ANNUAL REPORT
2016-2017

भारतीय प्रौद्योगिकी संस्थान इन्दौर

Indian Institute of Technology Indore

Contents

Director's Message

In the eight years since IIT Indore began its academic programme, the institute has matured in its academic and research endeavours. The National Institutional Ranking Framework 2017 places IIT Indore as the top ranked new IIT and an impressive 24th ranked amongst all institutions and universities. Amongst the engineering institutions, the institute is ranked 15th and under the teaching, learning resources classification, IIT Indore is ranked an impressive 5th amongst all engineering institutions.

Our upward trajectory is the result of outstanding contribution by our faculty and staff members, and the students. The institute is marked by many as the chosen favourite to begin their teaching and research careers or their student lives. We continue to have an outstanding student placement record and the high international standard of our PhD programme is a major factor propelling us upwards in various rankings. With hands on training, experimentation and research with state of the art facilities available to undergraduate and postgraduate researchers, the institute imbibes excitement amongst all for innovation and invention. International collaboration linkages form a major component of the institute's objective to pursue cutting edge research. IIT Indore has hosted a number of international conferences and meetings and has led the IITI – TU9 linkage initiative, a partnership which has already led to significant results as seen by a number of outstanding joint publications. Three dozen patents have been filed and numerous institute – industry joint projects have been initiated.

This year the institute witnesses 118 B. Tech., 25 M. Tech., 22 M.Sc., and 38 PhD degrees being awarded.

I gratefully acknowledge the hard work put in by all students, staff and faculty members in placing IIT Indore where it is today and extend my heartfelt congratulations.

Professor Pradeep Mathur
Director, IIT Indore

Board of Governors (2016-17)

Chairperson

1. Professor Pradeep Mathur
   Chairman, IIT Indore BoG from 04.03.2016 & Director, IIT Indore
   (As per MHRD directives vide letter D.O. No.3-23/2012-TS.1(Pt.II) dated March 18, 2016)

Members

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

3. Mr. Aman Kumar Singh
   Secretary to Hon. Chief Minister,
   Government of Chhattisgarh,

4. Mr. Ashok Jaipuria
   CMD, Cosmo Films Ltd., New Delhi
   (Up to May 9, 2016)

5. Mr. Som Mittal
   Former President, NASSCOM, New Delhi
   (Up to May 12, 2016)

6. Mr. Prakash V. Deshmukh
   Former MD, HAL, Pune
   (till May 13, 2016)

7. Dr. William Selvamurthy
   President - Amity Science, Technology & Innovation Foundation (ASTIF)
   New Delhi

8. Dr. Siddharth Malu
   HoD, Astronomy, IIT Indore
   (till February 22, 2017)

9. Dr. I. A. Palani
   Head, Discipline of MSME, IIT Indore
   (w.e.f February 23, 2017)

10. Dr. Somaditya Sen
    Associate Dean Planning - I, IIT Indore

11. Dr. Arunachalam Subramanian
    Registrar, IIT Indore and Secretary to BoG
    (till January 18, 2017)

12. Mr. Subrata Sarkar
    OSD (Admin), IIT Indore and Secretary to BoG
    (w.e.f January 20, 2017)

Finance Committee (2016-17)

Chairperson

1. Professor Pradeep Mathur
   Director,
   Indian Institute of Technology Indore,
   Khandwa Road, Simrol, Indore - 453552

Members

2. Mr. R. Subrahmanyam
   Additional Secretary (TE) MHRD
   Ministry of Human Resource Development, GOI
   118-C, Shastri Bhawan, New Delhi 110115

3. Ms. Darshana M Dabral
   JS & FA,
   Integrated Finance Bureau, MHRD
   Ministry of Human Resource Development, GOI
   Department of Higher Education,
   120-C, Shastri Bhawan, New Delhi 110115

4. Prof. K. Krishnamurthy Rao
   Department of Bio Science & Bio Engineering,
   IIT Bombay, Powai,
   Mumbai-400 076

5. Prof. N.K. Khosla
   Department of Metallurgical Engineering and Materials Science,
   Indian Institute of Technology Bombay,
   Powai, Mumbai-400 076
   (till September 28, 2016)

6. Prof. N. K. Jain
   Dean, Academic Affairs
   Indian Institute of Technology Indore,
   Khandwa Road, Simrol, Indore 453552
   (w.e.f. February 20, 2017)

7. Prof. Pradeep Mathur
   Director
   Indian Institute of Technology Indore,
   Khandwa Road, Simrol, Indore 453552

8. Dr. Arunachalam Subramanian
   Registrar, IIT Indore and Secretary to FC
   (till January 18, 2017)

9. Mr. Subrata Sarkar
   OSD (Administration), IIT Indore and Secretary to FC
   (w.e.f January 20, 2017)

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Chairperson

1. Professor Pradeep Mathur
   Director
   Indian Institute of Technology Indore,
   Khandwa Road, Simrol, Indore 453552

Members

2. Dr. Rajesh Kumar
   Dean, Planning
   Indian Institute of Technology Indore,
   Khandwa Road, Simrol, Indore 453552 (till July, 2016)

3. Dr. Somaditya Sen
   Acting Dean, Planning
   Indian Institute of Technology Indore,
   Khandwa Road, Simrol, Indore 453552
   (till October 20, 2016)

4. Dr. Abhirup Datta
   Acting Dean, Planning
   Indian Institute of Technology Indore,
   Khandwa Road, Simrol, Indore 453552
   (w.e.f October 21, 2016)

5. Dr. KCS Rao
   Former Director General (Works) (Retd.)
   Military Engineering Services,
   Secunderabad 500 015

6. Dr. Rakesh Kumar
   Principal Scientist
   Central Road Research Institute, New Delhi 110 025

7. Mr. Biswakesan Sahoo
   Executive Engineer (Electrical)
   Electrical Maintenance Division,
   Indian Institute of Technology Bombay, Powai, Mumbai 400 076

8. Mr. Aditya Kumar Singhal
   Former Director General (Works) CPWD,
   Ghaziabad 201 014

9. Dr. Arunachalam Subramanian
   Registrar, IIT Indore and Secretary to FC
   (till January 18, 2017)

10. Mr. Subrata Sarkar
    OSD (Admin), IIT Indore and Secretary to FC
    (w.e.f January 20, 2017)

Senate (2016-17)

Chairperson

1. Professor Pradeep Mathur
   Director, IIT Indore

Members

2. Professor V. M. Gadre
   Professor, Department of Electrical Engineering,
   IIT Bombay

3. Professor Ajai Kumar Singh
   Professor, Department of Chemistry, IIT Delhi

4. Professor Meenakshi Gupta
   Professor, Department of Humanities & Social Sciences,
   IIT Bombay

5. Prof. Makarand R. Paranjape,
   Professor, Centre for English Studies,
   JNU, New Delhi

6. Professor Neelesh Kumar Jain
   Dean of Academic Affairs, IIT Indore

7. Dr. Abhirup Datta
   Acting, Dean of Planning, IIT Indore

8. Dr. Abhinav Kranti
   Dean of Research and Development, IIT Indore

9. Dr. Abhishek Srivastava
   Dean of Student Affairs, IIT Indore

10. Dr. Pritee Sharme
    Dean of Administration, IIT Indore

11. Dr. Shaibal Mukherjee
    Head, School of Engineering, IIT Indore

12. Dr. Swadesh Kumar Sahoo
    Head, School of Basic Sciences, IIT Indore

13. Dr. Sanjram Premjit Khanganba
    Head, School of Humanities and Social Sciences, IIT Indore

14. Dr. Kapil Ahuja
    HOD, Computer Science and Engineering, IIT Indore

15. Dr. Trapti Jain
HOD, Electrical Engineering, IIT Indore

16. Dr. Devendra L. Deshmukh
HOD, Mechanical Engineering, IIT Indore

17. Dr. I. A. Palani
HOD, Metallurgy Engineering and Material Science, IIT Indore

18. Professor U.C. Chaube
Co-ordinator, Civil Engineering, IIT Indore

19. Dr. Bulusu Satya Silendra
HOD, Chemistry, IIT Indore

20. Dr. Sk Safique Ahmed
HOD, Mathematics, IIT Indore

21. Dr. Manavendra Mahato
HOD, Physics, IIT Indore

22. Dr. Abhirup Datta,
Head, Centre of Astronomy, IIT Indore

23. Dr. Suman Mukhopadhyay
Head, Centre for Biosciences and Biomedical Engineering, IIT Indore

24. Dr. Amit Kumar
Chief Warden, IIT Indore

25. Dr. Prabhat Kumar Upadhyay
Faculty In-charge, Training and Placement, IIT Indore

26. Ms. Anjali Bandiwadekar
Deputy Librarian, IIT Indore

27. Dr. Arunachalam Subramanian
Registrar, IIT Indore and Secretary to Senate
(till January 18, 2017)

28. Mr. Subrata Sarkar
OSD (Administration), IIT Indore and Secretary to Senate
(w.e.f January 20, 2017)

Institute Functionaries

Director, IIT Indore
Professor Pradeep Mathur

Dean, Academic Affairs
Professor N. K. Jain

Dean, Research & Development
Dr. A. Kranti

Dean, Planning
Dr. Rajesh Kumar
(till July, 2016)

Acting Dean, Planning
Dr. Somaditya Sen
(till October 20, 2016)

Acting Dean, Planning
Dr. Abhirup Datta
(w.e.f. October 21, 2016)

Dean, Administration
Dr. Pritee Sharma

Dean, Student Affairs
Dr. Abhishek Srivastava

Registrar, IIT Indore
Dr. Arunachalam Subramanian
(till January 18, 2017)

OSD (Administration)
Mr. Subrata Sarkar
(w.e.f. January 20, 2017)

Associate Deans

Academics: Dr. Vipul Singh
Research and Development: Dr. Bhupesh Lad
Planning I: Dr. Somaditya Sen
Planning II: Dr. Abhirup Datta
Planning III: Dr. Shaikh M. Mobin (w.e.f September 26, 2016)
Planning IV: Mirza Saqib Baig (w.e.f September 26, 2016)

Heads of Schools

Basic Sciences: Dr. Swadesh Kumar Sahoo
Engineering: Dr. Shaibal Mukherjee
Humanities & Social Sciences: Dr. Sanjram Premjit Khanganba

Heads of Departments

Computer Science & Engineering: Dr. Kapil Ahuja
Electrical Engineering: Dr. Trapti Jain (w.e.f. – August 9, 2016)
Electrical Engineering: Dr. Srivathsan Vasudevan (till – August 8, 2016)
Mechanical Engineering: Dr. Devendra Desmukh
Chemistry: Dr. Satya Bulusu
Mathematics: Dr. SK Safique Ahmad
Physics: Dr. Manavendra Mahato
Astronomy: Dr. Siddharth Malu
Biosciences and Biomedical Engineering: Dr. Suman Mukhopadhyay (w.e.f September 13, 2016)
Biosciences and Biomedical Engineering: Dr. Prashant Kodgire (till August 30, 2016)
Metallurgy Engineering and Materials Science (MEMS): Dr. I. A. Palani
Civil Engineering – Dr. Umesh Chandra Chaubey – Coordinator

Administration Support Services Team

Registrar –Dr. Arunchalam Subramanian (till January 18, 2017)
OSD (Administration) – Mr. Subrata Sarkar (w.e.f January 20, 2017)
DR Finance – Mr. Pradeep Agarwal
DR Academics – Mr. T. Satyanarayana
DR Materials Management – Mr. S. P. Hota
DR R&D - Mr. Pradeep Agarwal
DR Admin. & Audit – Mr. T. Satyanarayana
Administrative Officer – Mr. Rajeev Kumar (relieved w.e.f on February 22, 2017)
Administrative Officer – Mr. Kumar Gaurav (joined w.e.f on March 1, 2017)
Chief Security Officer – Mr. Ramakant Kaushik
Officer on special duty – Mr. Pargat Singh
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
Sr. Medical Officer – Dr. Shilpa Raut
Counsellor – Ms. Monika Gupta

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
kahuja@iiti.ac.in

Introducing Members of CSE

In CSE, we have ten faculty members as below.

Dr. Kapil Ahuja

Dr. Gourinath Banda

Dr. Narendra S. Chaudhari

Dr. Somnath Dey

Dr. Neminath Hubballi

Dr. Bodhisatwa Mazumdar

Dr. Surya Prakash

Dr. Anirban Sengupta

Dr. Abhishek Srivastava

Dr. Aruna Tiwari

CSE@IIT Indore has a strong PhD student group comprising of around thirty-five students. We have around two hundred undergraduates.

Discipline Research Areas

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

- 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, Program Analysis) and Semantics-based Emulation of Languages & Systems.
- Algorithms and Theoretical Computer Science.
- 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.
- Hardware Security, Side Channel Analysis Attacks on Cryptographic Implementations, Security Aspects in Emerging VLSI Technologies.
- 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 consistently starts below 1000, 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 (IIM) 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
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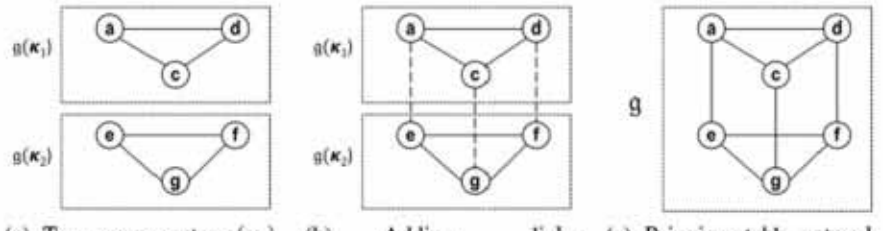
Dr. Kapil Ahuja *(MS: Virginia Tech, USA; PhD: Virginia Tech, USA; Postdoctoral Research Fellow: Max Planck Institute, Germany)* has a varied background, including degrees in Computer Science, Mathematics, and Mechanical Engineering. Dr. Ahuja works on applying mathematics and computation to solve science and engineering problems. Specifically, his research focuses on efficiently solving linear and nonlinear systems of equations as well as optimization.

Dr. Ahuja has had externally funded projects from CSIR (Council of Scientific and Industrial Research) and DAAD (German Academic Exchange Service) over past many years. This past year he got GIAN (Global Initiative of Academic Networks) project funded from MHRD.

Since joining IIT Indore, he has published his work in prestigious journals (SIAM, Elsevier etc.). Research breakthrough here has been in development of efficient algorithms for model reduction of large dynamical systems as well as solving Navier–Stokes problems. These algorithms have shown up to 35% savings in runtime. Most recent work of his group has been in proving stability of model reduction algorithms with respect to the error introduced by iterative solves as well as providing necessary and sufficient conditions for pairwise stability of social storage networks (see attached figure). In the past one year, he has been invited for presenting this latest works at TU Braunschweig (Germany) and IIT Indore – TU9 Research Workshop at TU Berlin (Germany).

On teaching end, Dr. Kapil Ahuja has received best teacher award at IIT Indore for the years of 2013, 2014 and 2016. In the past, Dr. Ahuja has held many administrative positions at IIT Indore. Since past one and half year, he is heading the Computer Science and Engineering discipline as well as leading the Indo-German initiative at IIT Indore.



(a) Two components, $g(\kappa_1)$ and $g(\kappa_2)$, of g (b) Adding links $\langle ae \rangle, \langle cg \rangle, and \langle df \rangle$ (c) Pairwise stable network g'

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

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) Cyber Physical Systems (CPS); (ii) Internet Of Things (IoT); (iii) formal methods such as: model checking, abstract interpretation and static analysis; (iv) Real-time systems' (such as kernels, RTOSs, applications, avionics, etc.) design and their formal analysis; (v) Enhancing user-experience of devices; (vi) Embedded interventions for zeroing power wastage; (vii) Energy aware computing technology and (viii) Embedded systems interventions for challenged.

Research Interests:

Formal analysis of safety critical systems; Real-time systems design and analysis; Rigorous analysis techniques for Cyber-physical systems, Embedded systems, Mechatronics Systems, Big data and IoT -based prognosis techniques and platforms for environment monitoring.

Dr. Narendra S. Chaudhari
Professor
Computer Science
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Dr. Narendra S. 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
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Dr. Somnath Dey (PhD: IIT Kharagpur) is an Assistant Professor in the Discipline of Computer Science and Engineering at IIT Indore. His primary area of research is biometrics security. Apart from this, his research area also includes image processing, computer vision, human computer interaction and cloud computing.

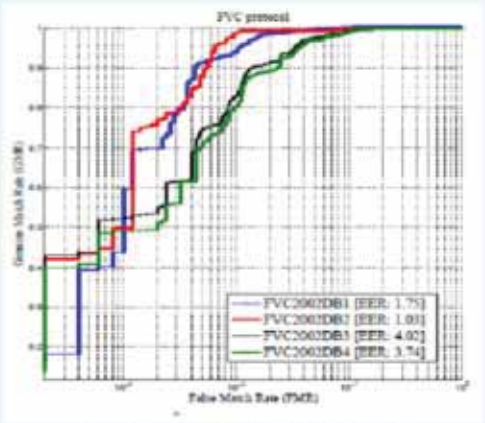

Fig: ROC Curve for FVC 2002 Database

Dr. Dey's group is currently working on cancelable biometrics research problems. They are trying to provide a solution for cancelable biometric template generation when the original biometric template is compromised. Further, Dr. Dey's group is also looking for a security model which could protect the stored templates in the database.

Dr. Neminath Hubballi
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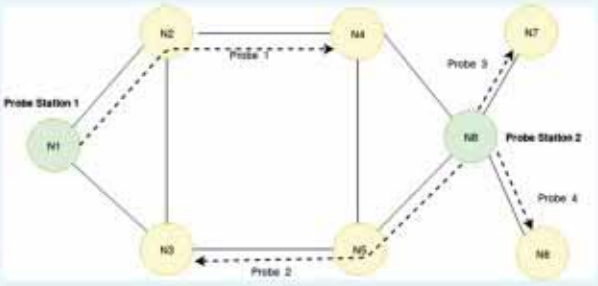
Dr. Neminath Hubballi (Ph.D from IIT Guwahati) is an assistant professor in the discipline of computer science and engineering. He is part of Network Security research group at IIT Indore. His research interests are in Network Security, System Security, Cloud Security and Fault Detection in Networks. Previously he has worked with Hewlett-Packard, Infosys Labs, Samsung R&D on various security and distributed computing research projects.



His team conducts cutting edge research in Network Protocol analysis to identify vulnerabilities. In the recent past his group successfully identified exploitable vulnerabilities in Dynamic Host Configuration Protocol and HTTP/2.0 which is standardized very recently. His research group also works in Deep Packet Inspection for traffic classification and security monitoring where they are working on identifying mobile application traffic. In Cloud computing they are working towrads novel security architectures and protocols for data security. Recent works of his team are in Fault detection in Networks where they are working on new methods to monitor Networks to identify node and link failures quickly and localize them. Detecting and localizing failures/faults help in taking corrective measures and minimize downtime. In specific his group is working on adaptive monitoring techniques where the fault monitoring techniques adapt to the traffic dynamics experienced by the nodes and links in Network so as to cause minimum disruption to normal traffic passing through the nodes and links. His group's recent research works have appeared in jounrlas like IEEE Transactions on Information and Forensic Security, Computers & Security and also in reputed conferences like IEEE Globecom and Comsnets.

Dr. Bodhisatwa Mazumdar
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Dr. Bodhisatwa Mazumdar (PhD: IIT Kharagpur) works in the domain of hardware security, such as side-channel aspects of cryptographic implementations and devising logic synthesis techniques to thwart such attacks. Apart from these he is interested in security aspects in IP design flow such as logic locking, camouflaging and side-channel resistance across the design flow. He is presently involved in fault sensitivity analysis attacks on lightweight block ciphers such as Simon block cipher that recently been standardized by National Security Agency (NSA) for lightweight security applications such as internet-of-things (IoTs). His present research work has been published in IEEE Transactions of Information Forensics and Security (IEEE TIFS), IEEE Transactions on Emerging Topics nd Computing, and ACM Transactions on Design Automation of Electronic Systems (ACM-TODAES).

Dr. Surya Prakash
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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 and secure biometric techniques for human recognition using face, ear and fingerprint data.

Figure: Sample 2D ear, 3D ear and fingerprint biometric images
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 traits. 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, fingerprint etc. The research work of this group currently involves development of techniques for assessment of quality of biometric images, image enhancement and efficient recognition in 2D and 3D. It is also involved in developing techniques for biometric template protection.

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 (images with noise, blur, poor illumination and contract) 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 adaptive techniques for automatic detection and correction of problems like contrast, illumination and noise in 2D ear images and to develop an efficient recognition system.

Another important issue in a biometric system to deal with is about securing of biometric templates from the adversary when they are stored in the database at the time of enrolment. Biometric systems based on fingerprint usually store fingerprint information directly in the form of minutiae template in the database. However, it is often found that databases are prone to get attacked by the adversary. Many recent works show that a fingerprint can be generated using the location and orientation information of its minutiae points. Fingerprint of a user cannot be changed as it is permanently associated with the human body so if it is compromised, it is lost forever. Hence it is essential to ensure the security of fingerprint data in biometric systems. This group is working towards development of strong biometric template protection technique, particularly for fingerprint data.

Dr. Anirban Sengupta
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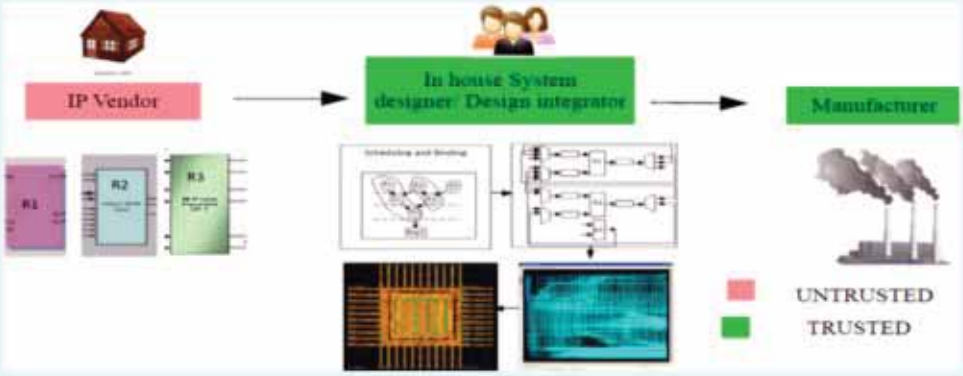
Dr. Anirban Sengupta is working in the Discipline of Computer Science and Engineering at Indian Institute of Technology (IIT) Indore. Here he directs the research lab on 'Behavioural Synthesis of Digital IP core'. He holds a Ph.D. & M.A.Sc. in Electrical & Computer Engineering from Ryerson University, Toronto (Canada). In the past, he was also affiliated with Indian Institute of Science (IISc) Bangalore as a visiting research scholar. He holds an external affiliation as 'Honorary Chief Scientist' at VividSparks IT Solutions Pvt Ltd, besides his regular affiliation at IIT-I. His research interest includes Security, Protection and Reliability of application specific hardware. His research/sponsored projects are funded by Department of Science & Technology (Science & Engineering Research Board), Govt. of India as well as supported by Intel Corporation and Department of Electronics & IT (DEITY), Govt. of India. He has 113 Publications & Patents which include Journals, Patents and Invited Book Chapters from IEEE, IET, Elsevier, Springer and USPTO/CIPO/IPO.



He features in the list of Top 10 Most Cited Researcher in Consumer Electronics area (as per Google Scholar Data). He features in the list of Top 25 Most Cited Researcher in High Level Synthesis area (as per Google Scholar Data). He features in the list of Top 12 Most Cited Researcher in ASIC area (as per Google Scholar Data). He has been 'Awarded highest rating "Excellent" by expert committee of Department of Science & Technology (DST) based on the performance (output) in externally funded project in 2017. One of his work has been bestowed with "Best Research

Paper Award 2017" by Indian Institute of Technology Indore. His multiple research papers have featured in top 50 articles from major IEEE Journals. He currently serves in Editorial positions of 10 IEEE Transactions/Journals, Elsevier, & IET Journals including IEEE Transactions on Aerospace and Electronic Systems (TAES), IEEE Transactions on VLSI Systems, IEEE Aceess Journal, IET Journal on Computer & Digital Techniques, Elsevier Microelectronics Journal, IEEE Consumer Electronics Magazine, IEEE VLSI Circuits & Systems Letter. He further serves as Guest Editor of IEEE Transactions on Consumer Electronics, IEEE Transactions on VLSI Systems and IEEE Access Journals. 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.

Dr. Abhishek Srivastava
Assistant Professor
Computer Science and Engineering
asrivastava@iiti.ac.in

Dr. Abhishek Srivastava (Ph.D: University of Alberta, Canada; Formerly Assistant Professor, Rose-Hulman Institute of Technology, USA) is involved in research on machine to machine interactions in constrained environments. Besides this, he is also interested in quantitatively assessing the behaviour of the 'human in the loop' in such environments.

Constrained environments include those of mobile devices and the infrastructure supporting the so called Internet of Things. The thrust of his research group is towards developing robust security standards, sustainable models for seamless compositions in such constrained environments. In addition to this, his research group is also involved in exploring and comprehending the behaviour and thinking process of the 'human in the loop' in such environments. How 'interested' are humans in participating in crowdsourcing endeavours, how to assess and predict the otherwise arbitrary behaviour of humans in such environments, how to understand what drives human participation, and so on.

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

Dr. Aruna Tiwari (PhD) Associate Professor:

Area of interest: Soft-computing Techniques, Data Mining

Her interest are around the Soft computing, Machine learning frameworks which are able to perform learning by handling real life ambiguous situations. Specifically with artificial neural networks, fuzzy clustering, genetic programming and their applications to bioinformatics, medical diagnosis. The growing births of new intelligent system architectures are often due to the multi strategy learning and adaptation of advanced soft computing techniques in various fields such as pattern recognition, and data mining, particularly to address the issues of Big data for classification, clustering and feature selection. Big data computing needs advanced technologies or methods to solve the issues of computational time to extract valuable information, in a realistic and practical time frame, without compromising the models quality. Therefore, the need for developing intelligent scalable algorithms has been felt, which will be able to perform classification, clustering and feature selection in optimal sense after

adjusting their parameters in an adaptive way to accomplish faster solutions to address Big data. Collaboration is enabled with Soyabean Research Centre, Indore for testing real life bigdata.

To make soft computing frameworks useful in industry, there is a need to realize these frameworks on hardware. Hardware-based Soft computing models are important to industry as they offer low power consumption and small size compared with PC software and they can be embedded in a wide range of systems. Thus, it originated the need to define high-level descriptions of the Soft computing algorithms with industry standards to allow full simulations & fabrication and to produce demonstrators of the technology for industry. That enables to achieve high speed of information processing. Currently, collaborating with CSIR-Central Electronics Engineering Research Institute, Pilani for the problems related to hardware realization of Soft computing models.

Discipline of Electrical Engineering

From the HoD's Desk

Dr. Trapti Jain
Associate Professor,
Electrical Engineering,
HOD, Electrical Engineering
traptij@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. The M.Tech program in VLSI Design and Nanoeletronics is commencing from July 2017. The discipline also hosts many Post-Doctoral candidates from time to time.

The discipline presently has 13 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 many foreign 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

PhD: Nanyang Technological University, Singapore

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
Associate 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 member of the IEEE Communications and Vehicular Technology Societies.

Graduated PhD Student: Pankaj Kumar Sharma

Current PhD Students: Devendra Singh Gurjar (Thesis Submitted), Satish Tiwari, Sourabh Solanki, and Vinay Bankey.

M.Tech. Students: Anish Kumar Singh and Ugrasen Singh

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

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

WiCom Research Group: http://wicom.webs.com/

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

PhD: University of Oklahoma, USA

Post Doctoral Research: Northwestern University, USA

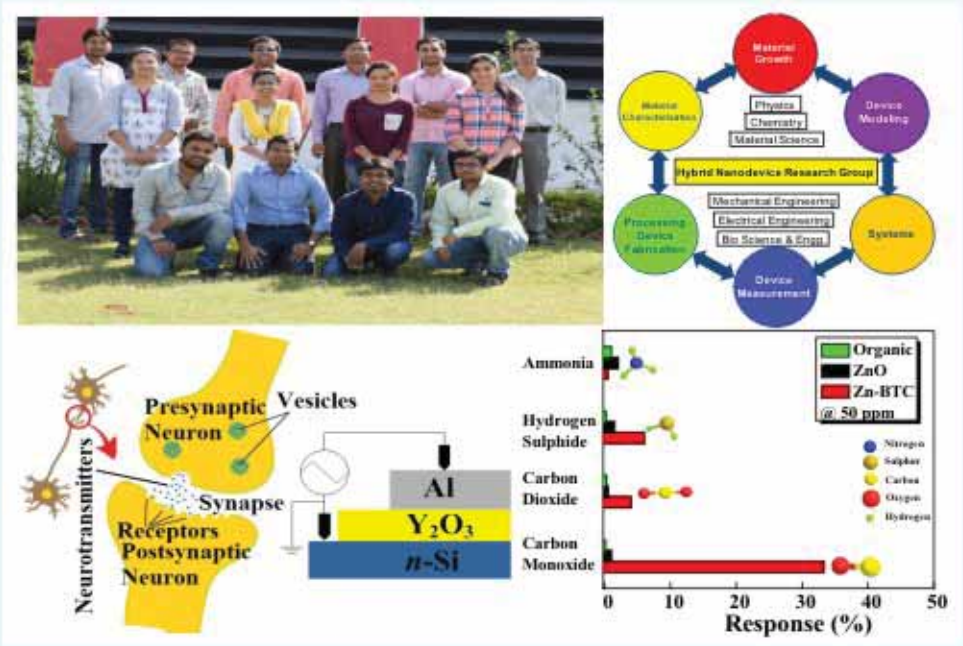
The Hybrid Nanodevice Research Group (HNRG) led by Dr. Shaibal Mukherjee in Electrical Engineering at IIT Indore is exploring the new physics of micro- and nano-structured materials and is applying this knowledge to realizing advanced tools and devices for chemical, biological, optical, electronic and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

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 inside a standard laboratory environment.

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

Visvesvaraya PhD Scheme for Electronics and Information Technology, Department of Electronics and Information Technology (DEITY), Government of India. Dr. Shaibal Mukherjee has recently been awarded with the prestigious Bhaskara Advanced Solar Energy (BASE) Fellowship of Indo-US Science and Technology Forum (IUSSTF) and DST.

Since joining IIT Indore in September 2010, Dr. Mukherjee's research group has published 30 peer-reviewed journals (with an average impact factor of 2.4), 33 proceedings in international conferences, and 1 book chapter. Moreover, Dr. Mukherjee's group has already filed 2 Indian patent applications.



To date, Dr. Mukherjee has successfully completed 6 externally funded research projects from DST and CSIR and currently associated with 7 projects from DST, CSIR, DST Indo-Russia, DST Indo-USA, DST Indo-Taiwan, DAE-BRNS, and CEERI Pilani-IIT Indore are running. Altogether research grant accumulated from external funding agencies is more than Rs. 4.0 Crores.

As of now, 4 PhD students have graduated from HNRG group under the supervision of Dr. Mukherjee. Among the graduated PhD students, Dr. Saurabh K. Pandey, has joined as Assistant Professor in Electrical Engineering of IIT Patna; Dr. Sushil K. Pandey has joined the University of Minnesota, USA as a postdoctoral research fellow, Dr. Shruti Verma joined as Visiting Assistant Professor in IIT Ropar. Currently 12 students are doing their doctoral research work and 2 students are doing their M.Tech. project work under the supervision of Dr. Mukherjee.

Current PhD Students: Pankaj Sharma, Brajendra S. Sengar, Amitesh Kumar, Vivek Garg, Aaryashree, Rohit Singh, Mangal Das, Ritesh Bhardwaj, Md. Arif Khan, Biswajit Mandal, Gaurav Siddharth, Nisheka Anadkat

M.Tech. Students: Astha Sharma, Anjali Tripathi

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

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

PhD: The University of Edinburgh, UK

Post PhD: DTS (UK), AudioSoft (UK), AmberFin (UK) and Openwave (UK)

Dr. Bhatia has mix of academic and industrial experience of over 16 years. 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 Centre for Innovation and Entrepreneurship, and DST-Innovation and Entrepreneurship Development Centre. Dr. Bhatia is awarded Young Faculty Research Fellowship (YFRF) by MeitY, and prestigious DST-UKIERI award.

Doctoral: Manish Mandloi, Rangeet Mitra, Nagendra Kumar, Sidharth Shukla, Masters: Azahar Hussain Mohammed

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

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

PhD: 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
Associate Professor
Electrical Engineering,
Matallurgical Engineering
and Materials Science
skvishvakarma@iiti.ac.in

PhD: 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, SRAM reliability analysis and Sub-circuit Design for Ultra Low Power applications. His research group is also analysing power reduction techniques in FPGA based digital design. His Research group has published various papers in IEEE Transactions, Journals & Peer reviewed Conferences.

He has seven ongoing research projects funded by different agencies such as CSIR, DST, SERB, CEERI Pilani etc. He is the co-ordinator of Indo Finland project Centre for International Mobility (CIMO), Helsinki, Finland with the collaboration of Aalto University, Finland. 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 scholar 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 defence 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: Nandakishor Yadav

Research Scholars: Pooran Singh, Deepika Gupta, Mahesh Kumawat, Maisagalla Gopal, Ankur Beohar, Abhishek Upadhyay, Gaurav Singh, Ravi Kumar (Supervisor: Dr. S.Vasudevan), Pooja Bohara, Vishal Sharma, Tejaram Chaudhary, Swati Mishra (Co-supervisor: Dr. M. Santhakumar), Ambika Prasad Shah, Sajid Khan.

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 and emerging device architectures to address technological issues associated with downscaling and low power operation. The group has ongoing research collaborations with leading international research groups through international funding schemes.

Dr. Kranti has interests in emerging solid-state devices, circuit design, memory design, 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 web links: http://iiti.ac.in/people/~abhinav/,

http://abhinavkranti.yolasite.com

Doctoral candidates: M. Gupta, N. Navlakha, P. Diwedi, A. Kumar, R. Singh, Md. A. Khan, Y.V. Bhuvaneshwari, N. Jaiswal, H.R. Ansari

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

PhD: 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, Vinay Kumar Tiwari

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

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

PhD: Indian Institute of Technology Kanpur, 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, 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
Associate 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
Associate 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

PhD: 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. 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.

Current PhD Scholars: Lalit Singh, Sulabh, Sourabh Jain, Vishal Kaushik, Swati Rajput, Surbhi Tidke.

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

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 15 regular faculty. Below are some stand-out achievements of the past year:

RESEARCH HIGHLIGHTS

- **Dr. Bhupesh Kumar Lad**

1. Received Hamied-Cambridge Visiting Lecture fellowship, University of Cambridge, International Strategy Office, Cambridge, UK, 2016
2. Best Technology Development Award, National Technical Institutes Competition 2016, Aditya Birla Group and ITP publishing
3. Best Student Project Demo award, Year: 2016, Category: Technology, Aditya Birla Group and ITP publishing
4. Appointed as Regional Editor, South Asia for International Journal of Performability Engineering (IJPE), Totem Publishing, Inc, USA
5. PhD Student, Mr. Sandeep Kumar received a DST Travel grant to present a research paper in the 2016 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM), 04 Dec - 07 Dec 2016, Bali , Indonesia
6. Innovative Student Projects Award-2016 by Indian National Academy of Engineering (INAE) for M.Tech. thesis of Mr. Vibhor Pandhare titled "A social network for machines–Realizing Industry 4.0".
7. Received Newton-Bhabha Research Grant (GBP 50000) from Royal Academy of Engineering, UK and Interdisciplinary Cyber Physical Systems (ICPS) research grant (INR 117 Lakh) from Department of Science and Technology (DST), India.

- **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. Research article entitled "Experimental Study On Structured Surfaces For Nucleate Pool Boiling Enhancement" by Vishal Nirgude, Avadhesh K. Sharma, Mayank Modak, Santosh K. Sahu, is selected as qualified student award winner of the student paper competition in the 25th International Conference on Nuclear Engineering (ICONE25), Shanghai, China, 2017.
2. 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.
3. Research scholar Mr. Mayank Modak received a SERB international travel grant to attend and present research papers at the 24th International Conference on Nuclear Engineering (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.
2. Research scholar Mr. Vinod Kumar Singh received a SERB international travel grant to attend and present research papers at the International Conference (IMPRES 2016) at Taormina, Sicily, Italy, October 23-26, 2016.
3. Dr. Anil Kumar is serving as expert panel member for DST- CERI (Materials for Energy Storage, 2017)

- Dr. I. A. Palani

1. Appointed as Editorial board Member for International journal of intelligent machines and robotics
2. Appointed as President SPIE student chapter for the year 2017-2018 by SPIE Head office, USA
3. Project guided by Dr.I.A.Palani was awarded Best B.Tech project for the year 2015-2106
4. Project guided by Dr.I.A.Palani is awarded Best B.Tech project for the year 2016-2017
5. M.Tech project guided by Dr.I.A.Palani has received Best poster award in the international conference on emerging trends in Materials and manufacturing Engineering
6. 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:-

- "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 (Anmolsrivastava, AvulaAgastya)", 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.

- **Dr. Shanmugam Dhinakaran**

1. Received funding of 24000USD from MHRD to conduct 3 GIAN Courses in the year 2016

Prof. N.K. Jain

- Academic highlights – outstanding performances in curricular and/or extra-curricular activities, development of new courses/programmes, and awards and achievements.
- Developed Curriclum For B.Tech Metallurgy 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.

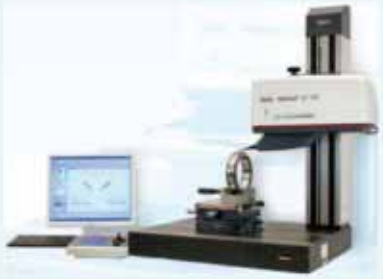
Project Implementation Group: Prof N K Jain (Group leader), Dr. Anand Parey, Dr. I A Palani, Dr. Bhupesh K Lad.

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: **Procured and installed**

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

7. Gear-Train Prognostic Simulator (to be procured in FY 2017-18)

8. High Nd-YAG Laser with Accessories for Shock Peening of Gears (to be procured in FY 2017-18)

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
Associate Professor
Mechanical Engineering
anil@iiti.ac.in

PhD: Indian Institute of Technology Madras

Dr Anil works on hydrogen storage and related engineering applications, C02 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, Co2 and NH3) on adsorbents. His team is also developing prototypes for demonstration and evaluation of performance of sorption systems.

Doctoral students: Vinod Kumar Sharma (completed), YogeshMadaria, Vinod Singh, Rakesh Sharma, Dharmendra Kumar Panchariya, Debashis Panda and Dhananjay Mishra

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

Dr. I.A.Palani
Associate Professor
Mechanical Engineering, Metallurgy Engineering & Materials Science.
palaniia@iiti.ac.in

Dr. I. A. Palani, is currently an Associate 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
Associate Professor
Mechanical
Engineering
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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. Saurabh Yadav, 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, 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.

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
Associate Professor
Mechanical Engineering
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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 Al2O3-Cr2O3 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 Cr2O3 added to the Al2O3 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
Associate Professor
Mechanical Engineering
Adjunct Faculty
Biosciences and Biomedical Engineering
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PhD: Indian Institute of Technology Kharagpur

Dr. Shanmugam Dhinakaran is an Associate Professor in the department. Following his postdoctoral fellowships in French and Portuguese Universities, he joined the institute in 2012. He is a computational fluid dynamicist and works in the area of nanofluids, bluff body flows, bio-fluid mechanics, non-Newtonian fluid Mechanics and porous media. After joining the institute Dr. Dhinakaran developed the Computational Fluid Dynamics Lab in the department.

Currently, he has a team of PhD scholars and Post Graduates who concentrate on afore mentioned areas. In the area of nanofluids, his team focuses on the analysis of heat transfer enhancement characteristics of fluids containing ultrafine nano-size particles, when they flow around bluff bodies and in

passive cooling devices (heat pipes) for potential application in electronic cooling. They also concentrate on the heat transfer aspects of porous bodies of different porosities and permeabilities. He is also an active member of the Centre for Bioscience and Biomedical Engineering, IIT Indore. Dr. Dhinakaran has completed two external funded projects and two GIAN Courses recently. He has been teaching two PG courses on Computational Fluid Dynamics and Biofluid Mechanics apart from few other department courses.

Doctoral students:

Anirudh Kulkarni, Rajendra Singh Rajpoot, Vijaybabu, Deepak Selvakumar, Tushar Chourushi, Ashutosh Verma

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

Dr. Bhupesh Kumar Lad is an Associate Professor in Discipline of Mechanical Engineering at the Indian Institute of Technology Indore, India. He received the Ph.D. degree in the area of Reliability Engineering from the Department of Mechanical Engineering at the Indian Institute of Technology Delhi, India, in 2010.

He worked with GE Global Research Center, Bangalore, India as a Research Engineer from 2010 to 2011. He is also serving as Regional Editor-South Asia, for the International Journal of Performability Engineering (IJPE), USA. He is the author of the book, Machine Tool Reliability, Scrivener-Wiley Publishing, USA, 2016. He is investigator of various research projects funded by national and international funding agencies. His major research interest includes smart manufacturing, reliability engineering, and prognostics.

Dr. Lad was a recipient of Newton-Bhabha grant of Royal Academy of Engineering (RAE), London in 2016 and the Hamied-Cambridge Visiting Lecture Fellowship of University of Cambridge, UK, in 2016.

Dr. Lad is currently working on a novel idea of development of a Human-Machine communication platform for smart manufacturing.

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

Ph.D students: Amit Kumar Jain, Sandeep Kumar, Bhushan Purohit, Pradeep Kundu, Manish Rawat

M.Tech. Student: Vibhor Pandhare, Priya Chauchan

B.Tech. Students: Namit Agrawal (ME), Kartikeya Upasani (CS), Miroojin Bakshi (CS)

Webpage: http://bklad.webs.com/

Dr. Santhakumar Mohan
Assistant Professor
Mechanical Engineering
Robotics and Control
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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
Associate Professor
Mechanical
Engineering,
ritunesh@iiti.ac.in

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 high performance falling film towers for desiccant cooling applications. 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.

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Dr. Shailesh I. Kundalwal
Assistant Professor
Mechanical
Engineering
kundalwal@iiti.ac.in

PhD: Indian Institute of Technology Kharagpur

Postdocs: University of Toronto; Masdar Institute

Research interests: mechanics of carbon and boron nitride-based nanostructures, nano and micro-mechanics of composite materials, computational nanomechanics of solids, and smart structures.

Prior to joining IIT Indore in 2017, he was the Banting Fellow at the University of Toronto. He earned his Master of Technology and PhD degrees from IIT Kharagpur, both in Solid Mechanics. He had proposed a novel multifunctional Fuzzy Fiber Reinforced Composite in his doctoral studies which created the crucial breakthrough in the field of hybrid nanocomposites. During three-separate international postdoctoral stints, he worked in the field of multiscale modeling of composites and nanotechnology in engineering. He has authored 25 research articles (excluding conference papers and chapters) in reputed international journals. He is also contributing as a reviewer on several international journals and Elsevier books in the broad field of mechanics and is a member of professional bodies such as ISTAM, ASME, CSME, APS and IEI (I).

Discipline of Civil Engineering

A-DESCRIPTION OF THE CE DISCIPLINE

The CE Discipline was established as a part of the School of Engineering in IIT Indore during this period. First batch of forty students were admitted (through IIT JEE)in the first year of B.Tech Civil Engineering course in July, 2016.

Professor Umesh C Chaube joined as Visiting Professor on 25th July,2016 in the CE Discipline. He was the only faculty available in the CE Discipline during the reporting period.

Three candidates were selected at position of Assistant Professor and Associate Professor and appointment letters were issued to them by the IIT Indore.

Most of the equipment and furniture etc for Solid Mechanics lab and Fluid Mechanics lab have been procured . Following developmental activities continued through out the reporting period.

a)Procurement of office furniture (for faculty and staff), computers, library books; b)Recruitment process for faculty and staff ; c)Allocation of additional space for faculty, staff, labs; d)Academic and research activities(syllabus and teaching allocation for UG level courses, selection of Ph.D. research scholars); e)Inputs were provided in campus development activities(rain water harvesting, drainage, participation in construction work monitoring mmetings

B-RESEARCH WORK IN CE DISCIPLINE

Research Publications by faculty

Provision for Rain Water Harvesting in Housing Schemes: U. C. Chaube	5th All India Police Housing Conference, November, 2016, Bhopal (M.P.)
Decomposition-coordination approach for study of a large water resource system, U.C. Chaube	Book on "Sustainable Water Resources Management" American Society of Civil Engineers, 2017(under publication).
Integrated Water Resources Management of Ken-Betwa link S. Suryavanshi*, A. Pandey, S. K. Mishra, U.C.Chaube	Book "Sustainable Water Resources Management" American Society of Civil Engineers, 2017 (under publication)
Hydrological simulation of the Betwa river basin (India) using the SWAT model Suryavanshi, S., Pandey, A., U.C. Chaube	Hydrological Sciences Journal, January, 2017

Ph.D Level Research Supervision at IIT Indore: Two research scholars

Industry-Academia interaction: A proposal has been received from MP Police Housing & Infrastructure Development Corporation Ltd Indore Division for laboratory and field tests.

Civil Engineering Faculty Profile

Professor Umesh C Chaube

47 years professional experience in the area of Civil Engineering. Out of this, more than eleven years experience is at executive level in Central Water Commission (Govt. of India) and thirty six years experience in teaching,research and consultancy work on field problems and capacity building of in-service professionals from Afro-Asian countries

Research Work: Supervision of 1 Post Doctoral Research and 15 Ph.Ds; Supervision of 95 M.E. / M.Tech Dissertations; Supervision of 152 M.E./ M.Tech Special Problem Studies; Published 105 papers in Int./Nat. Journals/Conf.

Academic Qualifications:

Examination/ Degree	Subjects/ Specialization	Year	Division	University/ College/Board	Distinctions/ Scholarship
Bachelor of Technology	Civil Engineering	1969	First	Indian Institute of Technology, Kanpur	Institute Scholarship
Master of Technology	Civil Engineering (Water Resources)	1971	First	Indian Institute of Technology, Kanpur	Research Assistantship
Doctor of Philosophy	River Basin Management	1984	Part time	Indian Institute of Technology, Delhi	

Job History:

Name of the post and employer	Period of employment		Nature of duties performed
	From	To	Teaching and research,
Visiting Professor, Civil Engineering Discipline, IIT Indore	July, 2016	continuing	Design and development of various laboratories, campus development work
Emeritus Fellow, Indian Institute of Technology Roorkee, Government of India	July, 2013	continue	Teaching, research and consultancy in Civil Engineering Water infrastructure development and management
Water Resource Management Specialist and Hydrologist-UN-FAO, Afghanistan	June, 2011	Dec, 2012	Water resource investigation, planning and management in Afghanistan
Reader,Professor, Water Resources Development and Management, IITRoorkee, Government of India	Feb,1983	June, 2011	Teaching, research and consultancy in Civil Engineering water infrastructure development and management,
Deputy Director/Assistant Director, Central Water Commission, Govt. of India	Dec,1971	Feb, 1983	Water supply, irrigation and flood control engineering, river basin planning, system studies, instrumentation

Discipline of Chemistry

From HoD's Desk

Dr. Satya S. Bulusu
HOD, Chemistry
Assistant Professor
Chemistry
Metallurgy Engineering and Material Science
sbulusu@iiti.ac.in

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 67 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.

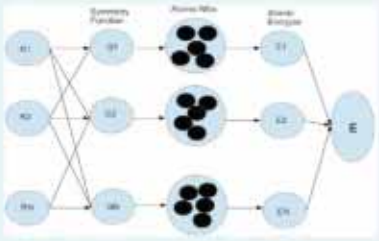
The discipline of Chemistry also offers interdisciplinary collaboration with institutes of national (Banaras Hindu University, RRCAT, IACS, IIT Kharagpur, SNU) and international (Uppsala University, Sweden, Kalshrue Institute of Technology, University of Mainz, Germany, National Institute of Advanced 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

Dr. Satya S. Bulusu
HOD, Chemistry
Assistant Professor
Chemistry,
Metallurgy Engineering
and Material Science
sbulusu@iiti.ac.in

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
Assistant Professor
Chemistry
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Biomedical Engineering
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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.

Dr. Anjan Chakraborty
Associate Professor
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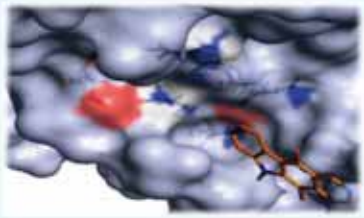

Dr. Anjan Chakraborty (PhD: IIT Kharagpur; Postdoctoral Fellow: Pennsylvania State University, Florida State University USA, Kobe University, Japan) works on anticancer drug molecules e.g. Doxorubin, Topotecan, Campothecin and ellipticine in different biological media. His research interest is in photophysics 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, Doxorubicin, Topotecan and Campothecin and exploited their photophysical properties to understand their interaction with biological systems.

Dr. Apurba K. Das
Associate Professor
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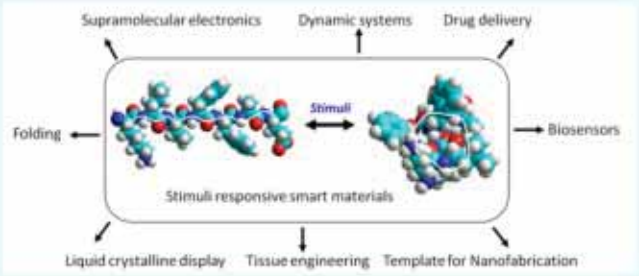
Dr. Apurba K. Das (PhD: Indian Association for the Cultivation of Science; Postdoctoral Research Associate: Manchester Interdisciplinary Biocentre and School of Materials, University of Manchester, Manchester, UK; Department of Pure and Applied Chemistry, University of Strathclyde, Glasgow, UK) is working 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, 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:CCH2 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 CS2 has resulted in isolation of thiones and an unusual h3-coordinated S2CCCPh 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.

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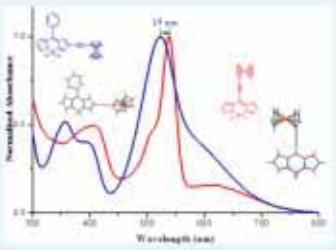
Dr. Rajneesh Misra (PhD: IIT Kanpur; Postdoctoral Fellow: GATECH, Atlanta, USA, University of Kyoto, Japan) focuses on design and synthesis of conjugated organic molecules for organic electronics, and photonics such as solar cells, field-effect transistors, light-emitting diodes, and multi-photon absorption.



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 ethynyl ferrocene 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.

Dr. Shaikh M. Mobin
Associate Professor
Chemistry,
Biosciences &
Biomedical
Engineering,
Metallurgy Engineering
and Material Science
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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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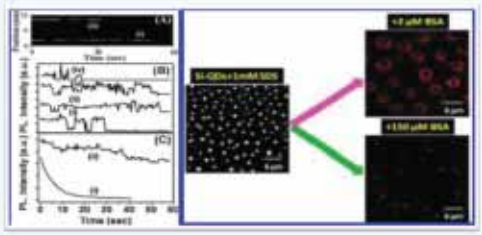
Dr. Tushar K. Mukherjee (Ph.D IIT Bombay; Postdoctoral Scientist, Columbia University Medical Center, New York, USA) works on Single molecule fluorescence imaging using TIRFM, Single molecule spectroscopy in heterogeneous media, developing high resolution optical microscope and Ultrafast fluorescence 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.

Dr. Suman Mukhopadhyay
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Head BSBE
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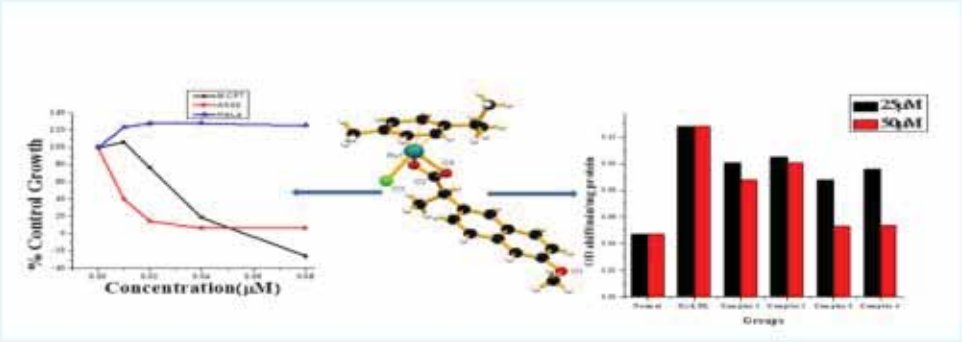
Dr. Suman Mukhopadhyay (Ph.D: Indian Association for the Cultivation of Science; Postdoctoral Fellow: National University of Singapore; FCT post-doctoral fellow: Instituto Superior Técnico in Portugal;Marie-Curie International Incoming Fellow: EPFL in Lausanne (Switzerland)) works on application of metal 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.



Non-steroidal anti-inflammatory drugs (NSAIDs) are a group of molecules which have been found to be active against cancer cells with chemopreventive properties by targeting cyclooxygenase (COX-1 and COX-2) and lipoxoygenase (LOX), commonly upregulated (particularly COX-2) in malignant tumors. Synthesis of four novel Ruthenium(II)-arene complexes using different NSAID drugs as chelating ligands have shown promising antiproliferative activity against different cell lines with GI50 (Concentration of drug causing 50% inhibition of cell growth) values comparable to adriamycin.

Dr. Biswarup Pathak
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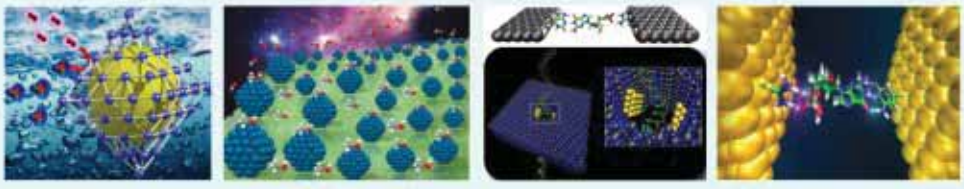
Dr. Biswarup Pathak (Ph.D: Hyderabad Central University, Hyderabad; Postdoctoral Fellow: Jackson State University, USA & Uppsala University Sweden) uses advanced computational methods to work on various solid state materials for clean energy (Hydrogen storage, Photocatalysis, Catalysis, Fuel Cell, Li and Al-ion Batteries, CO2 reduction, Spintronics, Gas Sensors) applications.



Dr. Pathak is involved in designing nano-materials for Fuel Cell (Nanoscale 2015, J Materials Chemistry A 2016), CO2 reduction (Journal Phys. Chem. C 2016), Spintronics (Nanoscale 2016), Catalysis (Scientific Reports 2016), Photocatalysis (Journal Phys. Chem. C 2016) and Bio-applications (Journal Phys. Chem. C 2013). He is actively working on the semiconductor based water splitting (Journal Phys. Chem. C 2016) and Gas sensors (Journal Phys. Chem. C 2015, 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, Journal Phys. Chem. C 2013).

Dr. Sampak Samanta
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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.

Dr. Tridib K. Sarma
Assistant Professor
Chemistry
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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 hybrids for 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.

3. Functional supramolecular nanostructures assembled from bioactive building blocks

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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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and Material Science
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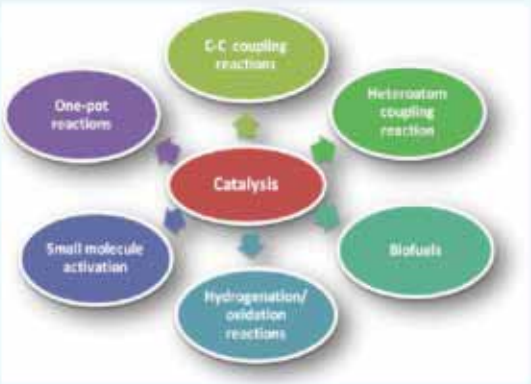
Dr. Sanjay K. Singh (Ph.D A. P. S. University, India; JSPS Postdoctoral Fellow and AIST Postdoctoral Scientist at AIST, Osaka, Japan; Alexander von Humboldt (AvH) Postdoctoral Fellow at Karlsruhe Institute of Technology (KIT), Germany) focuses on synthetic inorganic and organometallic chemistry of transition 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 coupling reactions, hydrogenation/oxidation reactions, Biomass Transformations, Hydrogen Generation and so on. His group has developed several metal-arene complexes with readily available nitrogen ligands as catalysts for C-N coupling, C-C coupling and C-H bond activation reactions. These catalysts were also used for facile transformation of biomass derived furans to open-chain diketones and ketoacids for applications in bio-fuel and fine chemicals. Moreover, several activated bimetallic nanoparticle based catalysts were also developed, which showed excellent TOF and TON for C-C coupling reactions, HMF to FDCA, and so on. His work has been appeared in several high impact research papers in Inorg. Chem., Green Chem., Catal. Sci. Technol., ChemCatChem, Chem. Asian J., Inorg. Chem. Front., Eur. J. Inorg. Chem., and so on.



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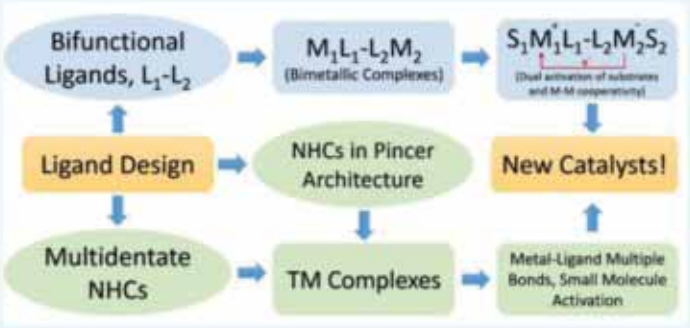
Dr. Amrendra K. Singh (PhD IIT Bombay, India; Recipient of the Shyama Prasad Mukherjee (SPM) Fellowship – 2003, CSIR, India; Carl Trygger Foundation's Postdoctoral Fellow – Lund University, Sweden; Research Associate, Michigan State University, USA) focuses on development of renewable energy and energy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



The idea of cooperative catalysis has inspired synthetic chemists to create artificial dual activation catalysts that use dual, cooperative activation modes, allowing for mild reaction conditions and high turnover numbers. Our group is working towards the development of a new class of bifunctional, binucleating pincer ligands for effecting multi-electron reduction of small molecules, where the two metal centres are electronically coupled through a redox-active ligand backbone. Unlike nature, which uses sophisticated enzyme active sites as a catalyst, we rely on the subtle electronic and steric interactions between the substrate and the tailor-made artificial low molecular weight catalysts with two or more metallic centres. One metal centre serves to activate an electrophile, whereas the second metal can, e.g., be used to generate a nucleophile. 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:

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

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 Ph.D and M. Sc. 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 Ph. D 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). First time in India, we have organized a course called"Julia" at IIT Indore (more details: https://qz.com/963225/julia-an-indian-computer-scientist-built-a-new-programming-language-from-bengaluru/).Another one GIAN course on "Big Data Stream Analytics" has been conductedbetween 26thOctober and 01stNovember 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 Cherugond

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 Wave Propagation.

Facilities in Mathematics:

We have one postgraduate computers 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 and some research projects have been submitted to funding agencies.
- Faculty members have been actively collaborating with various institutes across the globe (Finland, China, France, Germany, Singapore, Canada, USA etc.)
- Faculty members are invited from various prominent institutes of the World as research visitor.
- The discipline conducted two international symposia.
- Faculty members have been awarded grants to conduct GIAN (Global Initiative of Academic Networks) courses
- Department promotes activities of nurturing Mathematics. In this summer the O-Level Mathematics Training and Talent Search Programme, which is funded by National Board for Higher Mathematics, will be held in IIT Indore during May 29, 2017 to June 24, 2017.

Faculty Profiles in Mathematics

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

Dr. Sk. Safique Ahmad *(Ph.D.: Indian Institute of Technology Guwahati and Post Doc : TU Berlin).* 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-efficients. He also works on localisation theorems and bounds of zeros of polynomials and bounds of eigenvalues of matrix polynomials over a quaternion algebra.

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Dr. Swadesh Kumar Sahoo
Head, School of Basic Sciences
Associate Professor
HOD, Mathematics
till September 24, 2015
swadesh@iiti.ac.in
hoss@iiti.ac.in

Dr. Swadesh Kumar 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. Antony Vijesh
Associate Professor
Mathematics
vijesh@iiti.ac.in

Dr. Antony Vijesh *(Ph.D: 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. Md. Aquil Khan
Associate Professor
Mathematics
aquilk@iiti.ac.in

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.

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Dr. Anand Parkash
Assistant Professor
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Dr. Anand Parkash *(Ph.D: 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.

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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.

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Dr. Ashisha Kumar
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Dr. Ashisha Kumar *(Ph.D: Indian Institute of Technology Kanpur).* He works on "d-plane transform" which is a generalization of X-ray and Radon transform. His research is focused on the mapping properties of the d-plane transform on certain Euclidean and Non-Euclidean Spaces.

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Dr. M Ashok Kumar
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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).

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Dr. M. Tanveer
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Dr. M. Tanveer *(Ph.D: Jawaharlal Nehru University, New Delhi; Postdoctoral Research Fellow: Nanyang Technological University, Singapore)* works on optimization, machine learning and its applications to early diagnosis of human brain disorders diseases including Alzheimer, Epilepsy, sleep disorders etc. Dr. Tanveer has developed optimization models for variants of support vector machines for classification and regression problems. Currently, he received Early Career Research Award from Science and Engineering Research Board (SERB), Government of India.

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Dr. Vijay Kumar Sohani
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Dr. Vijay Kumar Sohani *(Ph.D. Harish Chandra Research Institute Allahabad)*. His area of research is Harmonic Analysis and PDE. His recent studies include well posed ness results for nonlinear Schrodinger equation for the twisted Laplacian and Laguerre operator. He further worked on Hardy-Sobolev inequality for the twisted Laplacian. He is currently working on well posed ness results for nonlinear Schrodinger equation for the discrete Hermite operator.

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Dr. Santanu Manna
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Professor
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Dr. Santanu Manna *(Ph.D: Indian Institute of Technology (Indian School of Mines)* Dhanbad; Post-Doctoral Fellow: Indian Institute of Science Engineering and Research Kolkata; Awarded: NPDF from SERB-DST, Dr. DSK from UGC, India, 2016). He is working in the area of "modelling, analysis and numerical simulation of Partial Differential Equations with applications in wave propagation and mathematical seismology". Dr. Manna is equally interested on the study of earthquake source parameters and earthquake prediction with real seismic DATA.

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Dr. Charitha Cherugondi
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Dr. Charitha Cherugondi *(PhD: Indian Institute of Technology Kanpur)*. Her area of research in a broad sense is Optimization Theory, and in specific, continuous optimization and variational analysis.Her recent work has been on (Exact) Regularization and Error Bounds for Monotone Variational Inequalities, Linear convergence of the Douglas Rachford/ ADMM algorithms and applied to Statistical Imaging. She is currently working on projection algorithms for convex optimization and generalized gap functions -algorithms for variational inequalities.

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Discipline of Physics

From HoD's Desk

Dr. Manavendra Mahato
HOD, Physics
Associate Professor
Physics
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In physics, we have 4 major areas of research with 11 Associate Professors 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 programwith 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. They have also enhanced our research with passionate contribution to research projects with some fruition.

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,CBM in FAIR, GSI, 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 has been very encouraging. A motivating academic environment to learn physics has helped about 80% of our senior batch of master's program to successfully qualify GATE physics examination.Previous batches have 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 300 in various reputed journals. A significant achievement this year is that we have been able to obtain DST FIST grant for installing a RAMAN vibrational spectrometer and to augment our computing facilities.

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 dynamic physics community at IIT Indore is continually striving to extend the scientific outlook and research progressto the benefit our region and our nation in a larger perspective.

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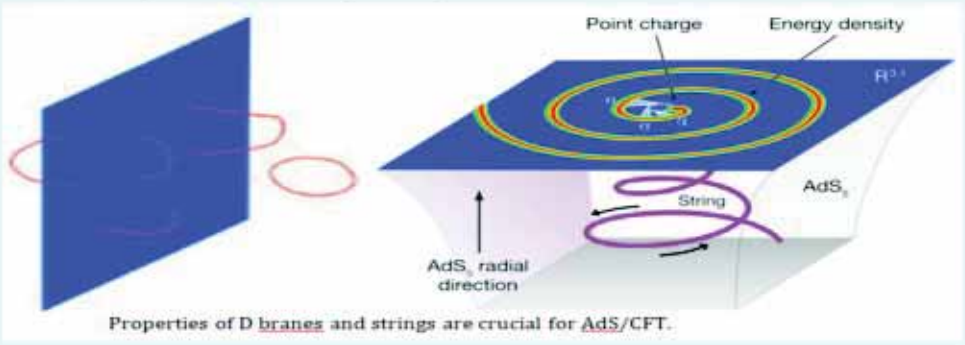
Dr. Manavendra Mahato *(Ph.D: University of Michigan, Ann Arbor, USA; Visiting Fellow: TIFR, Mumbai)* is working in the area of holography. He deals with those theories of gravity which contain a lot of information about its boundary encoded in its geometry.



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
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Dr. Preeti A. 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
Associate Professor
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Metallurgy Engineering and Material Science,
Biosciences &
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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.

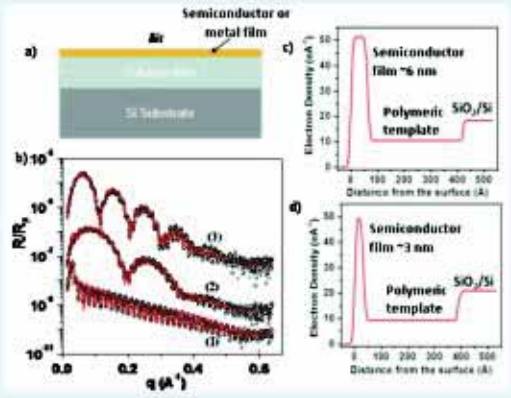

Fig. (a) Schematic representation of controlled deposition of thin semiconductors or metal film (~3-6 nm) on confined polymeric film (or template). (b) Specular reflectivity data for (1) polymer film, (2) ~3nm ITO/ polymer film, (3) ~6nm ITO/polymer film. Lines are best fits from which the electron density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

Her research Interests:

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

(ii) Improvement of 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
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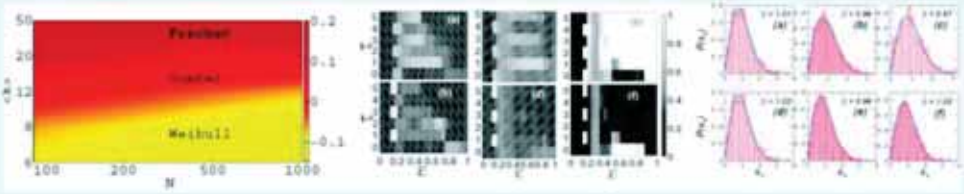
Dr. Sarika Jalan *(Ph.D: Non-Linear Dynamics from Physical Research Laboratory; Senior Research Fellow: National University of Singapore, Singapore; Guest Scientist, Postdoctorate Fellow: Max-Planck-Institute for the Physics of Complex Systems, Dresden, Germany)* works on nonlinear



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, 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.

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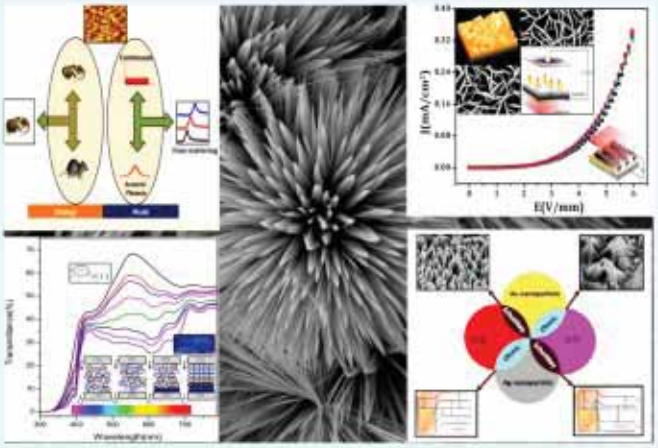
Dr. Rajesh Kumar *(Ph.D: IIT Delhi; Postdoctoral Fellow: National Institute for Nanotechnology (NINT),* University of Alberta, Canada, Member, American Chemical Society (ACS), Associate Editor, Advanced Materials Processing and Technology (Taylor & Francis))works in the field of experimental solid state Physics. His field of specialization is Raman and Photoluminescence spectroscopy and device physics. 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 and electrochromic devices is a part of his research along with understanding subtle physics in systems at nanoscale.



The "Materials Research Laboratory", Discipline of Physics, IIT Indore has prepared various semiconductor nanostructures 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. Various applications of these nanostructure are explored which covers, electrochromic displays, field emission displays and glucose sensing etc.

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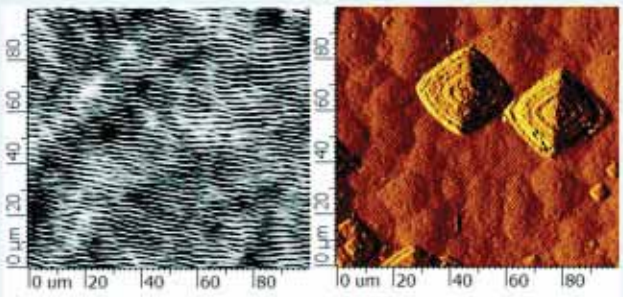
Dr. Krushna Mavani *(Ph.D: Saurashtra University; WPI Postdoctoral Researcher: Kyoto University, Japan; Postdoctoral Researcher: Osaka University, Japan; Postdoctoral Researcher: Tata Institute of Fundamental Research, Mumbai)* is working onthin films and multilayers of Functional Oxides, Exploring Phenomena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

Dr. Mavani works on thin films, nanostructured films and multilayer of oxides. She synthesizes high quality materials using Pulsed Laser Deposition method. She studies the electronic, magnetic and structural properties of different oxide thin films 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 properties in functional oxides for device-based applications. The strongly correlated properties of oxides can give rise to applications in fast memory-devices, scanning devices, electronics and various sensors.



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. Subhendu Rakshit
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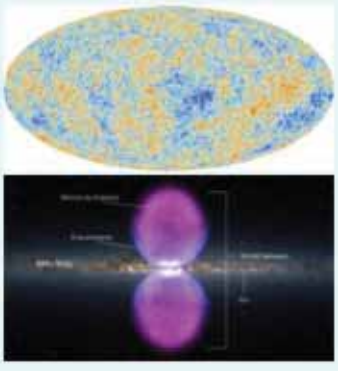
Dr. Subhendu Rakshit *(Ph.D: Calcutta University; Visiting Scientist: TIFR, India; Postdoctoral Fellow: University of Dortmund, Germany, Saha Institute of Nuclear Physics, India; Technion University, Israel; Harish-Chandra Research Institute, Allahabad)* works on phenomenological aspects of particle 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 detection-experiments, 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)* works on Hadron Physics at Intermediate Energy and Ultra-relativistic heavy ion Physics. One of the main goals of hadron physics is the quantitative understanding of Quantum Chromodynamics (QCD) at low energy. A unique way of doing this is through studying different decays modes of light mesons (eta, etaprime, omega mesons). Currently Dr. Roy along with her students is working on the following topics: Dalitz Plot parameters of the etaprime meson and transition form factor of the eta meson.

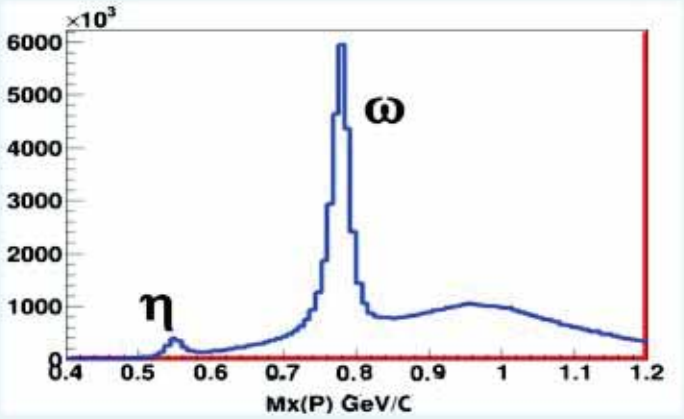

Fig: Missing mass of eta and omega mesons.

Main physics motivation of ultra relativistic heavy ion collision is to study the different properties of strongly interacting hot, dense state of matter through its phase transition to hadron gas. Here, one expects chiral phase transition, other than the de-confinement phase transition. Formation of Disoriented Chiral Condensate (DCC) is proposed during the transition of the chiral symmetric phase to the broken phase. Dynamical fluctuation of neutral pion to charge pion ratio is one of the observables to study DCC. No clear evidence of DCC is reported so far in heavy ion collision. For this analysis, she is using the information of the Photon Multiplicity Detector (PMD), which is contributed by the Indian Scientists in ALICE experiment at LHC, CERN.

Her group is also working on heavy flavor hadrons in heavy ion collision. Hadrons carrying heavy flavour, i.e. charm or beauty quarks, are unique probes in hadronic collisions at high energies. The measurement of heavy-flavour production cross sections in proton-proton collisions at the LHC serves as a sensitive test for QCD, the well-established theory of strong interactions, at the high energy frontier. Furthermore, heavy-flavour measurements in proton-proton collisions provide a crucial baseline for corresponding investigations in proton-nucleus collisions, where effects due to the presence of a nucleus in the collision system play a role, and in nucleus-nucleus collisions, where the quarks propagate through the produced hot and dense medium and interact with its constituents. Dr. Roy is pursuing this research through DST-DAAD project.

Dr. Roy is working in collaboration with WASA-at-COSY, Juelich (Germany), LMD-CAA at Jefferson Laboratory (USA) , ALICE experiment at LHC, CERN and CBM experiment at FAIR, GSI (Germany).

Dr. Pankaj R. Sagdeo
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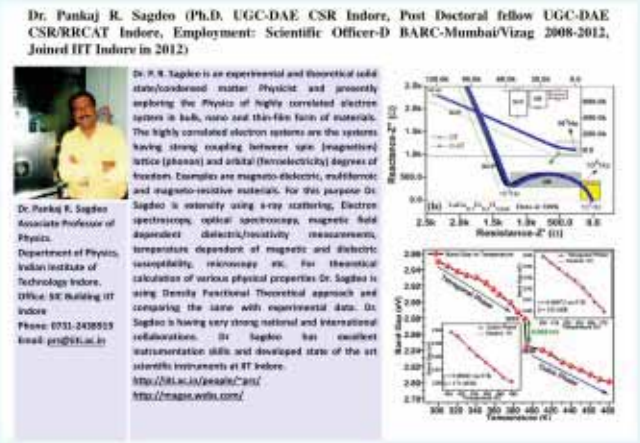
Dr. Pankaj R. Sagdeo *(Ph.D: UGC-DAE CSR Indore; Scientific Officer/Coordinator: Bhabha Atomic Research Centre, Visakhapatnam, India; Research Associate/Postdoctoral Researcher: UGC-DAE-CSR Beamlines on Indus-I AND Indus-II, Indian Synchrotron source)* is interested in surface interface physics, surface 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 AB7O12 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 17-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 the Principal Investigator and Team Leader of ALICE and CBM experiments from IIT Indore and a member of ALICE and CBM Collaboration Board. As an active member of the ALICE-India Management Board, he has worked as a member of the Future Physics Task Force as well. He is the Guest editor of the internal journal, Advances in High Energy Physics and also worked as the referee in many international

journals in high energy physics, along with reviewers of the research projects from Utrecht University, The Netherlands and Jan Kochanowski University in Kielce, Poland. He has the credit of highest number of peer-reviewed scientific publications with highest h-index and the highest external research funding in the institute.

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.

This is achieved in heavy-ion collisions at ultra-relativistic energies in the popular "Big Bang Experiment" to produce Quark Gluon-Plasma (QGP): a plasma of fundamental constituents (quarks and gluons) of matter.

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, particle spectra in heavy-ion and proton+proton collisions at the Large Hadron Collider. His group is involved in production of resonances 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 study the QCD phase diagram and search for critical point in the domain of high baryon density.

Dr. Somaditya Sen
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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, TiO2, CuO, CeO2, PbTiO¬, BaTiO3, etc. The group synthesizes materials and characterizes using Xray diffraction, Xray Absorption, UV-vis, IR, Raman spectroscopy, Photoluminescence, etc. The group also study the magnetic properties in collaboration with Miami university, Ohio and Univ of Wisconsin Milwaukee. Further active collaboration exist 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.

Discipline of Metallurgy Engineering & Material Science

From HoD's Desk

Dr. I.A. Palani
Assoicate Professor
Head of the Discipline,
Metallurgy Engineering and Material Science
Email: palaniia@iiti.ac.in

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 behavior 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 3 core faculty members, 19 associated faculty members from various disciplines and 2 DST Inspire faculties. The Discipline has a Ph.D program with a current strength of 30 scholars. The discipline has a Undergraduate program on B.Tech (Metallurgy Engineering and Material Science) program was started in the year 2016 with an intake of 40. M.Tech (Material Science and Engineering) program was started in the year 2015 with a batch intake of 15 per year. The discipline has been focusing on four major thrust areas 1) Physical metallurgy and Heat treatment 2) Materials for high temperature applications 3) Tribology, corrosion and surface coatings 4) Materials for Energy 5) Nano materials and nano structures 6) Bio-materials and devices.

Areas of Expertise

The discipline has expertise on the following sub topics such as Physical Metallurgy, Heat treatment of Metals and Alloys, Surface Engineering: Surface Alloying, Surface Deformation, Microstructure-Properties correlations, Corrosion Engineering, Lightweight alloys for automotive and aerospace applications, Processing-Structure-Property correlation in multicomponent / high entropy alloys, Material design for high temperature applications, Synthesis of Metalogels, Field

emission displays and electrochromic smart windows, Resistive Switching devices, 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) Mr.Rajagopalan a Ph.D research scholar from the discipline has DST:Korean flellowship to pursue a part of his Ph.D research in Jeju National University, south korea on Energy harvesting for a period of one year
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.
5) Mrs.Nandini Patra Ph.D research scholar is visiting Australian national Univeristy as a research intern for a period of four months
6) Mr.Ashish Shukla a Ph.D research scholar has developed a Self –energised Shape memory alloy based solar tracker

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 & Material Science

Dr. Parasharam M. Shirage
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Associated Department:
Department of Physics (Ramanujan Fellow)
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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Core Department:
Discipline of Metallurgy Engineering and Materials Science
Research Areas:

- 1D/2D Metal-Oxide nanostructures for engineering applications
- Polymers for energy applications
- Nano-hetero-architectures and Core-shell nanostructures
- Energy conversion/storage devices fabrication
- Resistive Switching devices
- Field emission displays and electrochromic smart windows
- Photoluminescence etc

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Core Department:
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Research Areas:

- Nanomaterials
- Structure-Property Correlations in High Entropy Alloys
- Corrosion Engineering
- Lightweight alloys for automotive and aerospace applications
- Phase transformation

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Research Areas:

- Solid Electrolytes for Lithium Batteriess
- Cathode Materials for Li/Na ion Batteries
- Lead-free Piezoelectric Materialss
- Solid State Ionics
- Dielectric & Electrochemical Impedance Spectroscopyc

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Discipline of Metallurgy Engineering and Materials Science
Research Areas:
Nanomaterials and Energy Devices Group/

- Design and growth of nanomaterials/thin films
- Optical and transport properties of semiconductors
- 2-D materials based electronic devices
- Energy efficient coatings
- Energy conversion devices: PEC water splitting, photovoltaic, piezoelectric and thermoelectric

Associated Faculty

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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

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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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Associated Department:
Department of Physics (Assistant Professor)
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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Associated Department:
Department of Chemistry(Assistant Professor)
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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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:

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- Multiferroics
- Metal-Insulator Transition
- Magnetism

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http://iiti.ac.in/people/~rajneesh/
Associated Department:
Department of Chemistry (Associate Professor)
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

Dr. Shaibal Mukherjee
Associate Professor
Metallurgy Engineering and
Material Science
shaibal@iiti.ac.in

View Full Profile:
http://iiti.ac.in/people/~shaibal/
Associated Department:
Department of Electrical Engineering (Assistant Professor)
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

Dr. Biswarup Pathak
Associate Professor
Metallurgy Engineering and
Material Science
biswarup@iiti.ac.in

View Full Profile:
http://iiti.ac.in/people/~biswarup/index.html/
Associated Department:
Department of Chemistry (Assistant Professor)
Research Areas:

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

Dr. Kazi Sabiruddin
Associate Professor
Metallurgy Engineering and
Material Science
skazi@iiti.ac.in

View Full Profile:
http://me.iiti.ac.in/Kazi.html/
Associated Department:
Department of Mechanical Engineering (Assistant Professor)
Research Areas:

- Thermal spray coatings

Dr. Pankaj R. Sagdeo
Associate Professor
Metallurgy Engineering and
Material Science
prs@iiti.ac.in

View Full Profile:
http://iiti.ac.in/people/~prs/index.html/
Associated Department:
Department of Physics (Assistant Professor)
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

Dr. Somaditya Sen
Associate Professor
Metallurgy Engineering and
Material Science
sens@iiti.ac.in

View Full Profile:
http://iiti.ac.in/people/~sens//
Associated Department:
Department of Physics (Associate Professor)
Research Areas:

- Multiferroics
- Magnetic Semiconductors
- Nano-materials
- Semiconducting Glasses
- Perovskites

Dr. Shaikh M. Mobin
Associate Professor
Metallurgy Engineering and
Material Science
xray@iiti.ac.in

View Full Profile:
http://www.iiti.ac.in/people/~xray/index.html/
Associated Department:
Department of Chemistry (Assistant Professor)
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

Dr. Sanjay K. Singh
Associate Professor
Metallurgy Engineering and
Material Science
sksingh@iiti.ac.in

View Full Profile:
http://iiti.ac.in/people/~sksingh/index.html/
Associated Department:
Department of Chemistry (Assistant Professor)
Research Areas:

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

Dr. Vipul Singh
Associate Professor
Metallurgy Engineering and
Material Science
vipul@iiti.ac.in

View Full Profile:
http://iiti.ac.in/people/~vipul/index.htm/
Associated Department:
Department of Electrical Engineering (Assistant Professor)

Research Areas:

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

School of Humanities and Social Sciences

From HoD's Desk

Dr. Sanjram Premjit Khanganba
Head, School of HSS
Assistant Professor, Psychology
sanjrampk@iiti.ac.in

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 five Associate Professors and three Assistant Professors:

- Dr. Amarjeet Nayak, English
- Dr. C. Bharath Kumar, Philosophy
- Dr. C. Upendra, Philosophy
- Dr. Neeraj Mishra, Sociology
- Dr. Nirmala Menon, English
- Dr. Pritee Sharma, Economics
- Dr. Ruchi Sharma, Economics
- Dr. Sanjram Premjit Khanganba, Psychology

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 undergraduate and PhD students.

Discipline Research Areas

- Human Factors
- Moral and Political Philosophy
- Philosophy and Literature
- Translation Studies
- Digital Humanities
- Economics of Innovation
- 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.

Four students have already completed their PhD from the Discipline of Economics, two from English and one student from Discipline of Philosophy and are placed in academic positions in institutions of repute in India like NITs.

The faculty members from various disciplines in HSS 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 as well as published books and conducted GIAN courses. PhD students from various disciplines in HSS have published high quality articles in peer-reviewed journals.

Dr. Bharath was the Co-Coordinator for the paper 'Philosophy of Education' for UGC e- PG Pathasala project, 2016. He has also been nominated as a speaker for the Symposium on 'Philosophical Methods' for the 92nd session of Indian Philosophical Congress scheduled to be held at Surat in January 2018. Dr. Bharath Kumar has edited a course material book for Yashwantrao Chavan Maharashtra Open University, Nashik, 2016. He was the Resource Person for the Indian Council of Philosophical Research (ICPR) Workshop on the 'Works of Nietzsche' from 21-30 March 2017 at ICPR, Lucknow Centre. He has conducted 6 sessions on various themes related to Nietzsche.

Dr. Nirmala Menon became Academic Project Lead, KSHIP Multilingual Scholarly Publishing Portal, IIT Indore in partnership with Ubiquity Press, UK and a partner network of university presses globally. Fullbright Scholar, Melissa DeLury will be the first Fulbright scholar to join IIT Indore with the Digital Humanities Research Group, HSS. Reema Chowdhury, Research Scholar of the Digital Humanities Research group won the Charles Wallace- British Council Fellowship for 2017. Dr. Nirmala Menon gave invited Keynotes / public lectures, the details of which are as follows:

1. Postcolonial Digital Humanities, Saint Anselm College, New Hampshire, US April 2017
2. A Multilingual Research Scholarship in India, Internet Researchers Conference (IRC), March 2017
3. Plenary Lecture, Digital Humanities Winter School, Centre for Digital Humanities, Pune, India, December 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.

Dr. Pritee Sharma was invited as speaker and Chair for technical session at "International Conference on Make in India: An Opportunity for Sustainable Entrepreneurship Development", held during February 16-17, 2017 at Bhopal. Ms. Shanu Shukla research scholar from Discipline of Psychology has been selected as a USEIF Fulbright Nehru Doctoral Scholar and she will undertake her collaborative research work at Michigan University in 2018.

Dr. Ruchi Sharma received Best Paper Award for article titled, "Measuring Research Efficiency of Higher Academic Premier Technical Institutions of India: A Data Envelopment Analysis Based Malmquist Productivity Index Approach," co-authored with Aakriti Jain and P. Vigneswara Ilavarasan as second author, during the conference on Management of Intellectual Property Rights and Strategy 2016, held at IIT Bombay from July 15-16 2016. She also received funding of Rs. 30 Lakhs for a project titled, "Knowledge Spillovers of Foreign Patenting on Indian Firms: Econometric Analysis Using Patent Citation Data," from Indian Council for Social Science Research, New Delhi, for a period of two years. Dr. Ruchi Sharma also authored a Textbook on International Trade and International Business for Yashwantrao Chavan Maharashtra Open University (YCMOU), Nasik.

Dr. Ruchi Sharma organized GIAN course on Intellectual Property Rights and International Economic Development with Prof. Walter G. Park, American University, Washington D.C. from December 12-16, 2016. She gave distinguished lecture on "Make in India, Make for India and Innovate in India," during Make in India Conference in Bhopal on 17 February 2017.

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.

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. 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.

Department of Sociology conducts research in the field of urban and rural water governance, river basin management, anthropology of urbanization, and usage of ethnographic methods in developmental research. The department provides facilities for the collection of qualitative and GIS data. The software for the analysis of qualitative data, such as ATLAS.ti is also available for the researchers. A fully functional computer assisted qualitative data analysis (CAQDA) Lab is also in the process of development.

Faculty Profiles in School of Humanities and Social Sciences

Dr. Sanjram Premjit Khanganba
Assistant Professor
Psychology
sanjrampk@iiti.ac.in

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
Associate Professor
Philosophy
bharathk@iiti.ac.in

Dr. Bharath Kumar *(Ph.D: University of Hyderabad)* works in the areas of Contemporary Indian Philosophy, Moral Philosophy, Social and Political Philosophy. He is interested in engaging with the philosophical and theoretical concerns of modern Indian thinkers. He is in the phase of consolidating his understanding, in his effort, to contribute to an authentic and autonomous Indian political theory.

Dr. Amarjeet Nayak
Assistant Professor
English
amarjeet@iiti.ac.in

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, 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 Science, Humanities and Arts: JOSHA, Muse India, etc. Some of the major achievements of Dr. Nayak's doctoral students include presenting research papers in prestigious international conferences at MIT, Harvard, Unsiversity of Osnabruck, Germany as well as participating in the Summer School at Harvard and at Institute of Economic Growth, Delhi University.

Dr. Nirmala Menon
Associate Professor
English
nmenon@iiti.ac.in

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.

Dr. Ruchi Sharma
Associate Professor
Economics
ruchi@iiti.ac.in

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.

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, 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
Associate Professor
Economics
Dean, Administration
psharma@iiti.ac.in

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
Associate Professor
Philosophy
cupendra@iiti.ac.in

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
Assistant Professor
Sociology
nmishra@iiti.ac.in

Dr. Neeraj Mishra *(PhD: The Center of Development Research, University of Bonn, Germany; Postdoc- University of Amsterdam, M.Phil.- IIT Bombay).*

My research interest areas: sociology of water, river basin management and development, usage of spatial tools and GIS in natural resource management, anthropological research on developmental issues etc.

My 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 part of the research group working on urban Rivers and will be undertaking research on the gaps existing in the present institutions and governance of Kshipra 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 river front communities affect the health of the river.

Biosciences and Biomedical Engineering

From HoD's Desk

Dr. Suman Mukhopadhyay
Associate Professor
HOD, Biosciences &
Biomedical Engineering
suman@iiti.ac.in

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 seven core faculty members along with two other core faculty fellows. Ten more faculty members from other disciplines are also associated with this interdisciplinary center.

- Dr. Suman Mukhopadhyay - Head
- Dr. Prashant Kodgire
- 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. Ram 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.

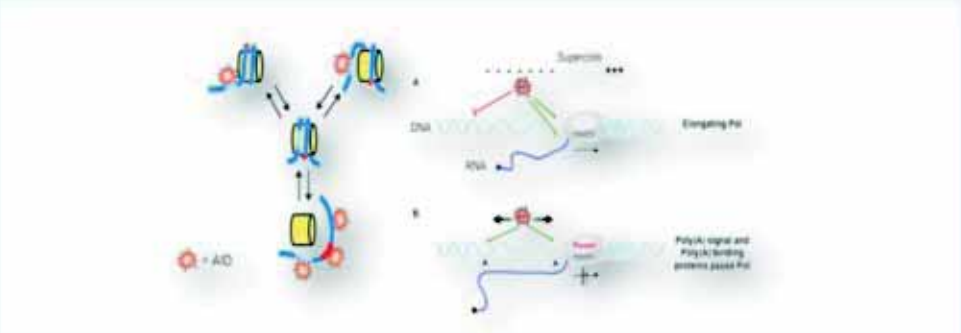
- Published about twenty research papers in reputed international journals.
- Dr. Prashant Kodgire won Excellence in Teaching Award of IIT Indore.
- Dr. Amit Kumar and his group won the best research paper award.
- Mr. Vinay Sharma has been awarded ESONN (European School on Nanosciences and Nanotechnologies) 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 instrumentation facilities are currently available in Center of BSBE: Confocal Microscopy Research Facility, Flow Cytometry Facility, Proteomics Facility

Dr. Prashant Kodgire
Associate Professor
Biosciences &
Biomedical Engineering
pkodgire@iiti.ac.in

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 hypermutation 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.

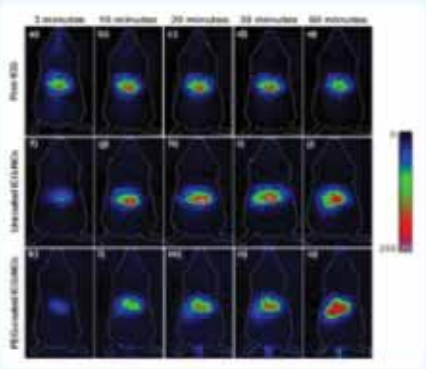


His group's current efforts are on identifying the molecular mechanisms of action and targeting of activation-induced cytidinedeaminase (AID) on the Ig genes. These studies are important for determining how the varied repertoire of antibody genes is created with the potential to react against any foreign 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
Biosciences &
Biomedical Engineering
shgupta@iiti.ac.in

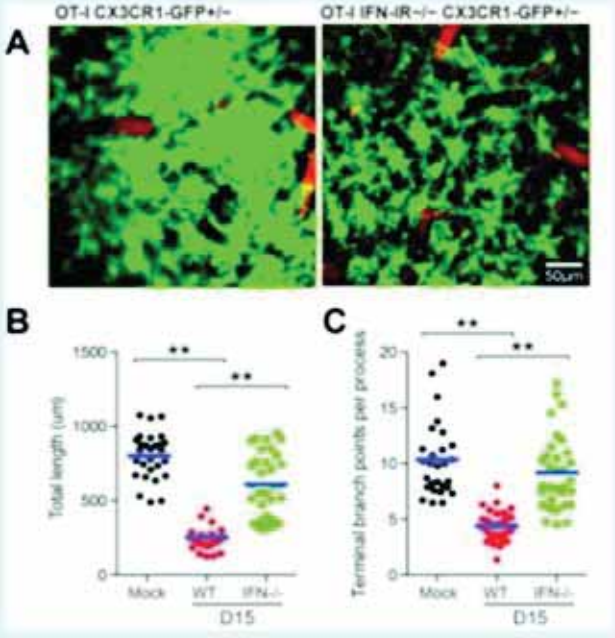
Dr. Sharad Gupta *(Ph.D: IIT Kanpur, India; Postdoctoral Fellow: Tufts University, MA, USA; Visiting Research Associate: Bio systems, KAIST, Korea; Assistant Project Scientist, Academic Coordinator and Lecturer: University of California, Riverside)* focuses on the development of biocompatible nano-carriers 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
Biosciences &
Biomedical Engineering
nayakdn@iiti.ac.in

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.



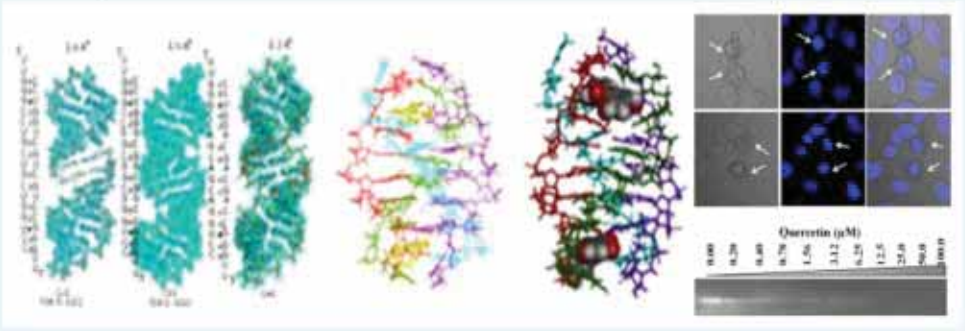
Dr. Nayak's laboratory also investigates innate immune function of microglia, the resident immune cells of brain. Microglia are the most abundant immune cells of the central nervous system (CNS). In resting brain, microglia possesses small body and highly ramified processes. These processes are constantly 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
Associate Professor
Biosciences &
Biomedical Engineering
amitk@iiti.ac.in

Dr. Amit Kumar *(Ph.D: IIT Roorkee, India; Postdoctoral Research Associate: The Scripps Research Institute, U.S.A.; Postdoctoral Fellow: SUNY Buffalo, U.S.A)* Research Area: Structure Biology, Neurobiology, Chemical Biology, Target Identification and Drug discovery.

Figure:(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). (centre) NMR based structure showing the G-quadruplex DNA complexed with the lead small molecule. (Right) Effect of Quercetin on cancer cell lines and DNA replication.



Dr. Kumar's group members are involved in targeting cancer, neurological disorders and other various diseases that are caused by bacteria and viruses, using libraries of bioactive small molecule/ligands that can target a variety of toxic DNA/RNAs at molecular level. In many of 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 DNA/RNA targets are done. 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.

Important Publications:

1. Mishra, SK, Pandya, N., Tawani, A., Mishra, A. and **Amit Kumar*.** DNDAT: A Database for Neurological Diseases and Their associated Targets. *Scientific Reports.* (minor revision submitted) 2017
2. Tawani, A., and **Amit Kumar*.** Structural insight for the recognition of G-quadruplex structure at human c-myc promoter sequence by flavonoid Quercetin. *Scientific Reports,* 38192, 2017
3. Mishra, S.K., Tawani, A., Mishra, A and **Amit Kumar*.** G4IPDB: A G-quadruplex interacting protein database. *Scientific Reports,* 6, 38144, 2016.
4. Tawani, A., Amanullah, A., Mishra, A. and **Amit Kumar*.** Evidences for Piperine inhibiting cancer by targeting human G-quadruplex DNA sequences, *Scientific Reports,* 6, 33528, 2016.
5. Tawani, A., and **Amit Kumar*.** Structural Insight in to the interaction of Flavonoids with Human Telomeric Sequence. *Scientific Reports.* 5:17574. 2015

Funding:

- **DST-SERB: SR/FT/LS-29/2012-(2013-2016)-** A therapeutic approach for targeting CAG repeat expansion RNA that causes Huntington's Disease (HD) and Spinocerebellar Ataxias (SCAs)- Completed
- **DST-EMR: DST/EMR/003897- (2017-2020)-** Recognition of Human G-quadruplex Structure by natural product Piperine and its derivatives for mechanistic insight of its anticancer activity- Ongoing (Amount 53 Lakh)

Dr. Abhijeet B. Joshi
INSPIRE Faculty
Biosciences &
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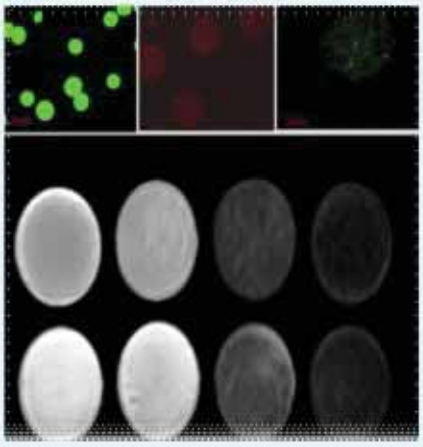
Dr. Abhijeet B. Joshi *(Ph.D: IIT Bombay, India, Lecturer: NIPER-Ahmedabad, India, IYBA Fellow: IIT Bombay, India)* works in the fields of Biomedical Engineering especially in biosensor development, drug delivery, diagnostics and theranostics. He has received several awards from national and international agencies like TR-35 Award India, INAE-Innovative student project award, Dr. Gargi Vishnoi 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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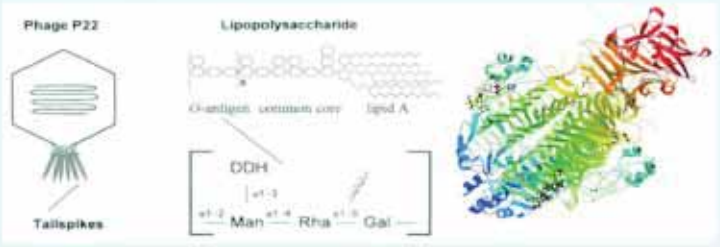
Dr. Parimal Kar *(Ph.D: Michigan Technological University, USA; Postdoctoral Fellow: Max Planck Institute of Colloids and Interfaces, Potsdam, Germany; Visiting Research Associate: Michigan State University, USA)* focuses on the development and application of physics-based new computational approaches 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. Kiran Bala
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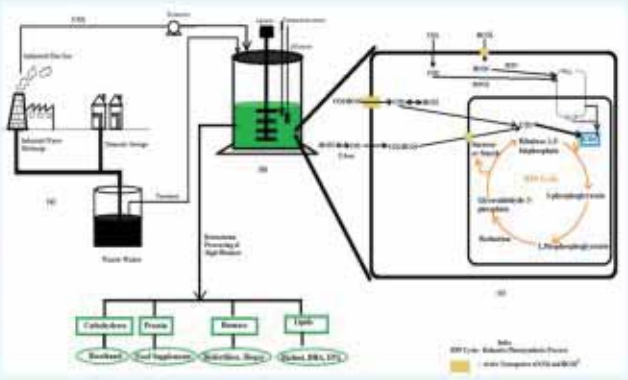
Dr. Bala's group works with in diverse areas of algae biotechnology. Members of the lab. are working on integrative approach for wastewater treatment, carbon sequestration from flue gases and biodiesel production potential.



Dr. Hem Chandra Jha
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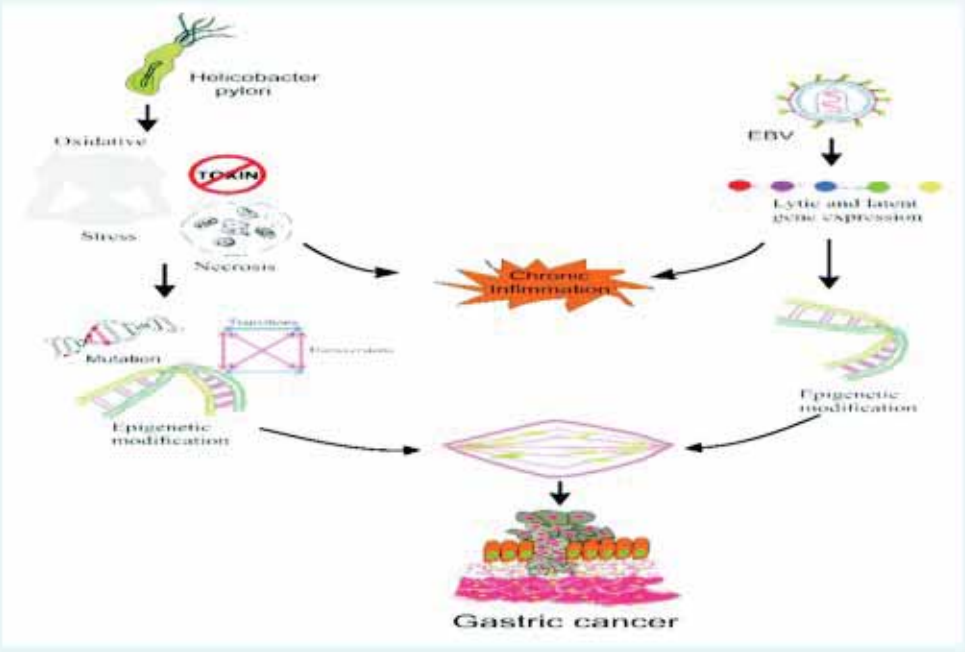
Dr. Hem Chandra Jha *(Ph.D: Birla Institute of Technology & Science, India; Postdoctoral Fellow: University of Pennsylvania Perelman School of Medicine, PA, USA; Research Associate: University of Pennsylvania Perelman School of Medicine, PA, USA)* focuses on the Epstein- Barr virus and Kaposi Sarcoma Associated Herpesvirus in B-cell lymphoma. He was utilized genetic engineering, cell biology, epigenetics, drug discovery and in vivo study models in his studies. He got approved for prestigious Ramalingaswamiand Ramanujan fellowship from Govt. of India. He received an extramural grant from the CSIR India for his research work at IIT Indore.

Currently, his group isworking on EBV association with Multiple Sclerosis. Another research question working on his group is how EBV and Helicobacter pylori co-infection leads to aggressive carcinoma. This co-infection is one of the major challenge in the field of infectious agents associated carcinoma. Hence, through epigenetics and genetic engineering approach may find an explanation in this filed. Animal model study for tumorigenesis will provide in depth explanation in stage specific manner.

A representative model of EBV and H. pylori co-infection which leads to gastric cancer through various cellular mechanism has been shown here. Moreover, a mechanistic approach for EBV and associated infectious agents derived disease pathogenesis will be interesting to explore.



Dr. Mirza S. Baig
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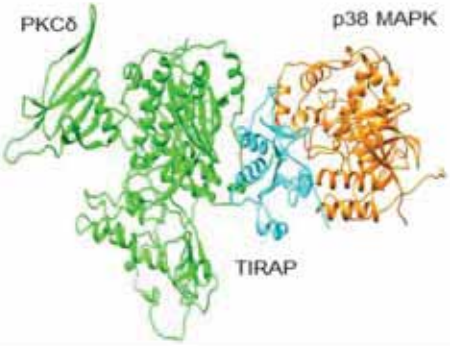
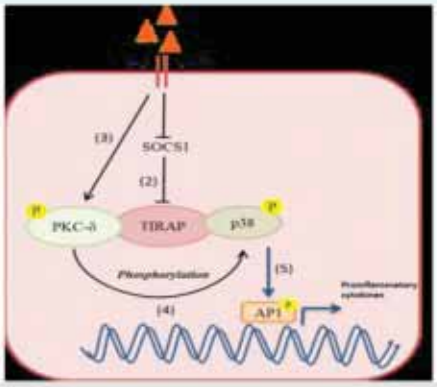
Dr. Baig received his *(Ph.D. from Central Drug Research Institute, Lucknow in 2008)*. His post-doctoral work in Immunology was carried out at the Department of Medicine, University of Illinois at Chicago. In 2014, Dr. Baig was appointed as a Research Scientist at the Department of Gastroenterology and 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 complex of PKCδ-TIRAP-P38 in inflammation



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

Associate members of BSBE

Dr. S. Dhinakaran
Associate 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
Associate Professor, Chem.

Dr. Rajesh Kumar
Associate Professor, Phy.

Dr. Sarika Jalan
Associate Professor,
Physics

Dr. Suman Mukhopadhyay
Associate Professor
Chemistry

Dr. Sudeshana Chattopadhyay
Associate Professor
Physics

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 year, 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. Dr. Datta and Prof. Hablani has been awarded grants to further studies on ionosphere and navigation in connection with the IRNSS system (India's own GPS). Dr. Malu and Dr. Datta explored the high-frequency behavior of the Bullet cluster, with data from the Australia Telescope Compact Array. They have now funding from DST-SERB to build a prototype radio interferometer as a proof-of-concept. The Centre is now active with more than 7 PhD students, several intern students and many UG students from IITI B.Tech program. We are now running successfully the Astronomy Minor program as well as starting to offer M.Sc in Astronomy from July, 2018.

The future can only be bright from here.

- Dr. Abhirup Datta, HoD (Astronomy)

Recent News

1. M.Sc Astronomy program to be offered from July 2018 – intake through JAM exams.
2. Centre of Astronomy received DST-SERB Grant for "C and L-Band Interferometer as Galaxy Cluster Observatory Pathfinder", starting March 2017-2020, Total grant of Rs. 83.77 lacs.
   --- P.I. Dr. Siddharth Malu, Co-P.I. Dr. Abhirup Datta & Dr. Somaditya Sen
3. Centre of Astronomy was awarded a ISRO funded project on "Differential NavIC & GAGAN aided Inertial Navigation with Applications to Land, Air and Space Vehicles ", starting Janurary 2017-2019, Total grant – Rs. 37.32 lacs
   --- P.I. Dr. Abhirup Datta, Co-P.I. Prof. Hari H. Hablani
4. Dr. Abhirup Datta became a Visiting Associate of IUCAA (Inter University Centre of Astronomy and Astrophysics), Pune from August, 2016 for a period of 3 years,

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: 2016-17

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, 2016Published
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, 2016In 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, 2016In 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: 2016-2017

1. Proposal submitted for Early Career Research Award on January, 2017- "Unveiling Mergers Of Galaxy Clusters With Radio Halos/Relics: Using High Fidelity Radio and X-ray Observations - Other Technical Details" - P.I. Dr. Abhirup Datta
2. Proposal submitted to ICPS (Interdisciplinary Cyber Physical Systems Division) on March, 2017 – "How to deal with Big Data from the Early Universe? " – P.I. Dr. Abhirup Datta, Co-PI – Dr. Siddharth Malu
3. 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
4. Supercomputing Initiative Proposal – Dr. Abhirup Datta is leading the effort for an institute-wide facility, to be followed by a large Supercomputing facility proposal
5. Observations and Characterizations of Earth's Ionosphere – Implications to a Smart City – PI: Dr. Abhirup Datta (Smart City Initiative)
6. IIT Indore Remote Internet Access System (RIAS): Connecting Rural India with Development – PI: Dr. Siddharth Malu (Smart City Initiative)
7. Sensor-Radio Telescope Grid for Climate Monitoring & Agriculture – PI: Dr. Siddharth Malu (Smart City Initiative)
8. Common Research & Technology Development Hubs (CRTDH) scheme
9. A low-cost ground-based RF receiver with applications to astronomy and communications – Dr. Siddharth Malu, Dr. Abhirup Datta (Uchhatar Avishkar Yojana)
10. 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)
11. 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)

12. 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)
13. 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)
14. 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)
15. 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)
16. 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
17. C and L-Band Interferometer as Galaxy Cluster Observatory Pathfinder – Drs. Siddharth Malu, Abhirup Datta, Somaditya Sen
18. Long-Range High-Accuracy Robust Navigation, Guidance and Control of Autonomous Underwater Vehicle National Design Research Forum, Prof. H. Hablani & Dr. Abhirup Datta – submitted to Space Aplications Centre, ISRO, Ahmedabad
19. 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
20. EoI: Establishment of Centre on Digital Gov. and Knowledge Societies at IIT Indore, PI: Dr. Neeraj Mishra, Co-PIs: Drs. Datta & Malu
21. Cosmological Study of Wideband Radio as part of Team Indus
22. DST – Texas Instruments Startup Challenge

Faculty Profiles in Astronomy

Dr. Abhirup Datta
Assistant 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 scientist 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
Visiting Professor
hbhalani@iiti.ac.in

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 S. Malu
Associate Professor
siddharth@iiti.ac.in

Dr. Siddharth S. 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
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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.

Scientist Profiles

Dr. Abhijeet B. Joshi
INSPIRE Faculty
Discipline: Biosciences & Biomedical Engineering
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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 TherapeuticsL 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 wellbeing. 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. Ajay Kumar Kushwaha
Inspire Faculty
Discipline: Metallurgy Engineering & Materials Science
ajaykk@iiti.ac.in

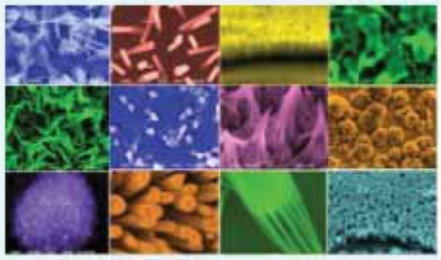
Dr. Kushwaha is a materials scientist, working in the area of design and synthesis of nanomaterials for energy devices. He received the M.Sc. degree in Physics (Electronics) from C.S.J.M. University, Kanpur, Uttar Pradesh, India, in 2006 and Ph.D. degree in Physics (Nanomaterials) from IIT Bombay in 2014.He is with IIT Indore since July 2016 working as an Inspire Faculty in the School of Engineering. Before joining IIT Indore, he worked as a Scientist-I in Institute of Materials Research and Engineering, A*STAR, Singapore from Feb 2014 to July 2016. He has published more than 43 research articles, 01 International Patent (Technology is licensed) and 01 book chapter.Dr. Kushwaha is life-member of Indian Physics Association (IPA), Electron Microscope Society of India (EMSI) and Luminescence Society of India (LSI).

His group is exploring new pathways to design and synthesize functional nanomaterials. He is interested in investigating the fundamental properties of various nanomaterials and fabrication of nanomaterials based devices. The main focus of his group is to develop the low cost, largescale and facile materials fabrication process for application in energy conversion devices andenergy efficient coatings. His group research can be categories in three sub-areas given as follows:

(1) *Nanomaterials Design, Growth and Fabrication of Devices:* (Design and Growth of Nanomaterials, Defects in Semiconductors and Optoelectronics Properties, Electro deposition and Electrochemical Sensors, and 2-D Materials Based Electronic Devices)

(2) *Energy Conversion Devices:* (Solar Energy Harvesting Using Earth Abundant Materials (Solar driven water splitting forhydrogen production and Quantum dot sensitized/ thin film solar cell), Mechanical Energy Harvesting, and Thermal Energy Harvesting)

(3) *Energy Efficient Coatings:* (Electrochromic Devices, and Multifunctional Coatings)



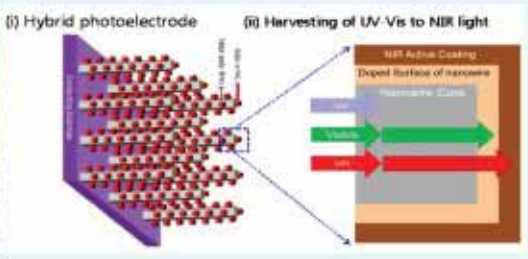


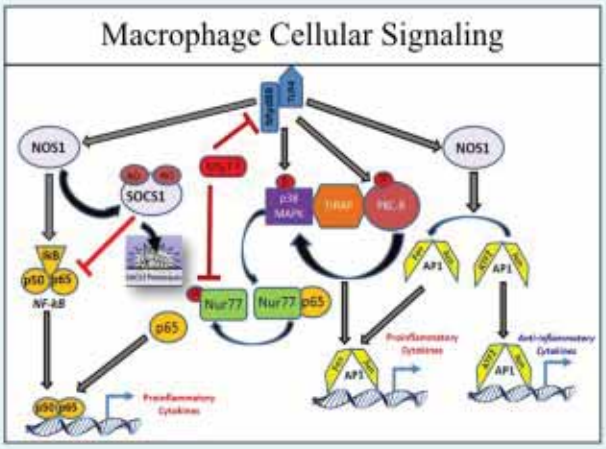
Fig1. Solution Grown ZnO NanostructuresFig2. Harvesting of Wider Spectrum of Solar Energy

Currently, his group is working in a DST funded sponsored research project on photo electrochemical (PEC) water splitting. Solar driven water splitting is an eco friendly and safer process to generate hydrogen and have good potential to resolve energy challenges by producing an environmental friendly fuel. We are exploring various earthabundant materials to develop photo electrode forsolar driven water splitting. The ZnO, TiO2, SnO2,CuO, Cu2O nanostructures, α-Fe2O3, graphenequantum dots, CZTS nano-crystal are few examples, to apply in PEC water. The aim of our research is to harvest the wide solar spectrum in whole UV to NIR wavelength range. Dr. Ajay group is also working on electrochemical biosensor in another project that is funded by IIT Indore- CSIR CEERI Pilani.

Research Group Webpage: http://kushwaha09.wixsite.com/ajay

Dr. Mirza S. Baig
Assistant Professor
Discipline: Biosciences & 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, USA. Currently, he is serving as an Assistant Professor 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. Dr. Baig has received multiple external funding from different Government bodies including DBT, DST, and CSIR. He has published several research articles in peer-reviewed international Journals. He has delivered talks in different National and International Conferences.



Dr. Parasharam M. Shirage
Associate Professor & Ramanujan Fellow
Discipline: Metallurgy Engineering & Materials Science and Physics
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.

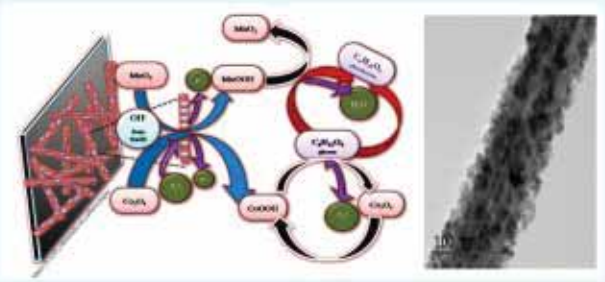


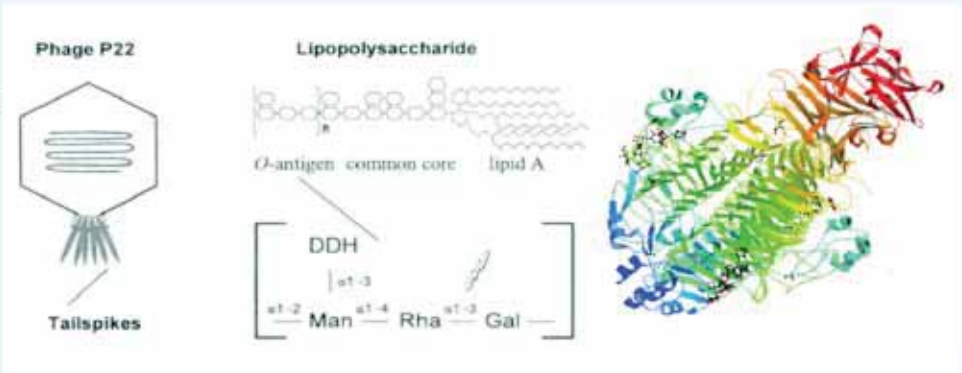
Fig. Mechanism of electrolytic oxidation of glucose on MnO2/Co3O4 hybrid nano structure in the presence of NaOH.

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 chemicals 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, also invented few new materials and origin of room temperature ferromagnetism in ZnO. 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 2 postdocs, 9 Ph. D. students and 7 master students at present. He has published more than 35 research papers from IIT Indore in highly reputed journals in last three years. 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. Parimal Kar
Ramalingaswamy Fellow
Discipline: Biosciences & Biomedical Engineering
parimal@iiti.ac.in

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



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. M. Tanveer
Ramanujan Fellow
Discipline:
Mathematics
mtanveer@iiti.ac.in

Dr. M. Tanveer (Ph.D: Jawaharlal Nehru University (JNU) New Delhi; Postdoctoral Research Fellow: Nanyang Technological University (NTU) Singapore) works on (i) early detection of human brain disorders diseases including Alzheimer, Epilepsy, sleep disorders disease etc. using machine learning techniques; (ii) developing optimization models and algorithms for parallel and non-parallel support vector machines. Dr. Tanveer received prestigious Ramanujan Fellowship in 2016 from Science and Engineering Research Board (SERB), Department of Science and Technology (DST), Government of India, and Early Career Research Award in 2017 from DST-SERB. He has appointed Editorial Review Board Member of Applied Intelligence, Springer. Dr. Tanveer is organizing two international events at IIT Indore. Details are following:

1. International symposium on computational mathematics, optimization and computational intelligence during July 17-19, 2017 under NTU-India connect program (http://cmoci.iiti.ac.in/).
2. International conference on machine intelligence and signal processing during December 22-24, 2017 (http://misp.iiti.ac.in/)

Dr. Tanveer's OPTIMAL research group focusses on two key areas:

(i) Early detection of Alzheimer's disease using machine learning techniques. Alzheimer's disease (AD) is the most common cause of cognitive disability and dementia. It is a major public health problem, with 35 million people affected today. This number is expected to reach 115 million cases in 2050. The cost of care is evaluated to approximately USD 600 billion worldwide. Early and accurate diagnosis of AD is crucial in order to enhance care for patients and for the development of new treatments. However, AD is currently under-diagnosed and most patients have not received a precise diagnosis.

The current criteria for the inclusion of patients in clinical trials may thus not be sufficient for the discovery of disease-modifying treatments. Recently, neuroimaging has emerged a powerful tool to identify patients with AD. Multiple modalities allow measuring various types of alterations: magnetic resonance imaging (MRI) tracks atrophy caused by neurodegeneration, positron emission tomography (PET) allows measuring the presence of amyloid plaques and hypometabolism. However, powerful analysis tools are needed to fully exploit this multimodal data. In this context, machine learning approaches are particularly promising in order to design systems that can accurately classify patients with AD and predict their evolution. Machine learning approaches have been successfully applied to the individual classification of different neurological and psychiatric conditions such as Alzheimer disease, fronto-temporal dementia, autism and Parkinsonian syndromes.

(ii) To develop novel optimization models and algorithms for non-parallel support vector machines for the analysis and classification of large scale benchmark datasets including human brain disorders disease datasets. The performance of the developed algorithm will be compared with the existing algorithms using several measures; classification accuracy, sensitivity, specificity, computational complexity and Matthews correlation coefficient etc. Signal processing based methods together with novel machine learning algorithms can be used for automated diagnosis of brain disorders diseases on EEG signals. In the first phase, we are developing optimization models and algorithms for non-parallel support vector machines, and apply on the realworld benchmark datasets. Next, we use signal decomposition based methods for extracting features, and these extracted features will be provided as an input to developed classification systems in order to have better classification accuracy.

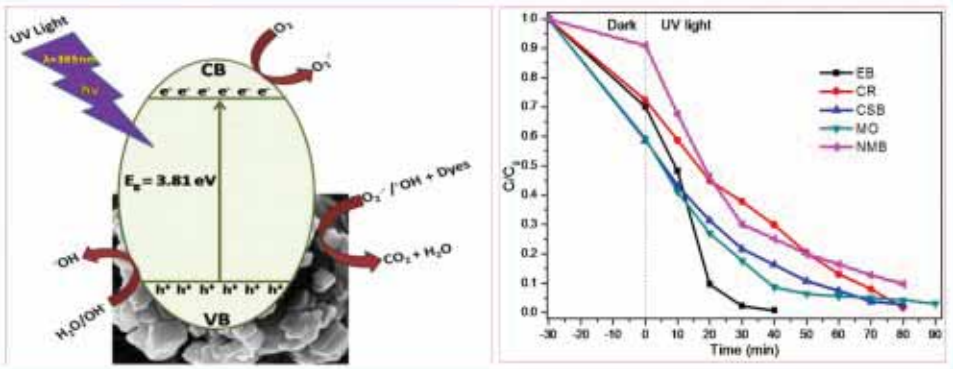
Investigator-
Dr. Archana Chaudhary
Discipline of Chemistry
archana@iiti.ac.in

Design and development of metal/metal oxides nano particles and their catalytic applications

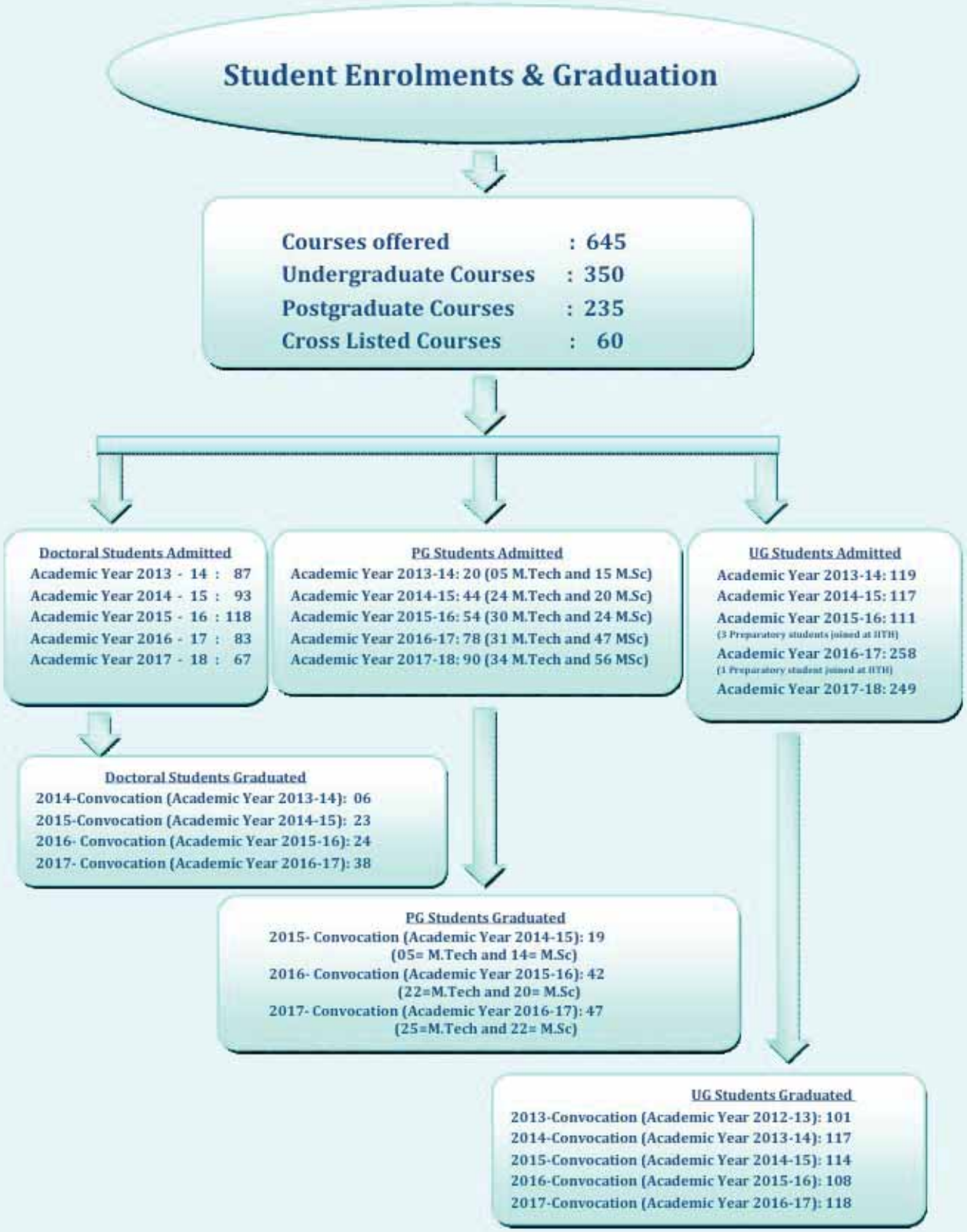
We have synthesized ZnAl2O4 nanoparticles using a single source molecular precursor (SSMP) which contains a preformed Zn-O-Al bond. This SSMP facilitates the formation of phase pure ZnAl2O4 nanoparticles instead of a mixture of two phases.

After careful evaluation of physical properties of this catalyst using PXRD, SEM, TEM, BET etc., We explored it for the photocatalytic degradation of industrial dyes.

The catalyst showed excellent degradation efficiency for anionic dyes due to positively charged surface of the catalyst.



Student Statistics



PhD Students (Graduated 2016-17)

S. No.	Roll No.	Discipline	Name	PhD Thesis Title [Thesis supervisor(s)]
1	11113109	Chemistry	Veenu Mishra	Investigation of Structurally Diversified Homo and Heterometallic Complexes **(Dr. Shaikh M. Mobin and Prof. Pradeep Mathur)**
2	12110311	ME	Yogesh Singh	Performance Investigations on Mechanical Design and Motion Control of Planar Parallel Manipulators **(Dr. M. Santhakumar)**
3	11116101	HSS (English)	Jaya Shrivastava	Perspective Development in the Novels of Colson Whitehead: A Cognitive Narratological Approach **(Dr. Amarjeet Nayak and Dr. Joe Verghese)**
4	11113101	Chemistry	Anvita Srivastava	Development of Novel Methodolgy for the Synthesis of an Important Class of Functionalized Indoles and Related Heterocyclic Scaffolds **(Dr. Sampak Samanta)**
5	11120303	ME	Manish Rawat	Investigation of joint decision making in fleet system reliability design and maintenance planning **(Dr. Bhupesh Kumar Lad)**
6	11125102	Physics	Najimuddin Khan	Exploring Extensions of the Scalar Sector of the Standard Model **(Dr. Subhendu Rakshit)**
7	1301102005	EE	Pankaj Kumar Sharma	Performance Analysis of Cooperative Cognitive Spectrum Sharing Systems over Fading Channels **(Dr. P.K. Upadhyay)**
8	1301102007	EE	Rajeev Sharma	Automated Identification Systems Based on Advanced Signal Processing Techniques Applied on EEG Signals **(Dr. Ram Bilas Pachori)**
9	11110201	EE	Anubha Bilgaiyan	Investigations on the influence of ZnO nanostructures on ZnO/P3HT based Hybrid Photodetectors **(Dr. Vipul Singh)**
10	12110202	EE	Ashish Kumar	Optimization of Hydrothermally Grown ZnO Nanorods Network towards UV Sensitive FET Applications **(Dr. Vipul Singh)**
11	11123104	Chemistry	Jadhav Thaksen Vasant	Tetraphenylethylene Luminogens: Design, Synthesis and Applications **(Dr. Rajneesh Misra)**
12	12123108	Chemistry	Rohit Kumar Rai	Development of Nanoparticle Based Heterogeneous Catalysts for Important Organic Reactions **(Dr. Sanjay Kumar Singh)**

13	12110212	EE	Vishnu Awasthi	Investigation of Heterojunction Interface of CIGSe/doped ZnO for Solar Cell Applications **(Dr. Shaibal Mukherjee)**
14	11120202	EE	Bhupendra Reniwal	Variability Aware Design of SRAM in Conventional & Non-Conventional MOS Technologies: A Sense Amplifier Perspective **(Dr. S.K. Vishvakarma)**
15	11123101	Chemistry	Anupam Das	Liposome-DNA/Protein Interactions: Impacts on Anticancer Drug Molecules **(Dr. Anjan Chakraborty)**
16	12116103	HSS (English)	Bijaya Kumar Sethi	Caste, Gender and the Aesthetics of Experience in Dalit Autobiographical Narratives: A Dalit Literary Perspective **(Dr. Amarjeet Nayak)**
17	12123112	Chemistry	Deepika	Design, Synthesis and Characterization of Arene-Ru(II) Complexes Based on Nitrogen Donor Ligands: Catalytic Reactions and Mechanistic Investigations **(Dr. Sanjay Kumar Singh)**
18	11126101	HSS (Economics)	Sanjaya Kumar Lenka	Financial Development, Financial Inclusion and Economic Growth: Empirical Evidence from India **(Dr. Ruchi Sharma)**
19	11114101	Maths	Manas Ranjan Mohapatra	Geometric Properties of the Cassinian Metric **(Dr. Swadesh Kumar Sahoo)**
20	11113108	Chemistry	Shivendra Singh	Development of Metal-Free Based One-Pot Synthetic Protocol for the Facile Constructions of Indole and Coumarin Based Fused Heterocyceles **(Dr. Sampak Samanta)**
21	11123102	Chemistry	K Maruthi	Synthesis and Self-assembly Study of Hybrid Peptide Foldamers for the Development of Functional Supramolecular Architectures **(Dr. Apurba K. Das)**
22	1301202010	EE	Rangeet Mitra	Nonlinear Signal Processing for Visible Light Communications **(Dr. Vimal Bhatia)**
23	12127102	BSBE	Arpita Tawani	Structural and Molecular Insights of Naturally Available Small Molecule Modulators for their Anti-Cancer Activity via Targeting G-Quadruplex DNA **(Dr. Amit Kumar)**
24	1301202006	EE	Manish Mandloi	Detection Algorithms for Multiple-Input Multiple-Output Wireless Communication Systems **(Dr. Vimal Bhatia)**

25	12110211	EE	Tejendra Dixit	Investigations on the Effect of Surface Plasmon Resonance Towards Performance Improvement of Hydrothermally Grown $ZnO/ZnCr_2O_4$ Nanostructures Based Optoelectronic Devices
				(Dr. Vipul Singh and Dr. I.A. Palani)
26	11110302	ME	Kadam Sambhaji Tanaji	Studies on Heat Transfer in Microchannel **(Dr. Ritunesh Kumar)**
27	12113104	Chemistry	Manoj Kumar Manna	Supramolecular Construction of Optoelectronic π-Conjugated Peptide and Peptide-Inorganic Hybrid Materials **(Dr. Apurba K. Das)**
28	1301131003	Chemistry	Chandan Adhikari	Stimuli Responsive Drug Delivery Systems Composed of Biocompatible Materials for the Controlled Delivery of Chemotherapeutic Drugs **(Dr. Anjan Chakraborthy)**
29	1301202008	EE	Nagendra Kumar	Performance Analysis of Cooperative Relay Network for QAM Signals under Various Fading Channels **(Dr. Vimal Bhatia)**
30	1301231002	Chemistry	Arup Mahata	Atomic Scale Designing of Materials for Low-Temperature Fuel Cells **(Dr. Biswarup Pathak)**
31	1301202003	EE	Deepika Gupta	Analysis of Charge Trap NAND Flash Memory forImproved Reliability **(Dr. S.K. Vishvakarma)**
32	11123103	Chemistry	Sonam Mandani	Fluorescent Carbon dots and their Composites for Multifunctional Applications **(Dr. Tridib Kumar Sarma)**
33	12115109	Physics	Hari Mohan Rai	Observation, Evidence and Origin of Magnetodielectric Effect in Mn/Fe Doped LaGaO3 **(Dr. P.R. Sagdeo and Dr. Rajesh Kumar)**
34	12110203	EE	Deblina Biswas	Development of Photoacoustic Spectral Response Technique for Biomedical Applications **(Dr. S. Vasudevan)**
35	1301103009	ME	Shiva S	Laser Additive Manufacturing of Bulk Shape Memory Alloy Structures: Numerical Modeling and Experimental Investigation **(Dr. I.A. Palani and Dr. C.P. Paul)**
36	1301202004	EE	Devendra Singh Gurjar	Performance Analysis of Two-Way Relaying with MIMO and D2D Communications **(Dr. P.K. Upadhyay)**
37	1301102004	EE	Karthik Thirumala	Power Quality Monitoring in Emerging Power Systems Using Adaptive and Intelligent Techniques **(Dr. Amod C. Umarikar and Dr. Trapti Jain)**
38	12120304	ME	Vinod Kumar Singh	The Measurement of CO2 Adsorption Isotherms and Kinetics of Activated Carbons Suitable for the Development of CO2 based Adsorption Cooling Systems **(Dr. E. Anil Kumar)**

Awards and Recognition

5th Convocation 2017: Recipients of Medals and Awards

PRESIDENT OF INDIA GOLD MEDAL

Mr. Chaware Ketan Uday
B Tech (CSE)
Roll No. 130001009

Institute Silver Medal For Undergraduate Programs

Mr. Aishwary Gagrani
B Tech (CSE)
Roll No. 130001004

Mr. Ritesh Modi
B Tech (EE)
Roll No. 130002032

Mr. Vivek Khokhar
B Tech (ME)
Roll No. 130003039

Institute Silver Medal For Postgraduate Programmes

Mr. Vijay Choyal
MTech (Production and Industrial Engineering)
Roll No. 1502103009

Best B.tech. Project Award Certificate

Mr. Akash Kumar Jain
B Tech (ME)
Roll No. 130003005

Mr. Karmarkar Gaurav Abhay
B Tech (ME)
Roll No. 130003019

Mr. Jadhav Aniket Sandip
B Tech (ME)
Roll No. 130003018

Project title: "Shape memory alloy actuated micro-flapper for micro aerial robot"

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 in all areas of Science, Engineering and Humanities and Social Sciences. The institute has the highest h-index among all new IITs. Total 193 externally funded research projects are secured by IIT Indore since its inception, currently we are successively doing research on 127 funded projects and for the year 2016-17 the Institute has secured 40 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. 21.28 Crore. International projects with several countries namely Brazil, Russia, UK, Tunisia, Germany and Poland have been approved under various collaboration schemes in the last year. Besides this, faculty members have been successful in securing several international fellowships/awards for joint research work.

The institute has conducted 22 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 in running a number of sponsored and consultancy projects. These projects aimed at jointly develop technologies for the challenges being faced by participating industrial partners.

IIT Indore has consciously 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 7th 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 inaugurated the Start-up Centre on August 15, 2017 which is a part of Centre for Innovation and Entrepreneurship (CIE). Other constituents of CIE are Industry Relation Cell, Innovation and Entrepreneurship Development Centre (IEDC) (supported by DST), Student Entrepreneurship Support Cell (SESC) and ENACTUS. Since inception IEDC has supported 15 student projects and several patent applications have been filed out of these projects. In addition, two start-up companies have been incubated at the start-up Centre at IIT Indore.

Publication Statistics

No. of Journals /conferences / Book Chapters/ Books

Sl.	Name		Designation	Discipline/ Center	2009	2010	2011	2012	2013	2014	2015	2016	2017	**Total**
1	Dr.	Prashant Kodgire	Associate Professor	BSBE				1	1			1	1	**4**
2	Dr.	Amit Kumar	Associate Professor	BSBE							2	5	2	**9**
3	Dr.	Sharad Gupta	Assistant Professor	BSBE +MEMS					3	1	2	2	1	**9**
4	Dr.	Debasis Nayak	Assistant Professor	BSBE						1	2	2		**5**
5	Dr.	Abhijeet Joshi	Inspire Faculty	BSBE								2		**2**
6	Dr.	Chelvam Venkatesh	Assistant Professor	BSBE								3		**3**
7	Dr.	Mirza S. Baig	Assistant Professor & Ramalinga swami Fellow	BSBE							1	6	2	**9**
8	Dr.	Sarika Jalan	Associate Professor	BSBE								15		**15**
9	Dr.	Hem Chandra Jha	Assistant professor	BSBE									3	**3**
10	Dr.	Parimal Kar	Ramalinga swamy Fellow	BSBE									1	**1**
11	Dr.	Mohammad Mobin Shaikh	Associate Professor	BSBE				1	9	16	2	44		**72**

12	Dr.	Kiran Bala	Assistant Professor & Inspire Faculty	BSBE						3		7	4	**14**
13	Dr.	Kapil Ahuja	Assistant Professor	CSE						1	2	4	1	**8**
14	Dr.	Gourinath Banda	Associate Professor	CSE								2	2	**4**
15	Dr.	Somnath Dey	Assistant Professor	CSE					1	3	3	3		**10**
16	Dr.	Neminath Hubballi	Assistant Professor	CSE						2	5	7	3	**17**
17	Dr.	Bodhisatwa Mazumdar	Assistant Professor	CSE									5	**5**
18	Dr.	Surya Prakash	Assistant Professor	CSE						2	4	6	1	**13**
19	Dr.	Anirban Sengupta	Assistant Professor	CSE					5	15	25	17	13	**75**
20	Dr.	Abhishek Srivastava	Assistant Professor	CSE						10	2	5	1	**18**
21	Dr.	Aruna Tiwari	Associate Professor	CSE					3	12	6	14		**35**
22	Dr.	Tridib Kumar Sharma	Assistant Professor	Chemistry		1		1	2	2	2	1	3	**12**
23	Dr.	Rajneesh Misra	Associate Professor	Chemistry				3	12	14	4	7	8	**48**
24	Dr.	Anjan Chakraborty	Associate Professor	Chemistry			2	2	2	5		4	1	**16**
25	Dr.	Apurba Kumar Das	Associate Professor	Chemistry		1		2	3	8	6	8	1	**29**
26	Dr.	Suman Mukhopadhyay	Associate Professor	Chemistry		1			3	4	3	5	5	**21**

27	Dr.	Sampak Samanta	Associate Professor	Chemistry				2	5	3	3	9	2	**24**
28	Dr.	Tushar Kanti Mukherjee	Associate Professor	Chemistry					2	4	2	6		**14**
29	Dr.	Mohammad Mobin Shaikh	Associate Professor	Chemistry				1	54	66	42	44	10	**217**
30	Dr.	Satya Silendra Bulusu	Assistant Professor	Chemistry					2		1	2	3	**8**
31	Dr.	Sanjay Kumar Singh	Associate Professor	Chemistry + MEMS					2	3	4	8	4	**22**
32	Dr.	Biswarup Pathak	Associate Professor	Chemistry				3	14	6	1	22	10	**56**
33	Dr.	Chelvam Venkatesh	Assistant Professor	Chemistry				2	4	1	1	4		**12**
34	Dr.	Pradeep Mathur	Professor	Chemistry		7	5	8	5	11	1	4		**41**
35	Dr.	Amod C. umarikar	Associate Professor	EE				1	1	1	3	4		**10**
36	Dr.	Ram Bilas Pachori	Associate Professor	EE		5	7	5	10	11	20	11	26	**95**
37	Dr.	Santosh Kumar Vishvakarma	Associate Professor	EE+ MEMS			2	4	14	6	15	17	11	**69**
38	Dr.	Shaibal Mujherjee	Associate Professor	EE	N A		2	4	14	10	11	15	11	**67**
39	Dr.	Vipul Singh	Associate Professor	EE + MSE			1		14	9	10	6	14	**54**
40	Dr.	Abhinav Kranti	Associate Professor	EE			2	7	8	7	9	8	7	**48**

41	Dr.	Srivathsan Vasudevan	Assistant Professor	EE							1		3	**4**
42	Dr.	Anbarasu M	Associate Professor	EE				1		1		3		**5**
43	Dr.	Prabhat Kumar Upadhyay	Assistant Professor	EE				1	4	4	4	14	10	**37**
44	Dr.	Trapti Jain	Associate Professor	EE					1	9	5	4	6	**24**
45	Dr.	Vivek Kanhangad	Associate Professor	EE					1	1	2	3		**7**
46	Dr.	Vimal Bhatia	Associate Professor	EE					1	5	17	36	21	**80**
47	Dr.	Mukesh Kumar	Assistant Professor	EE								1	4	**5**
48	Dr.	Pritee Sharma	Associate Professor	HSS				4	6	3	6	4		**23**
49	Dr.	C. Bharath Kumar	Associate Professor	HSS	4	1	1	1		2		7	3	**19**
50	Dr.	Chidella Upendra	Associate Professor	HSS			1	3	6	6	2	2		**20**
51	Dr.	Ruchi Sharma	Associate Professor	HSS	2		1	4	1	2	4	10	4	**28**
52	Dr.	Amarjeet Nayak	Assistant Professor	HSS			2	2	3	3		3		**13**
53	Dr.	Premjit Sanjram Khanganba	Assistant Professor	HSS					4			1		**5**
54	Dr.	Nirmala Menon	Associate Professor	HSS				1	2	8	6	3	3	**23**

55	Dr.	Neeraj Mishra	Assistant Professor	HSS		1	1				1	1	2	**6**
56	Dr.	Anand Parkash	Assistant Professor	Mathematics							1			**1**
57	Dr.	Swadesh Kumar Sahoo	Associate Professor	Mathematics					1	6	2	4	2	**15**
58	Dr.	S.K. Safique Ahmad	Associate Professor	Mathematics		2	1	1			1	2		**7**
59	Dr.	Vijesh Antony	Associate Professor	Mathematics						1		5		**6**
60	Dr.	Niraj Kumar Shukla	Assistant Professor	Mathematics						2	1	1	3	**7**
61	Dr.	Md. Aquil Khan	Associate Professor	Mathematics						1	5	2	1	**9**
62	Dr.	Ashisha Kumar	Assistant Professor	Mathematics						1		1		**2**
63	Dr.	Ashok Kumar	Assistant Professor	Mathematics								2		**2**
64	Dr.	M. Tanveer	Ramanujan Fellow	Mathematics									2	**2**
65	Dr.	Vijay Kumar Sohani	Assistant Professor	Mathematics										**0**
66	Dr.	Santanu Manna	Visiting Assistant Professor	Mathematics										**0**
67	Dr.	Charitha Cherugondi	Visiting Assistant Professor	Mathematics										**0**
68	Dr.	Anand Parey	Associate Professor	ME			1	4	2		8	9		**24**

69	Dr.	Ritunesh Kumar	Associate Professor	ME			1	1	3	8		2	2	**17**
70	Dr.	Santosh Kumar Sahu	Associate Professor	ME		1		4	15	15	14	14	8	**71**
71	Dr.	Neelesh Kumar Jain	Professor	ME		6	6	7	14	14	9	17	9	**82**
72	Dr.	Anil Kumar Emadabathuni	Associate Professor	ME			3		3	5	6	12	9	**38**
73	Dr.	Satyajit Chatterjee	Assistant Professor	ME				2			1	1	7	**11**
74	Dr.	Bhupesh Kumar Lad	Associate Professor	ME			1		4	2	7	15	5	**34**
75	Dr.	Kazi Sabiruddin	Associate Professor	ME+ MEMS					1		1	5	3	**10**
76	Dr.	Palani Iyamperumal Anand	Associate Professor	ME + MEMS				7	9	4	9	16	15	**60**
77	Dr.	Mohan Santhakumar	Assistant Professor	ME				7	11	10	9	15		**52**
78	Dr.	Dhinakaran Shanmugam	Associate Professor	ME				1	1	3		3		**8**
79	Dr.	Devendra Laxmanrao Deshmukh	Assistant Professor	ME				1		2		2		**5**
80	Dr.	Shailesh I. Kundalwal	Assistant Professor	ME			1	2	6	7	5	6	2	**29**
81	Dr.	Subhendu Rakshit	Associate Professor	Physics						1	4	2	2	**9**
82	Dr.	Krushna Mavani	Associate Professor	Physics			1	1	3	4	2	1	1	**13**

83	Dr.	Ankhi Roy	Associate Professor	Physics			1	3	5	5	3	4	2	**23**
84	Dr.	Manavendra Mahato	Associate Professor	Physics			2	1		1		1		**5**
85	Dr.	Raghunath Sahoo	Associate Professor	Physics			1	15	14	10	26	53	13	**132**
86	Dr.	Sarika Jalan	Associate Professor	Physics			1	2	4	8	2	21		**38**
87	Dr.	Preeti Anand Bhobe	Associate Professor	Physics					1	0	3	5	4	**13**
88	Dr.	Rajesh Kumar	Associate Professor	Physics				1	1	7	1	16	8	**34**
89	Dr.	Pankaj R. Sagdeo	Associate Professor	Physics					2	7	2	20		**31**
90	Dr.	Sudeshna Bandyopadhyay	Associate Professor	Physics + MEMS				2	1	1		3	2	**9**
91	Dr.	Somaditya Sen	Associate Professor	Physics					1			5	10	**16**
92	Dr.	Parasharam M. Shirage	Associate Professor	MEMS					1	1	6	15	18	**41**
93	Dr	Ajay Kumar Kushwaha	DST Inspire Fellow	MEMS									3	**3**
94	Dr.	Biswarup Pathak	Associate Professor	MEMS								6		**6**
95	Dr.	Sanjay Kumar Singh	Associate Professor	MEMS								1		**1**
96	Dr.	Somaditya Sen & Dr. Parasharam Shirage	Associate Professor & Ramanujan Fellow	MEMS								4		**4**

97	Dr.	Umesh C. Chaube	Visiting Professor	Civil Engg									2	**2**
98	Dr.	Siddharth Savyasachi Malu	Associate Professor	Astronomy				2				2		**4**
99	Dr.	Abhirup Datta	Assistant Professor	Astronomy							2	5	1	**8**
100	Dr.	Prasant Samantray	Assistant Professor	Astronomy								2		**2**

Major Achievements / Awards / Milestones

Sl.	Name of the Faculty and Discipline	Major Achievements / Awards / Milestones
1.	Dr. Raghunath Sahoo Associate Professor, Physics	a) Guest Editor: Advances in High Energy Physics (2017). b) Member, ALICE (CERN, Switzerland) and CMB (GSI, Germany) Collaboration Boards. c) Member, ALICE-India, Management and Collaboration Board d) Referee (American, European Physics Journals).
2.	Dr. Ankhi Roy Associate Professor, Physics	a) Received DST-DAAD project, 2017-2019
3.	Dr. Sudeshna Chattopadhyay Associate Professor, Physics Adjunct Professor in -Discipline of Metallurgy Engineering and Materials Science (MEMS), -Centre for Biosciences and Biomedical Engineering (BSBE).	a) Appointed Guest Associate Editor of Materials Today: Proceedings (Elsevier) b) Invited Speaker in International Conference on Functional Nanomaterials (IC-FNM 2016)
4.	Dr. Krushna R. Mavani, Associate Professor, Physics	a) Appointed as Editorial Board Member of 'Heliyon'-The open access journal by Elsevier
5.	Dr. Rajesh Kumar, Associate Professor, Physics	a) Associate Editor in journal "Advances in Materials and Processing Technology" published by Taylor and Francis, UK
6.	Dr. Preeti A Bhobe, Associate Professor, Physics	a) Invited to contribute review article in the special section of Current Science that observed International Women's Day by publishing the scientific contributions of select women scientists working in India and celebrate their achievements.
7.	Dr. Sk. Safique Ahmad Associate Professor, Mathematics	a) Reviewer of American Mathematical Society

8.	Dr. Santanu Manna Visiting Professor, Mathematics	a) Awarded for "Dr. D.S. Kothari Postdoctoral Fellowship" from University Grants Commission, Govt of India, August 2016. b) Awarded for "National Post-Doctoral Fellowship (NPDF) from SERB, DST, Govt of India, May 2016. c) Got invitation as a Research Visitor in the Department of Applied Mathematics and Theoretical Physics (DAMTP) of the University of Cambridge, March 2017.
9.	Dr. Swadesh Kumar Sahoo Associate Professor, Mathematics	a) Appointed as Technical Editor of The Journal of Analysis, published by Springer.
10.	Dr. M. Tanveer Ramanujan Fellow, Mathematics	a) Appointed Member of Editorial Review Board, Applied Intelligence, Springer b) Received Early Career Research Award from Science and Engineering Research Board (SERB), Government of India
11.	Dr. Devendra Deshmukh Assistant Professor, HOD, Mechanical Engineering	a) Received project under special call on "Combustion" by SERB. Titled "Investigation of Biodiesel Spray in an Optical Diesel Engine"
12.	Dr. Neelesh Kumar Jain Professor, Mechanical Engineering	**a) Published two books** : (i) Kapil Gupta, **Neelesh Kumar Jain** and R.F. Laubscher **(2017) "Advanced Gear Manufacturing and Finishing: Classical and Modern Processes" (1st Edition)** Academic Press (USA). [ISBN 978-0-12-804460-5] (DOI: 10.1016/B978-0-12-804460-5) (ii) Kapil Gupta and **Neelesh Kumar Jain (2016) "Near Net-Shape Manufacturing of Miniature Gears by Wire Spark Erosion Machining"**Springer Pvt. Ltd. Singapore [ISBN: ISBN: 978-981-10-1562-5 (Print); 978-981-10-1563-2 (Online)] (DOI: 10.1007/978-981-10-1563-2) [Series ISSN 2195-0911]
13.	Dr. Santosh K. Sahu Associate Professor, Mechanical Engineering	a) Research article entitled "Experimental study on heat transfer characteristics of circular jet impingement boiling on the variety of structured copper surfaces in stagnation zone" by MayankModak, Vishal Nirgude, Avadhesh K. Sharma, S K Sahu, has been selected as qualified student award winner of the student paper competition in the 24th International Conference on Nuclear Engineering (ICONE24), USA, 2016. b) Research article entitled"Experimental Study on Structured Surfaces for Nucleate Pool Boiling Enhancement by Vishal Nirgude, Avadhesh K. Sharma, Mayank Modak, Santosh K. Sahu, is selected as qualified student award winner of the student paper competition in the 25th International Conference on Nuclear Engineering (ICONE25), Shanghai, China, 2017.
14.	Dr. Shanmugam Dhinakaran Associate Professor, Mechanical Engineering	a) Received funding of 24000USD from MHRD to conduct 3 GIAN Courses in the year 2016

15.	Dr. Bhupesh Kumar Lad Associate Professor, Mechanical Engineering	a) Received Hamied-Cambridge Visiting Lecture fellowship, University of Cambridge, International Strategy Office, Cambridge, UK, 2016. b) Received Best Technology Development Award, National Technical Institutes Competition 2016, Aditya Birla Group and ITP publishing. c) Received Best Student Project Demo award, Year: 2016, Category: Technology, Aditya Birla Group and ITP publishing. d) Appointed as Associate Editor for International Journal of Performability Engineering (IJPE), Totem Publisher, Inc, USA.
16.	Dr. I. A. Palani Associate Professor, Mechanical Engineering	a) Appointed as Editorial board Member for International journal of intelligent machines and robotics. b) Appointed as President SPIE student chapter for the year 2017-2018 by SPIE Head office, USA c) Project guided by Dr.I.A.Palani was awarded Best B.Tech project for the year 2015-2106 & 2016-2017. d) M.Tech project guided by Dr.I.A.Palani has received Best poster award in the international conference on emerging trends in Materials and manufacturing Engineering.
17.	Dr. E. Anil Kumar Associate Professor, Mechanical Engineering	a) Research scholar, Mr. Yogesh Madaria received a DST Travel grant to attend the World Hydrogen Energy Conference (WHEC 2016) at Zaragoza, Spain, June 13-16, 2016. b) Research scholar, Mr. Vinod Kumar Singh received a SERB international travel grant to attend and present research papers at the International Conference (IMPRES 2016) at Taormina, Sicily, Italy, October 23-26, 2016. c) Dr. Anil Kumar is serving as expert panel member for DST- CERI (Materials for Energy Storage, 2017).
18.	Dr. Mohan Santhakumar Assistant Professor, Mechanical Engineering	a) Received the SERB international travel grant for attending OCEANS 2016 at Shangahi. b) Received the Alexandar von Humboldt fellowship for 12 months.
19.	Dr. Shailesh I. Kundalwal Assistant Professor, Mechanical Engineering	a) Biography listed in Who's Who in America – Nov 2016. b) Awarded- Albert Nelson Marquis Lifetime Achievement Award, in recognition of broad field of Mechanics.
20.	Dr Umesh C Chaube, Visiting Professor, Civil Engineering	a) Nominated as Panel Expert for 23rd International Congress on Irrigation and Drainage by the International Commission on Irrigation and Drainage b) Emeritus Fellow at IIT Roorkee till June 30 ,2016 and Visiting Professor at IIT Indore from July 25, 2016 onwards.
21.	Dr. Kapil Ahuja Assistant Professor, Computer Science & Engineering	a) Successfully hosted the French Admissions Tour (organized by French Embassy) at IIT Indore, March 2017. b) Awarded Best Teacher for the year 2016 by IIT Indore, January 2017. This is the 3rd time Dr. Ahuja has received the best teacher

		award at IIT Indore. c) Successfully organized the first IIT Indore - TU9 research workshop at TU Berlin, Germany, November 2016. d) Enabled signing of MoU between IIT Indore and the following German institutes: TU Berlin, TU Dresden, LU Hannover, and Max Planck Institute in Magdeburg, November 2016. e) Successfully secured German Academic Exchange Service (DAAD) funding for a month long stay of PhD student (Mr. Navneet Pratap Singh) in TU Braunschweig, Germany, September – October 2016. f) Successfully secured Max Planck Society (MPG) funding for a month long stay of PhD student (Mr. Rajendra Choudhary) in Max Planck Institute in Magdeburg, Germany, September – October 2016. g) Successfully ran the GIAN (Global Initiative of Academic Networks) course "Linear and Nonlinear Systems, and Opt. with Appl. in Medical Imaging, Optimal Design, and Graphics" at IIT Indore, June-July 2016. Prof. Eric de Sturler from Virginia Tech was the course instructor. Invited for talk at Institute of Computational Mathematics, TU Braunschweig, Germany, June 2016
22.	Dr. Gourinath Banda Associate Professor, Computer Science & Engineering	a) Journal Publication "One IoT: an IoT protocol and framework for OEMs to make IoT-enabled devices forward compatible" in Journal of Reliable Intelligent Environments 2 (3), 131-144 (Nov 2016). b) Developed the OneIoT Protocol both V1 and V2. c) One invention about a process and product reported for patent filing this May2017. The invention is about Wheelchair that could be controlled via brain waves. d) In May 2017, a publication "" got accepted into Special Issue on "Advanced Methodologies and Challenges in Multimedia Data and Services in the Internet of Things" in the International Journal of Internet Technology and Secured Transactions. The title of this paper is "A Forward Compatible IoT Protocol and Framework Addressing Concerns due to Internet-outage". e) Organised a GIAN course titled "Basic Concepts andIssues in Big Data Management". The funding granted was about INR 800000. Course period: 3 Dec to 17 Dec 2017. Prof. Nicolas Spyratos, LRI, Uni. of South Paris, is the foreign expert faculty for the course. About 22 candidates attended this course from all over India;
23.	Dr. Somnath Dey Assistant Professor, Computer Science & Engineering	a) Best Paper Award for the paper entitled "Cloud Audit: A Data Integrity Verification Approach for Cloud Computing" in the 12th International Conference on Communication Networks (ICCN 2016), Bangalore, India, August, 2016.
24.	Dr. Neminath Hubballi Assistant Professor, Computer Science & Engineering	a) Nikhil Tripathi, Ph.D student of Dr. Neminath Hubballi participated in Sixth IDRBT Doctoral Colloquium held at IDRBT Campus Hyderabad. b) A new project under DST-UKIERI approved recently. c) Delivered an Invited Talk in "International Symposium on Green Technologies for Sustainable Development" held at Bagalkot Karnataka. Anuja Tayal Ph.D student of Dr. Neminath Hubballi offered internship at TRDDC Pune.

25.	Dr. Surya Prakash Assistant Professor, Computer Science & Engineering	a) Conducted a 10-days GIAN course tilled "Probabilistic models and Belief Propagation" from August 1 - 10, 2016.
26.	Dr. Anirban Sengupta Assistant Professor, Computer Science & Engineering	a) Awarded prestigious award 'Sir Visvesvaraya' Faculty Research Fellow (Awarded by Ministry of Electronics & IT) b) Awarded 'Best Research Paper Award 2017' by Indian Institute of Technology Indore. c) Awarded 'Excellent' ratings by expert committee of Department of Science & Technology (DST) based on the performance (output) in externally funded project in 2017. d) Appointed Associate Editor of IEEE Transactions on Aerospace & Electronic Systems in 2016. e) Appointed Guest Editor of IEEE Transactions on Consumer Electronics in 2016. f) Appointed Guest Editor of IEEE Transactions on VLSI Systems in 2016. g) Appointed Executive Editor of IEEE Consumer Electronics in 2016. h) Appointed Guest Editor of IEEE Access Journal in 2016. i) Awarded by IEEE Access Journal for research contributions in advancing engineering profession in 2016. j) Appointed Editor of Elsevier Microelectronics Journal in 2016. k) Appointed 'Program Chair ' of 36th IEEE International Conference on Consumer Electronics (ICCE), Las Vegas (Flagship conference of IEEE Consumer Electronics Society) in 2017. l) Appointed 'Program Chair ' of **15th IEEE International Conference on Information Technology (ICIT)** in 2016. m) Features in Top 10 Most Cited Researcher in 'Consumer Electronics' area (As per Google Scholar data) n) Features in Top 12 Most Cited Researcher in 'ASIC' area (As per Google Scholar data) Features in Top 25 Most Cited Researcher in 'High Level Synthesis area (As per Google Scholar data)
27.	Dr. Aruna Tiwari Associate Professor, Computer Science & Engineering	a) Joined as Associate Professor in Feb 2017. b) Funds approved from three government bodies for organizing three days NTU-India connect program (between IIT Indore & Nanyang Technological University Singapore) in coming July 2017. c) Organized One Day Research Workshop" & enabled to sign MOU with CSIR-Central Electronics Engineering Research Institute (CSIR-CEERI), Pilani on 16th September 2016. d) Conducted MHRD sponsored Global Initiative of Academic Networks (GIAN) Short Term Course (10 days) Title: Neural Network Learning Theory-Advanced Topics Expert speaker: Dr. Suresh Sundaram , Nanyang Technological University Singapore Course Schedule: July 06 - 15, 2016. Organized a one day Workshop on Nature Inspired Optimization Techniques & their Applications jointly organized with Soft Computing Research Society (SCRS), India on 3rd June 2016.

28.	Dr. Hem Chandra Jha, Assistant Professor, Bioscience and Bio – medical Engineering	a) Received Ramanujan fellowship and grant from DST for the period July 2016- June 2021. b) Received Extra Mural Funding from CSIR for the period May 2017- April 2020. c) Received Intra Mural Funding from IIT Indore- CEERI Pilani joint program for the period Jan 2017- Dec 2017.
29.	Dr. Abhijeet Joshi, INSPIRE Faculty, Bioscience and Bio – medical Engineering	a) Early Career Awarded given by SERB b) Project Grant from DBT
30.	Dr. Sharad Gupta Assistant Professor, Bioscience and Bio – medical Engineering	a) Appointed Guest Editor of Journal of Nanotechnology.
31.	Dr. Mirza S Baig Assistant Professor, Bioscience and Bio – medical Engineering	a) Travel Grant from Indian Council of Medical Research (ICMR), New Delhi, India for 19th International conference on inflammation (ICI 2017), Amsterdam, The Netherland (2017). b) Early Career Research Award from Department of Science and Technology, Government of India, New Delhi, India (2016). c) Outstanding Scientist Award for the contribution in the field of Immunology from the Centre for Advanced Research and Design CARD of Venus International Foundation, Chennai, India (2016). d) **CSIR EMR (2016-2019)** 28 lacs Council of Scientific and Industrial Research (CSIR), New Delhi, India. Title: Role of Macrophages in Alcoholic Liver Disease (ALD). e) **DST ECR (2016-2019)** 52 lacs Department of Science and Technology (DST), New Delhi, India Title: Role of neuronal nitric oxide synthase (NOS1) in the TLR4 triggered inflammatory response via the SOCS1p38AP1 signaling axis. f) **News coverage:** **2016** Dr. Baig's Interview by New York Academy of Science (NYAS). *http://www.nyas.org/AboutUs/AcademyNews.aspx?cid=b9fb7623a59649c3898d4c15585d71a7* **2017** Findings from School of Basic Science IIT Indore Provides New Data on Liver Diseases [Noncanonical role of matrix metalloprotease (MMP) in activation and..... *https://financial.org/Pages/NewsDetails.aspx?i=X7H5aGzBJvh1LwHFsfw4 Noklf%2B%2FyFFPY3PpquJkpDUY%3D*
32.	Dr. Parashram Shirage Associate Professor , Metallurgy Engineering and Materials Science	a) Materials Research Express (iop) international advisory board.
33.	Dr. Chelvam Venkatesh Assistant Professor, Chemistry	a) Invited Professors from Purdue University, USA, Prof. Kavita Shah, Illinois Wesleyan University, USA, Prof. Ram Mohan and University of Hamburg, Germany, Prof. Malte Brasholz under GIAN (Global Initiatives of Academic Networks) program to IIT Indore for lectures and probable joint research collaboration.

		b) Two Ph.D students working in my research group, Mr. Premansh Dudhe and Ms. Mena Asha were awarded Newton-Bhabha Research grant for performing part of their Ph.D thesis at Keele University, United Kingdom with Prof. Paul Roach for a period of 6-months. Board of Radiation and Isotope Technology, BARC has signed MoU with IIT Indore for joint Ph.D admission, research collaboration and training programs.
34.	Dr. Biswarup Pathak Associate Professor, Chemistry	a) Indo-Australia Early/Mid Career Research Grant from INSA, 2017
35.	Dr. Amod C. Umarikar Associate Professor Electrical Engineering	a) Received best research paper prize award 2017 of IIT Indore for the following paper - K. Thirumala; S. P. Maganuru; T. Jain; **A. Umarikar**, "Tunable-Q Wavelet Transform and Dual Multiclass SVM for Online Automatic Detection of Power Quality Disturbances," in IEEE Transactions on Smart Grid b) Member of a Technical Committee of National Power Electronics Conference 2017.
36.	Dr. Shaibal Mukherjee Associate Professor, Electrical Engineering	a) Recipient of prestigious **Bhaskara Advanced Solar Energy (BASE) Fellowship** under the program supported by **Department of Science and Technology**, Govt. of India, and the **Indo-U.S. Science and Technology Forum (IUSSTF).** b) **Young Researcher Award** to PhD student of Dr. Shaibal Mukherjee (Mr. Pankaj Sharma) for Outstanding Work presented in **3rd International Conference on Smart Materials and Structures, Orlando, Florida, USA**, 2017. c) Recipient of 2016 Outstanding Reviewer Awards for IoP Materials Research Express. Recipient of **Young Faculty Research Fellowship (YFRF)** under Visvesvaraya PhD Scheme for Electronics and IT, Department of Electronics and Information Technology, Ministry of Communications and Information Technology, Government of India, 2016-2020.
37.	Dr. Vimal Bhatia Associate Professor, Electrical Engineering	a) Best Paper Award at IEEE ANTS, 2016 at IISc Bangalore. b) Best paper award at Optical Society of America's PHOTONICS, 2016 at IIT Kanpur. c) Best poster Award at OPTRONIX, 2016 at IEM Kolkata. d) Paper included in most downloaded articles in May 2017 in Optical Fiber Technology Journal. e) 13th most downloaded paper in July 2016, IEEE Photonics Journal. f) 11th most downloaded articles in April 2016, IEEE Photonic Technology Letters. g) MeitY's Sir Visvesvaray's Young Faculty Research Fellowship. h) DST-UKIERI Award.
38.	Dr. Prabhat Kumar Upadhyay Assistant Professor, Electrical Engineering	a) Best Technology Development Award 2017 by IIT Indore. b) Selected for Sir Visvesvaraya Young Faculty Research Fellowship under MeitY, Govt. of India.
39.	Dr. Ram Bilas Pachori Associate Professor, Electrical Engineering	a) Appointed Editor of IETE Technical Review Journal

40.	Dr. Bharath Kumar Associate Professor, Humanities and Social Sciences	a) Co-Coordinator for the paper 'Philosophy of Education' for UGC e- PG Pathasala project, 2016. b) Nominated as a speaker for the Symposium on 'Philosophical Methods' for the 92nd session of Indian Philosophical Congress scheduled to be held at Surat in January 2018. c) Edited a course material book for Yashwantrao Chavan Maharashtra Open University, Nashik, 2016. d) Resource Person for the Indian Council of Philosophical Research (ICPR) Workshop on the 'Works of Nietzsche' from 21-30 March, 2017 at ICPR, Lucknow Centre. He has conducted 6 sessions on various themes related to Nietzsche.
41.	Dr. Nirmala Menon Associate Professor, Humanities and Social Sciences	a) Became Academic Project Lead, KSHIP Multilingual Scholarly Publishing Portal. b) 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.
42.	Dr. Pritee Sharma, Associate Professor, Humanities and Social Sciences	a) Invited as speaker and Chair for technical session at "International Conference on Make in India: An Opportunity for Sustainable Entrepreneurship Development", held during February 16-17, 2017 at Bhopal.
43.	Dr. Ruchi Sharma Associate Professor, Humanities and Social Sciences	a) Received Best Paper Award for article titled, "Measuring Research Efficiency of Higher Academic Premier Technical Institutions of India: A Data Envelopment Analysis Based Malmquist Productivity Index Approach, during the conference on Management of Intellectual Property Rights and Strategy 2016, held at IIT Bombay from July 15-16 2016 b) Authored a Textbook on International Trade and International Business for Yashwantrao Chavan Maharashtra Open University (YCMOU), Nasik. c) Organized GIAN course on Intellectual Property Rights and International Economic Development with Prof. Walter G. Park, American University, Washington D.C. from December 12-16, 2016.
44.	Dr. Siddharth Malu Associate Professor, Astronomy	a) DST-SERB Grant for "C and L-Band Interferometer as Galaxy Cluster Observatory Pathfinder", 2017-2020, Rupees 83.77 lacs
45.	Dr. Abhirup Datta Assistant Professor Astronomy	a) DST-SERB Grant for "C and L-Band Interferometer as Galaxy Cluster Observatory Pathfinder", 2017-2020, Rupees 83.77 lacs. b) ISRO funded "Differential NavIC & GAGAN aided Inertial Navigation with Applications to Land, Air and Space Vehicles ", 2017-2019, Rupees 37.32 lacs. c) Awarded Visiting Associateship of Inter-University Centre for Astronomy and Astrophysics, from August 1, 2016 for next 3 years.
46.	Prof. Hari H. Hablani Visiting Professor Astronomy	a) ISRO funded "Differential NavIC & GAGAN aided Inertial Navigation with Applications to Land, Air and Space Vehicles ", 2017-2019, Rupees 37.32 lacs

Sophisticated Instrumentation Centre (SIC) A National Facility

Sophisticated instrumentation center (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 center 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, 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; 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 up to publication level.

Cambridge Structure Database searc`hing.

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 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.

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.

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

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

Nuclear Magnetic Resonance 400 MHz (NMR)

NMR spectrometer: Fourier transform 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

Gas Chromatography and Mass Spectrometer (GCMS)

It is a combined analyzer that has a superior ability in analyzing organic compounds qualitatively and quantitatively. It inherits the features of high resolution and accurate mass measurement with simple operation and high sensitivity.

Type of analysis :

- Ion detection MS
- GC-MS
- GC-FID
- GC_TCD
- NIST Library search
- Gaseous Sample Analysis

Surface Area Analyzer (BET)

Quanta chrome Autosorb iQ2 BET Surface Area & Pore Volume Analyzer is an instrument to determine the specific surface area of powders, solids and granules. Analyses: Single- and Multipoint BET (Brunauer, Emmett, and Teller) surface area, thickness,, pore area distributions (BJH method), pore volume, and pore surface area Langmuir surface area, Temkin and Freundlich isotherm analyses.

Physisorption

The Autosorb iQ2 can determine total BET surface area with remarkable sensitivity. Multi-point or single point measurements can be performed. Surface area of 0.01m2/g and upwards can be accurately determined using nitrogen at liquid nitrogen temperature.

Chemisorption

Some surfaces, especially catalysts, are sufficiently reactive to form chemical bonds with certain gases. In contrast to physisorption, chemical adsorption (chemisorption) involves the formation of strong bonds between adsorbate molecules and specific surface locations known as active sites. Chemisorption is thus used primarily to evaluate quantitatively the number of surface active sites which are likely to promote (catalyze) chemical reactions. Both static adsorption isotherms and dynamic pulse titrations yield monolayer uptake, metal area, nanocluster (crystallite) size and active metal area of heterogeneous catalysts. Isothermal results can be used to map surface energetic heterogeneity via heat of adsorption calculations.

Other Instruments with the facility:

- TGA/DSC, Mettler Toledo: It provides quantitative information on the composition and thermal stability of materials.
- Elemental Analysis, Thermo Scientific: Quantitative determination of carbon, hydrogen, nitrogen, oxygen and sulfur.
- LC-MS, Microtof-Q-II Bruker Daltonik: Identify the amount and type of chemicals present in a sample by measuring the mass-to-charge ratio.
- HPLC, Dionex: Separation of organic molecule with respect to retention time using combination of mobile phase.
- Cyclic Voltammetry, CH Instruments: It is used to study a variety of redox processes, to determine the stability of reaction products, the presence of intermediates in redox reactions, reaction and electron transfer kinetics, and the reversibility of a reaction.
- Lyophilizer, VirTis Benchtop K & Labconco: dehydration process typically used to preserve a perishable material or make the material more convenient for transport
- FT-IR, Bruker: sensitive technique particularly for identifying functional group of organic compounds in a whole range of applications.
- UV- Vis Spectrometer, Varian: For detection of impurities, structure elucidation of organic compounds, quantitative analysis, and qualitative analysis.
- Spectrofluorometer, Horiba: Based on fluorescent properties of some compounds it provides information regarding their concentration and chemical environment in a sample, metal ion detection, ion sensing and molecular probe
- TCSPC, Horiba: for sensing repetitive optical waveforms such as fluorescence time decay and the interaction of photon pulses with matter with picosecond time resolution and ultimate single photon sensitivity.
- Polarimeter, Rudolph: Identification of isomer based on optical activity of compounds.
- Circular Dichroism, Jasco: Observation of conformation changes in biological molecules as a function of temperature or of the concentration of denaturing agents.
- Contact Angle analyser, DataPhysics: It quantifies the wettability of a solid surface by a liquid via the Young equation.
- Rheometer, Anton Paar: device used to measure the way in which a liquid, suspension or slurry flows in response to applied forces.
- Langmuir-Blodgett Film Deposition System, Apex: For deposition of one or more monolayers of an organic material.
- Single Molecule Imaging Using Total Internal Reflection Fluorescence Microscopy, Nikon: exploits the unique properties of an induced evanescent wave or field in a limited specimen region immediately adjacent to the interface between two media having different refractive indices.

SCIENTIFIC PUBLICATIONS : +340 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
TIFR Hyderabad
Awadhesh Pratap Singh University, Rewa
University of Hyderabad, Telangana
Pondicherry University, Puducherry
Vikram University, Ujjain
Mewar University, Rajasthan
Raja Ramanna Centre for Advanced Technology (RRCAT), Indore

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
IPCA Ltd., Ratlam

International Academic Institutes:

Universität Stuttgart, Germany
Jehangirnagar University, Bangladesh
Dhaka University, Bangladesh

Dr. Shaikh M. Mobin
Incharge
Email: xray@iiti.ac.in

Sarita Batra
Instruments:
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
Instruments: LC-MS, HPLC, HRMS, GC-MS, FT-IR

Manish Kushwaha
Instrument: CD

Dr. Ravinder
Instrument: Confocal Microscope

Central Workshop

The Central Workshop is equipped with modern state-of-the-art instruments. Currently, the workshop is having seven sections, Glassblowing, Machining, Welding, Forming, Foundry, Plastic parts manufacturing, 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 scientists by facilitating 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 (IC 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 and staff under the guidance of Dr. Somaditya Sen, Workshop In-charge. A strong team effort supported by the motivation of the Workshop In-charge, 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. Facilities of fitting and carpentry sections were expanded in Jan-2017 to fulfill experimental requirements due to increased strength of B.Tech students.

Available facilities

- Precision Turning, Facing, Drilling, Boring, Tapping, Knurling.
- Surface and cylindrical grinding.
- Radial drilling
- Pedestal grinder.
- Vertical and Horizontal milling,
- Slotter.
- Injection moulding.
- Sheet shearing.
- Sheet bending.
- Deep drawing
- Wire drawing.
- Pipe bending.
- Arc welding.
- MIG/MAG welding
- Gas welding and brazing.
- Spot welding.
- Induction furnace.
- Fitting and carpentry shop.

Welding Section Activities

- Conduction of lab experiments (IC-156,ME-258).
- Fabrication of research testrig and supporting fixtures for research components.
- Welding related repairing of Transport vehicle.
- Welding realted work of other Dept./Section of institute.
- Fabrication of E-car, ATV, other for compititive event.

MIG/MAG welding

Arc welding

Spot welding machine

Drilling machine

Forming Section Activities

- Conduction of lab experiments (IC-156,ME-258).
- Sheet cutting, bending,drawing, pipe bending for reseacrh components and fabrication of E-car, ATV, other for compititive event.

Deep drawing machine

Sheet bending machine

Sheet shearing machine

Pipe bending machine

Foundry Section Activities

- Conduction of lab experiments (IC-156,ME-258).
- Heat treatment for research work

Induction furnace

Pit furnace

Machining Section Activities

- Conduction of lab experiments (IC-156,ME-355)
- Turning, facing, drilling, milling, grinding, thread cutting of components for research and for competitive event.

Lathe machine

Radial drilling machines

Vertical milling machine

Horizontal milling machine

Tool and cutter grinder

Surface grinder

Plastic Parts Manufacturing Section Activities

- Conduction of lab experiments (IC-156, ME-258)
- Research components

Injection moulding machine

Fitting and Carpentry Section Activities

- Conduction of lab experiments (IC-156, ME-258).
- Fabrication of reasearch components .
- Repairing and fabrication of wooden and other item on request of various Dept./Section of institute.

Carpentry vise, Wooden Cutting, Sawing

Fitting table, Vises and Table top grinder

Fabrication of ATV for SAE –BAJA-2017

A group of Mechanical Engineering students has fabricated ATV for SAE-BAJA2017 competition. The complete fabrication activities including welding, assembly, machining takes place inside by active participation of students & staff. The concept vehicle was then analyzed using various analysis software and specially developed program to optimize the vehicle design. The final vehicle was manufactured and assembled in the IIT-Indore workshop.

Fabrication work of ATV for BAJA SAE-2018 has already started for the next year's competition.

ATV fabricated in
Central Workshop
Event for BAJA SAE-2017

Fabrication of Robot for ROBOCON-2017

A group of Mechanical Engineering students has fabricated Robot for ROBOCON-2017 competition. Fabrication activities of Robot from cutting, drilling, welding and machining completed in Central Workshop.

← Robot fabricated for ROBOCON-2017

Fabrication of E-car

A group of Mechanical Engineering students started working on fabrication of battery operated car. Fabrication work of assembly components and fixtures are in the process in Central Workshop.

Central Workshop visits

Central Workshop facilities were visited by various school students from Simrol and Indore.

← Visit of school students to see workshop facilities -2017

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, and research scholars of the institute. Necessary tools and equipment for carrying out the glassware works are available and is augmented from time to time.

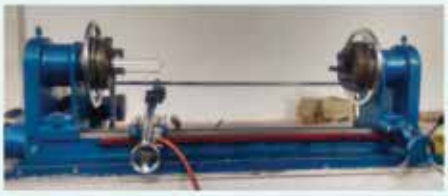
Laboratory Glassware prepared in the facility




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

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

Surface Grinding Machine

Counselling Cell

Counselling cell at IIT Indore is an integral part of IIT Indore since its inception in December,2011. Presently cell consists of a full time trained counselor Ms. Monika Gupta (M.Phil, Clinical Psychology, NIMHANS, Bangalore and a visiting consultant psychiatrist Dr. Ashutosh Singh (MBBS, DNB Psychiatry).

With a vision to enhance positive well being and facilitate overall development of IIT Indore student's community counselling cell closely works with office of Dean of student affairs, and office of Dean of academic affairs and student gymkhana. Cell's services are equally accessible to all the students (B.Tech, M.Tech/ M.Sc, Ph.D and any other course) of IIT Indore. Having the focus on prevention of mental health issues- prevention of suicide and chronic mental health problems, counselling cell works for early identification and early intervention for various mental health issues in students.

Counselor with Team of Student Mentors

Counseling cell undertakes various activities-

- Individual counselling sessions- supportive counselling, cognitive behaviour therapy with eclectic approach.
- Small group interaction with students having common concerns
- Creating a good liaison with various departments and services at the institute to facilitate the implementation of the intervention plan.
- Working towards creating a strong referral system as a basis for enhancing mental health services, where students are being referred by academic office, medical unit, faculty advisors, sports and security officers, wardens and hostel office, parents and friends, apart from walk in students who approach the counselor on their own.
- Facilitation of a meeting during orientation program involving fresher students and their parents, faculty advisors, student mentors.
- Peer tutoring and peer mentoring program.
- Greater support for students coming from underprivileged background- PwD
- Facilitation of various policies for students having academic concerns.
- Organises expert talk and activities to create awareness for mental health issues and enhancing positive well being.

Central Library

The Central Library started with a small number of books in 2009. The Collection Development activity gathered momentum in the year 2010. At present, the Library has a collection of31258 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, 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.

Library at a Glance:

Collection:

Books	E Journals	E Books	Print Journals	Magazines	Newspapers
31258	3320+	7600 approx.	03	26	09

Library Usage: (April 2016 to March 2017)

Books Issued	Reading Room Usage per month (Average)
20297	4000 users p.m. approx

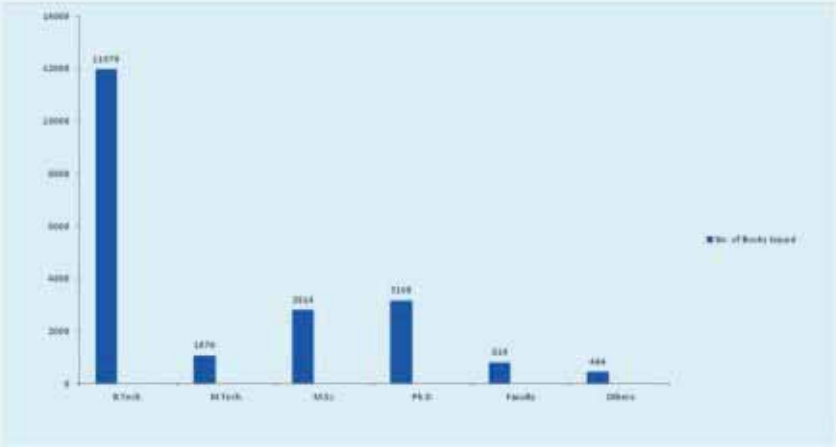


Figure 1. Book Issue Statistics-Category wise (Apr.2016 to Mar.2017)

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, access to electronic information resources is essential, particularly in an academic environment. The library has developed a collection of Electronic Resources which includes thousands of journal articles, research papers, books, and other resources. The E Resource collection of the library includes electronic journals in various disciplines published by reputed societies such asAmerican 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 and Springer are also 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 30 books for a semester + 10 books for 15 days.
- **Overnight Lending:** Overnight lending facility is provided to students who wish to borrow a book from the reserved section, or have crossed their entitlement limit. Books on overnight issue have to be returned by 9.30 a.m. the next day.
- **Claims/ Reservations:** Users can claim/ reserve books which are issued out. Claimed/ reserved books are kept in the Library for the user for 3 days from the date of return by the previous borrower, before they can be issued to the next claimant.
- **Renewals:** Books can be renewed only if there are no claims.
- **Reading Room:** The Library provides air conditioned and wi-fi enabled Reading Room with a seating capacity of 50 students in each of the three campuses. In addition to this, 40 PCs are kept in the reading room 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 arrangements and Document Delivery Services with institutes such as IIMIndore, RRCAT Indore, IIT Bombay, GSITS Indore, etc. Under this facility, access is provided to books or electronic materials which may be needed by users but is not available in our library.
- **Book Bank:** Under the Book Bank scheme, text books are provided to SC/ST students for the period of a semester.
- **Library Portal:** Detailed information about the Library can be accessed through the Library portal. It can be accessed at : http://library.iiti.ac.in/
- **Reprography Services:** Users are provided Photocopies or Printouts of library resources subject to the provisions of the Copyright Act.
- **Orientation Program:** 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:** The library provides originality reports to students on their assignments and papers, using Turnitin software.
- **Remote access to library resources:** The Library provides 24x7 access to its resources for the users of the library, using RemoteXs.

Library Automation

ILMS: The Library usesLibsys7, anIntegrated Library Management System (ILMS), for the automation of all its activities and services. The library is in the process of shifting to KOHA, an open source library management system. Users can check the Library collection by using the Web OPAC (Online Public Access Catalog).

CCTV Surveillance: The Library has installed high tech cameras for the surveillance of all its 3 campuses 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 implementation: RFID implementation is under consideration in the library.

QR Codes: The Library is using QR codes to provide quick access to users to the library website, library OPAC, and recommendation forms for books and journals.

Mobile app: A mobile app has been developed by the library to provide its users quick access to library resources and services.

Other Activities: The Library organizes various Training Programs/ Informative Sessions for E Resources and also for Print Resources.





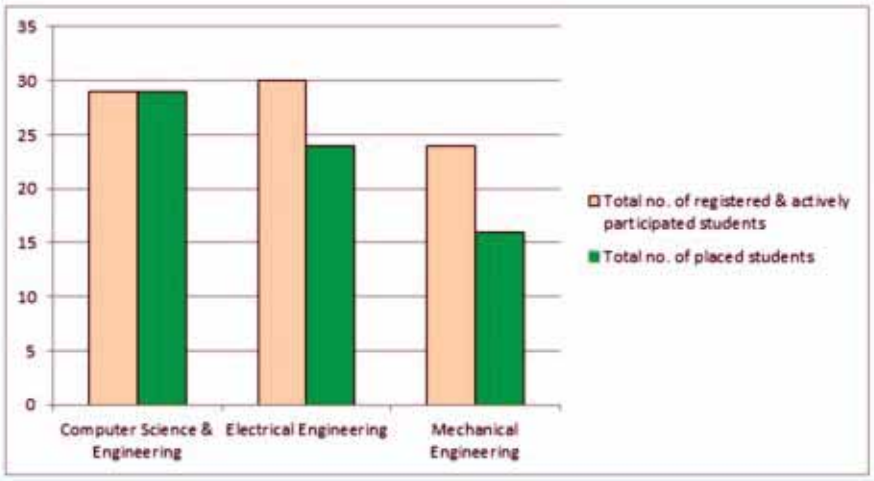
At present, the Library is functioning from two locations: Room No. 201 & 202, School Building; and Academic POD CSE 02. Users can avail of all services of the Library at both locations.

Placement Report (2016-17)

IIT Indore has achieved more than 80% placements in 2016-17 session. Most of the students, who were registered & actively participated for placements, were able to get attractive job offers. In this placement session, companies from various sectors visited IIT Indore which mainly includes Amazon, Microsoft, DE-Shaw, Arcesium, Works Applications, Directi, BookMyShow, Hyundai Motor, Go Jek, Strand Life Sciences, Codenation, Capgemini, Samsung R&D India, TCS, Infosys, Mahindra & Mahindra, L&T, ISRO, BPCL, TATA Motors, Bharat Forge, Tata Trusts, Ujaas Energy, Wipro, Reliance Jio, Evalueserve, United Health Group Ltd., MAQ Software, Futures First, Quantile Analytics etc.

The average salary package for B.Tech is 13.65 LPA w.r.t placed students and highest package received is 40 LPA, INR. In addition to above, no. of Internship offers have been increased in this placement session and among these Microsoft, Amazon, Wipro, Mentor Graphics, Works Applications, TCS, DE-Shaw, Arcesium offered attractive internships along with full time placements.

On the other hand, almost 10% students opted for higher studies at IIMs, IITs, and top-rated foreign institutions while many others have shown their interest to prepare for competitive exams. A few were also shown interest to start their own venture.



Placements Status

CSE Placements • CSE Others • EE Placements • EE Others • ME Placements • ME Others

Placement Statistics & Key Highlights for Session 2016-17 (B.Tech)

Particulars	No. of students in (CSE+EE +ME)	No. of students registered & actively participated for placement	No. of students placed	Placement percentage placed (%)	No. of companies visited	Average package (INR, LPA)	Range of salaries offered (In INR)	Highest Package Received/ Offered* (In INR)
Placement Session 2016-17	123	83	69	83.13	45	13.65	4.5 LPA to 40 LPA	40 LPA, INR International 29.5 LPA, INR (Domestic)

Placement details of PG & Ph.D students

Name of Student	**PG/Ph.D**	**Branch/Discipline**	**Company/Organization Name**
Akshay Verma	M.Sc	Physics	Ming Chi University of Technology
Yagnik Khushbu Nalinkant	M.Tech	Communication & Signal Processing	Secure Meters Limited
Anish Kumar Singh	M.Tech	Communication & Signal Processing	Ujaas Energy
Akash Laharia	M.Tech	Production & Industrial Engineering	Tata Trusts
Gaurav Kumar	M.Tech	Production & Industrial Engineering	Tata Trusts
Rahul Kashyap	M.Tech	Production & Industrial Engineering	Tata Trusts
Rahul Raj Khare	M.Tech	Material Science & Engineering	Tata Trusts
Rituraj Verma	M.Tech	Material Science & Engineering	Campus Students Communities Pvt. Ltd.
Inderpal Singh Pasrija	M.Tech	Material Science & Engineering	Innovative Clad Solutions Pvt. Ltd.
Harish Kumar Kotapally	Ph.D	Mathematics	Tata Trusts
Vikas Sharma	Ph.D	Mechanical Engineering	Amity University

Avana Report: IITI Student Social Outreach

Our progress from the academic year 2016-17

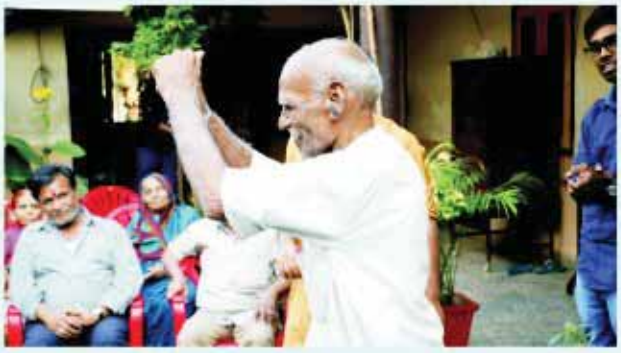
- Celebration of Children's day at the Sideras Orphanage which houses about 200 children.
- Celebration of Diwali with the elderly at an old age home.
- Organised a seminar on role of fundamental rights and duties in strengthening Democracy.
- Performed a series of cloth donation drives in the slums near Tejaji Nagar.
- Carried out a plantation drive and renovated the classroom walls at Simrol Govt School.
- Organised a vigilance awareness week at Simrol Govt School.
- Organised an annual blood donation camp in collaboration with M.Y. hospital and Model blood bank.
- Founded INSIGHT, an initiative by AVANA in collaboration with Rashtriya Avishkar Abhiyaan(RAA) and Unnat Bharat Abhiyaan(UBA) that focuses on conducting regular teaching sessions on weekdays along with the weekend sessions.
- Celebrated Independence Day at Simrol Govt School with an interactive quiz based on the theme of Independence.

Besides these we have other programmes too

PATHASHALA : An innovative concept that helps in improving the quality of education by providing video lectures. The students of IIT Indore are also working on a projector that costs low and can be operated without a personal computer.

INSIGHT : -described above-

Here are a few pics from our work :



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 include 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.

SESC has been able to reach new heights with setting up of Centre for Innovation and Entrepreneurship. The Centre now hosts SESC, Enactus, DST supported IEDC, MHRD-DST supported Startup Centre, and Industry Relations. This year also saw setting up of IIT Indore's incubation facility with two of IIT Indore's alumni startups as first hosts.

This year also saw launch of TEDxIITIndore chapter by organizing first event on March 26th of 2017 with a theme called "Impact". It was the most inspiring and thriving event for SESC. It saw huge participation from across the city as it was the first city wide TEDx event. We were happy to see youth participating in this kind of event. The theme "Impact" highlighted the influence of life changing critical moments in an individual's lifespan. It also extends to the effect of our work on other's lives. Circumstances in the life of a person define who he/she would grow up to be. Everyone has an impact on other's life in some way or the other. It depends on the attitude, motivation and ambition of the person which decide whether it would turn out to be a boon or bane to the society. Pushing the boundaries of innovation, creativity, art, music and innumerable other fields, "Impact" encourages everyone to have a positive effect on today's society. There have been many people who have sacrificed their lives for the welfare of the society. "Impact" is a tribute to all those benevolent souls which have made our planet a better place to live.

Sports & Yoga

Indian Institute of Technology Indore celebrated the International Day of Yoga on June 21, 2016 at its Permanent campus. On the occasion, two programmes were organized for IITI community as well as the nearby students of Govt. Sr. Secondary School Simrol (adopted by the institute). A Team of Parmanand Yoga Science and Research University Trust conducted sessions on both days.

On June 20, 2016 classroom sessions delivered by Mr. Ashutosh Upadhayay of Parmanand Yog Science and Research Trust conducted two sessions (One for the IITI community members and the other for the students and teacher of Govt. Senior Secondary School Simrol).

On June 21, 2016 Dr. Omanandand, an international renowned yoga guru (having widely travelled across 55 countries) and his team conducted practical session for around two hours from 0800 hrs to 1000 hrs. A book stall from Vivekananda Kendra was placed on the venue for benefit of the community members to facilitate purchasing of yoga literature.

During the event Dr. Omanand and his team conducted yoga and meditation session for the audience, all participated in the event with full enthusiasm and got benefitted. Total 155 members participated in the event of June 20, 2016 and around 275 persons attended the practical session on June 21, 2016.

It is worth to mention here that consequent upon the Government initiative to conduct Yoga every year, a Yoga and Fitness Club has been formed at the institute which is being manned by highly motivated team of PhD scholars of the institute, the list of the members of the Yoga and Fitness Club is as under:-

1. Mr. Debashis Panda, Mechanical Engineering, Secretary (Yoga)
2. Mr. Vishal Sharma, Mechanical Engineering, Joint Secretary (Fitness)
3. Mr. Sidheswar Panda, HSS
4. Mr. Prateek Jain, Electrical Engineering
5. Mr. Sayan Chaudhuri, Physics
6. Mr. Abhiram Panigrahi, Chemistry
7. Mr. Amitesh Kumar, Electrical Engineering
8. Ms. Suchi Smita Priyadarshan Behra

IIT Indore Sports Team participated in the Inter-IIT Sports Meet 2016 held at IIT Kanpur.

IITI Contingent at Inter-IIT Sports Meet 2016

Ms. Monika Meena (Mechanical 3rd year: 140003023) has won the **Gold Medal** (centre on podium) for IIT Indore at **women's shotput final** at Inter IIT Students' Sports Meet, 2016 held at IIT Kanpur.

The highlight of IITI team has been the **Gold Medal** won by **Mr. Rameshwar Dohare** (centre on podium) in the **Javelin Throw** event. He bettered his own personal best with a throw of 46.23 meters. What is even more striking is that his throw was a whopping 4 meters more than that of the silver medalist! He has already won 2 golds and 1 silver in this event in the last three Inter-IIT Sports meets.

The other highlight was the performance of the **Table Tennis** Team that reached the Semi Finals after defeating IIT Guwahati, IIT Mandi and IIT Gandhinagar on the way and narrowly lost the 3rd place match to IIT Delhi, in which Dr. Neeraj Mishra managed to win his singles match against the IIT Delhi player.

Among other memorable performances by IIT Indore were the **Cricket Team's victory** over IIT Madras and the Lawn Tennis Team's Singles Match win over IIT Madras in what was easily the longest tennis match of the tournament (about 150 minutes).

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 and Time**	**Venue**
Prof. Satishchandra Ogale	**Department of Physics and Centre for Energy Science, IISER Pune**	**Clean Energy Solutions via Novel Materials Design**	19th August, 2016 04:30 pm	SB-309, School Building
Seminars				
Speaker	**Affiliation**	**Title**	**Date and Time**	**Venue**
Prof. Ajit Mohan Srivastava	**Sr. Professor, Institute of Physics, Bhubaneswar, Odisha**	**Detection of Gravitational Waves a new window to the Universe.**	July 5, 2016 11:00 am	School Building Room No. 209, IIT Indore

Administration

1. General Administration:

1.1 About the Organization:

IIT Indore is an autonomous statutory organization functioning within the Institutes of Technology Act, 1961, as amended by The Institute of Technology Act, 2012. The IITs are administered centrally by the Council of IITs, the apex body established by the Government of India (GoI) to coordinate the activities of these Institutes. The Minister of Human Resource Development, GoI is the Chairman of the Council. Each IIT has a Board of Governors responsible for the overall governance, superintendence and control.

The Senate is the apex body of the institute which decides on academic policies and matters of the Institute, 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 periodically reviewed 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 Report.

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

1.2 Staff position:

As on 31st March, 2017, **94** no of faculty and **88** no of non-teaching staff were in the roll of IIT Indore. Their details are given in the table below;

Faculty members - **90**

Visiting Faculty - **04**

Group A Officers - **14**

Technical Staff - **34**

Other Administrative Staff - **40**

Number of faculty / staff members appointed during the year 2016-17 is as under:

Professors - **Nil**, Associate Professor **40**, Assistant Professor - **17**, Visiting Faculty - **04**, Non-teaching staff - **17**

No of faculty members relieved due to resignation or other reasons of separation - **01**

No of staff relieved due to resignation / other reasons - **05**

1.3. The list of faculty / staff appointed between 1st April, 2016 and 31st March 2017 are as under:

Sl. No.	Name of Employee	School / Discipline / Centre	Position / Designation	Qualification	Date of Joining
1.	Dr. Bharath Kumar	Humanities & Social Sciences	Associate Professor	Ph. D	06-06-2016
2.	Dr. Nirmala Menon	Humanities & Social Sciences	Associate Professor	Ph. D	06-06-2016
3.	Dr. Ruchi Sharma	Humanities & Social Sciences	Associate Professor	Ph. D	06-06-2016
4.	Dr. Pritee Sharma	Humanities & Social Sciences	Associate Professor	Ph. D	15-06-2016
5.	Dr. Anjan Chakraborty	Chemistry	Associate Professor	Ph. D	06-06-2016
6.	Dr. Sampak Samanta	Chemistry	Associate Professor	Ph. D	06-06-2016
7.	Dr. Biswarup Pathak	Chemistry	Associate Professor	Ph. D	06-06-2016
8.	Dr. Apurba K. Das	Chemistry	Associate Professor	Ph. D	07-06-2016
9.	Dr. Tushar Kanti Mukherjee	Chemistry	Associate Professor	Ph. D	14-06-2016
10.	Dr. Shaikh M. Mobin	Chemistry	Associate Professor	Ph. D	01-11-2016
11.	Dr. Pankaj R. Sagdeo	Physics	Associate Professor	Ph. D	06-06-2016
12.	Dr. Preeti Anand Bhobe	Physics	Associate Professor	Ph. D	06-06-2016
13.	Dr. Rajesh Kumar	Physics	Associate Professor	Ph. D	14-06-2016
14.	Dr. Antony Vijesh	Mathematics	Associate Professor	Ph. D	06-06-2016
15.	Dr. Amod C. Umarikar	Electrical Engineering	Associate Professor	Ph. D	06-06-2016

16.	Dr. Santosh Kumar Vishvakarma	Electrical Engineering	Associate Professor	Ph. D	06-06-2016
17.	Dr. Vipul Singh	Electrical Engineering	Associate Professor	Ph. D	06-06-2016
18.	Dr. Shaibal Mujherjee	Electrical Engineering	Associate Professor	Ph. D	13-06-2016
19.	Dr. Anbarasu M.	Electrical Engineering	Associate Professor	Ph. D	20-06-2016
20.	Dr. Santosh Kumar Sahu	Mechanical Engineering	Associate Professor	Ph. D	06-06-2016
21.	Dr. Shamugam Dhinakaran	Mechanical Engineering	Associate Professor	Ph. D	06-06-2016
22.	Dr. Ritunesh Kumar	Mechanical Engineering	Associate Professor	Ph. D	08-06-2016
23.	Dr. Anil Kumar Emadabathuni	Mechanical Engineering	Associate Professor	Ph. D	01-08-2016
24.	Dr. Bhupesh Kumar Lad	Mechanical Engineering	Associate Professor	Ph. D	12-01-2017
26.	Dr. Palani Iyamperumal Anand	Mechanical Engineering	Associate Professor	Ph. D	09-09-2016
27.	Dr. Amrendra K. Singh	Chemistry	Assistant Professor	Ph. D	03-06-2016
28.	Dr. Trapti Jain	Electrical Engineering	Associate Professor	Ph. D	21-02-2017
29.	Dr. Vivek Kanhangad	Electrical Engineering	Associate Professor	Ph. D	21-02-2017
30.	Dr. Aruna Tiwari	Computer Science & Engineering	Associate Professor	Ph. D	21-02-2017
31.	Dr. Gourinath Banda	Computer Science & Engineering	Associate Professor	Ph. D	21-02-2017
32.	Dr. Kazi Sabiruddin	Mechanical Engineering	Associate Professor	Ph. D	21-02-2017

33.	Dr. Shailesh Kundalwal	Mechanical Engineering	Assistant Professor (Regular)	Ph. D	21-02-2017
34	Dr. Parasharam Maruti Shirage	Metallurgy Engineering and Materials Science	Associate Professor	Ph. D	21-02-2017
35.	Dr. Prashant Kodgire	Biosciences & Biomedical Engineering	Associate Professor	Ph. D	21-02-2017
36.	Dr. Amit Kumar	Biosciences & Biomedical Engineering	Associate Professor	Ph. D	21-02-2017
37.	Dr. Mirza Saqib Baig	Biosciences & Biomedical Engineering	Assistant Professor (Regular)	Ph. D	21-02-2017
38.	Dr. Kiran Bala	Biosciences & Biomedical Engineering	Assistant Professor (Regular)	Ph. D	21-02-2017
39.	Dr. Hem Chandra Jha	Biosciences & Biomedical Engineering	Assistant Professor (Regular)	Ph. D	21-02-2017
40.	Dr. Sanjay Kumar Singh	Chemistry	Associate Professor	Ph. D	21-02-2017
41.	Dr. Sudeshna Chattopadhyay	Physics	Associate Professor	Ph. D	21-02-2017
42.	Dr. Sk. Safique Ahmad	Mathematics	Associate Professor	Ph. D	21-02-2017
43.	Dr. Swadesh Kumar Sahoo	Mathematics	Associate Professor	Ph. D	21-02-2017
44.	Dr. Mohammad Aquil Khan	Mathematics	Associate Professor	Ph. D	21-02-2017
45.	Dr. Vijay Kumar Sohani	Mathematics	Assistant Professor (Regular)	Ph. D	22-02-2017
46	Dr. Bodhisatwa Mazumdar	Computer Science & Engineering	Assistant Professor (Regular)	Ph. D	01-03-2017
47	Dr. Rupesh Shivaji Devan	Metallurgy Engineering and Materials Science	Assistant Professor (Regular)	Ph. D	28-03-2017

48	Dr. Vinod Kumar	Metallurgy Engineering and Materials Science	Assistant Professor (Regular)	Ph. D	30-03-2017
49	Mr. Swapnil Dasharath Sankhe	R & D Accounts	Deputy Manager (Accounts)	B.Com, CA Inter (Pass)	25-04-2016
50	Mr. Amit Kumar Mishra	BSBE	Deputy Manager (Lab)	B.Sc (BioTech), M.Sc (BioTech)	20-05-2016
51	Mr. P.K.Parthiban	Central Workshop	Manager (Technical) Glassblower	SSC, B.COM, Certification of Training Course in GlassBlowing	01-06-2016
52	Mr. Rameshwar Dohare	Chemistry	Lab Incharge / Office Incharge	SSC, HSC	24-06-2016
53	Mr. Nitin Upadhyay	Physics	Deputy Manager (Lab)	B.Sc, M.Sc, M.Tech	28-06-2016
54	Ms.Vinita Kothari	Chemistry	Deputy Manager (Lab) (On Contract- On Scale)	B.Sc, MBA	29-06-2016
55	Mr. Jitendra Verma	Mathematics	Lab Incharge / Office Incharge	BA	19-07-2016
56	Mr. Sachin Laxman Bhirodkar	ME	Deputy Manager (Lab)	B.E.(Mech), M.Tech	19-09-2016
57	Ms. Kriti Jain	Library	Manager (Library)	B.Com, B.Lib Isc, M.Lib. Isc DCA,PGDCA	14-10-2016
58	Mr. Kapil Kumar Gupta	Library	Manager (Library)	BCA, BLiSC, MLiSC	07-11-2016
59	Mr. Murali B	EE	Deputy Manager (Lab)	B.Tech (EE), M.Tech	28-11-2016
60	Mr. Digant Karve	Hostel Office	Deputy Manager	B.Sc	22-12-2016
61	Ms. Nisha Choudhary	R & D Accounts	Deputy Manager	BE(CS)	26-12-2016
62	Mr. Nitin Parashar	Academics	Deputy Manager	B.Sc, MBA	30-12-2016
63	Mr. Piduru Venkata Narayana Rao	Estate	Superintending Engineer (On Contract-On Scale)	M.Tech, MBA, AMIE	30-12-2016
64	Mr. Jagat Singh	CSE	Deputy Manager (Lab)	B.Sc, MBA	30-12-2016
65	Mr. Kumar Gaurav	Audit + R & D + Hospitality	Administrative Officer	B.Com, MBA(Fin),BJMC	01-03-2017

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

1. Dr. N.S. Chaudhari (on Deputation to VNIT Nagpur)
2. Dr. Mohan Santhakumar (on sabbatical leave)

1.5 Staff Welfare

Installation of Print Management system was carried out so that entire IIT community can avail print facility through smart card.

Canara Bank has started its banking operations, including opening of ATM, in Simrol campus which has saved lot of time of the employees, students in carrying out banking operations. Further, Canara Bank has started construction of its own building for banking operation on BLOT scheme.

1.5.1 Human Resource Development

As part of its Human Resource Development activities, the Institute plans and implements programs for providing opportunities to the technical and administrative staff to update and upgrade their knowledge and skills. These programs have been highly beneficial to the staff in performing their duties effectively. In addition, staff is encouraged to participate in various courses / training which not only enhance their knowledge but also broaden their horizon. These activities also form a part of the training requirements under the ISO dispensation.

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

- Approval of Recruitment and Promotion Rules were approved for non-teaching staff by the Board of Governors vide its 21st meeting dated March 11, 2017.
- Approval of Health Care Rules for IIT Community by the Board of Governors during its 21st meeting dated March 11, 2017.
- Issue of Smart cards for dependent family members which will subsequently replace Medical books to be submitted in hospital while going for treatment in due course of time.
- Review of Forms generated by administration to make it user friendly.
- Implementation of pickup and delivery of letters by Post Office staff from IIT Indore resulting in saving of time of Disptach staff.
- Introduction of new forms for hospitality requirement enabling Hospitality Section to reconcile bills submitted by caterer along with requisition received from user section.

- All the Recruitments in respect of regular posts have been done in accordance with the laid down norms and procedures.
- Transition of outsourcing from M/s KAAPRO to M/s Prime one has been completed smoothly. Uniforms to staff have been issued with the initiation of administration.
- MoU with Choithram, Greater Kailash, Rajsree 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 and export of items bills for unhindered import/export.
- All the Grievances/RTI have been resolved in a timely manner.
- Shifting of Hostel facility of 500 (approx) students from leased flats at Silver Springs to the newly constructed hostel at Simrol Campus was planned meticulously. Every effort was put in to ensure minimum disturbance to the students.
- All the issues relating to renewal of flats for students residential purpose have been handled properly.

1.7 Meetings of the Authorities:-

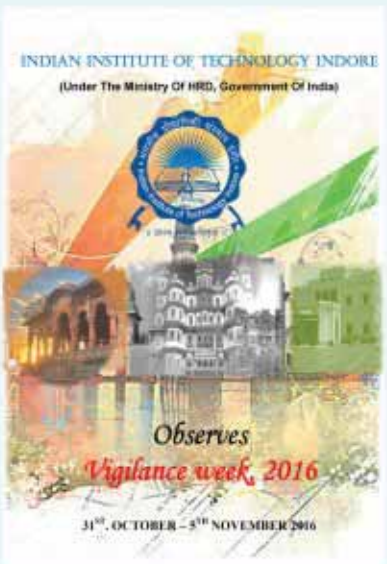
Board of Governors:	Two meetings held on May 07, 2016, March 11, 2017
Finance Committee:	Two meetings held on May 07, 2016, March 11, 2017
Building and Works Committee:	Six meetings held July 13, 2016, August 20, 2016, November 14, 2016, December 23, 2016, February 11, 2017 and March 25, 2017.
Senate:	Two meetings held on May 4, 2016 and November 11, 2016

1.8 Activities held as per MHRD instructions:

1 Celebration of Independence Day fort night:
   - Pledge taking and signature campaign
   - Slogan writing competition

2 Vigilance awareness week from 31st October - 5th November 2016
   - Release of vigilance awareness news letter

3 International Yoga Day 2016
   - Yoga Camp



2. Finance and Accounts

2.1 The year 2016 – 17 is characterized with the following Income and Expenditure:

(₹ in crores)

S. No.	Particulars		2016-2017
1.	**INCOME**		
1.1.	**Grants** Total Grant received **Less** –Allocated for creation of Capital assets **For Recurring Purpose**	: 200.00 : 113.50 **: 86.50**	86.50
1.2.	Academic Receipts		07.75
1.3.	Interest Earned		05.87
1.4.	Other Income		00.77
1.5.	**Total of 1**		**100.89**
2.	**EXPENDITURE**		
2.1.	Staff Payments & Benefits		25.67
2.2.	Academic Expenses		18.80
2.3.	Administrative & General Expenses		12.94
2.4.	Transportation Expenses		01.40
2.5.	Repairs and Maintenance		01.03
2.6.	Depreciation		13.47
2.7.	Other Expenses		00.97
2.8.	**Total of 2**		**74.28**
3.	**Balance being excess of Income over Expenditure**		**26.61**

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

(₹ in crores)

S. No.	Particulars		2016-2017
2.1	Opening Balance of Grant-in-Aid Plan		-46.61
2.2	Grant received during the year - For Creation of Capital Assets - For Revenue Expenditure **200.00**	112.50 86.50	200.00
2.3	Internal Revenue Generation		14.37
2.4	**Total funds available at the disposal of the Institute**		**167.76**
2.5	Revenue Expenditure excluding Depreciation (74.28-13.47)		60.81
2.6	Plan Grant after adjusting utilization for Income & Expenditure (200.00-46.61-60.81)		92.58
2.7	Utilized for developing infrastructure - Buildings & Works	107.77	120.31
	Utilized for Equipment's and other Assets	12.54	
2.8	Unspent balance as on 31.03.2017		-27.73

2.3 Funds availability and status of utilization thereof:

During financial year 2016-17, against sanction of Revised Detailed Project Report (DPR) of ₹ 1,902 crores, a sum of ₹ 200.00 crores were released by Ministry of Human Resource Development. The Internal income of the Institute reckoned during the year was ₹ 14.37 crores and after considering the unspent balance as on 01.04.16 of ₹ -46.61 crores, the total funds available at the disposal of the Institute was of the order of ₹ 167.76 crores.

A sum of ₹120.31 crores has been utilized for the creation of Capital assets and a sum of ₹ 60.81 cores (which excludes Depreciation of ₹13.47 crores) was incurred on recurring expenditure out of the grant at the disposal with the Institute. Further Internal Revenue Generation for the year amounting to ₹ 14.37 crores transferred to Corpus Fund.

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 Tuition fees for the undergraduate students joining from Academic Year 2016-17 is revised and subsequently MHRD has introduced Vidyalaxmi scheme vide MHRD letter No. 24-2/2016 TS 1 dated July 14, 2016 for provision of interest free loans to students for first five years to be paid by IIT. 27 students applied for Education loan under Vidyalaxmi scheme through State Bank of India, Nodal Bank for the scheme. Interest implication for Financial Year 2016-17 is ₹ 2,38,174/-.

2.4.2 Public Finance Management System (PFMS) is a platform for all DBT payments.

2.4.3 Institute has developed payment gateway on IIT Indore website with State Bank of India as channel partner bank for the facility.

2.5. Education assistance for children:

During the financial year 2016-2017, the Institute reimbursed a sum of ₹ 15,39,977/- to 60 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 subsidized rates.

2.7. Advances: During the reporting year, a total sum of ₹ 9.72 lakhs was sanctioned as personal advances for the following.

Sl. No.	Nature of Advance	No. of Beneficiaries	Amount Sanctioned (in ₹)	Amount outstanding as on 31.03.2017 (in ₹)
1	House Building Advance	2	4,75,400	14,81,040
2	Car Advance	-	-	1,38,000
3	Two-wheeler advance	7	3,48,000	3,56,212
4	Personal computer advance	-	-	-
5	Festival advance	33	1,48,500	88,200
		Total	**9,71,900**	**20,63,452**

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 ₹ 11,54,252/- during financial year 2016-17. Care of 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 2016-17, 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	249	JRF- ₹ 25,000/- + HRA @ 20% SRF- ₹ 28,000/- + HRA @ 20%
02.	DST Funded (PHD)	20	
03.	CSIR Funded (PHD)	17	
04.	UGC Funded (PHD)	17	
05.	Institute Funded through MHRD grant M.Tech.	50	₹ 12,400/- + HRA @ 20%

2.10.2. Merit cum Means Scholarship:

Institute has disbursed ₹ 99,19,539/- 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.	78	59,81,185
		MSc.	9	1,35,601
02.	General (PD)	B.Tech.	1	8,415
		MSc.	-	-
03.	OBC	B.Tech.	41	26,78,853
		MSc.	4	64,687
04.	SC	B.Tech.	13	5,20,301
		MSc.	3	1,46,334
05.	ST	B.Tech.	8	3,16,747
		MSc.	2	67,416
	Total		**159**	**99,19,539**

2.10.3. Remission of Tuition Fees to Deprived Class of Students:

Institute has Remitted/disbursed ₹ 1,43,33,370/- as Remission of Tuition fees of Under Graduate Students of Depraved Class admitted in Academic Session 2016-17 as per Ministry of HRD letter F. No. 24-2/2016 TS 1 dated April 04, 2016. Students how are meeting the eligibility criteria under various categories are as under:

S. No.	Category	No. of Students	Amount of Fees Remission (in ₹)
01.	General	39	56,66,686
02.	OBC	52	86,66,684
03.	SC	-	-
04.	ST	-	-
Total Rs. ⟶		**91**	**1,43,33,370**

3. Material Management Section (MMS)

Material Management Section (MMS) is part of the administrative structure of the institute which is entrusted with the responsibility of procuring goods and services for all user departments to pursue academic, research and institutional activities. MMS at IIT Indore is also shouldering the task of creating and facilitating campus facilities of the institute through various contracts.

The institute policy of "buying the best" by following the Principles of Transparency, Accountability, Fair Competition and financial propriety is well documented in the "Manual and Procedure for Purchase of Goods and Services 2014" which broadly confirms the General Financial Rules (GFR) and other norms of public procurement.

During the F.Y. 2016-17 the following initiatives have been taken up to streamline the procedure and standardize practice besides adding value to the institute:

1. **Renewal of DSIR Certificate:** DSIR Renewal has been done for next five years i.e. 21/08/2021 to avail the concessional custom and excise duty. The DSIR certificate revised with the permanent address of the institute and PIN Code.
2. **E-publishing of Tenders/NITs on CPPP and E-tendering:** Completed registration has been done with CPPP for e-publish/e-tendering with publication of 73 no. of tenders for FY 16-17. All tenders/NITs/RFPs/RFQs including single source items above ₹ 2 Lakh on CPPP & Institute Website as per Govt. notification no. 10/3/2012 dated 09/01/2014 are being uploaded regularly.
3. **Cashless Transactions at MMS:** The MMS team took initiative to collect the EMD/Bid Security online to promote Cashless transactions. The separate link has been created at MMS webpage for online submission of EMD http://deposit.iiti.ac.in/mms/. All the payments are released to the suppliers vis NEFT, RTGS, Wire Transfer and Letter of Credit.
4. **Tender space at website:** To enable the transparency in the procurement process separate tender page has been created with details of floated tender and MMS contact details on IITI webpage i.e. http://www.iiti.ac.in/tender_mms.php
5. **Migration of data:** Since inception, the stock ledger has been maintained manually in registers such as PIR, DIR, Non-Consumable/Asset register and Consumable. Now to simplify the data and for faster retrieval, entire data maintained/entered in various stock ledgers/registers are to be migrated into electronic mode.
6. **Software:** MMS took initiative to develop a software for streamlining the MMS activities, few of them are listed below:
    a) Issuance of Indent number for tracking of files/requisitions.
    b) Drafting of sanction proposal and draft purchase order for placement of order.
    c) Issuance of purchase order number via software to avoid any duplication, mismatch etc.
    d) Recording of stocks in software for swift retrieval of data for no-dues, departmental record, personal inventory, item wise stock etc.
    e) Generation of various documents for clearance/movement of items such as Custom Duty Exemption Certificate (CDEC), Excise Duty Exemption Certificate (EDEC), Road Permit etc.
    f) MIS reports etc.
7. **Barcoding of Assets:** Barcoding of assets has been initiated and the same is in progress along with the physical verification of assets. Meanwhile, the barcoding of chairs procured for convocation/events has been done.

8. **Manual and Procedure for Store Management:** After accessing the need of stores at Institute, development of storage center was proposed and accordingly, a detailed manual and procedure for management of Store was put up and approved in the 21st BOG Meeting held on 11/03/2017.

9. **Development of Storage Centre:** As the institute is far off the city and to cater the daily requirement of IITI Community development of a storage center was proposed by MMS. Detailed proposal with requirement of location, area, space and layout for development of storage center has been finalized and approved by the 31st BWC meeting at Point No. 31.6 the final proposal is with Estate section for further processing.

10. **Streamlining of Project Indents:** Separate series for indents and purchase order under projects has been streamlined.

11. Activities of MMS during 2016-17 at a glance:

Sl.No.	Details	Remarks	Value in ₹
1	Total Purchase Order Issued	619	19,32,04,477.00
2	Total Import Order issued	45	3,80,57,542.00
3	Total Indigenous Order	574	15,51,46,935.00
4	Total Order Under LPC	510	6,76,00,963.00
5	Total Order Under Limited tender	51	4,63,04,245.00
6	Total Order Under Open Tender	15	3,61,04,441.00
7	Total Order Under Rate Contract	28	2,50,20,199.00
8	Total Order Under PAC	11	1,66,04,142.00
9	Total Order Under Repeat Order	02	15,70,487.00
10	Total CDEC	180	Total 180 Custom duty exemption certificates were issued in FY 16-17
11	Total EDEC	78	Total 78 excise duty exemption certificates were issued in FY 16-17
12	Total Road Permit	334	Total 334 road permits were issued in FY 16-17
13	Stock Entries completed for inventory	9184	Direct Purchase- 5825 Purchase Order- 1073 Advance Settlement- 1456 CPDA- 334 General Reimbursement- 396 Imprest- 77 Other 23
14	Service Order Issued	1. Rate Contract for Advertisement 2. Rate Contract for Stationery & Office Consumables 3. Rate Contract for Hiring of Vehicle 4. Rate Contract for Courier Services 5. Rate Contract for C&F 6. Rate Contract for Medicine 7. Rate Contract for Furniture 8. Rate Contract for Travel Desk Facility 9. Insurance of Fixed Asset 10. RC Hotel Accommodation & Food Services 11. Rate Contract for Computer & Accessories 12. Set up of Food Joints 13. Security & Surveillance Services 14. Manpower Services	

15	Total Prebid Presentation & Demonstration conducted for procurement of Various items/services:	1. Networking Device 2. Hostel Furniture- Cot, Almirah & Table 3. Ambulance ACLS 4. Chemistry Lab Set up 5. Equipment for Civil Engineering Lab 6. Equipment for MEMS Lab 7. Patrolling Vehicle 8. Green Vehicle 9. Classroom Desk & Infrastructure 10. Mini Refrigerator to hostel 11. Set Up of Guest House Rooms 12. Hostel Furniture- Cot, Almirah & Table 13. Real Time Digital Power System Simulator 14. Catering Services 15. Security & Surveillance Services 16. Housekeeping Services-Cleaning Capability & Skill in Mechanized wash 17. Portable FFT Data 18. Replacement of Office Car 19. I P Telephony

12. Graphical representation of Data:

13. Value Added Services:

(i) Furnishing of Guest House: MMS was assigned a specific task of furnishing of 25 rooms at Studio Apartment within a time frame and the task was accomplished well within a time frame. Few of the activities pertaining to the furnishing are mentioned below:

a) Planning of guest house inventory matching with VIP Suits of recognized hotels of Indore.

b) Market survey and price rationalization of items

c) Sourcing of items from Rate Contract, Local Market confirming approved samples

d) Execution, arrangement of materials as per layout at shortest available time (48 hrs.)

e) Mobilization of institute resources for arrival, stay and academic events.

(ii) **Green Campus Initiative:** MMS team took initiative and interacted and conducted prebid meeting for accessing the suppliers for green vehicle across India. The order was placed for a fleet of Green vehicles after rounds of meetings and discussions at reasonable price. The special arrangements of logistics of Green Vehicles in absence of any unloading facility such as

a) Ramp

b) Material handling tools etc.

The vehicles are being used widely for intra campus movement.

(iii) **Demonstration of Advance Life Support Ambulance:** The procurement of Advance Life Support Ambulance was finalized after the arrangement of demonstration of features and functionality of ambulance etc. MMS team was rigorously involved in finalization of design of body graphics; follow up of delivery, inspection of ambulance, assistance in pre-dispatch and post-dispatch inspection etc. This world-class facility is unique in the Institute.

(iv) **Standardizing furniture:** Standardizing furniture for labs, office space, hostels etc. B scrutinizing and by facilitating the institute Furniture Committee.

(v) **Other major activities:**

a. Shifting of hostel from Silver Spring to Simrol Campus- monitoring repair, upkeep and return to owners of 41 houses.

b. Furnishing of Hostel Building- as preparedness to accommodate new batch of students.

c. Disposal of 02 Buses- task completed through open tender

d. Disposal of scrap at PACL - task completed through open tender to salvage the scrap value and optimize space.

e. Disposal of scrap at Silver Spring has been completed.

f. Facilitated the procurement of Tractor, Tanker, Trolley and E-cart on fast track for horticulture and landscaping

g. Furnishing of health Centre at Hostel Building Simrol- physiotherapy unit for students

h. Furnishing of Classrooms at Academic Pod with furniture & fixtures

i. Event Management:

(i) Convocation 2016

(ii) Fluxus- Students venture

(iii) Industry Academia Conclave

(iv) TU9 Submit- Printing, designed and customized items and coordinated delivery in desired location abroad

4. Safety and Security Department

4.1.1 Comprehensive security services have been awarded to M/S Security and Intelligence Services (India) Limited from March 21, 2017. The security agency would also be deploying the technical gadgets to cover almost all parts of institute where building have come up. A world class security control room is coming up at Hub-Building wherein 24x7 monitoring of CCTV cameras would be done by the security department.

4.1.2 The 4th convocation was held on Nov 12, 2016 at Simrol Campus. Dr. Ashutosh Sharma, Secretary, Department of Science and Technology Government of India, was the chief guest on the occasion. The safety and security department arranged the necessary permissions for the event. Various passes were issued by the Safety and Security Department for students, invitees and media, the function was conducted smoothly.

4.1.3 Fire-fighting demonstration cum training was conducted for the security personnel on May 26, 2016 and on Jan 10, 2017 the training was conducted for the students, faculty members, Staff as well as for the security personnel. The security personnel have actively and promptly responded to fire which occurred in the forest stretch of the institute during midnight of Feb 12, 2017 and brought the fire to control immediately. The security personnel are prompt in controlling the fire whenever noticed in the institute premises.

4.1.4 Security department arranged and co-ordinated safety and security related activities during various functions like FLUXUS-2016 and Industry Academia Conclave-2016 and eminent dignitaries for public lecture at the institute including public lecture by Mr. Ajay Kumar Sharma, Addl. Director General of Police .

5. Transport Department

5.1.1 IIT Indore has full-fledged transport department that functions to provide transport facility to students, faculty and staff members from various places for commuting to institute and going back. The institute provides transport facilities free of cost to the students and nominal amount is charged from the staff and faculty members as a welfare measure. The transport department holds 09 nos 52 seat buses 01 no 40 seat bus and 02 nos 20 seat buses. The institute has 2 sumo grand which are being utilized extensively to provide the transport facility to visiting faculty and guests of the institute for pickup and drop to the Airport, Railway Station and Bus station on various occasions. Institute also have 01 Tractor with two water tankers and two trolleys for maintenance of institute garden area. 02 motor bikes are also held by the institute for office use and for use by the security department. Apart from this 01 institute truck for facilitating support to the logistics operation within the campus and for transporting the materials for various official purposes.

5.1.2 In addition to the above vehicle the institute have 09 green vehicles (01 – 04 seat, 06 – 6 seats and 02 – 14 seat capacity) these vehicles are provided for movement within the campus to facilitate the frequent commuters commuting from one building to another building including Specially abled persons. These vehicles have been introduced to encourage/promote the pollution control and save fuel. One battery cart is also available with transport department which is serving to Estate section to meet their daily requirement of movement within the campus for maintenance.

5.1.3 Transport department presently have team of 33 experienced and expert drivers, 19 Cleaners and 1 Assisting staff out of which 2 drivers are performing the duty of supervisors round the clock.

5.1.4 The glimpses of Institute vehicles are here under:

6. Housekeeping Services

In order to maintain impeccable cleanliness and sanitation of the entire campus , a team of 80 housekeeping staff and 01 Manager put in their tireless effort and contribute towards realizing the dream of "Swachha Campus". Despite the challenges posed by the ongoing construction activities, the housekeeping staff leave no stone unturned in keeping the campus spic and span. Additionally, the team also facilitate smooth shifting of materials and equipment as and when required. It is also worth mentioning that the team has been instrumental in successful conduct of various events viz Convocation, Industry –Academia Conclave, FLUXUS, Republic Day, Independence Day celebrations and other academic programmes such as GIAN lecture series, Seminars, Talks and symposia etc. by way of preparing the site before the conduct of the events. Post – event the trashes are disposed off by the team in a meticulous manner ensuring proper hygiene & sanitation.

An Start up venture by IIT Indore Alumni "SWAAHA" has also been engaged for methodical waste collection and its proper disposal and recycling. This ensures Zero waste campus and helps the institute in realizing the dream of "Swachha Campus".

7. Health Centre

Health Centre provides dedicated health services to institute community. It is operating at 2 units with main centre in permanent campus Simrol and another unit is located at E-Block, Silver Springs Hostel. The health centre is open 24 X 7 for primary medical care at both units.

The medical team comprises of medical officers, specialist consultants and patient friendly paramedical and supporting staff.

Facilities

The health centre provides O.P.D., day care and in-patient facility for minor ailments. It provides essential investigation facility. This includes -

a) ECG Facility

b) Rapid Spot blood investigation

For further evaluation, sample collection facility is available at both units.

A well equipped Physiotherapy facility has been started since December 2016.

Technical up-gradation

a) Advanced life support ambulance

b) Cardiac monitor in wards

c) Emergency set up

Activities

Basic life support training was organized for students and employees including drivers and security guards in January 2017.

A workshop on 'Women's Health and Wellness was organized in May 2016.

Blood donation camp- Health centre with Avana group organized blood donation camp in November 2016.

Annual Census of Health Centre FY 2016-2017						
S.No.	O.P.D.	IN PATIENT AND DAY CARE CASES	EMERGENCY CASES	TRAUMA/ MINOR SURGICAL CASES	ECG	LABORATORY TESTS
1	11399	346	850	1155	278	756

8. Hostel Facilities

8.1: Simrol Campus:

IIT Indore provides accommodation for B.Tech Students at Simrol Campus. Rooms are provided on single and sharing basis in a hygienic environment for which we have employed dedicated and professional housekeeping team. We aim to provide a home like facility so that residents are comfortable and can focus on their studies. Students are staying, at present, in two buildings in Simrol campus: Hall of Residence Building and Studio Apartment with large spacious rooms having natural light and proper ventilation. Following facilities are provided:-

Rooms:

1. In Studio Apartment each unit has five rooms with a Common hall and a balcony.
2. A furnished kitchen is provided in each unit that students can use as per their convenience and requirements.
3. 24X7 internet facility is available for residents.
4. In each unit, we have provided basic facilities including refrigerator, sofa, RO water with chiller facility, hot water in washrooms, intercom telephone, discussion table, reading table, lights, fans, almirah, and bed.
5. Pest control services are also available on request.

Recreation:

1. Televisions are installed in the common areas.
2. Sports and gymnasium facilities are available so that students can relax after the studies.
3. Foosball and table-tennis tables are also set up in the hall common areas.

4. Turf badminton court in the Hall quadrangle for students is available for their recreation.
5. A basketball pole is also available to facilitate student's sports activities.
6. We have student facilities center (La Fresco) with milk parlor where residents can buy food items, stationary and other daily-need items almost at door-step.

Dining Hall:

1. Students are served 4 healthy meals a day in spacious dining halls.
2. Mess menu is decided by the students and is updated regularly.
3. Night time canteen facility is also available.

Medical Facilities:

1. Institute Health Centre in the Hall premise provides 24x7 medical services to the students.
2. An advanced life support ambulance is always available in the vicinity of the Hall for medical emergencies.

Transport:

1. The green vehicles, available for the movement within the campus, ply at regular intervals.
2. Institute provides buses for market on every weekend.
3. Additional Transport facility to a large group of students is made available on written request to the authorities.

Safety Securities:

1. Dedicated security staff members for the security and emergency related issues are on duty in Hall of Residence and Studio Apartment.
2. Thumb impression entry system is installed in Hall's individual unit for restricted entry.
3. Fire extinguishers are available on every floor to avoid any fire emergency.

Hall Office:

1. A staff member and an attendant are available 24x7 in the Hall Office to deal with the hall related issues.
2. The students can also go to the Hall Office with their concerns and suggestions.
3. We have office of the student's counsellor inside the campus for interaction.

8.2: Silver Spring

IIT Indore provides residential facility for post-graduate students and research scholars at Silver Spring Campus. Rooms are provided on single and sharing basis in a hygienic environment for which we have employed dedicated and professional housekeeping team. We aim to provide a home like facility so that residents are comfortable and can focus on their studies. Facilities provided are as follows:-

Rooms:

1. Students are staying in a big township having uninterrupted water and power supply. We have 52 units to accommodate students. Students are accommodated in a 2BHK/3BHK flat which is as big as 2000 Sq feet for average 6-8 students. So, that they get enough space for their studies.
2. In each unit, we have provided basic facilities including washing machines, geyser, RO tables, lights, fans, almirahs, and bed.
3. 24X7 internet facility is available for residents.

Recreation:

1. Televisions are installed in the common areas.
2. Sports facilities are provided so that residents can relax after studies.

Dining Hall:

1. Students are served 4 healthy meals a day in a spacious dining hall.
2. Menu is decided by the students and is updated regularly.
3. Night time canteen facility is also provided.

Medical Facilities:

1. Institute Health Centre in Silver Springs provides 24x7 medical services to the students.
2. An ambulance is always available in the vicinity of the hall for medical emergencies.

Transport:

1. Institute provides buses for market on every weekend.
2. Additional Transport facility to a large group of students is made available on written request to the authorities.

Safety Securities:

1. Dedicated security staff members are on duty for the security of residents and any emergency issues.
2. Fire extinguishers are available in every unit to avoid any fire emergency.

Hall Office:

1. An attendant is available in the Hall Office who deals with the Hall related issues.
2. The students can go with their concerns and suggestions to the Hall Office.

9. Academic Report:

1	Courses offered	a) Undergraduate Courses: 350 b) Postgraduate and Doctoral Courses: 235 c) Cross-listed courses: 60 Total: 645 (including new courses of BTech-Civil, BTech-MEMS, MTech-VDN and MSc-Biotechnology)
2	Doctoral Students Admitted in AY 2016 - 17	83
3	Doctoral Students Graduated	1. 27 students have successfully defended their thesis and passed out (during 1 April 2016 to 31 March 2017) 2. 10 students have defended their thesis successfully during 1 April 2017 to 1 June 2017. 3. PhD theses of 8 students have been evaluated and their viva is awaited. 4. PhD theses of 14 students are under evaluation.
4	Under Graduate Students Admitted in AY 2016-17	259 (**255** BTech + **3** last year preparatory students joined after preparatory course from IIT Hyderabad + **1** joined IIT Hyderabad for preparatory course)
5	Under Graduate Students Graduated	1. 108 BTech students conferred the degree in the 4th Convocation held on 12 November 2016 2. 118 BTech students are passed out in May 2017 and will be conferred the degree in 5th Convocation 2017.
6	Post Graduate Students Admitted in AY 2016-17	78 (31 MTech + 47 MSc students admitted in 2016 Autumn Semester)
7	Post Graduate Students	1. 22 MTech and 20 MSc students will be graduated this year. 2. 25 MTech and 22 MSc students are likely to passed out in the month of June-July 2017 and will be conferred the degree in 5th Convocation 2017.

Details of PhD Students Graduated (during 1 April 2016 to 31 March 2017)

S.no.	Roll no.	Discipline	Name	Date of viva	Thesis title and name of supervisor
1	11110205	EE	Kshitij Bhargava	11-Apr-16	Investigation on the influence of internfacial and morphological effects in organic field effect transistors **(Dr. Vipul Singh)**
2	1010408	Chemistry	Prabhat Gautam	12-Apr-16	Symmetrical and unsemmetrical donor-acceptor benzothiadiazoles **(Dr. Rajneesh Misra)**
3	11115105	Physics	Sanjeev Dwivedi	12-Apr-16	Spectral analysis of complex networks **(Dr. Sarika Jalan)**

4	1010703	Maths	Navneet Lal Sharma	15-Apr-16	Analytic and Geometric Properties of Certain Classes of Univalent and p-Valent Functions **(Dr. Swadesh Kumar Sahoo)**
5	11120201	EE	Dipankar Ghosh	16-Apr-16	Evaluation of Nanoscale MOSFET Architectures for Low Power Analog/RF Applications **(Dr. Abhinav Kranti)**
6	1301101005	CSE	Saumya Bhadauria	18-Apr-16	Low cast fault reliability and trojan security aware high level synthesis for application specific datapath processors **(Dr. Anirban Sengupta)**
7	1010502	HSS (Philosophy)	Sreelekha Mishra	18-Apr-16	Revisiting multiculturalism: Some reflections **(Dr. Bharath Kumar)**
8	1010407	Chemistry	Bhagwati Sharma	16-May-16	Bioinspired organic-inorganic hybrid functional nanoscale materials: Synthesis and Applications **(Dr. Tridib K. Sarma)**
9	12115101	Physics	Aditya Nath Mishra	1-Jul-16	Multihadron Production in High-energy Collisions and Forward Rapidity Measurement of Inclusive Photons in Pb+Pb Collisions at $\sqrt{sNN}$ = 2.76 TeV in ALICE Experiment at LHC **(Dr. Raghunath Sahoo)**
10	12120303	ME	Sunil Pathak	2-Aug-16	Investigations on the Performance Characteristics of Straight Bevel Gears by Pulsed Electrochemical Honing (PECH) Process **(Prof. Neelesh K. Jain & Dr. I.A. Palani)**
11	104120005	Physics	Ajay Kumar	11-Aug-16	Conceptual Design of the Lambda Disks Detector for the PANDA Experiment **(Dr. Ankhi Roy & Dr. Raghunath Sahoo)**
12	11120301	ME	Yogesh Madaria	22-Aug-16	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)**
13	11120204	EE	Vikas Vijayavargiya	23-Aug-16	Investigation of drain extention feature in a double-gate silicon based tunnel fet for low power SoC applications **(Dr. Santosh K. Vishvakarma)**
14	12115112	Physics	Shailendra Kumar Saxena	15-Sep-16	Fabrication and Optoelectronic Properties of Silicon Nanostructure **(Dr. Rajesh Kumar & Dr. P.R. Sagdeo)**
15	11113104	Chemistry	Manideepa Saha	20-Oct-16	Studies on mono- and polynuclear metal tetrazolato complexes synthesized via 1,3-dipolar cycloaddition **(Dr. Suman Mukhopadhyay)**
16	12113110	Chemistry	Surajit Chatterjee	21-Oct-16	Investigation of Photoluminescence Behavior of Silicon Quantum Dot and its Effectiveness as Single Particle Luminescent Marker **(Dr. Tushar Kanti Mukherjee)**

17	11114102	Maths	Sarita Agrawal	24-Oct-16	Analytic and Mapping Properties of Certain Analytic Functions with Applications **(Dr. Swadesh K. Sahoo)**
18	11113109	Chemistry	Veenu Mishra	14-Dec-16	INVESTIGATION OF STRUCTURALLY DIVERSIFIED HOMO AND HETEROMETALLIC COMPLEXES **(Dr. Shaikh M. Mobin and Prof. Pradeep Mathur)**
19	12110311	ME	Yogesh Singh	19-Dec-16	Performance Investigations on Mechanical Design and Motion Control of Planar Parallel Manipulators **(Dr. M. Santhakumar)**
20	11116101	HSS (English)	Jaya Shrivastava	19-Dec-16	Perspective Development in the Novels of Colson Whitehead: A Cognitive Narratological Approach **(Dr. Amarjeet Nayak & Dr. Joe Verghese)**
21	11113101	Chemistry	Anvita Srivasrava	6-Jan-17	Development of Novel Methodolgy for the Synthesis of An Important Class of Functionalized Indoles and Related Heterocyclic Scaffolds **(Dr. Sampak Samanta)**
22	11120303	ME	Manish Rawat	20-Jan-17	Investigation of joint decision making in fleet system reliability design and maintenance planning **(Dr. Bhupesh Kumar Lad)**
23	11125102	Physics	Najimuddin Khan	6-Feb-17	Exploring Extensions of the Scalar Sector of the Standard Model **(Dr. Subhendu Rakshit)**
24	1301102005	EE	Pankaj Kumar Sharma	16-Feb-17	Performance Analysis of Cooperative Cognitive Spectrum Sharing Systems over Fading Channels **(Dr. P.K. Upadhyay)**
25	1301102007	EE	Rajeev Sharma	17-Feb-17	Automated Identification Systems Using Advanced Signal Processing Techniques Applied on EEG Signals **(Dr. Ram Bilas Pachori)**
26	11110201	EE	Anubha Bilgaiyan	24-Feb-17	Investigations on the influence of ZnO nanostructures on ZnO/P3HT based Hybrid Photodetectors **(Dr. Vipul Singh)**
27	12110202	EE	Ashish Kumar	10-Mar-17	Optimization of Hydrothermally Grown ZnO Nanorods Network towards UV Sensitive FET Applications **(Dr. Vipul Singh)**

Statement of Accounts

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

A. Balance Sheet As At 31.03.2017

(Amount in ₹)

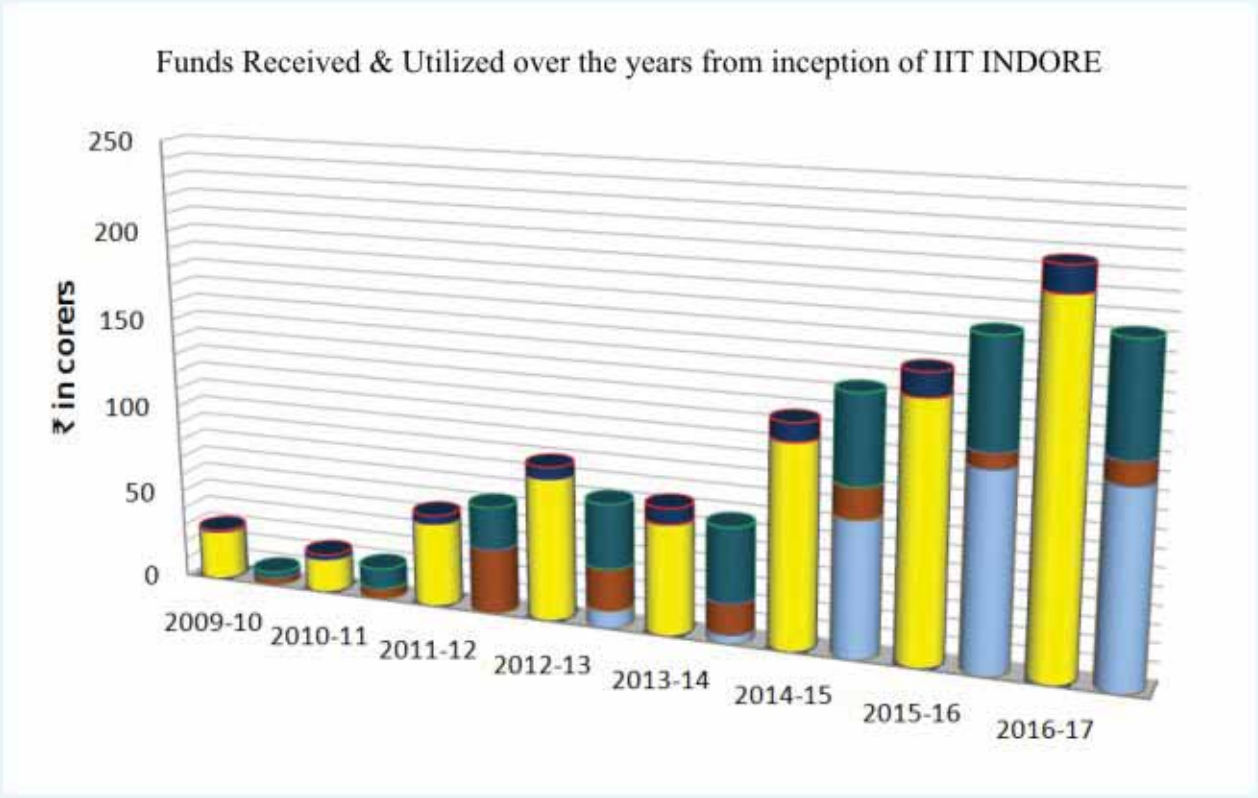
SOURCES OF FUNDS	SCHEDULE	AS AT 31-03-2017	AS AT 31-03-2016
Corpus/Capital Fund	1	4,31,10,83,703	3,08,82,65,489
Designated/Earmarked Funds	2	4,87,01,472	3,21,24,346
Current Liabilities & Provisions	3	47,40,15,389	41,80,85,762
TOTAL		**4,83,38,00,564**	**3,53,84,75,597**
APPLICATION OF FUNDS			
FIXED ASSETS	4		
A. Tangible Assets		79,24,25,016	69,98,34,883
B. Intangible Assets		36,78,959	14,88,558
C. Capital Work-In-Progress		2,89,40,68,390	1,89,74,40,939
CURRENT ASSETS	5	40,19,88,331	35,36,84,403
LOANS, ADVANCES & DEPOSITS	6	74,16,39,868	58,60,26,814
TOTAL		**4,83,38,00,564**	**3,53,84,75,597**

B. Income And Expenditure Account For The Year Ended 31st March'2017

(Amount in ₹)

PARTICULARS		SCHEDULE	2016-2017	2015-2016
(A) INCOME				
Academic Receipts		7	7,74,60,242	6,22,01,939
Grants & Subsidies	2,00,00,00,000	8		
Less: Capital Grants for Fixed Assets	1,13,50,00,000		86,50,00,000	43,30,00,000
Interest Earned		9	5,87,31,049	6,32,34,253
Other Income		10	68,67,242	42,94,295
Prior Period Income		11	9,10,013	4,48,433
TOTAL (A)			**1,00,89,68,546**	**56,31,78,920**
(B) EXPENDITURE				
Staff Payments & Benefits		12	25,67,21,357	21,50,47,397
Academic Expenses		13	18,79,98,498	20,52,15,624
Administrative and General Expenses		14	12,93,65,637	15,03,09,588
Transportation Expenses		15	1,39,74,812	1,00,87,528
Repairs and Maintenance		16	1,03,18,184	71,73,542
Finance Costs		17	3,109	2,781
Depreciation		4	13,46,79,687	12,21,84,139
Other Expenses		18	60,19,564	34,68,961
Prior Period Expenses		19	37,19,495	15,00,783
TOTAL (B)			**74,28,00,343**	**71,49,90,343**

Balance being excess of Income over Expenditure (A-B)		**26,61,68,203**	(15,18,11,423)
Less: (i) Transfer to Corpus fund towards Internal Revenue Generation of 2016-2017 (2015-16) (See Notes to Account - no.6)		14,37,30,372	13,24,45,286
(ii) Transfer to Corpus fund towards Internal Revenue Generation during 2009-2010 to 2014-15 (See Notes to Accounts - no.6)		-	34,49,50,825
Add: Amount transfer to Capital Fund (Depreciation)		13,46,79,687	12,21,84,139
Balance being Surplus (Deficit) Carried to Schedule 3C Unutilized Grant from Govt. of India		25,71,17,518	(50,70,23,395)



Sr. No.	Particulars		2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
1	RECEIPT	GRANT	₹ 27.78	₹ 19.15	₹ 47.47	₹ 80.00	₹ 62.00	₹ 113.45	₹ 142.80	₹ 200.00
		IRG	₹ 0.97	₹ 2.65	₹ 4.68	₹ 6.58	₹ 9.10	₹ 10.51	₹ 13.24	₹ 14.37
2	EXPENDITURE	BUILDING	₹ 0.00	₹ 0.00	₹ 0.00	₹ 9.89	₹ 4.98	₹ 75.82	₹ 109.41	₹ 107.77
		EQUIPMENT	₹ 3.99	₹ 5.98	₹ 36.36	₹ 23.54	₹ 17.29	₹ 17.39	₹ 8.46	₹ 12.54
		RECURRING	₹ 3.50	₹ 11.47	₹ 24.06	₹ 36.14	₹ 42.15	₹ 49.32	₹ 59.51	₹ 60.79

Campus Development

DETAILS OF COMPLETED PROJECTS:

SOPHISTICATED INSTRUMENT CENTRE:

- Total built up area: 1,208 Sqm.
- Semi-permanent RCC framed structure with GI roofing
- Cost of construction: Rs. 2.12 Crores
- Completion & Occupation: April 2014
- Facilities:
  - Single Crystal X-ray Diffraction, Nuclear Magnetic Resonance, Mass Spectrometry, Atomic Force Microscopy (AFM), Elemental Analysis, Single Molecule Imaging and other Spectroscopic.

CENTRAL WORKSHOP:

- Total built up area: 2,594 Sqm.
- RCC framed structure with G+1
- Cost of construction: Rs. 8.02 Crores
- Completion & Occupation: June 2015
- Facilities –
  - Workshop hall
  - Offices

BOUNDARY WALL:

- Total length: 12.5 Km (approx)
- Height 1.5 mtr above GL.
- RCC column with masonry wall and concertina coil on top
- Cost of construction: Rs. 10.33 Crores
- Completion :
  - Boundary wall of non-forest area: April 3, 2014
  - Boundary wall of forest area: August 31, 2015
  - Few openings in compound wall are pending closure due to public agitation.

DIRECTOR's RESIDENCE CUM OFFICE:

- Total built up area: 666 Sqm.
- RCC framed structure in G+1 configuration
- Projected cost: Rs. 2.33 Crores (as part of lump sum contract of Rs. 306 crores under M/s SIL)
- Completion & Occupation: November 2015

ENABLING SCHOOL BUILDING:

- Total built up area: 8,628 Sqm.
- RCC framed structure in G+2 configuration
- Projected cost: Rs. 23.35 Crores (as part of LS contract of Rs. 306 Crores under M/s SIL)
- Occupation: October 2014
- Facilities:
  - Principal Room, Vice- Principal Room and Staff Room (currently being used as Director & Dean's Office)
  - Meeting Room and Classrooms
  - Chemistry and Physics labs
  - Tennis court and basket ball court outside building
  - 01 No. of Lift of 15 passenger capacity

STUDIO APARTMENT:

- Total built up area: 11,025 Sqm.
- RCC framed structure in G+5 configuration
- Projected cost: Rs. 30.40 Crores (as part of LS contract of Rs. 306 crores under M/s SIL)
- Completion & Occupation: July 23, 2017
- Facilities:
  - Total 142 rooms for bachelor accommodation
  - 02 Nos. of Lift of 16 passenger capacity each
  - Solar water heater
  - RO on each floor
  - Laundry and common room

HOSTEL BUILDING:

- Total built up area: 14,004 Sqm.
- RCC framed structure in G+5 configuration
- Projected cost: Rs. 40.08 Crores (as part of LS contract of Rs. 306 crores under M/s SIL)
- Completion & Occupation : December 28, 2016
- Facilities:
  - Total 489 rooms with single occupancy.
  - Common room for Gym and Indoor games.
  - Badminton court
  - Warden's Office
  - Dispensary unit
  - RO and Solar plant
  - 02 Nos. of Lifts of 16 passenger capacity each

MRS & ESSs:

- Total built up area of MRS & ESS-13 is 1041 Sqm., ESS-2 is 426 Sqm., ESS-5 is 343 Sqm. and ESS-7A is 271 Sqm.
- RCC framed structure.
- Projected cost: Rs. 14.82 Crores for MRS & ESS-13 and Rs. 18.82 Crores for ESSs (as part of LS contract under M/s SIL)
- For receiving and transmission of electricity power to various buildings of campus.
- Facilities:
  - MRS : Receives power from MPPKVVCL Indore with double feeder 33 KV overhead incoming line one from Memdi 132 KV Substation and other one from Simrol 33 KV Substation. MRS comprises 6-pole structure for receiving 33KV supply, two 33/11KV; 6.3MVA ONAN Oil filled Power Transformers, 33 KV switch boards, , 11 KV switch boards, Battery banks, Dual FCBC battery charger with DCDB, HT/LT cables etc. MRS feeds electrical power to various electrical substations in the campus.

  - Other Electrical substations (11/0.433kV) : The installed capacity of these load substations varies from 630 KVA to 2500 KVA, 11 KV RMU panels, LT isolator panels, Main Normal panel & main Emergency panel include in these sub-stations.
  - ESS-13 - 630KVA – Supplies power to School building & Director Residence
  - ESS-2 – 1600KVA – Supplies power to Hostel & Canara Bank
  - ESS-5 – 2000KVA – Supplies power to POD-3, Studio Apartment, Shiru Café.
  - ESS-7(A) – 2500KVA (2Nos.) – Supplies power to workshop, SIC, Hub Building, Taste bud.

DETAILS OF ONGOING BUILDINGS:

ACADEMIC POD3:

- Total built up area: 43,405 Sqm.
- RCC framed structure
- Projected cost: Rs. 128.90 Crores (as part of LS contract of Rs. 306 crores under M/s SIL)
- Facilities:
  - The structure consist of 5 units viz., CSE 1, CSE 2, PHY 1, PHY 2 and PHY 3.
  - CSE 1 - Mechanical department labs and classrooms.
  - CSE 2 - Electrical department labs, library and faculty offices.
  - PHY 1 – Classrooms, academic office, start-up centre and labs.
  - PHY 2 – Faculty offices, drawing hall and various departmental labs.
  - PHY 3 – Civil engineering department, HFSA and computer department and labs.

UGT B, UGT G, UGT A:

- Total built up area for UGT B is 105 Sqm., UGT G is 174 Sqm. and UGT A is 118 Sqm.
- RCC framed structure
- Projected cost including pumps & accessories: Rs. 2.37 Crores (as part of LS contract of Rs. 306 crores under M/s SIL)
- Facilities:
  - Storage and distribution tanks
  - Pumps

FACULTY HOUSING:

- Total built up area: 10,000 Sqm.
- RCC framed structure in G+6 configuration
- Agreement value: Rs. 23.73 Crores
- Facilities:
  - Housing building with 2 & 3 BHK flats
  - 27 flats of 2 BHK and 27 flats of 3 BHK
  - One community hall
  - 04 Nos. of Lifts (02 Lifts in 2 BHK units and 02 in 3 BHK units)

HUB BUILDING:

- Total built up area: 2,000 Sqm.
- RCC framed structure in G+1 configuration
- Agreement value: Rs. 2.79 Crores
- Facilities:
  - Data Centre, Networking and DBMS
  - Security Office, Emergency Operation Room
  - Communication Room, Conference Hall
  - IBMS, Electrical room, Battery, UPS and Panel Room, Pantry

SEWAGE TREATMENT PLANT (STP):

- Total built up area: 780 Sqm.
- RCC framed structure in G+1 configuration
- Projected cost: Rs. 5.09 Crores (as part of LS contract of Rs. 306 crores under M/s SIL)
- Treatment : MBBR technology
- Plant Capacity: 1,950 KLD comprising 3 units of each 650 KLD. In phase 1, E&M equipments were installed for 650 KLD only.
- Facilities:
  - Collection sump, equalisation tanks, Sewage lift Pumps, Sedimentation tank, Aeration tank, Clari-floculator, treated water tank, pump room, Sludge loading tank
  - Lab and Staff room

WATER TREATMENT PLANT (WTP):

- Total built up area: 714 Sqm.
- Capacity:
  - 02 Nos. of domestic tank with capacity of 10.25 Lakhs litres each
  - 04 Nos. of raw water tank with capacity of 7.75 Lakhs litres each
  - 01 No. of fire tank with capacity of 4.0 Lakhs litres
- RCC framed structure
- Projected cost: Rs. 5.83 Crores (as part of LS contract of Rs. 306 crores under M/s SIL)
- Plant is designed for treatment of row water of 4.5 Lakhs litres which is supplied from Narmada - Kshipra Link project.
- Facilities:
  - Desilting chamber, Pressure sand filters, Dual media filters, Fire water tanks, raw water tanks, Domestic water tanks

INDOOR SPORTS COMPLEX:

- Total built up area: 4,257 Sqm.
- RCC framed structure with Ground floor
- Projected cost: Rs. 12.63 Crores (as part of LS contract of Rs. 306 crores under M/s SIL)
- Facilities:
  - Squash court, Badminton court
  - Indoor games
  - Swimming Pool, Filtration tanks

CENTRAL HVAC PLANT:

- Total built up area: 1,685 Sqm.
- RCC framed structure
- Projected cost: Rs. 15.17 Crores (as part of LS contract of Rs. 306 crores under M/s SIL)
- Facilities: Centralized air conditioning system for identified buildings
  - Capacity for Phase 1A(a): 1800 TR (600 × 3 units)

DETAILS OF DEPOSIT WORKS ENTRUSTED TO CPWD

HOSTEL BUILDING (02 UNITS): On-going work

- Total built up area: 14,004 Sqm. each
- G+5 configuration
- The estimated cost: Rs. 93.15 Crores
- Capacity: 490 Students
- Work in progress
- Expected date of completion: November 2018

LEARNING RESOURCE CENTRE (Library Block):

- Total built up area: 9,641 Sqm.
- G+4 configuration
- The estimated cost: Rs. 59.56 Crores
- Drawings & detailed estimates frozen and tendering process is on.

LECTURE HALL COMPLEX:

- Total built up area: 19,706 Sqm.
- G+4 configuration
- The estimated cost: Rs. 125.56 Crores

ADMINISTARTIVE BUILDING:

- Total built up area: 8,365.72 Sqm.
- G+9 configuration
- The estimated cost: Rs. 46.96 Crores

DINING HALL & FOOD COURT:

- Total built up area: 9,289.25 Sqm.
- G+2 configuration
- The estimated cost: Rs. 52.32 Crores

HEALTH CENTRE:

- Total built up area: 3775.39 Sqm.
- G+2 configuration
- The estimated cost: Rs. 24.59 Crores

HOSTEL (02 UNITS):

- Total built up area: 14,004 Sqm. each
- G+5 configuration
- The estimated cost: Rs. 116 Crores

ANIMAL HOUSE & RADIOACTIVITY LAB:

- Total built up area: 529 Sqm.
- G+1 configuration
- The estimated cost: Rs. 2.50 Crores

HOUSING:

- Total built up area: 10,000 Sqm.
- G+6 configuration
- The estimated cost: Rs. 29.50 Crores

INFRASTRUCTURE SERVICES Phase-II:

- Campus infrastructure (external) services for roads, sewerage, drainage works, ELV lines.
- The estimated cost: Rs. 41.20 Crore

AIR COOLING SYSTEM FOR EXISTING HOSTEL & STUDIO APARTMENTS:

- Supply, installation, testing & commissioning of air cooling system for existing Hostel (BH02) and Studio apartments (SA02).
- The estimated cost: Rs. 3.05 Crores

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