ANNUAL REPORT
2015-2016

IIT INDORE

INDIAN INSTITUTE OF TECHNOLOGY INDORE

Board of Governors (2015-16)

Mr. Ajay Piramal
Chairman, Board of Governors, IIT Indore
(till 3.3.2016)

Professor Pradeep Mathur
Chairman BoG, IIT Indore from 4.3.2016 &
Director, IIT Indore

Mrs. Kalpana Shrivastava
Principal Secretary,
Department of Technical Education & Skill Development,
Govt of Madhya Pradesh,

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Secretary to Hon. Chief Minister,
Government of Chhattisgarh,

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Former President, NASSCOM, New Delhi

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CMD, Cosmo Films Ltd., New Delhi

Dr. William Selvamurthy
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Former MD, HAL, Pune

Dr. Siddharth Malu
Head, Center of Astronomy, IIT Indore

Dr. Somaditya Sen
Associate Dean Planning, IIT Indore

Dr. Arunachalam Subramanian
Registrar, IIT Indore and Secretary to BoG

Institute Functionaries

Director, IIT Indore
Prof. Pradeep Mathur

Dean, Academic Affairs
Prof. N. K. Jain

Dean, Research & Development
Dr. A. Kranti

Dean, Planning
Dr. S. Mukhopadhyay
(till January 5, 2016)

Dean, Planning
Dr. Rajesh Kumar
w.e.f. January 6, 2016

Dean, Administration
Dr. Pritee Sharma

Dean, Student Affairs
Dr. A. Vijesh
(till September 20, 2015)

Dean, Student Affairs
Dr. Abhishek Srivastava
w.e.f. September 21, 2015

Registrar, IIT Indore
Dr. Arunachalam Subramanian

Associate Deans

Academics	:	Dr. Vipul Singh
Research and Development	:	Dr. Bhupesh Lad
Planning I	:	Dr. Rajesh Kumar (till January 5, 2016)
Planning I	:	Dr. Somaditya Sen (w.e.f. January 6,2016)
Planning II	:	Dr. Somaditya Sen (till January 5, 2016)
Planning II	:	Dr. Abhirup Datta (w.e.f. January 6, 2016)

Heads of Schools

Basic Sciences	:	Dr. Swadesh Kumar Sahoo
Engineering	:	Dr. Shaibal Mukherjee
Humanities & Social Sciences	:	Dr. Bharath Kumar (till March 27, 2016)
Humanities & Social Sciences	:	Dr. Sanjram Premjit Khanganba (from March 28, 2016)

Heads of Departments

Computer Science & Engineering	:	Dr. Abhishek Srivastava (till October 25, 2015)
Computer Science & Engineering	:	Dr. Kapil Ahuja (w.e.f. October 26, 2015)
Electrical Engineering	:	Dr. Srivathsan Vasudevan
Mechanical Engineering	:	Dr. Anil Kumar Emadabathuni (till September 24, 2015)
Mechanical Engineering	:	Dr. Devendra Deshmukh (w.e.f. September 25, 2015)
Chemistry	:	Dr. Satya Bulusu
Mathematics	:	Dr. Swadesh Kumar Sahoo (till September 24, 2015)

Mathematics	:	Dr. Safique Ahmad (w.e.f. September 25, 2015)
Physics	:	Dr. Manavendra Mahato
Astronomy	:	Dr. Siddharth Malu
Biosciences and Biomedical Engineering	:	Dr. Prashant Kodgire
Material Science & Engineering	:	Dr. I. A. Palani

Administration Support Services Team

Registrar	–	Dr. Arunchalam Subramanian
DR Finance	–	Mr. Pradeep Agarwal
DR Academics	–	CA. Mrs. Vasundhara Laad
DR Materials Management	–	Mr. S. P. Hota
DR R&D	–	CA. Mrs. Vasundhara Laad
DR Admin. & Audit	–	Mr. T. Satyanarayana
Administrative Officer	–	Mr. Rajeev Kumar
Chief Security Officer	–	Mr. Ramakant Kaushik
Officer on special duty	–	Mr. Pargat Singh
Superintending Engineer	–	Mr. N.Varma
Executive Engineer (Electrical)	–	Mr. Saroj Kumar Mallick
Project Engineer & Estate Officer	–	Mr. Atul Kumar Pandey
Deputy General Manager Workshop	–	Mr. Anand Petare
Sports Officer	–	Mr. Ritesh Guchhait
Dy. Librarian	–	Ms. Anjali Bandiwadekar
Library Information Officer	–	Mr. Rajesh Kumar
Medical Officer (Female)	–	Dr. Shilpa Raut
Counsellor	–	Ms. Monika Gupta

Contents

Director's Message

It gives me immense pleasure and pride to present the academic results of the IIT Indore community since its inception.Our community has truly matured, and taken great leaps in every sphere.

Our fourth convocation, held on November 12, 2016, recognized the achievements of the 4th batch of B.Tech. graduates in the disciplines of Computer Science, Electrical and Mechanical Engineering; we also conferred 22 M.Tech. degrees in Electrical and Mechanical Engineering. This year, we also had 20 M.Sc. students graduate with Masters in Physics and Chemistry.

A total of 24 students across departments received their doctoral degrees from IIT Indore. A total of 174 students walked with their degrees at this year's ceremony.

IIT Indore's focus on research from its inception is reflected in all aspects of our pedagogy, curriculum and infrastructure. The benefits of such a commitment to research are now visible.

The last year has seen significant progress in academic and campus development – two new B.Tech. programs have been initiated, supported by two new departments – Civil Engineering and Metallurgical Engineeringand Material Science (MEMS). Construction work is on in full swing and all our academic activities and some residences have moved to the permanent campus at Simrol, Indore. I laud the hard work, dedication and support of the IIT community – faculty members, staff and students. It has been a collaborative effort and responsibility has been shared cohesively to make this possible, and I am very proud of leading this endeavour.

On behalf of the institute, I wish our graduates all success. We are very proud of their achievements.

Best wishes

Prof. Pradeep Mathur
Director, IIT Indore

2. Disciplines & Faculty members: Profiles

Discipline of Computer Science and Engineering

From the HoD's Desk

Dr. Kapil Ahuja
Assistant Professor
Computer Science and Engineering
HOD CSE
w.e.f. October 26, 2015

kahuja@iiti.ac.in

Introducing members of CSE

In CSE, we have nine faculty members with one professor (Dr. Narendra S. Chaudhari) and eight assistant professors as below.

- Dr. Kapil Ahuja (HOD)
- Dr. Gourinath Banda
- Dr. Somnath Dey
- Dr. Neminath Hubballi
- Dr. Surya Prakash
- Dr. Anirban Sengupta
- Dr. Abhishek Srivastava
- Dr. Aruna Tiwari

CSE@IIT Indore has a strong Ph.D. student group comprising of around thirty-five students. We have around one hundred and eighty undergraduates.

Discipline Research Areas

Current CSE faculty members and students are focusing on a wide range of emerging research areas as below.

- Algorithms and Theoretical Computer Science.
- Computational Science & Engineering, Numerical Linear Algebra, Numerical Analysis, Optimization, Computational Intelligence, Big Data Analytics, and Cloud Computing.
- Embedded Systems (Cyber-physical Systems, Internet-of-Things, Wireless Sensor Networks, etc.), their Formal Verification (Model Checking, Abstract Interpretation, Program

Transformation & Generation, and Program Analysis) and Semantics-based Emulation of Languages & Systems.
- Pattern Recognition, Computer Vision, Image Processing, Biometrics, and Human Computer Interaction.
- Network Security, System Security, Cloud Security, Dependable Systems & Data Mining, Network Management, Network Security, and Enterprise Management.
- 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, and Software-as-a-Service.
- Soft Computing, Artificial Intelligence, Learning Algorithms, Neural Networks, Genetic Algorithms, and Evolutionary Approaches.

Notable Achievements

The individual research group achievements are described in the faculty write-ups that follow this. Here are some general achievements of CSE@IIT Indore.

- Advance JEE rank of the current CSE undergraduate students is between 933 and 1344, which is one of the best among new IITs.
- Around half of the CSE faculty members have been awarded GIAN (Global Initiative of Academic Networks) projects.
- Around half of the CSE faculty members have been received external funding for executing research projects.
- CSE faculty members have active collaboration with centrally funded institutes in India including Indore (Indian Institute of Management Indore and Indian Institute of Soybean Research).
- CSE faculty members have active collaboration with established institutes across the globe (France, Germany, Singapore, Canada, USA etc.).

Facilities in CSE

We have two undergraduate labs, which consists of the following:

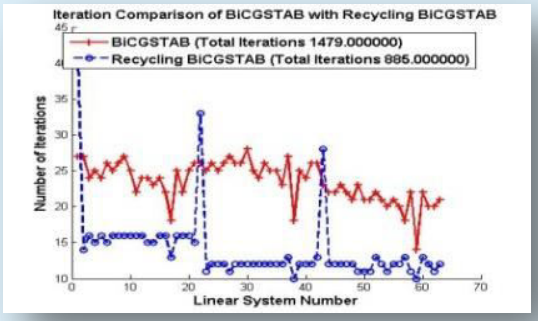
- Three high-end servers supporting a full-fledged Network File System (NFS), LDAP functionalities, and a Moodle Server.
- Around 110 computing terminals catering to the academic requirements of undergraduate students, graduate students, and placement cell. All terminals offer both Windows and Linux working environments. The thrust is towards the use of Open-Source Software for various applications.

Besides the labs, our faculty members have built high performance clusters for development of scalable soft computing learning algorithms for big data handling as well as running large computational science and engineering, image processing, and cloud computing application codes.

Faculty Profiles in Computer Science & Engineering

Dr. Kapil Ahuja
Assistant Professor
Computer Science and Engineering
HOD CSE
w.e.f. October 26, 2015
kahuja@iiti.ac.in

Dr. Kapil Ahuja (PhD: Virginia Tech, USA; Postdoctoral Research Fellow: Max Planck Institute, Germany) has a varied background, including degrees in Computer Science, Mathematics, and Mechanical Engineering. He has recently received the prestigious DAAD (German Academic Exchange Service) award for summer visit to TU Braunschweig. Dr. Kapil Ahuja works on applying mathematics and computation to solve science and engineering problems. Specifically, his research focuses on efficiently solving linear and nonlinear systems of equations as well as optimization.



Application areas include: study of crack propagation in an airplane wing; finding optimal material distribution in a domain using topology optimization; micro-electro-mechanical systems (MEMS) design using model reduction; and study of electronic structure and properties of materials using quantum Monte Carlo (QMC), etc.

Dr. Abhishek Srivastava
Assistant Professor
Computer Science and Engineering
HOD CSE
till October 25, 2015
asrivastava@iiti.ac.in

Dr. Abhishek Srivastava (PhD: University of Alberta, Canada; Assistant Professor, Rose-Hulman Institute of Technology, USA) is the Head of the Discipline of Computer Science and Engineering. His research comprises development of novel techniques of web-service composition in dynamic environments. Further, his research explores the possibilities of using mobile devices for effectively hosting web-services.

Mobile devices are ubiquitous, but these devices collectively have tremendous untapped computing capability. The research group of Dr. Srivastava is looking into this by way of utilizing these devices for web-service provisioning. Working on the concept of Service-Oriented Crowdsourcing over mobile devices the group is looking to eliminate the need for centralized infrastructure computing support for hosting web-services.Further, the group is working towards utilizing fundamental properties of nature such as the behavior of raindrops, friction, the properties of cellular membranes and others to come up with novel

techniques for web-service composition. The group has been able to demonstrate increased efficiency in forming composite web applications ‘on the fly’ using such techniques.

Dr. Gourinath Banda
Assistant Professor
Computer Science and Engineering
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Dr. Gourinath Banda(PhD: Roskilde University, Denmark; MSEngg: University of Southern Denmark, Denmark;Chief Engineer: Samsung Software Engineering Labs, Noida, India; Scientist Fellow: National Aerospace Laboratory, Bangalore, India) works on: (i) formal verification technologies such as model checking, abstract interpretation and static analysis; (ii) Real-time systems’ (such as kernels, RTOSs, applications, avionics, etc.) design and their formal analysis; (iii) Enhancing user-experience of devices; (iv) Embedded interventions for zeroing power wastage and (v) Energy aware computing tech.

Research Interests:

Formal analysis of safety critical systems;

Real-time systems design and analysis;

Software engineering and Rigorous analysis techniques for Cyber-physical systems, Embedded systems, Mechatronics Systems and Green devices and technologies.

Dr. Narendra Chaudhari
Professor
Computer Science and Engineering
Director, VNIT, Nagpur
nsc@iiti.ac.in

Dr. Narendra Chaudhari (PhD: IIT Bombay; Associate Professor: School of Computer Engineering, Nanyang Technological University (NTU), Singapore; Professor/Reader of Computer Science in M.Sc. (DRDO) program of Ministry of Defense, Government of India)He has done significant research on game AI, novel neural network models like binary neural nets and bidirectional nets, context free grammar parsing, and graph isomorphism problem.

Prof. Choudhari together with his team of research scholars has developedefficient and secure authentication and key agreement (AKA) protocols for security of cellular networks. These AKA protocols are extended to provide secure delivery of value added services using SMS and end-to-end SMS security to multiple recipients simultaneously where authentication server is able to handle multiple requests in a batch.

Prof. Choudhari’s recent interests in optimization algorithms have resulted in the design of methods for generating high quality solutions for

the cutting and packing challenges. The problem of one dimensional cutting stock problem deals with generating patterns for cutting the available raw stock that results in minimum trim loss. The strip packing problem involves packing of small items into a large container (called as strip) such that the resulting height of packing layout is minimized.

Prof. Choudhari, together with his research students, has recently investigated minimum-sum diameter clustering algorithms. While 2-Cluster minimum-sum diameter clustering problem has polynomial complexity, 3-Cluster minimum-sum diameter clustering is NP-Complete. The research efforts have resulted in developing a new technique, based on bit-wise representation, for clusters. Computational experiments have demonstrated the savings in time when this technique was used.

Dr. Somnath Dey
Assistant Professor
Computer Science and Engineering
somnathd@iiti.ac.in

Dr. Somnath Dey (PhD: IIT Kharagpur) primarily works on biometrics researchdomains. Apart from this, his research area includes image processing, computervision, human computer interaction and cloud computing.

Nowadays, there has been a significant improvement in the use of biometrics for user authentication applications. However, the different sources of attacks on the system are a growing concern when employed in security-critical applications. Dr. Dey's group is working to provide a mechanism to generate a new biometric template which can replace the stolen template. Further, Dr. Dey's group is also looking for a security model which can protect the stored template in the database.

Dr. Surya Prakash
Assistant Professor
Computer Science and Engineering
surya@iiti.ac.in

Dr. Surya Prakash (PhD: IIT Kanpur) is an Assistant Professor. His field of research includes Biometrics, Pattern Recognition, Computer Vision and Image Processing. He is currently working on the development of efficient techniques for human recognition using face and ear biometrics. He is also involved in developing efficient techniques for indexing of large biometric databases to make the search and identification process fast.

Sample face images of different quality

Biometrics Research @ IIT Indore

Biometrics is a technology which is expected to replace key and password based traditional authentication methods which are easy to get forged. Fingerprints, face, iris, and voiceprints are commonly used biometric features. Current research work undertaken in the field of biometrics at IIT Indore by Dr. Surya's group deals with biometric authentication using various biometric traits such as face, ear, etc. The research work of this group currently involves development of techniques for assessment of quality of biometric images, image enhancement and efficient recognition.

Image quality plays an important role in the performance of a biometric system where good quality images lead to superior performance. Use of bad quality images lead to bad training and results into poor recognition. Hence there is a need of quality assessment of images before their use in training and recognition. Dr. Surya's group is working towards development of novel technique for image quality assessment without use of reference image. Among various biometric traits, face provides more direct, friendly and convenient way of recognition and is more acceptable as compared to other ways of biometric recognition. One important challenge in face biometrics is to perform recognition in presence of facial expressions. Facial expression variations, namely facial behaviour, can be positively used for face recognition. This research group is attempting to develop multi-modal face recognition framework by positively utilizing the information obtained from facial expression variations. Facial recognition also suffers from problems arising due to the variations in pose. Research work of this group focuses on recognition of face in presence of pose variations where with the help of three face images (one frontal and two profile face images); face mosaic is generated. The face mosaic contains the features of all three face profile images. The mosaic also includes information from ear. Use of fusion of face and ear information from the obtained mosaic leads to improved face recognition.

Dr. Neminath Hubballi
Assistant Professor
Computer Science and Engineering
neminath@iiti.ac.in

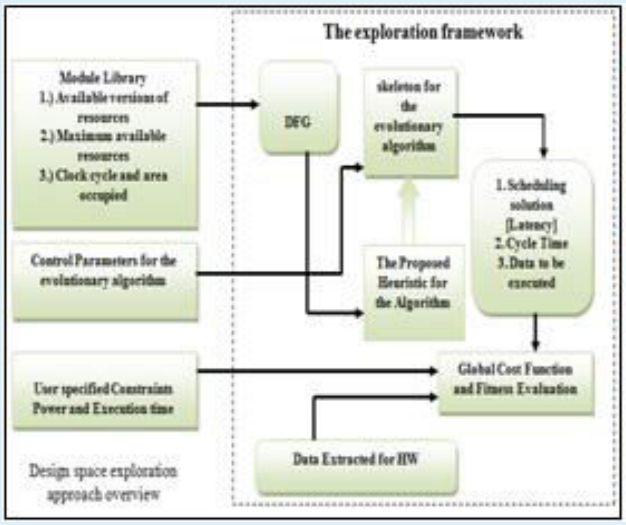
Dr. Neminath Hubballi (Ph.D. from IIT Guwahati) is an assistant professor in thediscipline of computer science and engineering. His research interests are in the broad areas of system and network security, dependable computing and data mining. Previouslyhe has worked with Hewlett-Packard, Infosys Labs and Samsung R&D on the researchprojects related to his areas of interest.

Network and system security is an active research field thanks to everincreasing cyber attacks. It has a strategic importance from the defense IT infrastructure security and IT security of various financialinstitutions of nation. It involves policies and mechanismsadapted to prevent and/or monitor unauthorized access, alteration and denyingaccess to data.

Monitoring of security events and data require storage and processing of network traffic, various logs from different security equipment. Given the operating speed of today's networks and diverse devices connecting to the Internet conventional storage and processing techniques are becoming inadequate. To address this, Dr.Neminath's research group is currently working on applying Big Data Analysis techniques for security monitoring. Big Data Analysis platforms have the capabilities of distributed computing and storage of data at large scale. His research group is working to leverage this to improve information security and situational awareness. Big Data Analytics can be used to analyze financial transactions, log files, and network traffic to find anomalies and suspicious activities, to correlate multiple sources of information into coherent view.

Dr. Anirban Sengupta
Assistant Professor
Computer Science and Engineering
asengupt@iiti.ac.in

Dr. Anirban Sengupta is currently an Assistant Professor in Discipline of Computer Science and Engineering at Indian Institute of Technology (IIT) Indore, where he directs the research lab on 'Behavioural Synthesis of Digital IP core '. He holds a Ph.D. &M.A.Sc.in Electrical & Computer Engineering from Ryerson University, Toronto (Canada) and is a registered Professional Engineer of Ontario (P.Eng.). He also holds a B.Tech degree from West Bengal University of Technology, India. In the past, he was also affiliated with Indian Institute of Science (IISc) Bangalore as a visiting research scholar. His research interest includes Optimization during Design Space Exploration for Hardware Accelerators, High Level Synthesis, Fault Secured High Level Synthesis, Trojan Security Aware HLS, Hardware Trust in High Level Synthesis, IP core Protection during HLS, Evolutionary Computing during HLS as well as Physical Design using CAD.

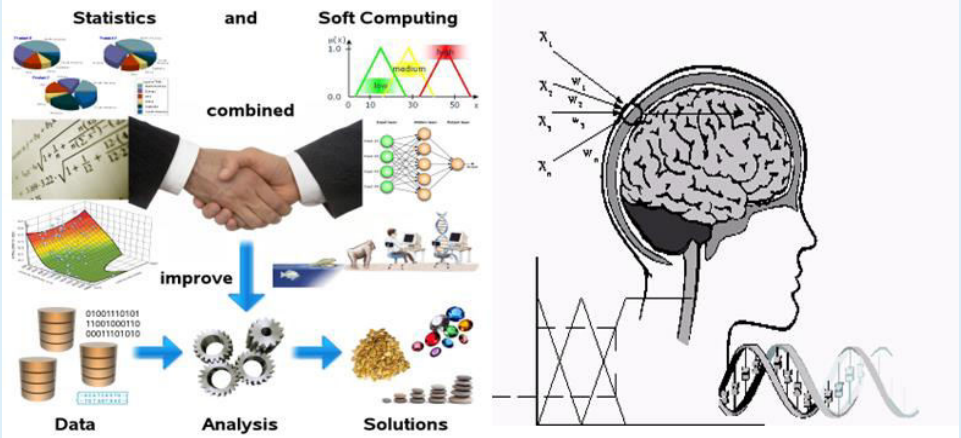


His research/sponsored projects are funded by Department of Science & Technology (Science & Engineering Research Board), Govt. of India as well as supported by industries such as Intel Corporation and Vivid-Sparks IT solutions.. He has ~ 100 Publications & Patents which include Journals, Patents and Invited Book Chapters from IEEE, IET, Elsevier, Springer and US Patent Office/ Canadian Patent Office /Indian Patent Office. He is owner 11 Patents (granted/published). At IIT Indore he has contributed around 60 publications (including 30 Journals, 23 Conference and 7 Patents).In the past, his Patents generated funding from Ontario Center of Excellence (OCE), Canada.

He holds leading positions in Editorial Boards of 7 IEEE & IET Journals as Associate Editor, Columnist and Guest Editor. Such as in IET Journal on Computer & Digital Techniques, IEEE Consumer Electronics(M-CE), IEEE VLSI Circuits & Systems Letter (VCAL), IEEE Transactions on Consumer Electronics and IEEE Access Journal. He is currently the Program Chair of 15thIEEE ICIT 2016. He is a regular reviewer of IET Journal on Computers and Digital Techniques, IEEE Transactions on VLSI, Elsevier Journal on Swarm and Evolutionary Computation, Elsevier Journal on Applied Soft Computing and Elsevier Journal on Expert Systems. He regularly serves as a member of the Technical Program Committee of IEEE-CS ISVLSI, ACM GLVLSI, IEEE CCECE and IEEE ICIT. He has supervised 4 Ph.D. candidates (2 completed and 2 pursuing) and 6 A/B.Eng.

Dr. Aruna Tiwari
Assistant Professor
Computer Science and Engineering
artiwari@iiti.ac.in

Dr. Aruna Tiwari (Ph.D.: RGPV Bhopal; Associate Professor: Shri Govindaram Sakseria Instt. Of Technology & Science, Indore) works on Soft-computing Techniques, Neural Network Learning Algorithms.



To make the machine intelligent, soft-computing based learning algorithms have problems for solving classification problems due to handling large unstructured data having overlaps of data belonging to various classes, adaptation capability and unbalanced classes. Dr. Tiwari's group is working with Fuzzy based supervised and unsupervised learning algorithms with an application to Big Data Classification. The group has demonstrated the novel Genetic Programming based learning algorithm in pattern recognition domain as well. Hybrid neuro-fuzzy models are under construction to work out the cluster validation to address the problem of validity of fuzzy partitions. This can lead to better modeling of learning algorithms with efficient design of classifiers for big data handling.

Discipline of Electrical Engineering
From the HoD's Desk

Dr. Srivathsan Vasudevan
Assistant Professor,
Electrical Engineering
svasudevan@iiti.ac.in

The vision of the discipline is to impart quality education and promote inter-disciplinary, industry-oriented advanced scientific research to address the challenges towards future technologies and societal requirements. The discipline 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. In order to cater the needs of the discipline for research as well as academic programs, the discipline has grown significantly in terms of faculty strength with diversified specializations, some of the state of the art research facilities and undergraduate and postgraduate students' strength.

The academic programs offered by the discipline include B.Tech, M.Tech and Ph.D. The M.Tech program with a specialization in Communication and Signal Processing is being offered currently and the discipline is planning to start M.Tech in other specializations as well. The discipline also hosts many Post-Doctoral candidates from time to time.
The discipline presently has 14 faculty members with expertise in diverse areas including Power Electronics and Power Systems, Micro and Nano-electronics, Communications, Signal Processing, Image Processing and Bio-photonics. It has the following research laboratories.

- Advanced Memory Technology Laboratory
- Bio-medical Signal Processing Laboratory
- Bio-Photonics Laboratory
- Devices, Circuits and System Design Laboratory
- Hybrid Nanodevice Research Laboratory

- Low Power Nano-Electronics Laboratory
- Optoelectronic Nanodevice Research Laboratory
- Organic Electronics Laboratory
- Power Electronics and Power Systems Laboratory
- Wireless Communication Research Laboratory

The discipline currently has about 20 ongoing research projects funded by various external agencies including Department of Science & Technology, Council of Scientific and Industrial Research, Department of Biotechnology, Department of Atomic Energy, Department of Electronics and Information Technology. In addition to this, the discipline has received DST FIST Project grant of Rs. 2.3 crores to strengthen the facilities in Smart Grid Research. The discipline is consistently moving forward in research activities as evinced by publications in various high quality International Journals and Conferences and the patents filed.

The faculty of the discipline strives to promote to develop analytical and practical learning 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 mini 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 been attracted by manyforeign internships (ie. DAAD, Fulbright fellowships etc.,), higher study options with scholarships from top Universities and also appreciation of their work in industries.

A constantly evolving environment has been created in IIT Indore, where the community interacts frequently in looking for out-of-the box solutions to solve problems, invited many industries to visit our 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.

Faculty Profiles in Electrical Engineering

Dr. Srivathsan Vasudevan
Assistant Professor,
Electrical Engineering,
Biosciences and Biomedical Engineering
svasudevan@iiti.ac.in

Ph.D.: Nanyang Technological University, Singapore

Dr. Srivathsan is working on developing new biomedical imaging techniques at the tissue level and cellular level. These techniques would have potential applications in performing in-vivo imaging for various diagnostic purposes such as cancer. The focus would be to build an instrument so that it can be transferred from lab to clinical research. The idea is to apply these techniques to study different mechanisms in detail such as the apoptosis process of cells and the continuous monitoring of tumour generation in tissues.

Doctoral: Deblina Biswas, Abhijeet Gorey

Webpage: http://www.iiti.ac.in/people/~svasudevan/

Dr. Amod C. Umarikar
Assistant Professor
Electrical Engineering
umarikar@iiti.ac.in

PhD: Indian Institute of Science Bangalore
Dr. Amod Umarikar's domain of expertise is in the application of power electronics in renewable energy systems and power quality monitoring. In power electronics, he is working in the area of high step up DC-DC converters, standalone PV systems and microgrid. In power quality monitoring, his research focuses on various algorithms for classification of disturbances as well as power quality indices.

Doctoral: Karthik Thirumala, Ravindra Dhakad, Vinay Tiwari, Suvamit Chakraborty, Ajinkya Sonawane

Webpage: http://iiti.ac.in/people/~umarikar/

http://poweriiti.weebly.com/faculty.html

Dr. Prabhat Kumar Upadhyay
Assistant Professor
Electrical Engineering
pkupadhyay@iiti.ac.in

PhD: Indian Institute of Technology (IIT) Delhi
Dr. Prabhat K. Upadhyay works in the area of wireless and mobile communications that include cooperative relaying techniques, cognitive radio, and multiple-input multiple-output (MIMO) systems. He is leading various research projects in the Wireless Communications (WiCom) Research Group. The WiCom is intended to conduct fundamental and applied research to cater to the emerging needs of the next generation wireless communication systems. The research leverages tools from statistics, random processes, convex optimization, and signal processing. The WiCom is equipped with computer workstations, vector signal generators, network analyzers with simulation packages and libraries of SystemVue (from Agilent Technologies).

Dr. Upadhyay is serving as a reviewer for a number of international journals which includes IEEE Transactions on Wireless Communications, IEEE Transactions on Vehicular Technology, and IEEE Communications Letters.Dr. Upadhyay is a Senior Member of the IEEE and IEEE Communications Society.

Current Ph.D. Students: Pankaj Kumar Sharma, Devendra Singh Gurjar, Satish Tiwari, Sourabh Solanki, and Vinay Bankey.

M.Tech. Student: Anish Kumar Singh

Webpage: http://iiti.ac.in/people/~pkupadhyay/

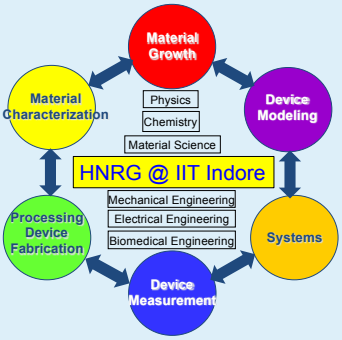
Personnel Homepage: http://pkupadhyay.webs.com/

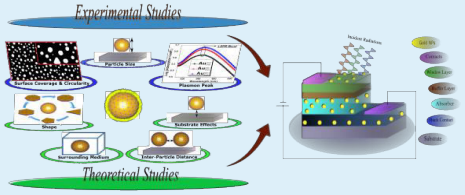
WiCom Research Group: http://wicom.webs.com/
http://iiti.ac.in/people/~sens/

Dr. Shaibal Mukherjee
Assistant Professor
Electrical Engineering
shaibal@iiti.ac.in

PhD: University of Oklahoma, USA. Post Doctoral Research Fellow: Northwestern University, USA

The Hybrid Nanodevice Research Group (HNRG) led by **Dr. Shaibal Mukherjee** in Electrical Engineering at IIT Indore is exploring the new physics of micro- and nano-structured materials and is applying this knowledge to realizing advanced tools and devices for chemical, biological, optical, electronic and energy applications.





The HNRG at IIT Indore is focused on developing cost-effective, environment-friendly and high-performance light-emitting diodes (LEDs), photo-detectors, and solar cells. Dr. Mukherjee and his group at IIT Indore have recently demonstrated, for the first time in the world, dual ion beam sputtering (DIBS)-grown ZnO double-heterojunction and multiple-quantum well (MQW)-based blue LED operating at room temperature. This research achievement by HNRG at IIT Indore is remarkable considering the fact that the fabrication of such bright blue LED was accomplished within a normal laboratory environment.

In light of his acclaimed research at IIT Indore, Prof. Mukherjee was recently awarded the Young Faculty Research Fellowship (YFRF) under Visvesvaraya PhD Scheme for Electronics and Information Technology, Department of Electronics and Information Technology (DEITY), Government of India.

Since joining IIT Indore in September 2010, Dr. Mukherjee's research group has published 26 peer-reviewed journals (with an average impact factor of 2.4), 25 proceedings in international conferences, and 1 book chapter. Moreover, Dr. Mukherjee's group has recently filed 1 Indian patent application.

To date, Dr. Mukherjee has successfully completed 4 externally funded research projects from DST and CSIR and currently 7 projects from DST, CSIR, UGC DAE CSR, DAE-BRNS, and ELOIRA are running. The total research grant accumulated from all these projects is Rs. 3.0 Crores.

As of now, 3 PhD students have graduated from HNRG group under the supervision of Dr. Mukherjee. One of the PhD students, Dr. Saurabh K. Pandey, has joined as Assistant Professor in Electrical Engineering of

IIT Patna and another PhD student, Dr. Sushil K. Pandey, has joined the University of Minnesota, USA as a postdoctoral research scientist. Currently 13 students are doing their doctoral research work under the supervision of Dr. Mukherjee.

Research Group Website: http://iiti.ac.in/people/~shaibal/hnrg.htm

Dr. Vimal Bhatia
Associate Professor
Electrical Engineering
Astronomy
vbhatia@iiti.ac.in

PhD: The University of Edinburgh, UK

Dr. Bhatia works in Signals and Software Group (SaSg) at IIT Indore, involved in cutting edge research and development in areas of wireless communication including communication channel estimation, equalization, and performance measurements of communication systems in high interference environment. The algorithms and techniques developed are applicable for OFDM, CDMA, SISO, MIMO, WLAN, Co-operative and Relay Networks, Cognitive Radio and related areas. The group is also involved in general software based applications and product development. Dr. Bhatia is also Coordinator for Student Entrepreneurship Support Cell, and DST-Innovation and Entrepreneurship Development Centre.

Doctoral: Manish Mandloi, Rangeet Mitra, Nagendra Kumar, Sidharth Shukla,

Masters: Azahar Hussain Mohammed

Webpage: http://iiti.ac.in/people/~vbhatia/

Dr. Vivek Kanhangad
Assistant Professor
Electrical Engineering.
kvivek@iiti.ac.in

Ph.D.: Hong Kong Polytechnic University, HK
Dr. Vivek Kanhangad's research interests are in the overlapping areas of digital image processing, pattern recognition and computer vision and their applications in biometrics for personal recognition. He has published peer reviewed journal and conference papers on 3D Hand authentication, Multimodal biometrics and Spoof detection techniques. His research team developed an iris spoof detection algorithm that won the Best Iris Liveness Detection with Portable Devices Competition award at IJCB 2014. He served as technical program committee member for a number of reputed conferences in the area of biometrics. Recently, he won the Best Reviewer Award at the IEEE International Conference on Identity, Security and Behavior Analysis (ISBA 2015).

Research Scholars: T. Sunil Kumar, Ankita Jain, Shruti Bhilare, Vijay Anand.

Webpage: http://iiti.ac.in/people/~kvivek/

Dr. Santosh Kumar Vishvakarma
Assistant Professor
Electrical Engineering
Material Sc. & Material Engg.
skvishvakarma@iiti.ac.in

Ph.D.: Indian Institute of Technology, Roorkee

Dr. Santosh Kumar Vishvakarma has research interest in various domains varying from Nanoscale Devices, VLSI design to Internet of Things (IoT). Presently, his research group is developing compact & unified model for conventional and non-conventional devices such as Multigate-FET, GAA, and TFET. Further, device and circuit co-design techniques are used to implement circuits using developed models. The group also investigates analog/RF and digital performance of these multigate devices. They are also characterizing device architecture and circuit performance through TCAD tool. Furthermore, his research group is working in the field of NV-memory where they are optimizing SONOS Flash cell through barrier and channel engineering. His research group is also working on SRAM and Sub-circuit Design for Ultra Low Power applications. His research group is also analyzing power reduction techniques in FPGA based digital design. His Research group has published various papers in IEEE Transactions, Journals & Peer reviewed Conferences.

He has one ongoing research project funded by CSIR. He is also a Principal Investigator at IIT Indore for SMDP-II Chip to System Design Project. His research group has several industrial linkages for research collaboration and technology sharing. Three students of his group already have successfully completed their internship at IBM technologies, Bangalore and two of them got the prestigious IBM Ph.D. fellowship award. One of his research scholars received the prestigious Fulbright-Nehru Doctoral Research fellowship and worked at Georgia Tech University, USA.

Recently, His group started working on high speed transceiver design and Graphene based digital standard cell design. His group is also working on IoT application ranging from healthcare to defense applications. His group has also developed an IoT based Smart Vending Machine. The machine is completely designed and developed by his group and is the one of a kind Vending machine that utilizes IoT to expand the normal set of vending machine services to a whole different level. His group is also working on development of a generic System on Chip (SoC) for IoT applications. His research lab is equipped with high end workstations, Industrial TCAD & EDA tools and various development platform (Software/Hardware) tools for IoT. The Lab also has 28nm & 40nm technologies from Global Foundries and 65 nm technology from TSMC & UMC.

Post-Doctoral Scholar: Nanda KishoreYadav

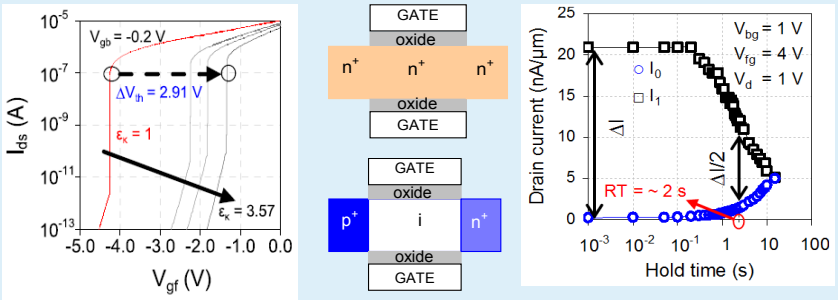
Research Scholars: Vikas Vijayvargiya, Pooran Singh, B. S. Reniwal, Deepika Gupta, Mahesh Kumawat, MaisagallaGopal, Ankur Beohar, Abhishek Upadhyay, Gaurav Singh, Ravi Kumar, Pooja Bohara, Vishal Sharma, Tejaram Chaudhary.

Webpage: https://sites.google.com/site/svishvakarma/

Dr. Abhinav Kranti
Associate Professor
Electrical Engineering
akranti@iiti.ac.in

PhD: University of Delhi, Delhi
Post PhD: Université catholique de Louvain, Belgium, Queen's University Belfast, UK, Tyndall National Institute, Ireland
The Low Power Nanoelectronics Research Group led by **Dr. Kranti** has been working towards the design, development and optimization of novel devices and circuits for logic, memory, analog, RF and biosensing applications. The research work utilizes innovative transistor architectures to address technological issues associated with downscaling and low power operation. The group has ongoing collaborations with leading international research groups.

Dr. Abhinav Kranti has interests in Solid-State Devices, VLSI, Circuit Design, Dynamic Memories, Nanotechnology and Biosensors, and has co-authored more than 100 research papers in peer-reviewed international journals and conferences. He has served as a technical reviewer for several IEEE, IOP, Elsevier, AVS, Wiley and Springer journals. For more details, please visit the website given below.



Doctoral: M. Gupta, N. Navlakha, P. Diwedi, A. Kumar, R. Singh, Y.V. Bhuvaneshwari, N. Jaiswal

Webpage:http://iiti.ac.in/people/~abhinav/,

http://abhinavkranti.yolasite.com

Dr. Trapti Jain
Assistant Professor
Electrical Engineering
traptij@iiti.ac.in

Ph.D.: Indian Institute of Technology Kanpur
Technological advancements are expected to change the operational philosophy of tomorrow's power grid. The research group of **Dr.Trapti Jain** has been working towards analyzing the impact of these technologies on the operation of power systems and determining the measures needed to mitigate possible negative impact. The stable operation of microgrids, the use of synchrophasor technology for security assessment of power systems, the optimal operation of electric vehicles and power quality monitoring are a few thrust areas of our research.

Doctoral: E.S.N. Raju P, Prateek Jain, T. Venkatesh,
Karthik Thirumala, Joice G. Philips, Ravindra Dhakad
Webpage: http://iiti.ac.in/people/~traptij/

Dr.Ram Bilas Pachori
Associate Professor
Electrical Engineering
pachori@iiti.ac.in

Ph.D.: Indian Institute of Technology, Kanpur, India
Post Doctoral Fellow: University of Technology of Troyes, Troyes, France

Dr. Pachori works in the areas of biomedical signal processing, nonstationary signal processing, speech signal processing, and signal processing for communications, computer-aided medical diagnosis and signal processing applications.

Doctoral: A. Upadhyay, R. Sharma, A. Bhattacharyya, M. Kumar, A. Nishad, S. Maheshwari, R. R. Sharma

Webpage: http://people.iiti.ac.in/~pachori/

Dr. Vipul Singh
Assistant Professor
Electrical Engineering
vipul@iiti.ac.in

PhD: Kyushu Institute of Technology, 2-4 Hibikino, Wakamatsu, Fukuoka, Japan.
Post Doc: Research Institute of Eletronics, Shizuoka University, Johoku Hamamatsu, Shizuoka, Japan.

Dr. Vipul Singh established the Molecular and Nanoelectronics Research Group (MNRG). The group focuses on the research and development of Organic electronic devices viz. Organic Field Effect Transistors (OFETs) and Organic photodiodes (OPDs), through cheap solution processed techniques. Our aim is to develop disposable electronic, large area based flexible devices and applications. We are also interested in studying the underlying device physics pertaining to charge carrier transport in organic materials. Our other research interests are in optoelectronic and biosensing devices consisting of organic/ZnO as an active semiconductor layer. We are also focusing on device simulations to gain better insight into the functioning of various devices. Other areas of interests are the growth of nanostructures, Surface plasmon resonance and Hydrothermal growth.

Doctoral Students: Mr. Ashish Kumar, Mr. Tejendra Dixit, Ms. Mayoorika Shukla, Ms. Pramila Jakhar, Ms. Shalu Choudhary , Mr. Jitesh Agarwal and Ms. Gunjan Rajput

Webpage: http://www.iiti.ac.in/people/~vipul/index.htm

Dr. M. Anbarasu
Assistant Professor
Electrical Engineering
Metallurgical Engineering and Materials Science
anbarasu@iiti.ac.in

PhD: Indian Institute of Science, Bangalore
Post-Doc.:Heriot-Watt University, UK, RWTH Aachen University, Germany

Dr. M. Anbarasu's research interests are development of high-speed non-vlatile memory, Phase change random access memory, multi-bit data storage, Universal memory concepts, Novel selector devices, Phase-change logic devices, 3T Ovonic devices, functionally expanded phase change memory, electro-optical switching devices, vertically stackable cross-point memory, novel synaptic devices for neoromorphic computing.

Also, collaborating with Dr. I.A. Palani towards development of multi-functional substrates and novel materials design for PV applications and SMA based flapper design.

Doctoral: Smriti Sahu, Krishna Dayal Shukla, Shivendra Kumar Pandey, Nishant Saxena, Suresh, D, Arjunan M.S., Rathinavelu, Ashish Kumar Shukla, Maniprabhu

Webpage: http://www.iiti.ac.in/people/~anbarasu/

Dr. Mukesh Kumar
Assistant Professor
Electrical Engineering
mukesh.kr@iiti.ac.in

Ph.D.: Tokyo Institute of Technology, Japan

Dr. Mukesh Kumar received his Master in Technology (M.Tech) degree from Indian Institute of Technology (IIT) Kharagpur, India in 2004 in Solid State Technology and his PhD in Integrated optoelectronics in 2009 from Tokyo Institute of Technology, Japan. He had been in University of California Berkeley, USA as an Exchange Researcher. He had been a JSPS Postdoctoral Research Fellow in Tokyo Institute of Technology, Japan. He was with Thapar University Patiala, India during June 2011-December 2015 as an Assistant Professor in Department of Electronics and Communication Engineering. Currently he is working as an Assistant Professor in Department of Electrical Engineering at Indian Institute of Technology (IIT) Indore, India.

His research interests include Integrated Optoelectronics, Nano Devices, Nanophotonics, Microelectronic fabrication and Semiconductor Optoelectronics. He is also working on some sponsored research projects funded by Government of India. He has published more than 30 research papers in journals and conference of international repute. He is a senior member of IEEE.

Webpage: http://iiti.ac.in/people/~mukesh.kr

Dr. Dipankar Debnath
Assistant Professor
Electrical Engineering
ddebnath@iiti.ac.in

PhD: Indian Institute of Technolgoy Bombay
Dr. Dipankar Debnath is presently working on the application of power electronics to different aspects of solar photovoltaic (PV) systems. Some of the specific applications include: a) design of solar PV based standalone/off-grid systems for deployment in rural areas, b) transformer-less single-phase inverter design for grid connected solar PV systems, c) distributed maximum power point tracking (DMPPT) schemes for medium/large scale solar plants, d) PV based UPS schemes for semi-urban areas. He is planning to expand his research in the following areas as well: a) multi-functional, decentralized inverter schemes for grid integration of renewable energy sources, b) design of integrated converter topologies for various applications, c) study of micro-grid: dc, ac and hybrid.

Webpage:http://iiti.ac.in/people/~ddebnath/,

Discipline of Mechanical Engineering
From the HoD's Desk

Dr. Devendra Deshmukh
Assistant Professor
HOD, Mechanical Engineering
w.e.f. - September 25, 2015
dldeshmukh@iiti.ac.in

Here at the Mechanical Engineering department, we are committed to providing quality education by carrying out robust research programs and working closely with industry. One of our major objectives is to provide quality engineering education with basic and specialized engineering training required for the present and emerging requirements of society. The discipline also has equal responsibility to contribute to the advancements of knowledge by conducting relevant social research with cutting edge technology. With a responsibility to provide continuing education to practicing industrial engineers and to develop industry/academia collaborations, the Discipline is also organizing continuing educational programs. The Discipline composes of 12 regular faculties. Below are some stand-out achievements of the past year:

RESEARCH HIGHLIGHTS

- **Dr. Bhupesh Kumar Lad**
  1. Best Working Prototype Award in 1st Annual Student Research Symposium (SRS) for UG & PG students of IIT Indore, held on January 16, 2016, for the combined projects as given below:-
     - Design and Development of Distributed planning System for Smart Manufacturing: B.Tech. Project (Miroojin Bakshi & Kartikeya Upasani)
     - Development and Implementation of Smart Manufacturing System for Industries: B.Tech. Project (Namit Agrawal)
  2. Received Royal Academy of Engg, UK Newto-Bhabha Research Grand (GBP 50000)

- **Dr. M. Santhakumar**
  1. Received the SERB international travel grant for attending OCEANS 2016 at Shangahi.
  2. Received the Alexandar von Humboldt fellowship for 12 months.

- **Dr. Santosh Kumar Sahu**
  1. The research article entitled "An experimental study on the heat transfer characteristics of circular jet impingement boiling on the variety of structured copper surfaces in stagnation zone" by Mayank Modak, Vishal Nirgude, Avadhesh K. Sharma, S K Sahu, has been selected as a qualified student award winner of the student paper competition in the 24th International Conference on Nuclear Engineering (ICONE24), scheduled during June 26-30, 2016, in the USA.

     Research scholar Mr. Mayank Modak received a SERB international travel grant to attend and present research papers at the 24th International Conference on NuclearEngineering (ICONE24), June 26-30, 2016, in the USA

- **Dr. E. Anil Kumar**
  1. PhD Student, Mr. Yogesh Madaria received a DST Travel grant to attend the World Hydrogen Energy Conference (WHEC 2016) at Zaragoza, Spain, June 13-16, 2016.

- **Dr. I. A. Palani**
  1. Best BTP project Award in 1stAnnual Student Research Symposium (SRS) for UG & PG students of IIT Indore, held on January 16, 2016 , for the combined projects as given below:-

a. “Design and Development SMA actuated Aquatic BOT: B.Tech. Project (Akshay N Shwatkar, Shahil Mittal and Vishal Jain)”,
b. “Development of salt duck wave energy convertor: B.Tech. Project (Anmolsrivastava, AvulaAgastya)”, Institute best B.Tech Project for the year 2015-2016,
c. “Design and Development SMA actuated Aquatic BOT: B.Tech. Project(Akshay N Shwatkar, Shahil Mittal and Vishal Jain)”

2. Sathyabama University Alumni award in Research and Innovation for the year 2015.

ACADEMIC HIGHLIGHTS – OUTSTANDING PERFORMANCES IN CURRICULAR AND/OR EXTRA-CURRICULAR ACTIVITIES, DEVELOPMENT OF NEWCOURSES/PROGRAMMES, AND AWARDS AND ACHIEVEMENTS.

- Developed Curriclum For B.TechMetallurgy Engineering and Material Science
- Invited as the keynote speaker for the district heating and cooling session of the 10th conference on Sustainable Development of Energy, Water and Environment Systems” held in Dubrovnik, September 27- October 3, 2015.

DST-FIST Center of Excellence in Gear Engineering:

Objective: To strengthen research on different aspects of Gear Engineering such as gear finishing, miniature gear manufacturing, gear metrology, noise and vibration analysis, functional testing, failure analysis, condition monitoring and diagnosis, prognosis and reliability prediction, surface treatment, laser shock peening, etc.

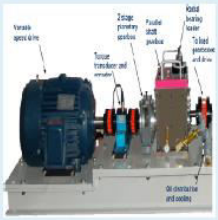
Project Implementation Group: Prof N.K.Jain (Group leader), Dr. Anand Parey, Dr. I.A. Palani,
Dr. Bhupesh K Lad, HOD (ME), ex-officio
Funding Agency: Department of Science and Technology (DST), Government of India
Duration: 2014-2019
Sanctioned Amount: INR 280 Lacs

The following eight equipment/machines are sanctioned:

1. 3D Surface Roughness Measuring-cum-Contour Tracing Equipment (Model: LD 130 from Mahr Germany): **Procured and installed**

2. CNC Wire-EDM Machine with inclined surface machining capability (Model: SprintCut WIN from EMTL Pune): **Procured and installed**

3. Computerized Double Flank Gear Roll Tester (Model: DO 125 K PC): **Procured and installed**



4. Noise and Vibration Analyzer for Gears along with sound intensity probe (Model: OR35: FREQ-4 from OROS France): **Procured and installed**

5. Semi-automatic Conical Gear Cutting Machine: PO placed

6. High Nd-YAG Laser with Accessories for Shock Peening of Gears (to be procured in FY 2016-17)

7. Machinery Fault Simulator (Model: MFS 2010 PK-7 from Spectraquest Inc. USA): **Procured and installed**

8. Gear-Train Prognostic Simulator (to be procured in FY 2016-17)

Faculty Profiles in Mechanical Engineering

Dr. Devendra Deshmukh
Assistant Professor
HOD, Mechanical Engineering
w.e.f.- September 25, 2015
dldeshmukh@iiti.ac.in

PhD: Indian Institute of Science, Bangalore.
Dr. Devendra Deshmukh received his Ph.D. degree in Mechanical Engineering from IISc Bangalore in 2012. He carried out his doctoral research in the area of biofuel spray characterization at high pressures. He has previously worked as a research engineer in GM-TCI Bangalore and at the TVS Motor Company. His current research interests are in the areas of biofuels, spray and combustion diagnostics, and the modelling of the IC engine processes..

Doctoral students: Rajan Lanjekar, Aniket Kulkarni, Vasudev Chaudhari

Webpage: http:// me.iiti.ac.in/Deshm.html

Dr. E. Anil Kumar
Assistant Professor
HOD Mechanical Engineering
till – September 24, 2015
anil@iiti.ac.in

PhD: Indian Institute of Technology Madras
Dr. Anil works on hydrogen storage and related engineering applications, $C0_2$ separation from industrial flue gases and development of sorption heating/cooling systems. At present his group developed experimental setups for studying sorption characterises of different gases (Hydrogen, Co_2 and NH_3) on adsorbents. His team is also developing prototypes for demonstration and evaluation of performance of sorption systems.

Doctoral students: Vinod Kumar Sharma (completed), Yogesh Madaria, Vinod Singh, Rakesh Sharma

Webpage: http://me.iiti.ac.in/Anil.html

Dr. I. A. Palani
Assistant Professor
Mechanical Engineering & Material Sc. & Material Engg.
palaniia@iiti.ac.in

Dr. I. A. Palani is currently an Assistant Professor in the Mechatronics and Instrumentation lab, Discipline of Mechanical Engineering, Indian Institute of Technology Indore. Before Joining IIT Indore, he was working as a Post doctoral research scientist in Graduate school of Information science and Electrical Engineering, Kyushu University, Fukuoka Japan. His area of research includes Opto-Mechatronics system design; Laser assisted micro-manufacturing, smart materials and structures. He is into the development of Shape memory alloy for micro-device development; he has more than 70 research publications in International journal and conference. He has also contributed few book chapters and three patents.

Webpage: http://drpalaniia.webs.com/

Dr. Santosh K. Sahu
Assistant Professor
Mechanical Engineering
sksahu@iiti.ac.in

PhD: Indian Institute of Technology Kharagpur

Dr. Sahu works on heat transfer characteristics of hot stationary/moving surfaces with various fluids. His research interest includes the thermo hydraulics of nuclear reactors, impinging jets, pool boiling heat transfer, heat transfer of moving surfaces, heat exchanging equipments, nanofluids and heat transfer of gaseous flows through micro channels. His research group has developed various test facilities to study the heat transfer behavior of hot stationary (plain, structured)/ moving surfaces, pool boiling heat transfer, flow through corrugated tubes. Also, test facilities have been developed to evaluate the thermal performance of nanofluids in various thermal devices.

Webpage: http://me.iiti.ac.in/Santosh.html

Doctoral students:
Completed: Mr. Manish Kumar Agarwal,
Mr. Sandesh S. Chougule, Mr. Hari Mohan
Ongoing: Mr. Mayank Modak, Mr. SaurabhYadav,
Mr. Avadhesh K. Sharma, Mr. Vishal Nirgude,
Mr. Syed Junaid

Dr. Neelesh Kumar Jain
Professor
Mechanical Engineering
nkjain@iiti.ac.in

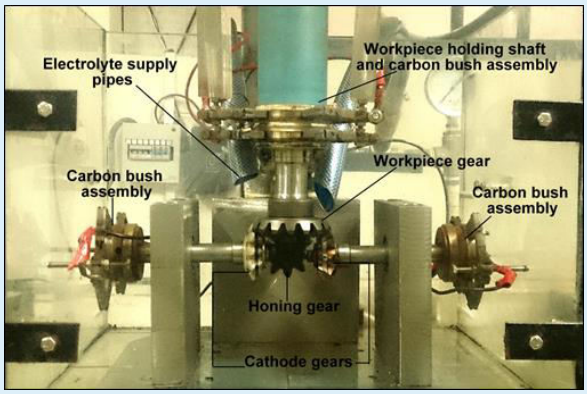
PhD: Indian Institute of Technology Kanpur, India (2003)

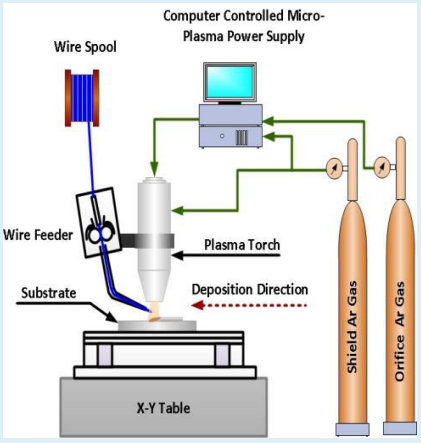
Prof. Neelesh Kumar Jain is working on various aspects of advanced and hybrid machining processes, micro-machining, nano-finishing and micro-joining processes through experimental investigations. He has worked extensively on establishing electrochemical honing (ECH) processes as a precision gear finishing process, establishing WEDM as a near-net shape manufacturing process for miniature gears and the development of micro-plasma transferred arc processes for metallic deposition and the joining of SS thin sheets for the repair of cracks in dies and gears. His work also includes modeling and developing parameter optimization of machining processes and process selection of manufacturing processes.

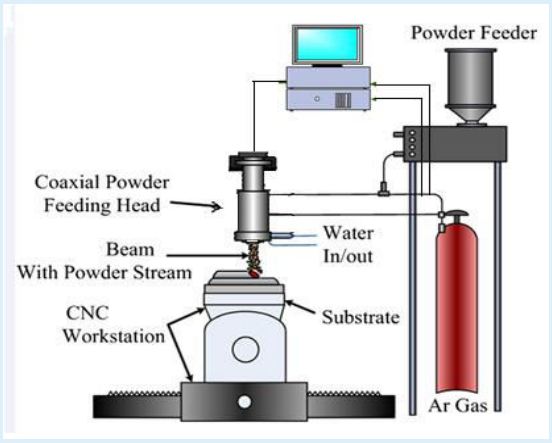
Prof. Jain and his team has conceived, designed and fabricated an innovative experimental apparatus for the high quality finishing of different types of gears using ECH and PECH processes. Different stages of experiments were conducted to study the effect of important ECH/PECH parameters on improvements in surface finish, micro-geometry, and topography, wear indicating parameters and micro-hardness of the gears after finishing them by ECH/PECH process. Significant improvements were obtained in these responses within finishing for 2 and 6 minutes by ECH and PECH respectively.

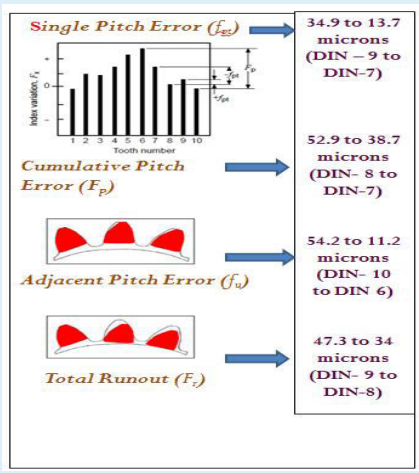
Prof. Jain and his team has also developed Micro Plasma transferred arc (μ-PTA) deposition process for various additive layer manufacturing (ALM) and coating applications of metallic materials. It is an emerging energy-efficient, material-efficient and low cost process for the deposition of metallic materials. It can produce near-net shaped components, add delicate features to the existing components, repair and modify surfaces for cost-intensive components.

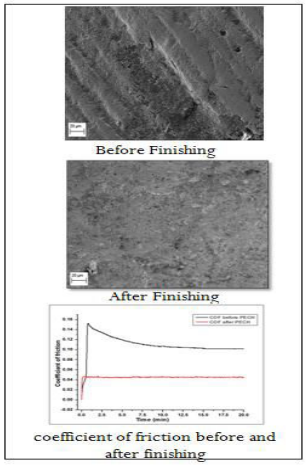
Machining chamber for high quality finishing of bevel gearby ECH/PECH

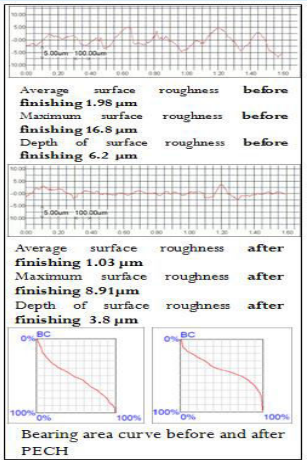












Dr. Satyajit Chatterjee
Assistant Professor
Mechanical Engineering
satyajit@iiti.ac.in

PhD: Indian Institute of Technology, Kharagpur

Dr. Satyajit Chatterjee has joined Mechanical Engineering Department as Assistant Professor. His Research interests include Conventional and Non-conventional Machining, Surface Technology and Solid Lubrication. Having the background of Production Engineering with Tool Engineering specialization, he is involved in teaching Production and Manufacturing Technologies since he joined IIT Indore. Apart from this, he works for the development of hard, wear resistant tribological coatings through the application of high power laser. He has published his research works in reputed journals like Surface and Coatings Technology and The International Journal of Advanced Manufacturing Technology.

Research Interest:
Surface Technology
Solid lubrication
Tribological coatings
Doctoral students: Balmukund Dhakar
Webpage: http://iiti.ac.in/people/~satyajit

Dr. Kazi Sabiruddin
Assistant Professor
Mechanical Engineering
skazi@iiti.ac.in

Ph D: Indian Institute of Technology, Kharagpur

Dr. Kazi works on thermally sprayed ceramic coatings applied on metallic substrates to upgrade their functional capabilities. Presently his group work on plasma sprayed Al_2O_3-Cr_2O_3 coatings on steel substrate to enhance the mechanical properties of the surface. Their work is focussed on the correlation of the phases present in the coating material with its properties. It is observed that with increase in stable α-phase in the coating, the tribo-mechanical properties of the coating are enhanced. Small quantity of Cr_2O_3 added to the Al_2O_3 feedstock helps to stabilize the metastable phases present in the final coating.

Doctoral students: Balmukund Dhakar, Vishal Sharma
Webpage: http://me.iiti.ac.in/Kazi.html

Dr. Shanmugam Dhinakaran
Assistant Professor
Mechanical Engineering
Adjunct Faculty
Biosciences and Biomedical Engineering
sdhina@iiti.ac.in

PhD: Indian Institute of Technology, Kharagpur

Dr. Shanmugam Dhinakaran is a computational fluid dynamicist. He is interested in the development of new high resolution and higher- order schemes for non-Newtonian fluid flows in order to understand their flow features which cannot be captured by lower-order schemes. His group is also interested in analysing the heat transfer enhancement characteristics of porous media as well as nanofluids in relation to cooling of electronic components.

Doctoral students: Tushar Chourushi, Ashutosh Verma, Deepak Selvakumar, Anirudh Kulkarni, Rajendra Singh Rajpoot

Webpage: http://people.iiti.ac.in/~sdhina

Dr. Anand Parey
Associate Professor
Mechanical Engineering
anandp@iiti.ac.in

PhD: Indian Institute of Technology Delhi

Dr. Anand works on Condition monitoring, noise andvibration isolation and signal processing of mechanical systems. At present his group is working on gear fault diagnosis.

Doctoral students: Yogesh Pandya (completed), Ankur Saxena, Naresh Raghuwanshi, Vikas Sharma, Ram Bihari Sharma, Amandeep Singh Ahuja

Webpage: http://me.iiti.ac.in/Anand.html

Dr. Bhupesh Kumar Lad
Assistant Professor
School of Engineering
Mechanical Engineering
bklad@iiti.ac.in

Ph.D: Indian Institute of Technology Delhi
His research interests are: Reliability Engineering, Prognostics and Intelligent Manufacturing Operations Planning. He has published several research articles in national and international journals and conferences of repute. He has also published one book chapter in "Handbook of Performability Engineering".

Dr. Bhupesh Kumar Lad is also Editorial Boardmember ofInternational Journal of Performability Engineering (IJPE). Currently he is working on following major research ideas:

1. Cyber physical system based virtual manufacturing network for intelligent operations planning (partially funded by DST IEDC student project funds)

2. Gearbox prognostics (In development stage, under DST funded FIST project of the department)
Post PhD Research Experience: Research Engineer, GE Global Research Center, Bangalore
Webpage: http://bklad.webs.com/

Ph.D students: Manish Rawat, Amit Kumar Jain, Sandeep Kumar, Bhushan Purohit, Pradeep Kundu
M.Tech. Student: Vibhor Pandhare, Priya Chauchan
B.Tech. Students: Namit Agrawal (ME), Kartikeya Upasani (CS), Miroojin Bakshi (CS)

Dr. Santhakumar Mohan
Assistant Professor
Mechanical Engineering
Robotics and Control
santhakumar@iiti.ac.in

PhD: Indian Institute of Technolgoy Madras;
Postdoc: KAIST, Daejeon, ROK
Visiting positions: RWTH Aachen, Germany, KAIST, ROK; IISc Bangalore and PSG Tech. Coimbatore, India
Dr. Santhakumar is working on the Dynamic analysis and Controller development of Robotic manipulators and systems. He developed a novel indirect adaptive control scheme for underwater vehicle-manipulator systems and parallel robotic motion platforms. His research and interest on robotic platforms brought a new family of parallel robotic manipulators which can provide a basis to develop new technologies for precise and micro positioning applications using smart actuators. His team also brought a new spatial parallel manipulator which has overcome the majority of the shortcomings of the existing manipulators. His team is working towards bringing a new meso-size machining / material handling centre. This research group is also developing a new type of lower limb rehabilitation robot. His group is also collaborating with Prof. B. Corves, RWTH Aachen, Germany and his team to propose a body weight support system based on a novel spatial platform.

Doctoral: Yogesh Singh, Jayant Kumar Mohanta
Webpage: http://santhakumarm.wix.com/crciiti

Dr. Ritunesh Kumar
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Ph.D: Indian Institute of Technology Delhi

Dr. R. Kumar group is currently working on absorption cooling systems, heat transfer at microscale, biofuels and energy. In heat transfer in the microscale area, we are exploring bubble dynamics, heat transfer augmentation methods and maldistribution problems. In absorption cooling systems, we are developing highperformance falling film towers for desiccant coolingapplications. In the sphere of biofuels and energy, we are exploring microalgal biofuels.
PhD Students: Kadam Sambhaji, Vikas Yadav, Gurjeet Singh, Yogendra Upadhyay, Digvijay Patil and Suchit Deshmukh.

Webpage: http://me.iiti.ac.in/Ritunesh.html

Discipline of Chemistry
From HoD's Desk

Dr. Satya S. Bulusu
HOD, Chemistry
Assistant Professor
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Discipline of Chemistry at Indian Institute of Technology Indore was started in 2009 with a vision of establishing a centre of excellence and state of the art facilities in chemical sciences research, education and scientific leadership in technology transfer to industry. Today, the discipline is home to 14 faculty members and 79 PhD students.Research areas and funding: The faculty and students are focusing on various frontier areas of nanotechnology, organic light harvesting materials, organo metallic pharmaceuticals and catalysts, asymmetric synthesis, biosensor metal clusters, molecular fluorescence spectroscopy, computational aspects of materials and molecular inhibitors for disease targets. Research in these areas is acknowledged by the scientific world in the form of international research publications and in several lectures in national and international conferences. Our research is supported by generous funding from private and public agencies, especially DST and CSIR to an amount nearly to 4.9 crores shows that a model of self-sustaining system.

Teaching: The Chemistry discipline at IIT Indore will be one among other new IIT's in India to open the avenue for full fledged two year masters program in Chemistry discipline, in the academic year 2013, beginning then the attention is focussed for one full year by master students on real research problems in laboratory rather than a traditional two year theoretical programme with meagre space for research exercise.

Notable achievements: Prof. R. Misra: INSA Young Scientist Medal 2014; NASI Young Scientist Platinum Jubilee Award 2014.
Dr. D. B. Rasale: Eli Lilly Outstanding Thesis Award 2014 (1st Prize)
Mr. Surajit Chatterjee: Best Poster Award, NSRP-2015, IIT Kanpur

Apart from individual achievements we wish to highlight research areas in which discipline is very actively involved. This includes 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 (by Prof. R. Misra), solid state supramolecular Chemistry (by Prof. M. Shaikh) , single molecule florescence imaging (by Prof. T. Mukherjee), molecular design of dynamic peptide based materials for the applications in biology and nanosciences (Prof. A. Das) , computational study of nanonmaterials for fuel cell application, spintronics, catalysis (by Prof. B. Pathak), organo-catalytic mediated asymmetric synthesis, total synthesis of highly biologically active compounds, metal mediated synthetic transformations (by Prof. S. Samanta), synthetic inorganic and organometallic Chemistry of transition metals and nano-materials for catalysis (by Prof. S. Singh).

Workshops and Symposiums: Faculty members of Chemistry discipline are actively involved in conducting workshops to serve the society under the scheme "Continuing Educational Programme" (CEP). Few such successful workshops, "Modern Spectroscopic Techniques-I & II", has been conducted in partnership with Sophisticated Instrumentation Centre (SIC) during which faculties, scientists, researchers, postgraduate and under graduate students from various institutes across the country had participated in large numbers. Discipline organized two national symposiums namely Frontier lecture series in Chemistry and Frontier in organomettalic and inorganic Chemistry in which renowned professors from varies parts of India had participated.

Facilities: Single Crystal XRD, Nuclear Magnetic Resonance (NMR), Atomic Force Microscope (AFM), Scanning Electron Microscope (FE-SEM), Fluorescence Microscope, Cyclic Voltammeter, Elemental Analyzer, Polarimeter, Rheometer, Langmuir-Blodgett Film Deposition System, UV-Vis, Circular Dicroism, TSCPC, FT-IR, HPLC, Dynamic light scattering. Toxic and hazardous substances generated in the Chemistry laboratories during day to-day research activities are being disposed off in an environmental friendly manner by following world class research practice.

The discipline of Chemistry also offers interdisciplinary collaboration with institutes of national (Banaras Hindu University, RRCAT, IACS, IIT Kharagpur, SNU) and international (Uppsala University, Sweden, Kalshrue Institute of Technology, University of Mainz, Germany, National Institute of Advanced Industrial Science and Technology, Osaka University, Japan, Purdue University, University of Nebraska, York University, Virginia University, USA, IST, Lisbon, Portugal, Nanyang Technological University, Singapore) repute to expedite scientific discoveries in various disciplines of research ranging from sciences to engineering.

Faculty Profiles in Chemistry

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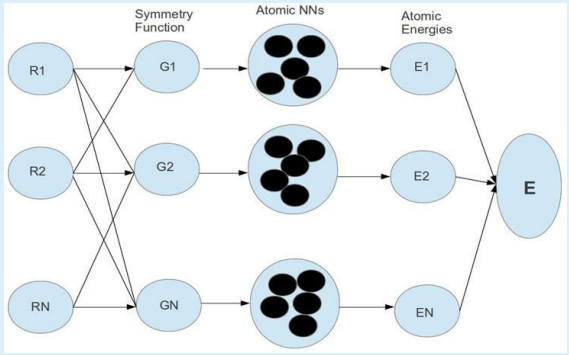
Dr. Satya S. Bulusu (PhD: University of Nebraska, USA; Assistant Professor: Shobhit University, India; Postdoctoral Fellow: York University, University of New Brunswick, University of Nebraska) works on Computational Chemistry, Structural evolution of Nanoclusters and Nanoalloys, Global Optimization Methods, Algorithms for predicting Transition State and DFT Guided Simulations.



Potential Functions for metal clusters and nanoalloys: We study potential energy surfaces of metal clusters and nanoalloys. Numerous empirical potentials were developed earlier to study metals but none were transferable to study small sized metals clusters (less that few 100 atoms). This is because of quantum effects that dominate this size regime. To accurately model interactions in metals clusters including

quantum effects, we built an on-the-fly fitting approach based on Artificial Neural Networks (ANN). ANN is basically a softcomputing technique that is widely used in many non-linear problems. For this, we require to train our ANN using variety of structures of Na previously evaluated using DFT. Once trained we can directly use this network to generate PES using molecular simulations.

Potential Functions for small organic molecules:Our aim is to generate potentials functions that are relatively cheap and reliable for small organic molecules. We are particularly interested in AMOEBA (atomic multipole based force field for biomolecular applications). AMOEBA uses charges, dipoles and quadrapoles to study long range interactions. We are trying to develop a standalone code that can generate AMOEBA force field parameters for any organic molecules. At present we generated parameters for all nucleobases. To test the reliability of the potential parameters, we performed global optimizations for small clusters of all nucleobases. Global optimizations were carried out using montecarlo minimization technique using different levels of theory. We used OPLSAA potentials, AMOEBA potentials and DFT methods to generate PES. For these small clusters, in gas phase, we found that AMOEBA predicts identical global minimums identical to that of DFT. It requires a few hours of computing time for a DFT optimization while AMOEBA is computationally very cheap (just takes a few seconds).

Dr. Chelvam Venkatesh
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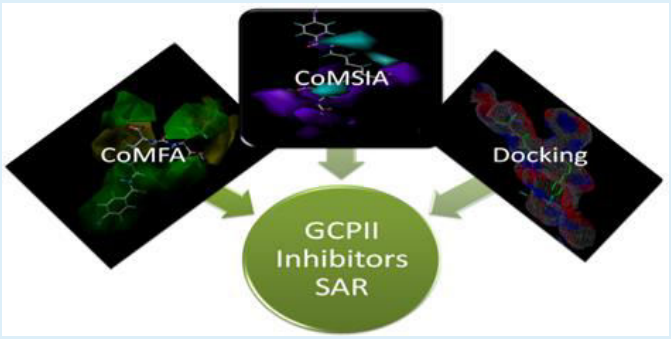
Dr. Chelvam Venkatesh (PhD: IIT Kanpur; Alexander von Humboldt fellowship: Freie University Berlin, Germany; Postdoctoral Fellow: Purdue University, USA) is heading the discipline of Chemistry. His research interests include synthesis of natural products, heterocycles, carbocycles and small molecule targeting ligands or inhibitors for therapeutic and diagnostic applications of pathological diseases.



Dr. Venkatesh's research group activity revolves around design, synthesis and application of new targeting ligands for diagnosis and therapy of various pathological diseases. The research group's long term goal is to establish a centre of excellence in the field of bio-science and medicinal chemistry, especially for detection and treatment of cancer and inflammatory diseases. A brief description of research projects that are currently in progress are as follows. Combination of in vivo imaging and molecular biology gave birth to a new research area of interest called molecular imaging in the field of medical diagnosis. This allows visualization of dynamic cellular process non-invasively in live cells. The unique ability of this technique carved out newer insights in the field of diagnosis especially in cancer, inflammatory, neurological and cardiovascular diseases. Conventional techniques such as X-ray, ultrasound, computed tomography (CT), and magnetic resonance imaging (MRI) can detect only morphological and anatomical changes in organs and tissues and often fail to distinguish abnormalities arising due to inflammation and

pathological diseased state. In molecular imaging, targeted or non-targeted ‘radio or fluorescent labeled tracers are systemically introduced into the biological system and monitored for their ready uptake by abnormal or hyperactive tissues. Many of those abnormal cells express or over-express special cellular proteins known as biochemical markers that have high affinity for their natural ligand. Therefore, the binding of radio or fluorescent labeled tracers or ligands to the over-expressed biomarkers identifies diseased cells and distinguishes them from normal and healthy tissues. Based on this principle several new methods were discovered for molecular imaging applications. Most commonly described modalities include magnetic resonance spectroscopic imaging (MRSI), positron emission tomography (PET), single photon emission computed tomography (SPECT), optical and radionuclear imaging. Separate or in combination with conventional tools, these techniques could be employed to understand the cellular processes responsible for onset and progression of diseases and also for the evaluation of new imaging agents and drug candidates for pathological diseases.

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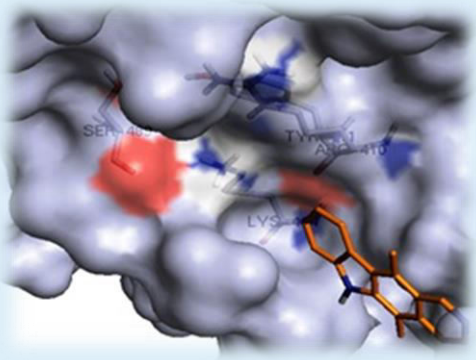

Dr. Anjan Chakraborty (PhD: IIT Kharagpur; Postdoctoral Fellow: Pennsylvania State University, Florida State University USA, Kobe University, Japan) works on anticancer drug molecule, ellipticine in different biological media. His research interest is in photophysics of drug molecules and study of different biological systems by fluorescence spectroscopy.

Reactants confined in molecular assemblies such as micelles, reverse micelles, microemulsion and vesicles, etc., offer a greater degree of organization compared to their geometries in homogeneous solution. They are able to mimic reactions in biosystems and also have great potential to encapsulate important drug molecules. Since the local properties e.g. polarity, viscosity, and pH in such a nano-environment are vastly different from those in a bulk medium, the structure, dynamics, and reactivity of biomolecules at an interface differ markedly from those observed in the bulk. Interestingly, most natural and biological processes occur at such interfaces or in confined systems, e.g., proteins, biomembranes, and vesicles. Therefore, chemistry in organized assemblies mimics the extremely efficient chemical processes occurring in the natural systems. We have undertaken entrapment of various drug in different biomimetic systems and the dynamical and photophysical behavior of those complexes. Various biomimetic systems studied by us are bile salt aggregates, reverse micelles, liposome-bile salt aggregates, proteins and liposomes-proteins complex. We used anticancer drug molecules namely ellipticine and doxorubicin and exploited their photophysical properties to understand their interaction with biological systems.

Dr. Apurba K. Das
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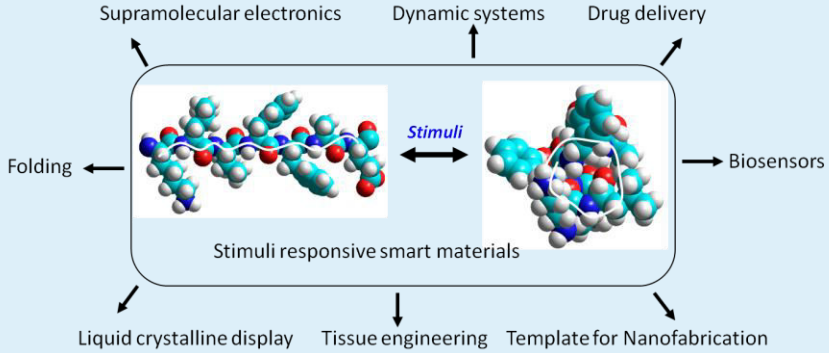
Dr. Apurba K. Das (PhD: Indian Association for the Cultivation of Science; Postdoctoral Research Associate: Manchester Interdisciplinary Biocentre and School of Materials, University of Manchester, Manchester, UK; Department of Pure and Applied Chemistry, University of Strathclyde, Glasgow, UK) is working on directed self-assembly of peptides and DNA-based molecules for potential applications in Biology and Nanosciences. His group is focused on multidisciplinary (Chemistry, Biology and Nanosciences) research.



This group's research focuses on the molecular design of dynamic peptide based materials for the applications in biology and nanosciences. Several chemical reactions are used to generate dynamic peptide libraries. The group has a long-standing interest on supramolecular electronics, cell culture and nanocatalysis applications of synthesized self-assembled molecular materials.

Dr. Pradeep Mathur
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Prof. Pradeep Mathur (PhD: Keele University, UK; Research Associate: Yale University, USA; J.C.Bose Fellow; Recipient of the Shanti SwarupBhatnagar Prize in Chemical Sciences; Professor: IIT Bombay; Visiting Professor: University of Cambridge, University of Freiburg; DAAD Distinguished Guest Professor: University of Karlsruhe; Fellow of the Indian Academy of Sciences, Bangalore; Editorial Board Member-Organometallics, Journal of Organometallic Chemistry and Journal of Cluster Science; and Chair of Inorganic Ring Systems 2009)

Research Interest: Synthesis and molecular structures of organometallic clusters, design and facile synthesis of mixed metal clusters, reactivity, and activation of organic molecules on them and use of metal carbonyls in catalytic processes.

Metal mediated transformations of acetylenes
Using simple mononuclear metal carbonyls, some unusual transformation have been observed, including the first example of a structurally characterized pentahapto-coordinated cyclopentadienone ligand system. Ferrocenyl-substituted thiophene and selenophene derivatives and ferrocenylchalcogenopropargyl complexes can now be obtained under facile conditions. These have served as precursors to unusual ferrocenyl-containing metal clusters with novel five-membered $FeSCH:CCH_2$ ring ligand systems. Intermediates in the formation of ferrocenyl-substituted quinones have been isolated and structurally characterized.

Metal-acetylide chemistry:
New types of acetylide coupling on mixed-metal clusters, including the first example of tail-to-tail coupling and influence of secondary bridging ligands on acetylide reactivity have been investigated. Several other new ligand systems have been generated on mixed-metal clusters, featuring, C-S and C-

Se formation and acetylide flip. Reactivity of metal acetylide with CS_2 has resulted in isolation of thiones and an unusual h^3-coordinated S_2CCCPh ligand. Electrochemistry and non-linear activity of some of the new systems have been investigated.

Synthesis of mixed-metal clusters:
Methodology of using the lone pairs of some single atom ligands for addition of coordinatively unsaturated metal carbonyl fragments has been successful for designed construction of metal cluster compounds. The most significant feature of this strategy is that variation in the transition metal as well as main group element ligands can now be controlled. Identical cluster core geometries but with variable compositions has enabled systematic studies to be made on variation of properties such as non linear optical activity on composition of clusters.

Ferrocenyl-incorporated metal carbonyl complexes:
Extension of reactivity of new cluster compounds is the reactivity of ferrocenyl and related acetylenes to form organics arising from unusual oligomerisation and co-oligomerisation reactions. This forms the present thrust of the main research projects. Work involves synthesis, spectroscopic and structural characterisation by single crystal X-ray diffraction methods.

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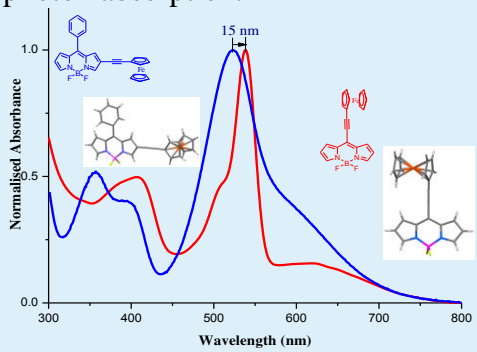
Dr. Rajneesh Misra (PhD: IIT Kanpur; Postdoctoral Fellow: GATECH, Atlanta, USA, University of Kyoto, Japan) focuses on design and synthesis of conjugated organic molecules for organic electronics, and photonics such as solar cells, field-effect transistors, light-emitting diodes, and multi-photon absorption.



Electronic absorption spectra of ferrocenyl substituted BODIPYs

Increasing the Electronic Communication in the BODIPYs
Superior electronic communication was achieved by introducing the ethynyl spacer at the meso-position of the BODIPY as compared to the β-position. Previous reports show that the substituents on the meso-phenyl ring of the BODIPY hampers the conjugation with BODIPY core due to the orthogonal orientation of the meso-phenyl ring. This problem was eradicated by introducing the 'ethynyl' spacer at the meso-position.

The meso-ethynyl spacer facilitates the superior electronic communication, and induces stronger interaction between the substituent and the BODIPY core. The ethynylferrocene substituent at the meso-position shows 15 nm red shifted absorption as compared to the same substituent at β-pyrrolic position, indicating higher degree of conjugation.

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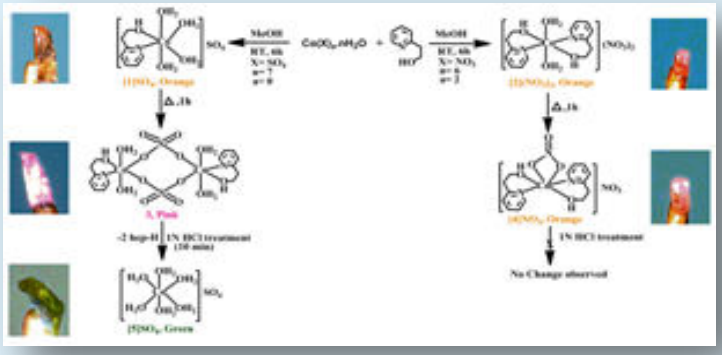
Dr. Shaikh M. Mobin (PhD: University of Bombay, India; Research Scientist: IIT Bombay) is in-charge of the Sophisticated Instrument Centre at IITI. He studies Single-Crystal to Single-Crystal (SCSC) Transformation and works on Synthesis and Structural Characterization of Some Novel Organo-metallic Clusters and Inorganic MOFs.



Solid-state Structural Transformations:
Transformation from one type of structure to another is not common in supramolecular chemistry. Solid-state supramolecular reactions involving transformation of different structures are very rare since they involve breaking and forming of bonds in more than one direction. The Single-crystal to single crystal (SCSC) transformation is upcoming fields, particularly due to solvent-free reaction conditions in SCSC processes are an added advantage particularly from the point of view of environmentally benign green chemistry. Our group is focus on SCSC transformations at discrete and polymeric level by applying heat, light or vapor techniques. We are further exploring the possibilities of SCSC by using laser or photocrystallographic techniques.

Dr. Tushar K. Mukherjee
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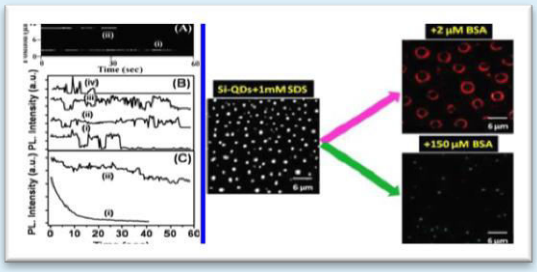
Dr. Tushar K. Mukherjee (Ph.D IIT Bombay; Postdoctoral Scientist, Columbia University Medical Center, New York, USA) works on Single molecule fluorescence imaging using TIRFM, Single molecule spectroscopy in heterogeneous media, developing high resolution optical microscope and Ultrafast fluorescence spectroscopy.



Dr. Mukherjee's research group at IIT Indore is presently involved in studying photoluminescence properties of bio-compatible water soluble quantum dots by photoluminescence spectroscopy and imaging techniques. Quantum dots show unique and characteristic PL that distinguishes them from organic dyes. In the past few decades core-shell QDs, namely CdSe/ZnS, CdTe/ZnS, CdSe/ZnTe and InAs/CdSe have emerged as a far better candidate for light emitting device than conventional organic dyes due to their higher brightness, photostability and broad excitation spectrum with narrow emission band. As a consequence of these advantages, QDs have replaced conventional organic dyes in optical imaging application. However, these core-shell QDs do have significant drawback in biomedical application due to their bigger size and cytotoxicity.

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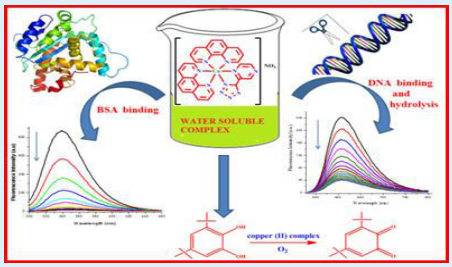

Dr. Suman Mukhopadhyay (Ph.D: Indian Association for the Cultivation of Science; Postdoctoral Fellow: National University of Singapore; FCT post-doctoral fellow: Instituto Superior Técnico in Portugal; Marie-Curie International Incoming Fellow: EPFL in Lausanne (Switzerland)) works on application of metal mediated cycloaddition to develop metal complexes with potential application in the field of catalysis and bioactivity. He is also currently working on ruthenium based organometallic complexes with with anti-metastatic property by inhibition of enzymes and proteins.

Tetraozole ligands are showing great promise to generate multidimensional metal-organic frameworks with interesting catalytic, magnetic and spectroscopic properties. However generation of tetrazoles involves in-situcycloaddition reactions between organonitriles and azide mainly by hydrothermal process having not much control over it. Dr. Mukhopadhyay's group is currently working upon use of microwave techniques to generate multidimensional polymers as well as getting a control over cycloadditions by limiting nuclearity of the desired systems. Generated compounds have shown interesting catalytic properties for organic transformation reactions.

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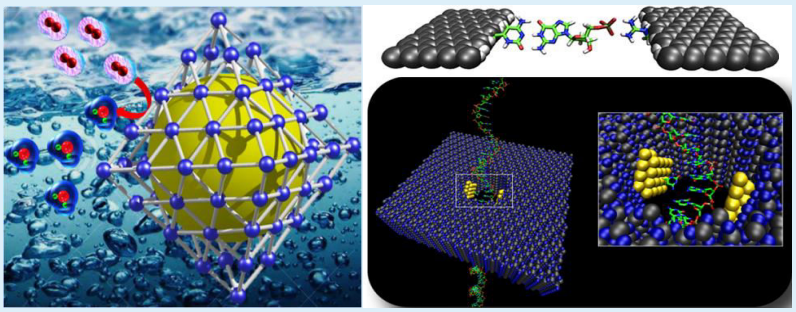
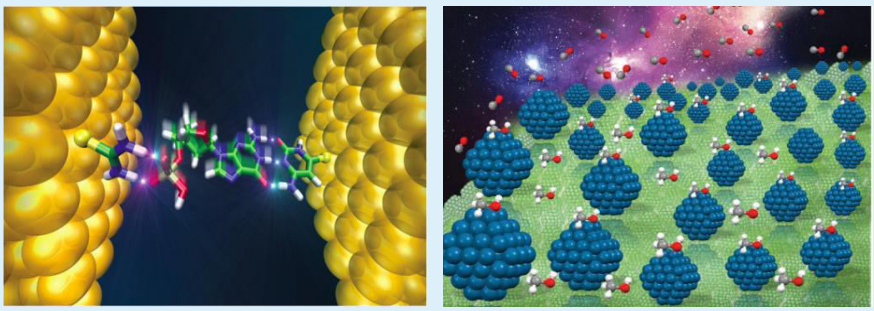
Dr. Biswarup Pathak (Ph.D Hyderabad Central University, Hyderabad; Postdoctoral Fellow: Jackson State University, USA & Uppsala University Sweden) uses advanced computational methods to work on various solid state materials for clean energy (Hydrogen storage, Photocatalysis, Catalysis, Fuel Cell, Li and Al-ion Batteries, CO_2 reduction, Spintronics, Gas Sensors) applications.





Dr. Pathak is involved in designing nano-materials for Fuel Cell (Nanoscale 2015, J Materials Chemistry A 2016), CO_2 reduction (Journal PhysChem C 2016), Spintronics (Nanoscale 2016), Catalysis (Scientific Reports 2016) and Bio-applications (Journal PhysChem C 2013). He is actively working on thesemiconductor based water splitting (Journal PhysChem C 2016) and Gas sensors (Journal PhysChem C 2016, ACS Sensors 2016).

His other interest is to design nano-pore based electrodes for rapid DNA sequencing. He has shown the nano-pores embedded gold/graphene electrodes could be very effective for rapid DNA sequencing (Nano Letter 2011, APL 2012, and Journal PhysChem C 2013).

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Dr. Sampak Samanta (PhD: Indian Association for the Cultivation of Science, India; Postdoctoral Fellow: University of Missouri Rolla, USA, University of Texas at San Antonio, USA; JSPS Post-doctoral Fellow: Tokyo University of Science, Japan; Senior Research Scientist,New Drug Discovery Research Centre, Medicinal Chemistry, Ranbaxy Laboratories Limited and Daiichi Sankyo Research Centre in India, Medicinal Chemistry Gurgaon) is interested in organo-catalytic mediated asymmetric synthesis, total synthesis of highly biologically active compounds, metal mediated synthetic transformations and green chemistry.

The research in Sampak's group spans methodology and complex molecule synthesis. In this context, the development of novel one-pot multi-component reactions will be followed by their implementation in the total synthesis of biologically active natural products and analogs, with a special emphasis on compounds relevant for anti-cancer drugs.In this direction, we have developed a highly efficient, organocatalytic, practical protocol for the preparation of biologically significant pyrimido fused carbazole scaffold also known as topoisomerase II inhibitors. In total synthesis, we emphasize shortness, efficiency and flexibility in generation of molecular complexity. In our search for new reactions, we utilize the readily available metal-free catalysts efficiently and pursue organic reactions in a green manner, aiming at achieving high selectivities (chemo-, regio-, diastereo- and enantioselectivity) during the course of reaction. Moreover, the design of high-performance catalysts is primary focus in my research group in consideration of the following keywords, "synthetic power", "environmental harmony", "atom economy", and "sequential transformations.

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Dr. Tridib K. Sarma (Ph.D IIT Guwahati, India; JSPS Post-Doctoral Research Fellow: University of Tokyo, Japan; Alexander-von-Humboldt Post-Doctoral Fellow: University of Heidelberg, Germany) works on nanosciences, catalysis and coordination polymers with an intention of developing functional materials with potential multidisciplinary applications. He is also studying metal-biomolecule interactions and subsequent development of functional materials.

A few projects that have been currently pursued in this endeavor are:

1.Development of magnetic nanoparticle based MRI contrast agents

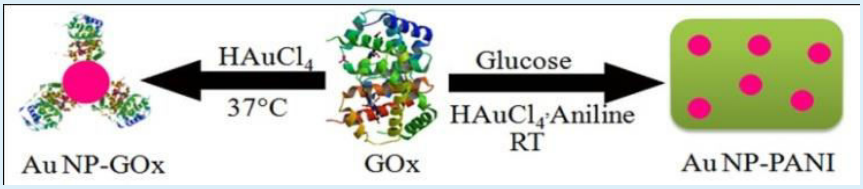
2.Development of inorganic nanoparticle-carbon nanostructure hybridsfor various applications

3.Functional supramolecular nanostructures assembled from bioactive building blocks

4.Enzymes as nanobioreactors for synthesis of functional nanostructures

One of the major focus areas of this research group is to use the biomacromolecules such as enzymes as reactors for the synthesis of

inorganic nanostructures. These studies are important as the nanoparticles bound to the enzymes can activate or inhibit the catalytic functionality of the enzyme.



Self-assembled supramolecular systems from functional building blocks are synthesized where the bioactive function and the self-assembling segment are conjugated. The group has recently found new supramolecular hydrogels based on assembly of amino acids and nucleic bases with metal salts.

The group also works on the application of graphene oxides as supports for inorganic nanoparticles (Au, Pt, Pd, metal oxides and alloys) to be used as heterogeneous catalysts for important organic transformations such as C-H oxidations. Synthesis of carbon dots, studying their physio-chemical properties, synthesis of metal-C-dot composites and their applications as catalysts and nanobeacons for sensing biomolecules is being done. This group develops easy synthetic routes towards metal oxide-graphene oxide composite materials for photocatalysis, dye-sensitized solar cells and LED.

This research group also intents to develop multimodal imaging probes involving nanomaterials that could be used efficiently for simultaneous cancer cell imaging and photo-thermal therapy.

Dr. Sanjay K. Singh
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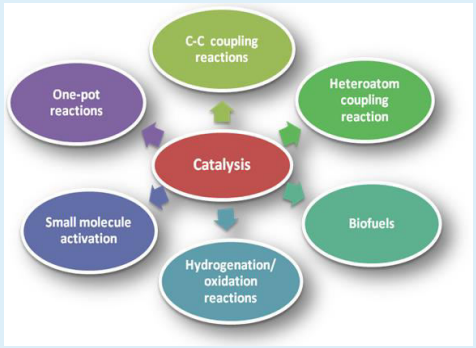
Dr. Sanjay K. Singh (Ph.D A. P. S. University, India; JSPS Postdoctoral Fellow and AIST Postdoctoral Scientist at AIST, Osaka, Japan; Alexander von Humboldt (AvH) Postdoctoral Fellow at Karlsruhe Institute of Technology (KIT),Germany) focuses on synthetic inorganic and organometallic chemistry of transition metals and nano-materials for catalysis.



Dr. Singh's research group has undertaken the task to development of homo- and heterogeneous catalytic systems for various important organic transformations, including C-C coupling reactions, C-heteroatom coupling reactions, one-pot hydrogenation/oxidation reactions, and so on. His group has developed several metal-arene complexes with nitrogen and phosphorous based ligands and these catalysts have been successfully employed for C-N coupling, C-C coupling and C-H bond activation reactions. Moreover, these complexes can also catalyze hydration of several polar and non-polar unsaturated bonds to produce aldehydes and alcohols. Recently these catalysts were also used for facile conversion of bio-derived furans to open-chain diketones and ketoacids under water based mild reaction condition with excellent recyclability. Moreover, several activated bimetallic nanoparticle based catalysts were also developed, which showed excellent TOF and TON for C-C coupling reactions in water. His work has been appeared in several high impact research papers in Inorg. Chem., Green Chem., Catal. Sci. Technol., ChemCatChem, DaltonTrans. and so on.

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Dr. Amrendra K. Singh (PhD IIT Bombay, India; Recipient of the Shyama Prasad Mukherjee (SPM) Fellowship – 2003, CSIR, India; Carl Trygger Foundation's Postdoctoral Fellow – Lund University, Sweden; Research Associate, Michigan State University, USA) focuses on development of renewable energy and energy efficient processes.

Two ligand architectures, namely pincer ligands and tripodal chelating ligands, have been shown to provide powerful platforms for small molecule activation. Pincer ligands have been extensively investigated due to the ease by which their steric and electronic properties can be tuned. The easy tunability of NHCs facilitates systematic modifications of sterics and electronics and their integration in tripodal or pincer type ligand architectures is beneficial due to the already established robustness of such ligand systems.

Discipline of Mathematics
From HoD's Desk

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Overview and Contributions

The Discipline of Mathematics of IIT Indore was started in 2009. The current faculty members of the discipline are well equipped to conduct research programme in various areas of pure and applied Mathematics.

The discipline currently offers PhD and MSc programs in Mathematics and envisages other master programs in allied fields such as statistics and applied computing. The discipline also plans to start a B. Tech. programme in Mathematics and Computing. Provision can also be made for B. Tech. students to earn minor in Mathematics who have strong interest in Mathematics that goes beyond their required B. Tech. courses in Mathematics. This will also be reflected in their degree certificate. The discipline also encourages bachelor and master students in Science and Engineering for their summer internships and PhD programs in Mathematics.

The discipline conducted a short course on "Modern Applications of Numerical Linear Algebra Methods" during June-July 2016 under the aegis of Global Initiate Academic Network (GIAN). Another such GIAN course on "Big Data Stream Analytics" will be held during 26 October – 01 November 2016. The discipline has been engaged in conducting "Madhava Mathematics" competition every year to promote Mathematics in India. The discipline also conducted two international symposia, one in December 2013 and other in December 2015. The discipline also invites eminent mathematicians around the world for delivering series of lectures in both pure and applied Mathematics.

Introducing Mathematics Faculty Members

- Dr. Sk. Safique Ahmad (HOD)
- Dr. Swadesh Kumar Sahoo
- Dr. Antony Vijesh
- Dr. Anand Parkash
- Dr. Niraj Kumar Shukla
- Dr. Md. Aquil Khan
- Dr. Ashisha Kumar
- Dr. Ashok Kumar
- Dr. M. Tanveer
- Dr. Vijay Kumar Sohani
- Dr. Santanu Manna
- Dr. Charitha Cherugondi

Discipline Research Areas

Current Mathematics faculty members and students are focusing on a wide range of research areas as follows:

- Algebra, Analysis,
- Differential Equations,
- Rough Set Theory, Modal Logics, Co-algebra,
- Numerical Linear Algebra, Numerical Analysis, Quaternion Linear Algebra,
- Information Theory, Statistics, Probability,
- Wavelet Analysis, Machine Learning, Optimization, and Seismology.

Facilities in Mathematics

We have one postgraduate lab that consists of the following:

- Around 20 computing terminals catering to the academic requirements of graduate students. All terminals offer both Windows and Linux working environments.

Notable Achievements

The individual research group achievements are described in the faculty write-ups that follow this. Here are some general achievements of the Discipline of Mathematics.

- Currently four research projects have been granted for faculty members from various Govt. funding agencies
- Faculty members have been actively collaborating with various institutes across the globe (Finland, China, France, Germany, Singapore, Canada, USA etc.)
- The discipline conducted two international symposia.
- Faculty members have been awarded grants to conduct GIAN (Global Initiative of Academic Networks) courses.

Faculty Profiles in Mathematics

Dr. S. K. Safique Ahmad
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Dr. Ahmad (Ph.D.: Indian Institute of Technology Guwahati). He is working on perturbation analysis on linear and nonlinear eigenvalue problems, Analyzing the Stability analysis on Differential Equations, Differential Algebraic Equations, and also for Stochastic Differential Equations with different matrix co-efficient. Basically he works on the following areas:

1. Numerical linear Algebra
2.Multiparameter Eigenvalue problems
3. Quaternion Linear Algebra
4. Stability Analysis on various Stiff Differential Equations

Webpage: http://iiti.ac.in/people/~safique/

Dr. Swadesh Kumar Sahoo
Head, School of Basic Sciences
Assistant Professor
HOD, Mathematics
till September 24, 2015
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Dr. Sahoo (Ph.D: Indian Institute of Technology Madras).His research area is Geometric Function Theory and the current research interests include Univalent Function Theory, Special Functions, Hyperbolic-type Metrics, Quasiconformal Mappings, and role played by them in Mathematical Analysis. Some of the recent problems that are under consideration with his doctoral students are (i) to extend theory of hyperbolic-type geometry associated with quasiconformal mappings and domains having geometric characterizations; (ii) to find necessary and sufficient conditions for certain analytic functions in terms of coefficient estimates, pre-Schwarzian and Schwarzian derivatives; and (iii) to study analytic and geometric properties of partial sums, arc length, area, and radius problems for univalent functions.

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Dr. Md. Aquil Khan
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Dr. Md Aquil Khan (Ph.D: Indian Institute of Technology Kanpur), Visiting Researcher: University of Amsterdam, The Netherlands; Postdoctoral Fellow: The Institute of Mathematical Sciences, Chennai, India; Marie-Curie Fellow: Fraunhofer SIT, Darmstadt, Germany.Dr. Md Aquil Khan works on modal logics, rough set theory and its applications. Since the inception of rough set theory, it has seen applications in many areas viz. medicine, finance, information science, decision analysis, social science,, pharmacy, etc. To increase the applicability of the rough set theory, it is important to extend the theory to relate it with some important issues in artificial intelligence such as multiple-source (agent) knowledge bases, temporal evolution of knowledge bases, information updates. This line of research comes under Dr. Khan's expertise. Moreover, he also focuses on the logical systems which can be used for reasoning with rough sets.

Webpage: http://iiti.ac.in/people/~aquilk/

Dr. Ashisha Kumar
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Dr. Ashisha Kumar (PhD: Indian Institute of Technology Kanpur). His main research area is Integral Geometry. He studies the Mapping properties of Radon transform and X-ray transform. The d-plane transform is a generalization of X-ray and Radon transform. His current research interest is the d-plane transform in certain Non-Euclidean Spaces.

Webpage: http://iiti.ac.in/people/~akumar/

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

Dr. Anand Parkash (PhD: Indian Institute of Technology Kanpur). He is working on Prime Submodules and Radical Formulae. For commutative rings with unity, intersection of all prime ideals is equal to the set of all nilpotent elements and it is called the radical formula for rings. Prime submodules are generalization of prime ideals and some radical formulae have been defined for modules. Recently, he has find a necessary and sufficient condition for a local domain of dimension one to satisfy the radical formula.

Webpage: http://iiti.ac.in/people/~anandparkash

Dr. Niraj Kumar Shukla
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Dr. Niraj Kumar Shukla (Ph.D:University of Allahabad) Dr.Shukla's main research area is Frame and Wavelet Analysis and the current research interests include Dual frame wavelets, Shift invariant spaces, Parseval Super wavelets and Parseval Semi-orthogonal wavelets and their applications. A wavelet is a function which together with its dilates and their translates determine all functions of our need. Wavelets are well suited for approximating data with sharp discontinuities and automatically adapt to different components of a signal by a procedure known as the multiresolution analysis. Currently, he is working on the path connectivity of collection of all wavelets, and duality of frame wavelets on the space of square integrable as well as square summable complex valued functions.

Webpage: http://iiti.ac.in/people/~nirajshukla/

Dr. Antony Vijesh
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Dr. Antony Vijesh (PhD: Indian Institute of Technology Madras) He is working on Numerical Functional Analysis and Differential Equations. Presently he is working on existence and uniqueness theorem for various kind of differential equation arising in modeling using monotone iterative technique. One of his students is working on numerical scheme for nonlinear partial differential equations based on wavelets.

Webpage: http://iiti.ac.in/people/~antony/

Dr. M. Ashok Kumar
Assistant Professor
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Dr. M. Ashok Kumar (Ph.D: Indian Institute of Science, Bangalore). His area of research falls under the broad subject area of 'Information Geometry'. He studies the geometry of information measures associated with various robust inference procedures. This geometry many a times helps us understand the underlying estimation problem better and enables us to transform the underlying estimation problem into a rather easier convex optimization. Many of these divergence measures are also fundamental to 'Information Theory' (The Mathematical Theory of Communication).

Webpage: http://iiti.ac.in/people/~ashokm/

Discipline of Physics
From HoD's Desk

Dr. Manavendra Mahato
HOD, Physics
Associate Professor
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In physics, we have 4 major areas of research with 10 associate professors, 1 assistant professor and 1 Ramanujan fellow.

- **Theoretical High energy Physics**
  - Dr. Manavendra Mahato
  - Dr. Subhendu Rakshit
- **Complex Systems and non linear dynamics**
  - Dr. Sarika Jalan
- **Experimental High energy physics**
  - Dr. Raghunath Sahoo
  - Dr. Ankhi Roy
- **Experimental Condensed matter physics**
  - Dr. Krushna Mavani
  - Dr. Somaditya Sen
  - Dr. Rajesh Kumar
  - Dr. Pankaj Sagdeo
  - Dr. Preeti Bhobe
  - Dr. Sudeshna Chattopadhyay
  - Dr. Parasharam Shirage

Physics has a PhD program in physics with more than 40 Ph.D. students. It also offers a 2 year program in Masters in Sciences with 24 seats in each year. In this program, emphasis is given to introduce research

experience early to students by providing them enough credits and time to pursue current research in various well equipped laboratories.

Early placement records have been encouraging and show that most of our Masters students are well motivated and trained to pursue career in physics in diverse reputed institutes and research centers across the country.

The theoretical physics group comprises two broad topics. The particle physics phenomenology area delves into problems related to dark matter, Higgs boson stability and neutrino properties in ICE cube experiment. String theory group delves into problems in anisotropic metrics as well as transport properties of various strongly coupled field theories.

There is also an active complex systems group delving into a range of interdisciplinary problems from extreme events, synchronization and delay in networks, multilayer networks, biological and social networks, atmospheric systems, random matrix theory, spectral graph theory, cancer network analysis and chaos in electronic circuits.

In Experimental high energy physics, the faculty members have active international collaborations ranging from ALICE in LHC, Switzerland, STAR in RHIC, USA, CBM in FAIR Germany, WASA at COSY in Germany, Jefferson lab, USA. The group also investigates problems in quark gluon plasma phenomenology and hadronic physics.

Our condensed matter physics group has been active in various research problems with notable results in synthesis and properties of Silicon nanowires, properties of various nanoparticles and oxides, magnetic properties of Heusler alloys and properties of various thin films under doping and various conditions. The group's research also include multiferroics, metal insulator transition, study of crystal and electronic structure, X ray absorption fine structure and photo electron spectroscopy, organic and inorganic semiconductors, perovskites, chalcogenides, semiconducting glasses, surfaces and interfaces. There are 7 research labs in this area and the group also gets active help from various facilities in Sophisticated Instrumentation Center.

Our placement records for Masters students have been very encouraging. Majority of them are able to qualify NET examinations and secured PhD offers from reputed research institutions across the country. Discipline has been able to attract externally sponsored projects worth close to Rs 10 crores so far from various agencies such as DST, CSIR, etc. The cumulative publications since inception are more than 170 in various reputed journals.

Discipline has also organized various events. Apart from some notable international conferences, we have organized many workshops, lecture series, talks by many eminent scientists, open day interactions with school and college students as a part of our societal outreach.
Notable facilities in our discipline includes X-Ray diffractometer with XRR attachment, Pulsed laser deposition system, high temperature programmable furnaces, Arc melting furnaces and some high performance servers for computational needs.

We envisage our various groups to further strengthen and take upon various challenging problems in various areas in physics. This will lead to more matured PhD programme and a rich experience for our graduates. This will also simultaneously strengthen our Masters programme with providing them unique motivation and experience to engage into realm of physics. We also plan to start Bachelors program in physics as well as more specialized Masters programs in due course. A vibrant community in physics at IIT Indore is expected to be greatly beneficial for our region and for our nation in general in extending our scientific outlook.

Faculty Profiles in Physics

Dr. Manavendra Mahato
HOD, Physics
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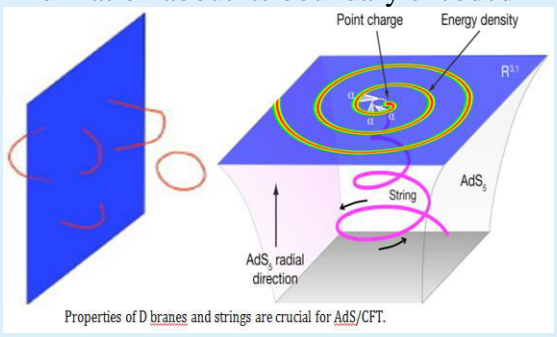
Dr. Manavendra Mahato (Ph.D: University of Michigan, Ann Arbor, USA; Visiting Fellow: TIFR, Mumbai) is working in the area of holography. He deals with those theories of gravity which contain a lot of information about its boundary encoded in its geometry.



Properties of D branes and strings are crucial for AdS/CFT.

Dr. Mahato's group works in the area of holography, a specialized topic in theoretical high energy physics. Here, those theories of gravity are investigated which contain a lot of information about its boundary encoded in its geometry. The information about the boundary may correspond to some quantum field theory such as non-Abelian Yang Mills theory, conformal field theory, or a condensed matter theory or fluid dynamics. This area is also known as gauge/gravity correspondence or AdS/CFT correspondence. Recently, these techniques were used to investigate dynamical properties of quenched field theories. Also, some anisotropic solutions of general relativity were constructed and were studied by the group.

Dr. Preeti A. Bhobe
Assistant Professor
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Dr. Preeti Bhobe (Ph.D: Goa University; JSPS Postdoctoral Fellow: Institute for Solid State Physics (ISSP), University of Tokyo and RIKEN, SPring8 synchrotron source, Japan; Postdoctoral Fellow: Tata Institute of Fundamental Research, Mumbai) has extensive experience on X-ray Absorption Fine Structure (XAFS) and Photoemission Spectroscopy (PES). Her expertise is on Experimental Condensed Matter Physics: Study of crystal and electronic structure, and magnetic properties of functional materials.

Dr. Preeti Bhobe has set up a highly sophisticated experimental facility to carry out "X-ray Absorption Spectroscopy". This versatile facility enables in-house performance of advanced experiments like XAS, XANES, and EXAFS which were hitherto, performed using a synchrotron source. It is a distinctive interdisciplinary technique and works equally well in amorphous materials, liquids, (poly)-crystalline solids, and molecular gases. It is worth mentioning that such a facility has very little foot-print within India.

Dr. Sudeshna Chattopadhyay
Assistant Professor
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Dr. Sudeshna Chattopadhyay (Ph.D: Saha Institute of Nuclear Physics; Research Associate: Northwestern University, USA; Postdoctoral Appointee of Center for Electrical Energy Storage (CEES); Guest Researcher: Chemical Sciences and Engineering Division, Argonne National Laboratory, USA) is working in the field of atomic scale characterization of surface and interfaces of materials. She has recently received DAAD award.Her group has expertise on preparation of the template mediated selfassembled tunable nanoparticle array using a generalized route to study the advanced photonic and plasmonic properties of these tailor-made nano-scale arrays.

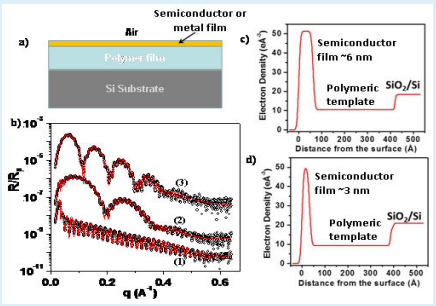

Fig. (a) Schematic representation of controlled deposition of thin semiconductors or metal film (~3-6 nm) on confined polymeric film (or template). (b) Specular reflectivity data for (1) polymer film, (2) ~3nm ITO/ polymer film, (3) ~6nm ITO/polymer film. Lines are best fits from which the electron density profiles (Fig. (c) and (d)) are determined.

Her research Interests:

(i) Study of Surfaces and interfaces – Solids, liquids, soft matter and nanomaterials (metal-polymernanocomposites, nanostructured organic / inorganic ultra-thin films etc.).

(ii) Improvementof the capacity of Electrical Energy Storage Materials: Study of Electrode electrolyte interface, structure, mechanism:

(iii) Structure-property relationship of high pressure thermo electric materials.

(iv) Specialization in techniques: X-ray scattering,Spectroscopy (vUV, UV-vis, IR, EELS, XPS, NEXAFS, SIMS), Atomic force microscopy,Magnetron sputtering, spin coating, electrochemistry.

Dr. Sarika Jalan
Associate Professor
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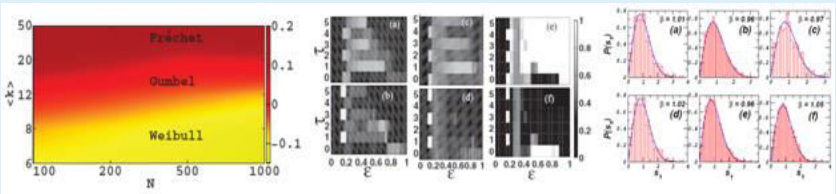
Dr. Sarika Jalan (Ph.D: Non-Linear Dynamics from Physics Research Laboratory; Senior Research Fellow: National University of Singapore, Singapore; Guest Scientist, Postdoctorate Fellow: Max-Planck-Institute for the Physics of Complex Systems, Dresden, Germany) works on nonlinear dynamics and complex systems emphasizing on complex biological networks, Spectral graph theory, Random matrix theory, Synchronization, Coupled chaotic dynamics on large networks, Adaptation and Evolution.



Research in Complex Systems Lab at IIT Indore involves nonlinear dynamics and complex systems. Synchronization and coupled chaotic dynamics on large networks, random matrix analysis of complex biological networks, social networks, and extreme value statistics are the prime domains of focus. In 2013, there have been three major publications from Complex Systems Lab in peer-reviewed journals apart from one in press.

The group studies the role of delay in phase synchronization and phenomena responsible for cluster formation in delayed coupled maps on various networks, revealing that delay may lead to a completely different

relation, between dynamical and structural clusters.They also study the effects of delay in diffusively coupled logistic maps on the Cayley tree networks, importance of which is reflected in understanding conflicts and cooperation observed in family business.The group inspired by the importance of inhibitory and excitatory couplings in the brain, analyzed the largest eigenvalue statistics of random networks incorporating such features, deriving that systems having more interactions among its constituents are likely to be more unstable. They deal with the analysis of protein–protein interaction networks for six different species under the framework of random matrix theory, depicting universality in nearest neighbour correlations, indicating randomness in underlying systems. Two of the species deviating from randomness at next to next neighbour correlations can be construed as a supportive evidence of non-random mutations prevalent in biological systems.

Dr. Rajesh Kumar
Assistant Professor
Physics,
Materials Sc. and Engg.
Dean, Planning
w.e.f.- January 6, 2016
Associate Dean, Planning-I
till January 5, 2016
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Dr. Rajesh Kumar (Ph.D: IIT Delhi; Postdoctoral Fellow: National Institute for Nanotechnology (NINT), University of Alberta, Canada) works in the field of experimental solid state Physics. His field of specialization is Raman and Photoluminescence spectroscopy. He also specializes in junction fabrication and is involved in a variety of electronic and spectroscopic diagnostics of junction structure and performance, with the long-term goal of understanding electron transfer in organic nanostructure junctions. Conducting polymer- based memory devices is a part of his research along with using semiconductor (mainly Silicon) as one of the components in molecular tunnel devices.

The “Materials Research Laboratory”, Discipline of Physics, IIT Indore has prepared silicon nanowires contained inside porous silicon membrane which emits red light as a result of quantum confinement effect in low dimensional silicon. This is done by simple metal assisted chemical etching method. These results can be used for application in SILICON PHOTONICS.

Dr. Krushna Mavani
Associate Professor
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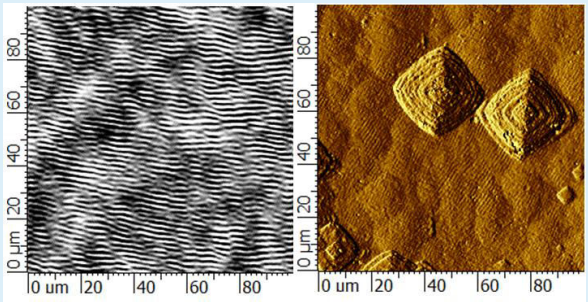
krushna@iiti.ac.in

Dr. Krushna Mavani (Ph.D: Saurashtra University; WPI Postdoctoral Researcher: Kyoto University, Japan; Postdoctoral Researcher: Osaka University, Japan; Postdoctoral Researcher: Tata Institute of Fundamental Research, Mumbai) is working onthin films and multilayers of Functional Oxides, Exploring Phenomena at Terahertz Frequencies using different Terahertz Spectroscopic techniques.



Magnetic domains on the surface of thin films where black and white parts show opposite orientations of magnetic spins.

Surface of a thin film showing a growth with pyramid shape structures of micrometer thickness.

Dr. Mavani works on structurally oriented thin films (in nanometer thickness) and multilayer of oxides. She synthesizes the thin films and multilayer using Pulsed Laser Deposition method. She studies the electronic, magnetic and structural properties of different oxide materials using techniques like X-ray diffraction, magnetization measurements, resistivity measurement, Hall coefficient measurements and terahertz spectroscopy. She studies the surface morphology and magnetic domains using Atomic Force Microscopy and Magnetic Force Microscopy. She investigates the structural, magnetic and electronic correlations in functional oxides for device-based applications. The strongly correlated properties of oxides can give rise to applications in fast memroy-devices, scanning devices, electronics and as various sesors. During last year Dr. Mavani had delivered two invited talks and attended conferences in India and abroad. She has published four research papers from IIT Indore, in international journals during the year 2013-14.

Dr. Subhendu Rakshit
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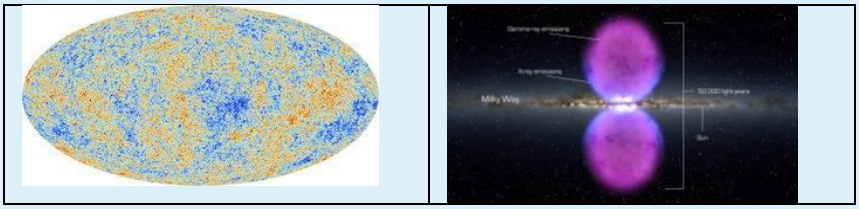
Dr. Shubhendu Rakshit (Ph.D: Calcutta University; Visiting Scientist: TIFR, India; Postdoctoral Fellow: University of Dortmund, Germany, Saha Institute of Nuclear Physics, India; Technion University, Israel; Harish-Chandra Research Institute, Allahabad)works on phenomenological aspects of particle physics. His interests include probing beyond the standard model particle physics, especially neutrino physics, super-symmetry, Large Hadron Collider related physics and neutrino astronomy.



Several astrophysical evidences suggest the presence of dark matter in our Universe. However the standard model of particle physics offers no such candidate, which fits the description of a dark matter “particle”. Hence it is a challenge to extend the standard model to include such a particle. Subhendu Rakshit and his collaborators have proposed a solution to this problem by extending the standard model by introducing two real scalar particles. This model can explain the observations made by the earth-based direct detectionexperiments, produce the right relic abundance of dark matter,as indicated by the observed cosmic microwave background radiation by satellite-based experiments like WMAP or Planck, and can also provide an explanation of the excess gamma ray emission from our galactic center as observed by Fermi gamma ray space telescope.

Dr. Ankhi Roy
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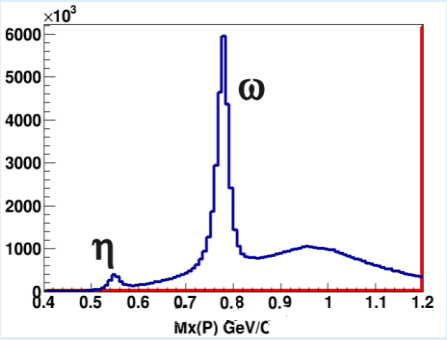
Dr. Ankhi Roy (Ph.D: IIT Bombay; DST Young Scientist IIT Bombay) works on Hadron Physics, Physics beyond Standard Model and Multivariate Analysis Techniques to analyze rare decay modes. She is collaborating with institutes like WASA-at-COSY, Germany, PANDA, Germany and LMD-CAA, Jefferson Laboratory, USA on different projects. She is one of the main faculties involved in the IIT Indore- ALICE collaboration.



One of the fascinating goals of hadron physics is the quantitative understanding of low energy QCD (Quantum Chromodynamics) which is the theory of strong interaction. A unique way of doing this is through studying different decay modes of mesons. Currently, Dr. Roy is involved with WASA-at-COSY, LMD-CAA, and PANDA collaboration. Her present physics interests are: Dalitz plot analysis through hadronic decays of eta, omega and etaprime mesons, calculation of transition form factor through Dalitz decay of eta meson, etc. She is also involved in the development of a detector, named as Lambda Disks detector, of the PANDA experiment.

Dr. Pankaj R. Sagdeo
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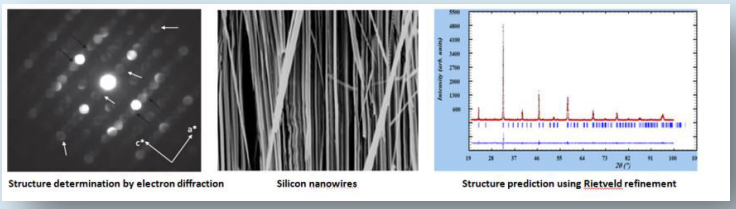
Dr. Pankaj R. Sagdeo (Ph.D: UGC-DAE CSR Indore; Scientific Officer/Coordinator: Bhabha Atomic Research Centre, Visakhapatnam, India; Research Associate/Postdoctoral Researcher: UGC-DAE-CSR Beamlines on Indus-I AND Indus-II, Indian Synchrotron source) is interested in surface interface physics, surface modifications/treatments by high power lasers and plasma, material characterization using synchrotron radiation, synthesis of composite materials for industrial applications, optical/magnetic multilayer, solar cell, etc.



Dr. Sagdeo works in the field of experimental solid state Physics. His field of interest is structure property correlation in highly correlated electron system such as manganites and multiferroic materials. Dr. Sagdeo has mastered various characterization techniques which include transmission electron microscopy, x-ray photoelectron spectroscopy, grazing incidence x-ray diffraction, x-ray reflectivity, atomic force microscopy, energy dispersive analysis of x-ray, x-ray florescence, raman spectroscopy, etc. and extensively used the thin film deposition techniques such as pulsed laser deposition, magnetron sputtering, electron beam deposition, spin coater etc. for sample preparation.

Ongoing projects:
1) Quantitative Substrate-Strain Induced Effect on Optical, Electrical and Magnetic Properties of Manganites: Funding agency CSIR, amount 20 lakhs.
2) Characterizations of pure and doped AB_7O_{12} type multiferroic oxides using Indus synchrotron radiation source. Funding agency DAE-BRNS, amount 25 lakhs.

Dr. Raghunath Sahoo
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Dr. Raghunath Sahoo (Ph.D: Institute of Physics, Bhubaneswar; CNRS Postdoctoral Fellow: Subatech, France and INFN Fellow in INFN Padova, Italy; Visiting Scientist, University of Cape Town, South Africa.).

Dr. Sahoo has almost 14-years of experience working in large-scale experiments starting from detector R&D, operation and data analysis, since his Ph.D. in STAR experiment at Brookhaven National Laboratory USA and later at LHC (Large Hadron Collider), CERN, Geneva, Switzerland, the world's largest particle accelerator. He is presently the Principal Investigator and Team Leader of ALICE group from IIT Indore and a member in ALICE Council. He has also taken up the responsibility of the Convenership of PWG-CF: ALICE-India Physics Working Group for particle Correlations and Fluctuations.

As an experimentalist in high energy physics, his research interest aims at studying of matter created in relativistic heavy-ion collisions at the extreme conditions of temperature and energy density, namely a million times the core of the Sun temperature and around 100 times the normal nuclear matter density: a process called "Big Bang Experiment" to produce Quark Gluon-Plasma (QGP): a plasma of fundamental constituents of matter, in the laboratory.

He has the expertise of handing large scale data for the study of global properties like transverse energy, charged particle production and freeze out properties. His group is involved in the Photon multiplicity measurement at the forward rapidities in ALICE experiment at LHC and also in the neutral pion spectra using PHOS detector. He also works in the phenomenology of QGP, where he has substantial scientific contributions.

Dr. Sahoo is the Principal Investigator of the future Compressed Baryonic Matter (CBM) Experiment at FAIR facility at GSI, Germany. He is also the member of Collaboration Board, CBM Experiment. This is a forthcoming experiment to studythe QCD phase diagram and search for critical point in the domain of high baryondensity.

Dr. Somaditya Sen
Associate Professor
Physics,
Material Science and
Engineering,
Astronomy,
Associate Dean Planning I
w.e.f. – January 6, 2016,
Associate Dean Planning II
till – January 5, 2016
sens@iiti.ac.in
adopii@iiti.ac.in

Dr. Somaditya Sen (Ph.D: Jadavpur University, Indian Association for the Cultivation of Science, Kolkata) .He works on magnetic oxide materials in both the nano and bulk regime. Working on different simple and complex oxides he tunes the physical properties of these materials by substitution, and studies the phase diagrams of the new materials. Synthesis and studying the structural and physical properties and finally extending these studies to device fabrication is the mode of research followed by his group containing postdocs, doctoral and internship students.

His group had been recently working on TM substituted ZnO, TiO_2, CuO, CeO_2, PbTiO, $BaTiO_3$, etc. The group synthesizes materials and characterizes using Xray diffraction, Xray Absorption, UV-vis, IR, Raman spectroscopy, Photoluminescence, etc. The group also studies the magnetic properties in collaboration with Miami university, Ohio and Univ of Wisconsin Milwaukee. Further active collaboration exists with RRCAT, UIC and DAE labs in Indore, Mumbai, Kalpakkam and Kolkata. Recent student exchange program has been started with Ming Chi Univ of Technology (MCUT). The group trains bachelors and masters interns along with doctoral students.

School of Humanities and Social Sciences
From HOD's Desk

Dr. Sanjram Premjit Khanganba
Head, School of HSS
w.e.f.- March 28, 2016
Assistant Professor
HSS
sanjrampk@iiti.ac.in


Faculty Members and Students of School of HSS

Introducing School of HSS members

School of Humanities and Social Sciences (School of HSS members) is a multidisciplinary establishment of IIT Indore. In School of HSS, we have eight faculty members with one associate professor (Dr. C. Upendra) and seven assistant professors:

- Dr. Amarjeet Nayak
- Dr. C. Bharath Kumar* (Head, SHSS till March 27, 2016)
- Dr. Neeraj Mishra
- Dr. Nirmala Menon
- Dr. Pritee Sharma
- Dr. Ruchi Sharma
- Dr. Sanjram Premjit Khanganba (Head, SHSS from March 28, 2016)

School of HSS members at IIT Indore has a strong PhD student group comprising of around thirty-four students. We emphasize on providing students the much-needed experiences that enable them to face the opportunities and challenges of today's changing world. In this effort, we always prepare ourselves to provide excellence in teaching and research through a continuous improvement process. Faculty members are teaching a full range of courses from introductory classes to advanced electives for graduate and PhD students.

Discipline Research Areas

- Human Factor
- Moral and Political Philosophy
- Philosophy and Literature
- Translation Studies
- Digital Humanities
- IPR,Patent Pilicy and Technology Transfer
- Agricultural Economics
- Development Economics
- Water Resource Governance
- River Basin Management

Notable Achievements

The individual research group achievements are described in the faculty write-ups that follow this. Here are some general achievements of School of HSS at IIT Indore.
Three students have already completed their PhD from the Discipline of Economics, one student from Discipline of Philosophy and are placed in academic positions in institutions of repute in India like NITs.

The DHRG, HSS conducted the first GIAN course at IIT Indore titled "Digital Humanities: Tools, Text, Theory" from March 19-25, 2016.

Dr. Nirmala Menon was appointed Editor In charge of Literary Encyclopedia on Postcolonial and Indian Literature and also as a member of Advisory board of Open Library of Humanities.

The Digital Humanities Research Group (DHRG) members presented 4 research papers at international conferences – University of Oxford (U.K), University of Krakow (Poland), University of Vienna (Austria) and published 5 research papers and 2 reports in international journals in 2015-16.

PhD students from the Discipline of Philosophy have published articles in quality journals like Humanities Circle, AI & Society and book chapters published by Springer.

Our student secured a Civil Certificate by Socratic Philosophical School, UNESCO, 2015.

The faculty members from the Discipline of Philosophy have published articles and reviews in Journals of national and international repute, have peer reviewed manuscripts for Oxford University Press and Routledge, contributed modules/reviews to UGC e-PG Pathshala of MHRD, 2015-16.

One of the recent major contributions of the school in terms of psychological research output is in the area of understanding cognitive processes in multitasking. General popular notion that managing workload becomes difficult for people while engaging in handling tasks needs to be understood contextually. Our research findings in the discipline of Psychology highlight that performance decrements is not necessarily associated with an increased cognitive workload. This research report appeared in the journal Displays. It has been listed among TOP25 Hottest Articles by Science Direct for the year 2014.

Dr. Ruchi Sharma has delivered a lecture on "An International Perspective on IPRs," during Innovation and Intellectual Property Management, at Ujjain Engineering College Ujjain on March 21, 2015.

Ms. Shanu Shukla, research scholar from the discipline of Psychology, has received Best Paper Presentation award at First International Conference on Applied Psychology at New Delhi on March 4, 2016.

Facilities in School of HSS

In Economics, we have extensive research facilities in terms of software and databases like STATA, Arc View, CMIE Indian Harvest, CMIE State Analysis Services, CMIE India Trades, CMIE Prowess, EPWRF

database, ASI database and IMD database. The discipline has received research assignment under the Ganga Grams Scheme of Namami Ganga project of the Ministry of Water Resources and Ganga Rejuvenation, Government of India. A research project on the Impact of Patent Policy on Innovativeness and Technology Transfer in India has been completed which was funded by the ICSSR. Faculty members along with their PhD students have presented their work in reputed international conferences and have also published research papers in peer-reviewed international journals.

In the discipline of Psychology, we have advanced research lab in the area of Human Factors & Applied Cognition equipped with eye-tracking systems, Emotiv, and Data Generation and Processing Software Systems. We are in the process of developing new facilities emphasizing on priority domains of Safety, Innovation, Occupation, Defense, Sports, Work, and Computational/Mathematical Modeling.

Programs and research activities of the discipline of Sociology focus on the integration of social, political, historical, cultural and economic approaches to developmental issues and to global and regional disparities.

Faculty Profiles in School of Humanities and Social Sciences

Dr. Sanjram Premjit Khanganba
Head, School of HSS
w.e.f.- March 28, 2016
Assistant Professor
HSS
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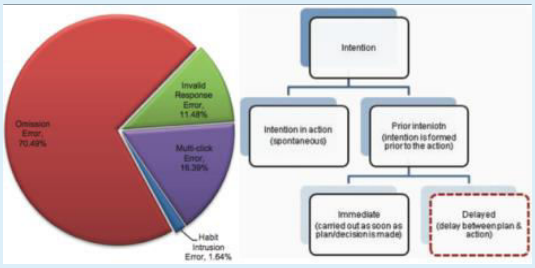
Dr. Sanjram Premjit Khanganba (Ph.D: IIT Bombay) performs Human Factors Research employing both experimental and non-experimental techniques.



Having extensive research experience in his area of expertise, he performs applied research with scientific rigor and is passionate about research projects and consultancy that will have social implications. His research at 'Human Factors & Applied Cognition Lab' concentrates on broad domains of: Interaction, Transport, Performance, Innovation, and Social Design. He is a founding member of HCI Professional Association of India. He has recently published his scientific papers entitled "Task difficulty and time constraints in programmer multitasking: An analysis of prospective memory performance and cognitive workload" and "Attention and intended action in multitasking: An understanding of cognitive workload" in International Journal of Green Computing and Displays respectively. His specific topic of research interest include- Human Error, Human Multitasking, Human Factors in, Computer and Information Systems, Interactive System Design & Evaluation, Psychology of Programming/Empirical Study of Programming, User Cognition, and Community System.

Dr. Bharath Kumar
Assistant Professor
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Dr. Bharath Kumar (Ph.D: University of Hyderabad; Indian Council of Philosophical Research (ICPR) General Fellow) .He works on Moral and Political Philosophy as the focus areas. He is interested in the issues of Nationalism, Multiculturalism, Citizenship, etc. in the Indian context.

Dr. Amarjeet Nayak
Assistant Professor
HSS
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Dr. Amarjeet Nayak (Ph.D: IIT Kanpur) major areas of interests are Indian Writing in English, Postcolonial Theory and Translation Studies. He has published academic papers in international and national refereed journals such as SKASE journal of Literary Studies, Jura Gentium, Parnassus, Journal of Drama Studies, Pegasus, Apperception, etc.

Dr. Nayak's research work in the fields of postcolonial literature, disability studies, politics of literary marginalization, etc. has been published in many international journals of repute such as New Writing: The International Journal for the Practice and Theory of Creative Writing, Disability and the Global South, Short Fiction in Theory and Practice, etc. Dr. Nayak's doctoral students have also published their works in reputed international and national journals such as Notes on Contemporary Literature, Wizcraft Journal of Language and Literature. Some of the major achievements of Dr. Nayak's doctoral students include presenting research papers in prestigious international conferences at MIT, University of Osnabruck, Germany, as well as participating in the Summer School at Harvard and at Institute of Economic Growth, Delhi University.

Dr. Nirmala Menon
Assistant Professor
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Dr. Nirmala Menon (Ph.D: George Washington University, USA) works primarily on Postcolonial Literature and Theory. Her focus is on comparative study of twentieth century postcolonial literatures in English, Hindi and other languages. Gender studies, Globalization and Translation studies are additional areas of research. Her research interests are multilingual and interdisciplinary; she investigates cultural, gender and historical representations in colonial and postcolonial works. Her work examines the ways in which literatures from different non-Western languages influence and redefine/reframe understanding of postcolonial theoretical concepts.

Her primary area of research is Postcolonial Literature and Theory. Her focus is on comparative study of twentieth century postcolonial literatures in English, Hindi and other languages. Gender studies, Globalization and Translation studies are additional areas of research. Her interests are multilingual but also interdisciplinary; she looks at cultural, gender and historical representations in colonial and postcolonial works. Her research examines the ways in which literatures from different non-Western languages influence and can redefine and reframe or understanding of the postcolonial theoretical concepts.

Dr. Ruchi Sharma
Assistant Professor
HSS
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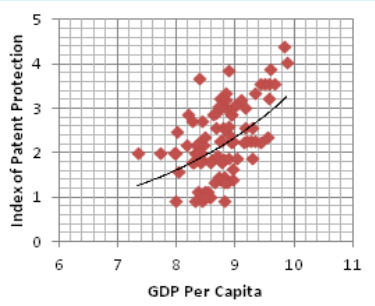
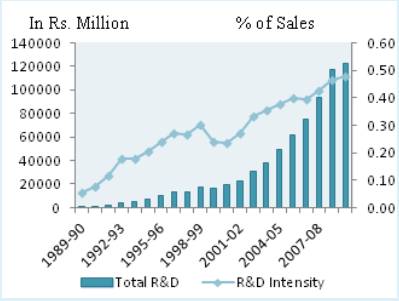
Dr. Ruchi Sharma (Ph.D: IIT Kanpur; M.Phil. and M.A. (Economics) Punjab University, Chandigarh; U.G.C Doctoral Research Fellow) has worked as Economist with Tata Services Limited. She has also worked at IIT Delhi and holds visiting position at IIM Indore.



This figure shows that countries tend to formulate patent policy per the domestic economic and technological requirements.



This figure shows that total R&D expenditure and intensity of Indian industries has increased in the last two decades.

Her research areas are Economics of Innovation, Patent Policy and Technology Transfer (FDI and Licensing). Currently, her research group is working on R&D and patenting by Indian firms, patenting by Indian universities and academic institutions and the impact of FDI on innovation by Indian firms. She has completed sponsored research project funded by Indian Council of Social Sciences Research. She has published research papers in international journals of repute like Economics of Innovation and Technology, Journal of Economic Studies, Global Economic Review and Journal of Intellectual Property Rights and World Patent Information. Dr. Ruchi Sharma has presented her research work in international conferences held at University of Illinois and Oxford University. She was awarded Kusuma Young Faculty Incentive Fellowship at IIT Delhi.

Dr. Pritee Sharma
Assistant Professor
HSS
Dean, Administration
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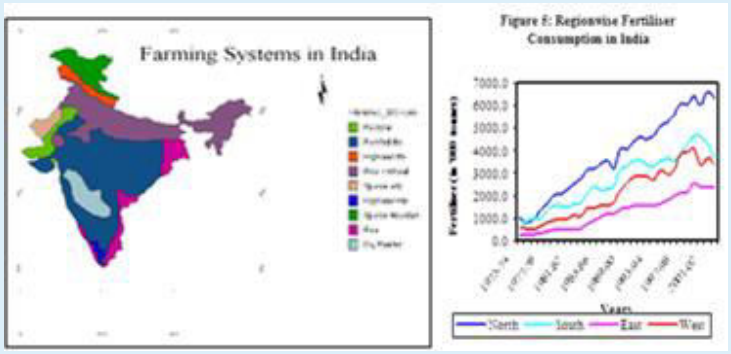
Dr. Pritee Sharma (Ph.D: IIT Bombay; Project Associate: Gujarat Institute of Development Research, Ahmedabad; Academic Associate: Indian Institute of Management, Ahmedabad) is interested in Agricultural Economics (Economics of Land, Water and Forests) and Development Economics (Rural Poverty and Trade Concerns of Developing Countries).



Prior to her doctorate she has worked on research assignments from the Ministry of Agriculture, Ministry of Environment and Forests, GOI, and the World Bank. Her current research focuses on water resource economics, energy economics, and climate change adaptation in Indian agriculture. At IIT Indore she is also a part of "Indian consortium on Indo-UK Collaboration on River Health" and will be undertaking research on Ecosystem Services Valuation and Implications of Ganga Health on Agriculture and Food Security. She is also a Principle Investigator for proposal submitted to JICA on "Centre for Excellence in Sustainability Studies." She is the lead for research group working on "Rural Technologies and Development Studies." She is undertaking PhD students' supervision in the areas of Climate Change and Food Security, Renewable Energy Policy and Labour Market Rigidities and Industrial Regulations in India.

Dr. C. Upendra
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Dr. C. Upendra [Ph.D: IIT Bombay; Research Fellow at Forum on Contemporary Theory, Baroda (funded by Ford Foundation)].

C. Upendra is currently working on some issues related to philosophy of biology, radical political philosophy and deeper concerns of moral philosophy. In this regard, his research specifically focuses on three aspects: First, to see the implications and relevance of evolutionary theory to human beings and evolution at large. In doing so, Upendra attempts to see biologism's understanding of life. Secondly, he is critically looking at political utopia and the necessity of radical political transformation. Here, he asserts that the ontological status of any society lies in its ideological commitments. Finally, Upendra's research looks at F.Nietzsche's [a German Philosopher] denouncement of the western metaphysics and further attempts to eliminate metaphysics. The central claim is such negations are weak philosophical stances. Besides these, Upendra's heart lies in understanding the connections between philosophy and literature.

Dr. Neeraj Mishra
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Dr. Neeraj Mishra (PhD: The Center of Development Research, University of Bonn, Germany) research interests are: 'political sociology of water governance', river basin management and development, usage of spatial tools and GIS in natural resource management, anthropological research on developmental issues etc.

His current research focuses on urban and rural water resource governance, river basin management, inter-basin water politics and climate change adaptability research in the water sector.

At IIT Indore he is also part of "Indian consortium on Indo-UK Collaboration on River Health" and will be undertaking research on the gaps existing in the present institutions and governance of Ganga river basin that has led to its poor health status. The study also documents the traditional and tacit community knowledge for river basin management that exists among the local people and suggests how such knowledge can be documented and included to support the Decision Support Systems (DSS). Towards a more nuanced understanding of river basin management, this study would also collect qualitative data to show how local people construct the river in their own 'world-views' and how does the historical, linguistic, and political situated-ness of different riverfront communities affect the health of the river?

Dr. Neeraj Mishra is also a co-Investigator for proposal submitted to JICA on "Centre for Excellence in Sustainability Studies." He is undertaking PhD students' supervision in the areas urban water governance, watershed management, and inter-regional and national water politics.

Biosciences and Biomedical Engineering
From HOD Desk

Dr. Prashant Kodgire
Assistant Professor
HOD, BSBE
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Biosciences and Biomedical Engineering (BSBE) is a unique interdisciplinary center which has been established in 2012 with a vision to encourage human resource development and research in the area of bioscience, bioengineering and biomedical engineering.

Introducing BSBE members

In BSBE there are four core faculty members along with four other core faculty fellows. Ten more faculty members and one more faculty fellow from other disciplines are also associated with this interdisciplinary center.

- Dr. Prashant Kodgire - Head
- Dr. Amit Kumar
- Dr. Sharad Gupta
- Dr. Debasis Nayak
- Dr. Mirza S Baig
- Dr. Abhijeet Joshi
- Dr. Parimal Kar
- Dr. Hem Chandra Jha
- Dr. Shaikh M Mobin
- Dr. Chelvam Venkatesh
- Dr. S. Dhinakaran
- Dr. Kiran Bala
- Dr. Sarika Jalan
- Dr. Sanjram Premjit Khanganba
- Dr. Rab Bilas Pachori
- Dr. S. Vasudevan
- Dr. Rajesh Kumar
- Dr. Sudeshna Chattopadhyay

BSBE currently runs a PhD program with more than forty students in different areas of modern biology. Furthermore, about 12 research projects are currently undergoing in this multidisciplinary center.

Discipline Research Areas

As BSBE is basically a multidisciplinary center therefore the area of research is also wide and diverse. Following are some key research areas which are getting explored by faculty members and researchers.

- Bio-sensors and Bio-electronics
- Biomedical Signal Processing
- Biofluid mechanics, CFD and Heat Transfer, Blood flow analysis, Non-Newtonian fluid flows
- Biological Networks
- Biophotonics
- Cancer Biology
- Chromatin structure and gene regulation
- Cytoplasmic flows
- Detection and role of delay in large extended systems
- Disease spreading, co-evolution and adaptation
- Drug delivery systems, near-infra red fluorescence, nuclear Imaging and bio-conjugate chemistry
- Human factors
- Molecular Biology
- Molecular Immunology
- Photo-acoustic microscopy for biomedical applications
- Photothermal response and photothermal imaging Design, synthesis and diagnostic applications of new targeting ligands for cancers and inflammatory diseases
- Raman imaging and Spectroscopy
- Systems Biology
- Somatic hypermutation of immunoglobulin genes
- Spectral analysis of gene expression profile of zebra-fish under various toxic/environmental perturbation
- Spectral properties of directed networks
- Synchronization of coupled dynamics on networks and its application to neurosciences
- Synthesis of Inhibitors for drug targets
- Metals in biology

Notable Achievements

The detailed research achievements are described in the individual faculty profile. Some general achievements of center are provided below.

- Published about twenty research papers in reputed international journals.
- Dr. Prashant Kodgire won Excellence in Teaching Award of IIT Indore.
- Dr. Amit Kumar and his group won the best research paper award.

Mr. Vinay Sharma has been awarded ESONN (European School on Nanosciences and Nanotechnologies) Fellowship, Grenoble France August -Sept 2016.

Ms. Jaya Singhal has won the first position in both poster and oral presentations in International Conference on NanoBio Interface 2016 hosted in JNU, New Delhi.

Facilities in BSBE

Following instrumental facilities are currently available in Center of BSBE: Confocal Microscopy Research Facility, Flow Cytometry Facility, Proteomics Facility

Faculty Profiles in Bioscience & Biomedical Engineering

Dr. Prashant Kodgire
Assistant Professor
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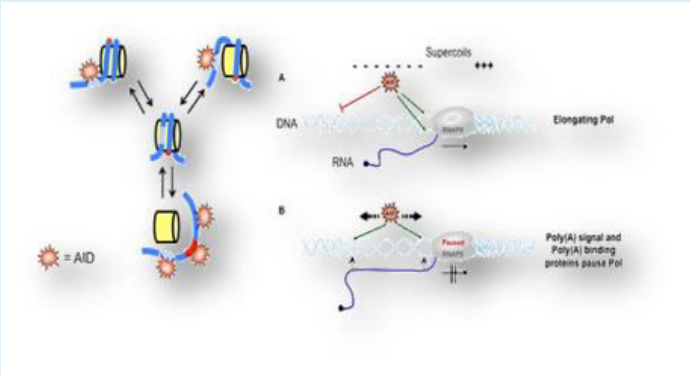
Dr. Prashant Kodgire (Ph.D: IIT Bombay; Postdoctoral Fellow: University of Chicago, USA; Research Associate: Wockhardt Research Centre, Aurangabad, India) works on Molecular Immunology, Somatic hyper-mutation of immunoglobulin genes, Chromatin structure and gene regulation. He got the prestigious Ramanujan fellowship from Govt. of India.He also received Irvington Institutes postdoctoral fellowship from the Cancer Research Institute, USA, for work in Immunology and Cancer Immunology. He received another very prestigious International postdoctoral fellowship award from the Lady Tata Memorial Trust, UK, for research in Leukemia.



His group's current efforts are on identifying the molecular mechanisms of action and targeting of activation-induced cytidinedeaminase (AID) on the Ig genes. These studies are important for determining how the varied repertoire of antibody genes is created with the potential to react against any foreign antigenic substance, including tumor cell antigens. Besides aiding the defense against tumors by creating potent anti-cancer antibodies, SHM can have a negative effect as a promoter of cancer by giving rise to B cell lymphomas and leukemias.

Understanding somatic mutation will aid in the investigation of the cellular, genetic and environmental causes of B lymphocyte malignancies as well as in learning how to influence the production of high affinity antibodies against infectious agents and tumor antigens.

Dr. Sharad Gupta
Assistant Professor
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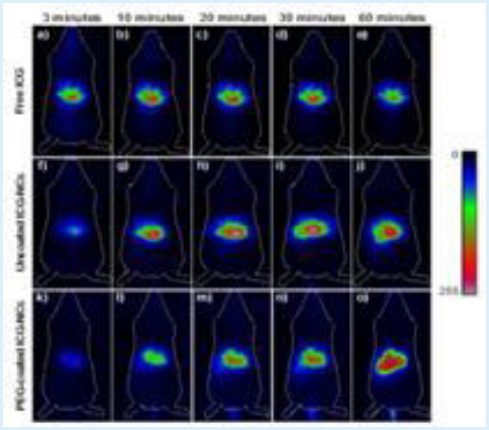
Dr. Sharad Gupta (Ph.D: IIT Kanpur, India; Postdoctoral Fellow: Tufts University, MA, USA; Visiting Research Associate: Bio systems, KAIST, Korea; Assistant Project Scientist, Academic Coordinator and Lecturer: University of California, Riverside) focuses on the development of biocompatible nano-carriers for in-vivo molecular imaging. He plans to use these nano-carriers for cancer diagnosis and therapy. He also develops new biomaterials for the development of biologic wound dressings.



The main focus of Dr. Gupta's research is on development of optical techniques for biomedical applications, bio-nanotechnoIogy and biomaterials. Currently he is focusing on a project that studies the mechanism of small peptide interaction with plasma membrane. In this work, the effect of cholesterol on interaction of small peptide with plasma membrane is also studied. To understand these mechanism he is using optical interferometric techniques, it has been found that inclusion of cholesterol in plasma membrane makes membranes more resilient towards the cytolytic action of this small peptide. In addition to this he is developing a nanotechnology based approach for near infrared (NIR) biomedical imaging for disease diagnosis. In this project, he is developing biocompatible and biodegradable nanoparticles that will bring the NIR chromophore such as Indocyanine green (ICG) to a target location to diagnose the abnormality inside the tissues.

Dr. Debasis Nayak
Assistant Professor
BSBE
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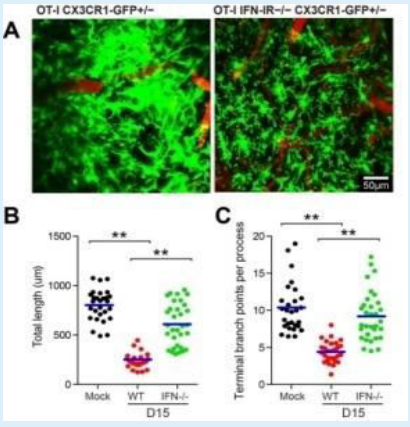
Dr. Debasis Nayak (Ph.D, University of Nebraska-Lincoln, USA in Molecular Virology and Viral Pathogenesis in 2008) studying vesicular stomatitis virus (VSV). He works in the area of viral immunology and infectious viral disease at the center for Biosciences and Biomedical Engineering. Dr. Nayak received his His current research includes development of novel viral vector vaccines against human enterovirus and Chikungunya virus infection. Further, his research group is engaged in development of field based diagnosis kit for viral diseases affecting livestock population. These include bovine ephemeral fever and contagious ecthyma.



Dr. Nayak's laboratory also investigates innate immune function of microglia, the resident immune cells of brain. Microglia is the most abundant immune cells of the central nervous system (CNS). In resting brain, microglia possesses small body and highly ramified processes. These processes are constantly engaged in sensing CNS microenvironment and communicate directly to astrocytes, neurons, blood vessels etc., to perform specialized tasks essential for normal physiology of the brain. While in pathology, these cells launch very specific innate responses in which they undergo dramatic morphological transformation, become motile, and gain proliferative and phagocytic capacity. Microglial mediated neuroinflammation often promote neuroprotectivefunctions, though, neurotoxic actions are also reported.

As microglia actions can lead to neuroprotective and/or neurodegenerative consequences, their action during CNS pathophysiological conditions is strictly regulated. **IFN-I signaling regulates activation and dynamics of microglia in LCMV infected brain.**A. Two-photon laser scanning images performed through a thinned skull window in OT-I CX3CR1-GFP$^{+/-}$ (left) and OT-I IFN-IR$^{-/-}$ CX3CR1-GFP$^{+/-}$ (right) mice at day 15 post LCMV infected brain. Maximal projections of two-photon Z stacks (50 µm depth) show the distribution of microglia (green) in relation to cerebral blood vessels (red). Note that microglia remain non-activated and highly ramified in LCMV-infected OT-I IFN-IR$^{-/-}$ CX3CR1-GFP$^{+/-}$ mice relative to OT-I controls. (B, C) Quantification of microglial branch length (B) and complexity (C) was performed in denoted groups (n=4) of mice. Each dot represents an individual, randomly selected microglia. Blue bars represent the mean of the group. Asterisks denote statistical significance (P<0.05).

Dr. Amit Kumar
Assistant Professor
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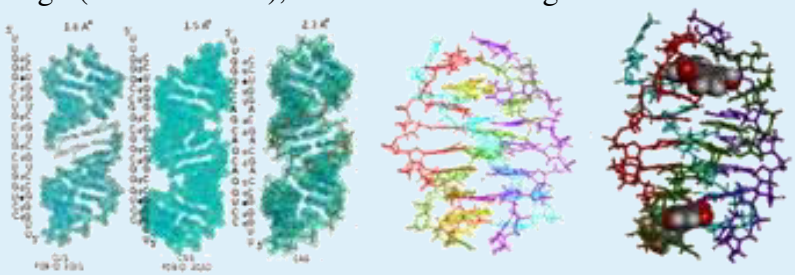
Dr. Amit Kumar (Ph.D: IIT Roorkee, India; Postdoctoral Research Associate: The Scripps Research Institute, U.S.A.; Postdoctoral Fellow: Research Foundation, SUNY Buffalo, U.S.A; CSIR Research Fellow: IIT, Roorkee) works on Structure Biology, NMR Spectroscopy, Target Identification and Drug discovery for different diseases, Proteomics, Computer Based Drug Design (SBDD/FBDD), Molecular Modeling.



(Left) Crystal structure that have been refined of a model duplex of r(CUG)exp in Myotonic dystrophy Type I, r(CGG)exp in Fragile X-associated tremor ataxia/ Fragile X syndrome and r(CAG)exp in Huntington's Disease (HD) and Spino Cerebellar Ataxia (SCAs). (Right)Minimized structure showing the G-quadruplex DNA complexed with the lead small molecule.

Dr. Kumar's group members are involved in developing libraries of bioactive small molecule ligands that can target a variety of toxic DNA/RNAs that are present in several untreatable neurological and orphan diseases. Such toxic RNA based diseases include: Myotonic dystrophies, Kennedy's disease, the Spinocerebellar ataxias, Huntington's disease, Fragile X syndrome and many others. In many of these cases, not only do we use directly the information contained in the RNA motif-ligand database but also we utilized similarity searching and virtual screening to rationally optimize the initial leads into potently bioactive small molecules. Further, rational design of small molecules and structural studies of these small molecules in complex with their RNA targets, these studies will not only allow us to understand the molecular and atomic level interactions that drive association of complexes but will also allow us to rationally design improved small molecules that target RNA.

Dr. Abhijeet B. Joshi
INSPIRE Faculty
BSBE
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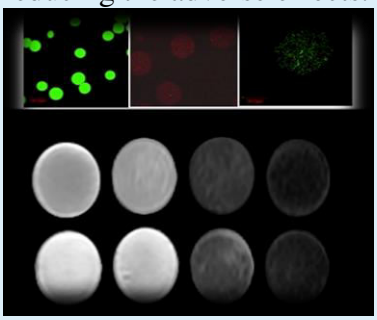
Dr. Abhijeet B. Joshi (Ph.D: IIT Bombay, India, Lecturer: NIPER-Ahmedabad, India, IYBA Fellow: IIT Bombay, India) works in the fields of Biomedical Engineering especially in biosensor development, drug delivery, diagnostics and theranostics. He has received several awards from national and international agencies like TR-35 Award India, INAE-Innovative student project award, Dr. GargiVishnoi Memorial Best PhD thesis Award, Gandhian Young Technological Innovation (GYTI) Award, travel awards etc.

The main focus of Dr. Joshi's group is development of nano/micro technologies for diagnostics and therapeutics. His group is involved in development of biomaterials, nano-materials and using them for biosensors and novel drug delivery systems. His group works towards developing drug-loaded nano-carriers for delivery of drugs at sites which less accessible using conventional methods of drug delivery. Using these nano/microcarriers he plans to improve the therapeutic efficacy of disease treatment by localizing, targeting and reducing the adverse effects.



In an example study, Dr. Joshi's group has developed combined capable of biosensing, drug delivery and imaging materials for glucose biosensing, anti-inflammatory agent delivery and MRI imaging using magnetic nanoparticles. Dr. Joshi's group aims in translating these biomaterial matrices into point of care systems that can be used in resource poor settings.

Dr. Parimal Kar
Ramalingaswamy Fellow
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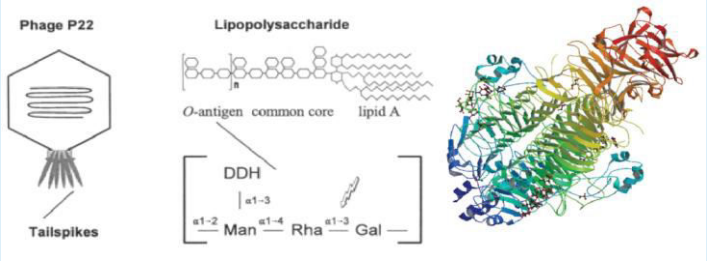
Dr. Parimal Kar (Ph.D: Michigan Technological University, USA; Postdoctoral Fellow: Max Planck Institute of Colloids and Interfaces, Potsdam, Germany; Visiting Research Associate: Michigan State University, USA) focuses on the development and application of physics-based new computational approaches for biomolecular simulations elucidating the structure and thermodynamics of biomolecules and the biophysical basis of ligand recognition by the target protein at the atomic level. He got the prestigious Ramalingaswamy fellowship from Govt. of India. He also received the Postdoctoral Independent Career Potential Award from Michigan State University, USA.



Currently, his group is modeling the molecular basis of phage infections caused by bacteriophages. Bacteriophages can penetrate the dense coating of bacterial cells that are covered with lipopolysaccharides (LPS), and subsequently inject their DNA without destroying the cell. LPS is composed of an amphipathic lipid A component and hydrophilic oligosaccharides of the core, and O-antigen. The first steps of infection comprise the recognition of the long O-antigenic polysaccharides of the LPS by the tail spike proteins (TSP) of the phages and successive cleavage. In this project, his group is working on characterizing the binding mode of TSP-LPS and investigating the relation between the flexibility of LPS and their specific recognition using fully atomistic molecular dynamics (MD) along with various free energy simulation methods, such as Molecular Mechanics/Poisson-Boltzmann Surface Area (MM/PBSA) and Umbrella Sampling (US). Our study will reveal various driving forces for these recognition events and possibly predict in which way structural features of a protein-carbohydrate complex influence the thermodynamics and the mechanism of binding.

A concise picture of the bacterial LPS recognition by TSP of bacteriophages is important in order to understand the essential steps of phage infection, and to further develop phage therapy against bacterial infectious diseases.

Dr. Vikas Yadav
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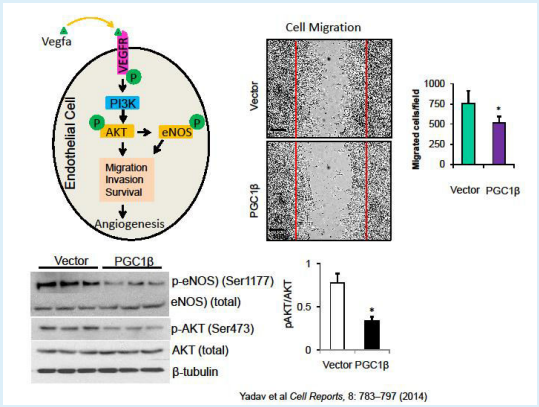
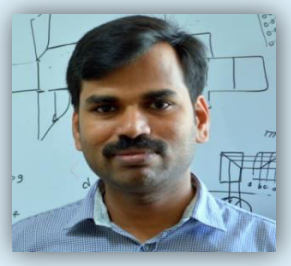
Dr. Vikas Yadav (Ph.D: Jawaharlal Nehru University, New Delhi; Postdoctoral Fellow: Tufts University, Boston; Harvard University, Boston; University of Texas, Houston, USA) works on find the therapeutic role of nuclear receptor ERRs and their coactivators (ERRs and PGCs) in diabetes mediated



vascular complication. In addition to that, he is working on discovering novel regulatory proteins involved in transcriptional regulation of PGCs (PGC1α and PGC1β) and ERRs. He has been awarded the prestigious Ramalingaswami Fellowship from the department of Biotechnology, Govt of India. His research group is keen to understand the uncovered molecular events that lead to endothelial dysfunction in metabolic disease such as diabetes. Since endothelial dysfunction lead to devastating consequence (ie. foot ulcers, cardiovascular complications, retinal degeneration, kidney dysfunction, neural abnormalities etcs) in diabetes patients. Therefore, his efforts are to understand the molecular mechanism that leads to the endothelium dysfunction. The long term goals of his studies are to find out the therapeutic molecules to restore the endothelium dysfunction. He is also interested in protein-protein interactions studies to reveal unknown proteins that interact with nuclear receptor ERRs during their docking at genome. The other research interest that he has, are to elucidate the role of ERRs in cancer progression and metastasis.

Associate members of BSBE



Dr. S. Dhinakaran
Assistant Professor, ME

Dr. Chelvam Venkatesh
Assistant Professor, Chem.

Dr. Srivathsan Vasudevan
Assistant Professor, EE

Dr. Premjit K. Sanjram
Assistant Professor, HSS

Dr. Ram Bilas Pachori
Associate Professor, EE

Dr. Shaikh M. Mobin
Assistant Professor, Chem.

Dr. Rajesh Kumar
Assistant Professor, Phy.

Dr. Sarika Jalan
Associate Professor, Phy.

Metallurgy Engineering &Material Science
From HOD Desk

Dr. I. A. Palani
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Introduction to the discipline

Discipline of Metallurgy Engineering and Material Science formerly called as Centre for Material Science and Engineering was established in the year 2013. The primary focus of the discipline is to promote interdisciplinary research in the field of metallurgy and materials related to the areas catering different applications. The discipline focuses on understanding the relationships between processing, structure, properties, and the performance of materials. Also to design and develop tailor made material to cater the cutting edge technology for quality products of industrial standards.

The discipline has 19 associated faculty members from various disciplines, 1 Ramanujam research faculty and 2 DST Inspire faculties. The Discipline has a Ph.D program with a current strength of 25 scholars. M.Tech (Material Science and Engineering) program was started in the year 2015 with a batch intake of 15 per year. This year B.Tech (Metallurgy and Material Science Engineering) has been initiated with batch strength of 40. The discipline has been focusing on four major thrust areas 1) Tribology and surface coatings 2) Materials for Energy 3) Nano materials and nano structures 4) Bio-materials and devices.

Areas of Expertise

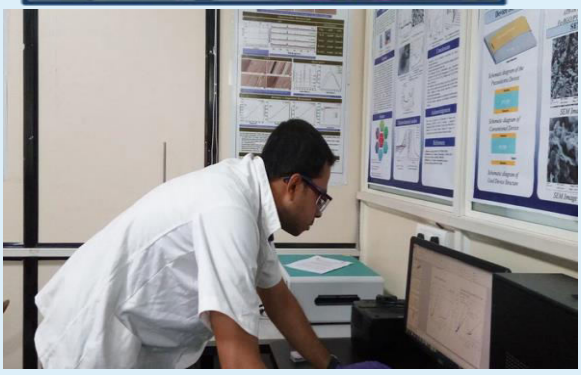
The discipline has expertise on the following sub topics such as photo catalysis of water for hydrogen generation, developing super capacitors for energy storage and harvesting, synthesizing metal nano catalyst for energy generation, developing flexible large area piezo electric energy harvesters, organic hybrid solar cells, UV LED's , developing high power thermo electric materials, novel electrode materials for batteries, low power nano electronic devices, phase change memory devices, laser and plasma based surface treatment, tetra hertz spectroscopy, bio-medical imaging, bio-sensors. More than 40 research publications have been

published in reputed journals on the above mentioned areas from this discipline. The discipline has sanctioned projects worth more than ten million Indian rupees from DST-SERB.
Recent highlights from the discipline include

1) Research Paper Published by Dr.Bishwarup Pathak on the topic “Cuboctahedral Platinum (Pt79) Nanocluster Enclosed by Well Defined Facets Favours Di-sigma Adsorption and Improves the Reaction Kinetics for Methanol Fuel Cell” in the international journal of Nano scale is highly appreciated and published as the back cover page of the journal.
2) Dr.Parashram Shirage has developed an in-house Gas Sensing, Humidity Sensing device and his research group has also developed rGo-Ag Nanocomposite for controlling the anti fungal activity.
3) Mr.Sarthak Acharya, M.Tech Student has received fellowship under DAAD-IIT Indore Master Sandwich Program in 2016 to work in RWTH Aachen University Germany
4) Mrs.Swati Mishra Ph.D Research Scholar visited University of Hannover Germany as a Research Intern for a period of three months.

Industrial collaboration and future focus

The Discipline is currently in collaboration with industries and government R&D centres which includes INOX Wind, WABCO India Ltd, L& T Transmission Lines, Raja Ramanna Centre for Advanced Technology etc.Currently the discipline is focussing towards developing high end Metallurgy, Metal Forming, Advanced casting and welding laboratories to equip the students with par excellence and also to cater the need of the industries nearby.



Faculty Profiles in Metallurgy Engineering and Material Science

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Associated Department:
Department of Mechanical Engineering (Assistant Professor)
Research Areas:

- Optical instrumentation
- Mechatronics System Design
- Laser assisted synthesis and characterization of Nano structures for functional devices

Dr. M. Anbarasu
Assistant Professor
Metallurgy Engineering
and Material Science

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Associated Department:
Department of Electrical Engineering (Assistant professor)
Research Areas:
Nanoscale phase change electronic memory devices
Multi-bit data storage, stackable cross-point memory devices
Ovonic threshold switch selector devices
Amorphous semiconductors, Chalcogenide glasses

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Research Areas:

- Understanding Crystal Structure and Electronic Properties coorelation in Functional
- X-ray Absorption Fine Structure Spectroscopy (XAFS), Photoemission Spectroscopy (PES), X-ray Magnetic Circular Dichroism (XMCD)
- Electrical transport and Magnetic properties measurement; Thermoelectric power measurements

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Research Areas:
Model Potentials for metal clusters and nanoalloys
Model Potentials for small organic molecules
Devolopment of novel computational techniques to study nanoalloy clusters

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Research Areas:
Surfaces and interfaces - Solids, liquids, soft matter and nanomaterials
Improvement of the capacity of Electrical Energy Storage Materials
Structure-property relationship of high pressure thermo electric materials.
The interface of water and hydrophobic surfaces

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Non-Invasive Characterization and Disease Diagnosis

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Research Areas:
Solid-State Devices, Circuit Design and Nanotechnology
Semiconductor Devices: Physics, Simulation and Modeling
Novel MOS devices (single and multi-gate) in Bulk/SOI technology
Circuit design with nanoscale devices
Bipolar Transistors: Thermal resistance optimization

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Research Areas:
Experimental Solid State Physics
Organic and Inorganic Semiconductors
Nanostructures
Raman and PL spectroscopy
Device Physics

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Research Areas:
Thin films and Multilayers
Multiferroics
Metal-Insulator Transition
Magnetism

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Research Areas:
Reversible mechanochromism and enhanced aggregation induced emission
Organic synthesis/ Synthetic methedology
Photosensitizers for photodynamic cancer therapy and Supramolecular systems for molecular devices
Organic light emitting diodes and electron and energy transfer in molecular systems
Multiphoton absorption

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Research Areas:
Opto-electronics, organic electronics, nano-scale sensors and memory devices
Nano-scale multiple quantum well lasers, hybrid LEDs, photodetectors, solar cells: Materials covering group II-VI, III-V, and IV-VI from periodic table viz. ZnO, PbSe, GaN, GaAs etc
Nanophotonics, plasmonics
High electron mobility transistor (HEMT) based on ZnO, GaN, AlGaN

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Research Areas:
Clean Energy Materials
Hydrogen Storage and Production (Photo catalysis)
Li-ion Batteries
Fuel Cell
Surface Catalysis
Molecular Electronics

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Research Areas:
In house development of scientific instruments
To search for the novel experimental technique and or methodology for material characterization
Search and development of new smart materials
To understand the origin of magnetism in non magnetic oxides such as TiO2 using XMCD experiments
To understand the origin of alloying at interfaces in chemically non reactive systems

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Research Areas:
Multiferroics
Magnetic Semiconductors
Nano-materials
Semiconducting Glasses
Perovskites

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Research Areas:
metal chalcogenized clusters
coordination polymers
Inorganic co-crystals
Solid-State Studies by employing SCSC techniques to the metal complexes
Time-Resolved X-ray Crystallography

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Research Areas:
Nanomaterials for Energy Applications
Superconductors: New Materials, Basic Mechanism
Isotope effect for Understanding the Basic Mechanism of superconductivity
Point Contact Spectroscopy and Scanning Tunneling Microscopy/Spectroscopy

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Nanoparticles for catalysis
Organometallic and coordination complexes of transition metals as catalysts

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Organic Field Effect Transistors (OFETs)
Study of photo generated charge carriers in organic thin films
Study of Hybrid Devices
Hydrothermal Growth of ZnO

Centre of Astronomy
From the HoD's Desk

IIT Indore Centre of Astronomy was founded in 2015 as an interdisciplinary centre, in order to promote and promulgate research in Astronomy and Space Sciences. Work being done at the Centre of Astronomy ranges from Space weather / Ionospheric studies, to Novel Materials for Space applications, and from Navigation Systems to Radio Astronomy. With this wide range of inter-linked and related interests, Astronomy at IIT Indore has grown from a Special Interest Group to a full Centre, with rapidly expanding interdisciplinary research interests, and is now contributing significantly to two consortia / collaborations – the Square Kilometre Array-India Consortium (SKAIC), and Indian Regional Navigation Satellite System (IRNSS), or the NAVIC (NAVigation with Indian Constellation).

Astronomy started its activities after its first core member, Dr. Prasant Samantray, joined the institute on December 26, 2014. In March 2015, Astronomy became the first Centre / Discipline to transfer entirely to IIT Indore's own campus in Simrol, in a small room in the Workshop building. Dr. Siddharth Malu joined the Centre as a core member in the same month, having served as a faculty member in Physics for three years, 2012 to 2015.

The Centre operated from this one small room, from March 2015, until the end of the 2015-16 academic years, with its own space coming up speedily due to the proactive intervention of Dr. Abhirup Datta, who joined in September, 2015. Dr. Datta designed the layout, and with help from Dr. Somaditya Sen (Associate Member), and some support from Dr. Malu, was able to make the Centre's space ready in a short time, by July-end, 2016.

The Centre now has a regular Ionosphere-monitoring facility, operating continuously, as part of Dr. Datta's research program, following his publication on **Effects of the Ionosphere on Ground-based Detection of the Global 21 cm Signal from the Cosmic Dawn and the Dark Ages** (accepted, Astrophysical Journal).

Dr. Malu and Dr. Datta explored the high-frequency behavior of the Bullet cluster, with data from the Australia Telescope Compact Array.

Dr. Prasant Samantray's proposal to CSIR, titled "Quantum Gravity in Rindler Space" was sanctioned this academic year. He also has a paper on "The Schwinger Mechanism in (Anti) de Sitter Spacetimes".

- Dr. Siddharth Malu, HoD (Astronomy)

Recent News

Prof. Hari Hablani joined Astronomy as Visiting Professor on July 25, 2016.

Prof. Hablani works in Aerospace, and has had a distinguished career in the Aerospace industry, in Boeing, and the NASA Johnson Space Center. Prof. Hablani received his Ph.D. in Aerospace from the Indian Institute of Science, Bangalore, in 1978, and currently works on IRNSS Inertial Navigation, SAM guidance with IR&mm-wave radar; control systems for spacecraft manoeuvres. Astronomy welcomes Prof. Hablani.

Strategic Intiatives of Centre of Astronomy

I. Square Kilometre Array – India Consortium (SKAIC)

The Square Kilometre Array is a planned radio telescope; it gets its name from the total collecting area of all its dishes combined, which will be one square kilometer, or one million square metres (10 million square feet).

Fifteen organizations, including NCRA-TIFR (National Centre for Radio Astrophysics, which constructed and now operates the Giant Metrewave Radio Telescope, GMRT) and IIT Indore formed the SKAIC during a workshop on "Indian Participation in the SKA" on February 16, 2015. India is one of eleven member nations in the SKA Organization and Indian scientists are participating in three of the ten design work packages, and have a leading role in one of them.

Dr. Abhirup Datta, IIT Indore, a member of the Executive Council of SKAIC, is leading IIT Indore's contribution to the Square Kilometre Array, through his research in impact of Ionosphere on low-frequency ground-based instruments for studies of formation of earliest structures in the universe. He also works on analysis of data from large-scale structures, with another faculty member in the Centre of Astronomy.

II. MoU with Space Applications Centre (ISRO), Ahmedabad

Centre of Astronomy, IIT Indore, has signed an MoU with Space Applications Centre (SAC), ISRO, Ahmedabad, through an initiative by Dr. Abhirup Datta, Centre of Astronomy. This MoU allows Centre of Astronomy to receive two IRNSS receivers from SAC, ISRO, for Dr. Abhirup Datta and Prof. Hablani's research. Moreover, this MoU also opens up possibility of further research collaboration with ISRO-SAC.

The focal person for the MoU is Dr. Abhirup Datta.

Background

ISRO has recently successfully established the Indian constellation of satellites that constitutes the Indian Regional Navigation Satellite System (IRNSS), or the NAVIC (NAVigation with Indian Constellation).

IIT Indore would receive two IRNSS receivers from SAC in the coming months. These IRNSS receivers will contribute to the ionospheric research initiated by Dr. Abhirup Datta's group. IRNSS receivers will also be used by Prof. Hari Hablani and his students for satellite navigation research.

Publications: 2016

1. "First detection at 5.5 and 9 GHz of the radio relics in bullet cluster with ATCA", Astrophysics and Space Science, vol. 361(8), pp. 1, 2016 Published
2. "Clusters of galaxies and the cosmic web with SKA", Journal of Astrophysics and Astronomy, 2016, In Press

3. Time Evolution of Temperature Fluctuation in a Non-Equilibrated System, European Physical Journal A, 2016, In Press
4. The Schwinger Mechanism in (Anti) de Sitter Spacetimes, Journal of High Energy Physics, vol. 04, pp. 60, 2016, published
5. Effects of Ionosphere on the Ground-Based Detection of Global 21CM Signal from The Cosmic Dawn, The Astrophysical Journal, 2016 In Press
6. Line of sight anisotropies in the Cosmic Dawn andEoR 21-cm power spectrum, Journal of Astrophysics and Astronomy, 2016In Press
7. Probing individual sources during reionization and cosmic dawn using SKA HI 21-cm observations, Journal of Astrophysics and Astronomy, 2016 In Press
8. Evolution of Temperature Fluctuation in a Thermal Bath and its Implications in Hadronic and Heavy-Ion Collisions
9. "Autonomous Formation-Keeping of Geostationary Satellites with Regional Navigation Satellites and Reduced Dynamics," AIAA Journal of Guidance, Control, and Dynamics
10. "Orbit Injection Error Mitigation by Time-Differenced GPS Carrier Phase Observables-Aided Inertial Navigation," AIAA Guidance, Navigation, and Control Conference
11. "Precision Munition Guidance and Moving-Target Estimation," AIAA J. Guidance, Control and Dynamics, 2016, pp. 1-12. DOI: 10.2514/1.G000382, available on line.

Proposals submitted: 2016

1. Centre of Excellence in Astrophysics & Space Science Applications – PI: Dr. Abhirup Datta, CoIs: Prof. N.K. Jain, Drs. Siddharth Malu, Kapil Ahuja, Aruna Tiwari, Ram Bilas Pachori, Somaditya Sen, Parasharam Shirage, Vimal Bhatia, Surya Prakash, M. Ashok Kumar
2. Supercomputing Initiative Proposal – Dr. Abhirup Datta is leading the effort for an institute-wide facility, to be followed by a large Supercomputing facility proposal
3. Observations and Characterizations of Earth's Ionosphere – Implications to a Smart City – PI: Dr. Abhirup Datta (Smart City Initiative)
4. IIT Indore Remote Internet Access System (RIAS): Connecting Rural India with Development – PI: Dr. Siddharth Malu (Smart City Initiative)
5. Sensor-Radio Telescope Grid for Climate Monitoring & Agriculture – PI: Dr. Siddharth Malu (Smart City Initiative)
6. Common Research & Technology Development Hubs (CRTDH) scheme
7. A low-cost ground-based RF receiver with applications to astronomy and communications – Dr. Siddharth Malu, Dr. Abhirup Datta (Uchhatar Avishkar Yojana)
8. Ultra-low Noise Instrumentation in GHz-THz Frequency Range for Future Space Research – Dr. Somaditya Sen (Associate member, CoA), Dr. Parasharam Shirage (Associate member, CoA), Dr. Abhirup Datta, Dr. Siddharth Malu (Uchhatar Avishkar Yojana)
9. K-Band Aperture Synthesis Vehicle Collision Avoidance System – Defense Applications in Direction Finding – Dr. Siddharth Malu, Dr. Abhirup Datta (IMPRINT – currently in Phase III consideration)
10. Simple, Economical, Low Noise and High Performance Topological Insulator Field Effect Transistor for space applications – Dr. Somaditya Sen, Dr. Parasharam Shirage, Dr. Abhirup Datta, Dr. Siddharth Malu (IMPRINT)
11. Low-cost Radio Array for Communications, Outreach and Emergency Services for Remote Areas – Dr. Siddharth Malu, Dr. Abhirup Datta (IMPRINT – currently in Phase III consideration)
12. Low Power K-band Radar Level Gauge for Monitoring and Control of essential natural resources (water tanks/reservoirs, stored food grains) – Dr. Abhirup Datta, Dr. Siddharth Malu, Mr. Palshikar (SAPCON Industries) (IMPRINT)
13. Enhancing Social Security for rural / semi-urban population through affordable indigenizable technology: A Techno-Ecological Approach for rural and semi-urban area study – Dr. Neeraj Mishra (PI), Dr. Siddharth Malu (IMPRINT)
14. Technology Demonstrator for Low Frequency Radio Experiment, ISRO proposal for Mars Orbitor Mission-2 (MOM-2) – Dr. Siddharth Malu & Dr. Abhirup Datta from IIT Indore in the consortium

15. C and L-Band Interferometer as Galaxy Cluster Observatory Pathfinder – Drs. Siddharth Malu, Abhirup Datta, Somaditya Sen
16. Long-Range High-Accuracy Robust Navigation, Guidance and Control of Autonomous Underwater Vehicle National Design Research Forum, Prof. H. Hablani & Dr. AbhirupDatta – submitted to Space Aplications Centre, ISRO, Ahmedabad
17. Geographically distributed data facility with software defined storage to store and analyze Big Data, BRICS Proposal – Drs. Abhirup Datta& Siddharth Malu as Co-PIs – cleared EoI stage; full proposal invited
18. EoI: Establishment of Centre on Digital Gov. and Knowledge Societies at IIT Indore, PI: Dr. Neeraj Mishra, Co-PIs: Drs. Datta & Malu
19. Cosmological Study of Wideband Radio as part of Team Indus
20. DST – Texas Instruments Startup Challenge

Faculty Profiles in Astronomy

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Dr. Prasant Samantray
Assistant Professor
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Prof. Hari Hablani
Visiting Professor
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Dr. Abhirup Datta works in the area of observational cosmology at Centre of Astronomy. Dr. Datta received his Ph.D. (National Radio Astronomy Observatory/ New Mexico Tech, USA) in Physics with dissertation in Astrophysics in 2011 studying HI 21 cm cosmology. His current research includes 21 cm cosmology at radio wavelengths. He is also involved in studying galaxy clusters at radio and x-ray wavelengths. Dr. Datta is involved in India's participation in Square Kilometer Array (SKA) project. He is one of the lead scientists in 21 cm cosmology key science project of SKA. He is also involved in the SKA continuum group. Dr. Datta's group is involved in high performance computing mainly to progress on simulations related to SKA science.

Dr. Datta's group is also involved in studying effect of ionosphere in low frequency radio astronomy. The group has recently acquired a GNSS receiver to study the ionosphere above Indore. The group is in talks to acquire IRNSS receiver from ISRO-SAC. The group is working on studying and characterizing the ionosphere. There is already a dense grid of GNSS receivers in Northern India. Our proposal will complement that in Central and Western India. This will allow us to predict the ionospheric conditions and model them with better precision. In turn, this will help in satellite and aerospace communication as well as making it possible to observe at low radio frequencies. This study will help us to establish leadership in ionospheric research mainly in context of astronomical observations. India's role in SKA (Square Kilometer Array) can be used to share this information with the upcoming state-of-the-art largest radio telescope in the world.

Dr. Datta joined Centre of Astronomy on September 28, 2015.

Prof. Hari Hablani works in Aerospace, and has had a distinguished career in the Aerospace industry, in Boeing, and the NASA Johnson Space Center. Prof. Hablani received his Ph.D. in Aerospace from the Indian Institute of Science, Bangalore, in 1978, and currently works on

1. Navigation error analysis of IRNSS receiver
2. Guidance of Air-to-surface missiles with Infra-red Seeker and Millimeter Wave Radar, and IRNSS-Aided Inertial Navigation
3. Agile maneuvers of spacecraft and precision pointing with control moment gyros
4. Satellite-based navigation of missiles under jamming and spoofing Prof. Hablani joined Centre of Astronomy as Visiting Professor on July 25, 2016. The Centre welcomes Prof. Hablani.

Dr. Siddharth Malu works in Observational Cosmology. He received his Ph.D. (University of Wisconsin-Madison) in Physics (Astrophysics), 2007, and specializes in instrumentation and data analysis in cosmology. He is currently working on analyzing data from galaxy cluster mergers, and on upgrading IIT Indore's radio telescope.
Dr. Malu joined the Centre of Astronomy on March 5, 2015.

Dr. Prasant Samantray did his B.Tech in mechanical engineering from IIT-Madras, before receiving a PhD in Physics from Arizona State University in Dec 2012. After a year of postdoctoral research at the International Center for Theoretical Sciences, TIFR, Dr. Samantray joined the faculty of IIT-Indore as an Assistant Professor in the Centre of Astronomy. His research interests span a wide range of topics in theoretical physics, including the AdS/CFT correspondence, black holes, and quantum field theories in non-trivial backgrounds.

Dr. Samantray was the first faculty member to join Centre of Astronomy, on December 26, 2014.
The central theme of his research is aimed at unraveling some of the mysteries concerning event horizons using the AdS/CFT correspondence. In order to address the fundamental issues in quantum gravity, it is crucial to understand the role of quantum mechanics in the presence of strong gravitational fields, like in the case of black holes. The study of black holes offer a natural setting where quantum effects become important, and the presence of an event horizon leads to interesting effects like the Hawking radiation. However, understanding quantum effects in the presence of an event horizon is greatly simplified by considering Rindler space instead of black holes. Though much studied, there are many outstanding issues in Rindler space that quantum field theoretic approaches do not seem to be able to resolve. This motivates a quantum gravitational treatment of Rindler space. Such a study is handicapped by the fact that quantum gravity in flat space is poorly understood. By contrast, quantum gravity in anti-de Sitter space (AdS), is relatively well understood via the celebrated AdS/CFT correspondence. This "holographic" correspondence states that a quantum gravitational theory in d + 1 dimensional AdS space is completely dual to a non-gravitational quantum field theory living on the boundary of AdS in n-dimensions. Taking this cue, Dr. Samantray constructed Rindler coordinates for AdS space in n + 1 spacetime dimensions, in order to probe the event horizon. Additionally, He has also worked on the Schwinger mechanism in de Sitter as well as anti de Sitter spaces, via instanton methods by directly working in the flat embedding space. This has helped shed light on the possible deep connection with the Davies-Unruh effect.

3. Scientist Profiles

Dr. Sunil Kumar
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Dr. Sunil Kumar (Ph.D: Indian Institute of Science, Bangalore; Visiting Researcher: Polytechnic University of Catalonia- Barcelona Tech, Spain; Research Fellow: National University of Singapore). His research focuses on the experimental investigations of structure–property–processing relationship in functional materials as a mean to develop novel materials with desired properties. Dr. Kumar is currently working on inorganic electrolyte materials for rechargeable lithium batteries. His other research interests include lead-free Piezo/Ferroelectrics, Solid-State Ionics and Electrochemical Impedance Spectroscopy.

Dr. Kiran Bala
INSPIRE Faculty
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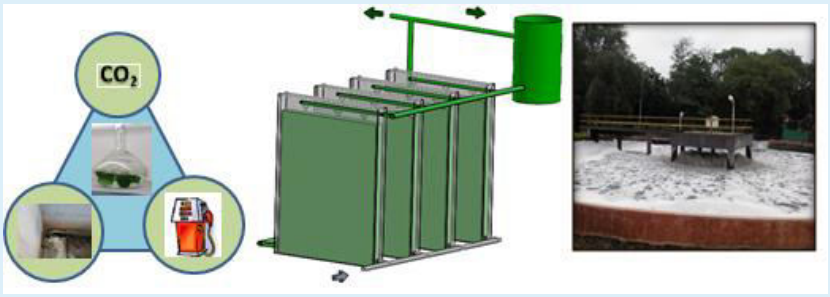
Dr. Bala's group works on a variety of algae biotechnology research directions. Members of the lab. are working on integrative approach for algal treatment of wastewater and biodiesel production potential. Other lab members are demonstrating the efficacy of algae in carbon sequestration from flue gas of thermal power plant.



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Department : BSBE
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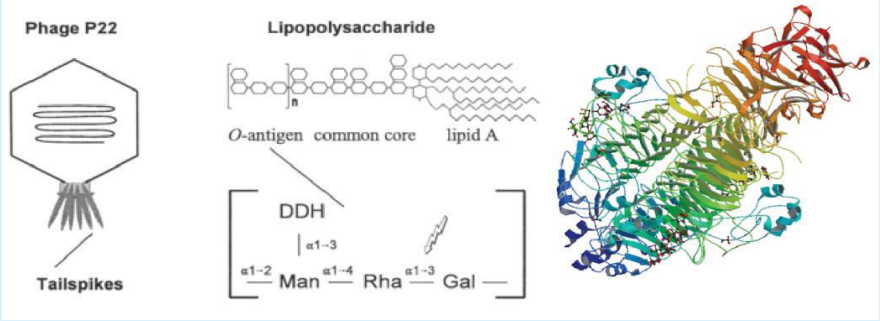
Dr. Parimal Kar (Ph.D: Michigan Technological University, USA; Postdoctoral Fellow: Max Planck Institute of Colloids and Interfaces, Potsdam, Germany; Visiting Research Associate: Michigan State University, USA) focuses on the development and application of physics-based new computational approaches for biomolecular simulations elucidating the structure and thermodynamics of biomolecules and the biophysical basis of ligand recognition by the target protein at the atomic level. He got the prestigious Ramalingaswamy fellowship from Govt. of India. He also received the Postdoctoral Independent Career Potential Award from Michigan State University, USA.



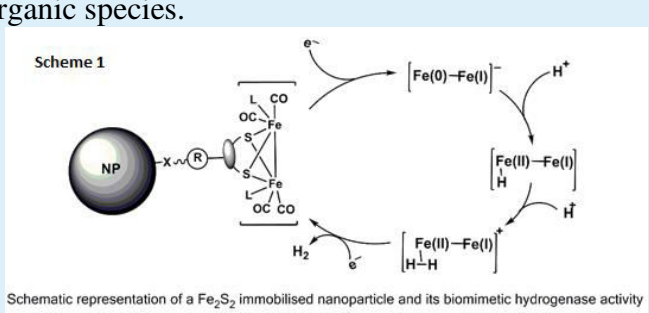
Currently, his group is modeling the molecular basis of phage infections

caused by bacteriophages. Bacteriophages can penetrate the dense coating of bacterial cells that are covered with lipopolysaccharides (LPS), and subsequently inject their DNA without destroying the cell. LPS is composed of an amphipathic lipid A component and hydrophilic oligosaccharides of the core, and O-antigen. The first steps of infection comprise the recognition of the long O-antigenic polysaccharides of the LPS by the tail spike proteins (TSP) of the phages and successive cleavage. In this project, his group is working on characterizing the binding mode of TSP-LPS and investigating the relation between the flexibility of LPS and their specific recognition using fully atomistic molecular dynamics (MD) along with various free energy simulation methods, such as Molecular Mechanics/Poisson-Boltzmann Surface Area (MM/PBSA) and Umbrella Sampling (US). Our study will reveal various driving forces for these recognition events and possibly predict in which way structural features of a protein-carbohydrate complex influence the thermodynamics and the mechanism of binding.
A concise picture of the bacterial LPS recognition by TSP of bacteriophages is important in order to understand the essential steps of phage infection, and to further develop phage therapy against bacterial infectious diseases.

Dr. Dhirendra Kumar Rai
DST Young Scientist
Department: Chemistry
dhirendrak@iiti.ac.in

Dr. Dhirendra Kumar Rai (Ph.D.: Indian Institute of Technology Bombay; Institute Postdoctoral Fellow: Indian Institute of Technology Indore (March, 2015 – September, 2015) ; Research Associate: Indian Institute of Technology Indore (2014 – 2015) : Research Scientist: Indian Institute of Technology Indore (2013 – 2014)) works on stoichiometric and catalytic activations of small molecules on transition metal framework, synthesis and electrochemical investigation of ferrocene based metal carbonyl complexes and chalcogenised metal carbonyl clusters, and synthesis of metal phosphide/chalcogenide nanoparticles from pnictogen/chalcogen bridged metal carbonyl clusters as molecular precursors and their applications in catalytic processes.

Development of facile synthetic strategies has been the primary focus of Dr. Rai research pursuit. In this regard, reactions of simple mononuclear metal carbonyl complexes and clusters were explored with alkynes bearing different substituents, including ferrocenyl, to achieve unusual stoichiometric and catalytic transformations under mild conditions. Carbon-carbon bond formation using mild reaction conditions have been achieved using simple metal carbonyl complexes. An inclusion of chalcogen and nitrogen containing small organic molecules in these reactions has led direct route to corresponding heterocycles. One pot synthesis of some biologically active organic molecules has been shown from straightforward and inexpensive precursors using iron pentacarbonyl as a catalyst. Besides metal mediated organic transformations, emphasis on the formation of several novel homo- and hetero-organometallic complexes and clusters has also been given to understand the unique bonding interaction between the metal atoms and the unsaturated organic species.



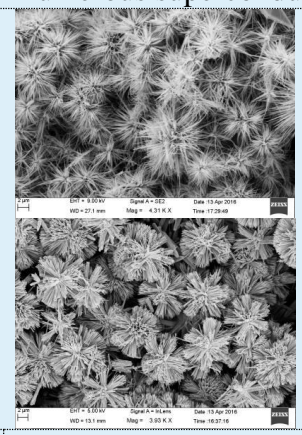
Schematic representation of a Fe_2S_2 immobilised nanoparticle and its biomimetic hydrogenase activity

Currently, Dr. Rai is involved in the design of a new class of material having

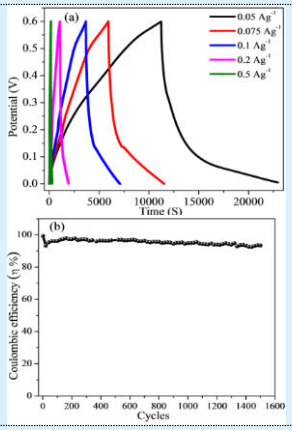
unique and superior hydrogenase activity, arising from co-operative interactions of metal nanoparticle and the dithiolate chelated clusters tethered on its surface, for hydrogen evolution reactions (Scheme 1).

Dr. Parasharam M. Shirage
Ramanujan Fellow
Department: Physics and Centre for Materials Science and Engineering
pmshirage@iiti.ac.in

Dr. Parasharam Shirage (Ph.D: Shivaji University, India; Postdoc Scientist: 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); Lecturer: Rajaram College, Kolhapur (Maharashtra Govt.) (2003-2004)) works on superconductors, synthesis and single crystal growth; advanced functional materials, thin films, nanostructured materials for energy harvesting and storage, sensors, etc. His fundamental contribution to science is the inverse isotope effect on the transition temperature of (Ba,K)Fe2As2 superconductor, which is a historic finding in high-Tc superconductivity. He has invented and synthesized innumerous superconductors.



SEM Images of Controlled Growth of Nanostructured Materials for Energy Storage



(a) Galvanostatic charge-discharge (GCD) curve obtained at different current densities, (b) shows the coulombic efficiency as a function of cycle number

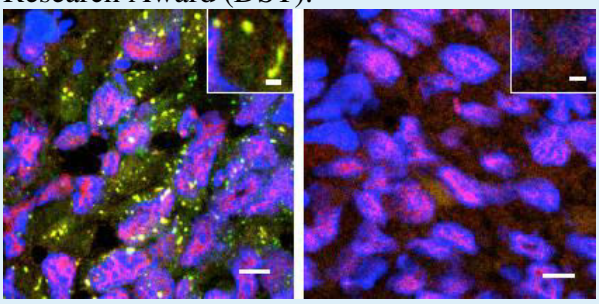
Advanced functional materials are the materials whose physical and chemical properties are sensitive to a change in the environment such as temperature, pressure, electric field, magnetic field, optical wavelength, adsorbed gas molecules and the pH value. The functional materials utilize the native properties and functions of their own to achieve an intelligent action. Few materials belong to magnetism, energy storage functions, ferroelectricity, piezoelectricity, etc.

Dr. Shirage has contributed in the basic and applied science branch of science by synthesizing and studying new superconductors, nano-materials, topological insulators, single crystals growth etc. for basic studies and for energy applications. He developed a facile technique for growing nano-materials by avoiding toxic and sophisticated instrumentation. He demonstrated that porous carbon can be utilized as superior materials for supercapacitors. Dr. Shirage is an expert in high pressure high temperature synthesis of novel advanced functional materials and basic properties studies, he contributed fundamental finding of inverse isotope effect on Tc of (Ba,K)Fe2As2 superconductor and also invented few new materials. He also works on developing a facile technique for the growth of nano-materials including single layer graphene and their applications in energy generation and storage. He is guiding 8 Ph. D. students and 6 master students at present. He is one of the leaders in growing large single crystals of varieties of

functional materials. More details can be found at http://iiti.ac.in/people/~pmshirage/

Dr. Syam Prakash Somasekharan
Ramanujan Fellow
Department: Bioscience & Bio Medical Engg.
spsomasekh@iiti.ac.in

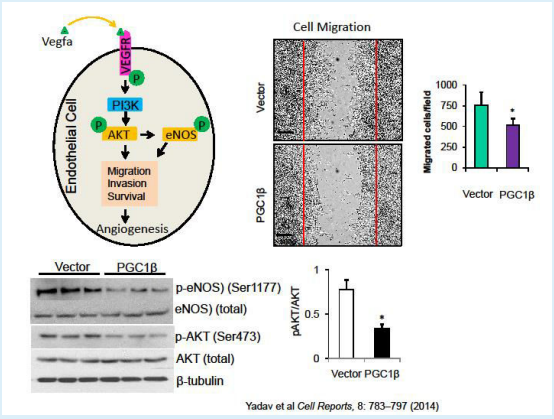
Dr. Syam Prakash Somasekharan (Ph.D: Indian Institute of Science, Bangalore (2001-2006); Postdoctoral Fellow: Department of Cell Biology, University of Geneva (2007-2010); Postdoctoral Fellow: Department of Pathology and Laboratory Medicine, University of British Columbia (2010-2015). Dr. Somasekharan's present research focuses on molecular mechanisms of cell death, mRNA translational regulation during stress conditions, role of RNA binding proteins and RNA granules in cancer progression, and quantitative proteomics using stable isotope labelling and liquid chromatography-tandem mass spectrometry (LC-MS/MS). Dr. Somasekharan significantly contributed in the field of apoptosis and stress granule biology, and his work is recognized through publications in several top journals such as Cell, Cancer Cell, PNAS, and JCB etc. Dr. Somasekharan is a recipient of several awards including Ramanujan Fellowship (DST), Ramalingaswami Fellowship (DBT) and Early Career Research Award (DST).



Fewer stress granules (yellow) occur in osteosarcoma cells lacking G3BP1 (right) than in controls (left). Nuclei are labeled blue.

Dr. Vikas Yadav
Ramalingaswamy Fellow
Department: Bioscience & Bio Medical Engg.
parimal@iiti.ac.in

Dr. Vikas Yadav (Ph.D: Jawaharlal Nehru University, New Delhi; Postdoctoral Fellow: Tufts University, Boston; Harvard University, Boston; University of Texas, Houston, USA) works on find out the therapeutic role of nuclear receptor ERRs and their coactivators (ERRs and PGCs) in diabetes mediated vascular complication. In addition to that, he is working on discovering novel regulatory proteins involved in transcriptional regulation of PGCs (PGC1α and PGC1β) and ERRs. He has been awarded the prestigious Ramalingaswami Fellowship from the department of Biotechnology, Govt of India. His research group is keen to understand the uncovered molecular events that lead to endothelial dysfunction inmetabolic disease such as diabetes. Since endothelial dysfunction lead to devastating consequence (ie. foot ulcers, cardiovascular complications, retinal degeneration, kidney dysfunction, neural abnormalities etcs) in diabetes patients. Therefore, his efforts are to understand the molecular mechanism that leads to the endothelium dysfunction. The long term goals of his studies are to find out the therapeutic molecules to restore the endothelium dysfunction. He is also interested in protein-protein interactions studies to reveal unknown proteins that interact with nuclear receptor ERRs during their docking at genome. The other research interest that he has, are to elucidate the role of ERRs in cancer progression and metastasis.



Dr. Uzma Saqib
Investigator
Department: Chemistry
Email: uzmas@iiti.ac.in

Funding Agency: Science and Engineering Research Board, Department of Science and Technology, Government of India
Duration: 2015-2018
Sanctioned Amount: INR 19,96,400
Targeting EB3-IP3R interaction as a therapeutic strategy for prevention of Lung vascular permeability in Acute Respiratory Distress Syndrome (ARDS)

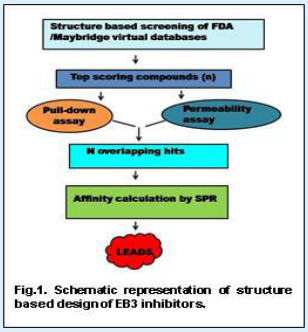


Fig.1. Schematic representation of structure based design of EB3 inhibitors.

Objective: The proposed studies aim to explore novel and potent EB3 inhibitors with a therapeutic potential against endothelial hyperpermeability and lung injury. By targeting EB3 function with small molecule inhibitors we expect to ameliorate the increase in endothelial permeability that is associated with inflammation response.
The significance of the work lies in the novel approach involving EB3 and IP3R3 interaction we have identified for the treatment of vascular leakage associated with lung inflammation and leaky lung vessels. Our approach will be the first to screen for the novel and potent EB3 inhibitors using structure-based design followed by testing the compounds in in vitro and biochemical assays.We aim to develop highly potent and novel therapies for treating increased endothelial permeability associated with critical diseases like Acute lung injury (ALI) and ARDS.

Dr. Abhijeet Joshi
INSPIRE Faculty
Department: Bio-sciences and Biomedical Engineering
Email: abhijeet.joshi@iiti.ac.in

Research Areas: Drug delivery, Biosensors, Theranostics, Biomaterials

1. Novel Polymeric Biomaterials:

Development of polymers useful for implantation and for drug delivery inside body. Several drugs cannot be delivered inside the body owing to their low bioavailability and or greater toxicity. For such drugs newer methods of delivery and newer biomaterials, or polymers carriers need to be investigated.

2. Biosensors

Optical Biosensors for common clinically present analytes which are important for diagnosis of diseases and health monitoring. Till now several projects have been handled dealing with glucose, lactate, urea, uric acid, cholesterol biosensors using fluorescence assay. The method used analyte specific enzyme based fluorescent detection of catalytic reaction. The area has a lot of scope for developing cheap point of care devices which can bring up-liftment of health conditions in the most rural parts of the country. The health services can be improved by offering cheap diagnostic devices for biomarkers and drugs. The platform of analyte detection can be easily transformed into other related areas of food, fermentation industry, antibiotic production, space medicine, exercise and health monitoring.

3. Stimuli Responsive Drug Delivery

Stimuli responsive drug delivery is a area with tremendous potential. With the scarcity of new drugs in the health care pipeline currently available treatment methods and drugs need to be used to their potential. This can be brought about by bringing spatial and temporal control over drug release by passive and active targeting. Another means is by delivering drugs based on stimuli like by heat, light, pressure, chemical, pH, NIR light, magnetism etc.

4. Implantable Devices esp. Implantable Biosensors:

Implantable biosensor based on NIR radiations can make possible the smart tattoo concept. Smart Tattoo concept describes the possibility of implanting sensing assay under the skin and then measuring the in vivo clinical analytes by having an analyte specific biological recognition element in close proximity to fluorophore. One of the areas is to work towards developing implantable biosensors.

5. Theranostics: Diagnostics, Imaging and Therapeutics

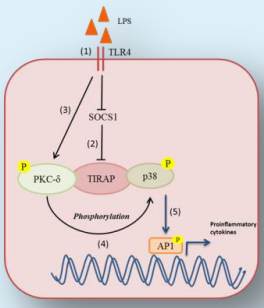
Theranostics comes from merger of diagnostics and theranostics. It is imperative that both diagnosis and therapeutics need to be coupled together in a single system for better understanding of patient well being. Patient health can be monitored or treated effectively with minimal side effects by coupling diagnosing machinery to the drug delivery devices. Such systems can serve multiple functionalities like biosensing, drug delivery, imaging etc.

6. Interdisciplinary Research:

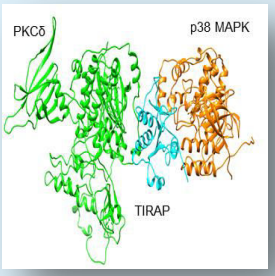
In areas relating to biosensors and pharmaceutical sciences: Most important research interest in working in interdisciplinary areas where biology and engineering intermingle and can be used to develop useful applications. One example is to develop biological detecting assays for clinical analytes, biochemical compounds like metabolites, toxins, xenobiotics, drugs, plant components etc

Dr. Mirza S. Baig
Ramalingaswamy Fellow
Department: Bioscience &Biomedical Engineering
Email: msb@iiti.ac.in

Dr. Baig received his Ph.D. from Central Drug Research Institute, Lucknow in 2008. His post-doctoral work in Immunology was carried out at the Department of Medicine, University of Illinois at Chicago. In 2014, Dr. Baig was appointed as a Research Scientist at the Department of Gastroenterology and Hepatology, Mayo Clinic, Rochester, Minnesota. Currently, he is serving as a Scientist (RLF) at the Centre for Bioscience and Bioengineering, Indian Institute of Technology Indore, India. Dr. Baig's research focuses on the role of macrophages in the initiation, progression, and resolution of inflammatory processes. His work is recognized through various international and national awards, including the prestigious DBT- Ramalingaswami Fellowship Award, DST-Ramanujan Fellowship Award, Mirus Research Award, FEBS pre-doctoral award, eCheminfo Award, EMBL International Ph.D. Fellow Award. Dr. Baig has received multiple external funding from different Government bodies including DBT, DST, and CSIR. He has published several research articles in PubMed indexed, peer-reviewed international Journals. He has delivered talks and also presented many posters and papers, in different National and International Conferences.

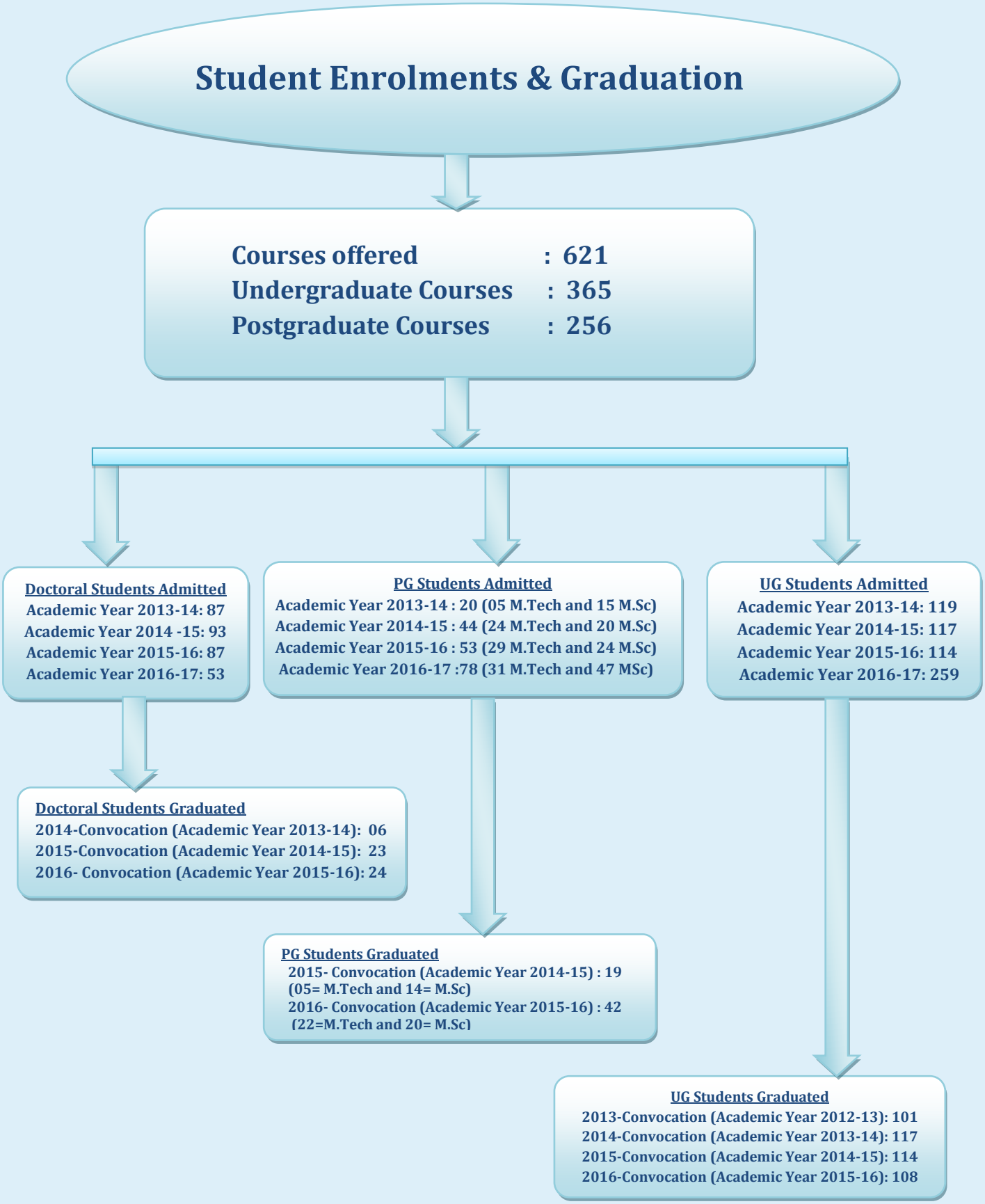


Heterotrimer complexof PKCδ-TIRAP-P38 in inflammation



Heterotrimer complex of PKCδ-TIRAP-p38 mediated inflammatory response in macrophages

4. Student Statistics



Ph.D. students (graduated 2015-16)

S.No.	Roll No.	Discipline	Name	PhD Thesis Title [Thesis supervisor(s)]
1	1010406	Chemistry	Tamalika Bhattacharya	Investigation of Graphene Oxide and Au Based Monometallic and Alloy Nanoparticles as Nanocatalysts for Coupling and Oxidative Organic Transformations (Dr. Tridib Kumar Sarma)
2	1010408	Chemistry	Prabhat Gautam	Symmetrical and unsemmetrical donor-acceptor benzothiadiazoles (Dr. Rajneesh Misra)
3	1010407	Chemistry	Bhagwati Sharma	Bioinspired organic-inorganic hybrid functional nanoscale materials: Synthesis and Applications (Dr. Tridib Kumar Sarma)
4	11113104	Chemistry	Manideepa Saha	Studies on mono- and polynuclear metal tetrazolato complexes synthesized via 1,3-dipolar cycloaddition (Dr. Suman Mukhopadhyay)
5	12113110	Chemistry	Surajit Chatterjee	Investigation of Photoluminescence Behavior of Silicon Quantum Dot and its Effectiveness as Single Particle Luminescent Marker (Dr. Tushar Kanti Mukherjee)
6	12110102	CSE	Arpit Bhardwaj	Investigation in tree based genetic programming for data classification (Dr. Aruna Tiwari)
7	1301101005	CSE	Saumya Bhadauria	Low cast fault reliability and trojan security aware high level synthesis for application specific datapath processors (Dr. Anirban Sengupta)
8	11110202	EE	Mukta Singh Parihar	Evaluation of Junctionless Transistor Architecture for Next Generation CMOS Devices and Circuits (Dr. Abhinav Kranti)
9	12110210	EE	Suneel Yadav	Performance Evaluation and Optimization for Analog Network Coding with Spatial Diversity (Dr. P.K. Upadhyay)
10	11110205	EE	Kshitij Bhargava	Investigation on the influence of internfacial and morphological effects in organic field effect transistors (Dr. Vipul Singh)
11	11120201	EE	Dipankar Ghosh	Evaluation of Nanoscale MOSFET Architectures for Low Power Analog/RF Applications (Dr. Abhinav Kranti)

12	11120204	EE	Vikas Vijayavargiya	Investigation of drain extention feature in a double-gate silicon based tunnel fet for low power SoC applications (Dr. Santosh K. Vishvakarma)
13	1010502	HSS (Phil.)	Sreelekha Mishra	Revisiting multiculturalism: Some reflections (Dr. Bharath Kumar)
14	12116102	HSS (Eco)	Irfan Ahmed Sofi	Impact of labour market regulations on industrial performance: Evidence from Indian manufacturing sector (Dr. Pritee Sharma)
15	1010703	Maths	Navneet Lal Sharma	Analytic and Geometric Properties of Certain Classes of Univalent and p-Valent Functions (Dr. Swadesh Kumar Sahoo)
16	11114102	Maths	Sarita Agrawal	Analytic and Mapping Properties of Certain Analytic Functions with Applications (Dr. Swadesh K. Sahoo)
17	11110301	ME	Hari Mohan	Heat transfer characteristics of gaseous flows through microchannels (Dr. Santosh Kumar Sahu)
18	12120303	ME	Sunil Pathak	Investigations on the Performance Characteristics of Straight Bevel Gears by Pulsed Electrochemical Honing (PECH) Process (Prof. Neelesh K. Jain & Dr. I.A. Palani)
19	11120301	ME	Yogesh Madaria	Augmentation of effective thermal conductivity of metal hydride beds and its effect on the performance of energy conversion and storage devices (Dr. E. Anil Kumar)
20	104120004	Physics	Mahesh Chandra	Phase Transitions n Ndnio3 Thin Films and Ndnio3/Ndmno3 Multilayers: Influence of Strain and Doping (Dr. Krushna R. Mavani)
21	11115105	Physics	Sanjiv Kumar Dwivedi	Spectral analysis of complex networks (Dr. Sarika Jalan)
22	12115101	Physics	Aditya Nath Mishra	Multihadron Production in High-energy Collisions and Forward Rapidity Measurement of Inclusive Photons in Pb+Pb Collisions at √sNN = 2.76 TeV in ALICE Experiment at LHC (Dr. Raghunath Sahoo)
23	104120005	Physics	Ajay Kumar	Conceptual Design of the Lambda Disks Detector for the PANDA Experiment (Dr. Ankhi Roy & Dr. Raghunath Sahoo)
24	12115112	Physics	Shailendra Kumar Saxena	Fabrication and Optoelectronic Properties of Silicon Nanostructure (Dr. Rajesh Kumar & Dr. P.R. Sagdeo)

5. Awards and Recognition

CONVOCATION 2016: Recipients of Medals and Awards

PRESIDENT OF INDIA GOLD MEDAL

Mr. Vikas Raunak
CSE - 1200137

INSTITUTE SILVER MEDALS

Ms. Juniper Gujral
CSE - 1200113

Mr. Patil Ishan Ankur
EE - 1200222

Mr. Vikram Vadiraj Katti
ME- 1200335

BEST B.TECH. PROJECT AWARD

Mr. Akshay N Shewatkar
ME - 1200304

Mr. Sahil Mittal
ME – 1200329

Mr. Vishal Jain
ME -1200337

Project title: "SMA Actuated Aquatic Bot"

INSTITUTE SILVER MEDAL FOR MASTERS PROGRAM

Ms. Priya Chouhan
MTech (Production and Industrial Engineering)
Roll No. 1402103009

6. Research and Development

IIT Indore envisages the process of convergence of disciplines as the key to accomplish ground breaking research objectives. With this vision, the institute has done very well all areas of Science, Engineering and Humanities and Social Sciences. The institute has the highest h-index among all new IITs. Last year, IIT Indore has secured 27 externally funded research projects from various funding agencies. The institute has also filed 15 patent applications with another 15 under various stages of process.

Research at IIT Indore has been recognized at International level with active participation through joint collaborations with research organizations/institutes/universities in Japan, South Korea, Russian Federation, Portugal, France, Germany, USA, Taiwan, UK, Canada, South Africa and many other countries. The research funding from these projects is nearly Rs. 13.4 Crore. Some of approved international projects include Newton-Bhabha Programme of Royal Academy of Engineering, UK and India-Taiwan Cooperation in Science and Technology. The institute is heavily engaged in strengthening the ongoing collaboration between TU9 from Germany and IIT Indore.

The institute has secured approval for 23 courses under Global Initiative of Academic Networks (GIAN) scheme of Ministry of Human Resource Development. These courses are aimed at sharing knowledge and expertise of distinguished visitors and further strengthening of the existing linkages. In a major initiative to engage with industry on cutting-edge research, the institute has been successful securing sponsored projects under the Uchhatar Avishkar Yojana. These projects aimed at jointly develop technologies for the challenges being faced by participating industrial partners.

IIT Indore has consciosly promulgated the idea of involving undergraduate students in forefront research projects through a research scheme, Promotion of Research and Innovation for Undergraduate Students (PRIUS). This scheme along with a dedicated 7^{th} semester for undergraduate research project has been instrumental in the involvement of students in the forefront of state-of-the-art research in various laboratories.

The Sophisticated Instrumentation Centre (SIC) at IIT Indore, unique facility of state-of-the-art equipment's under one roof, continues to provide growth and characterization facilities to users from all over the country and, also from abroad. Facilities include Single Crystal X-ray Diffraction, Nuclear Magnetic Resonance, Mass Spectrometry, Atomic Force Microscopy, Field Emission Scanning Electron Microscopy, Elemental Analysis, Single Molecule Imaging, Dual Ion Beam Sputtering Deposition System, and other characterization facilities.

The institute has a very active Student Entrepreneurship Support Cell (SESC) which has been instrumental in securing funding for Innovation and Entrepreneurship Development Centre (IEDC) to promote start ups and incubation in the institute for prototype and product development. Since inception, 10 projects have been supported with another 5 being considered for support in the next financial year. Already 6 patent applications have been filed out of these projects.

7. Publication Statistics

NO. OF JOURNALS /CONFERENCES / BOOK CHAPTERS/ BOOKS

No	Name		Designation	Discipline/ Center	2009	2010	2011	2012	2013	2014	2015	2016	Total
1	Dr.	Prashant Kodgire	Assistant Professor	BSBE				1	1			1	3
2	Dr.	Amit Kumar	Assistant Professor	BSBE							2	7	9
3	Dr.	Sharad Gupta	Assistant Professor	BSBE									
4	Dr.	Debasis Nayak	Assistant Professor	BSBE						1			1
5	Dr.	Abhijeet Joshi	Inspire Faculty	BSBE								1	1
6	Dr.	Chelvam Venkatesh	Assistant Professor	BSBE								3	3
7	Dr.	Mirza S. Baig	Ramalingaswami Fellow	BSBE								5	5
8	Dr.	Sarika Jalan	Associate Professor	BSBE								15	15
9	Dr.	Aruna Tiwari	Assistant Professor	CSE					3	12	6	14	35
10	Dr.	Abhishek Srivastava	Assistant Professor	CSE						10	2		12
11	Dr.	Kapil Ahuja	Assistant Professor	CSE					1	1		2	4
12	Dr.	Surya Prakash	Assistant Professor	CSE						2	4	6	12
13	Dr.	Gaurinath Banda	Assistant Professor	CSE								2	2
14	Dr.	Somnath Dey	Assistant Professor	CSE					1	4	1	3	9
15	Dr.	Neminath Hubballi	Assistant Professor	CSE						2	2	7	11
16	Dr.	Anirban SenGupta	Assistant Professor	CSE					5	19	18	30	72
17	Dr.	Tridib Kumar Sharma	Assistant Professor	Chemistry		1		1	2	2	2	1	9
18	Dr.	Rajneesh Misra	Associate Professor	Chemistry				3	12	14	4	7	40
19	Dr.	Anjan Chakraborty	Assistant Professor	Chemistry			2	2	2	5	0	4	15
20	Dr.	Apurba Kumar Das	Assistant Professor	Chemistry		1	0	2	3	8	2	15	31

21	Dr.	Suman Mukhopadhyay	Associate Professor	Chemistry		1	0	0	3	4	3	5	16
22	Dr.	Sampak Samanta	Assistant Professor	Chemistry				2	5	3	3	9	22
23	Dr.	Tushar Kanti Mukherjee	Assistant Professor	Chemistry					2	4	2	6	14
24	Dr.	Mohammad Mobin Shaikh	Assistant Professor	Chemistry				1	9	16	2	44	72
25	Dr.	Satya Silendra Bulusu	Assistant Professor	Chemistry					2		1	2	5
26	Dr.	Sanjay Kumar Singh	Assistant Professor	Chemistry					2	3	2	5	12
27	Dr.	Biswarup Pathak	Assistant Professor	Chemistry				3	14	6	1	15	39
28	Dr.	Chelvam Venkatesh	Assistant Professor	Chemistry				2	4	1	1	3	11
29	Dr.	Pradeep Mathur	Professor	Chemistry		7	5	8	5	11	1	4	41
30	Dr.	Amod C. umarikar	Assistant Professor	EE									
31	Dr.	Ram Bilas Pachori	Associate Professor	EE		5	7	5	10	11	15	15	68
32	Dr.	Santosh Kumar Vishvakarma	Assistant Professor	EE			1	4	13	6	8	21	53
33	Dr.	Shaibal Mujherjee	Assistant Professor	EE			1	0	5	7	6	10	29
34	Dr.	Vipul Singh	Assistant Professor	EE + MSE			1	0	14	9	10	6	40
35	Dr.	Abhinav Kranti	Associate Professor	EE			2	7	8	7	3		27
36	Dr.	Srivathsan Vasudevan	Assistant Professor	EE							1		1
37	Dr.	Anbarasu M	Assistant Professor	EE				1		1		3	5
38	Dr.	Prabhat Kumar Upadhyay	Assistant Professor	EE			0	1	4	4	4	14	27
39	Dr.	Trapti Jain	Assistant Professor	EE					1	8	3	4	16
40	Dr.	Vivek Kanhangad	Assistant Professor	EE					1	1	2	3	7
41	Dr.	Vimal Bhatia	Associate Professor	EE					1	5	6	11	23
42	Dr.	Mukesh Kumar	Assistant Professor	EE								1	1
43	Dr.	Pritee Sharma	Assistant Professor	HSS				4	6	3	6	4	23

44	Dr.	C. Bharat Kumar	Assistant Professor	HSS	4	1	1	1		2		7	16
45	Dr.	Chidella Upendra	Associate Professor	HSS			1	3	6	6	2	8	26
46	Dr.	Ruchi Sharma	Assistant Professor	HSS	2		1	4	1	2	4	7	21
47	Dr.	Amarjeet Nayak	Assistant Professor	HSS			2	2	3	3		1	11
48	Dr.	Premjit Sanjram Khanganba	Assistant Professor	HSS					4				4
49	Dr.	Nirmala Menon	Assistant Professor	HSS				1	2	8	6	4	21
50	Dr.	Neeraj Mishra	Assistant Professor	HSS		1	1				1	1	4
51	Dr.	Anand Parkash	Assistant Professor	Mathematics								1	1
52	Dr.	Swadesh Kumar Sahoo	Assistant Professor	Mathematics					1	4	2	3	10
53	Dr.	S.K. Safique Ahmad	Assistant Professor	Mathematics		2	1	1				3	7
54	Dr.	Vijesh Antony	Assistant Professor	Mathematics						1		5	6
55	Dr.	Niraj Kumar Shukla	Assistant Professor	Mathematics						2	1	1	4
56	Dr.	Md. Aquil Khan	Assistant Professor	Mathematics						1	5	6	12
57	Dr.	Ashisha Kumar	Assistant Professor	Mathematics						1		1	2
58	Dr.	Ashok Kumar	Assistant Professor	Mathematics								2	2
59	Dr.	Anand Parey	Associate Professor	ME				1	4	2		8	15
60	Dr.	Ritunesh Kumar	Assistant Professor	ME			1	1	3	8		2	15
61	Dr.	Santosh Kumar Sahu	Assistant Professor	ME		1		4	18	15	7	15	60
62	Dr.	Neelesh Kumar Jain	Professor	ME		6	6	6	14	14	8	20	74
63	Dr.	Anil Kumar Emadabathuni	Assistant Professor	ME			3		3	5	6	12	29
64	Dr.	Satyajit Chatterjee	Assistant Professor	ME				2					2
65	Dr.	Bhupesh Kumar Lad	Assistant Professor	ME				1	4	2	6	11	24
66	Dr.	Kazi Sabiruddin	Assistant	ME								2	2

			Professor										
67	Dr.	Palani Iyamperumal Anand	Assistant Professor	ME				7	9	4	9	16	45
68	Dr.	Mohan Santhakumar	Assistant Professor	ME				6	11	10	4	10	41
69	Dr.	Dhinakaran Shanmugam	Assistant Professor	ME				1	1	3			5
70	Dr.	Devendra Laxmanrao Deshmukh	Assistant Professor	ME				1		2		2	5
71	Dr.	Subhendu Rakshit	Associate Professor	Physics					1	1	1	4	7
72	Dr.	Krushna Mavani	Associate Professor	Physics			1	1	3	5		11	21
73	Dr.	Ankhi Roy	Associate Professor	Physics			1	3	5	4			13
74	Dr.	Manavendra Mahato	Associate Professor	Physics			2	1		1		13	17
75	Dr.	Raghunath Sahoo	Associate Professor	Physics			1	15	14	10		53	93
76	Dr.	Sarika Jalan	Associate Professor	Physics			1	2	4	8	2	21	38
77	Dr.	Preeti Anand Bhobe	Assistant Professor	Physics					1			6	7
78	Dr.	Siddharth Savyasachi Malu	Associate Professor	Astronomy				2				2	4
79	Dr.	Rajesh Kumar	Assistant Professor	Physics				1	1	7	1	16	26
80	Dr.	Pankaj R. Sagdeo	Assistant Professor	Physics					2	7	2	20	31
81	Dr.	Sudeshna Bandyopadhyay	Assistant Professor	Physics				2	1	1		3	7
82	Dr.	Somaditya Sen	Associate Professor	Physics					1			5	6
83	Dr.	Parasharam M. Shirage	Ramanujan Fellow	Physics								16	16
84	Dr.	Manavendra Mahato	Associate Professor	Physics								5	5
85	Dr.	Gayatri Sahoo	Scientist	Physics					1	5	2		8
86	Dr.	Parasharam M. Shirage	Ramanujan Fellow	MSE					1	1	6	7	15
87	Dr.	Vipul Singh & Dr. I. A. Palani	Assistant Professor	MSE								6	6

88	Dr.	Biswarup Pathak	Assistant Professor	MSE								6	6
89	Dr.	Sanjay Kumar Singh	Assistant Professor	MSE								1	1
90	Dr.	Somaditya Sen & Dr. Parasharam Shirage	Associate Professor & Ramanujan Fellow	MSE								4	4
91	Dr.	Vipul Singh	Assistant Professor	MSE								2	2
92	Dr.	I. A. Palani	Assistant Professor	MSE								5	5
93	Dr.	Kiran Bala	Inspire Faculty	BSBE + ME						2	0	4	6
94	Dr.	Abhirup Datta	Assistant Professor	Astronomy							3	4	7
95	Dr.	Prasant Samantray	Assistant Professor	Astronomy						0	0	2	2

8. Major Achievements / Awards / Milestones

Discipline of Computer Science and Engineering

Dr. Abhishek Srivastava

- Dr. Abhishek Srivastava appointed as Dean, Student Affairs of IIT Indore.

Dr. Anirban Sengupta

- Dr. Anirban Sengupta appointed Guest Editor of IEEE Transactions on Consumer Electronics.
- Dr. Anirban Sengupta appointed Guest Editor of IEEE Access Journal.
- Dr. Anirban Sengupta appointed Columnist on "Hardware Matters" of IEEE Consumer.
- Dr. Anirban Sengupta appointed Expert Evaluator (Scientific Committee) for Marie Curie Fellowship (France) by Research Executive Agency of European Union in area of Hardware Accelerators".
- Dr. Anirban Sengupta is commissioning a Special Issue on 'Security and Reliability Aware System Design for Mobile Computing Devices' in IEEE Access Journal.
- Special Issue on "Chipset Architectures and Hardware Design for Consumer Electronics" in IEEE Consumer Electronics to be commissioned by Dr. AnirbanSengupta.
- Dr. Anirban Sengupta has been appointed as Associate Editor of IET Journal on Computers and Digital Techniques for a period of 3 years from September 2015.
- Dr. Anirban Sengupta appointed as Associate Editor of IEEE Access Journal for a period of 3 years.
- Dr. Anirban Sengupta inducted into Editorial Board as Associate Editor of IEEE Journal Consumer Electronics.
- Dr. Anirban Sengupta appointed as an Associate Editor in prestigious IEEE VLSI Circuits and Systems Letter.
- Dr. Anirban Sengupta to organize a Special Session on 'Reliability and Security Aware RTL Design' as Chair in IEEE iNIS 2015with Intel, Broadcom, Pennsylvania State University, IISc.

Dr. Aruna Tiwari

- Dr. Aruna Tiwari's GIAN proposal with Dr. Suresh Sundaram, Nanyang Technological University Singapore got approved by MHRD.
- Dr. Aruna Tiwari enabled signing of an MOU between Indian Institute Of Technology Indore (IITI) and Directorate of Soyabean Research Centre Indore.
- A paper authored by Mr. Chandan Gautam, a PhD scholar and Mr. Sriram Ravindran, BTech 4th year student in the Discipline of CSE, receives best paper award in ICCIC 2015.

Dr. Gourinath Banda

- Gourinath Banda, Chaitanya Krishna and Harsh developed the "One IoT" protocol and framework. This work is presented at the SITIS 2015 conference, Bangkok, Thailand. This conference has sponsors such as IEEE, ACM and Ifip.
- Mr. Chaitanya Krishna Bommakanti, a B.Tech CSE Final Year student guided by Dr. Gourinath Banda, is granted Rs. 1,40,000/- from IIT Indore under the PRIUS programme.
- Mr. Chaitanya Krishna Bommakanti presented the research paper "SimIoT - A simulator for the oneIOT protocol" at SITIS 2015 Conference (Bangkok, Thailand) in the student track.
- Mr. Harsh Mohan, a B.Tech CSE Final Year student guided by Dr. Gourinath Banda, is granted Rs. 1,40,000/- from IIT Indore under the PRIUS programme.
- Mr. Harsh Mohan presented the research paper "A Formal Verification Framework for QoS metrics in IoT paradigm" at SITIS 2015 Conference (Bangkok, Thailand) in the student track.
- Gourinath Banda is appointed as JEE Adv. Chairman at IIT Indore in November, 2015.
- Dr. Gourinath Banda's GIAN course proposal "Basic Concepts and Issues in Big Data Management" with Prof. Dr. Spyratos Nicholas of University of Paris-South approved by MHRD.

Dr. Kapil Ahuja

- Dr. Kapil Ahuja's Ph.D. students, Mr. Rajendra Choudhary and Mr. Navneet Pratap Singh, presented papers at International Conference on Mathematical Modeling, Differential Equations, Scientific Computing & Applications at IIT Kanpur, March 2016.
- Dr. Kapil Ahuja was a distinguished invitee at the Academic Research Summit organized by ACM, Microsoft, and Infosys (29th and 30th January, 2016).
- Dr. Kapil Ahuja's GIAN proposal with Prof. Eric de Sturler of Virginia Tech, USA approved by MHRD, Jan 2016.
- Dr. Kapil Ahuja's B.Tech. student, Ms. Juniper Gujral, won the Best B.Tech. Project award in CSE at 1st Student Research Symposium of IIT Indore, January 2016.
- Dr. Kapil Ahuja sponsored and invited to give research talk at Brown University, December 11, 2015.
- Dr. Kapil Ahuja sponsored and invited to give research talk at Virginia Tech, December 14, 2015.
- Dr. Kapil Ahuja enabled signing of anMoU between Indian Institute of Technology Indore (IITI) and Technical University Braunschweig in Germany (TU Braunschweig), November, 2015.
- Dr. Kapil Ahuja appointed as JEE chairman (Advanced) from IIT Indore, August, 2015.

Dr. Narendra S. Chaudhari

- Mr. Ashish Jain, a PhD scholar, has received partial travel grant from Microsoft Research India to present his research paper at IEEE CEC 2016 in Vancouver, Canada.
- Mr. Ashish Jain, a PhD scholar, has received partial travel grant to present the research paper at ICONIP 2015 from Microsoft Research India.

Dr. Neminath Hubballi

- Nikhil Tripathi a Ph.D scholar working with Dr. Neminath Hubballi has been selected for participation in "IRISS 2016: 10th Inter-Research-Institute Student Seminar in Computer Science", an event organized by ACM India.
- Sainath Batthala an undergraduate student working with Dr. Maitreya Natu and Dr. Neminath Hubballi has been selected to make presentation in the graduate forum of COMSNETS 2016.
- A paper titled "Exploiting DHCP Server-side IP Address Conflict Detection: A DHCP Starvation Attack " authored by Nikhil Tripathi and Neminath Hubballi gets Honorable Mention at ANTS 2015.
- Dr. Neminath Hubballi made a presented a research paper in 22nd National Conference on Communications (NCC 2016) at IIT Guwahati.
- Sainath Bhattala B.Tech final year student presented a research paper in the 22nd annual IEEE International Conference on High Performance Computing (HiPC 2015).
- Dr. Neminath Hubballi gave an Invited lecture at IDRBT Hyderabad on Cyber Security to Bankers.
- Mayank Swarnkar presented a research paper in ANTS 2015.

Dr. Somnath Dey

- Mr. Rajat Saxena, a PhD scholar working with Dr. Somnath Dey, has received the "Best Student Paper Award" in the 8th Int'l Conference on IDCS 2015 at Windsor, UK.
- Mr. Rudresh Dwivedi, a PhD scholar in the Discipline of CSE, receives third prize in Fifth IDRBT Doctoral Colloquium 2015.

Dr. Surya Prakash

- Dr. Surya Prakash's GIAN proposal with Prof. Gaurav Sharma of University of Rochester, USA got approved by MHRD.
- Dr. Surya Prakash has authored a book titled Ear Biometrics in 2D and 3D: Localization and Recognition, published by Springer, Singapore.

CEPs/Workshops/Expert Talks

- Expert talks on "Graph theoretic approaches for visual domain adaptation" and "A mid level feature mining based approach for image foreground extraction under one-shot learning" delivered by **Dr. Biplab Banerjee** (Research associate at IIT Genova) on January 25, 2016.
- Short Term Course on Recent Advances in Network and Cloud Security by Dr. Neminath Hubbali and Dr. Somnath Dey conducted from December 10 to 11, 2015.
- Expert talk "Advanced analytics tools: State of the art and Practice" delivered by **Dr. Srinivas Padmanabhuni** (ACM India President) on August 17, 2015.

Discipline of Electrical Engineering

Dr. Shaibal Mukherjee

- Young Faculty Research Fellowship (YFRF) under Visvesvaraya PhD Scheme for Electronics and IT, Deity (Government of India) awarded to Dr. Shaibal Mukherjee.

Dr. Prabhat Kumar Upadhyay

- Dr. Prabhat Kumar Upadhyay has been elevated to the Senior Member grade of IEEE.

Dr. M. Anbarasu

- Dr. M. Anubarasu organized a symposium on Phase change materials and applications (MD4), at Materials Research Society (MRS) Spring Meeting at Phoenix, Arizona, USA during March 28 – April 1, 2016.

Dr. Vimal Bhatia

- IIT Indore's Best Technology Development Award, January 2016.
- IIT Indore's Best UG Researcher Award, January 2016.

Dr. R. B. Pachori

- Best research paper award, Indian Institute of Technology Indore, January, 2016.

Discipline of Mechanical Engineering

Dr. Bhupesh Kumar Lad

- Best Working Prototype Award in 1st Annual Student Research Symposium (SRS) for UG & PG students of IIT Indore, Held on: - January 16, 2016

  For the combined projects as given below:-

  - Design and Development of Distributed planning System for Smart Manufacturing: B.Tech. Project (Miroojin Bakshi & Kartikeya Upasani).
  - Development and Implementation of Smart Manufacturing System for Industries: B.Tech. Project (Namit Agrawal).
  - Received Royal Academy of Engg, UK Newto-Bhabha Research Grant (GBP 50000).

Dr. M. Santhakumar

- Received the SERB international travel grant for attending OCEANS 2016 at Shangahi.
- Received the Alexandar von Humboldt fellowship for 12 months.

Dr. Santosh Kumar Sahu

- Research scholar Mr. Mayank Modak has been selected as qualified student award winner of the student paper completion, ICONE24. The conference ICONE24 scheduled to be held during June 26-30, 2016 at USA.

Dr. I. A. Palani

- Best BTP project Award in 1st Annual Student Research Symposium (SRS) for UG & PG students of IIT Indore, Held on: - January 16, 2016.
  For the combined projects as given below: - "Design and Development SMA actuated Aquatic BOT: B.Tech. Project (Akshay N Shwatkar, Shahil Mittal and Vishal Jain)", "Development of salt duck wave energy convertor: B.Tech. Project (Anmol Srivastava, Avula Agastya)", Institute best B.Tech Project for the year 2015-2016, "Design and Development SMA actuated Aquatic BOT: B.Tech. Project (Akshay N Shwatkar, Shahil Mittal and Vishal Jain)".
- Sathyabama University Alumni award in Research and Innovation for the year 2015.

Research highlights

- Developing optical engine for combustion research in CI engine.
- PhD Student, Mr. Yogesh Madaria received DST Travel grant for attending World Hydrogen EnergyConference (WHEC 2016) at Zaragoza, Spain, June 13 to 16, 2016.

Discipline of Chemistry

Dr. C. Venkatesh

Three GIAN courses approved for the year 2015-16

- Introduction to Principles of Green Chemistry, Illinois Wesleyan University, USA.
- Modern Photochemistry and Photo catalysis, Hamburg University, Germany.
- Chemical Biology: The Integration of Chemistry, Biology, and Medicine, Purdue University, USA.

My Ph.D student in Chemistry, Mr. Premansh Dudhe, has been awarded.

Newton-Bhabha Ph.D placement fellowship (scholarship, consumables etc., worth Rs.15 Lakhs) to carry out doctoral research at Keele University, UK for a

Period of 6-months.

Dr. Biswarup Pathak

- Back Cover page Article: Nanoscale (2015); Angew Chem. Intl. Ed. (2015).
- Won Institute Best Research paper Award, 2016.
- DST-SERB Grant 44 lakhs (2016-2019).
- ACS Sensors Selected my student Indrani in their "Introducing our Authors" section.

Discipline of Mathematics

- Dr. S. K. Safique Ahmad got a position of Reviewer for Mathematical Reviews from American Mathematical Society (AMS).

Discipline of Physics

- Dr. Parasharam M. Shirage(Ramanujan Fellow)

Received "Excellence in Teaching" Award from Indian Institute of Technology Indore, January, 2016.

- Open Seminar has been successfully given by Mr. Shailendra Saxena under the guidance of Dr. Rajesh Kumar.
- Open Seminar has been successfully given by Mr. Aditya Nath Mishra under the guidance of Dr. Raghunath Sahoo.
- Open Seminar has been successfully given by Mr. Ajay Kumar under the guidance of Dr. Ankhi Roy.
- Thesis submitted by Mr. Mahesh Chandra under the guidance of Dr. Krushna R Mavani.
- Ph.D. student working in my group, Ms. P. Suchismita Behera, was awarded the Best Poster Award at an International Conference on Magnetic Materials and Applications (ICMAGMA-2014), held in September 15-17, 2014, for presenting her paper titled "Crystal Structure-Magnetic Property Correlation in $CdCr_2Se_4$".

- Ms. P. Suchismita Behera's paper entitled" Investigation of Local Structure and Magnetic Properties of CdCr2Se4" has been selected for ORAL presentation at the "International Union of MRS-International Conference on Electronic Materials" to be held at Suntec, Singapore from July 4-8, 2016.

School of Humanities and Social Sciences

- IIT Indore conducted the first ever short term course in the inter-disciplinary field of Digital Humanities titled: "Digital Humanities: Tools, Texts, Theory" under MHRD's **Global Initiative of Academic Networks** (GIAN) scheme with Prof Paul Arthur, Western Sydney University Australia during March 19 - March 25, 2016.

Dr. Ruchi Sharma has delivered a lecture on "An International Perspective on IPRs," during Innovation and Intellectual Property Management, at Ujjain Engineering College Ujjain on March 21, 2015.
Ms. Shanu Shukla, research scholar from the discipline of Psychology, has received Best Paper Presentation award at First International Conference on Applied Psychology at New Delhi on March 4, 2016.

Unnat Bharath-Namami Gange-Ganga Grams

IIT Indore is now a part of New Centre for Ganga River Basin Management and Studies (CGRBMS) which was inaugurated at New Delhi on April 17, 2016, by the Hon. Minister Ms. Uma Bharti. IIT Indore will now undertake the river basin management related studies from socio-economic perspective by undertaking case studies in Allahabad District.

The studies will be welfare/economically -driven but ecology-centric, multi-sectoral, integrative and evidence based. Given that the private sector, stakeholders across civil society, and national river managers responsible for the Ganga across the basin need to have access to a comprehensive evidence base, as well as have the opportunity to engage with, debate and discuss the implications of this information both nationally and trans-nationally. Through stakeholder engagement, information support, and public wider debate, appropriate applied research will provide the opportunity to allow the people of the region through which this socio-environmentally significant river flows to consider the possible consequences of interventions to improve the health of the river Ganga and enhance the potential for cooperation in the management of the vital economic and ecological services the river provides.

IIT Indore will be represented by Dr. Pritee Sharma (Water Resource Economics); Dr. Neeraj Mishra (River Basin Governance) and Dr. Kiran Bala (Biotechnological Interventions for Bater Bodies). Dr. Sharma's contribution in the project will be in the areas of (i) "Economic Valuation of Ecosystem Services" including livelihood concerns, climate change adaptation and change in agricultural practices; and (ii) "Impacts of River Health on Agriculture and food security" including agricultural productivity and change in land use pattern. Dr. Neeraj Mishra will work on (i) "Governance and Institutions" based on anthropological approach to identify socio-ecological and socio-political issues in river health management, and (ii) "Community Knowledge and Participation" based analysis to create decision support systems for rural, urban, industrial and agricultural needs. Dr. Kiran Bala will undertake the waste water treatment, affluent volume estimations, etc.

Biosciences and Biomedical Engineering

- Dr. Amit Kumar -Best paper research award 2016, IIT INDORE.
- Dr. Prashant Kodgire – Award for Excellence in Teaching (2016), IIT Indore.
- Dr. Chelvam Venkatesh-
  - Three GIAN courses are approved worth Rs.24 Lakhs for the year 2015-16.
  - My Ph.D student in BSBE, Ms. Mena Asha Krishnan, has been awarded Newton-Bhabha Ph.D placement fellowship (scholarship, consumables etc., worth Rs.15 Lakhs) to carry out doctoral research at Keele University, UK for a period of 6-months.
- Dr. Mirza S. Baig

GRANTS:

2015-2016	Department of Biotechnology (DBT New Delhi), New Delhi (DBT-RLF (BT/HRD/35/02/2006) 2/2/2015-2/1/2020 Project: Neuronal nitric oxide synthase (NOS1) driven macrophage phenotypic polarization. INR: 90 lacs
2015-2016	CSIR-Extra Mural Research Funding, New Delhi (37/1664/15EMR-II) 1/4/2016-31/3/2019 Project: Role of Macrophages in Alcoholic Liver Disease (ALD). INR: 30 lacs
2015-2016	Department of Biotechnology (DBT), New Delhi Project: Ex vivo expansion and transplantation of hematopoietic stem cells (HSCs). INR: 80 lacs
	Pending
2015-2016	Department of Science and Technology (DST), New Delhi Project: Role of neuronal nitric oxide synthase (NOS1) in the TLR4-triggered inflammatory response via the SOCS1-p38-AP1 signaling axis. INR: 60 lacs
2015-2016	Department of Science and Technology (DST), New Delhi Project: Macrophages in atherosclerosis: Molecular mechanisms and implications of atherosclerosis progression. INR: 80 lacs

AWARDS: Dr. Mirza S. Baig

2015-2016	Received best presentation recognition in "Immunology 2015" Houston, Texas, USA.
2015-2016	Ramanujan Fellowship Award from Department of Science and Technology (DST), India.
2015-2016	The Welcome Trust/DBT Indian Alliance bursary Award for EMBO Meeting 2015, Birmingham, UK.
2015-2016	DBT-Research bursary award from Department of Biotechnology, New Delhi, India for 4th International Conference and Exhibition on Immunology, Houston, Texas, USA.
2015-2016	CICS Travel Grant from Department of Biotechnology, New Delhi, India for 4th International Conference and Exhibition on Immunology, Houston, Texas, USA.

MEDIA: Dr. Mirza S. Baig

- 2015-2016 Interviewed by New York Academy of Science (NYAS) for the excellent contribution to the field of Immunology.
- 2015-2016 Lecture published March 31, 2016 4th International Conference and Exhibition on Immunology.

APPOINTED AS EDITORIAL BOARD MEMBER: Dr. Mirza S. Baig

- American journal of Life Sciences
- International Journal of Vaccines and Technologies
- Austin Liver

Discipline of Metallurgy Engineering and Material Science

- Dr. Parasharam M. Shirage(Ramanujan Fellow)

  Received "Excellence in Teaching" Award from Indian Institute of Technology Indore, January 2016.

- Dr. BiswarupPathak:
  - Work on Fuel Methanol Fuel Cell Published as a Back Cover page Article in NanoScale (Impact Factor: 7.394). They even highlighted about our CMDG group (Computational Material Science and Designing group) at IIT Indore and the research.

    (Title: Cuboctahedral Platinum (Pt79) Nanocluster Enclosed by Well Defined Facets Favours Di-sigma Adsorption and Improves the Reaction Kinetics for Methanol Fuel Cell, Nanoscale 7, 13438-13451, 2015.
  - Our work on Mercury Detoxification Published as a Back Inside Cover page Article in Angew Chem.(Impact Factor: 11.261)

    (Title: Chemical Detoxification of Organomercurials. M. Banerjee, R. Karri, K. S. Rawat, K. Muthuvel, Biswarup Pathak, G. Roy, Angew. Chem. Int. Ed. (Inside Back Cover Page Article), 54, 9323-9327, 2015.)

Astronomy

Strategic Intiatives of Centre of Astronomy

I. Square Kilometre Array – India Consortium (SKAIC)

The Square Kilometre Array is a planned radio telescope; it gets its name from the total collecting area of all its dishes combined, which will be one square kilometer, or one million square metres (10 million square feet).

Fifteen organizations, including NCRA-TIFR (National Centre for Radio Astrophysics, which constructed and now operates the Giant Metrewave Radio Telescope, GMRT) and IIT Indore formed the SKAIC during a workshop on "Indian Participation in the SKA" on February 16, 2015. India is one of eleven member nations in the SKA Organization and Indian scientists are participating in three of the ten design work packages, and have a leading role in one of them.Dr. AbhirupDatta, IIT Indore, a member of the Executive Council of SKAIC, is leading IIT Indore's contribution to the Square Kilometre Array, through his research in impact of Ionosphere on low-frequency ground-based instruments for studies of formation of earliest structures in the universe. He also works on analysis of data from large-scale structures, with another faculty member in the Centre of Astronomy.

II. MoU with Space Applications Centre (ISRO), Ahmedabad

Centre of Astronomy, IIT Indore, has signed an MoU with Space Applications Centre (SAC), ISRO, Ahmedabad, through an initiative by Dr. Abhirup Datta, Centre of Astronomy. This MoU allows Centre of Astronomy to receive two IRNSS receivers from SAC, ISRO, for Dr. Abhirup Datta and Prof. Hablani's research. Moreover, this MoU also opens up possibility of further research collaboration with ISRO-SAC.
The focal person for the MoU is Dr. Abhirup Datta.

Background

ISRO has recently successfully established the Indian constellation of satellites that constitutes the Indian Regional Navigation Satellite System (IRNSS), or the NAVIC (NAVigation with Indian Constellation).

IIT Indore would receive two IRNSS receivers from SAC in the coming months. These IRNSS receivers will contribute to the ionospheric research initiated by Dr. Abhirup Datta's group. IRNSS receivers will also be used by Prof. Hari Hablani and his students for satellite navigation research.

9. Sophisticated Instrumentation Centre (SIC)

A National Facility

Sophisticated instrumentation centre (SIC) was established in September 2011 with institute funding to expedite the research program at IIT Indore. The SIC mission is to support and foster the research enterprise in the School of Basic Science, at the Indian Institute of Technology (IIT) Indore, as opportunities exist, by providing state-of-the-art instrumentation and ancillary equipment, and expertise in its use and application. The SIC in the School of Basic Science at IIT Indore is equipped with Single Crystal X-ray Diffraction, Nuclear Magnetic Resonance, Mass Spectrometry, Elemental Analysis, Single Molecule Imaging and Spectroscopy and other Spectroscopic facilities all together under one roof to provide the very highest quality of data analysis to academics and students in both research and teaching. With our excellent facilities and high level of expertise, we can offer our analytical services to other schools within the Institute sector and external commercial organizations.

SIC has now emerged as one of the first such centers in the country providing extensive support to the users across the country. It has become a self sustained centre by generating funds from service provided to external users from academia and industry.

A major advantage of SIC is its accessibility to the 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, Metallurgy Engineering and Material Science, and Condensed Matter Physics

Some Major Facilities:

Atomic Force Microscopy (AFM)

Atomic Force Microscopy (AFM) or Scanning Probe Microscopy (SPM) AIST-NT Smart SPM 1000, is one of the first 100% automated systems that offers its cutting-edge technology of ultra-fast, metrological and high resolution measurements for the most advanced materials research at the nano scale in all AFM and STM modes. Various Measuring modes, Contact AFM in air/liquid; Semi-contact AFM in air/liquid; Non-contact AFM; Phase Imaging; Magnetic Force Microscopy (MFM); Kelvin Probe (Surface Potential Microscopy); Electric Force Microscopy (EFM); Piezo Response Force Microscopy; Force curve measurements; Nanolithography; Conductive AFM; Scanning Tunneling Microscopy STM (optional); Photocurrent Mapping; Volt-ampere characteristic measurements.

Single Crystal X-ray Diffraction

Single Crystal X-ray Diffraction Facility at SIC is equipped with state- of –the- art dual core Agilent Technologies (Oxford Diffraction) Super Nova CCD System. It gives access to micro-focus Cu and Mo sources which allows even small size crystals data collection and fairly good structure solutions. It is also equipped with Oxford cryo systems which enable temperature range from 90 to 400 K. There are also high definition microscopes for separations and mounting of crystals. Services provided include: Crystal screening and mounting, including air-sensitive samples. Diffraction data collection under various conditions, including temperatures as low as 90 K. Structure solution, refinement, and interpretation upto publication level.

Cambridge Structure Database searching

Single Crystal X-ray Diffraction Facility is an independent National Facility. Currently, it is offering service to School of Basic Science within the Institute, other academic institutes and Industries throughout India for X-ray Crystallographic studies.

Dual Ion Beam Sputtering Deposition(DIBSD)

The goal is to encourage and foster the research initiative in the School of Engineering, at Indian Institute of Technology Indore, by providing state-of-the-art research facility, and expertise in its use and application. The diverse novel researches performed by this unique facility will be a platform to attract top-seeded researchers and experimentalists in key semiconductor opto-electronic and nanotechnology industries, research laboratories, and academic institutions across the entire globe to establish a strong collaborative research programme with IIT Indore. Research activities, boosted by the DIBSD facility, are mainly focused on growth of novel nanostructures and high-quality thin films having enormous applications in semiconductor opto-electronics, sensors, solar photovoltaics, detectors, biotechnology, microelectro-mechanical systems (MEMS), nanoelectromechanical systems (NEMS) etc.

Diverse novel research activities would have major impact on following industries:

Automobile
Nanotechnology
Pharmaceutical (Nano-Bioelectronics)
Electronics
Chemical
Renewable Energy

In a broad sense, the research work accomplished by this facility would be extremely beneficial to showcase our expertise in the emerging areas of current research and development.

Nuclear Magnetic Resonance 400 MHz (NMR)

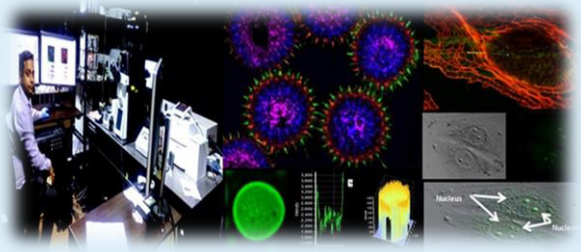
NMR spectrometer: Fourier transforms Nuclear Magnetic Resonance spectrometer, Model AVANCE III 400 Ascend Bruker BioSpin International AG, Switzerland. Magnet: 8.96 Tesla (Superconducting), 50 mm bore Probes Available: For Solution State NMR 5 mm Broad Band Fluorine Observe Probe with gradient along Z-axis and Automated Tuning & Matching (ATM) accessory. 5 mm Broad Band Inverse Probe with gradient along Z-axis and Automated Tuning & Matching (ATM) accessory. Console: The state of the art Avance III 400 NMR console with digital lock and 2 independent RF channels providing 60 W 1H/19F transmitter and 150 W transmitters and broad band Preamplifier. In addition 5 W 2H transmitter for deuterium observe and decoupling.

Field-Emission Scanning Electron Microscope (FE-SEM)

Supra55 Zeiss provides excellent imaging properties combined with analytical capabilities makes this high end FE-SEM suitable for a wide range of applications in materials science, life science and semiconductor technology. The large specimen chamber for the integration of optional detectors and accessories enables the user to configure the SUPRA for specific applications without sacrificing productivity or efficiency.

- GEMINI Technology with high efficiency in-lens detector and no magnetic field at specimen level
- Superb resolution and image quality at high and low operating voltages
- Extremely wide operating voltage range from 0.02-30kV
- Designed-in ease of use with minimal adjustments required when changing operating conditions
- Short analytical working distance of 8.5 mm for simultaneous high resolution imaging and X-ray analysis
- High probe current (up to 100 nA) with high stability (better than 0.2%/h) for precise analytical results
- Multi-User friendly with Windows® based SmartSEM control software

Confocal Laser Scanning Microscope (CLSM)



IIT Indore confocal microscopy facility is located at sophisticated instrument center (SIC) building, Simrol campus, IIT Indore. The facility has a state of the art imaging system with a fully motorized inverted microscope based multiphoton system capable of confocal imaging, fluorescence lifetime imaging microscopy (FLIM), fluorescence correlation spectroscopy (FCS), IR imaging, live cell imaging. The microscope is also fitted with Mai Tai DeepSee femtosecond tunable laser.

- Confocal laser scanning microscopy
- Two-photon laser scanning microscopy
- Fluorescence lifetime imaging microscopy
- Fluorescence correlation spectroscopy

Live cell imaging

- Surface Analyzer ,BET, Quantachrome
- Gas Chromatography Mass Spectroscopy (GC-MS)

NEW INSTALLATIONS:

- Surface Analyzer BET
- Gas Chromatography and Mass Spectroscopy

SCIENTIFIC PUBLICATIONS : +250 articles

Apart from these the SIC has several other instruments enlisted at http://www.iiti.ac.in/sic/index.php

Collaborators --- The Institutes and Industries for which service is being provided are:

Academic Institutions:
BARC, Mumbai
Banaras Hindu University
Delhi University
Guru Nanak Dev University, Punjab
IIT Bombay
IIT Madras
IIT Mandi
IIT Patna
IIT Gandhinagar
GITAM University, Visakhapatnam
Jammu University
MS University Baroda
NIPER Mohali
NIT Rourkela and others
Institute of Himalayan Bio-resource Technology (IHBT)
Pune University
Pinnacle Biomedical Research Institute (PBRI), Bhopal
Devi Ahilya Vishwavidyalaya, Indore
Shri Govindram Seksaria Institute of Technology and Science
NMU Jalgaon
RD University Jabalpur
Central University Sagar
Guru Ghasidas Vishwavidyalaya Central University, Bilaspur
SRM University
University College Trivandrum
Tumkur University, Karnataka
Thapar University, Patiala
Punjab University

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 Lab, Indore
Medilux Pharma, Indore
Emcure. Pune
Reliance Industries Ltd.
Navin Fluorine International Ltd., Dewas
SRF Ltd., Indore
M.P. Dye Chem., Indore

International Academic Institutes:
Universität Stuttgart, Germany
Jehangirnagar University, Bangladesh
Dhaka University, Bangladesh

TIFR Hyderabad
Awadhesh Pratap Singh University, Rewa
University of Hyderabad, Telangana
Pondicherry University, Puducherry
Vikram University, Ujjain
Mewar University, Rajasthan

PEOPLE at SIC

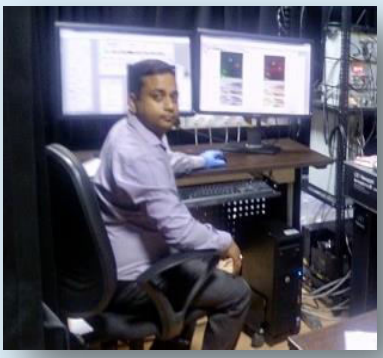
Dr. MOBIN SHAIKH
Head, SIC.
Email: xray@iiti.ac.in,

SARITA BATRA
Instrument: CHNS-O, TGA/DSC

KINNY PANDEY
Instruments: NMR, AFM, PXRD, FESEM/EDAX/WDX, FT-IR, TCSPC, UV- Vis, Polarimeter,Fluorimeter, LB-Film, CD, BET

GHANASHYAM A. BHAVSAR
Instrument: LC-MS, HPLC, HRMS, GC-MS, FT-IR

MANISH KUSHWAHA
Instrument: CD



Dr. RAVINDER
Instrument: Confocal Microscope

10. IITI Central Workshop

INTRODUCTION

The Central Workshop is equipped with modern state-of-the-art instruments. Currently, the workshop is having seven sections, Glassblowing, Machining, Welding, Forming, Foundry, Injection Molding, Fitting, and Carpentry; each section is manned by a team of skilled operators. Each member of the workshop operators have successfully proved themselves in various projects related to research and development. The Central Workshop was established to provide hands-on-experience to students in science and engineering and to facilitate research ideas by modifying simple mechanical components. Effective and successful working models using both machine tools and computers at the workbench has helped students brainstorm their innovations. Students are exposed to different methods of manufacturing, materials and components, as well as procedures and software programs currently used in commercial manufacturing and assembly processes. Here in the workshop we transform students to engineers and engineers to future scientist to facilitate research scholars to perform novel and cutting edge research using the state-of-the-art facilities available under the roof of Central Workshop.

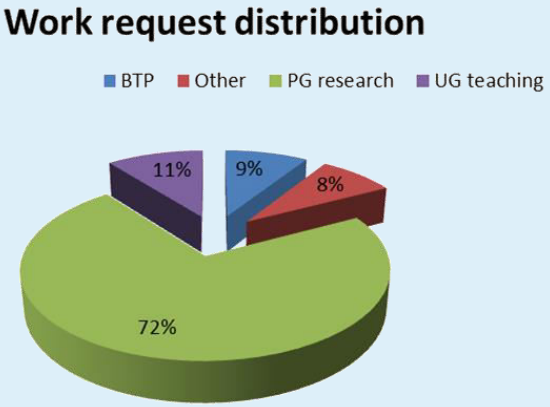
Basic Manufacturing Technique Lab (ME 156), Manufacturing Processes Lab (ME 258) and Machining Science Lab (ME 355) are held in the Central Workshop. Central Workshop provides infrastructure and services to faculty members and research scholars to fabricate their experimental setup for research and consultancy purposes and helping the UG/PG students in fabricating their B.Tech/ M.Tech/Ph.D projects.

In December 2, 2015 a new chapter opened in history of Central Workshop when it shifted to permanent campus. The entire workshop was relocated to Simrol Campus in just few days by dedicative efforts of machine operators, staff under the guidance of Dr. SomadityaSen, HoD (Workshop). A strong team effort supported by the motivation of the HoD, Workshop, made it fully functional on December 10, 2015 without affecting any lab and research activity. The complete setup of Central Workshop was rearranged with proper machining space, underground power supply system, and natural light following complete safety norms. In fact the Central Workshop building was actually the first building completed in the permanent Simrol Campus.

WORK REQUESTS COMPLETED

For the period Apr-15 to Mar-16 total 133 work requests has been received for various purposes which include PG Research, UG Teaching, BTP, other work.

Purpose	Distribution
BTP	12
PG Research	96
UG Teaching	14
Other	11
Total	133 Nos.

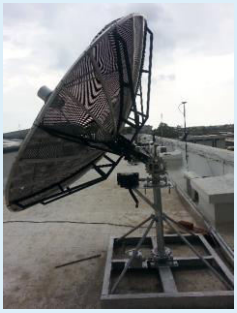


Students during first lab classes at CentralWorkshop, Simrol Campus

BAJA-SAE-2016 VEHICLE PROJECT

Students during fabrication of BAJA SAE-2016 vehicle

BAJA SAE-2016 AT vehicle



(a) A movable rotary base for small antenna detection fabricated under guidance of Dr. SomadityaSen and Dr. Siddharth Malu.

(b) 2.5 meter dish fabricated with base, gear boxes with azimuth and elevation motion system

IES AVAILABLE

The following facilities available in Central Workshop-

- Precision Turning, Facing, Drilling, Boring, Tapping.
- Surface Grinding.
- Milling & Slotting.
- Injection Moulding.
- Sheet Shearing, Bending, Punching, Wire drawing.
- Arc, MIG/MAG/Co2, Gas Welding & Brazing.
- Induction Heating & Metal Casting

LIST OF EQUIPMENT

Arc welding Equipment

Injection moulding machine

Spot welding machine

Wire drawing machine

Deep drawing machine

Sheet bending machine

Sheet shearing machine

Pedestal grinder

Lathe machine

Milling machine

Gear hobbing machine

Surface grinder

Tool and cutter grinder

Sheet shearing machine

Advanced Scientific Glass blowing Section

Glass blowing shop started functioning in May 2013 and offers support to research and academic laboratory works of Science and Engineering departments by repair of glass wares and quartz fabrication of specialized glassware as required by faculty members, master science students, research scholar of the institute. Necessary tools and equipment for carrying out the glassware works are available and is augmented from time to time.

GlassBlowing Section workrequest details 2015-2016

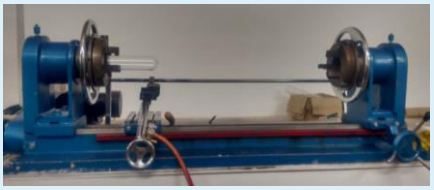
During April, 2015 to March, 2016, 105 work requests have been received from all departments.

Laboratory Glassware prepared in the facility

Condensers

Machinery available:

Table blowing, double chuck Lathe, Glass cutting machine, Grinding machine, Annealing Furnace, Surface Grinding, Pumping system and Accessories for thermal evaporation, Tools and Accessories.



Double Chuck Lathe - Bore 70mm

(Glassblowing Lathe)

Glass Cutting Machine

Surface Grinding Machine

Pumping system for vacuum seal attached with Thermal Evaporation for metallic thin film

11. Administration and Finances

1. General Administration

1.1 About the Organization:

IIT Indore is an autonomous statutory organization constituted vides "The Institutes of Technology Act, 1961", and 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 steer and monitor the activities of these Institutes. The Minister of Human Resource Development, GoI is the Chairperson of the Council. Each IIT has an independent Board of Governors responsible for the overall governance, superintendence and control of the functions of the Institute.

The Senate is the apex body to decide on academic policies and allied matters of the Institute which approves and administers the 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 the Chairman of the Senate. Members of the Senate are listed in the (Appendix-2).

The BoG is assisted by the Finance Committee on financial matters and by Building and Works Committeefor Campus Development matters. The composition of these committees is given separately in Appendix.

During the year, the Institute has started its shifting in a phased manner. The Labs and admin offices from IET-DAVV Campus was fully shifted to permenant campus on 30th Sep., 2015and the the Engineering Departments including Workshop and the Academic and R & D Offices have shifted on 31st March, 2016 by vacating the two temporary hired premises which has led to consolidation of Campus at Simrol during the year.

1.2 Staff position:

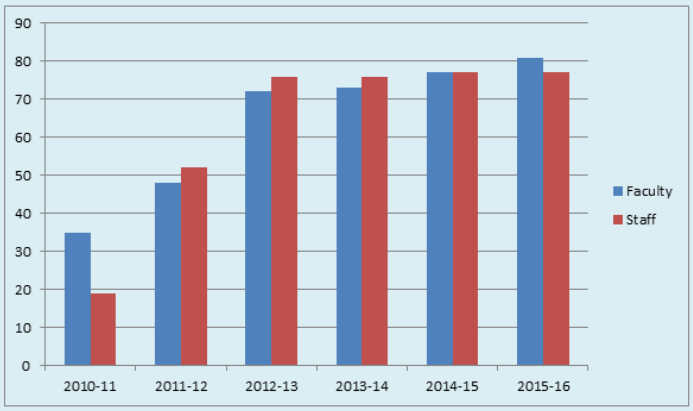
As on 31st March, 2016, 81 no of faculty and 77 no of non-teaching staff were in position as per the details given in the table below;

Faculty members - 81, Visiting Faculty - Nil
Group A Officers - 14
Technical staff - 26
Other Administrative Staff - 37
Number of faculty / staff members appointed during the year 2015-16 is as under:
Professors - Nil, Associate Prof – Nil, Assistant Prof - 04, Visiting Faculty – Nil, Non-teaching staff - 05.

No of faculty were relieved due to resignation or other reasons of separation were Nil and No of staff were relieved due to resignation / other reasons were 03.

Sl. No.	Name of Employee	Position / Designation	Department	Qualification	Date of joining
1	Dr. Abhirup Datta	Assistant Professor	Centre of Astronomy	Ph. D.	28-09-15
2	Dr. Mukesh Kumar	Assistant Professor	Electrical Engineering	Ph. D.	30-12-15
3	Dr. Dipankar Debnath	Assistant Professor	Electrical Engineering	Ph. D.	31-12-15
4	Dr. M. Ashok Kumar	Assistant Professor	Mathematics	Ph. D.	30-12-15
5	Mr. Rajan Thomas	Section Officer	Director Office	B.Com, MA(Sociology), MBA(HRM)	04-01-16
6	Ms. Jaya Vakade	Manager	Dean (R&D) + DOP	B.Com	22-02-16
7	Mr. Rakesh Jain	Deputy Manager	Administration	BBA, MBA, PGDCA	26-02-16
8	Mr. Neeraj Kumar Soni	Deputy Manager	Administration	B.Com, M.Com. B.Ed	26-02-16
9	Mr. Mayur Bangar	Deputy Manager	Finance & Accounts	B.Com, MBA	26-02-16

1.3 The list of faculty / staff appointed between April 1, 2015 and March 31, 2016 are as under:



Year wise details of Faculty and Staff

1.4 Faculty members on sabbatical leave / Deputation are as under: 01

(Dr. N.S. Chaudhari) On Deputation to VNIT Nagpur

1.5 Staff Welfare

Installation of Smart card project to issue smart cards to all the community of IIT. Print Management solutions for students as well as employees.

Infrastructure for community activities were initiated on Build, Lease, Operate and Transfer (BLOT) basis and the project was awarded to Canara bank for developing the space as well as to providing various banking facilities to all community of IIT Indore.

A new Cafeteria with state of the art facilities was made functional on BLOT basis for the benefit of the community members behind Workshop Building, which is also Central Kitchen with modern cooking and kithenette for hygenic preparation of food to meet the food safety requirements .

1.5.1 Human Resource Development

As part of human resource development initiatives, the Institute plans and implements programmes for providing opportunities to the technical and administrative staff to upgrade and enhance their knowledge, skills and practices so that they may perform their duties diligently and effectively. In addition, the external sponsorship for attending the programs is offered which are aimed at enhancing the pride and satisfaction they feel in their work. The overall feeling of happiness engendered by these programs also overflows to their home lives and contributes to a sense of well-being for the entire family. These activities also form a part of the training requirements under the ISO dispensation for which the Institute is eventually planning to accomplish.

1.6 Reforms measures undertaken during the year inter-alia include:

- Recruitment and Promotion Norms have been drafted and being submitted for consideration by 20th Boarding meeting to be held on May 7, 2016.
- Roaster for non-teaching staff has been prepared and keep on updating the same whenever new person joins/leaves the institute.
- Medical and Health Care Guidelines have been drafted and is ready for submission to the forthcoming Board meeting.
- Action has been initiated to open a full–fledged Post Office with PIN Code No 453552 at Simrol which will cater to the needs of IIT Indore Community for which formal approval has been received. The Institute is co-coordinating with local Post Office authorities for opening of the Post Office in Simrol. Action has also been initiated for services of pickup and delivery of letters including the Speed Post facility at the Campus by the Post Office.
- With the help of students an on-line leave application software utility has been initiated and that will be fine tuned in due course for operationalisation.
- Action has been initiated to issue smart card based Ids to one each of family members of the employees to avail the campus services on cashless basis.
- Guest house and hostel accommodation hired have been reviewed for monitoring the occupancy status and the process of occupation and vacation streamlined to reduce the number of Units hired. After review one Unit of Guest House was surrendered discontinued one unit on rent in order to save the monthly rent of around ₹ 22,000 to manage the facility.
- Outsourcing of staff has been streamlined through Manpower outsourcing agency instead of advertising by the Institute, leading to savings to institute.
- All the Recruitments in respect of regular posts have been completed as per the schedule with proper planning.
- Staff outsourced are kept at the bare minimum required level keeping in view the statutory and legal compliances;
- Salary processing of all out sourced staff has been monitored by the administration in order to have an effective control system.
- Hospitality activities are routed through administration and almost all the events have been managed within the available resource.
- MoU with Choithram, Greater Kailash, and Rajshree Apollo hospital have been signed with modification that, OPD facility for students also extended as CGHs rates.
- Institute has entered an agreement with Fedex for import as well as export items and properly processed the bills by co-ordinating with various stake holders of institute including students.
- Action has been initiated for Disposal of old vehicle to reduce operating and maintence expenses;
- All the Grievances have been handled on timely manner.
- Actively participated in shifting of IET as well PACL campuses.
- All the issues relating to letting out of flats for students residential purpose have been handled properly.

1.7 Meetings organised by the Board Secretariat:

Board of Governors:	Two meetings held on: August 24, 2015, December 8, 2015
Finance Committee	Two meetings held on: August 10, 2015, December 8, 2015
Building and Works Committee:	Five meetings held on: July 30, 2015, September 11, 2015, November 28, 2015, January 18, 2016, March 12, 2016
Senate:	One meeting held on: August 5, 2015

2. Finance and Accounts

2.1 The year 2015 - 16 is characterized with the following Income and Expenditure:

(₹ in crores)

S. No.	Particulars	2015-2016 Current Year
1.	INCOME	
1.1.	Grants Total Grant received : 142.80 Less –Allocated for creation of Capital assets : 99.50 For Recurring Purpose : 43.30	43.30
1.2.	Academic Receipts	6.45
1.3.	Interest Earned	6.32
1.4.	Other Income	0.47
1.5.	Total of 1	56.54
2.	EXPENDITURE	
2.1.	Staff Payments & Benefits	29.67
2.2.	Academic Expenses	19.03
2.3.	Administrative & General Expenses	08.58
2.4.	Transportation Expenses	01.01
2.5.	Repairs and Maintenance	00.72
2.6.	Depreciation	12.22
2.7.	Other Expenses	00.50
2.8.	Total of 2	71.73
3.	Balance being excess of expenditure over Income	15.19

2.2. The position relating to creation of capital assets is as under:

(₹ in crores)

S. No.	Particulars	2015-2016
2.1	Opening Balance of Grant-in-Aid Plan	22.45
2.2	Grant received during the year - For Creation of Capital Assets 99.50 - For Revenue Expenditure 43.30 142.80	142.80
2.3	Internal Revenue Generation	13.24
2.4	Total funds available at the disposal of the Institute	178.49
2.5	Revenue Expenditure excluding Depreciation (71.73-12.22)	59.51
2.6	Plan Grant after adjusting utilization for Income & Expenditure (178.49-59.51)	118.98
2.7	Utilized for developing infrastructure - Buildings & Works 109.41	117.87
	Utilized for Equipment's and other Assets 8.46	
2.8	Net balance as on 31.03.2016	01.11
2.9	Appropriation to Corpus Fund	47.74
2.10	Unspent balance as on 31.03.2016	-46.63

2.3 Funds availability and status of utilization thereof:

During financial year 2015-16, against sanction of Detailed Project Report (DPR) of ₹ 760 crores, a sum of ₹ 142.80 crores were released by Ministry of Human Resource Development. The Internal income of the Institute reckoned during the year was ₹ 13.24 crores and after considering the unspent balance as on 01.04.15 of ₹ 22.45 crores, the total funds available at the disposal of the Institute was of the order of ₹ 178.49 crores.

A sum of ₹ 117.87 crores has been utilized for the creation of Capital assets and a sum of ₹ 71.73 cores (which includes Depreciation of ₹ 12.22 crores) was incurred on recurring expenditure out of the grant at the disposal with the Institute. Further Corpus Fund has also been created by appropriating Internal Revenue Generation from 2009-2010 to 2015-2016 amounting to ₹ 47.74 crores.

2.4 Reforms, measures and initiatives undertaken during the year include:

During the year under review the following reforms, measures Initiatives were initiated from Finance & Accounts:

2.4.1 New banking relationship was evolved through an initiative by inviting RFP with Canara Bank. The Bank will construct a building on BLOT basis having carpet area of 5250 sq ft and leaving area of 3750 sq ft for IIT Indore use and remaining will be used by Canara Bank for opening branch and providing competitive door step banking services, most of which are without any charges or at concessional charges with latest features and facilities. Total estimated cost of the project is ₹ 70 lakhs.

2.4.2 As per mandate given by Government of India, all the bank accounts of the faculties/students getting fellowships have been linked with their Aadhar number except cases where individual does not have/has applied for Aadhar number.

2.4.3 Efforts were made for getting exemption under Section 80G of Income Tax Act. The matter was rigorously followed up from Bhopal to New Delhi and finally Institute has succeeded in receiving the Notification in this regard. Accordingly donors to the Institute are benefitted by way of getting 100% deduction u/s 80G of the Income Tax Act for the donations made.

2.5. Education assistance for children:

During the financial year 2015-2016, the Institute reimbursed a sum of ₹ 12,66,268/- to 58 faculty and staff members against for education assistance according to Government of India norms.

2.6. Transport facilities for staff members:

Transport facilities have been provided for the benefit of movement of staff from one campus to another campus at subsidised rates apart from other market trips for the benefit of community from the residential zone on holidays.

2.7. Advances:

During the reporting year, a total sum of ₹ 6.29 lakhs was sanctioned as advances for the following.

Sl. No.	Nature of Advance	No. of Beneficiaries	Amount Sanctioned (in ₹)	Amount outstanding as on 31.03.2016 (in ₹)
1	House Building Advance	2	4,68,260.00	11,97,692.00
2	Car Advance	-	0.00	1,95,700.00
3	Two-wheeler advance	1	30,000.00	91,000.00
4	Personal computer advance	--	0.00	0.00
5	Festival advance	29	1,30,500.00	79,650.00
		Total	6,28,760.00	15,64,042.00

2.8 Insurance:

Group Medical Insurance cover of ₹ 1.50 lakhs is provided to all students of the Institute for In-Patient treatment. Expenses towards insurance is ₹ 10,17,997/- during financial year 2015-16. Out-patient treatment is taken care mainly by the Health Centre internally.

2.9 Financial Assistance to Research Scholars/Students for Presentation of Papers Abroad/India:

This Institute encourages research scholars to present papers at international conferences and give them financial assistance towards this endeavour. The assistance (adhoc amount, including registration fees) provided to Ph.D scholars is ₹ 80,000/-. Assistance is given to other PG students also as per need basis.

2.10 Fellowships/scholarships:

2.10.1. To Research Students:

During financial year 2015-16, Institute has disbursed Fellowships for following category of Students:

S.No.	Category of Students	No. of Student	Fellowship (per month)
01.	Institute Funded through MHRD grant-PHD	262	JRF- ₹ 25,000/- + HRA @ 20% SRF- ₹ 28,000/- + HRA @ 20%
02.	DST Funded (PHD)	11	
03.	CSIR Funded (PHD)	11	
04.	UGC Funded (PHD)	17	
05.	Institute Funded through MHRD grant-M. Tech.	49	₹ 12,400/- + HRA @ 20%

2.10.2. Merit cum Means Scholarship:
Institute has disbursed ₹ 84,69,552/- 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 (in ₹)
01.	General	B.Tech.	59	50,58,925
		MSc.	6	62,043
02.	OBC	B.Tech.	32	26,96,771
		MSc.	1	33,723
03.	SC	B.Tech.	7	3,19,217
		MSc.	2	1,16,333
04.	ST	B.Tech.	4	1,82,487
		MSc.	-	-
	Total		111	84,69,552

Summary of the Balance Sheet and Income & Expenditure is as under:

A. BALANCE SHEET AS AT 31.03.2016

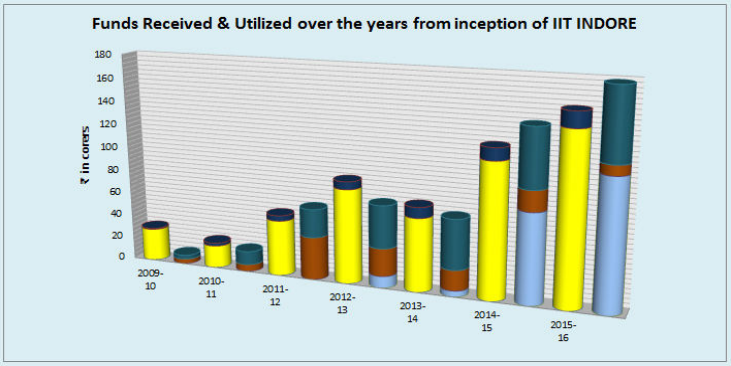
(Amount in ₹)

SOURCES OF FUNDS	SCHEDULE	AS AT31-03-2016	AS AT31-03-2015
Corpus/Capital Fund	1	3,08,82,65,489	1,55,43,72,053
Designated/Earmarked Funds	2	3,21,24,345	2,50,59,220
Current Liabilities & Provisions	3	- 3,06,81,912	66,57,85,688
TOTAL		3,08,97,07,923	2,24,52,16,961
APPLICATION OF FUNDS			
FIXED ASSETS	4		
A. Tangible Assets		69,98,34,883	63,42,82,032
B. Intangible Assets		14,88,558	-
C. Capital Work-In-Progress		1,89,74,40,939	90,79,85,021
CURRENT ASSETS	5	35,36,84,403	52,13,81,031
LOANS, ADVANCES & DEPOSITS	6	13,72,59,139	18,15,68,877
TOTAL		3,08,97,07,923	2,24,52,16,961

B. INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED MARCH 31, 2016

(Amount in ₹)

PARTICULARS		SCHEDULE	2015-2016	2014-2015
(A) INCOME				
Academic Receipts		7	6,44,68,305	4,57,09,685
Grants & Subsidies	1,42,80,00,000	8	43,30,00,000	40,03,50,000
Less: Capital Grants for Fixed Assets	99,50,00,000			
Interest Earned		9	6,32,34,253	5,61,61,418
Other Income		10	42,94,294	30,96,118
Prior Period Income		11	4,48,433	1,20,601
TOTAL (A)			56,54,45,286	50,54,37,822
(B) EXPENDITURE				
Staff Payments & Benefits		12	29,67,04,706	25,51,64,341
Academic Expenses		13	19,02,99,312	13,68,54,270
Administrative and General Expenses		14	8,58,34,957	8,28,24,192
Transportation Expenses		15	1,00,87,528	86,51,755
Repairs and Maintenance		16	71,73,542	65,21,343
Finance Costs		17	2,781	24,175
Depreciation		4	12,21,84,139	11,81,49,064
Other Expenses		18	34,68,961	22,44,187
Prior Period Expenses		19	15,00,783	9,51,513
TOTAL (B)			71,72,56,709	61,13,84,840
Balance being excess of Expenditure over Income (A-B)			-15,18,11,423	-10,59,47,018
Appropriation:				
a. Transfer to Corpus fund towards Internal Revenue Generation of 2015-2016 (See Note to Account - no.6)	-13,24,45,286			
b. Transfer to Corpus fund towards Internal Revenue Generation during 2009-2010 to 2014-15 (See Note to Accounts - no.6)	-34,49,50,825		-47,73,96,111	-
c. Amount transfer to Capital Fund (Depreciation)			12,21,84,139	11,81,49,064
Over Utilization of Grant in Aid for Revenue Purpose (Schedule 3C)			50,70,23,395	
Under Utilization of Grant in Aid for Revenue Purpose(Schedule 3C)				1,22,02,046



(₹ in crores)

Sr. No.	Particular		2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
1	RECEIPT	GRANT	27.78	19.15	47.47	80.00	62.00	113.45	142.80
		IRG	0.97	2.65	4.68	6.58	9.10	10.51	13.24
2	EXPENDITURE	BUILDING	0.00	0.00	0.00	9.89	4.98	75.82	109.41
		EQUIPMENT	3.99	5.98	36.36	23.54	17.29	17.39	8.46
		RECURRING	3.50	11.47	24.06	36.14	42.15	49.32	59.51

3. Materials Management

Materials Management Section (MMS) is part of the Administrative Services of the institute which caters to the procurement and distribution of Goods and Services for Academic, Research and non-academic departments under both institute as well as Project funds. The section forming part of Registry is responsible for the Procurement and Inventory management functions.

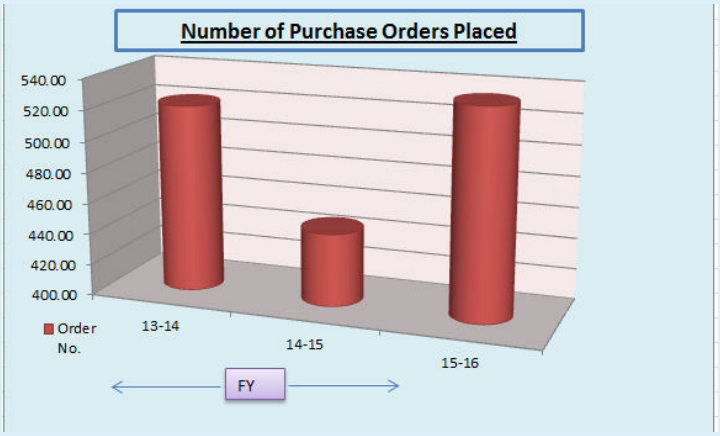
IIT Indore is committed to the principle of "Buying the best" and follows the 'Manual and procedures for purchase of goods and services – 2014' for the institute for all Procurement activities. The manual was approved by the BOG vide item no.17.7 in its meeting dated 05.03.2015 which broadly confirms the provisions of GFR-2005. The new procedure has been implemented in the institute from April, 2015.

As part of the institute policy to ensure Transparency, Accountability, Financial propriety and fair competition the following steps have been initiated at institute level during the financial year 2015-16:

1. Digital Signatures for all stakeholders in Procurement activities have been acquired for participation in the Decision making process at Tendering, Ordering and execution of the contract. This will be utilized in Tender upload, approval utilities in the Central Procurement Portal (CPP) of NIC, Govt. of India portal for Procurement.
2. Conclusion of Rate contract for supply of Stationery and Office consumables to ensure Uniformity of items and reasonableness of Price.
3. The procurement of Medicines and dressing items has been streamlined by concluding a rate contract with more than one supplier through Open tender mode.
4. Development of Cafeteria in the institute on BLOT (Build, Lease, Operate and Transfer) model inside the campus through Open tender mode, which is a new business model among IITs.
5. MMS has taken due care in tagging of the equipments and tangible Assets as the campuses at IET-DAVV and PACL have been closed during 2015-16.
6. Disposal of Scrap of IET & PACL campuses have been completed in record time enabling Academic departments to use the valuable Laboratory space.
7. Since IIT has moved to the permanent campus the arrangement of Fuel to the institute fleet of vehicles have been streamlined by sourcing the fuel supplier at nearest location.
8. IITI has initiated the practice of Pre-Bid conferences to make the Specifications as generic as possible by way of participation of prospective bidders. This system is adapted in all high value procurement which gives a platform for all manufacturers and Suppliers to raise queries discuss the terms of the tender and offer suggestions after which Open tendering is followed. All the Prebid reports are hosted on institute website for wide publicity ensuring competitive bidding.

Activities of MMS during 2015-16 in a glance:

Sl. No	Activities	No.	Value	Remarks
01	Indents received	563	---	Includes Local and Foreign Purchase requirements for Assets, Consumables and Services.
02	Purchase Orders issued	534	15,26,11,495.00	Foreign Purchases : 41 (₹ 3,86,63,592.00) Indigenous Purchases : 493(₹ 11,39,47,903.00)
03	P.O. through Local Purchase Committee	422	4,40,31,464.00	LPC are department specific committee which selects and recommends the source of supply and Price reasonableness etc.
04	Order for Service contracts	17	70,00,000.00	For hiring ad Outsourcing of Services
04	Road Permits Issued	243	---	Towards inter State transfer of goods
05	Customs Duty Concessional Certificates	192	---	For import of Items vide GOI notification no 51/96 dated 23.07.1996 valid till 31.08.2016.
06	Excise Duty exemption Certificate	78	---	For purchase of items indigenously vide GOI notification no 10/97 dated 01.03.1997 valid till 31.08.2016.
07	Total Advertisement	16	27,19,178.00	NIT s published in National and local news papers for wide publicity
08	Stock Entries made in Ledger	12180	Personal and Departmental Inventory	Items against Purchase order : 10971 Items against Direct Purchase:1209



4. Safety and Security Department

The 1st International Day of yoga was celebrated by the institute on June 21, 2015. Apart from the community members of IIT Indore residents from Silver Springs Township were invited, overwhelming response was received from IIT Indore community members as well as outsiders. A two hour session of Yoga was organized in which Dr. Omanand (Guruji) founder of Permanand yoga Trust Indore and his team has very actively conducted the yoga session.

5. Transport Department

The transport department of institute is holding 21 vehicles of various categories (14 buses of varying capacity, 02 sumo, 01 car, 01 Ambulance, 02 motorcycles and 01 truck). The buses are running as per schedule for catering to the needs of students, faculty and staff from one campus to other. Daily 108 services/trips inter campus as well as intra campus are being managed by the transport department apart from various other needs of transportation of faculty/guests coming to the institute for various official purposes and movement of various items through institute truck.

6. Housekeeping Department

Team of 63 housekeeping staff comprising of 01 manager, 02 supervisors and 60 helpers is working at its full efficiency in providing neat and clean environment for the students, faculty and staff members. Apart from the regular area maintenance the housekeeping team has also helped institute in shifting and arranging its assets from two erstwhile campuses (IET & PACL) to the main campus at Simrol. Housekeeping department is pro active in arrangements for special occasions like Republic Day Parade, Independence Day Parade and other functions like FLUXUS.

7. Health Care and Medical Facilities:

The Health centre, IIT Indore is providing dedicated medical care to IIT Indore community 24 x 7 and has given medical facility to 10,514 patients last year (2015-2016).

In-patient treatment facility was provided to 112 patients & 523 medical and trauma emergency cases were managed successfully.

The Centre has provided investigation facility 649 patients through in house investigation facility. The Medical Unit started operating from hostel building, Simrol since October 2015 and had provided medial services to 308 patients including day care facility to 12 patients. Simultaneously, it is also providing services at Silver springs campus. The health centre has given significance to preventive health care and had undertaken various awareness activities about lifestyle and communicable diseases from time to time.

It had organized training workshop on 'Basic Life Support' for IIT Indore community.

It had also organized medical check- up for all security guards and institute bus drivers through screening and awareness camps.

8. Hostel Facility

The Institute being a fully residential system offers hostel facility for the students and research scholars at the temporary Campus at Silver Springs where we strive to provide a hygienic environment for living on sharing basis and other facilities include the following:

8.1 Students stay in a big township having uninterrupted water and power supply. We have around 69 units to accommodate them. Students are accommodated in a2BHK/3BHK/4BHK flat which is as big as 2000 Sq. feet area for average 6-8 students. So, that they get enough space for their studies.

8.2 We have provided every basic facility like (water filter (RO), Washing machines, Tables, Lights, Fans, Kitchen, Elmira, bed) in their home so that they get home away home environment.

8.3 We have sports and gym facilities so that they can relax after studies.

8.4 We have music club inside the campus for relaxation.

8.5 24X7 internet facilities so that they could study on the internet.

8.6 We have our own student facilities center (La Fresco) where they can buy foods and stationary with daily needs stuff so that they don't have to go out for eating or buying something.

8.7 Night time canteen facilities for late night as per demand.

8.8 We have student Counsellor inside the hostel campus so that students can interact whenever they are down or disturbed.

8.9 Medical facilities inside the hostel campus are open for 24X7.

8.10 Dedicated hostel coordinator and security officer for their security and emergency related issues.

8.11 Four healthy regular meal provided in mess inside the hostel campus, so that they don't have to worry about the food.

And we are providing few extra facilities (including above) to research scholars mentioned below: 1. Refrigerator 2.Television3. Sofa Set4. Dining Table5. Micro Wave oven

1. Academic Section:

1.1 During the academic session 2015-16, the following was the programme-wise admissions:

S. No.	Programme	No. of Students
1	UG – B.Tech	463
2	PG – M.Sc.	44
3	PG – M.Tech.	49
4	Ph.D / Research Prog	118

1.2 The total strength of the students in the Campus as on March 31, 2016 was as under:

Year	B. Tech	M. Tech	M.Sc.	V yr. B.Tech. + M.Tech.	M.Tech.+ Ph.D.	Ph. D	Total
2009-10	01	-	-	-	-	-	01
2010-11	02	-	-	-	-	08	10
2011-12	02	-	-	-	-	31	33
2012-13	111	-	-	-	-	51	162
2013-14	120	-	-	-	01	75	196
2014-15	117	22	20	01	-	87	247
2015-16	110	25	24	-	-	118	277
TOTAL	463	47	44	01	01	370	926

Total student strength as on March 31, 2016 was 926.

1.3 Programmes offered during the year are:

B. Tech:-
(i) Computer Science and Engg.,
(ii) Electrical Engg.,
(iii) Mechanical Engg.

Ph.D:-
(i) Basic Sc.: (Chemistry, Maths, Physics)
(ii) Engineering: (Computer Sciences and Engg., Electrical Engg., Mechanical Engg.)
(iii) HSS (Economcis, English, Philisophy, Psychology, Sociology),
(iv) Inter Disciplinery Research Group (Bio-Sciences & Bio-Medical Engineering, Material Science and Engineering, Astronomy)

M.Sc., M.Sc.+Ph.D. dual degree:-
(i) Chemistry
(ii) Physics
(iii) Mathematics

M.Tech., M.Tech.+Ph.D. dual degree:-
(i) Communication and Signal Processing
(ii) Production and Industrial Engineering
(iii) Metallurgy Engineering and Material Science

1.4. Summary of the activities of the Academic section during the year 2015-16 broadly comprised of the following:

1	Courses offered	a) Undergraduate Courses: 305 b) Postgraduate and Doctoral Courses: 251 (PG & PhD courses) Total: 556
2	Doctoral Students Admitted in AY 2015-16	118 (total admissions including 2016 Spring Sem.)
3	Doctoral Students Graduated	a) 16 students have successfully defended their thesis and passed out.
4	Under Graduate Students Graduated	108 B.Tech student will be graduated this year
5	Post Graduate Students	Approx. 22 M.Tech and 20 MSc students will be graduating during this year

1.5 Summary of admitted Students in different academic year in IIT Indore:

	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
UG (B.Tech.)							
CSE	35	43	38	38	40	39	39
EE	38	42	39	39	40	38	37
ME	34	37	40	39	39	40	35
Total A	107	122	117	116	119	117	111
UG (Preparatory) Total B	0	0	0	1	0	0	0
PG (M.Tech.)							
PIE	0	0	0	0	3	12	11
CSP	0	0	0	0	2	12	9
MSE	0	0	0	0	0	0	10
Total C	0	0	0	0	5	24	30
PG (MSc)							
Chemistry	0	0	0	0	8	10	7
Physics	0	0	0	0	7	10	9
Mathematics	0	0	0	0	0	0	8
Total D	0	0	0	0	15	20	24
PhD							
CSE	0	3	6	7	11	2	11
EE	0	6	11	14	19	22	27
ME	0	6	5	11	21	14	7
Chemistry	0	8	9	15	13	13	25
Physics	0	4	5	10	4	20	8
Mathematics	0	3	3	2	3	1	2
Economics	0	2	2	2	0	1	5
English	0	0	2	1	3	1	2
Philosophy	0	1	0	2	1	0	1
Psychology	0	0	0	1	1	1	1

Sociology	0	0	0	0	1	0	2
BSBE	0	0	0	2	9	6	17
MSE	0	0	0	0	1	12	10
Total E	0	33	43	67	87	93	118
Grand Total (A+B+C+D+E)	107	155	160	184	226	254	283

1.6 Summary of graduated Students in different academic year in IIT Indore:

	AY 2012-13 Convocation 2013	AY 2013-14 Convocation 2014	AY 2014-15 Convocation 2015
UG (Btech)			
CSE	35	41	39
EE	35	42	39
ME	31	34	36
Total A	101	117	114
PG (Mtech)			
PIE	0	0	3
CSP	0	0	2
MSE	0	0	0
Total B	0	0	5
PG (MSc)			
Chemistry	0	0	8
Physics	0	0	6
Mathematics	0	0	0
Total C	0	0	14
PhD			
CSE	0	0	3
EE	0	2	8
ME	0	4	3
Chemistry	0	0	5
Physics	0	0	2
Mathematics	0	0	0
Economics	0	0	2
English	0	0	0
Philosophy	0	0	0
Psychology	0	0	0
Sociology	0	0	0
BSBE	0	0	0
MSE	0	0	0
Total D	0	6	23
Grand Total (A+B+C+D)	101	123	156

12. Industry – Academia Conclave

The 4th Industry-Academia Conclave (IAC) organised by IIT Indore was held from 18th-20th Feb. For the first time, the event was being held at our permanent campus in Simrol, welcoming close to 900 students, professors, research scholars and industry personnel.

The keynote address for the first day was delivered by Mr. Ananth Krishnan, Chief Technological Officer of Tata Consultancy Services, and it revolved around smart technologies and the blurring of boundaries between different fields required to achieve them.

The conclave featured experts and reputed speakers from both the industry and academia, who spoke on the following topics: Internet of Things (IoT), the Smart City initiative, data compression, smart grids, solar power, biofuel and energy self-sufficiency – which could be, in ways, related.

Among the speakers invited were Mr. Gangaram and Mr. Shriprakash Dwivedi, grassroot level innovators from Gorakhpur .The Additional Commissioner for the Smart City Project of Indore Municipal Corporation, Mr. Rohan Saxena, was also there to present the vision of the Municipal Corporation for Indore's future as a Smart city.

The first session was followed by a Panel Discussion on "Innovation and smart technologies". The panel comprised industry experts and representatives from academia. The discussion touched on the meaning of innovation, from both the industry and academic perspectives; and it ended with a unanimous agreement that innovation, in its true essence, is a culture that needs to be cultivated over time.

The second day's keynote address was given by Mrs. Pamela Kumar, Vice President of the Cloud Computing Innovation Council for India (CCICI), a platform bringing together technical experts from across the Industry, academia and government labs to promote innovation around cloud computing in India. The day also featured, among other talks by reputed experts from the Industry, a teleconferencing session with Dr. Mike Borowczak, Chief Research Scientist at Erebus Labs, on the importance of hardware security in an IoT driven world, and an analysis on Industry-Academia interactions in India by Professor Rishikesha T. Krishnan, Director of IIM Indore.

The third day ended with keynote address by GE Healh Care's Country manager Mr. G.Kumar and Dr. Reddy Laboratory's U.K. Syam Kumar showing how the role of research is vital for the growth of a smarter world. It also included lectures from academicians to highlight the importance of further Industry-Academic collaboration.

Also featured in the conclave was the Innovation Pavilion, a platform for researchers and innovators to display their ideas and products. Some of the products and ideas on display were:

- Robotic Fish: Artificial Fish made using smart materials useful for deep sea exploration and other operations such as leading a shoal of fish away from a disaster site.
- Artificial voice device based on sign language gesture recognition for the deaf and dumb.
- Industry Smartware: Automated system to endow intelligence to every single entity of an industry, in the light of internet of things. Benefits include robust planning and automated management.
- A robotic framework to assist in rehabilitation and therapy of the legs post trauma
- IET DAVV – Intelligent system to link number plates of cars with licence number and mobile phone number of drivers, and using image recognition algorithms for eChallan, traffic policing etc.

13. Central Library

The Central Library is a vibrant nexus, connecting collections, ideas, spaces, and intellectual capital of the institute. The collection of the library includes books, journals, theses, dissertations, CDs, standards, etc. The book collection consists of approximately 30,000 books and new books are being added to the collection continuously. These include books on all relevant subjects for teaching and for reference. The Library also boasts of a select collection of fiction, literature, and general interest books such as sports, films, current affairs, etc. to take care of the leisure and recreation reading needs of the users. The Library has also developed a special Collection of books on Gandhian Studies. In addition to this, a select collection of Hindi books is available in the library.

Library at a Glance

Collection:

Books	E Journals	E Books	Print Journals	Magazines	Newspapers
30000+	6000+	7600 approx.	03	26	09

Library Usage :(October, 2015 to September, 2016)

Books Issued	Reading Room Usage per month(Average)
16850+	4000 users p.m. approx

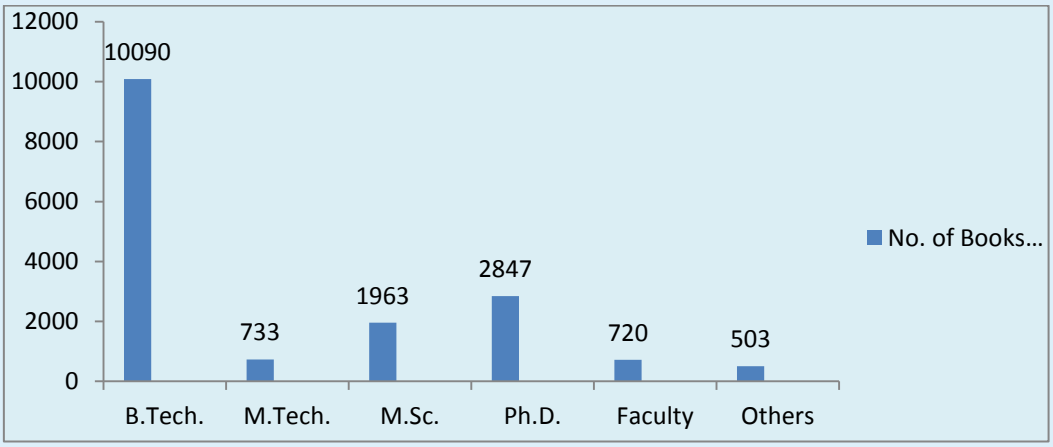


Figure 1: Book Issue Statistics-Category wise (October, 2015 to September, 2016)

Periodicals and Newspapers (Print Format): At present, the Library subscribes to 03Print Journals, 26 Magazines and 09 newspapers.

Electronic Resources: In today's world of Information explosion and rapid developments in Information and Communication Technology (ICT), access to information resources in electronic format is essential, particularly in an academic environment. The E-Resource collection of the library includes electronic journals in various disciplines published by reputed societies such as American Mathematical Society, American Chemical Society, American Institute of Physics, American Physical Society, Royal Society of Chemistry, SIAM, IEEE, and so on. In addition to this, journals published by publishers such as Elsevier, Taylor & Francis and Springer are also made available to users of the Library. The E Resource collection also includes 7600 E-Books from various publishers. The complete list of e-resources with hyperlinks is available on the Library web page at the Institute website for users' convenience, so that users can access the resources from the library webpage itself.

Library Services

At present, the Library offers services as described below:

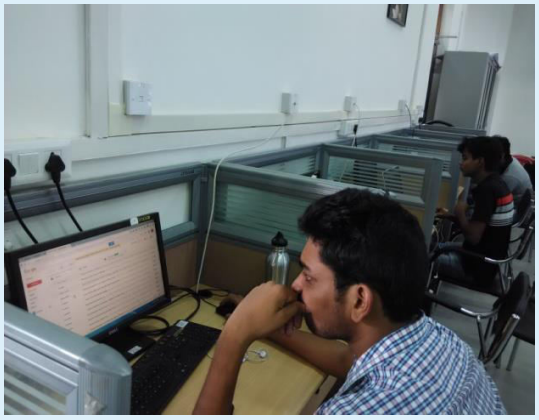
- Lending facility: Undergraduate students can borrow 08 books for the period of 15 days, whereas Ph.D. students can borrow up to 08 books for the period of 1 month. Faculty members can borrow up to 40 books for 6 months.
- Overnight Lending: Overnight lending facility is provided to students who wish to borrow a book from the reserved section, or have crossed their entitlement limit. Books on overnight issue have to be returned by 9.30 a.m. the next day.
- Claims/ Reservations: Users can claim/ reserve books which are issued out. Claimed/ reserved books are kept in the Library for the user for 3 days from the date of return by the previous borrower, before they can be issued to the next claimant.
- Renewals: Books can be renewed only if there are no claims.
- Reading Room: The Library facility is available at present in two buildings in the Simrol Campus: the School Building, and the POD Building. The Library provides air conditioned and wi-fi enabled Reading Room with a seating capacity of 50 students in each of the two buildings. In addition to this, 40 PCs are kept in each of the two reading rooms for the use of research scholars and faculty members for the purpose of accessing e-resources, checking Web OPAC, etc.
- Inter Library Loan & Document Delivery Services: The Library has informal Inter Library Loan and Document Delivery Service arrangements with institutes such as IIM Indore, RRCAT Indore, and with various other IITs. Under this facility, access is provided to books or electronic materials which may be needed by users but which may not available in our library.
- Book Bank: Under the Book Bank scheme, text books are provided to SC/ST students for the period of an entire semester.
- Library Portal: Detailed information about the Library can be accessed through the Library portal. It can be accessed at :http://jlibrary.iiti.ac.in/
- Reprography Services: Users are provided Photocopies or Printouts of library resources subject to the provisions of the Copyright Act.
- Orientation Programs: The Library conducts orientation programs for new students to make them aware of the library facilities and services and to help them utilize the library resources optimally.
- Originality Check: Students and faculty members can send their papers to the Library for originality check which is facilitated by Turnitin. The reports after originality check are sent to users within two working days.
- Remote Access: The Library uses RemoteXs authentication tool to provide its users off-campus access to its collection.

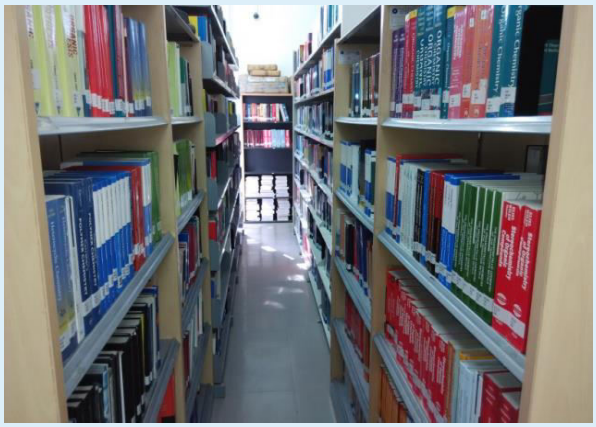
Library Automation

- ILMS: The Library uses Libsys7, an Integrated Library Management System (ILMS), for the automation of all its activities and services.
- Web OPAC:Users can browse the Library collection and also check the status (on shelf/ issued out) of a book by using the Web OPAC (Online Public Access Catalog) athttp://jlibrary.iiti.ac.in/index.php/opac-search
- CCTV Surveillance: The Library has installed high tech cameras for surveillance to ensure the safety and security of its users and collections.
- Bar Coding: Bar Code Technology is being used for issue/ return of books at the Circulation Counter.
- RFID: The implementation of RFID is under consideration and will begin in near future.

Other Activities

- Institutional Digital Repository: The Central Library has created Institutional Digital Repository of IITI to showcase, organize, share, and preserve the scholarly output of the institute. The collections in the repository include publications by faculty and researchers. Theses and dissertations by students form the other important group in the library collection.
- The Library organizes various Training Programs/ Informative Sessions for E Resources to help users make use of the resources more effectively.





14. Placement Statistics & Key Highlights for Session 2015-16 (B.Tech)

No. of students in (CSE+EE+ME)	No. of students registered for placement	No. of students placed	Placement %	No. of companies visited	Ratio of placed students/companies visted	Average package (INR, LPA)	Range of salaries offered (In INR)	Highest Package Offered * (In INR)
108	83	83	100	30	2.76	11	5 LPA to 28 LPA	28 LPA (Domestic)

- Minimum package received was 5 LPA in INR (3.5 LPA last year).
- New companies with good profile & package like Morgan Stanley (16.17 LPA in IN R) Practo (20 LPA in INR), Steel wedge Technologies (11 LPA in INR), Bookmyshow (7-14 LPA in INR), Quantile Analytics (10 LPA in INR) turned up & released offers at IIT Indore.
- Over all packages received by individual students improved this time, as most of the packages received were in more then 7 LPA range & up to 28 LPA.
- No. of companies approached us are more than 45 but most of students are placed even in less than 30 companies.
- No. of companies visited IIT Indore - 30
- Highest package received – 28 LPA
- Name of Premium Companies turned up in 2015-16 Placements– Amazon, Microsoft, IBM India, Morgan Stanley, HPCL, Coal India, Tata Motors, Mahindra, Volvo-Eicher, L&T, HCL Technologies, Practo, United Health Group, CA Technologies, Bookmyshow, DE-Shaw, Futures First, Endurance Technologies etc.
- Name of Premium Companies in 2015-16 Internships – Amazon, Microsoft, Morgan Stanley, UHG, Volvo-Eicher, Mentor Graphics, Practo, TCS etc.
- We have achieved 100% placements in all three B.Tech disciplines.
- Ratio of placed students versus no. of companies visited has been improved than last year (2.76)

15. AVANA, A Student Initiative

PATHASHALA: A first of its kind programme aims to bring up an online webportal with a database of Hindi medium educational videos designed to improve the learning of underprivileged students.

TRAFFIC AWARENESS CAMPAIGN in INDORE City: On the 69th Independence Day,
Team AVANA directed a 'TRAFFIC AWARENESS DRIVE ' in association with INDORE TRAFFIC POLICE along with the help of SIMROL Govt School students at four major centres of Indore.

Team AVANA and its volunteers along with 32 Simrolgovt school students celebrated this auspicious day by making the citizens aware of traffic rules and asking them to abide by the rules in the most polite and appealing manner and by giving away specially designed key chains as a token of gratitude to those who were wearing a helmet. Statistics of helmet wears and non-wearers were also recorded.

In addition to the above, regular activities are carried out throughout the year:

1) Cloth Donation Campaign: TEAM AVANA with its fresh energy conducted Clothing Donations in 3 places over Indore.
   * A village named Bhagoda near Simrol.
   * Village adjacent to Bhagoda.
   * Workers colony in Phase-2, Silversprings.
   Our team distributed around 800 clothes in the space of approx. 3 hrs.
2) Regular teaching in government school.
3) Visits to Elderly and Retirement Homes
4) Organizing trips for government school students:

TEAM AVANA took 200 Grade 8 and 9 students from SIMROL GOVERNMENT SCHOOLS to INDORE ZOO and MUSEUM on JAN 2

16. Student Entrepreneurship Support Cell, SESC

The Student Entrepreneurship Support Cell, SESC was formed in August, 2013 and since then has been striving to bring in more people who will be creators rather than producers and people who will challenge the usual, and conquer the so called impossible. Since inception in 2013, the Student Entrepreneurship Support Cell at IIT Indore has been involved in numerous activities and workshops to promote entrepreneurial spirit amongst students and faculty members alike.

In 2014, following our submission of proposal complete with innovation and entrepreneurship activities done by the team, and successful defence of the proposal, Department of Science and Technology granted IIT Indore to setup an Innovation and Entrepreneurship Development Centre by funding of over Rs. 45 Lakhs. The DST-IEDC at IIT Indore creates an ecosystem for Innovation and Entrepreneurship at IIT Indore. It promotes and encourages Start-up and Incubation support in the institute for prototype/ product development. This was in fact the 1st externally funded centre at IIT Indore. The DST IEDC Centre's advisory board includes representatives from DST, MSME, SIDBI, SBI, RRCAT, IIM Indore, NEN, IIT Indore and entrepreneurs. Since inception, there has been two successful board meetings with support for 10-projects and further 5-being considered for support for the next financial year. In addition, since inception, of Department of Science and Technology's Innovation and Entrepreneurship Development Centre at IIT Indore, the Centre have already resulted in filing 6-IPRs, and further 2-IPR are under process.

17. Yoga Day Celebrations 2015

Indian Institute of Technology Indore celebrated the International Day of Yoga at its permanent campus at Simrol. On the occasion Dr. Omanand an international renowned yoga guru (having travelled 55 countries) and his team was invited. The event of yoga was conducted from 8:15 a.m. to 10:40 a.m. during the event students, faculty members, staff members and families have taken a very active participation in the event. 33 residents from Silver Springs Township (the hostels site of the institutes) also participated in the event. Dr. Omanand and his team conducted yoga and meditation session for the audience which was enjoyed by everyone in the event. Total 322 members participated in the event.

18. Boundary Talks & Seminars

IIT Indore seeks to foster academic debate in areas with implications for a more equitable and sustainable world. In working towards fulfilling this aim the Institute announces the conduct of a series of lecture events in the academic calendar. The lecture series is titled Boundaries: Eminent Scholars and the Public Sphere Lectures. While the word boundary defines a set of limits it simultaneously denotes a horizon that goes beyond those limits. At IIT Indore we see the horizon as fast expanding and consequently the seeming confines of our fields also need to be opened to include what hitherto seemed to lie beyond the horizon of disciplinary boundaries. In announcing this lecture series we foresee a confluence of people, academics, students, intelligentsia coming together to discuss the state of scholarship in various frontier areas of the sciences, humanities and engineering. The series aims at presenting seminal talks by the foremost exponents in their fields, a site from where further departures and disciplinary forays become possible. Boundaries will provide a platform where thought and action coalesce into instruments for change, change that predicates the equitable and sustainable world that we all hope for.

Boundaries				
Speaker	Affiliation	Title	Date & Time	Venue
Prof. Yashwant Gupta	National Centre for Radio Astrophysics, Pune	Probing the Universe at Radio Wavelengths : from the GMRT to the SKA	March 29, 2016, 9:30 am	SB-308-309, School Building, Simrol Campus, IIT Indore
Prof. Bikas K. Chakrabarti		Econophysics of Inequality & Social Dynamics.	July 27, 2015, 3:30 pm	VCR Room(IET Campus), IIT Indore
Seminars				
Speaker	Affiliation	Title	Date & Time	Venue
Dr. P. Vigneswara Ilavarasan	Associate Professor at the Dept. of Management Studies, Indian Institute of Technology Delhi	Mobile Phones & Microenterprises in ICTD : The Field & Experiences	March 1, 2016, 3:00 pm	School Building Room No. 209, Simrol Campus
Prof. Lilavati Krishn	Visiting professor at IISER Bhopal, former professor of Psychology at IIT Kanpur.	'Some Issues in Social Cognition'.	October 15, 2015, 11:00 am	Conference Room, Simrol Campus, IIT Indore
Dr. R.A. Mashelkar, FRS	National Research Professor is presently also the President of Global Research Alliance, a network of publicly funded R&D institutes from Asia-Pacific, Europe and USA with over 60,000 scientists.	From Incremental to Disruptive Innovation.	August 25, 2015, 3:00 pm	PACL Campus, PS09 live broadcasting in PS10, PS12, PS13
Dr. Prasun Chatterjee	Oxford University Press as a Commissioning Editor.	The 'Marginal' in the Medieval.	August 18, 2015, 9:30 am	VCR Room, IET Campus
Prof. Bale V Reddy	Professor and Chair of	Modeling and	August	Board room,

	Department of Automotive, Mechanical and Manufacturing Engineering, Faculty of Engineering and Applied Science, University of Ontario Institute of Technology (UOIT), Oshawa, Ontario, Canada	Simulation of Natural Gas, Biomass and Solar Integrated Energy Systems.	10, 2015, 10:00 am to 02.00 pm	PACL Campus
Dr. Bhaskarjyoti Borah	Assistant Professor, P. D. Patel Institute of Applied Sciences, Physical Sciences Division, Charotar University of Science and Technology Changa, Gujrat	In the quest of a material to store alternate green automobile fuel.	June 5, 2015, 11:30 am	VCR Room(IET Campus), IIT Indore
Dr. Sunil Kumar Misra	DST INSPIRE Faculty, Indian Institute of Technology (BHU), Varanasi, India	Generating multipartite maximally entangled states and random states in a kicked Ising model	May 27, 2015, 11:30 am	VCR Room(IET Campus), IIT Indore
Dr. Hem Chandra Jha	Post-doctoral fellow at the Department of Microbiology, Perelman School of Medicine at the University of Pennsylvania, USA.	Role of Gamma herpes viruses in cancer progression.	April 20, 2015, 4:00 to 4.30 pm	VCR Room(IET Campus), IIT Indore
Dr. Biswanath Swain	Indian Institute of Management Indore.	Ethical Innovation: Bedrock of a Sound and Healthy Business.	April 17, 2015, 3:00 pm	VCR Room(IET Campus), IIT Indore
Dr. Rajesh Kumar	PhD degree in Photonics Engineering from Ghent University-IMEC (Belgium).	Micro optical devices for optical logic, interconnects and signal processing	April 8, 2015, 12:00 pm	Board Room (PACL CAmpus), IIT Indore

19. Statement of Accounts

A. BALANCE SHEET AS ON 31.03.2016

SOURCES OF FUNDS	Sched.	AS AT 31-03-2016	AS AT 31-03-2015
Corpus/Capital Fund	1	3,08,82,65,489	1,55,43,72,053
Designated/Earmarked Funds	2	3,21,24,345	2,50,59,220
Current Liabilities & Provisions	3	-3,06,81,912	66,57,85,688
TOTAL		3,08,97,07,923	2,24,52,16,961
APPLICATION OF FUNDS			
FIXED ASSETS	4		
A. Tangible Assets		69,98,34,883	63,42,82,032
B. Intangible Assets		14,88,558	-
C. Capital Work-In-Progress		1,89,74,40,939	90,79,85,021
CURRENT ASSETS	5	35,36,84,403	52,13,81,031
LOANS, ADVANCES & DEPOSITS	6	13,72,59,139	18,15,68,877
TOTAL		3,08,97,07,923	2,24,52,16,961

B. INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH'2016

PARTICULARS		Sched.	2015-2016	2014-2015
(A) INCOME				
Academic Receipts		7	6,44,68,305	4,57,09,685
Grants & Subsidies	1,42,80,00,000			
Less: Capital Grants for Fixed Assets	99,50,00,000	8	43,30,00,000	40,03,50,000
Interest Earned		9	6,32,34,253	5,61,61,418
Other Income		10	42,94,294	30,96,118
Prior Period Income		11	4,48,433	1,20,601
TOTAL (A)			56,54,45,286	50,54,37,822
(B) EXPENDITURE				
Staff Payments & Benefits		12	29,67,04,706	25,51,64,341
Academic Expenses		13	19,02,99,312	13,68,54,270
Administrative and General Expenses		14	8,58,34,957	8,28,24,192
Transportation Expenses		15	1,00,87,528	86,51,755
Repairs and Maintenance		16	71,73,542	65,21,343
Finance Costs		17	2,781	24,175
Depreciation		4	12,21,84,139	11,81,49,064
Other Expenses		18	34,68,961	22,44,187
Prior Period Expenses		19	15,00,783	9,51,513
TOTAL (B)			71,72,56,709	61,13,84,840
Balance being excess of Expenditure over Income (A-B)			-15,18,11,423	-10,59,47,018
Appropriation:				
a. Transfer to Corpus fund towards Internal Revenue Generation of 2015-2016 (See Note to Account - no.6)	-13,24,45,286			
b. Transfer to Corpus fund towards Internal Revenue Generation during 2009-2010 to 2014-15 (See Note to Accounts - no.6)	-34,49,50,825		-47,73,96,111	-
c. Amount transfer to Capital Fund (Depreciation)			12,21,84,139	11,81,49,064
Over Utilization of Grant in Aid for Revenue Purpose (Schedule 3C)			50,70,23,395	
Under Utilization of Grant in Aid for Revenue Purpose (Schedule 3C)				1,22,02,046

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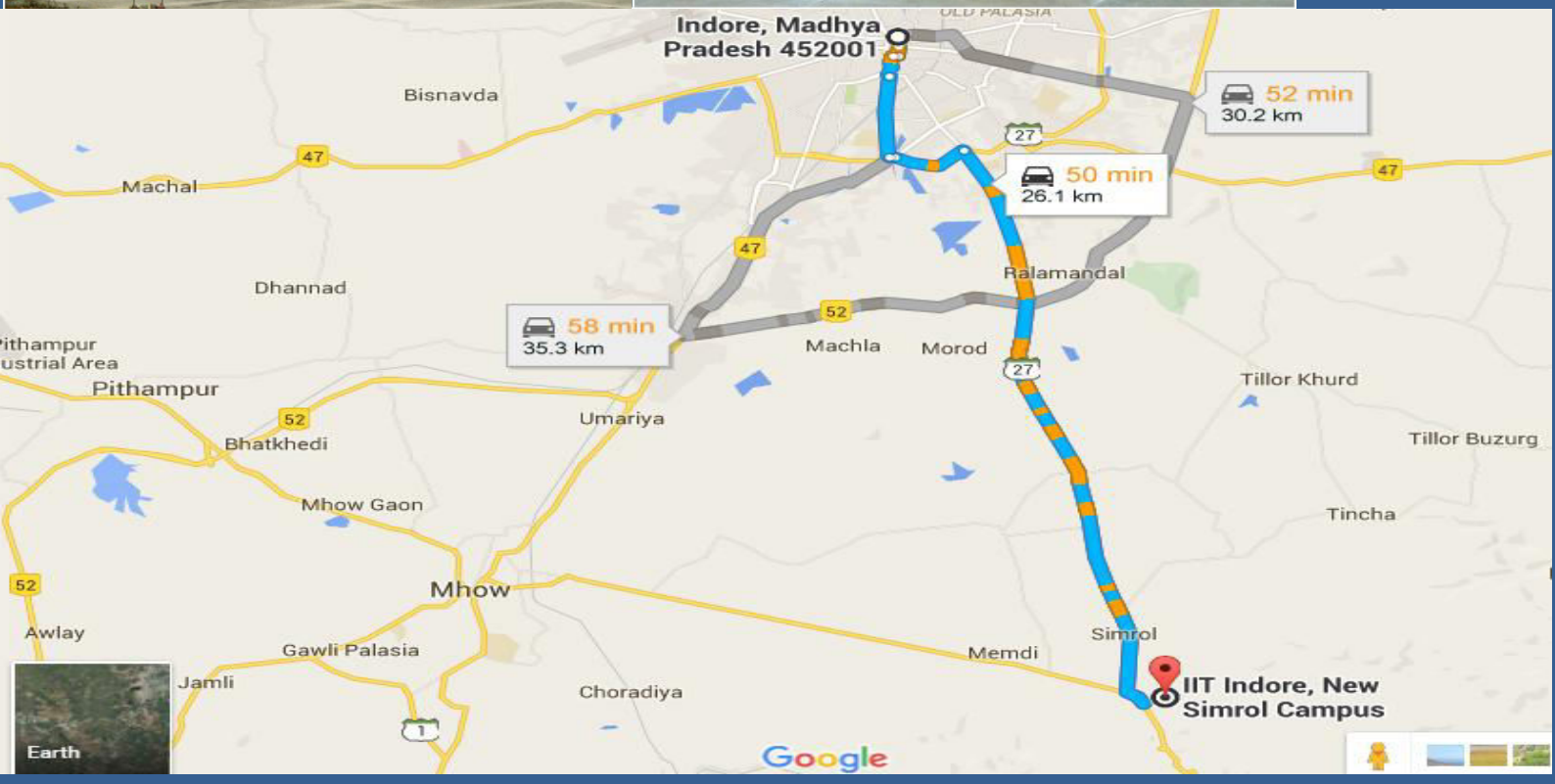
IIT INDORE



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