज्यादा स्कूल, एक करोड़ से ज्यादा अध्यापक और अमेरिका की आबादी से ज्यादा करीब 35 करोड़ छात्र-छात्राएं हैं।



▪ परंपरा के मुताबिक दीक्षांत समारोह के बाद छात्र-छात्राओं ने अपनी टोपी को हवा में उड़ाया। समारोह में 233 बी.टेक के 233, एमएससी के 58, एमटेक के 57, एमएस रिसर्च के 6 और पीएचडी के 58 छात्रों को मैडल दिए गए।

NEP will make India 1st nation to teach AI in school: Pokhriya

Minister Said It Will Give Thrust To Research & Patents To

TIMES NEWS NETWORK

Indore: National Education Policy 2020 (NEP) will give thrust to research work and patents and make India the first country to teach Artificial Intelligence in schools, said Union education minister Ramesh Pokhriyal 'Nishank' on Monday virtually addressing the convocation ceremony of Indian Institute of Technology (IIT), Indore.

IIT-Indore held its 8th convocation on a virtual platform, where total 412 students from various courses were awarded degrees online except toppers from different disciplines, who received the degrees in person by chairman, senate professor Nalesh Kumar Jain. Pokhriyal said, "NEP is for everyone's betterment. The pace of research and patents filed from the country needs to be improved and NEP will help in this. Students in schools will learn AI. Students leaving the course in the middle due to any unwanted circumstances will get the due credit."

Addressing students on the occasion Pokhriyal said, "The real exam of life has begun now. It's time to use education on ground and make the country proud." Of the graduating students, 233 were from BTech, 58 from MSc, 57 from MTech, 6 from MS (Research) and 58 from PhD. This year, IITech pass outs included the first batch of 34 students graduating in civil engineering and 31 students in metallurgy and materials science respectively.



Union education minister Ramesh Pokhriyal (below) virtually addresses the convocation ceremony of Indian Institute of Technology (IIT), Indore on Monday. Only toppers were present at the event



The MTech students include first batch of 10 students each with specialization in mechanical systems design and metallurgy. Professor Deepak B Phatak, chairman, board of governors, IIT Indore said, "Knowledge is an ever evolving process. I urge you all to gain knowledge continuously not only in your subject but also on other subjects as well. From now onwards you will have a new relationship with the institute which is much more than being a student."

Amongst the PhD students, Anand Petare was the first staff member of the institute to complete his PhD under Institute staff category. President of India Gold Medal the best academic performance among all the graduating UG students was awarded Saptarshi Ghosh from center science and engineering. Srija Tewari received the Foundation Gold Medal for best female student securing the highest CPI among all graduating students of all two years masters' programme. Education minister also inaugurated buildings of Kendriya Vidyalaya, Computer Information Technology Centre, Central Workshop, Anandan Bhawan and Taksh Lecture Hall Complex.



Saptarshi Ghosh | BTECH (CSE)
PRESIDENT OF INDIA GOLD MEDALIST

> Winning gold medal is a dream come true. IIT-I encourages research. I was able to pursue research

assistantship at Nanyang University. I will continue my job, will go for research later



Agam Gupta | BTECH (ME), SILVER MEDALIST

> I plan to pursue Masters at a US or Europe varsity. I was member of clubs and events, which helped me maintain my academic record. For newcomers I would suggest they choose thier field of interest, if you aren't sure, try different things during these 4 years of college



Arushi Jain | BTECH (CSE)

> I am glad that I did not just stick to books got involved in clubs and activities like lit and dramatics. My journey as the Placement Manager also holds a special place in my heart because nothing is more satisfying than the joy of seeing your batchmates placed. I am proud of who I am today as a person and as a professional



Shalay Gupta | BTECH (CE)

> My journey at IIT ind has been phenome I learned to handl the challenges t my goal, I got an offer from an IIT through campus placement whic joined. My message for newcom is to try to work in every aspect life, not just academics to evolv yourself as a better person

IIT-I's push for clean energy; hydrogen generated from methanol water sans CO_2

TIMES NEWS NETWORK



IIT researchers claimed that hydrogen produced from methanol at a higher temperature generated carbon dioxide as a side product leading issues with purification of hydrogen

Indore: Indian Institute of Technology (IIT), Indore, has developed a process to generate hydrogen gas from methanol water at a lower temperature eliminating the byproduct — carbon dioxide — and bringing down sharply the cost of purification.

Researchers claimed that hydrogen produced from methanol at a higher temperature generated carbon dioxide as a side product leading issues with purification of hydrogen.

Hydrogen gas, considered the fuel of the future, can be used in fuel-cell based vehicles, charge battery vehicles and generate electricity.

PhD students Mahendra K Awasthi and Rohit K Rai led the research under supervision of associate professor of Chemistry at IIT Indore Dr Sanjay K Singh.

Researchers have developed ruthenium catalysts for large scale production of hydrogen gas from methanol in water. The team has filed for a patent for this process.

Singh said, "We aim at addressing the issue of carbon dioxide by generating hydrogen at a lower temperature, where the by-product is formic acid, which is a valuable product. Throughout the world, hydrogen is in focus to control the carbon dioxide emission."

The research team working on this project for the last two years claimed that the developed process generated high content of hydrogen per molecule of methanol at a relatively lower temperature of less than 150 °C. The team is also working on other projects for producing hydrogen production.

Singh said, "This method is very much in line with efforts of India towards clean energy, where purified hydrogen gas will be used as a fuel in H2-powered fuel-cell based vehicles. Methanol can be produced from biomass waste and other sources and government is also encouraging production of methanol to be used as a gasoline blender."

Singh stressed that hydrogen had a very good future, but major bottlenecks were its efficient production, storage and utilization using fuel cells.

IIT-I marks vigilance awareness week

IIT, Indore conducted vigilance awareness week that included activities on fight against corruption, raising public awareness regarding the existence and gravity of the threat posed by corruption.

IIT researchers find cost-effective, and fast way of detecting cancer

TIMES NEWS NETWORK



A team of researchers at IIT-Indore has published a study in understanding the mechanism of propagation of a widely known cancer causing virus, Epstein-Barr Virus (EBV) in brain cells using Raman Spectroscopy (RS)

Indore: A preliminary study by researchers at Indian Institute of Technology (IIT), Indore claims to have found non-invasive detection of virus infection in the brain and early diagnosis of cancer using Raman spectroscopy.

A team of researchers at IIT-I has published a study in understanding the mechanism of propagation of a widely known cancer causing virus, Epstein-Barr Virus (EBV) in brain cells using Raman Spectroscopy (RS). EBV can cause cancers like nasopharyngeal carcinoma (a type of head and neck cancer), B-cell (a type of white blood cells) cancer and stomach cancer.

Dr Hem Chandra Jha, corresponding author of the research and faculty at Biosciences and Biomedical Engineering at IIT, Indore said, "This method can be an alternative for biopsy in detecting cancer. This will be a fast, cost effective and robust diagnosis for virus related infection and cancer detection. Since, all the techniques available for viral load detection in the brain by far include invasive methods, RS can be a sigh of relief for patients undergoing brain biopsies for diagnostic purposes." The findings can be helpful in determining the stage of infection based on biomolecular markers and aid in early diagnosis.

The research team was led by Dr Hem Chandra Jha and Dr. Rajesh Kumar, faculty at IIT, Indore and assisted by research scholars Deeksha Tiwari, Shweta Jakhmola and Devesh Pathak.

The study says Raman scattering provides information on the structure of any material based on the vibrations produced in them. The light falling on the virus generates vibration in the biomolecules and RS can be used to capture and analyze its structure and behaviour. Every virus has a different biomolecular composition and thus generates a unique Raman Spectrum that serves as a finger print to its identity. The study said that 95 per cent of the adult population is positive for EBV, though the infection is mostly asymptomatic and very little is known about the factors which trigger development of such disease.

Another corresponding author of the study Dr Rajesh Kumar said, "The recent reports of consistent presence of EBV in brain tissue of the patients suffering from neurological disorders such as Alzheimer, Parkinson and multiple Sclerosis, has made it important to study the mechanism and its probable role in neurodegenerative disorders." The study also showed that EBV can infect the glial cells in the brain.

Jha said "We found that the virus may take different time intervals to establish and spread infection in various types of glial cells of the brain".

Some additional findings in collaboration with Dr Fouzia Siraj from National Institute of pathology, ICMR-Delhi, include detection and grading of brain tumors using Raman scattering. Chanchal Rani, Manushree Tanwar, Anjali Chaudhary, Ritika Kaushik, Kumari Neeshu, Omkar Indari, Dharmendra Kashyap and Buddhadev Baral are other scholars who contributed in the study.

IIT-I Co-Hosts Tenth International Conference On Soft Computing

IIT Indore co-hosted the 10th international conference on Soft Computing for Problem Solving- SocPros 2020 along with Soft Computing Research Society (SCRS), New Delhi from 18 to 20 December 2020 via virtual mode.The conference received 334 pap that went through a stringent blind review process by an international expert committee and had a good acceptance rate per cent. These papers would be published as two books by Sprin Chandra Mohan Gold Medal for Excellence in Soft Computing was instituted, which was given to Prof Sankar Pal of ISI Kolkata.

No shortage of jobs for IITians in pandemic

TIMES NEWS NETWORK

Indore: Despite the pandemic and subsequent crisis in global job market, students of the Indian Institute of Technology (IIT), Indore saw bounty of offers from domestic and international firms in first phase of placement.

Out of 221 registered students, around 170 students appeared for the first phase of placements of which 114 students got placed in different companies, according to the institute. The first phase of placement will continue till this month. The highest annual package on offer remained the same as last year. The placement was held virtually this year owing to pandemic, where recruiters and students interacted through virtual mode. Students of various branches including Computer and Science Engineering, Electrical Engineering, Mechanical Engineering, Civil Engineering and Metallurgy Engineering & Materials Science appeared for the placement.

Some of the major companies like Goldman Sachs, Arcesium, BookMyShow, Larsen & Toubro Limited, an American multinational semiconductor company Analog Devices, Texas Instruments, Amazon.com, Barclays, Deloitte, Jaguar Land Rover, Jio, Tata Digital, Quantile Analytics, Razorpay, Salesforce, Strand Life Sciences, MathWorks, Fractal Analytics and ZS Associates among others visited the campus of IIT-Indore, a second generation institute.

FIRST PHASE OF PLACEMENT

The institute said Accenture Japan has offered overseas placement to students while state-owned GAIL is also expected to offer jobs to students.

IIT Indore spokesperson Sunil Kumar said, "We are expecting balance students to be placed in second phase of placements. The response from companies was encouraging unaffected by the impact of the pandemic. The hiring process is being held in a virtual mode owing to the prevailing pandemic condition giving an opportunity to students to prepare themselves in a more innovative and interactive manner."

Develop knowledge centre at IIT-Indore: MSMEs tells govt

TIMES NEWS NETWORK

Indore: Roping in top technical institutes to assist micro and small scale industries upgrade skills and efficiency will help them to revive production pace post pandemic outbreak, said industry players.

Industrialists representing micro, small and medium enterprises (MSMEs) have urged state government to develop a knowledge centre at the Indian Institute of Technology (IIT), Indore, for industries to help them upgrade their knowledge on new technology and enhance production efficiency.

TO REVIVE OUTPUT

Industrialists said, a platform to explore avenues in foreign markets and digitalisation will help local businesses and generate employment. An industrialist and global forum for industrial development president Deepak Bhandari said, "Unlike large scale industries, MSMEs are facing liquidity crunch and struggling to reach to the pre-Covid era level. To aid local industries, resources within the state should be tapped to help enhanc efficiency."

Association of industrie in a memorandum submitte to MSMEs minister urged t develop a digital platform fo small businesses to help the showcase their products an reach out to customers in for ign land. They also urged g vernment to develop a cluste for IT firms where small indu stries can get technical ass stance for business opera tions.

Industrialists said, d spite the mar date fro Centre, banks do not give cr dit without collaterals. The said the state government sho uld work on feedback from i dustries and add diplomas fo entrepreneurial courses i graduate courses.

Stressing on the need fo upgradation and researc work, industrialists emphas zed on need to restart the clo sed laboratory at electroni complex. Industries have pr sented a list of suggestion and tweaks in the policy t help small businesses surviv the slump.

IIT-I profs, scholars clear Math & Science concepts of school students

TIMES NEWS NETWORK

Indore: Professors of Indian Institute of Technology (IIT), Indore and scholars from across India have teamed up to take online interactive classes for school students to teach Math and Science by citing examples from every day's life.

IIT-I in association with Rashtriya Avishkar Abhiyan (RAA) and Madhya Pradesh's school education department has started weekly live online lectures on Maths and Science for students of Class 6 to 8 where experts talk about the concepts and theories for an hour every Wednesday.

The first broadcast held on January 13 by physicist H C Verma had more than 7,000 views from students, teachers and researchers among others.

WEEKLY LIVE SESSION

IIT, Indore plans to rope in more renowned educationalists and researchers to prepare the broadcast on different subjects every week.

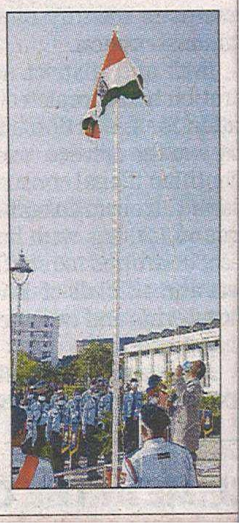
Dr Ajay Kushwaha, associate dean, student affairs at IIT, Indore said, "The broadcast is a part of National Invention Campaign which was launched by Madhya Pradesh on December 26 to provide educational activities to students of classes six to eight. The educational activities on Science and Maths are being broadcasted online through YouTube from 4 to 5 pm on every Wednesday. It is a unique initiative by the Institute which would help the New Education Policy 2020's vision to be forwarded."

Experts answer the queries raised by students in the chat box while pending answers are sent on email by experts.

Dr Niraj Shukla, convener, Ek Bharat Shresth Bharat team under the student affairs section said, "The session has been organised for students of Class 6-8 of Madhya Pradesh to introduce them to Science and Technology concepts. The response of the programme has been very encouraging and is being followed by not only students but teachers and other interested people. The students can contact the teacher directly to clarify any doubts."

@ IIT INDORE

IIT Indore celebrated 72nd Republic Day with great zeal and fervour. The occasion was marked by hoisting of the national tricolor by director (officiating) Neelesh Kumar Jain. Amid pandemic, physical presence of the guests was limited, and the event was webcasted live on institute website for the community. The event marked the inauguration of parking facility at the Health Centre and Institute's name plaque at Gate No.2.



Indore Felicitates Its Heroes On Republic D



@ IIM INDORE

IIM Indore celebrated 72nd Republic Day with flag hoi by director, IIM Indore, Himanshu Rai, in presence of IIM Indore, Col Gururaj Gopinath Pamidi. Entire IIM Indo community attended the event virtually with provisions few due to Covid norms. This was then followed by the national anthem. Rai talked about breaking the taboo a menstrual hygiene and announced that under the instit social responsibility, all women working at the institute be able to receive sanitary pads free of cost, as long as are working for the institute. The address was followed felicitation of IIM Indore's staff and security personnel.

@ Devi Ahilya Vishwavidyalaya

Devi Ahilya Vishwavidyalaya (DAVV) organized flag hoisting ceremony in presence of vice chancellor Dr Renu Jain. The varsity felicitated faculty for their outstanding performance. In assistant professor category, Dr Rashmi Dahima and Dr Sujata Parwani, in associate professor category, Dr. Niranjan Shrivastava, Dr. Archana Ranka were felicitated. Among professors Dr Rekha Acharya, and Dr BK Tripathi and a special award was conferred to Dr HS Parmar.

Pravin Barnale



People celebrated Republic Day at Nehru stadium

@ IIT INDORE

IIT Indore celebrated 72nd Republic Day with great zeal and fervour. The occasion was marked by hoisting of the national tricolor by director (officiating) Neelesh Kumar Jain. Amid pandemic, physical presence of the guests was limited, and the event was webcasted live on institute website for the community. The event marked the inauguration of parking facility at the Health Centre and Institute's name plaque at Gate No.2.



MP GIRLS BATTALION

First MP girls battalion organized a prog Indore NCC group commander, brigadi Desai hoisted the national flag which was f by singing the national anthem. On this occ NCC officer, and cadets were also present. NCC officers and army instructors were fel on this occasion.

IIT-I Conducts Public Lecture On Prevention Of Drug Abuse

IIT Indore organised a public lecture on prevention of drug abuse on February 9 under National Action Plan for Drug Demand Reduction (NAPDDR) programme. NCB, Indore and Bangalore zonal director IRS Amit Ghawate was the guest speaker for the event. The talk revolved around the cons of drug abuse and it's impact on the physical and mental state of a person. It included the measures and initiatives taken by the government to eradicate the same. IIT Indore has a committee which implements the action plan under NAPDDR programme.

COLLEGE CAMPUS BUZZ

IIT-I adds 54-apartment complex to its campus

Indore: Indian Institute of Technology (IIT), Indore has added a 54-apartment's residential complex on its campus its faculty. The institute on its 12th Foundation Day inaugurated Kshipra residential complex consisting of 2 and 3 BHK residences for faculty and staff.

This residential complex is in addition to an already fully occupied 54 apartment residence building for faculty of the institute. With this 108 faculty of IIT, Indore will move inside the residential complex. The institute has 154 faculty members.

Professor Neelesh Kumar Jain, director (officiating), IIT, Indore said, "This will lead to the

FOR FACULTY & STAFF

shifting of the faculty members and staff inside the campus thus saving them the time and efforts for commuting. Besides a Heating, Ventilation and Air Conditioning (HVAC) plant with 2 water cooled centrifugal chillers each having 650 TR capacity have also been added for air conditioning at newly inaugurated facilities in the institute."

The institute has recently inaugurated an administration office 'Abhinandan Bhavan', Takshashila Lecture Hall Complex for conducting classes and a guest house Vindhyachal.

Speaker at the Foundation Day celebration, Professor N. K. Ganguly, Padma Bhushan and former Director General, ICMR, delivered a talk on the current challenges in Covid19 vaccination and how we choose a vaccine. The chief guest on the occasion Professor William Daniel Phillips, a Nobel Laureate in Physics (1997) spoke on "A new measure: The revolutionary quantum reform of the international metric system". TNN

प्रदूषण के खिलाफ आए आईआईटी -निगम

इंदौर • डीबी स्टार

प्रदूषण मुक्त बनाने और हवा की गुणवत्ता सुधारने के लिए नगर निगम ने आईआईटी इंदौर से तकनीकी सहयोग मांगा है। इसके अलावा भी आईआईटी कई स्तर पर निगम की मदद करेगा। दोनों संस्थानों ने इसके लिए एमओयू साइन किया है। दोनों संस्थान एक भारत-श्रेष्ठ भारत और स्वच्छ भारत अभियान के तहत पांच साल मिलकर काम करेंगे। निगम कर्मचारियों की कार्यक्षमता बढ़ाने के लिए तकनीक को बेहतर किया जाएगा। वायु प्रदूषण कम करने और एयर क्वालिटी इंडेक्स बढ़ाने के लिए नई तकनीकों पर काम किया जाएगा। आईआईटी इंदौर के एक भारत-श्रेष्ठ भारत अभियान के कन्वेनर डॉ. नीरज कुमार शुक्ला ने बताया कि शहर के विकास के लिए काम करने के लिए दोनों संस्थानों के बीच सहमति बनी है। एमओयू पर आईआईटी के डीन ऑफ रिसर्च एंड डेवलपमेंट डॉ. आईए पलानी और निगायुक्त प्रतिभा पाल ने हस्ताक्षर किए।

IIT-I introduces 4 new courses

Indore: Indian Institute of Technology (IIT), Indore has introduced four new postgraduate programmes in the new academic year scheduled to commence from July 2021.

The newly-introduced courses are M.Tech in Electric Vehicle Technology by center for electric vehicles intelligent transport systems (CEVITS), M Tech in space engineering by department of astronomy, astrophysics and space engineering (DAASE), MS (Research) in space science and engineering by DAASE and M.S. (Research) in humanities and social science by school of humanities and social science.

The institute has opened admission in these new courses through its online portal. TNN

KV IIT gets sanction up to Class 9

Indore: Kendriya Vidyalaya (KV) on IIT-Indore campus has received sanction up to Class IX for academic session 2021-22 starting June 21st.

Kendriya Vidyalaya Sangathan issued a revised order in May sanctioning classes upto IX with one section in each class for the academic session 2021-22 at KV IIT-I.

The is country's 1,242 nd Kendriya Vidyalaya for which IIT, Indore has given its 'School building' to run the campus.

Professor Neelesh Kumar Jain, officiating director, IIT-I said, "KV IIT Indore campus has got sanction up to class IX from the new academic session 2021-22. The set up will benefit the IIT-I community and nearby villages as KV has a value-based education system and structured syllabus that offers bilingual instruction in English and Hindi."

The approval for setting up the central school in IIT-I was issued in June 2020 with initial permission to start with classes 1 to 5th in the academic session 2020-21, which was later altered to include class 6th in an order issued in March this year.

The central school at present has around 219 students in classes II to VI, while admission for class I is under process.

Acting on the revised order from Kendriya Vidyalaya Sangathan, new admissions for classes VII to IX that have 40 seats in each class, is also underway and schools will reopen from June 21, 2021. TNN

सेना के अफसरों ने आईआईटी में देखीं प्रयोगशाल

इंदौर | एमसीटीई महू में प्रशिक्षण प्राप्त कर रहे भारतीय सेना के तकनीकी अधिकारियों ने सिमरोल क्षेत्र में स्थित आईआईटी का दौरा कि ईबीएसबी, आईआईटी के संयोजक डॉ. नीरज शुक्ला, डॉ. आशीष और डॉ. मृगेंद्र दुबे ने बताया कि कैडेट्स ने रसायन विज्ञान, बायोसा और बायोमेडिकल इंजीनियरिंग, कम्प्यूटर साइंस इंजीनियरिंग, मैकेनि इंजीनियरिंग, सिविल इंजीनियरिंग, इलेक्ट्रिकल इंजीनियरिंग सोफिस्टिकेटेड इंस्ट्रुमेंटेशन सेंटर की प्रयोगशालाएं देखीं। इसके अ उन्होंने आईआईटी द्वारा अनुसंधान संचालित शिक्षण और नवाचार के प्रयोग की गई कार्यप्रणाली पर चर्चा की।

IIT-I gets patent for design invention

Professor Of The Institute Gets Another Individual Patent

TIMES NEWS NETWORK

Indore: Indian Institute of Technology (IIT), Indore has received a patent from Indian Patent Office for inventing a design exploration system inspired by a bacterial life cycle that is useful for designing digital chips of camera systems and mobile devices.

The invention "Design Space Exploration System and Method thereof using a Bacterial Foraging Optimization Mechanism," is several magnitudes efficient that other state of the art inventions used for this purpose, claimed the Institute.

Speaking about the invention, Dr Anirban Sengupta, faculty at Computer Science Department, IIT-Indore said, "The invention is capable of enhancing the speed of the chips and reducing power using biological chemotaxis and elimination-dispersal process."

RARE FEAT

Sengupta said, "The present invention relates to design space exploration (DSE) and more particularly to method and system for design space exploration in high level synthesis using bacterial foraging optimization mechanism for designing or obtaining an application-specific processor (ASP) or Hardware Accelerator or Intellectual Property Core."

Another patent is granted to Professor Avinash Sonawane, faculty, Department of Bioscience and Biomedical Engineering, IIT-Indore on the development of asparaginase drug for the treatment of blood cancer.

The invention entitled "Novel Mutant L-Asparaginases", is a new asparaginase drug (M-ASPAR) using protein engineering approach to treat Acute Lymphocytic Leukemia (ALL), a type of blood cancer.

Approximately 25,000 new cases of ALL are diagnosed in India each year.

Professor Avinash Sonawane, principal investigator of the research said, "Since last 12 years, with the financial support from DBT, SERB, DST and BRNS, Government of India, we were working to develop a novel asparaginase drug that can reduce serious side effects as well as improve the treatment of primary and relapse ALL treatment."

The repeated administration of asparaginase currently in use for the treatment of ALL patients causes serious side effects such as allergic reactions, neurotoxicity, immunogenicity, hypersensitivity and toxicity to the pancreas, liver and spleen among other organs.

आईआईटी : परिसर में ही मिलेंगी मॉल, बुटीक, सैलून की सुविधाएं

इंदौर | आईआईटी इंदौर के छात्रों, फैकल्टी और कर्मचारियों को शॉपिंग मॉल, सैलून, बुटीक और रेस्त्रां सहित अन्य सुविधाएं आने वाले समय में संस्थान परिसर में मिलेंगी। संस्थान ने करीब 17 तरह की सुविधाओं के लिए प्रस्ताव मांगे हैं। आईआईटी के अनुसार फिलहाल कैंपस में करीब दो हजार लोग रहते हैं। आने वाले कुछ सालों में ये संख्या पांच हजार तक जाएगी। ऐसे में लोगों की जरूरत को ध्यान में रखते हुए ये सुविधाएं जुटाई जा रही हैं। आईआईटी ने जिन सुविधाओं के लिए लोगों से प्रस्ताव मांगे हैं, उनमें सैलून, ट्रैवल डेस्क, कूरियर सर्विस, स्टेशनरी, कम्प्यूटर सामग्री, प्रिंटिंग और बाइंडिंग, खाने-पीने की वस्तुओं की वेंडिंग मशीन, बेकरी उत्पाद, सब्जी की गाड़ियां, जनरल स्टोर, साइकिल रिपेयर सहित अन्य सुविधाएं शामिल हैं।

International Affairs & Outreach 2021

IIT Indore is rapidly expanding globally with an aim to internationalize its teaching and research portfolio. Currently, we are collaborating intensely with countries like Germany, USA, UK, France, Switzerland, Canada, Portugal, Japan, Russian Federation, Taiwan, Korea, South Africa, and many more for the International bilateral projects. In continuation to the previous years, this year we had notable progress in recruiting and hosting many international students in our degree programs (from ASEAN and SAARC regions). We secured multiple grants from our Ministry of Education, which is feeding well into our internationalization endeavors. We expanded our footprint further in Europe, USA, Australia, and Asia.

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 departments at IIT Indore. These students were from SAARC nations (Bangladesh and Nepal) and joined us through the Study in India (SII) program. Also 02 international PhD students (from Vietnam) under ASEAN Ph.D. Fellowship program had joined in Autumn semester 2020. Although IIT Indore has been hosting foreign internship students since its inception, this year was path breaking because we hosted 06 Thai exchange students who took regular courses as well. This has helped us to establish our brand in ASEAN countries, and specifically Thailand. This year we also increased the intake of international students up to 25% in each Department/School.

Moving ahead with our national ranking and global recognition we have received many applications of the prospective international students this year. Total 29 applications received through different portals (ICCR-19 / Study in India -5 /ASEAN – 5 applications). Now we are also a member of Heritage Network with aim to strengthen Higher Education Cooperation (research and training) between Europe and India in the field of Engineering Sciences.

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 2020-21, a substantial number of such projects were awarded to IIT Indore (see below).

1. GIAN Courses – 74+
2. VAJRA Fellowships – 06+
3. SPARC Projects – 09+
4. ASEM-DUO Fellowships – 06 European Collaboration

MoU Signed

In the last one year (April 2020-March 2021), IIT Indore signed various MoUs with the globally reputed institutes and Universities which are listed below:

- Shinshu University, Matsumoto, Japan
- Western Norway Research Institute, Sogndal, Norway
- Rajamangala University of Technology PHRA Nakhon, Bangkok, Thailand

And few more important MoUs are lined up for collaboration across the globe such as Leibniz Lung Center, Germany, Università di Sassari (UNISS), Sassari, Italy, University of Technology, Ultimo, Australia, University of Alberta, Canada, University of Osijek, Croatia, and The University of Gothenburg, Sweden.

Foreign Collaborations

Spreading our wings globally including major countries like USA, UK, Germany, France, Italy, Australia, Croatia, Japan, Russia, Finland, South Africa etc., we are targeting to sign more than 50 MoU's for active collaborations by next year. We took a lead in Hosting number of international internships and student exchange programs. We are also planning to set up India's First Health Intelligence Hub on pandemic diseases. Our pleasure for taking over 30 bilateral research grants around the globe and over 74 approved projects under GIAN course. Several webinars and talks by reputed scientists and foreign faculty members are the key highlights for our outreach events online. Recently the Consulate General of French visited IIT Indore for the future prospective of collaborations.

Outreach Events

This is a subject of pride to organize successful webinars and talks by eminent speakers from various streams on E-platforms during the pandemic situation as given below:

Webinar Series/ Lectures	Eminent Speakers
Atomic Clocks	• Prof. David J. Wineland- Noble Laureate in Physics
The revolutionary quantum reform of the international metric system	• Prof. William D. Phillips- Noble Laureate in Physics
Nobel Prizes-2020	• Prof. Somak Raychaudhury- Director of the Inter-University Centre for Astronomy and Astrophysics, Pune • Prof. G. N. Sastry- Director of CSIR-Northeast Institute of Science and Technology, Jorhat, Assam • Dr. Jeevant Rampal- Assistant Professor of Economics at Indian Institute of Management Ahmedabad • Prof. Shormistha Panja- Department of English, University of Delhi • Mr. Bishow Parajuli- Country director of United Nations World Food Programme (WFP) in India • Prof. Saumitra Das- Indian microbiologist and a professor at the Department of Microbiology and Cell Biology of the Indian Institute of Science
Frontiers in Physics (Public Lecture Series-2020)	• Professor H.S. Mani- Professor Chennai Mathematical Institute • Professor Amol Dighe- Professor of Physics in Tata Institute of Fundamental Research, Mumbai. • Professor Ajoy Ghatak- Meghnad Saha Fellow of NASI • Professor S. M. Yusuf- Outstanding Scientist and Head of Solid-State Physics Division of BARC, Mumbai. • Professor Amit Roy- Former Director, Inter University Accelerator Centre, Delhi • Professor Bedangadas Mohanty- Professor, School of Physical Sciences, NISER, Bhubaneswar

	• Professor Sunil K. Gupta- Former Professor TIFR, Mumbai • Professor Tarun Souradeep- Professor and Chair, Physics, IISER, Pune • Professor Dinesh Kumar Srivastava- Homi Bhabha Chair Professor in the Energy and Environment Programme, NIAS, Bengaluru
Hardy-Ramanujan Lecture Series in Mathematics	• Prof. Atul Dixit- Associate Professor, Indian Institute of Technology, Gandhinagar • Prof. Nayandeep Deka Barua- Professor in the Department of Mathematical Sciences at Tezpur University
The current Challenges in the COVID vaccination and how do we choose a vaccine	• Prof. N. K. Ganguly, Padma Bhushan and Former Director General, ICMR
Automotive Light-weighting Technologies	• Prof. Raghu Echempati- Professor, Department of Mechanical Engineering Kettering University, USA
Prosperity Through Science Technology	• Prof. J. B. Joshi- Padma Bhushan as the Director of Institute of Chemical Technology. Indian Chemical Engineer, Nuclear Scientist, Consultant and Professor
Borametallomimetics - Activation of Small Molecules by Low-valent Boron Species	• Prof. Dr. Holger- University Professor of Physical Chemistry, University of Siegen, Germany
New photocatalytic reactions: Updates on radical cascades and photooxygenations	• Prof. Dr. Malte Brasholz- Professor of Organic Chemistry, University of Rostock, Germany
Organometallic Wires for Electronics	• Prof. Jean-François Halet- CNRS Research Director
Nanoparticle-Derived Functional Materials and Model Catalysts	• Prof. Dr. Silke Behrens- Group Leader (IKFT)- Nanoparticle
Role of Science in Nation Building during Global Health Crisis	• Prof. Anil Sahasrabudhe- Chairman of the All-India Council for Technical Education (AICTE), New Delhi
Outreach Talks/Events	**Institute/Discipline/ Faculty Member**
Impact of the digital revolution on higher education	Dr. Aruna Tiwari, Associate Professor, CSE represented IIT Indore as an Artificial Intelligence expert in the Internationalist Podcast series on "Impact of the digital revolution on higher education", organized by the Association of Commonwealth Universities, UK on June 8, 2021.
Chemistry Talks	India celebrated the National Science Day on 28th February to mark the discovery of the Raman effect by Sir C. V. Raman. On this occasion, the Department of Chemistry, IIT Indore had organized Chemistry based research talks by several eminent speakers from various countries.
National Science Day	National Science Day 2020 was organized at IIT Indore on Feb. 28, 2020, where over 90 students participated and fun learned science with interesting science experiments, demonstrations, talks and various fun activities.

Committees and Media

To stretch the thread of global existence the Outreach Committee and ISMAE Committees (Institute Student Mobility, Admission and Exchange Committee) have been formed. As a helping hand to IAO office and active involvement of students the SIAC (Student International Affairs cell) is formed. A Complete data related to Institute and International office is showcased on our newly launched IAO website and a short informative video of IIT Indore along with the brochure is made to represent our global existence



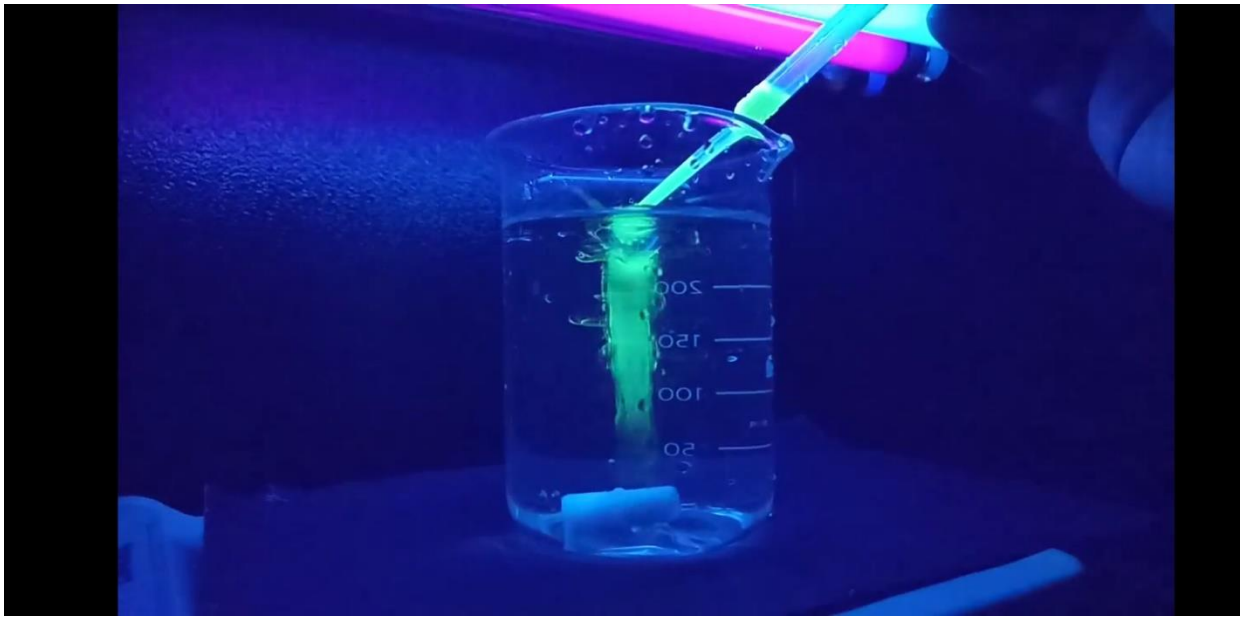
French Consulate visit to IIT Indore



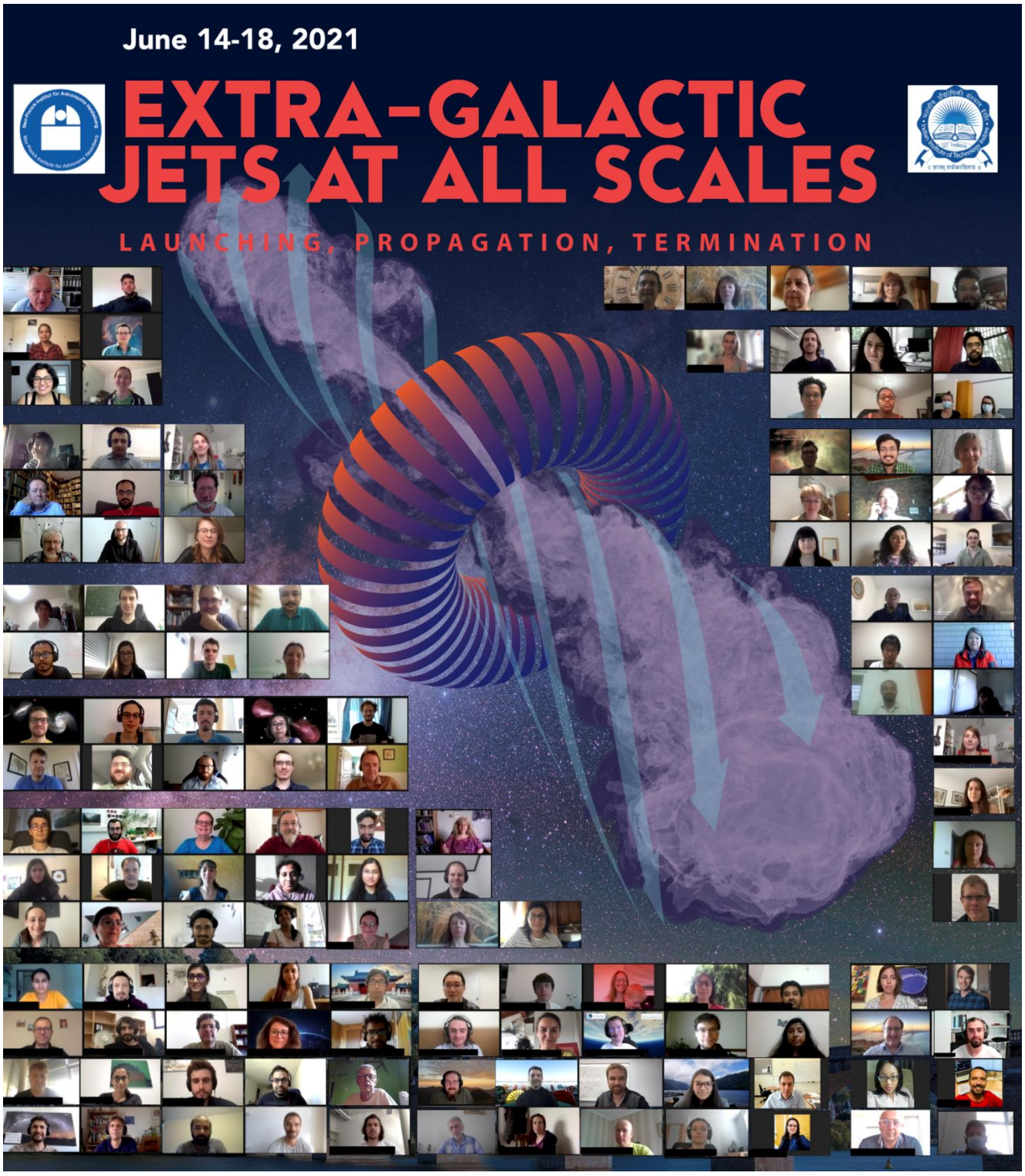
French Consulate Meeting with Director and Dean IAO

National Science Day





Indian Institute of Technology Indore organized a special half-day program on National Science Day on February 28, 2021, in virtual mode to cultivate interest in young school students towards pursuing a career in science. Many schools from Indore and Madhya Pradesh participated the event, which includes a talk on Optics by the renowned physicist Prof. Anurag Sharma, SSB Awardee, demonstrations of daily life physics experiments, chemical illusion, mathematical models, biology talk, journey through cosmos.



Joint Conference- virtual mode by Max Planck Partner group established at IIT Indore

Student Statistics

Student Enrolments and Graduation

Courses Offered	:	**870**
Undergraduate Courses	:	**410**
Postgraduate Courses	:	**345**
Cross Listed Courses	:	**115**

Enrolments									
Academic Year	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**
Doctoral Students Admitted									
PhD (Including Dual Degree)	87	93	118	83	117	89	189	106	128
Post Graduate Students Admitted									
MTech	5	24	30	31	34	62	41	78	73
MSc	15	20	24	47	56	69	80	102	103
MS (Research)	-	-	-	-	-	7	21	24	32
Under Graduate Students Admitted									
BTech	119	117	111	258	249	265	283	351	Awaited
Preparatory Course	-	-	-	-	-	-	4	-	Awaited

Graduation									
Convocation Year	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Doctoral Students Graduated									
PhD	-	6	23	24	38	67	83	58	70
Post Graduate Students Graduated									
MTech	-	-	5	22	25	26	29	57	40
MSc	-	-	14	20	22	41	55	58	79
MS (Research)	-	-	-	-	-	-	-	6	18
Under Graduate Students Graduated									
BTech	101	117	114	108	118	112	108	233	246

List of graduating students for B.Tech Program-2021

S.No.	Roll Number	Name	Department
1	160004021	NALIN GEDAM	CE
2	160004022	NAMRATA SINGH	CE
3	170004001	ADITYA PRAKASH SHARMA	CE
4	170004002	ALOK YADAV	CE
5	170004003	AMAN SHARMA	CE
6	170004004	ANKIT JAJOREA	CE
7	170004005	ASHWANI SHARMA	CE
8	170004006	GAGAN CHAUDHARY	CE
9	170004007	GARGI MEENA	CE
10	170004008	GAURAV ANIL KHADSE	CE
11	170004009	GOURAV MEENA	CE
12	170004010	HARSHIT AGRAWAL	CE
13	170004011	HARSHIT BHARDWAJ	CE
14	170004012	HARSHIT GUPTA	CE
15	170004013	MANISH KUSHWAH	CE
16	170004014	MEGHA SHARMA	CE
17	170004016	MUKHTAR HUSNAIN HUSAINI	CE
18	170004017	NAVEEN KUMAR YADAV	CE
19	170004020	PARMAR YASH HEMANGCHANDRA	CE
20	170004021	PARTH GILDA	CE
21	170004023	PIYUSH PATEL	CE
22	170004024	PRADYUMN PATHAK	CE
23	170004025	PRASHITA JAIN	CE
24	170004027	RAVI VERMA	CE
25	170004028	REVURI LOKESH	CE
26	170004029	ROSHNI DEEWAN	CE
27	170004030	SAHARSH JAIN	CE
28	170004031	SANCHIT OJHA	CE
29	170004032	SHIVAM KOUNDINYA	CE
30	170004033	SHRIKANT NILKANTH SARODE	CE
31	170004034	SHUBHAM WAIKAR	CE
32	170004035	SOURABH MAHAJAN	CE
33	170004036	SURABHI PRAVEEN MODHE	CE
34	170004037	TEJAS SONI	CE
35	170004038	TUSHAR SINGH	CE
36	160001015	BIPLAB KUMAR SAHOO	CSE
37	160001050	RISHIKA PATEL	CSE
38	170001001	ABHIJEET SINGH YADAV	CSE
39	170001002	ADITYA GUPTA	CSE
40	170001003	AJAYDEEP	CSE
41	170001004	AKSHIT	CSE
42	170001005	AMAN VERMA	CSE
43	170001006	AMANPREET SINGH	CSE
44	170001007	ANKIT	CSE
45	170001008	ANKIT GEHLOT	CSE
46	170001009	ARJIT ARORA	CSE
47	170001010	ASHISH AZAD	CSE
48	170001011	ASHUTOSH ANSHUL	CSE
49	170001012	ASHWINI JHA	CSE
50	170001013	ATCHE SRAVYA	CSE
51	170001014	B RUSHYA SREE REDDY	CSE
52	170001015	BHOGAVALLI SAMHIT CHOWDARY	CSE
53	170001016	BOPPUDI VENKATA PAVAN	CSE
54	170001017	CHINTAGINJALA SAI DINESH	CSE
55	170001018	DEV KALRA	CSE
56	170001019	DEVANSH SHAH	CSE
57	170001020	DHANANJAY DIWAKAR	CSE
58	170001021	DHARMESH KUMAR	CSE
59	170001022	DHRUV SINGHAL	CSE
60	170001023	DIVYANSH CHOUDHARY	CSE
61	170001024	JHALAK GUPTA	CSE
62	170001025	KALPIT KOTHARI	CSE
63	170001026	KASTURI AJIT SHARMA	CSE
64	170001027	KATURI PRUDHVI KIRAN	CSE
65	170001028	MALISETTY KARTHIK	CSE
66	170001029	MOHIT CHAUHAN	CSE
67	170001030	MRIGANK KRISHAN	CSE

S.No.	Roll Number	Name	Department
68	170001031	NAMAN JAIN	CSE
69	170001032	NISARG SONI	CSE
70	170001033	P SHARATH CHANDRA GURUKULA MITHRA	CSE
71	170001034	PELAMALA VENKATA RENUKA DEEPAK	CSE
72	170001035	PRANSHU MAHESHWARI	CSE
73	170001037	PRAYAG JAIN	CSE
74	170001038	RAHUL ANAND YADAV	CSE
75	170001039	RAVI PRAKASH MAURYA	CSE
76	170001040	ROHAN PATEL	CSE
77	170001041	RONAK BANDWAL	CSE
78	170001042	SAHEJ GANERIWALA	CSE
79	170001043	SAHIL KUMAR SONKAR	CSE
80	170001044	SAKSHAM TANWAR	CSE
81	170001045	SAURAV TAYAL	CSE
82	170001046	SEEMANDHAR JAIN	CSE
83	170001048	SONU SAGAR	CSE
84	170001049	SPARSH GUPTA	CSE
85	170001050	SUDHANSHU ARYA	CSE
86	170001051	TANMAY SINGH	CSE
87	170001052	TARUN KUMAR SINGH	CSE
88	170001053	VAIBHAV ANAND	CSE
89	170001054	VIKASH KUMAR	CSE
90	170001055	VIKRAM KUSHWAHA	CSE
91	170001056	VISHNUNARAYAN K I	CSE
92	170001057	VISLAVATH VAMSHI NAIK	CSE
93	170001058	VUTUKURU ROHITH	CSE
94	170002061	YASASVI V PERUVEMBA	CSE
95	170004019	NITESH AHIRWAR	CSE
96	170004040	VINAYAK SHANKAR MOHITE	CSE
97	170005020	NEERAJ VERMA	CSE
98	160002028	MANEKAR TUSHAR DEO	EE
99	160002045	RAHUL SINGH GURJAR	EE
100	160002047	RAJNEESH KUMAR	EE
101	160002048	RASHMI SINGH	EE
102	170002001	ABHISHEK KUMAR	EE
103	170002002	ABHISHEK VASHISHTHA	EE
104	170002005	AMAN GUPTA	EE
105	170002006	AMBATI DINESH	EE
106	170002007	AMIT RANJAN	EE
107	170002008	AMIT VERMA	EE
108	170002009	ARUN SHARMA	EE
109	170002010	BHAGAVATULA SRINATH	EE
110	170002011	BHAVESH KUMAR GEDAM	EE
111	170002012	BHAVYA TIWARI	EE
112	170002013	BHUKYA SHIRIDINATH	EE
113	170002014	CHETHAN N	EE
114	170002015	ESHIKA CHITTORA	EE
115	170002017	HIMANSHU VERMA	EE
116	170002018	ISHAAN DAMADIA	EE
117	170002019	JALLEPALLI TARUN	EE
118	170002020	JITENDRA KUMAR	EE
119	170002021	JONNALAGADDA ADITYA ABHIRAM	EE
120	170002022	JUBIN NAGPAL	EE
121	170002023	KAGITHA ROHITH	EE
122	170002024	KANDIBOINA CHAITANYA SAI	EE
123	170002025	KARAN KAUSHAL	EE
124	170002026	KOTLA DEEKSHITH REDDY	EE
125	170002027	LAXMI RACHANA BANOTH	EE
126	170002028	MUDDA HIMANTH	EE
127	170002029	MURLI MALIK I	EE
128	170002030	NIKHIL AGRAWAL	EE
129	170002031	OZA HARSHKUMAR AJAYKUMAR	EE
130	170002032	PRANJAL PATIDAR	EE
131	170002033	PRATEEK VERMA	EE
132	170002034	PRATHMESH SUNILRAO SANAP	EE
133	170002035	RAGHVENDRA MANGLAM SONI	EE
134	170002036	RINKU	EE

S.No.	Roll Number	Name	Department
135	170002038	NISHIT MEENA	EE
136	170002039	SAGAR RANGARI	EE
137	170002040	SANDEEP KUMAR	EE
138	170002041	SANKET DIXIT	EE
139	170002042	SATYAJEET SANJAY DESHMUKH	EE
140	170002043	SAURABH KUMAR	EE
141	170002044	SAURABH SUDHEENDRA KARKUN	EE
142	170002045	SHAIK NEMATH AHMED	EE
143	170002046	SHASHANK SHEKHAR AGRAWAL	EE
144	170002047	SHRAVAN KUMAR	EE
145	170002048	SHREYANSH THAKUR	EE
146	170002049	SHRUTI PARAG LANDGE	EE
147	170002050	SHUBHAM KUMAR	EE
148	170002051	SONU MEENA	EE
149	170002052	SONU YADAV	EE
150	170002053	SOURAB MISHRA	EE
151	170002054	SPARSH BANSAL	EE
152	170002055	SUPRAGYA UPADHYAY	EE
153	170002056	SURAJ POLAMAINA YADAV	EE
154	170002058	VARUN HEMANT PATIL	EE
155	170002059	VARUN SRIVASTAVA	EE
156	170002060	VIKAS KUMAR	EE
157	170003008	ANEESH NEMA	EE
158	170003013	CHINCHOLIKAR SARTHAK SANJAY	EE
159	170003023	MALICK SHAVEZ MINHAJUR RAHMAN	EE
160	160003011	AVINASH KHAJOTIA	ME
161	160003016	DIVYANSH SAGAR	ME
162	160003030	MUKHESH KAVULURI	ME
163	160003039	PILAKA PRASHANTH	ME
164	170003001	ABHISHEK EDPACHE	ME
165	170003002	ADARSH SINGH	ME
166	170003003	ADITYA ANILRAO BHANDARKAR	ME
167	170003004	AKASH KUMAR SINGH	ME
168	170003006	AMEYA ATUL CHITRE	ME
169	170003007	ANAGANI BHARGAV KRISHNA	ME
170	170003009	ARJUN SINGHAL	ME
171	170003010	AVINASH KUMAR SINGH	ME
172	170003011	AYUSH KUMAR SHAH	ME
173	170003014	CHINMAY HRISHIKESH LOTE	ME
174	170003015	DEOGADE MAYUR VINOD	ME
175	170003016	GORRUMUCHU DANI PAUL	ME
176	170003017	HIMANSHU MISHRA	ME
177	170003018	JAGU HARSHA SAI	ME
178	170003019	KAILASH CHOUDHARY	ME
179	170003020	KATTA M N V S HEMANTH KUMAR GOUD	ME
180	170003021	KESHAV RATHORE	ME
181	170003022	KETAN DILIP SURYAWANSHI	ME
182	170003024	MANTHAN VARGHESE	ME
183	170003025	MAYANK MAROLIYA	ME
184	170003026	MD AHTESHAM DANISH	ME
185	170003027	MOHAMMAD AFTAB ALAM	ME
186	170003028	MOHITRAJ THAKUR	ME
187	170003029	MUKUNDAN S	ME
188	170003031	NAVEEN SWAMI	ME
189	170003032	NEERAJ KUMAR	ME
190	170003033	PATEL BRIJKUMAR	ME
191	170003034	PRAFULL AGRAWAL	ME
192	170003035	PRASHANT BARAD	ME
193	170003037	PRATIK JAIN	ME
194	170003038	PUNEET KRISHNA CHITKARIYA	ME
195	170003039	PUSHPENDRA SHARMA	ME
196	170003040	RAHUL NAIDU SIRIPORAM	ME
197	170003041	RAIBOLE SANKALP SANJAY KUMAR	ME
198	170003042	RAJ KUMAR	ME
199	170003043	RAJ VORA	ME
200	170003044	RHYTHM	ME
201	170003045	RISHABH NIHALANI	ME

S.No.	Roll Number	Name	Department
202	170003046	SAJAL SAXENA	ME
203	170003047	SANTOSH ASHOK KALSHETTI	ME
204	170003048	SAURABH KUMAR	ME
205	170003051	SHANTANU SHARMA	ME
206	170003052	SHARDUL CHANDRASEKHAR	ME
207	170003053	SHIVAM	ME
208	170003054	SHIVANSH SAHU	ME
209	170003055	SHUBH AGRAWAL	ME
210	170003056	SHUBHENDU NARAYAN TRIPATHI	ME
211	170003057	TANMAY NARAYAN BANAGE	ME
212	170003058	VAIBHAV DALMIA	ME
213	170003059	VARSHA CHOUDHARY	ME
214	170003060	YASHODEEP DILIP CHIKTE	ME
215	170005035	VANDAN AGARWAL	ME
216	160005005	AMISHA ARYA	MEMS
217	160005037	SONAL ANISH JOJO	MEMS
218	170005002	ABHISHEK SINGH	MEMS
219	170005004	ANANDDEV MANGISH	MEMS
220	170005005	ANIL MEENA	MEMS
221	170005006	AYUSH SINGHAL	MEMS
222	170005007	CHAITANYA MAYANK SHAH	MEMS
223	170005008	DIVIK PATRE	MEMS
224	170005009	GUDIMELLA SREE YASHWANTH	MEMS
225	170005010	GUMPILI SAI PRANAV	MEMS
226	170005011	HAMPA FAAZIL HUSSAIN	MEMS
227	170005012	KAUSTUBH SANJAYKUMAR DOLAS	MEMS
228	170005014	MAYANK GARG	MEMS
229	170005016	MUDAVATH RAVI	MEMS
230	170005017	N YASHWANTH	MEMS
231	170005018	NAJMA GOLAM MAHABUB	MEMS
232	170005021	NISHITA CHITTORA	MEMS
233	170005023	PRADYUMNA JAGDISH SOMANI	MEMS
234	170005024	PRERNA	MEMS
235	170005026	SACHIN GUPTA	MEMS
236	170005027	SAI MURALI KARTHIK PUTCHA	MEMS
237	170005028	SAKSHAM RAJPUT	MEMS
238	170005029	SATISH SAHANI	MEMS
239	170005030	SINGH SAHAB	MEMS
240	170005032	SUNNY KUMAR	MEMS
241	170005033	UJJWAL TRIPATHI	MEMS
242	170005034	UTSAV SINGH	MEMS
243	170005036	VARTIKA PATHAK	MEMS
244	170005037	VEDANT MATTA	MEMS
245	170005039	VISHVESH JAIN	MEMS
246	170005040	YASHWANT V SONTAKKE	MEMS

INDIAN INSTITUTE OF TECHNOLOGY INDORE

List of graduating students for M.Tech Program-2021

S.No.	Roll Number	Name	Specialization
1	1902102002	Riya Verma	Communication and Signal Processing
2	1902102003	Kritika Agrawal	Communication and Signal Processing
3	1902102004	Ayush Dixit	Communication and Signal Processing
4	1902102005	Rohit Kumar Lilhare	Communication and Signal Processing
5	1902102006	Nikita Golait	Communication and Signal Processing
6	1902102007	Kalla Satya Ganapathi Kiran	Communication and Signal Processing
7	1902102013	Saurabh Singh	VLSI Design and Nanoelectronics
8	1902102015	Mummuluri Deepak Sunny	VLSI Design and Nanoelectronics
9	1902102016	Kadam Kiran Suryakant	VLSI Design and Nanoelectronics
10	1902102017	Somesh Mane	VLSI Design and Nanoelectronics
11	1902102018	Arava Veera Venkata Snehitha	VLSI Design and Nanoelectronics
12	1802103023	Ankit Kumar	Production and Industrial Engineering
13	1902103001	Priyanshu Upadhyay	Production and Industrial Engineering
14	1902103002	Piyush Chand	Production and Industrial Engineering
15	1902103003	Mali Umesh Vasant	Production and Industrial Engineering
16	1902103004	ASHWANI BULIWAL	Production and Industrial Engineering
17	1902103006	Kudali Satish Tarun	Production and Industrial Engineering
18	1902103007	Vivek Kumar	Production and Industrial Engineering
19	1902103012	Gorlea Thrinadh Ananthvenkata Tar	Mechanical Systems Design
20	1902103013	Sumit Chorma	Mechanical Systems Design
21	1902103014	Jadhav Apurva Anil	Mechanical Systems Design
22	1902103015	Pankaj Kumar Kori	Mechanical Systems Design
23	1902103016	Joshi Akhilesh Tulsiram	Mechanical Systems Design
24	1902105001	Harsha Rajput	Material Science and Engineering
25	1902105002	Shivam Karoliya	Material Science and Engineering
26	1902105004	Divyanshu Gupta	Material Science and Engineering
27	1902105005	Vishal Prajapati	Material Science and Engineering
28	1902105006	Abhishek Kumar Jaiswal	Material Science and Engineering
29	1902105007	Praveen Kumar	Material Science and Engineering
30	1902105008	Pallavi Singh	Material Science and Engineering
31	1902105010	Neelesh Singh	Material Science and Engineering
32	1902105011	Kaushal Gangwar	Material Science and Engineering
33	1902105013	Anurag Singh Chauhan	Metallurgy Engineering
34	1902105015	Arindom A Baruah	Metallurgy Engineering
35	1902105016	Raineesh Babu Kp	Metallurgy Engineering
36	1902105017	Deepansh Chourasiya	Metallurgy Engineering
37	1902105018	Ghanta Anurag	Metallurgy Engineering
38	1902105020	Rohan Jain	Metallurgy Engineering
39	1902105021	Pushpendra Sharde	Metallurgy Engineering
40	1902105022	Sakshi Mahloniya	Metallurgy Engineering
41	1902105023	Akanksha Sharma	Metallurgy Engineering

INDIAN INSTITUTE OF TECHNOLOGY INDORE

List of graduating students for MS (Research) Program-2021

S.No.	Roll Number	Name	Specialization
1	1804101006	Siddharth Gupta	Computer Science & Engineering
2	1904101002	Anil	Computer Science & Engineering
3	1904101003	Ajay	Computer Science & Engineering
4	1904101004	Anup Kumar Gupta	Computer Science & Engineering
5	1904101005	Namrata Tiwari	Computer Science & Engineering
6	1904101007	Shatendra Singh	Computer Science & Engineering
7	1904101009	Fyse Nassar	Computer Science & Engineering
8	1904101010	Saumya Mishra	Computer Science & Engineering
9	1904101011	Uttkarsh Aggarwal	Computer Science & Engineering
10	1904102001	K Harishwar Reddy	Electrical Engineering
11	1904102002	Pradeep Kumar Shrivas	Electrical Engineering
12	1904102004	Anil Yadav	Electrical Engineering
13	1904102005	Pandya Yash Avinashbhai	Electrical Engineering
14	1904102006	Harsh Chhajed	Electrical Engineering
15	1904103001	Deepak Kag	Mechanical Engineering
16	1904103003	Jayanta Sutradhar	Mechanical Engineering
17	1904103007	Varshil Rajivbhai Parikh	Mechanical Engineering
18	1904103008	Pawar Prathamesh Chandı	Mechanical Engineering
19	1904103009	Pravin Karna	Mechanical Engineering

INDIAN INSTITUTE OF TECHNOLOGY INDORE

List of graduating students for MSc Program-2021

S.No.	Roll Number	Name	Specialization
1	1903121001	Aadarsh Pathak	Astronomy
2	1903121002	Ravi Pratap Dubey	Astronomy
3	1903121003	Koyena Das	Astronomy
4	1903121004	Hemanth Kumar Reddy Bommireddy	Astronomy
5	1903121006	Pranoy Ghosh	Astronomy
6	1903121008	Chandan Kumar Das	Astronomy
7	1903121009	Anuraag Arya	Astronomy
8	1903121010	Saranniya S	Astronomy
9	1903121011	Mugatwala Ronish Himanshu	Astronomy
10	1903121012	Himanshu	Astronomy
11	1903121013	Prattipati Sanjeeva Rao	Astronomy
12	1903121014	Maneesh Bazgalia	Astronomy
13	1903121015	Vikrant Someshwar Londhe	Astronomy
14	1903121016	Vabbani Krishna Kumar	Astronomy
15	1903131001	Sweta Agarwal	Chemistry
16	1903131002	Ayushi Srivastava	Chemistry
17	1903131003	Pranav	Chemistry
18	1903131004	Annapurna Saxena	Chemistry
19	1903131005	Rashmi	Chemistry
20	1903131006	Bhavya Jain	Chemistry
21	1903131007	Arati Samal	Chemistry
22	1903131008	Ankur	Chemistry
23	1903131009	Garima Singh	Chemistry
24	1903131010	Aditya Raj	Chemistry
25	1903131014	Aparna Gangwar	Chemistry
26	1903131015	Shilpa Debnath	Chemistry
27	1903131016	Renuka Soni	Chemistry
28	1903131017	Aasha Yadav	Chemistry
29	1903131018	Mohd Farhan Ansari	Chemistry
30	1903131019	Puja Kumari	Chemistry
31	1903131020	Manisha Verma	Chemistry
32	1903131021	Priya	Chemistry
33	1903131022	Neha Sanjay Kakde	Chemistry
34	1903131023	Ujjwal Verma	Chemistry
35	1903131024	Lavudi Suresh	Chemistry
36	1803141006	Manish Nagar	Mathematics

S.No.	Roll Number	Name	Specialization
37	1803141007	Pradeep Singh Sigar	Mathematics
38	1803141012	Vikash Kumar	Mathematics
39	1903141001	Puja Ravindra Sonawane	Mathematics
40	1903141002	Mohammad Tabish	Mathematics
41	1903141003	Vaishnavi Singh Rathour	Mathematics
42	1903141004	Anushree Gupta	Mathematics
43	1903141005	Bhawesh Choudhary	Mathematics
44	1903141006	Shivani Prajapati	Mathematics
45	1903141007	Dharmendra Kumar	Mathematics
46	1903141008	Deepak Kumawat	Mathematics
47	1903141009	Neha Rana	Mathematics
48	1903141010	Sonal	Mathematics
49	1903141011	Nilesh Subhash Pawara	Mathematics
50	1903141013	Pankaj	Mathematics
51	1803151007	Bungkiu Kissinquinker	Physics
52	1903151001	Shivam Singh Kushwah	Physics
53	1903151002	Kangkan Goswami	Physics
54	1903151003	Rachit Dobhal	Physics
55	1903151005	Don P Benny	Physics
56	1903151006	Vardhman Dwivedi	Physics
57	1903151007	Manish Kandwal	Physics
58	1903151008	Rahul Gupta	Physics
59	1903151009	Ayushi Srivastava	Physics
60	1903151010	Stuti Pathak	Physics
61	1903151011	Lovish Chugh	Physics
62	1903151012	Prateek Pant	Physics
63	1903151013	Atish Panday	Physics
64	1903151014	Mathew Joshy	Physics
65	1903151016	Vivek Kumar	Physics
66	1903151017	Priyanka Yadav	Physics
67	1903151018	Pradeep Kumar Kumawat	Physics
68	1903151019	Mahesh Kumar	Physics
69	1903151020	Hima M P	Physics
70	1903151022	Rupak Das	Physics
71	1903151023	Verma Bunty Sardar	Physics
72	1903151024	Diwakar Singh	Physics
73	1903151025	Jeevan Kumar Sahoo	Physics
74	1903151026	Joy Ekka	Physics
75	1903151027	Sita Ram Meena	Physics
76	1903171002	Rohit Kumar Singh	Biotechnology
77	1903171004	Sayali Shantaram Vikhrankar	Biotechnology
78	1903171005	Kanika	Biotechnology
79	1903171006	Vinay Singh	Biotechnology
80	1903171007	Sharddha Ameria	Biotechnology
81	1903171008	Kumod Kishore	Biotechnology
82	1903171009	Aarpita Baa	Biotechnology
83	1903171010	Rohan Kumar Panda	Biotechnology

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List of graduating students for PhD Program-2021

S.No.	Roll Number	Name	Department
1	1010102	Rajkumar Jain	CSE
2	11115106	Ajay Pratap Singh	Physics
3	1301131006	Ramesh Reddy B	Chemistry
4	1301141005	Nitin Bisht	Maths
5	1301201002	Navneet Pratap Singh	CSE
6	1301203006	Patil Digvijay Ankush	ME
7	1401151008	Kavita Soni	Physics
8	1401171003	Mena Asha Krishnan	BSBE
9	1401203006	Rajendra Singh Rajpoot	ME
10	1401203008	Vishal Sharma	ME
11	1401231001	Amit Pandit	Chemistry
12	1401231007	Siddarth Jain	Chemistry
13	1401241001	Prince Kanhya	Maths
14	1401251002	Ankit Soni	Physics
15	1501102006	Pooja Bohara	EE
16	1501102015	Arjunan M S	EE
17	1501102019	S. Rathinavelu	EE
18	1501102021	Vinay Kumar Tiwari	EE
19	1501103004	Debjit Misra	ME
20	1501103006	Debashis Panda	ME
21	1501131001	Sourabh Kumar	Chemistry
22	1501131002	Premansh Dudhe	Chemistry
23	1501131003	Pramod Kumar Gavel	Chemistry
24	1501131006	Daisy Sarma	Chemistry
25	1501131008	Sayan Maiti	Chemistry
26	1501131009	Jamuna Kanaram Vaishnav	Chemistry
27	1501131011	Madhurima Poddar	Chemistry
28	1501131014	Shagufi Naz Ansari	Chemistry
29	1501131015	Shweta Jindal	Chemistry
30	1501131018	Ankan Biswas	Chemistry
31	1501131020	Jadhav Rohit Gajanan	Chemistry
32	1501131021	Neha Thakur	Chemistry
33	1501131022	Nishu Kanwa	Chemistry
34	1501151002	Gowthama Raju P	Physics
35	1501161001	Arun Kumar Bairwa	HSS (Eco)
36	1501161002	Manu Jose	HSS (Eco)
37	1501161006	Shaifali Arora	HSS (Eng)
38	1501161007	Sidheswar Panda	HSS (Eco)
39	1501171003	Rinki Singh	BSBE
40	1501171004	Monika Jain	BSBE
41	1501171009	Anjali Roy	BSBE
42	1501171010	A V R Krishna Rao	BSBE
43	1501171011	Prativa Majee	BSBE
44	1501181005	Alfa Sharma	MEMS
45	1501201001	Aditya Anand Shastri	CSE
46	1501201006	Aaditya Prakash Chouhan	CSE
47	1501202001	Uday Kumar Singh	EE

S.No.	Roll Number	Name	Department
48	1501202002	Biswajit Mandal	EE
49	1501231002	Topi Ghosh	Chemistry
50	1501251001	Priodyuti Pradhan	Physics
51	1501251002	Rode Sudhir Pandurang	Physics
52	1501261002	Rajesh Barik	HSS
53	1501271001	Basanta Pravas Sahu	BSBE
54	1501271014	Vishal Anand	BSBE
55	1501281001	Lichchhavi	MEMS
56	1502103009	Vijay Choyal (MTech+PhD)	ME
57	1503151003	Anil Kumar (M.Sc.+Ph.D.)	Physics
58	1503151004	Anjali Chaudhary (M.Sc.+Ph.D)	Physics
59	1601102001	Pragya Swami	EE
60	1601102002	Lalit Singh	EE
61	1601102004	Sulabh	EE
62	1601102006	Sourabh Jain	EE
63	1601102006	Sourabh Jain	EE
64	1601102010	Gaurav Siddharth	EE
65	1601102015	Sajid Khan	EE
66	1601103001	M. Muralidharan	ME
67	1601103003	Rohit Kothari	ME
68	1601121004	Chiranjit Mondal	MEMS
69	1601121006	Sumanjit Chakraborty	AASE
70	1601121009	Arnab Chakraborty	AASE
71	1601131004	Soumitra Guin	Chemistry
72	1601161002	Mohd. Shadab Danish	HSS (Eco)
73	1601181001	Pranav	MEMS
74	1601271002	Nisha Amarnath Jonniya	BSBE
75	1601271003	Charu Sonkar	BSBE
76	1701103003	Akash Sharma	ME
77	1701104001	Vivek Gupta	CE
78	1701105003	Kitchamsetti Narasimharao	MEMS
79	1701105008	Sheetal Kumar Dewangan	MEMS
80	1701105009	Aditya Kumar Litoria	MEMS
81	1701105011	Reliance Jain	MEMS
82	1701105013	Rameshwar Lal Kumawat	MEMS
83	1701151002	Aanchal Sati	Physics
84	1701151003	Devesh Kumar Pathak	Physics
85	1701202008	Neha Gupta	EE
86	1701203008	Shingare Kishor Balasaheb	ME
87	1701204003	Srinidhi Jha	CE
88	1701205002	Kathavate Vaibhav Sanjay	MEMS
89	1701205005	Parameshwar R. Chikate	MEMS
90	1701241001	Bharat Richhariya	Maths
91	1801103009	Vijay Kumar Choyal	ME
92	1801204002	Meghna Sharma	CE
93	1801204006	Nitin Tiwari	CE
94	1801103008	Ankit Rathi	ME

Number of Students Graduated in 2021-Convocation			
Sr.	**Program**	**Branch**	**Number of graduating students**
A	**B.Tech.**	Computer Science and Engineering	62
		Electrical Engineering	62
		Mechanical Engineering	56
		Civil Engineering	35
		Metallurgy Engineering and Materials Science	31
		Total A	**246**
B	**M.Tech.**	Communication and Signal Processing	6
		Material Science and Engineering	9
		Mechanical Systems Design	5
		Metallurgy Engineering	9
		Production and Industrial Engineering	7
		VLSI Design and Nanoelectronics	5
		Total B	**41**
C	**M.Sc.**	Astronomy	14
		Biotechnology	8
		Chemistry	21
		Mathematics	15
		Physics	25
		Total C	**83**
D	**MS (Research)**	Computer Science & Engineering	9
		Electrical Engineering	5
		Mechanical Engineering	5
		Total D	**19**
E	**Ph.D.**	Astronomy, Astrophysics and Space Engineering	2
		Biosciences and Biomedical Engineering	10
		Civil Engineering	4
		Chemistry	18
		Computer Science and Engineering	4
		Electrical Engineering	14
		Humanities and Social Sciences	6
		Mathematics	3
		Mechanical Engineering	11
		Metallurgy Engineering and Materials Science	11
		Physics	8
		Total E	**91**
F	**M.Sc.+Ph.D.**	Physics	**2**
		Total F	**2**
G	**M.Tech.+Ph.D.**	Mechanical Engineering	**1**
		Total G	**1**
		Grand Total	**483**

Indian Institute of Technology Indore

Recipients of Medals and Awards: Convocation 2020

INSTITUTE SILVER MEDAL

For the Best All Round Performance among all the graduating students

	
Mr. Avadhesh Kumar Sharma **PhD (ME)** **Roll No. 1401203002**	**Mr. Mehta Chaitanya Mukeshkumar** **BTech (ME)** **Roll No. 160003028**

Indian Institute of Technology Indore

9th Convocation 2021: Recipients of Medals and Awards

PRESIDENT OF INDIA GOLD MEDAL

For the best academic performance among all the graduating students



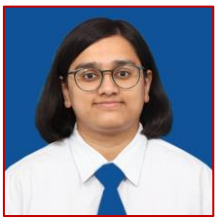
Mr. GAURAV ANIL KHADSE

BTech (CE)

Roll No. 170004008

INSTITUTE SILVER MEDAL

For the best academic performance among all the graduating UG students of a particular Discipline

				
Mr. Kasturi Ajit Sharma **BTech (CSE)** **Roll No. 170001026**	**Ms. Shruti Parag Landge** **BTech (EE)** **Roll No.170002049**	**Mr. Chinmay Hrishikesh Lote** **BTech (ME)** **Roll No. 170003014**	**Ms. Surabhi Praveen Modhe** **BTech (CE)** **Roll No. 170004036**	**Mr. Ananddev Mangish** **BTech (MEMS)** **Roll No. 170005004**

INSTITUTE SILVER MEDAL

For the best overall performance among all the graduating PG students (MTech./MS and MSc. Programs)



Mr. Raineesh Babu KP

M.Tech (MEMS)

Roll No. 1902105016



Mr. Vinay Singh

MSc (Biotechnology)

Roll No. 1903171006

AWARD FOR BEST B.TECH. PROJECT (BTP)

Amongst all the graduating UG students



Ms. Vartika Pathak

BTech (MEMS)

Roll No. 170005036

Project Title: "Machine Learning Techniques for Fractographic Analysis"

BUTI FOUNDATION GOLD MEDAL

For the best academic performance among all the graduating female PG students



Ms. Arati Samal

MSc (Chemistry)

Roll No. 1903131007

INSTITUTE SILVER MEDAL

For the best all round performance among all the graduating students



Mr. Shaik Nemath Ahmed

B.Tech (EE)

Roll No. 170002045

Research & 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.

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, Russian Federation, Portugal, France, Germany, UK, USA, and many other countries.

Mission

The driving force behind the 21st Century is the development of knowledge-intensive societies. It has led to establishment of new Institutes of higher learning in India. Indian Institute of Technology Indore, established in 2009, is part of the initiative that envisages India as a global knowledge and technology leader. Continuing with the tradition of the older IITs, IIT Indore aims to play an active role in propelling India on her growth-trajectory by focusing on research-based education and innovation driven research and entrepreneurship. IIT Indore aims to achieve this mission with humanistic concerns.

Vision

- Promote inter-disciplinary research in science, engineering, and humanities and social sciences
- Conduct disruptive and social impacting research some chosen areas such as sustainable development, climate change, food and water security
- Promote industry-oriented research leading to new products, processes, and technologies
- Focus on convergence of life sciences, medical sciences, and agricultural sciences with engineering.
- Promote culture of start-ups and entrepreneurship by establishing of Industrial Research Park which will be a focal point in Central India
- Aggressive patenting and protection of IPR

Objectives

- Enhancement of academic, technological, and social outreach of the Institute through societal research, education, healthcare, sanitation, and rural development.
- Development of world class research and learning facilities for industries, teaching and research institutions.
- Skill development and scaling up the research and innovation towards the national requirements.
- To contribute to development of world class technological innovation in Engineering and Biomedical instrumentation, Defense, E-vehicles, alternate energy resources, etc.

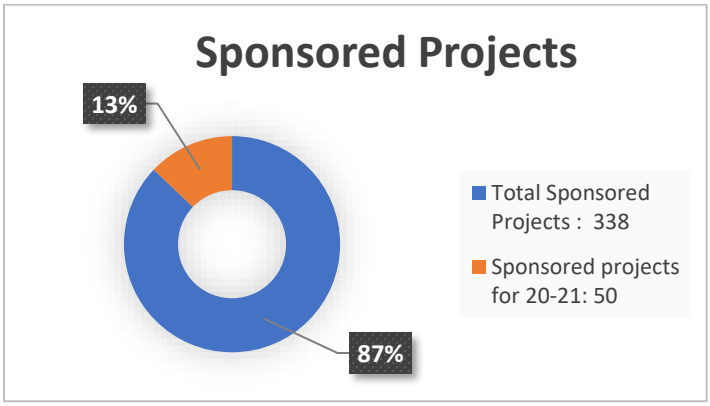
(A) Significant research work:

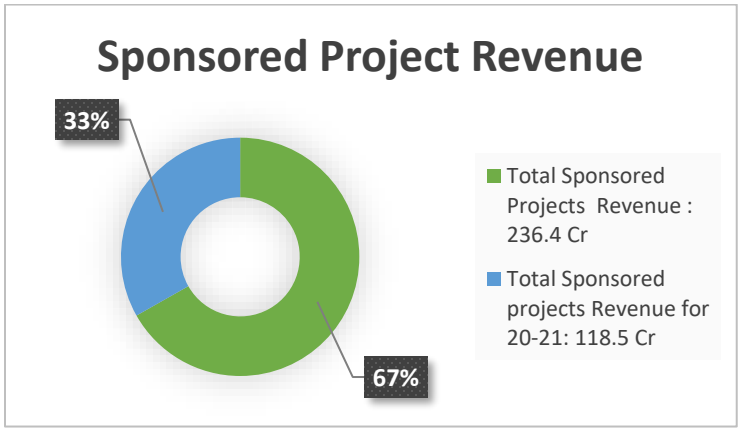
- Development of new asparaginase drug (M-ASPAR) for treatment of a type of blood cancer namely **Acute Lymphoblastic Leukemia (ALL)** which is prevalent among children.

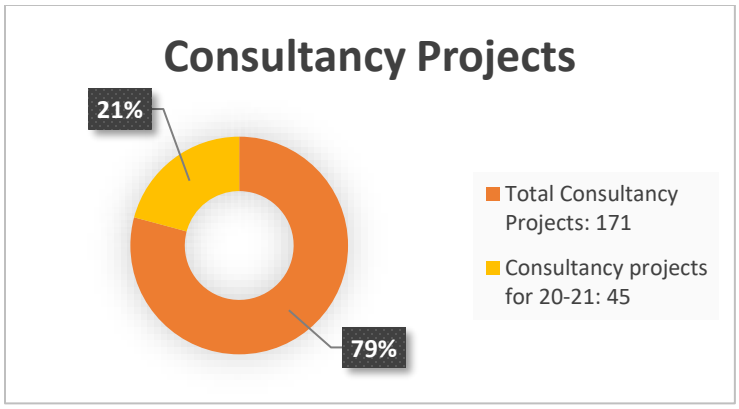
- Development of a cost-effective and instantaneous method to detect brain tumors and other cancer-causing viruses using Raman Spectroscopy.
- Identification of presence of 5647 mutations of SARS-CoV-2 surface proteins globally and possible impacts of these mutations on the host cells. These mutations include 42 mutants of E-protein, 156 mutants of M and 5449 mutants of S protein.
- Study on neurological impacts from dual infection of the malaria parasite and COVID-19 causing virus due their overlapping symptoms.
- Developing a vaccine against SARS-CoV2 using vesicular stomatitis virus (VSV, a mild animal virus which does not cause any disease in humans) and SARS-CoV-2 Spike proteins in collaboration with NCCS Pune. Present focus is to improve antigenicity and broadness of the vaccine to contain spreading of double mutant (B.1.617) strain of SARS-CoV2.
- Development of electronic memory storage devices from chemicals from Aloe Vera flowers.
- Study on response of Himalayan-Karakoram (HK) rivers to the Climate Change which is crucial for more than 1 Billion people who largely depend on water resources. This work was appreciated by different international media and got published in the prestigious SCIENCE.
- Development of sophisticated surveillance system using AI and ML tools and wireless sensor network (WSN) to detect forest fires so as save wild animals and tribal peoples.
- Energy harvesting device integrated shoes for soldiers for charging gadgets in Warfield.

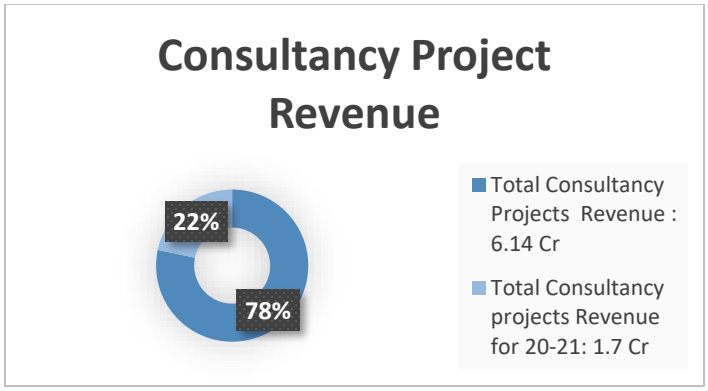
(B) Patents: For the year 20-21 Total 66 patents have been filed of which **2 patents have been granted**.

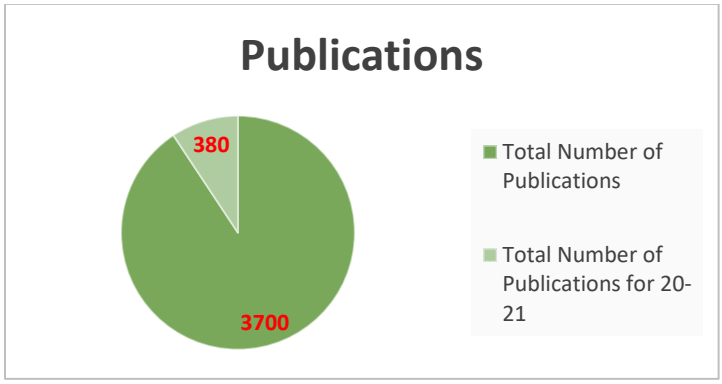
Glimpses of R&D

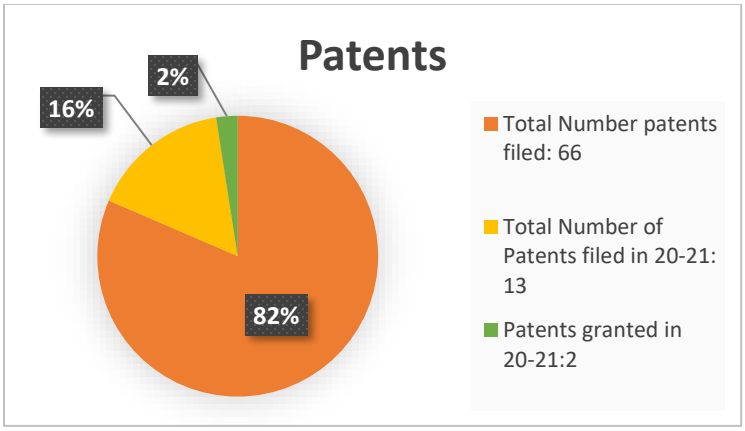





Consultancy Projects
21%
79%
Total Consultancy Projects: 171
Consultancy projects for 20-21: 45


Consultancy Project Revenue
22%
78%
Total Consultancy Projects Revenue : 6.14 Cr
Total Consultancy projects Revenue for 20-21: 1.7 Cr


Publications
380
3700
Total Number of Publications
Total Number of Publications for 20-21


Patents
2%
16%
82%
Total Number patents filed: 66
Total Number of Patents filed in 20-21: 13
Patents granted in 20-21:2

IIT Indore exemplary research in combating the COVID 19 challenges and the following research contributions

Sr. No	Faculty	Title of Research	Brief description
1	Principal Investigators: Dr. Debasis Nayak (IIT Indore) Dr. Akanksha Chaturvedi (NCCS, Pune)	Candidate Vaccine against SARS-CoV2.	**Candidate Vaccine against SARS-CoV2.** **Progress report: May 13, 2021.** In this project, we partner with NCCS Pune using a pseudovirus vector-based platform to develop a candidate vaccine against SARS-CoV2. We have successfully established pseudotype generation using vesicular stomatitis virus (VSV) backbone and SARS-CoV-2 Spike proteins. The VSV is a mild animal virus and does not cause any disease in humans. Following this, we have completed in vitro characterization of our candidate at IIT Indore. Subsequently, our collaborator at NCCS Pune, has performed immunogenicity studies in the mouse model. We are extremely excited to see that our candidate performed well in these animal experiments. The injected animals showed a high-quality neutralizing antibody response to the first and booster dose of the candidate vaccine. Currently, we are improving the antigenicity and broadness of the candidate to accommodate the spreading of the **double mutant (B.1.617) strain of SARS-CoV2**. In the next step, animal challenge studies are about to be performed. We have sent the proposal to CCMB Hyderabad and the Institute of Life Sciences (ILS) Bhubaneswar to conduct animal challenge studies in a BSL-3 environment with live viruses.
2	Dr. Sharad Gupta (Biosciences and Biomedical Engineering)	Sterlization Chamber	The departments of Biosciences & Biomedical Engineering and Electrical Engineering jointly are working on the development of sterilization chamber. The chamber uses 254 nm ultra-violate (UV) rays to sterilize personal objects i.e. mobile phone, wallet, etc. of duty-bound police, doctors, and associated personnel. This is being done on the request of **Shree Vivek Sharma, IG of Indore Zone**.
3	Dr. I A Palani, Dr. Indrasen Singh (Mechanical Engineering)	Reusable Mask	Developing customized 3D printed reusable masks having a provision to have reusable filters and straps. These 3D printing is done on the fabrics and they will have a provision to be cleaned and reused. Few masks are already printed for trial purposes. In addition, the group is also in the process of developing customizable mask based on the different face features of an individuals.

4	Dr. Vipul Singh (Electrical Engineering) Dr. I A Palani (Mechanical Engineering) Dr. Abhishek Srivastava (Computer Science and Engineering)	Wearable optical body temperature sensor	Development on Shape Memory Alloy based optical temperature sensor for sensing the body temperature. This device can be fitted into the fabric of the patient and the body temperature can be continuously monitored without physical contact or thermometer or thermal scanner. The group is working on the process to further enhance the resolution of the sensor to continuously monitor the body temperature and make it and IOT enabled system, so that the doctors can monitor the patient's temperature even at remote locations.
5	Dr. Vipul Singh (Electrical Engineering)	UVC LED	Development of UV-C LEDs and UV-C photodetectors for disinfection of surfaces/ PPEs against COVID-19 and other pathogens. The exposure to UV-C radiations is known to kill and inactivate pathogens by destroying their nucleic acids by disrupting their DNA.
6	Dr. Amit Kumar (Biosciences and Biomedical Engineering)	SARS-CoV-2 protein	Dr. Amit Kumar, faculty in Biosciences and Biomedical Engineering has been scrutinizing the SARS-CoV-2 protein information for the designing an effective vaccine encompassing both the T-cell and B-cell epitopes. He and his group has screened all the proteins of SARS-CoV-2 to search for the patches that can be used for immunity generation against this pathogen. These patches were thoroughly analyzed by using various computational tools to generate a model vaccine candidate having a propensity to elicit protective immune response. The work is currently under peer review and represents preliminary data that can act as an initial platform for the rapid generation of an efficacious protective vaccine against SARS-CoV-2 infection.
7.	Prof. Avinash Sonawane (Biosciences and Biomedical Engineering)	Stopping Covid-19 Pandemic	Six research groups representing different countries i.e. India, Norway, Sweden, USA, France and Denmark have been invited to be a part of the International Network Research Project "Stopping Covid-19 Pandemic", funded by Norwegian Research Council. The Indian research group led by Dr. Avinash Sonawane, faculty in Biosciences and Biomedical Engineering at IIT Indore. The objectives of this project are to study Covid-19 virus interaction with human host cells, pathology of Covid-19 in human and identify susceptibility-resistance factors, Cloud computing, Machine Learning (ML) and artificial intelligence (AI) as tools to identify primary drivers of COVID-19 infection. The Indian Research Group will be studying on the Proteomic and antibody generation.
8.	Prof. G.S. Murthy, Dr. Debasis Nayak, Dr. Sharad Gupta (Biosciences and Biomedical Engineering)	Disinfection Tunnel for Covid-19	Development of Disinfection Tunnel using ICMR approved water-soluble biocompatible disinfectant

9.	Dr. Parimal Kar (Biosciences and Biomedical Engineering)	Drug discovery for Covid-19	Computer-Aided Drug Discovery against COVID-19
10.	Dr. Parimal Kar (Biosciences and Biomedical Engineering)	Covid-19	Identifying Possible Potent Inhibitors against COVID-19 via Computational Drug Repurposing Study
11.	Dr. Mirza S Baig (Biosciences and Biomedical Engineering)	Fusion peptide for SARS-CoV-2	Designing of a novel fusion peptide as a preventive as well as therapeutic, agent against SARS-CoV-2 infection
12.	Dr. Mirza S Baig (Biosciences and Biomedical Engineering)	Covid-19	Structure-based design of novel peptidomimetics targeting the SARS-CoV-2 spike protein Expected Outcome: The study is expected to explore novel peptide derivatives, which could inhibit the interaction of SARS-CoV-2 with ACE2 thereby blocking its Entry into the Host Cells.
13.	Dr. Mirza S Baig (Biosciences and Biomedical Engineering)	Covid-19	Dual Targeting of 3CLpro and PLpro of SARS-CoV-2: A Novel Structure-Based Design Approach to treat COVID19 infection
14.	Dr. Mirza S Baig (Biosciences and Biomedical Engineering)	Covid-19	Identification of a Potential Peptide Inhibitor of SARS-CoV-2 Targeting its Entry into the Host Cells
16.	Dr. Shanmugam Dhinakaran (Mechanical Engineering)	Simulation for Covid-19 spread	Experiments and lattice Boltzmann simulations of infectious virus transport in the air from humans
17.	Prof. Sandeep Choudhary (Civil Engineering) Dr. Rajesh Kumar (Physics)	Fluorescent disinfectant bricks	Prof. Sandeep Choudhary of Civil Engineering and Dr. Rajesh Kumar of Physics are working on the development of self-illuminating fluorescent bricks and coatings for UV Disinfection Building Chambers to disinfect the passenger luggage. This will be done by converting existing concrete buildings into closed UV chambers by completely packing the openings (doors, windows, and ventilators) to avoid the exposure of UV light.
18.	Dr.Pankaj Sagdeo (Physics)	Covid-19	Development of UV based set up to deactivate Covid19 VIRUS
19.	Dr. Shantanu Manna (Mathematics)	Time dependent Mathematical Model for Covid-19	Working on the time dependent Mathematical Model based on the following parameters a)Total Population b) Susceptible Population c) Infected Population infected d)Undetected infected Population e) Expected recovery of quarantined population f)Recovered Population
20.	Dr. M Tanveer (Mathematics)	Machine Learning for virus detection	Detection of Coronavirus using advanced machine learning techniques

1) Total Projects : 388, Amount : Rs 2,36,40,03,168/-
2) Projects in FY 20-21 : 50, Amount: Rs 1,18,50,03,310/-
3) GIAN courses, TOTAL : 74, in FY 20-21 : 3 (As mentioned in the website)
4) Workshop : in FY 20-21 : 3 , Estimated Amount : Rs 3,50,000/-
5) Conference in FY 20-21 : 2 , Estimated Amount : Rs 39,50,000/-
6) Project / Research Staff : In FY 20-21 : New 37 added, Total : 172

Learning Resource Center

The Learning Resource Center (LRC) has a collection of 36578 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 LRC also boasts of a select collection of fiction, literature, and general interest books such as current events, sports, 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 LRC. The LRC shifted to its own building in March 2020.



Figure 1. The Learning Resource Center (LRC) Building

Library Usage: (April 2020 to March 2021)

User category wise book issue:

The number of books borrowed by various categories of users during the period April 2020 to March 2021 are displayed below.

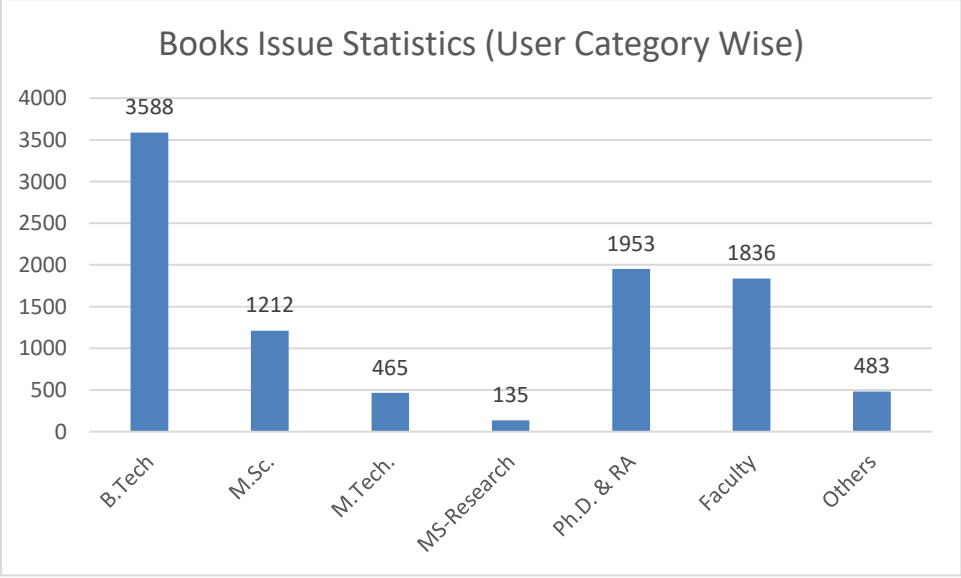


Figure 2. Book Issue Statistics (User Category Wise) (Apr.2020 - Mar.2021)

Department wise book issue: Books borrowed by users belonging to various departments are as displayed below.

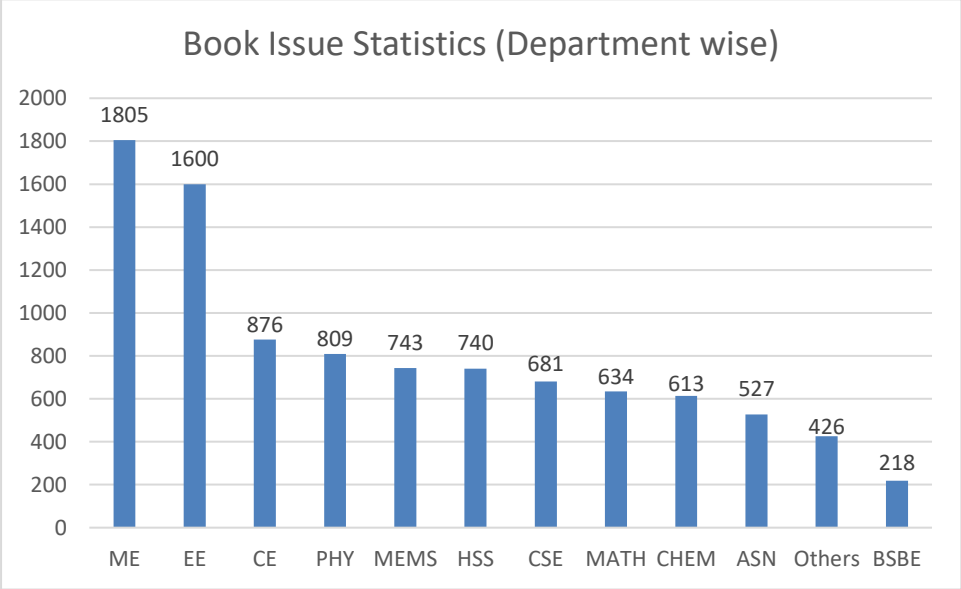


Figure 3. Book Issue Statistics (Department wise) (Apr.2020 – Mar.2021)

Electronic Resources: In today's world of Information explosion, access to electronic information resources is essential, particularly in an academic environment. The LRC 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 LRC. In addition to this, journals published by publishers such as Elsevier, Springer and Taylor & Francis are also available to users of the LRC. The LRC provides access to 8650+ e-journals and 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 LRC.

The complete list of e-resources with hyperlinks is available on the LRC website for users' convenience, so that users can access the resources from the LRC website itself.

The LRC Services:

At present, the LRC 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 LRC 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 LRC provides air conditioned and Wi-Fi enabled Reading Room with a seating capacity of 350 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.

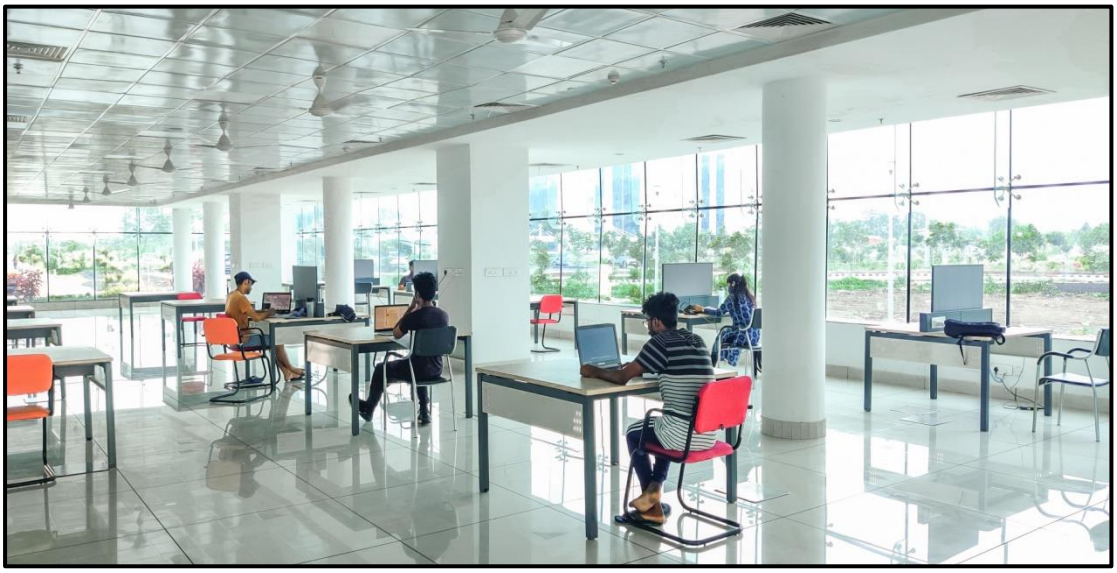


Figure 4. Reading Room

- **Inter Library Loan & Document Delivery Services**: The LRC 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 selected portions of library resources as required by them, subject to the provisions of the Copyright Act.
- **Orientation Program**: The LRC conducts orientation programs for new students to make them aware of the library resources and services and to help them utilize the LRC resources optimally.
- **Originality check:** The LRC provides originality reports to users for their assignments and papers, using Turnitin.
- **Remote access to the LRC resources:** The LRC provides 24x7 access to its digital resources for the users of the LRC, through RemoteXs.
- **CCTV Surveillance**: The LRC 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 LRC.
- **QR Codes:** The LRC is using QR code technology to provide quick access to users to the LRC website, LRC OPAC, and recommendation forms for books and journals.
- **Trial Access:** The LRC 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 LRC Committee discusses the subscription option based on the recommendations/feedback received from users.

- **Children's Collection:** The LRC 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 900+ titles are available for children in the age groups ranging from 04 to 14.

The LRC Services during Covid-19

The LRC team have worked tirelessly during lockdown period to make the library services available to its users to the extent possible. During this period, the LRC has purchased requested textbook in e-book format and provided access through RemoteXs to users. Many publishers have offered free access/trial access to their content in view of Covid-19 situation. The LRC has provided link on website and informed users. We have provided research papers/articles and similarity check reports to students and faculty as per their requirement. The LRC team has co-ordinated with students and hostel team to collect issued books for providing no dues to students.

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 LRC collection by checking the **Web OPAC** (Online Public Access Catalog) at ***koha.iiti.ac.in.***

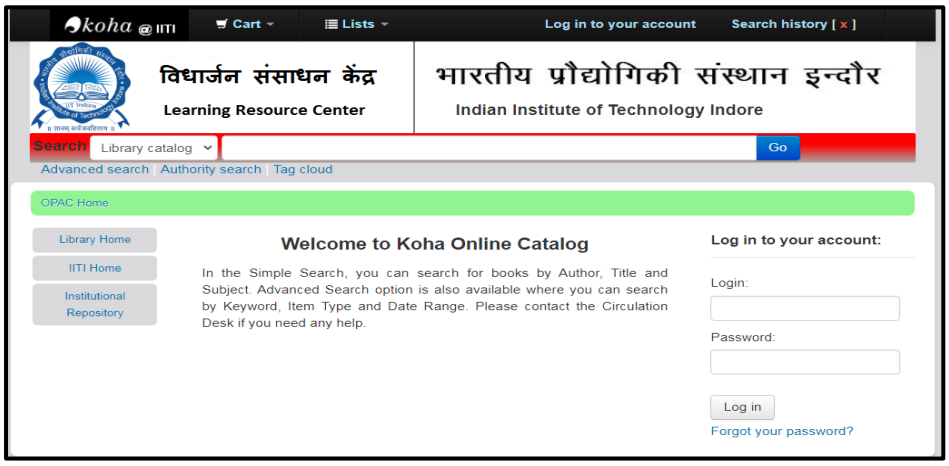


Figure 5. Web-OPAC

• **Library Website**: Detailed information about the LRC can be accessed through the LRC website at: http://library.iiti.ac.in/

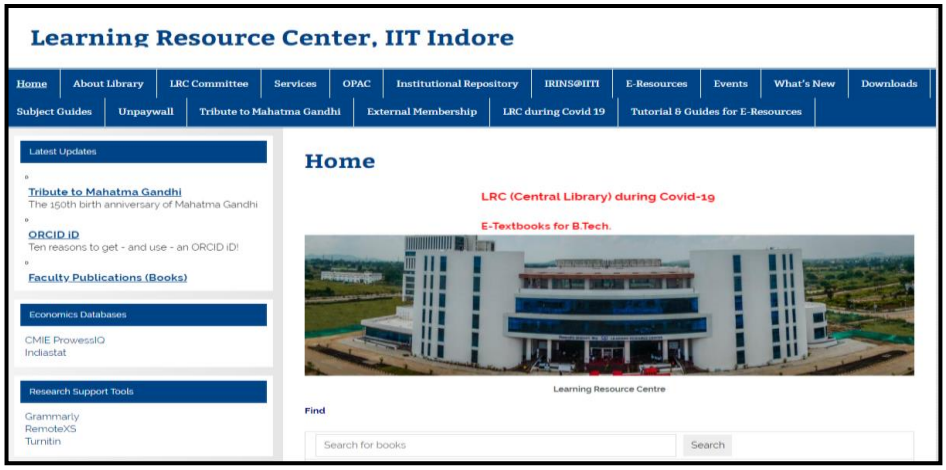


Figure 6. LRC Website

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 Ministry of Education, 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 Staff Position:

As on 31st March 2021, **114** non-teaching staff have been appointed, as per the details given in the table below.
Group 'A' Officers - **18**
Technical Staff - **41**
Other Administrative Staff - **55**
Number of non-teaching staff members appointed during the year is as under:
Non-teaching staff - **0**
No. of staff were relieved due to resignation/other reasons – **03**

1.3 Staff Welfare

As a result of dedicated efforts by the institute authorities the Ministry of Education in September 2020 has sanctioned for opening Kendriya Vidhyalaya in IIT Indore campus. This is one of the major achievements for facilitating in campus residents including PhD Scholars, Scientists, Post-Doctoral Fellows, Faculty/Staff members etc. It will also facilitate the nearby village residents to get an affordable and standard education.

Institute has entered an agreement with SBI Life Insurance Company Limited by following an appropriate tender procedure for providing Comprehensive Group Insurance Policy to the regular employees of the Institute. This has benefited the interested employees to get a policy with low premium with minimum documentation.

In order to increase transparency in the work system the Board of Governors of the institute has approved implementation of DoPT guidelines regarding Annual Performance Appraisal Reports (APAR) for non-teaching employees of the institute.

The Board of Governors of the institute has approved adoption of the Department of Personnel & Training, Government of India instructions in respect of compassionate appointment at the institute. Key objective of the scheme is to grant appointment on compassionate grounds to a dependent family member of IIT Indore employee deceased in harness or who is retired on medical grounds, their by leaving his/her family in penury and without any means of livelihood, to relieve the family of the IIT Indore employee concerned from financial destitution and to help it get over the emergency.

Nursery School and Day Care/Crèche Facility has also started in campus and a dedicated committee has been made to ensure all the necessary arrangements in this regard.

Continuous steps have been taken for increasing facilities for the students as well as institute community members residing inside the campus and several facilities like Vegetable Shop, Daily Needs shop, Laundry services, Bakery, Electronics (Sales & Services) has been inaugurated and are made functional with the help of a dedicated committee for the same.

1.4 Human resource development

Human resources development is important because it is an investment in one's employees that will ultimately result in a stronger and more effective workforce. 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 focuses on organizing in-house workshops training sessions, expert talks etc. so that a large no. of employees get benefited and a two way interaction will explore the topics appropriately. However, during this financial year because of pandemic conditions due to Covid not many staff members were sent for training, workshop, seminars etc. In tune with the current situations, several online webinars have been organized and few of the staff members have participated in online trainings to gain the expertise in the relevant work areas. 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 also been permitted to pursue higher studies as well without affecting their office duties.

Details of Online Training Programme

Name	Post Held	Training obtained from	Training/Course	From	To
Mr. Rakesh Jain	Deputy Manager	Indian Rubber Manufacturers Research Association (Affiliated to DPIIT, Ministry of Commerce & Industry, Govt. of India)	02 days Online webinar on "Transparency Audit with respect of compliance under Section 4 of RTI Act, 2005"	18.02.2021	19.02.2021

1.5. Reforms measures undertaken during the year inter-alia include:

- As per the instructions of Govt. of India the Board of Governors has considered proposal for opening dedicated outlet of "Pradhan Mantri Bhartiya Janaushadhi Kendra(PMBJP Kendra) inside the Campus.
- Starting of Post Office facility inside the campus premises.
- Adoption of DoPT rules on leave encashment.
- A camp has been organized through outsourced agency for verification of Provident Fund deductions and to resolve the queries of outsourced staff.
- 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)/Ministry of Education. All RTIs have been closed in a timely and hassle- free manner.
- Constitution of Covid Task force to deal with all issues related to reentry of faculty members, staff members, and students to the campus after completion of the national lockdown in view of COVID19.
- IIT Indore has created a pool of empty cylinders to help the needy people suffering from COVID-19 symptoms and also handed over 10 empty cylinders to Simrol Panchyant for establishing a COVID care hospital in rural area.

1.6 Meetings of the Authorities: -

Board of Governors:	Five Meetings held on 26.05.2020, 07.08.2020, 17.10.2020, 21.01.2021, 26.03.2021
Finance Committee:	Five Meetings held on 26.05.2020, 07.08.2020, 17.10.2020, 21.01.2021, 26.03.2021
Building and Works Committee:	Four Meetings held on 30.04.20, 10.07.2020, 06.01.2021, 23.03.2021
Senate:	Four Meeting held on 05.06.2020, 17.07.2020, 17.10.2020, 13.03.2021

1.7 Activities held as per the Ministry of Education instructions:

1. Observing the Birth Anniversary of Sardar Vallabh Bhai Patel on 31st October 2020 "Rashtriya Ekta Diwas"
   - Pledge Taking
2. Observance of "Vigilance Awareness Week 2020"
   - E-Pledge
   - Talk on Vigilance Awareness in common areas of work conducted on 3-11-2020.
   - Release of souvenir on Best Practices adopted by the institute.
   - Concluding session by Deputy Inspector General of Police (DIG), Indore.
   - Go live of online indent for purchases.
   - Plantation in campus.
3. Celebration of "Constitution Day"

2. Faculty Affairs

2.1 Faculty Affairs Office deals with all administrative matters related to the faculty members. It maintains administrative records from recruitment to relieving of the faculty members. The office 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 and Mr. Amit Mishra – Manager (Technical).

2.2 This office enables the following tasks:

(a) Conduct of recruitment drive and appointment of permanent/contractual/ visiting/emeritus faculty members in various departments.
(b) Joining formalities of newly joined faculty member.
(c) Maintenance of Service Records and Personal File of faculty members.
(d) Processing of all service matters including pay, promotion, leave, LTC, dependent list, deputation, annual increment, extension of tenure for contractual appointments, confirmation, etc.
(e) Regular updation of service details.
(f) Providing responses to MHRD/RTI Queries and Lok Sabha/Rajya Sabha questionnaires.

2.3 Some of the major works undertaken during the year 2020-21 are as follows:

(a) Conduct of Special Recruitment Drive for Reserved category and PWD candidates.
(b) Development of Faculty Affairs webpage.
(c) Publishing of Faculty Handbook consolidated with the rules, regulations, facilities, and expectations from IITI community.
(d) Development of Faculty Application Portal for New Recruitment.
(e) Digitisation of the administrative records.
(f) Formulation of various policies for standardisation of rules and procedures.
(g) Streamlining the joining formalities to ensure minimal movement and faster adaptation of the newly joined member to the new environment.
(h) Provision of Welcome Kit to the newly joined faculty members.
(i) Reduced paperwork and approval through emails.
(j) Timely provision of LTC Special Cash Package to faculty members.
(k) Shifting of the new office in Abhinandan Building.

2.4. The faculty positions filled as on March 31, 2021 is as follows:

Designation	Strength
Professor	14
Associate Professor	68
Assistant Professor Grade-I	53
Assistant Professor Grade-II	20
Total	**155**

2.5 The number of faculty members joined service at IIT Indore during the year 2020-21 is 13 and details are as follows:

Designation	Strength
Assistant Professor Grade-I	03
Assistant Professor Grade-II	10
Total	**13**

2.6 Dr. Sharad Gupta, Associate Professor, BSBE was relieved on lien for a period of one-year w.e.f. January 14, 2021 (AN) to join Jawaharlal Nehru University, New Delhi.

2.7 Dr. Raghunath Sahoo, Associate Professor, Physics proceeded on sabbatical leave for research activities from March 2021 for one year to visit CERN, Geneva, Switzerland to work in the Experimental Physics Department as a CERN Scientific Associate for advanced scientific research.

2.8 The list of faculty members who joined IIT Indore during the year 2020-21 is as under:

Sl. No.	Name of Faculty Member	Department	Position/ Designation	Date of Joining
(a)	Dr. Priyansh Singh	CE	Assistant Professor (Grade II)	16-Jun-20
(b)	Dr. Gourab Sil	CE	Assistant Professor (Grade II)	25-Jun-20
(c)	Dr. Nagendra Kumar	CSE	Assistant Professor (Grade II)	15-Jun-20
(d)	Dr. Ranveer Singh	CSE	Assistant Professor (Grade II)	30-Jun-20
(e)	Dr. Chandresh Kumar Maurya	CSE	Assistant Professor (Grade I)	14-Jul-20
(f)	Dr. Kalandi Charan Pradhan	HSS	Assistant Professor (Grade II)	9-Jun-20
(g)	Dr. Mohanasundari Thangavel	HSS	Assistant Professor (Grade II)	15-Feb-21
(h)	Dr. Mohd. Arshad	Maths	Assistant Professor (Grade II)	21-Jul-20
(i)	Dr. Indrasen Singh	ME	Assistant Professor (Grade I)	25-Aug-20
(j)	Dr. Yuvraj Kumar Madhukar	ME	Assistant Professor (Grade I)	25-Aug-20
(k)	Dr. Ashish Kumar Rajak	ME	Assistant Professor (Grade II)	24-Sep-20
(l)	Dr. Krishna Mohan Kumar	ME	Assistant Professor (Grade II)	8-Oct-20
(m)	Dr. Sandeep Singh	ME	Assistant Professor (Grade II)	17-Dec-20

3. Material Management Section

MMS activities were revamped considering the pandemic situation to cater the research and academic requirement of the institute. To cater the needs of IITI community below mentioned activities were initiated:

3.1 ERP system: ERP was introduced to enable the user to submit their requisition/indent from their home to follow the work from home protocol.

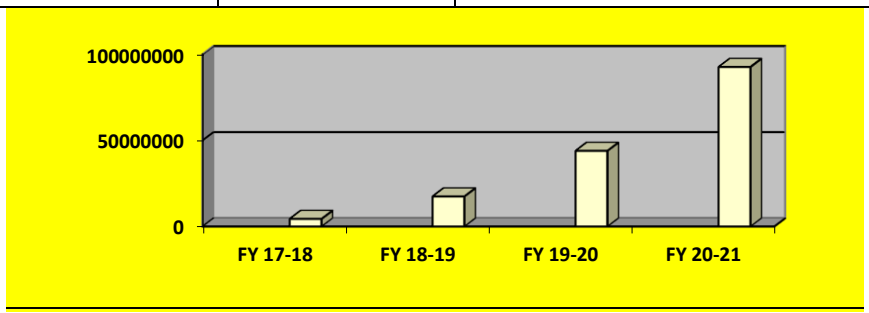
3.2 Online Pre-bid meeting: Online pre-bid meeting was introduced to give the opportunity to the buyer as well as supplier to discuss the technical parameters for better understanding of the item/service to be supplied from their home/office.
However, all the activities pertaining to the procurement and stores were performed online and MIS report of the same is mentioned below:

Sl. No.	Details	2020-21	Value
1.	Total Indent Issued	1144	Non-Project- 759 Project- 385
2.	Total Purchase Order Issued	1168 PO- 737 GeM- 431	Total Po Value ₹ 26,03,96,066/- PO- ₹ 16,77,47,852/- GeM- ₹ 9,26,48,214/-
3	Letter of Credit	05	LC - ₹ 1,01,44,441/-
4.	Import of Materials (Equipment + Consumables)	23	₹ 1,44,44,004.00 (8% of total procurement)
5.	Concessional Custom Duty	48	CDEC- ₹ 6,30,32,871/-
6.	Total GST Certificate Issued	GST 1170	GST- ₹ 11,22,81,541/-
7.	Indent under sanction stage		₹ 1,49,55,762/-
8.	Prebid Meetings		Online Prebid Meeting- 72+
9.	Stock Entry Till 31/03/2021	Total Stock Entry: 3969 Nos. – ₹ 51,33,13,204/-	

10.	Yearly Statistical Report of CPPP				
	Financial Year	2020-2021	2019 - 2020	2018 - 2019	2017 -2018
A	Indian Institute of Technology Indore	111	258	191	16
	Total	111	258	191	16

Yearly Statistical Report of GeM

Financial Year	No of Order	Value of Procurement on GEM (INR)
FY 17-18	10	₹ 44,09,088.00
FY 18-19	85	₹ 1,74,52,687.00
FY 19-20	436	₹ 4,39,20,775.00
FY-20-21	431	₹ 9,26,48,214.00



Graphical Growth on GEM Procurement

3.3 Pipeline Work in process:

Furnishing of upcoming buildings:	a) Abhinandan Bhawan (Furniture & Roller Blinds) b) Learning Resource Centre c) Lecture Hall Complex. d) Guest House (Furniture) e) Lecture Hall Classrooms (AV Equipment Installed)
Service Contracts	a) Flight Booking Services -Under approval stage.

	b) Radiation Services at health center- Order Placed, Operation activity will be started. c) Diagnostics at Health center- Order Placed, Operation activity will be started. d) Print management solution- Under Evaluation stage. e) END to END Housekeeping tender. f) END to END CHA/clearing & forwarding agency- Under Technical Evaluation Stage.

3.4 Major Saving of Expenditure on e-Procurement on GeM:-

Sl No.	Details of Procurement	Estimate Cost (Rs.)	GeM Order Value (Rs.)	Saving of Expenditure (Rs.)
01.	Audio Visual equipment for lecture hall complex	7,91,00,000/-	6,18,45,889/-	1,72,54,111/-
02.	LCD/DLP laser projector & digital podium for lecture hall complex	1,33,50,000/-	90,32,650/-	43,17,350/-
			Total Saving of expenditure (₹)	5,71,461.00

3.5 Achievement of MMS Activities:

a. Online Indent Module: Implementation of Online Indent module on November 5,2020.
b. BSBE Fire Claim Settlement: The incident was happened on 28/05/2019 at BSBE Lab at IIT Indore and the same was informed to insurance agency for survey and process of claim. The claim amount i.e. Rs. 61,02,000/- was submitted to insurance agency under the policy no: 12053717 and after several efforts and submission of all restatement of assets, claim has been settled. The settlement amount of Rs. 24,95,928/- has been received against the claim on February 08,2021.
c. PBG encashment of M/s. Tech SIS Limited against security services "CAPEX Model: Surveillance Solutions: The bank guarantee of Rs. 18 Lakhs approx. of M/s. Tech SIS Limited was encashed on February 01,2021 towards non-compliance of the warranty obligations of the supplied items. However, the firm has replaced the items and bank guarantee amount has been released to firm on March 15,2021.
d. Construction, Supply & Installation of Modular Kitchen facility for Faculty Housing at IIT Indore. (Indent no.525 /20-21): The tendering process for the captioned procurement has been completed and the order has been placed on M/s. SRK Trade Build India Pvt. Ltd, Indore for Rs. 38,45,555
e. Tender for Nalanda Auditorium Hall Furniture: The subject tender has been floated through CPP Portal along with newspaper publication and the estimated cost of the proposal is Rs 4.8 Crores. Total 07 bids have been received and the proposal is under technical evaluation stage.
f. Implementation of Hindi language in Office working for daily routine procurement file.
g. Standardization of Furniture for all teaching & Non-Teaching staff /Students is under process.
h. Laboratory shifting of BSBE, Chemistry & Physics from School Building to POD.
i. Shifting of departments from HUB & School Building to Abhinandan Building.
j. Opening of Allied services & Kiosk services in the Campus- 47 nos. bid opened.
k. Online Procurement on GeM, CPPP listed IITI as Major Entity with DSC of MMS, Finance, Administration, R&D, members.

3.6 POLICY MATTERS:

a) Exemption of GTE upto Rs. 200 Crore: In compliance of the letter no. 1-15/2017-TS.I Part (2) dated 29th January, 2021 issued by Department of Higher Education Ministry of Education, Govt. of India, all Global Tender Enquiries (GTE) for a value upto Rs 200 crores are to be tabled in the meeting of BoG. In view of the above, the list of tenders floated by the Institute under GTE is placed as Annexure -I for ratification.

b) MoU between GeM and IIT Indore: MoU has been signed with GeM for developing advanced version of GeM including development of mobile app with participation from the students and faculty members of IIT Indore. Copy of the MoU is attached herewith as Annexure -II

c) Revision of forms in MM & Stores: Forms are revised incorporating the GFR clauses and GeM Order.

d) GST Certificate: Initiated a form for issuance of GST Certificate against direct purchase for research purpose.

e) Bid Openers on CPPP: Member finance has been taken on board for online bid openings on CPPP.

f) Representation time to disqualified bidders: The disqualified bidders are given reasonable opportunity in each case to represent against their disqualification criteria.

3.7 MISCELLANEOUS- TIME BOUND TASK:-

a) Convocation 2020 - Proactively involved in Event Management Services including supply of Structure, Services, Facilities for Convocation function, Printing of Invitations and Convocation Reports etc.

b) Furnishing of Upcoming Classrooms.

c) Active support to facilitate the requirement for various events of TEQUIP/GIAN/Fluxes.

d) Active participation and coordination for Foundation Day Celebration & Alumni Meet.

e) Active participation in recruitment activities such as timely publication of recruitment advertisement, scrutiny of application and invigilation duty etc.

f) Finalization of Accounts: Submission of order details with delivery & installation status, LC status, submission of bills etc.

3.8 MMS Extraordinary activity in 1nd Wave of Covid Lockdown:

a) Coordinate with the staff members for arrangement of grocery, medicine for IIT community.

b) Transport arrangement for special delivery of shipment regarded to COVID 19 research.

c) Procured urgent items like PPE Kits, medicines and other medical items to facilitate the IIT Community.

d) Covid-19 research sample handed over to IIT Kanpur during the lockdown of 1st wave.

e) Scan the documents of various department to share with the staff member for online work.

f) Handing over the equipment Real time PCR to MGM collage for testing of RTPC Report of Indore.

3.9 MMS Extraordinary activity in 2nd Wave of Covid Lockdown:

a) Collected Oxygen Concentrator from Company Warehouse in Strict Lockdown in the city, and handed over to Health Centre.

b) Procured urgent items like PPE Kits through GeM, Remdesivir Injections, Fabiflu Tablets, Pulse Oxymeter, and other medical items to facilitate the IIT Community.

c) Collected Exports sample from IIT Campus and sent to Lithuania, Europe for research purpose, indented by Dr. Rajneesh Misra.

d) Organized Drive for Covid-19 Vaccination in IIT Campus and also designed poster for the drive.

e) Volunteered in the Vaccination Drive.

3.9 Food Court Facility at Central Dining Hall:- Kiosks installed and new Service providers started operating on different business models.

a) Bakeology

b) Daily Needs

c) Repair of Computer peripheral

d) Tea Post
e) Amul Milk Parlour
f) Vegetable & Fruit Counter
g) Saloon Facility etc.

3.10 Training & Handholding Sessions Conducted by MMS:

a) Online Indent ERP Module launched on 05/11/2020 by Director.
b) Online Indent ERP Module Demonstration cum Training Session on 24/12/2020 attended by 120 persons Online & Offline.
c) Training cum Hand holding Session on procurement through GeM held on 15/02/2021 attended by 80 persons Online & Offline.
d) Training cum Hand holding Session on procurement through GeM for Kendriya Vidyalaya IIT Indore on 12/02/2021 attended by 3 Persons (1-Vice principal and 2-Teachers).

4. Finance and Accounts Section:

4.1 The year 2020-21 is characterized with the following Income and Expenditure:

(` in crores)

S. No.	Particulars	2020-2021
		Current Year
1	**INCOME**	
1.1.	**Grants**	104.01
1.2.	Academic Receipts	20.29
1.3.	Income from Investment	5.84
1.4.	Interest Earned	7.44
1.5.	Other Income	1.73
1.6.	**Total of 1**	**139.31**
2	**EXPENDITURE**	
2.1.	Staff Payments & Benefits	54.11
2.2.	Academic Expenses	17.91
2.3.	Administrative & General Expenses	19.17
2.4.	Transportation Expenses	0.22
2.5.	Repairs and Maintenance	2.83
2.6.	Depreciation	37.15
2.7.	Other Expenses	15.44
2.8.	**Total of 2**	**146.83**
3	**Balance being excess of Income over Expenditure**	**-7.52**

4.2 The position relating to creation of capital assets is as under:

(Rs. in crores)

S. No.	Particulars	2020-2021		
		HEFA	Other Purpose	Total
2.1	Opening Balance of Grant-in-Aid Plan	32.78	50.59	83.37
2.2	Grant received during the year	43.55	92.79	136.34
2.3	Deficit under OH-31 being added from IRG	-	2.90	2.90
2.4	**Total funds available at the disposal of the Institute**	**76.33**	**146.28**	**222.61**
2.5	Grant utilized for Revenue Expenditure	-	90.41	**90.41**
2.5.1	Interest on Term Loan for HEFA	13.60	-	**13.60**
2.5.2	Repayment of HEFA Loan (75%)	35.95	-	**35.95**
2.6	**Plan Grant after adjusting utilization for Income & Expenditure**	**26.78**	**55.87**	**82.65**
2.7	Utilized for developing infrastructure Buildings & Works 8.83 Utilized for Equipment's and other Assets 17.75	-	26.58	26.58
2.8	Unspent balance as on 31.03.2021	26.78	29.29	56.07

4.3 Funds availability and status of utilization thereof:

During financial year 2020-21, against sanction of Revised Detailed Project Report (DPR) of ` 1,911.12 crores, a sum of ` 136.34 crores (For Recurring & non-recurring Purpose ` 92.79 crores + For HEFA Purpose ` 43.55 crores) were released by Ministry of Education and Deficit under OH-31 being added from IRG credited to Grant-in-Air ` 2.90 crores. The Internal income of the Institute reckoned during the year was ` 12.97 crores, after adjusting payment of 25% HEFA principal loan from IRG (Institute share) ` 11.98 cores and after considering the unspent balance as on 01.04.20 of ` 50.59 crores, the total funds available at the disposal of the Institute was of the order of ` 202.80 crores.

A sum of ` 26.58 crores has been utilized for the creation of Capital assets and a sum of ` 139.96 cores (For Recurring purpose Rs. 90.41 crores + For HEFA purpose `49.55 crores) (which excludes Depreciation of ` 37.15 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 ` 12.97 crores transferred to Corpus Fund.

4.4 Reforms, measures and initiatives undertaken during the year include:

During the year under review the following reforms, measures Initiatives were initiated from Finance & Accounts :

4.4.1 Tuition fees for the undergraduate students joining from Academic Year 2020-21 is revised and subsequently MOE has introduced Vidyalaxmi scheme vide MOE 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. 15 students applied for Education loan under Vidyalaxmi scheme through State Bank of India, Nodal Bank for the scheme. Interest implication for Financial Year 2020-21 is Rs. 10,82,609/-.

4.4.2 Public Finance Management System (PFMS) is a platform for all DBT payments.

4.4.3 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.

4.5. Education assistance for children:

During the financial year 2020-2021, the Institute reimbursed a sum of ` 19,96,386/- to 268 faculty and staff members against for education assistance according to Government of India norms.

4.6. 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.

4.7. Advances:

During the reporting year, a total sum of ` 83.54 lakhs was sanctioned as personal advances for the following.

Sl. No.	Nature of Advance	No. of Beneficiaries	Amount Sanctioned (in `)	Amount outstanding as on 31.03.2021 (in `)
1	House Building Advance	-	-	77,72,320
2	Car Advance	-	-	89,000
3	Two-wheeler advance	-	-	57,402
4	Personal computer advance	09	4,48,996	435,496
	Total		4,48,996	**83,54,218**

4.8 Insurance:

Group Medical Insurance cover of ` 2.50 lakhs is provided for In-Patient treatment and Group Personal Accident cover of ` 5.00 lakhs is provided to all Students of the Institute. Expenses towards insurance is ` 28,49,915/- during financial year 2020-21. Care of Out-patient treatment is taken care mainly by the Health Centre internally.

4.9 Fellowships/scholarships:

4.9.1. To Research Students:

During financial year 2020-21, Institute has disbursed Fellowships for following category of Students:

S. No.	Category of Students	No. of Student	Fellowship (per month)
01.	Institute Funded through MOE grant-PHD	224	JRF- ` 31,000/- SRF- ` 35,000/-
02.	DST Funded (PHD)	34	
03.	CSIR Funded (PHD)	89	
04.	UGC Funded (PHD)	98	
05.	Institute Funded through MOE grant – M. Tech.	105	` 12,400/-

06.	Institute Funded through MOE grant – M. S. Research	32	` 12,400/-
07.	DBT – NCCS Pune	1	` 35,000/-
08.	PMRF	5	JRF- ` 70,000/-

4.9.2. Merit cum Means Scholarship:

Institute has disbursed ` 9,006,501 /- 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	50	51,03,072
		MSc	5	67,967
2	General (PD)	B. Tech	1	10,742
		MSc	1	7,61
3	OBC	B. Tech	34	36,43,394
		MSc	4	62,968
4	SC	B. Tech	10	72,620
5	ST	B. Tech	2	20,944
6	OBC (PD)	B. Tech	2	17,633
Total			**105**	**90,06,501**

4.9.3. Remission of Tuition Fees to Depraved Class of Students:

Institute has Remitted/disbursed ` 2,91,33,383 /- as Remission of Tuition fees of Under Graduate Students of Depraved Class admitted in Academic Session 2020-21 as per Ministry of Education 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'2021

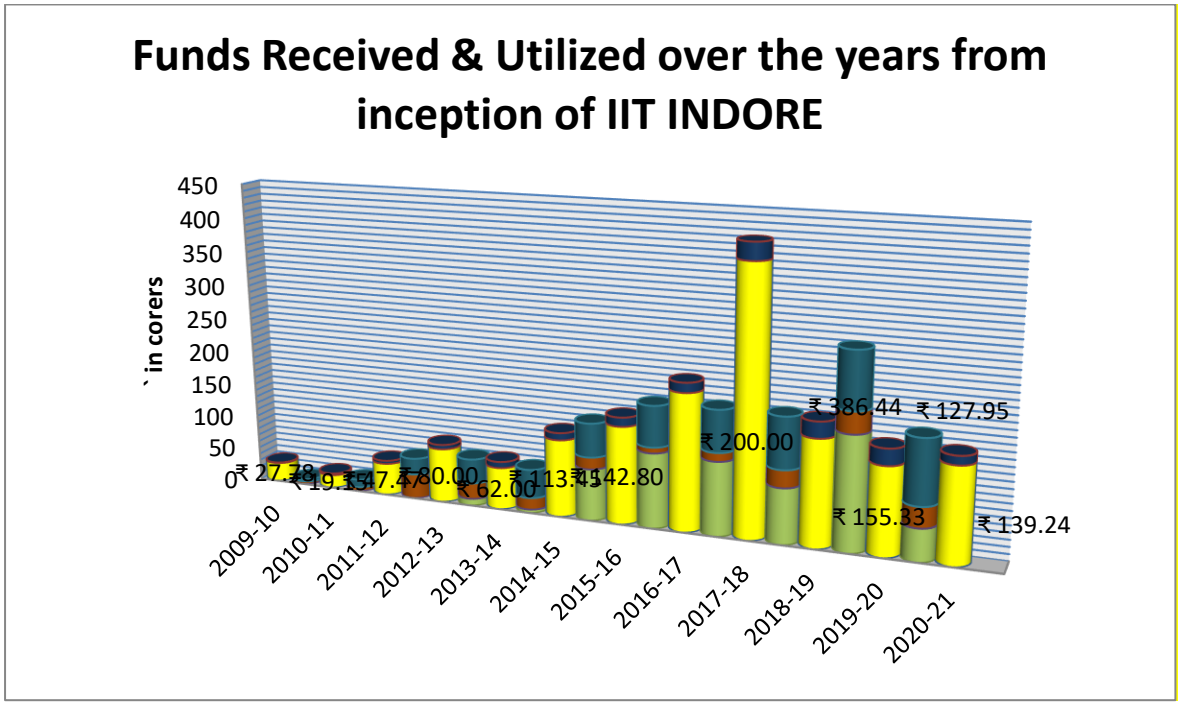
(Amount in Rs.)

SOURCES OF FUNDS	SCHEDULE	AS AT 31-03-2021	AS AT 31-03-2020
Corpus/Capital Fund	1	8,359,331,248	7,900,134,909
Designated/Earmarked/Endowment Funds	2	123,496,131	98,603,056
Current Liabilities & Provisions	3	4,353,030,629	3,507,194,517
TOTAL		12,835,858,009	11,505,932,482
APPLICATION OF FUNDS			
FIXED ASSETS	4		
A. Tangible Assets		8,532,173,070	6,048,644,775
B. Intangible Assets		43,499,732	43,310,715
C. Capital Work-In-Progress		954,974,024	2,405,406,939
INVESTMENTS FROM EARMARKED/ ENDOWMENT FUNDS	5		
Long Term			
Short Term		575,571	536,456
INVESTMENTS - OTHERS	6	-	-
CURRENT ASSETS	7	2,804,702,547	2,333,308,537
LOANS, ADVANCES & DEPOSITS	8	499,933,064	674,725,060
TOTAL		12,835,858,009	11,505,932,482

B. INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH'2021

(Amount in `)

PARTICULARS		SCHEDULE	2020-2021	2019-2020
(A) INCOME				
Academic Receipts		9	202,933,380	197,049,324
Grants & Subsidies:				
i. Grant Utilised for payment of Intereston Term Loan from HEFA	135,981,700	10	1,040,099,273	936,776,363
ii. Grant Utilised for Revenue Expenditure	904,117,573			
Income from Investments		11	58,375,213	68,054,242
Interest Earned		12	74,459,952	78,351,909
Other Income		13	10,505,882	23,812,191
Prior Period Income		14	6,775,974	17,752,447
TOTAL (A)			**1,393,149,674**	**1,321,796,476**
(B) EXPENDITURE				
Staff Payments & Benefits (Establishment Exp)		15	541,079,060	594,644,401
Academic Expenses		16	179,115,960	218,549,518
Administrative and General Expenses		17	191,762,101	220,072,502
Transportation Expenses		18	2,168,764	4,643,599
Repairs and Maintenance		19	28,328,871	36,301,668
Finance Costs		20	136,025,231	131,277
Depreciation		4	371,460,138	315,419,837
Other Expenses		21	8,935,484	2,044,537
Prior Period Expenses		22	9,494,564	2,837,604
TOTAL (B)			**1,468,370,173**	**1,394,644,943**
Balance being excess of Income over Expenditure (A-B)			**-75,220,499**	**-72,848,467**
Less: (i) Interest payable to MOE			-74,459,952	-78,351,909
(ii) Defecit under OH-31 being Utilised from IRG			-29,046,182	-
(iii) Payment of 25% HEFA Principal Loan from IRG (Institute Share)			-119,848,542	-
(ii) Transfer to Corpus fund towards Internal Revenue Generation of 2021-2022			-129,695,725	-306,668,204
Total			-428,270,900	-457,868,580
Add: Amount transfer from Capital Fund				
- Depreciation	371,460,138		-	-
- Leave Encashment liability	41,575,625		-	-
- Gratuity liability	15,235,137		-	-
Balance being Surplus (Deficit) Carried to Capital Fund			-428,270,900	-457,868,580



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	2020-21
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	`139.24
		IRG	`0.97	`2.65	`4.68	`6.58	`9.10	`10.51	`13.24	`14.37	`25.52	`23.57	`23.86	`12.97
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	`8.84
		EQUIPMENT	`3.99	`5.98	`36.36	`23.54	`17.29	`17.39	`8.46	`12.54	`25.48	`31.45	`29.99	`17.75
		RECURRING	`3.50	`11.47	`24.06	`36.14	`42.15	`49.32	`59.51	`60.79	`74.54	`82.73	`93.68	`90.41

5. Health Centre Report

The Health Centre provides dedicated health services to the Institute community. It includes outpatient, trauma and emergency medical care, day care facility and inpatient services for minor ailments. The medical team comprises of medical officers, specialist consultants and well trained paramedical and supporting staff.

Facilities:

- OPD
- Teleconsultation
- Inpatient service for minor ailments
- Day care
- Trauma and emergency care
- Physiotherapy
- Basic Dental care
- Investigation facility
- Pharmacy
- 24 X 7 ambulance services

The investigation facility includes-

- ECG Facility
- Rapid Spot blood and urine tests
- For higher evaluations- Sample collection facility

Facility up-gradation-

- Ophthalmology facility
- Tele-consultation facility

Screening of every human entry in campus (From May 2020- January 2021)

- Development of Screening form – Health Centre team developed a screening form for online evaluation of the individual planning to visit the campus. All the employees re-entering the campus for the first time after national lockdown were requested to submit the form to screen

them for any risk.

- In person screening of all entries in campus was carried out at the institute gate by the health centre team. Any symptomatic individual was directed to health centre for treatment and further management.

Management of Covid 19 pandemic

Health center took various measures for management and control of Covid 19 infection during the pandemic with continuous support and guidance from administration.

Measures taken for control and management-

- **Awareness material to prevent and control Covid 19-** It was provided through e-mails, web material on institute and health centre website, posters.
- **Screening of patients and segregation**- Everyone was screened with history and evaluation for Covid. The suspected cases were quarantined, advised for Covid testing and were provided with necessary medications.
- **Quarantine of symptomatic cases-** They were daily evaluated till the Covid report was received. If symptoms were persisting, the patients were admitted at Health centre for close evaluation.
- **Quarantine of contact tracing-** The individuals in close contact were evaluated, quarantined, and released after negative report.
- **Covid testing on campus-** Covid testing on campus was carried out with support from PHC Simrol.
- **Management of Covid patients-** All positive cases were isolated, and their contact tracing was done.
- **Isolation facility on campus-** The students, employees and their dependents with mild symptoms were admitted in institute isolation facility as per local and national guidelines.
- **Tele-consultation**- Home isolation cases were followed up with teleconsultation. Medicines were provided to most of the home isolation patients staying inside and outside the campus. Many students who were at their hometown were also provided teleconsultation.

Data of services provided during 2020-2021

Sr. No.	OPD cases	Trauma and Emergency cases	Admissions including day care	In-house investigations Such as rapid spot tests and ECG	Admission of Covid Patients in Institute isolation facility	Teleconsultation	Screening of entries At institute gate (May 2020-January 2021)
1	4508	337	72	223	15	445	39618

6. Hostel Department

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 First Hostel at IIT Indore permanent campus has been inaugurated/established in the year 2016 that is A.P.J. Hostel (Avul Pakir Jainulabdeen) Abdul Kalam, after that in the year 2019 H.J.B. Hostel (Homi Jehangir Bhabha) was inaugurated/ established and in the year 2020 three more Hostels were inaugurated/ established that is Devi Ahilya Hostel, Vikram Sarabhai Hostel, and C.V. Raman (Chandrasekhara Venkata Raman) Hostel, they all Hostels were fully functional at that time. Each Hostel has a capacity of 489 rooms/students, which means the

overall capacity of all five Hostels is 2445 rooms/students. Out of five Hostels, A.P.J. Hostel is fully air conditioner.

The Hostel Department Headed by Dr. Lalit Borana, Chief Warden who is assisted by Mr. Neeraj Kumar Soni, Manager, Chief Warden Office. Each Hostel is Headed by Warden/Associate Warden with assistance of Supervisor and Attendant. The information of Hostels and Warden/Associate Warden are as follows: -

Hostel No.	Hostel Name	Hostel Type (Girls/Boys)	Warden/Warden In-charge	Associate Warden
01	APJ Hostel (Avul Pakir Jainulabdeen Abdul Kalam)	Boys	Dr. Harekrishna Yadav	Dr. Harekrishna Yadav
02	CVR Hostel (Chandrasekhara Venkata Raman)	Boys	Dr. Saptarshi Ghosh	Dr. Saptarshi Ghosh
03	HJB Homi Jehangir Bhabha	Boys	Dr. Jayaprakash Murugesan	NA
04	Devi Ahilya Hostel	Girls	Dr. Ruchi Sharma	Dr. Ananya Ghoshal
05	Vikram Sarabhai Hostel	Boys	Dr. Ram Sanjeevan Maurya	NA

6.2 Guest Rooms/Units in Hostel: -

In the year 2020 we made 100 rooms (20 units) as a guest rooms in the Devi Ahilya Hostel (25 rooms) and Vikram Sarabhai Hostel (75 rooms). In the guest rooms we are giving facilities like smart LED TV, Sofa Set, Centre Table, Cooler, Microwave, Electric Cattle, Mattress, Blanket, Bedsheet, Pillow, Bath Wears Cloth Stand etc.

6.3 Hostel Photos

Hostel No. 01 – A.P.J. Abdul Kalam



Hostel No. 02 – C. V. Raman



Hostel No. 03 – Homi J. Bhabha



Hostel No. 03 -Devi Ahilya



Hostel No. 05 - Vikram Sarabhai Hostel



6.4 Basic Facilities in Hostel

Basic Room



Common Hall



Kitchen with RO Water and Fridge



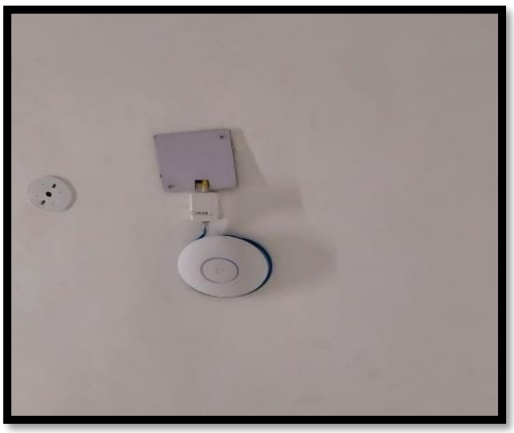
Washroom



Water Chiller



Wi-Fi



Sports Facilities in Hostel

Badminton Court

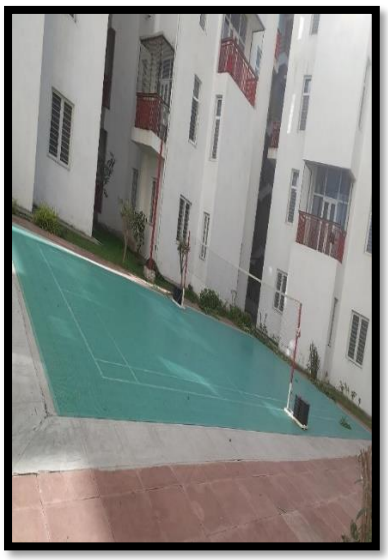


Table Tennis

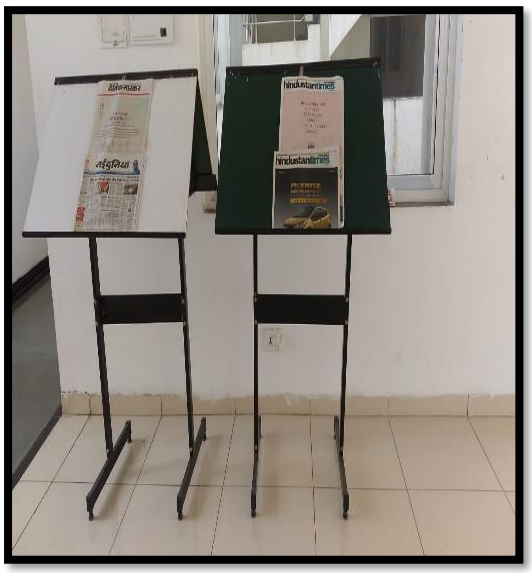


Soccer Table



Other Facilities in Hostel

News Paper Stand



Magazine Stand



Data of Service provided by the Hostel Department in 2020-21

Sr. No.	Particular	Numbers
1	Total number of students stayed in the Hostel in the year 2020-21 (During Worldwide pandemic Covid-19 time)	775 (Male-594 Female-181)
2	Number of students have been quarantined in Hostels for 14 days.	775 (Male-594 Female-181)
3	Number of students who have been provided/served of food and other facilities at Hostel itself for 14 days.	775 (Male-594 Female-181)
4	Sent luggage of graduate students to their Home with proper packing through DTDC Courier Service (Have taken photos of luggage packing and made Video call to the concerned students at the time of luggage packing).	400

Organized Window for reentry of students after national lockdown by Hostel

Window No.	Window Date	Number of Students Reported	Female Students	Male Students
1	May 20, 2020	34	04	30
2	June 19-21, 2020	62	10	52
3	September 16-17, 2020	66	27	39
4	October 13-14, 2020	72	23	49
5	November 6-7, 2020	88	26	62
6	January 5-6, 2021	99	25	74
7	January 21-22, 2021	103	11	92
8	February 16-17, 2021	171	37	134
9	March 12-13, 2021	80	18	62
	Total	**775**	**181**	**594**

Hostel Staff serving food and other Items to quarantined students



Hostel Staff checking temperature of the quarantined students



Hostel Staff activities during students quarantine in Hostel.



Hostel Staff activities during students quarantine in Hostel.









7. Central Dining Facility

The institute has a Central Dining Facility (Carbon building) wherein around 5000 people can have their meals at one point. Students of different hostels can have meals together in dining hall. Separate sections have been developed for dining of students, institute staff or any guests. The dining hall comprises of 02 big sized and 04 small sized kitchens, 02 common washrooms and lift facility as well. An Executive Dining Hall has also been equipped in Central Dining Facility for Hospitality & Dining services to the institute's invited/VIP guests.

Students are served healthy and nutritious meals wherein the student body decides the menu on a weekly basis and a dining committee monitors the overall functions. Quality of food is maintained by taking frequent feedbacks and immediate addressal of complaints. The payments are made to the caterer on the monthly meal plan basis. The payment is done through Smart Card Facility and is cashless only. The entire central dining facility follows COVID appropriate behaviour. Other than regular dining services, the carbon building also houses several kiosks which serve delicacies and other services round the clock.

The functioning of central dining section is supervised by a team of dining staff, student body, student volunteers, and administered by a dining committee headed by Dr. Abhijeet Joshi, Dining Warden.

Dining Hall Building Photo



Cleaning in Dining Hall during worldwide pandemic time





Secured and cleaned seating arrangements

Cooking activities with safety gears during worldwide pandemic time



8. Guest House Facility



The institute has a 03 star facility Guest House wherein 18 Non Executive Suites and 01 VIP Executive Suite is ready for the accommodation of the guest. Guest House rooms are equipped with world class facilities like Mini Bar, Tea/coffee kettle, In Room Wi-Fi, FHD Television, Telephone, Luxury bathroom fittings & Toiletries etc. The institute has also five fully furnished "1BHK" guest house units for the accommodation of family guest.

Guest House has an Executive Dining Hall where in 40 guests can seat and have meal in one shot. Guests are served healthy & nutritious meal whereas the menu is decided by the guests itself as per their preference. Guests are served the meal by the skilled hospitality staff.

The functioning of Guest House is supervised by the team of Guest House & Hospitality and headed by Dr. Suman Mukhopadhyay, Convener – Guest House & Hospitality.





IITI DRISHTI CPS FOUNDATION

About Us

IITI DRISHTI CPS Foundation is one of the various Technology Innovation & TBIs set up under NM-ICPS. The overarching goal of IITI DRISHTI CPS Foundation (A Section-8 Company) is to develop an eco-system that will enable knowledge generation through basic and applied research and foster an interactive environment where innovative products can be developed through joint efforts of industry and academia. To achieve this objective DRISHTI-CPS will enable technology development, job creation through HRD and skill development and create an entrepreneurship and start-up ecosystem.

TIH with the objective of promoting startups on the theme "System Simulation, Modelling and Visualisation" will undertake plethora of activities. Events under the hub and TBI will be beneficial in enhancing skills and entrepreneur development in the proposed area. The TBI will provide assistance/guidance/supervision in product/technology development, product simulation and prototype fabrication, analysis, machine tool requirement assessment and design to retain admitted incubates. Support for startup setup, layout, market survey, risk assessment, publicity, identifying investors, and human resources will be provided by the incubation centre.

Chairman's Message



Prof. Neelesh Kumar Jain

The objective of DRISHTI CPS will be achieved in the true sense by creating a self-sustaining system that supports R&D projects, patenting, licensing and commercialization, incubation of start-up companies, spin-offs and initiations of joint projects with industry.

The Hub has many milestones one of which is Center of Excellence in line with the objective of the Mission. I am pretty sure the ecosystem being created by the Hub will address many issues and gaps which different departments are facing.

I am sanguine the Hub will start soaring high soon, and the first Drishti Newsletter is a step towards it. Godspeed and big success to Dr. Sunil Dutta, CEO, and his team for their future endeavours.

Director's Message



Dr. K.R. Murali Mohan

The new challenges being faced across the globe have thrown many challenges in front of the Scientific Community. Some of these challenges are so critical, if not resolved in time, may result in severe consequences. Cyber-Physical Systems are the ray of hope for addressing issues that humanity is struggling with.

The Department of Science & Technology has launched a mission to create an ecosystem of Cyber-Physical Systems. Twenty-five premier Institutes have been selected, who will hold the baton of CPS and keep it rolling for addressing different issues. The National Mission on ICPS (NM-ICPS) aligns with high aspirations and offers a strategy to achieve the stated vision.

NM-ICPS is a Pan India Mission that includes Central Ministries, State Governments, Industry, and Academia. IITI DRISHTI CPS Foundation is one of the various TIHs set up under NM-ICPS. I wish all the best to IITI DRISHTI and looking forward to their contribution towards the goals and objectives of the Mission. Kudos to team Drishti on their first newsletter.
Dr. K.R. Murali Mohan

VISION

To become a pioneering center in simulation, modelling and visualization of cyber physical systems that will bolster Indian manufacturing via development and commercialization of state-of-the-art products and creation of skilled human resource (at all levels from researchers and entrepreneurs) and become a key enabler in catalyzing "Industry 4.0" to realize the vision of "Digital India".

MISSION

To develop a seamless platform by synchronizing and integrating various entities, making a fountainhead of knowledge, Skill enhancement, Research, Technology and Product Development, by innovation and commercialization for effecting resource optimization and sustainability.

THRUST AREAS

Modelling, simulation and decision making in cyber physical Industrial systems
Modeling and performance optimization of Energy systems
CPS-based Prognostics and health management (PHM)
Enabling precise and sustainable agriculture using CPS
Modeling and simulation for Biological and healthcare systems
Environmental systems modeling
Dynamical systems modeling and simulation

Modeling and simulation of material behavior
Social behavior modeling and simulation
HUB GOVERNING BODY

Board of Directors
At present there are two Board of Directors as appended:

- Prof. Neelesh Kumar Jain, Chairman IITI DRISHTI CPS Foundation
- Dr. I.A. Palani, Dean R&D, IIT Indore

Hub Governing Members

The HGB is a platform for all essential technical discussions in line with the Mission's objectives, adequately represented by academia, industry, and government.

- Prof. Neelesh Kumar Jain, Chairman IITI DRISHTI CPS Foundation
- (Officiating Director, IIT Indore)
- Dr. K.R. Murali Mohan, Mission Director, NM-ICPS Mission, DST, GoI.
- Dr. I.A. Palani, Dean R&D & Faculty, IIT Indore
- Prof. U.S. Dixit, Faculty, IIT Guwahati
- Mr. Akshay Hada, CMD Symphonia & Graphicus Pvt. Ltd.
- Mr. Amit Agrawal, COO, Cyber Infrastructure (CIS)
- Mr. Rinkesh Satija, Sr Director, PepsiCo India Holdings Pvt. Ltd.
- Prof. Sandeep Chaudhary, Faculty, IIT Indore
- Dr. Ankur Miglani, Faculty, IIT Indore
- Dr. Pavan Kumar Kankar, Project Director & Faculty IIT Indore

IIT-Indore sets up technology innovation hub

Indore: Indian Institute of Technology (IIT), Indore has set up a Technology Innovation Hub (TIH) aimed at creating an ecosystem to support development and commercialization of technologies facilitating modelling, simulation and visualization of Cyber Physical Systems (CPS).

Cyber-Physical Systems (CPS) is a computer-based system where a mechanism is controlled or monitored by algorithms.

The hub named as Driving Innovation through Simulation Hub for Technologies in Interdisciplinary Cyber Physical Systems (DRISHTI CPS), plans to lead in skill enhancement, technology development, product commercialization and joint initiations with industry partners.

Professor Neelesh Kumar Jain, director (officiating) said, "The objective of DRISHTI CPS will be achieved in the true sense by creating a self-sustaining system which supports R&D

TO BOOST TECH DEVELOPMENT

projects, patenting, licensing and commercialization, incubation of start-up companies and spin-offs and initiation of joint projects with the industry. The hub plans to organize short courses, webinars, and offer fellowship programs soon."

The technology hub also aims to support research activities and work on joint initiatives with industry players.

Dr Pavan Kumar Kankar, project director said that all entities of IIT Indore will have to work as a team along with the industry, R&D organizations and the sister Technology Innovation Hub's to achieve the objectives. CEO Col. Dr Sunil Dutta (Retired) said, "The growing importance of CPS in every field associated with human beings. The demand of digital presence in every facet of life has necessitated a paradigm shift in the existing ecosystem. This digitalization is not restricted to human beings. In fact, machines and modern systems, apart from being digitalized, are also expected to be interconnected via Internet of Things (IoT) deployments. TNN"

IIT-I sets up DRISHTI in Interdisciplinary Cyber Physical Systems

OUR STAFF REPORTER
Indore



The Indian Institute of Technology Indore has set up a Technology Innovation Hub (TIH), named DRISHTI CPS, which plans to lead in skill enhancement, technology development and product commercialisation. The overarching objective of the proposed hub is to create an ecosystem that supports the development and commercialisation of technologies facilitating modelling, simulation and visualisation of CPS.

Towards this IIT Indore has appointed a new CEO, Col. Sunil Dutta (retd).

IIT Indore director Prof. Neelesh Kumar Jain, director (officiating) said, "The objective of DRISHTI CPS will be achieved in the true sense by creating a self-sustaining system which supports R&D projects, patenting, licensing and commercialisation, incubation of start-up companies and spin-offs and initiation of joint projects with industry. The hub plans to organise short courses and webinars and offer fellowship programmes soon."

The details may be shortly available on the website (drishticps.iiti.ac.in) of the company.

Dr Pavan Kumar Kankar, project director, said, "All entities of IIT Indore, will have to work as a team along with industry, R&D organisations, and the sister technology innovation hubs to achieve the objectives of NM-ICPS."

After taking over the reins of the company Dutta said, "There is growing importance of CPS in every field associated with human beings. The demand of digital presence in every facet of life has necessitated a paradigm shift in the existing ecosystem. This digitalisation isn't restricted to human beings. In fact, machines and modern systems, apart from being digitalised, are also expected to be interconnected via Internet of Things (IoT) deployments. Such systems, popularly known as Cyber Physical Systems (CPS), are capable of taking autonomous decisions using data analytics and artificial intelligence. There has been a rapid proliferation of CPS in the lives of human beings. The National Mission on Interdisciplinary Cyber Physical Systems (NM-ICPS) clearly highlights the important part that CPS will play in everyday life. However, there are challenges when it comes to effective modelling, simulation and visualisation of CPS deployments."

Dutta was instrumental in coining the concept of Adaptive and NonCyclic Process Improvement Process Improvement (ANCPIPI) which is now known as Continuous Process Improvement (CPI).

आइआइटी में इनोवेशन हब स्थापित, प्रौद्योगिकी विकास पर होगा काम

इंदौर (नईदुनिया प्रतिनिधि)। भारतीय प्रौद्योगिकी संस्थान (आइआइटी) इंदौर ने इंटरडिसिप्लिनरी साइबर फिजिकल सिस्टम (सीपीएस) में ड्राइविंग इनोवेशन थ्रू सिम्युलेशन हब फार टेक्नोलाजी (दृष्टि) की स्थापना की है। इस इनोवेशन हब में कौशल वृद्धि, प्रौद्योगिकी विकास और व्यावसायीकरण पर काम होगा। इसमें टेक्नोलाजी की माडलिंग, सिम्युलेशन और विजुअलाइजेशन को सुविधाजनक बनाया जाएगा। इसे संचालित करने के लिए आइआइटी ने कर्नल (सेवानिवृत्त) डा. सुनील दत्ता को सीईओ नियुक्त किया है। संस्थान के कार्यवाहक निदेशक प्रो. नीलेश कुमार जैन का कहना है कि सीपीएस दृष्टि में अनुसंधान, विकास परियोजना, पेटेंट, लाइसेंसिंग प्रक्रिया को बेहतर बनाने के साथ स्टार्टअप और उद्योगों के साथ मिलकर नई परियोजनाओं पर काम किया जाएगा।

हब को बढ़ावा देने के लिए लघु पाठ्यक्रम, वेबिनार और अन्य कार्यक्रम आयोजित किए जाएंगे। इसकी जानकारी जल्द ही आइआइटी की वेबसाइट drishticps.iiti.ac.in पर जारी की जाएगी। हब के परियोजना निदेशक डा. पवन कुमार कांकर का कहना है कि प्रौद्योगिकी, अनुसंधान और विकास के क्षेत्र में काम करने वाली कई संस्थाओं के साथ मिलकर काम करेंगे।

Student Activities

The Student Affairs Section is headed by Dr. Santosh Kumar Vishvakarma, Dean assisted by Dr. Ajay Kumar Kushwaha, Associate Dean, Cdr. Sunil Kumar (Retd.), Deputy Registrar and Mr. Sunil Sawle, Manager.

The Section comprises of various sub sections, namely Technical, Cultural, Sports and Ek Bharat Shreshtha Bharat is led by Coordinators and assisted by Co- Coordinators & members:

Science and Technology	Dr. Sunil Kumar	Coordinator
	Dr. Chandresh Kumar Maurya	Co-coordinator
Cultural	Dr. Girish Verma	Coordinator
	Dr. Abhinoy K. Singh	Co-coordinator
Sports	Dr. Tridib Kumar Sarma	Coordinator
	Dr. Yuvraj Madhukar	Member
	Dr. DudekulaAlthaf Basha	Member
	Dr. Harekrishna Yadav	Member
	Dr. Bibekananda Maji	Member
	Mr. T. Renchu	Member & Sports Officer
	Mr. Rameshwar Dohare	Member
	Ms. Chainika Malhotra	Member
	Mr. Arun Bhagwaniya	Member
	Mr. Sandeep Patil	Member
	Mr. Shivcharan Patel	Member
Ek Bharat Shreshtha Bharat	Dr. Niraj K. Shukla	Convener
	Dr. Aruna Tiwari	Member
	Dr. Manish K. Goyal	Member
	Dr. Mrigendra Dubey	Member
	Dr. Ashish Kumar	Member
	Dr. Ananya Ghoshal	Member
	Cdr. Sunil Kumar (Retd.)	Member Secretary
	Ms. Monika Gupta	Member
	Mr. Dushyant Pratap	Member
	Mr. Lalit Jain	Member
	Mr. Santosh Kumar Sharma	Member

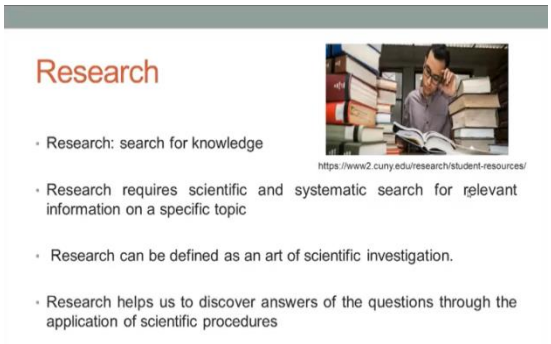
1. Students' Gymkhana, an elected body of the students, comprises of following members:

Students' Gymkhana	Mr. Shreyansh Jain	President
	Mr. Divyansh	General Secretary Culturals
	Mr. MohitrajMunot	General Secretary Science & Technology
	Mr. Bipin Kumar	General Secretary Sports
	Mr. Jogesh Kumar	General Secretary Academic UG
	Ms. Kanika	General Secretary Academic PG
	Mr. Priyam Bajpai	General Secretary Hostel Affairs
	Mr. Sudeep Patra	General Secretary COA
	Mr. Yash Ranjan	General Secretary Mess, Cafeteria & Allied services

This section conducts activities to enhance the confidence, leadership qualities, attitude, management, communication and creative skills of the students. Inspite of the lockdown and conduct of only online activities, the period from April 2020 to March 2021 witnessed a buzz of activity across various domains with some necessary adaptation in the activities pertaining to the pandemic situation.

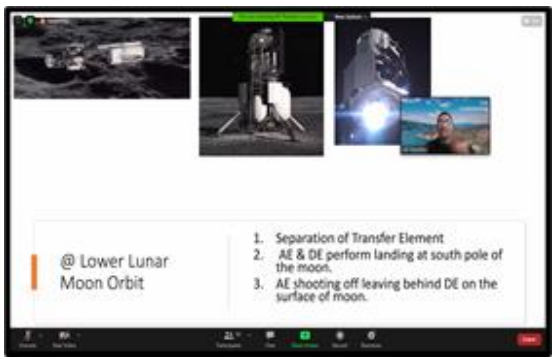
2. Few of the activities conducted by the students are as follows:

(a) **Career Guidance Series for UG Students**. The Academic Council organised a talk primarily focusing on the importance of UG students in research and the ways in which students can do research and publish journals. The talk focused on writing journals and about the importance of research work for UG students. The talk also focused on B. Tech Project for UG students. The talk primarily focused on soft computing and the basics of machine learning and its subsequent topics.





(b) **Space exploration and Careerpedia**. The Academic Council organised a talk by Dr. Amit Pandey, a research scientist from Lockheed Martin Space, Cleveland, Ohio, USA, on Space Exploration and The Careerpedia. The speaker talked about space, rockets, life on the Moon along with various career opportunities and addressed various problems faced by the young aspirants. Dr. Amit shared his area of expertise and a couple of projects that his company, Lockheed, are involved with NASA.



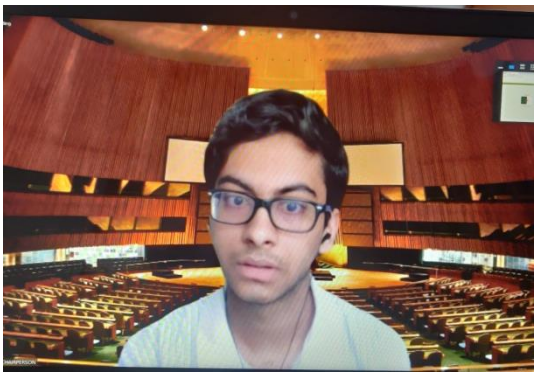


(c) **GATE Talk – 2020**. The Academic Council organized an interactive session of Mr. Abhishek Kamat, who managed to secure an astounding AIR 8 rank in GATE and is also an IIT INDORE alumnus, with the students. He discussed the preparation strategies with the students and advised to focus on time management. He talked about the competition level in our branch.

(d) **Youth Day celebrations**. Students' Gymkhana celebrated National Youth Day on January 12, 2021, which marks the 158th birth anniversary of Swami Vivekananda. The event flagged off with a talk delivered by one of the alumni of IITI, Mr. Dilkhush Meena who cleared UPSC CSE-2018 and is an Officer trainee, Indian Administrative Services (AGMUT Cadre). The talk was on '*Role of Youth in Accelerating the Implementation of Sustainable Development Goals*' to spotlight the role of youth in achieving global development. The speaker started with shedding some light on the life before and after IITI for an IAS aspirant. This was followed by the narration of some of his personal experiences that shaped him and motivated the audience to consider working for a global cause and not just at the ground level.



(e) **Model United Nations (MUN)**. MUN IIT Indore is a platform for young, ambitious delegates who wish to produce change in the society by debating about different social and economic problems around the world. It is a great stage to bring awareness amongst the youth about global issues and bring out the spirit of healthy politics. The event was held on the 12th & 13th December 2020. The United Nations Human Rights Committee (UNHRC) discussed important issues like violation of human rights in countries like Syria and Yemen. The Lok Sabha committee dived into an intense debate regarding farmers and traders in India. The United Nations General Assembly (UNGA) dealt with issues like accountability and innovation in the times of COVID 19. At the United Nations Commission on the Status of Woman (UNCSW), the delegates and Executive Board discussed on "Implementation of the Beijing Declaration and Platform for Action and its contribution towards the full realization of the 2030 Agenda for Sustainable Development". The All-India Political Parties Meet (AIPPM) involved leaders talking about the issue of women safety and crimes against women. Speakers raised concerns about increasing crimes against women.





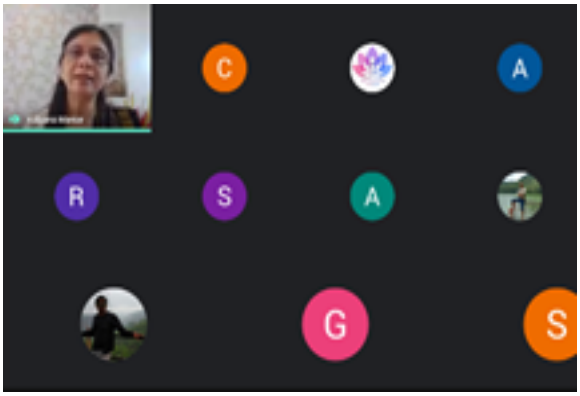
(f) **Talk on Prevention of Drug Abuse**. IIT Indore organised a public lecture on "Prevention of Drug Abuse" on February 09, 2021 under National Action Plan for Drug Demand Reduction (NAPDDR) programme. Mr Amit Ghawate, IRS, Zonal Director NCB, Indore & Bangalore was the Honorable Guest Speaker for the event. The talk revolved around the cons of drug abuse and impact on the physical and mental state of a person. It also included the measures and initiatives taken by the Government to eradicate the same from society.

(g) **Netritva**. The three days long Annual Leadership Conclave "Netritva" was organized by Students' Gymkhana on February 12, 13& 21 2021 and a Student panel discussion on February 21, 2021. The event

was highlighted by talks Mr. Anil Kumar Bharadwaj, Advisor, Broadcasting and Cable Services, TRAI, Mr. Abhishek Singh, IAS CEO MyGov, Mr. Anuruddh Pratap Singh, National Convener, IT and Social Media, BJP Kisan Morcha, and Dr. Satya Gupta, IESA Chairman and CEO, Seedeyas enlightened the audience with their valuable experience on the first day. The second session of the talk consisted of inspiring words from Mr. Naveen Kumar, Politician; Mr. Anuj Sharma, Chairman of EV Committee, Ministry of Road Transport and Highways; Mr. Gautam Gambhir, Honorable Member of Parliament and former Indian Cricketer; Mr. Hans Raj Hans, Padma Shri recipient, Honorable Member of Parliament, Singer; Mr. Vivek Agnihotri, Indian Film Director, Screenwriter, Author; and Ms. Nidhi Tripathi, National General Secretary of ABVP. The third session emphasized on the creation of "Leaders for radical changes for an Aatmanirbhar Bharat". Dr. Pawan Sharma, Commissioner, Indore Division and Shri Harinarayanchari Mishra, IGP, Indore shared their valuable experience.

(h) **Yoga for Wellbeing by Isha Foundation**. The Yoga & Fitness Club successfully organized an online yoga session on September 20, 2020 titled "Yoga for Wellbeing" which was delivered by Ms. Kalpana Maniar, an active volunteer of Isha Foundation. She was the former President & CIO at Edelweiss Financial Services Ltd. Practices like Yoga Namaskar and NadiShuddhi were taught, and the benefits and better practice methods were discussed.





3. **EBSB**: Rastriya Avishkar Abhiyan under Ek Bharat Shrestha Bharat, IIT Indore Team launched a program "Vigyan Par Charcha" in association with the State Education Department, Madhya Pradesh since January 13, 2021. This programme is designed for students of Class 6 to 8 to develop their basic scientific concept as well as for teachers to develop their teaching skills by using Internet based tools and reduce stress level created due to online teaching. Renowned Professors from different stream delivered lecture online. The program saw large viewership amongst students and teachers.





4. **<u>Best out of Waste- Art, Craft and Innovation Competition:</u>**Team Avana conducted event aims to spread creative ways of reusing everyday materials that will reduce waste and provide us with useful household products. Participants used all sorts of waste materials like newspaper, plastic bottles, jute threads, aluminium foils, used coconut shells, candles, mirrors, unused cables and more. The waste was used productively to create very artistic things. It was observed that students came up with enthusiasm and built some of the valuable items that no one could ever think of at first on watching those wastes.



Green Yatra (Intra Club Activity): Green Yatra was started to develop deep care and friendship with our environment. It is an initiative to grow and nurture a plant at our place. It gives the opportunity to indulge in the pleasures of taking care of a young sapling and watching it grow with time. This initiative provides a platform for enthusiasts to share their knowledge about plants. All the necessities to perform this activity can be easily found by the participants. Each participant has to grow a plant of their choice and update the pictures of their plants through google forms. There was good participation, and many participants are actively involved in caring for and nurturing their plants.





5. **<u>Fit India Movement</u>:** In view of the pandemic situation, the Fit India Cyclothonand Fit India freedom run were ideated in a unique way. Participants could do cycling and run at their own convenience, i.e. at their own pace and place. The staff and students of IIT Indore were active participants in this event.It was a great effort in maintaining health and fitness among the entire IIT community.





Apart from this certain event were conducted which are mentioned below:

- Online Chess Tournament April 27, 2020
- Online Chess Tournament May 8, 2020
- Online workshop on health and fitness June 29-30, 2020
- Online Physical fitness session July 17, 2020, onwards
- Online workshop yoga for wellbeing 20 September 20
- Online Chess Tournament 08 November 2020

6. Few of the achievements by the students are as follows:

(a) **<u>CSAW CTF</u>**. Team 'ByteBandits' from The Programming Club secured 1st place in India and 8th globally in CSAW CTF (Finals) 2020 held online. CSAW is one of the oldest and biggest cybersecurity competition and awareness events globally. This competition requires players to integrate concepts, develop skills, and learn to hack. Challenges mimic real-world scenarios modeling various computer security problems. Teams must demonstrate a profound understanding of the roles and ramifications of cybersecurity in these situations. Topics include Pwnable, RE, Web, Crypto, Forensics, etc. The members are Vaibhav Anand, Sarthak Jain, Vishnunarayan, Mrigank Krishan.

(b) **Civil Engineering Conclave**. IIT Roorkee conducted a Civil Engineering Conclave on November 8, 2020, in which 2 teams from the Institute participated in the case study competition of the topics, Rejuvenating River Ganga and Tinker: The water wheel. The teams stood 1st in the Rejuvenating River Ganga and 3rd in Tinker Water Wheel. The team members for Case Study of Rejuvenating River Ganga were Suyash Jain, Chitvan Ramani, Satyam Vatsa, Leksmi Sunil, Sakshi Pandey, Nishant Kumar, Sudeep Patra and for Case Study of Tinker: The water wheel wereShivam Rajpoot, Neeraj Andrali, Aditya Naik, Vivek Gupta.

(c) **IIT Tech-Meet 9.0**. IIT Guwahati virtually hosted IIT Tech-Meet 9.0 where all 23 IITs participated to solve real-life challenges. The contingent from IIT Indore secured an overall 6thposition amongst allIITs.The events where IIT Indore excelled are:

(i) Product Case Study (Gold Medal)
(ii) Bosch Traffic Sign Recognition (Silver Medal)
(iii) Bridgei2i (Silver Medal)
(iv) Network Security Hackathon (Silver Medal)
(v) AgroBot Design Innovation Challenge (Silver Medal)
(vi) Drishtee Tech-led Innovation Challenge (Bronze Medal)

This edition of the Tech Meet has been most successful edition for IIT Indore

(d) **Gate 2021**: Three Students of IIT Indore have secured top 10 position in GATE 2021:

(i) Ms .NishitaChittora: AIR-3
(ii) Mr. AnanddevMangish: AIR-5
(iii) Mr. DivikPatre: AIR-6

Campus Development Activities

Although the construction activities were severely hampered by Covid 19 related lockdown, still the Infrastructure Development Office managed to complete the construction of the major buildings under Phase II and developed services and infrastructure facilities:

1. Learning Resource Center
2. Lecture Hall Complex
   I) Takshshila classroom complex
   II) Vikramshilla seminar hall complex
   III) Nalanda Auditorium
3. CV Raman hostel
4. Abhinandan Bhawan
5. Executive Dining Hall in the central dining hall facility
6. Covered parking facilities in POD building
7. Covered parking facilities in NRC

Details of Completed projects/ works:

A) Works entrusted to CPWD

1. Library – LEARNING RESOURCE CENTER

- Estimated Cost: Rs. 24.59 Crores
- Date of completion: 31.10.2020
- Built-up area: 9641 sqm
- G+4 configuration
- Brief Description: The Library Building is centrally air conditioned having a capacity of accommodating 2000 people at a time. The LRC is one of its kind building comprising of approximately 80% DGU (Double Glass Unit) glazing surrounded from all sides supported on frameless spider fittings. There is a provision of a conference hall of 150 capacity equipped with AV facilities along with a separate free study hall and children's library.



Learning Resource Center

2. Lecture Hall Complex

- Estimated cost: Rs. 125.56 Crores.
- Block A – Takshila Class Rooms completed on 07.03.2020
- Block B – Vikramshila Seminar Halls completed on 05.09.2020
- Block C - Nalanda Auditorium completed on 15.04.2021
- Built up area: 19706 sqm.
- G+4 configuration
- Brief Description: The Lecture Hall Complex consist of 3 parts – Classroom complex with 50 class rooms of capacity 45 and 80, Seminar hall complex comprising of 02 no. of 180 capacities and 2 no. of 350 capacity rooms. The Nalanda auditorium has a capacity 2000 which is one of the largest in Central India.

  Seminar hall and Nalanda auditorium are equipped with latest AV facility with special stage lighting provision in the auditorium. The height of the auditorium is 22m. A unique feature of the auditorium is that the slab is supported on PT beam structure and there is no column throughout its span of 45 m. The seminar halls even have an amphitheater for the campus community with a seating capacity of 1000 people approximately.



Takshshilla Classroom Complex



Vikramshilla Seminar Hall Complex



Nalanda Auditorium

3. **Administrative Building – ABHINADAN BHAWAN**
    - Estimated Cost: Rs. 46.97 Crores.
    - Date of completion: 31.03.2021
    - Built up area: 8366 sqm
    - G+9 configuration
    - Brief Description: It is the tallest building in the campus with a height 40.65 m. The orientation of the structure is such that the broad sides of the building face the East and West direction. At the upper levels, recessed slit windows are provided. The design of the building is box structure with sets of 3 floors oriented in different direction (which looks like 3 boxes placed one over the other tilted such that the lower box is oriented inwards and top box is oriented outwards). The building is dedicated to all the administrative offices at IIT Indore including the Office of Director, Registrar Office, Office of Deans, Academics, Finance, Infrastructure Development, MMS, R&D, International affairs etc.


Abhinandan Bhawan

4. **Hostel (unit no. 2) – CV RAMAN HALL OF RESIDENCE**
    - Estimated Cost: 46.57
    - Date of completion: 30.01.2020
    - Built-up area: 14004 sqm.
    - G+ 5 configuration
    - Brief Description: The Hostel has 98 units with a total capacity of 490 rooms. The unique concept implemented in the Hostels is that each hostel unit is a 5 BHK unit (apartment) having a dedicated common toilet, pantry area and a lounge area i.e. set of 5 single occupancy rooms.



CV Raman hall of Residence

5. Housing – KSHIPRA RESIDENTIAL COMPLEX
    - Estimated Cost – Rs.
    - Built Up area – 10000 sqm.
    - Date of Completion – 31.05.2021
    - Configuration – G +6
    - Brief Description: The KRC is a residential facility comprising of 27 2BHK units and 27 3 BHK units for staff and faculty members of IIT Indore. It also has a common hall on the ground floor for the community members.



Kshipra Residential Complex

B) Works completed by Institute

1. Executive Dining Hall in the central dining hall facility
    - Cost: Rs. 8,54,411
    - Date of completion: 05.09.2020
    - Area: 72 Sqm





Executive Dining Hall

2. Covered parking facilities in POD building
    - Cost: Rs. 29,09,989
    - Date of completion: 04.09.2020
    - Built-up area: 540 sqm



Covered POD Parking



3. Covered parking facilities in NRC
    - Cost: Rs. 34, 77, 518
    - Date of completion: 04.09.2020
    - Area: 800 sqm.



Covered Parking at NRC



Campus IIT Indore



Abhinandan Bhavan



Computer and IT Center



Learning Resource Center



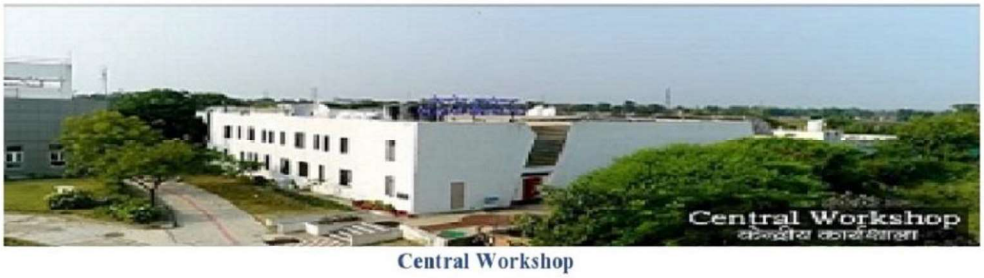
Kshipra Residential Complex



Nalanda Auditorium



KV IIT INDORE



Central Workshop

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