



INDIAN INSTITUTE OF TECHNOLOGY INDORE

A N N U A L R E P O R T

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ANNUAL REPORT

2010-2011



INDIAN INSTITUTE OF TECHNOLOGY INDORE

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Director's Message

In its third year of operation there are a lot of things happening at IIT Indore that lend itself towards feeling a cautious degree of optimism. Despite the constraint of not having our own campus, we have taken a calculated decision to proceed with the establishment of research labs in the space that is available to us. IIT Indore has now established a secondary campus at the Pithampur Automotive Cluster on the way to Mhow. The additional space now accommodates the Engineering departments, Research Labs and classrooms for the second year and third year undergraduate students. The first year undergraduates and the School of Basic Sciences and School of Humanities and Social Sciences continue to function from the transit campus at IET, Indore. A quantum leap has also been achieved in terms of residential facilities for students and faculty members whereby the Institute has taken on lease units at the Silver Springs commune on the Mumbai-Agra Highway so as to mimic a semblance of life on an integrated campus.

In continuing with the focus on research, faculty members in various disciplines are in the midst of setting up advanced labs in their respective fields. With the support of the Government of India and the Board of Governors, funds have been sanctioned approving the purchase of various high end equipment such as the Ion beam sputtering unit, one of very few such machines in the country, and other equipment for a Research Lab in the Nanosciences. Talks are also at a fairly advanced stage to establish a Fraunhofer center for Surface Engineering at the PACL campus of IIT Indore. This aggressive push towards

setting up the requisite facilities has seen the graduate student population already touching 60, and with rolling advertisements in almost all disciplines the population of research scholars is increasing by the day.

While the establishment of Labs and other facilities is proceeding at a fast clip the administration is doing its best to speed up the process of land acquisition and getting the necessary approvals so that construction of the permanent campus can begin in earnest at the Simrol site. The Institute on its part has completed the formalities to appoint the consultants for the construction work and after having taken input from all the stakeholders of the project, the Master Plan for the institute has been frozen ensuring that with the final approvals coming through the work on building the campus will also start.

It needs to be added and emphasized here that as anyone who is familiar with establishing new systems knows, the most important ideations of process and structure are governed by specific protocols that gain traction in an environment where a singular commitment to the job at hand is the need of the hour. This is being demonstrated in ample measure on a daily basis by the most important stakeholders of the institute, namely the students and faculty members. More than a sense of transitory monumentalization achieved by ordering physical spaces in a pre determined order, it is this diligent singularity that will see the institute through in these initial years establishing a culture of academic honesty and professional integrity that more than any technological artifact will stand the test of time.

The Institute

IIT Indore continues to function from the transit campus at DAVV University's IET campus, located at the city limits. While Administration, first year undergraduate classes and labs, School of Basic Sciences and School of Humanities and Social Sciences are at the IET campus, School of Engineering and second and third year undergraduate students have shifted to the new Pithampur Auto Cluster campus situated on the route to Mhow.

A major improvement in terms of residential facilities for students and faculty members has been made possible by a shift to the Silver Spring commune on the Mumbai-Agra bypass. Second and third year undergraduates, research scholars and several faculty members now live at this location. First year undergraduate boys continue to reside at the older Narmada hostel on the Khandwa road.

Despite the delay in shifting to a permanent campus development of advanced research labs in all disciplines remains a priority area for the institute. This is being done by adopting a philosophy of space utilization that seeks to maximize occupation for academic purposes and by keeping non academic allocations of space to an absolute bare minimum. As a consequence, faculty members are pressing ahead with the development of their research labs and instruments ordered for these labs have been installed or are in the process of being installed. The success of these efforts is also reflected in the research student population which has already touched 60 and is increasing by the day.

Academics



IIT Indore offers the B Tech programme in three streams, Computer Science and Engineering, Electrical and Mechanical Engineering. We also have Ph.D. programmes in the three Engineering disciplines and also in Chemistry, Physics and Mathematics. The School of Humanities and Social Sciences has Ph.D. programmes in Economics and Philosophy. The current student strength is 399, with 342 students in the undergraduate programme and 57 students in the PhD programme.

Category Male Female Total

Category	Male	Female	Total
General	153	21	174
OBC	86	08	94
SC	44	07	51
ST	22	01	23
Total	305	37	342

Ph.D. Programme:

Category	Male	Female	Total
General	31	17	48
OBC	07	01	8
SC	01	00	1
ST	00	00	0
Total	39	18	57

The academic calendar is divided into the Autumn and Spring semester. The Autumn semester runs from the last week of July to the first week of December. The Spring semester begins in January and closes in the first week of May. As in other IIT's a system of continuous evaluation and assessment is followed at IIT Indore with quizzes, assignments and mid semester and end semester examinations.

Academic affairs of the students are looked into by two committees with faculty representatives from all the Schools. Undergraduate student affairs are handled by the Undergraduate Academic Programme Evaluation Committee (UGAPEC) and Post/Graduate student affairs is under the charge of Postgraduate Academic Programme Evaluation Committee (PGAPEC).

Other than core courses in the discipline, undergraduate students also have the option of taking elective courses from their parent departments and also from other disciplines. In a span of eight semesters undergraduate students have to clear coursework and practicals with a weightage of around 170 credits to become eligible for their degree. Undergraduates also have a compulsory pre-requisite of 13.5 credits from the School of Humanities and Social Sciences that will be part of the eligibility criterion of 170 credits. Ph.D. students generally have to complete one year of compulsory course work to be eligible for their doctoral work. The credit weightage for doctoral students varies across the disciplines and also depends on their prior academic experience.

Faculty

Sanctioned Positions	90
Strength	40
Vacancy	50

Designation	Vacancy	Strength
Professor	14	01
Associate Professor	29	01
Assistant Professor	9	38
Total	52	40

Administration

Administrative staff strength at Indore has risen to 23 in various technical and support roles. The Institute currently has Deans for Administration and Planning (Dr. Subhendu Rakshit), Faculty Affairs (Dr. P.N. Puntambekar), Academics (Dr. Neelesh K Jain) and Research and Development (Dr. N. S. Chaudhuri). Institute affairs are looked into by the Board of Governors.

Members of the Board of Governors

1. **Shri Ajay Piramal**, Chairman
Chairman, Board of Governors, IIT Indore, Piramal Tower, Ganpatrao Kadam Marg, Lower Parel, Mumbai-400013
2. **Prof. Pradeep Mathur**, Member
Director, IIT Indore, M-Block, IET-DAVV campus, Khandwa Road, Indore-452017
3. **Shri Ashok Thakur**, Member
Special Secretary, Government Of India, Ministry of Human Resource Development, Department of Higher Education, Shastri Bhavan, New Delhi-110115
4. **Shri Sanjay Singh**, Member
Secretary- Government of Madhya Pradesh, Department of Technical Education & Skill Development, Mantralaya, Vallabh Bhawan, Bhopal-462004
5. **Dr Sibaji Raha**, Member
Director, Bose Institute, 93/1, Acharya Prafulla Chandra Road, Kolkatta-700009
6. **Shri Aman Singh**, Member
Secretary to Hon. Chief Minister, Government of Chhattisgarh, Energy & Information Technology, DKS Bhawan, Mantralaya, Raipur, CG-492001
7. **Shri K. K. Singh**, Member
Chairman & Managing Director, Rolta India Ltd, Rolta Technology Park, Rolta Tower, "A", MIDC-Marol, Andheri (E), Mumbai-400093
8. **Shri Harpal Singh**, Member
Mentor & Chairman Emeritus, Fortis Healthcare Ltd, B-10, Anand Niketan, New Delhi-110021
9. **Prof. Narendra Chaudhari**, Member
Professor, Computer Science & Engineering, IIT Indore, M-Block, IET- DAVV Campus, Khandwa Road, Indore-452017
10. **Dr Neelesh Jain**, Member
Associate Professor, Mechanical Engineering Department, IIT Indore, M-Block, IET- DAVV Campus, Khandwa Road, Indore-452017
11. **Col (Retd) G. Raja Sekhar**, Secretary
Registrar, IIT Indore, M-Block, IET, Khandwa Road, Indore-452017

Members of the Finance Committee

1. **Shri Ajay Piramal**, Chairman
Chairman, Board of Governors, IIT Indore, Piramal Tower, Ganpatrao Kadam Marg, Lower Parel, Mumbai-400013
2. **Prof. Pradeep Mathur**, Member
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3. **Shri Ashok Thakur**, Member
Special Secretary, Government Of India, Ministry of Human Resource Development, Department of Higher Education, Shastri Bhavan, New Delhi-110115
4. **Prof. K. K. Rao**, Member
Department of Bio Science & Bio Engineering, IIT Bombay, Powai, Mumbai-400076
5. **Prof. N. Puneekar**, Member
Department of Bio Science & Bio Engineering, IIT Bombay, Powai, Mumbai-400076
6. **Shri A. N. Jha**, Member
Joint Secretary & Financial Advisor, Government Of India, Ministry of Human Resource Development, Shastri Bhavan, New Delhi-110115
7. **Col(Retd) G. Raja Sekhar**, Secretary
Registrar, IIT Indore, M-Block, IET- DAVV Campus, Khandwa Road, Indore-452017

Members of the Building and Works Committee

1. **Prof. Pradeep Mathur**, Chairman
Director, IIT Indore, M-Block, IET- DAVV Campus, Khandwa Road, Indore-452017
2. **Mr. Govind Parchani**, Member
Superintending Engineer RRCAT, A-99, IDA Scheme No.103 Kesar Bagh Road Indore – 452 012
3. **Mr. Rajeev Kumar**, Member
Superintending Engineer, IISER, A-234, New Minal Residency, J. K. Road, Bhopal-462001
4. **Mr. B. Bose**, Member
Management Consultant, B-172, Chittaranjan Park, New Delhi – 110 019
5. **Mr. Anoop Mukund Kekere**, Member
Retired Chief Engineer (Electrical) RRCAT, 143, Kalindi-Kunj, Pipalyahana, Indore – 452 001
6. **Col (Retd) G. Raja Sekhar**
Secretary, Registrar IIT Indore, M-Block, IET-DAVV Campus, Khandwa Road, Indore – 452 017

The Campus



IIT INDORE, PACL Campus



IIT INDORE, IET-DAVV Campus

Objective

To establish a campus that will create a new Benchmark in sustainable and environment friendly building protocols in India.

Vision

The campus will be a seamless and integrated built environment that will facilitate a liberal and democratic sharing of thought. We envisage an institutional structure whose foundations will be reflective of the primary concern and pedagogical philosophy of IIT Indore, an understanding that the community here is involved in the process of teaching and sharing ideas.

Characteristics of IIT Indore

- ♦ Intelligent
- ♦ Environment Friendly
- ♦ Disabled Friendly
- ♦ Energy Efficient
- ♦ Low recurring cost on maintenance
- ♦ Socially Sensitive

Special Features

- ◆ Smart Buildings
- ◆ Integrated Building Management Systems
- ◆ Networking
- ◆ Renewable Energy (Storage and Transmission)
- ◆ Rain Water Harvesting
- ◆ Water Recycling
- ◆ Solid Waste Management
- ◆ Water Bodies
- ◆ Natural Landscaping

Current Status of Project

Government of India has approved the establishment of Indian Institute of Technology at Indore. The Government of Madhya Pradesh has allocated 501.62 acres of land for establishing the campus of IIT Indore near Simrol, Tehsil - Mhow, District – Indore. 80 hectares (198 acres) of land is forest land and Stage I approval has been accorded by the Ministry of Environment & Forests, Government of India. The process of expediting Stage II approval is in progress.

As per the Detailed Project Report (DPR) the Government of India has approved a construction area of 63,000 sq meters for the Academic Complex area which include Academic Cum Administrative buildings, Lecture hall complex, Laboratory Complex, Core laboratories and Central facilities, Computer Center, Conference Complex/Auditorium, Student Activities Center, Cafeteria and Library buildings. The Residential built-up area of 1, 58,000 sq meters includes student hostel with common facilities, faculty and staff housing, Guest House, Community Center, Commercial center, Health Center and the Campus School. The total built-up area, including academic and residential spaces, will come to 2, 21,000sq meters.

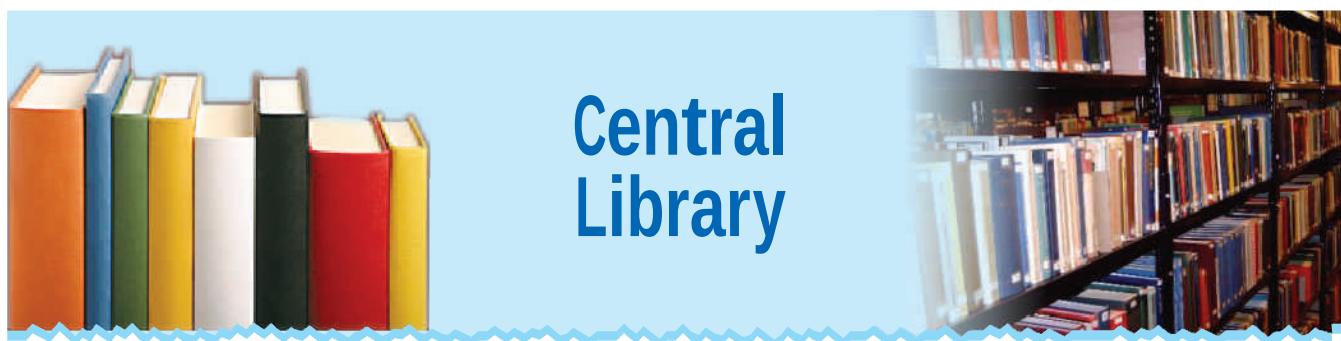
The Government of India has also approved the requisite services needed for a fully functional campus such as internal roads and paths, storm water drains, landscaping, horticulture, electrical supply, diesel generator sets, external lighting, data networking, water supply with water tanks and distribution network and a waste water treatment system. A provision of Rs. 388 crores (Rupees Three hundred eighty eight crores) has been made for the construction of buildings and services.

Site and Resource Optimization

The Ministry of Human Resources Development directed IIT Indore to secure three star rating through Green Rating for Integrated Habitat Assessment (GRIHA). This requirement has been kept in mind at the design stage itself and the Institute is committed to the plan for utilization of non conventional energy resources. The consultants for the Master Plan, Architecture and Engineering Services for the campus have already been appointed. The Master plan of the campus has been frozen and is in the final stages of being approved. In principle approval has been accorded by the Indore Municipal Corporation Indore for providing water supply lines to the campus. The Madhya Pradesh Power Transmission Company Limited (MPPCL), fully owned by the Government of Madhya Pradesh, has given the consent to establish an electrical substation at the Simrol site. The Contour Survey work has been completed and a Revised Detailed Project Report has been submitted to the Ministry of Human Resources Development for approval keeping in mind the upward spiral in labor costs as well as escalation in cost of raw material.

Project and Process

Faculty committees have been constituted to look into and advise on Services such as Energy and Water Resources, Space Management, Transportation, Networking and Communications and Sustainable Design. Proposals submitted by the project consultants will be vetted by the respective committee to ensure that the objective of creating new design benchmarks in sustainable practices is attained. Faculty members and Administration have frozen the various requirements for Academic and Administrative Infrastructure including Lecture Halls, Laboratories Complex, Core Laboratories and Central Facilities, Computer Centre, Conference and Seminar spaces, Auditorium, Student Activities Centre, Cafeteria, Library and Sports and Athletic stadia. A shift to the permanent campus will be made possible by 2014, if the possession of land will be given without any encumbrances by Madhya Pradesh Govt. The Government of India has approved the budget for the project.

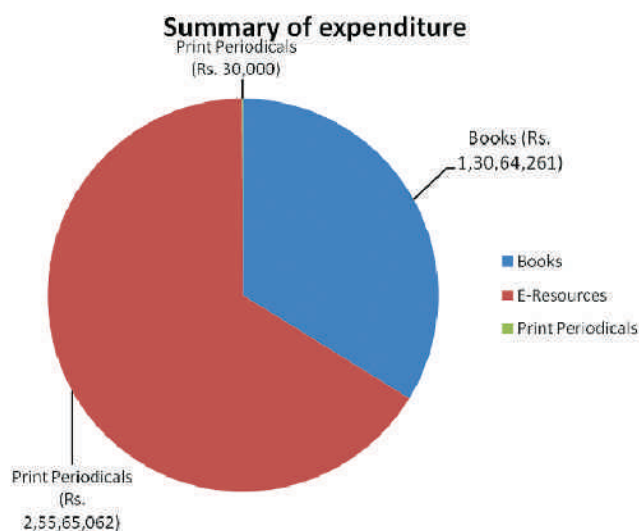


The Central Library started with a small number of books in 2009. The Collection Development activity gathered momentum in the year 2010. At present, the Library has a collection of 10000+ books and new books are being added to the collection continuously. These include books on all relevant subjects 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.

Library at a Glance :

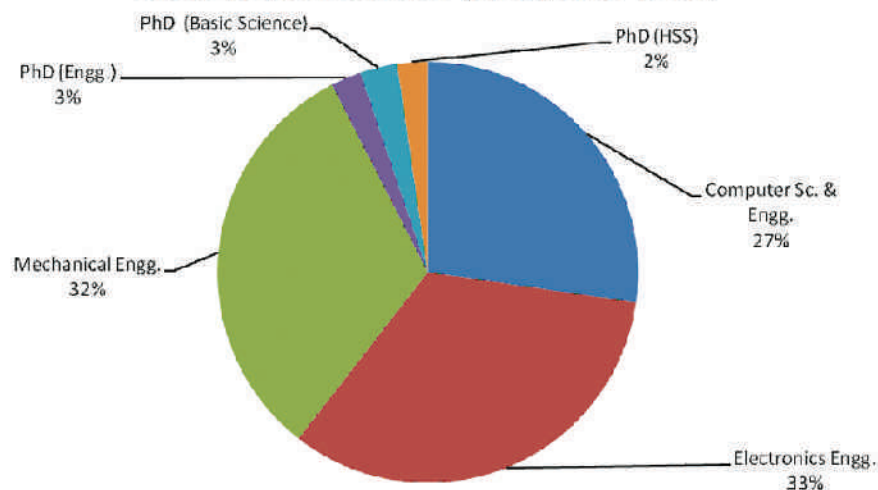
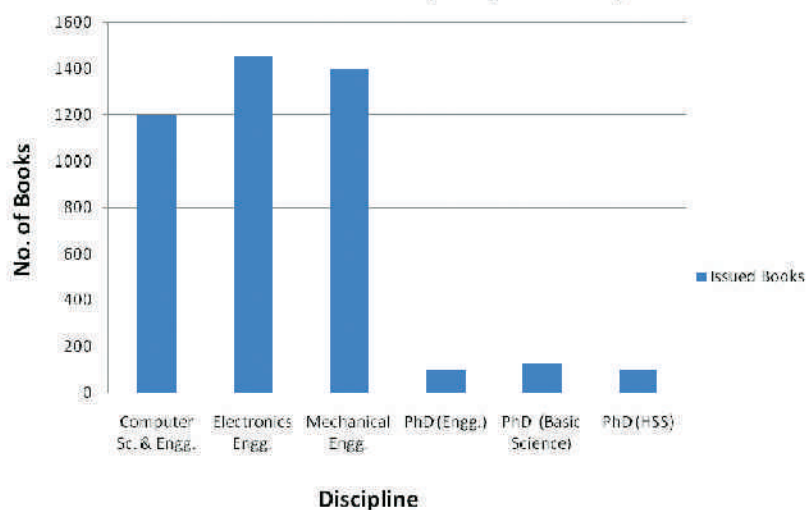
Collection :

Books	E Journals	E Books	Print Journals	Magazines	Newspapers
10,000+	2947 (36 Publishers)	486	46	15	6



Usage :

Books Issued per month month (Average)	Photocopies per month (Average)	Printouts per month (Average)	Reading Room Usage per (Average)
548	6500 approx	500	2100 users p.m. approx

Book Issue Statistics (Discipline Wise)**Book Issue Statistics (Discipline Wise)**

Periodicals and Newspapers (Print Format): At present, the Library subscribes to 46 Print Periodicals, 15 Magazines and 6 newspapers.

Electronic Resources: In today's world of Information Explosion, access to electronic information resources is essential, particularly in an academic environment. Therefore, the library has developed a collection of Electronic Resources which provide access to thousands of journal articles, research papers, books, and other resources. These include ASME Journals, IEEE Xplore Digital Library, and McGraw-Hill's Access Engineering through INDEST Consortium. Access is also provided to JSTOR through INFLIBNET. Also, electronic journals published by reputed societies and publishers such as American Mathematical Society, American Chemical Society, American Institute of Physics, American Physical Society, IEEE, Wiley, have been subscribed and the access activated since January 2011. The E Resource collection also includes 486 E Books. 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 webpage itself.

The Services:

At present, the Library offers services as enumerated below:

- ♦ **Lending facility:** Undergraduate students can borrow 8 books for the period of 1 month, whereas Ph.D. students can borrow up to 10 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 40 students at a time. In addition to this, 5 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:** The Library has Inter Library Loan arrangements with institutes such as IIM Indore, RRCAT, etc. Under this facility, access is provided to books or electronic materials which may be needed by users but not available in our library.

- ♦ **Book Bank:** Text books are provided to SC/ST students for the period of a semester.
- ♦ **Photocopying / Printing:** Users are provided Photocopy or Printouts of library resources subject to the provisions of the Copyright Act.

Library 2.0 Initiatives: In addition to the services mentioned above, the Library has started the following Lib 2.0 initiatives in order to overcome the space and time constraints faced by all libraries while offering more traditional services:

Library Wiki: This was started with a view to making Information available to users irrespective of time or space. Users can check the Library Rules, access the Book Recommendation Form, and check the list of books any time at:
<http://centrallibraryiitindore.pbworks.com/>

Library Blog: This was started as a channel of communication with users. As yet, this has been used to share information about books, and to invite users' views and comments. The student community has responded well to this channel. The blog can be accessed at:
<http://centrallibraryiitindore.blogspot.com/>

Twitter Account: The Library also has a Twitter Account which is being used for announcements of events such as presentations on Online Resources, etc. It can be accessed at:
<http://twitter.com/knowledgeforall>

Library Automation: ILMS: The Library has selected an Integrated Library Management System (ILMS), Libsys, for the automation of all its activities and services. It has been installed in April 2011. The Circulation and other modules have been operational since the beginning of the academic year in July 2011. Users can check the Library collection by using the Web OPAC (Online Public Access Catalog).

Bar Coding: Bar Coding of books is being done at the time of processing of books. Books are issued/ returned with the help of a Bar Code Scanner at the Circulation Counter.



Other Activities: The Library organizes various Training Programs/ Informative Sessions for E Resources and also for Print Resources. In addition to this, the Library organized a Book Exhibition under the name “IITI Booksville” from February 1-3, 2011.

Library at PACL Campus: At PACL Campus, a library with an area of 1781 sq. ft. has been set up to cater to the teaching and research needs of Engineering Faculty members, students, and research scholars. All the above mentioned facilities and services are provided to the users at PACL Campus Library.

The People: No initiative can be successful without support from people. The Library has a Library Committee which meets regularly for discussion on policy matters and decision making. The Committee

Members are:

Dr. Pritee Sharma
Convener

Dr. Neelesh Kumar Jain
Member

Dr. Anjan Chakraborty
Member

Ms. Anjali Bandiwadekar
Member Secretary

Ms. Paridhi Mishra
Student Member

The Library Team:

Ms. Anjali Bandiwadekar
Dy. Librarian (Tel. 2438713 ext. 713/ anjali@iiti.ac.in)

Mr. Lala Ram Ahirwar
Senior Library & Information Assistant (ext.757 lala@iiti.ac.in)

Mr. Gati Krushna Nayak
Senior Library & Information Assistant (ext. 757 gati@iiti.ac.in)

Mr. Anil Pattanayak

Senior Library & Information Assistant (ext. 757 anilp@iiti.ac.in)

Mr. Satish Bisen

Senior Library & Information Assistant (ext. 757 satishb@iiti.ac.in)

Mr. Sunil Kapoor

Library Attendant (ext.757 sunilk@iiti.ac.in)

Mr. Ranjeet Raghuvanshi

Library Attendant (ext. 757 ranjeetr@iiti.ac.in)

Mr. Gokul Soni

Library Attendant (ext.757)

Student Life

The year started with IIT Indore first marathon on the theme 'Save Our Tigers'. The event was a big success with a total of nearly 800 participants including the team from BSF. The year also saw IIT Indore's first All India sports festival 'FEROCIA -2011' being organized with nearly 20 colleges nationwide and over 1200 participants being involved in the event. IIT Indore is one of few IIT's to organize a sports fest in such a short time span.

Apart from these, our students got the privilege of being coached by various national and international level coaches. Various conditioning camps and pre-coaching camps were organized and students actively participated in it. This was reflected in the performance of the students in the 47th inter IIT aquatics meet. Our student Mr. Sanidhya Sanjay Naikwad (second year Mechanical Engineering) won the Bronze medal in 200 meter individual midley race. Students also participated in several local and state level tournaments and performed creditably.

External Linkages

A memorandum of understanding was signed between Indian Institute of Technology, Indore and Saarland University (Germany) on 12/11/2010 to facilitate a student exchange programme. Each institute will accept up to five students from the partner institute each year. The period of enrolment in the partner institute will not exceed one year unless a student's extension is approved by both institutes. The agreement is initially for a period of five years from the date of signing and can be renewed automatically every five years henceforward.

The exchange programme is meant to enhance educational and technology interaction between the two institutes and also to eventually find common areas of interest for advanced research in frontier areas of the Sciences and Engineering. IIT Indore is also in an advanced stage of concluding collaborative research agreements with other Institutes in Europe.

School of Basic Sciences

Discipline of Chemistry

1. (a) Degree program running for the discipline: Ph.D.

(b) Short Summary of the program:

The Discipline of Chemistry offers Ph.D. degree program with the following courses.

- i) CH 701: Spectroscopic techniques
- ii) CH 703: Biological Chemistry
- iii) CH 704: Chemistry of Surfaces and interfaces
- iv) CH 705: Materials Chemistry
- v) CH 706: Photochemistry
- vi) CH 720: Asymmetric synthesis
- vii) CH 797-CH798: Seminar Course

Along with these, Chemistry Discipline is still offering two courses at undergraduate levels (B.



(d) Details of research labs:

Our research laboratory is equipped with three fume hoods, four rotavapors, and two weighing balances, three solvent and chemical cabinets.

2. Faculty members including photographs/ Specialization of faculty members/ Current and long-term research interests:

- 1) **Prof. Pradeep Mathur**
Specialization : Organometallic and structural chemistry
- 2) **Dr. Anjan Chakraborty**
Specialization : Physical Chemistry (Spectroscopy)
Research Interests : Photophysics of drug molecules in different biological media
- 3) **Dr. Apurba K. Das**
Specialization : Organic Chemistry (Bio-organic Chemistry)
Research Interests : Systems Chemistry, Peptide and DNA based nanostructured materials
- 4) **Dr. Rajneesh Misra**
Specialization : Organic Chemistry
Research Interests : Organic electronics/Photonics, Functional Dyes
- 5) **Dr. Sampak Samanta**
Specialization : Synthetic Organic Chemistry
Research Interests : Asymmetric Synthesis

Current and long-term research interests: Our research focus is to conduct organic reactions in a green manner, aiming at achieving high selectivities (chemo, regio, diastereo and enantioselectivity) during the reaction. Our current research areas include:

Asymmetric reaction and catalysis; oxidation; organophosphorus compounds and total synthesis of important biologically active compound.

In this priority area, we utilize the readily accessible carbon resources efficiently, and pursue "preparation of important materials for the safety and security of the mankind" by developing (i) new synthetic reactions based on the truly efficient molecular transformations and (ii) the design of high-

performance catalysts in consideration of the following keywords, "synthetic power", "environmental harmony", "atom economy", and "sequential transformations". It is to urgently establish the scientific support system which supplies the results of our basic research to "process synthetic organic chemistry" in our industrial world.

6) Dr. Suman Mukhopadhyay

Specialization : Inorganic Chemistry

Research Interests : Metal organic Frameworks, Heteronuclear coordination polymers, Inorganic and Organometallic Pharmaceuticals, Activation of Small Molecules by Coordination with Biological and Industrial Significance

7) Dr. Tridib K. Sarma

Specialization : Physical Chemistry

Research Interests : Nanostructured Materials, Polymer composites, Biomimetic materials chemistry, self and directed assembly of organic-inorganic materials.

8) Dr. Tushar K. Mukherjee

Specialization : Physical Chemistry

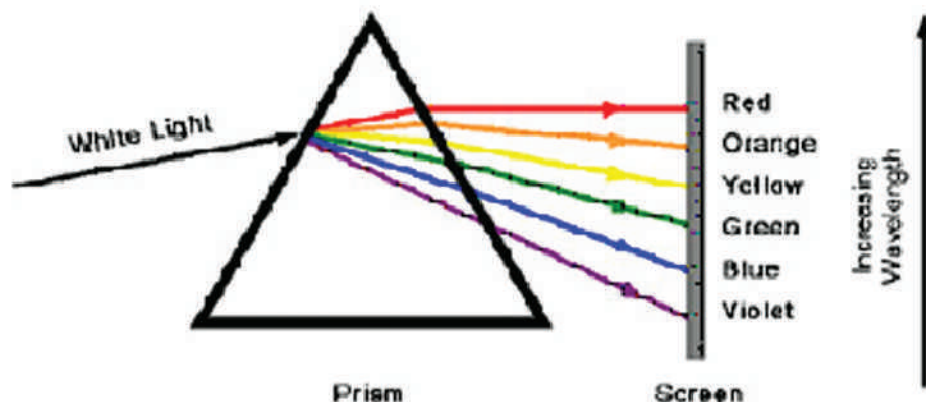
Research Interests : Single molecule fluorescence imaging using TIRFM: Fluorescent sensor, Single molecule spectroscopy in rigid media

Current and long-term research interests:

1. Single molecule fluorescence imaging using TIRFM: Fluorescent sensor

1 a). Why single molecule study is important?

Monitoring real-time molecular dynamics at a single molecule level attracted much attention from all branches of science. Specially, single molecule fluorescence imaging and spectroscopy provides a clear visual picture of actual reaction. In recent times single molecule techniques like total internal reflection fluorescence microscopy (TIRFM), single molecule fluorescence resonance energy transfer (sm-FRET) and atomic force microscopy (AFM) are gaining importance due to their unique power to resolve the dynamical structure of complex systems at the single molecule resolution. These systems can range from simple chemical to complex biological processes where little is known about the individual reactant molecules. In single molecule technique one observes the structural dynamics of individual reactant component instead of observing the average property in bulk ensemble measurement technique. The differences between the single molecule and bulk ensemble measurement can be explained by considering the following scheme 1,

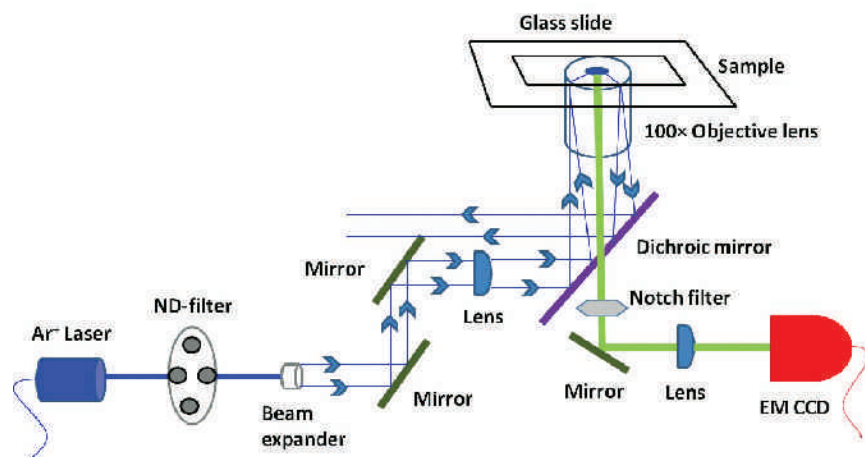


Scheme 1 : Diffraction of white light into its component by a prism.

Here the left hand side of the prism has a white light source and represent the bulk ensemble techniques, and the prism acts like a single molecule tool which results in splitting the white light into different color component light. Hence in single molecule experiment one study the individual component of the whole system and gain information about the heterogeneity and population distribution of the system.

1 b). Total Internal reflection fluorescence microscopy (TIRFM)

Total Internal reflection fluorescence microscopy is a technique which uses a light source to be totally internally reflected at the glass/water interface. This technique is based on the evanescent wave generated on the interface due to the total internal reflection of the light source. The depth of this evanescent wave at the glass water interface is roughly 100-150 nm, and hence any surface attached molecule which comes within this range will be excited by this wave and the rest of the bulk molecules remain dark.



Scheme 2: Schematic representation of TIRFM set up with Ar⁺-laser and EM-CCD camera.

Single molecule fluorescence imaging using TIRFM has emerged as an interdisciplinary field due to its broad range of application starting from simple in vitro bimolecular dynamics to in vivo live cell imaging. It all needs an inverted microscope with high numerical aperture objective lens which collects maximum fluorescence signal from the sample. For high resolution spectral and temporal detection of single molecules people are using highly sensitive EM-CCD camera.

1 c). Fluorescent sensors

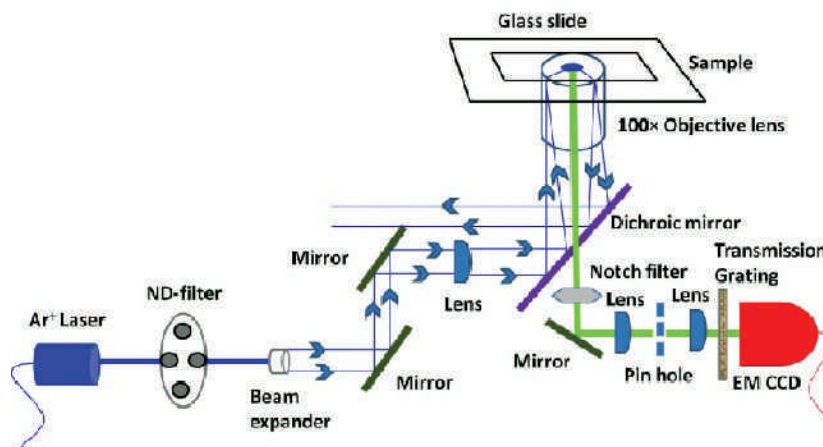
Fluorescent sensors are those molecular materials whose fluorescent properties are strongly dependent on the sensing material. The term fluorescent sensor is a vast area and covers a whole lot of sensors that are fluorescent in nature like,

- i) pH sensor
- ii) Ion sensor (cations and anions)
- iii) Proximity sensor
- iv) Humidity sensor
- v) Temperature sensor

These different classes of sensors find application from industry based material science to modern biomedical science. Hence it is very important to understand their functioning at the molecular level to improve their efficiency and sensitivity. There is a vast scope for the single molecule techniques to contribute actively in this field.

2. Single molecule spectroscopy in rigid media.

The spectral characteristic of a single molecule is much more informative compared to the spectra of bulk sample. The immediate environment surrounding a molecule can influence the spectral characteristic to a great deal. Hence studying spectroscopy of single molecule in rigid matrixes gives valuable information regarding their morphology. There are three major advantages of looking at the dynamics and spectroscopy of single molecules. The first is the study of processive or sequential dynamics. A population of molecules undergoing a series of events, such as a complex assembly process or linear polymerization, becomes out of phase and the detailed dynamics of individual steps are lost. Of course, on the single molecule level, one watches an individual molecule throughout the course of events, removing the phase problem. Another advantage of single molecule spectroscopy is that single molecules exist at any given time in particular conformational states with a particular solvent environment. Observing only population averages can hide dynamic or mechanistic features of biological molecules that are important to function.



Scheme 3 : Schematic representation of Single molecule spectrometer.

Publications:

Prof. Pradeep Mathur:

Area of specialization: Organometallic and structural chemistry

1. Varying structural motifs in oxyanions (NO_3^- , CO_3^{2-}) and phenoxyacetate (PhOAc^-) bridged coordination polymers derived from alkoxo-bridged dicopper building blocks with $\{\text{Cu}_2\text{O}_2\}$ core Mobin, Shaikh M.; Srivastava, Ashwini K.; Mathur, Pradeep; Lahiri, Goutam Kumar RSC Advances (2011), 1(5), 893-902.
2. Crystal Structure and Energy Optimization of Dichlorobis (ethylantranilatonicotinamide)Zinc(II) By Narayanan, Venkatraj V.; Gopalan, R. Srinivasa; Chakrabarty, Debojit; Mobin, Shaikh M.; Mathur, Pradeep Journal of Chemical Crystallography (2011), 41(6), 801-805.
3. Chemically modified oximate complexes of titanium (IV) isopropoxide as new precursors for the sol-gel preparation of nano-sized titania: Crystal and molecular structure of $[\text{Ti}\{\text{ONC}_6\text{H}_4\}_4 \cdot 2\text{CH}_2\text{Cl}_2]$ Chaudhary, Archana; Dhayal, Veena, Nagar, Meena, Bohra, Rakesh, Mobin, Shaikh M., Mathur, Pradeep Polyhedron (2011), 30 (5), 821- 831.
4. Synthesis and molecular structure of $[(\text{CO})_3\text{RuBr}_2]_2(\mu\text{-SePh})_2\text{Ru}(\text{CO})_4]$ cluster with a Ru_3Se_2 chain core Torubaev, Yury; Mathur, Pradeep; Pasynskii., Alexander Journal of Organometallic Chemistry (2011), 696 (4), 832-834.
5. Crystal Structure and Phase Transition of Diglycine Perchlorate Panicker, Lata; Mathur, Pradeep; Mobin, Shaikh M. From Journal of Chemical Crystallography (2011), 41 (2), 147-154.
6. Cyclodimerization of phenyliodoacetylene with elemental tellurium: New pathway to 1,3-

ditellurofulvenes Torubae, Yury; Mathur, Pradeep; Jha, Badrinath; Mobin, Shaikh M.; Skabitsky, I. V. *Journal of Organometallic Chemistry* (2011), 696 (2), 496-503.

7. Towards the catalytic formation of α, β -vinylesters and alkoxy substituted γ -lactones Mathur, Pradeep; Joshi, Raj Kumar; Jha, Badrinath; Singh, Amrendra K.; Mobin, Shaikh M. *Journal of Organometallic Chemistry* (2010), 695 (24), 2687 - 2694.
8. Reversible single-crystal to single-crystal transformations in a Hg(II) derivative. 1D-polymeric chain. Mobin, Shaikh M.; Srivastava, Ashwini K.; Mathur, Pradeep; Lahiri, Goutam Kumar *Dalton Transactions* (2010), 39(37), 8698-8705.

Publication by Faculty Member

(a) Journal papers:

1. Low-Frequency Spectra of Metallocenium Ionic Liquids Studied by Terahertz Time-Domain Spectroscopy, Anjan Chakraborty, Takashi Inagaki, Motohiro Banno, Tomoyuki Mochida and Keisuke Tominaga, *J. Phys. Chem. A*, 2011, 115, 1313–1319.
2. Solvent-Controlled Intramolecular Electron Transfer in Ionic Liquids, Xiang Li, Min Liang, Anjan Chakraborty, Minako Kondo and Mark Maroncelli, *J. Phys. Chem. B*, 2011, 115, 6592–6607.

(b) Conference Papers:

1. Sonication Induced Functional Peptide Hydrogel: A Template for In Situ Generation of Pt Nanoparticles, Indrajit Maity, Dnyaneshwar B. Rasale and Apurba K. Das, will be presented in International Symposium on recent trends of research in Chemistry at Midnapore College, Midnapore, West Bengal dated on 31st October and 1st November 2011.
2. Synthesis and Characterization of Metal-Organic Frameworks Based on Aminonitrile Ligand, Rajendar Nasani, Manideepa Saha and Suman Mukhopadhyay, going to be presented in Modern Trends in Inorganic Chemistry - XIV (MTIC-XIV), University of Hyderabad, Hyderabad, 10-13 December, 2011.

Short summary on ongoing research work of Discipline:

Samanta Research group are vigorously pursuing the idea of modularly designed self-assemblies as the organocatalysts for asymmetric reactions. For instance, the enantioselective oxidation reaction has been investigated using these kinds of catalysts. This new method for the formation of organocatalyst drastically reduces the efforts required for the synthesis and modification of an organocatalyst. This new chemical strategy will be utilized for the synthesis of various biologically important intermediates.

Currently Chakraborty research group is involved with the photophysical properties of Norfloxacin (NOR), a widely used antibiotic have been investigated in well characterized biomimicking environments formed by bile salts. Experimental results demonstrate that the dominance and variation (enhancement and fall) of a particular prototropic species is sensitive to the excitation wavelength in bile salt aggregates. Change in the excitation wavelength plays an important role in promoting a specific prototropic form of the drug molecule. The most striking observation of the present work is completely different (rather opposite) fluoremetric variations due to excitation at two different wavelengths. Excitation at 305 and 325 nm, reveals quenching of fluorescence neither of NOR with addition of NaDC and NaTC. On the contrary, excitation at 350 nm, we observe a steady increase in the fluorescence with a continuous red shift. The experimental results were rationalized in terms of the fact that neutral and zwitterionic form of NOR in bile salt aggregates are selectively excited at shorter wavelength (305 nm and 325 nm) while the cationic form of NOR is excited at 350 nm. The excess hydronium ions in bile salt aggregates convert the neutral form into a cationic form causing the increase in the emission intensity at excitation wavelength 350 nm. It was found that initially 1:1 complex is formed between NOR and bile salt and at higher bile salt concentration 1:2 complex is formed.

Research Scientists:

1. Dr. Deepa Dey **Project Summary**

The project work is focused on the developments of non-stoichiometric metal oxide material (Ti, V, Nb, Zr etc.) as potential photocatalyst to be used in solar cell development. The idea originates from the fact that non-stoichiometric oxides have unpaired electron that show electrical as well as magnetic behavior. We want to exploit these inherent physico chemical properties towards improvised solar energy conversion.

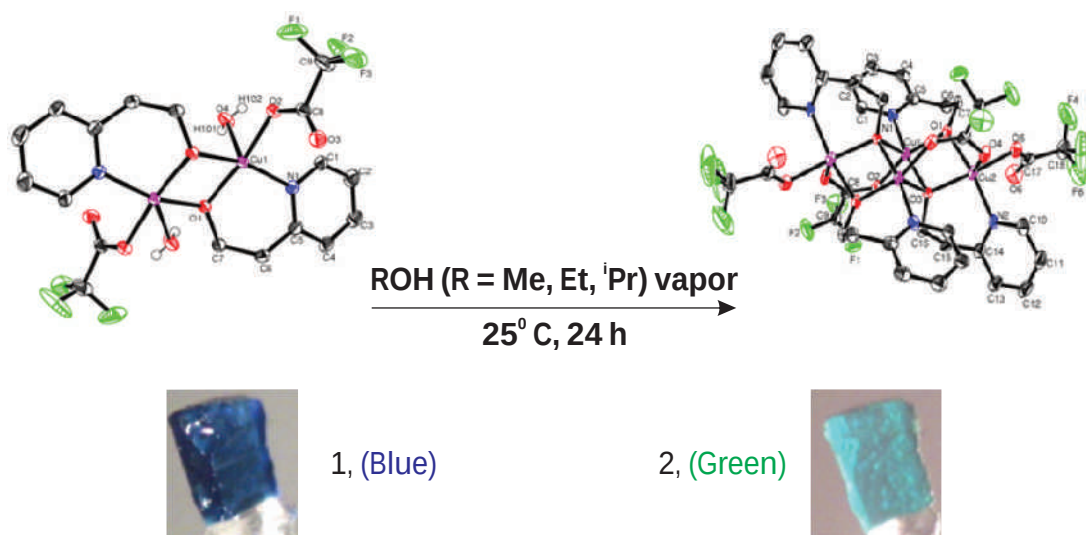
Apart from this work we are also interested in size and shape directed synthesis of coordination polymer nanoparticle taking advantage of various synthetic techniques such as emulsion, polymerization, hydrothermal, microwave and sonochemical methods.

2. Dr. Mobin Shaikh **Project Summary**

Single-Crystal to Single-Crystal Transformation: In recent years an appreciable efforts have been made towards the designing of single crystals of suitable metal-organic frameworks both at the discrete and polymeric levels which can undergo selective transformations by the application of either heat or light or simple vapor-diffusion without losing the crystallinity. This sort of solid state molecular transformation at the single-crystal to single-crystal (SCSC) level is rather interesting as it can lead to the formation of unusual products which are often either difficult or impossible to obtain from the bulk solid

materials. However, the SCSC process is considered to be quite challenging as only selective molecular frameworks are capable of retaining the necessary crystallinity while being exposed to external effects such as heat or light or vapor. The SCSC process has received considerable attention in recent years particularly because of their potential applications in obtaining functional materials, such as chemical sensors for toxic gases or volatile organic compounds. One such example is given below:

Vapor Diffusion Mediated Single Crystal-to-Single Crystal (SCSC) Transformation of a Discrete Dimeric Copper (II) Complex to a Discrete Tetrameric Copper (II) Complex.



The symmetric dimeric complex $[\text{Cu}(\eta^2\text{-hep})(\text{TFA})(\text{H}_2\text{O})]_2$ (1) has been synthesized from 2-(2-hydroxyethyl)pyridine (hep-H), trifluoroacetic acid (TFA-H), and copper acetate in a 95:5 (v/v) MeOH-H₂O mixture at 298 K.

At room temperature, the blue single crystals of 1 transform to the green single crystals of a tetrameric complex, $[\text{Cu}_4(\eta^3\text{-hep})_2(\eta^2\text{-hep})_2(\eta^2\text{-TFA})_2(\text{TFA})_2]$ (2), in presence of alcoholic vapor. The facile single crystal-to-single crystal (SCSC) transformation of 1 to 2 is accompanied by the removal of coordinated H₂O molecules in 1 and concomitant formation of four new covalent bonds, two Cu-O($\eta^3\text{-hep}$) and two Cu-O($\eta^2\text{-TFA}$). The SCSC transformation of 1 to 2 is selective to the alcoholic vapor; the exposure of single crystals of 1 to heat or light or in vacuum has resulted in an immediate loss in crystallinity.

(c) Current and long-term research interests :

1. Synthesis of inorganic complexes and its application in solid-state transformation at Single-Crystal to Single-Crystal (SCSC) transformations level.
2. Synthesis of metal carbonyl mediated metal chalcogenized clusters.
3. Construction of biomimetic sensors by using carbon paste electrode.

Name of the project	PI/Co-PI	Budget Sanctioned (Rs.)	Over heads (Rs.)	Duration	Starting date	Funding agency	Project staff
1. Photophysical and dynamical behavior of the drgs molecules in biological media	Dr. Anjan Chakraborty	23,88,000	477600	3 years	May 2011	DST	
2. Molecular self-assembly directed via chemical reactions for the applications in biology and nanosciences	Dr. Apurba K. Das	22,80,000	360000	3 Years	1st April 2011	DST	
3. Perylenedimide derivatives as Two-photon Absorbing materials	Dr. Rajneesh Misra	23 Lakh		3 years	Yet to start	DST	
4. Ferrocenyl Porphyrins as Optical Limiting Materials	Dr. Rajneesh Misra	21,20,000		3 years	1st August 2011	CSIR	
5. Heteronuclear Coordination Polymers Inspired by Cycloaddition and Hydrogen Bonds : Towards Dynamic Porous Metal organic Frameworks	Dr. Suman Mukhopadhyay	18,00,000		3 years	1st April 2011	CSIR	Manideepa Saha (JRF)
6. Development of Novel Organocatalyst for Asymmetric (4+2) Diels-Alder Reaction of α -Substituted- α,β -Unsaturated Aldehydes or Ketones with Dienes: Access a Chiral Quaternary Carbon Center	Dr. Sampak Samanta	Submitted	384600	3 years	NA	CSIR	NA

6. Size and shape Controlled Magneto-Optical Nanoparticles for Cancer Cell Imaging and Photo-thermal 150	Dr. Tridib K Sarma	50 lacs	10 lacs	3 years	October 2011	DST	Not yet appointed
8. DST Women Scientist Scheme	Dr. Deepa Dey	Rs. 22,80,000/-	Rs. 3,00,000/-	3 years	16 th August 2011	Department of Science and Technology (DST)	None

Picture and List of Hi-tech facilities and a brief write-up:

During this year, following equipments/facilities were added to the laboratory. These are :

1. 400 MHz NMR (Bruker)
2. ESI-Mass Spectrometer (Bruker)
3. Single Crystal X-ray Diffraction (Oxford)
4. CHNSO elemental analyzer
5. Time Correlated Single Photon Counting (Horiba)
6. HPLC (Young Lin)
7. Fluorescence Microscope (Nikon)

**Individual honorary work by faculty members:**

1. External Referee for Master of Engineering / Technology or M.Phil. /M.S. theses: 1 (Dr. Suman Mukhopadhyay)
2. Special Recognition/Awards: Honorary Research Associate, University of Glasgow, UK (Dr. Apurba K. Das)

Discipline of Mathematics

1. (a) Degree program running for the discipline : Ph. D. in Mathematics
- (b) Short Summary of the program:

The Discipline of Mathematics offers Ph.D. degree program with the following courses.

- i) MA 701: Experimental Designs and Data Analysis
- ii) MA 702: Conformal Mapping
- iii) MA 706: Numerical Linear Algebra
- iv) MA 601: Topology
- v) MA 701: Topics in Analysis

Along with these Mathematics Discipline is offering four courses at undergraduate levels (B. Tech.).

List of faculty members :

- 1) Prof. K. D. Joshi (Visiting Professor)

Specialization: Algebraic Topology

Research Interest: Algebraic Topology

- 2) Prof. Sk. Safique Ahmad (Assistant Professor)

Specialization: Numerical Linear Algebra and Stability analysis for Stochastic Differential Equations

Research Interest : Numerical Linear Algebra and Stability Analysis for Stochastic Differential Equations

- 3) Prof. M. G. Nadkarni (Visiting Professor)

Specialization: Ergodic Theory, Harmonic Analysis and Probability Theory

Research Interest: Ergodic Theory, Harmonic Analysis and Probability Theory

- 4) Prof. Swadesh Kumar Sahoo (Assistant Professor)

Specialization: Complex Analysis

Research Interest: Complex Analysis (Univalent Functions, Quasiconformal Mappings, Hyperbolic type metrics)

5) Prof. Antony Vijesh (Assistant Professor)**Specialization:** Applied Functional Analysis**Research Interest:** Applied Functional Analysis**Publications:****(a) Journal papers:**

1. On Pseudospectra, Critical points and Multiple Eigenvalues of Matrix Pencils, S. S. Ahmad, R. Alam, and R. Byers, Siam Journal of Matrix Analysis, vol. 31, no.4, pp. 1915-1933, 2010.
1. (2) On estimation of Transient Stochastic Stability of Linear Systems, S.S.Ahmad and S. Raha, Journal of Stochastic and Dynamics, vol. 10, no. 3, pp. 1-21, 2010.

(b) Books by: Prof. K. D. Joshi

- i. Prepared the second edition of Educative JEE (Mathematics) published by Universities Publishers, Hyderabad
- ii. Prepared the second edition of Applied Discrete Structures to be published by New Age International Publishers, New Delhi.

Short summary on ongoing research work of Discipline:

Dr. Sk. Safique Ahmad: Structured Polynomial eigenvalue problems associated with Delay differential equations and control theory problems; secondly, we study the logarithmic norm for matrix pencils which are associated with DAE and Stochastic Differential Equations.

Prof. M. G. Nadkarni: National Sample Survey Organisations (NSSO) have many years of data on Monthly Per capita Consumer Expenditure (MPCE) for rural and urban households. With the assistance of Vijesh Antony and Ankush Goswami, I have made some statistical analysis of this data which gives some results not expected at the beginning of the analysis.

Dr. Swadesh Kumar Sahoo: Radius problems associated with pre-Schwarzian and Schwarzian derivatives in the area of univalent functions.

Dr. Antony Vijesh: Working on fractional differential equations. In particular, theorems on existence and uniqueness theorem for fractional delay differential equation and its applications to various models such as fractional order Lotka-Volterra type model.

Ph D Students: Currently we have four Ph.D. students undergoing course works. Supervisors will be officially assigned after their completion of course works.

Individual honorary work by faculty members:

(i) Service to Academic Institutes:

Service to Academies by Prof. K. D. Joshi:

- a. Delivered a lecture series to prepare students for NET examination at Shivaji University, Kolhapur.
- b. Served on the Selection Committee for mathematics faculty at Management Institute, Jabalpur

Service to Academies by Prof. M.G.Nadkarni:

- a. One Student, Ankush Goswami from NICER, Bhubaneshwar, visited IIT, Indore, from May 9 to July 4 under the Summer Research Fellowship program of the Indian Academies of Sciences to study under my guidance.
- b. Service to U.G.C.: Evaluated online applications for the D. S. Kothari Post Doctoral Fellowship in Mathematics.

(ii) Service to Professional Societies:

Dr. Sk. Safique Ahmad: Life Member of OMS

(iii) Service as Editor/Associate Editor for International Journals:

Dr. Swadesh Kumar Sahoo: Technical Editor of Journal of Analysis published by Forum d'Analystes, Chennai.

(iv) Reviewer for Research Papers:

Dr. Sk. Safique Ahmad: (1). Journal: Linear Algebra and its Applications (Elsevier), Journal: Computers and Mathematics Applications (Elsevier)

Prof. M. G. Nadkarni: Refereed a paper for the Proceedings of the Indian Academy of Sciences, Mathematical Sciences, December, 2011.

Dr. Swadesh Kumar Sahoo: (Bull. Math. Anal. Appl.; J. Inequalities and Appl.; Journal Publicationes Mathematicae Debrecen; Abstract and Applied Analysis)

(v) Invited Lectures Delivered:**By Prof. K. D. Joshi:**

- (1) Lectures at IIT Guwahati in June 2010 for ATML in linear algebra
- (2) Lectures for faculty and students 'Why we need topologies?' at Shivaji University

By Dr. Sk. Safique Ahmad:

- (1) Presented a paper entitled "Perturbation analysis for rational and irrational eigenvalue problems" at University of Birmingham, UK
- (2) Invited Speaker on Study Group meeting on industrial problems (SGMIP-11) 14-26, March- 2011 in Supercomputer Education and Research Center, IISc. Bangalore funded by DST, India.
- (3) Tutor in Advanced Instructional School (AIS) on Numerical Linear, December 02 -22, 2010. Funded by the National Board for Higher Mathematics (NBHM), Govt. of India.

By Dr. Antony Vijesh:

- (1) Presented a paper entitled A generalized Newton-like method and its application in NSMMA Dec. 22, 2010
- (2) Gave an invited talk entitled Generalised Newton methods and their application in the National Conference on Nonlinear Functional Analysis at M.S. University Tirunelveli on 3rd-5th March 2011.
- (3) Gave an invited talk entitled Solution of a functional integral equation via iteration at Department of Mathematics IIT Madras on 1st April 2011.

(vi) Special Recognition/Awards:

By Dr. Sk. Safique Ahmad: Inclusion in Who's Who

Discipline of Physics

1. (a) Degree program running for the discipline : Ph.D. in Physics

(b) Short Summary of the program:

PhD Programme: The following courses run for the first year. Ph.D. student, before registration, needs to clear minimum four core courses and at least one elective course.

(i) Core courses:

- ♦ Quantum Mechanics
- ♦ Mathematical Methods
- ♦ Electrodynamics
- ♦ Numerical Methods
- ♦ Statistical Mechanics
- ♦ Seminar

(ii) Elective courses:

(An elective course runs if the certain number of students registers for that particular course)

- ♦ Theoretical Particle Physics
- ♦ Experimental Techniques in High Energy Particle Physics
- ♦ Solid State Physics
- ♦ Theory of Complex Systems

Once student gets required CPI can start research work with his/her supervisor in the respective research area.

(c) Details of Teaching Laboratories:

Undergraduate Physics Laboratory (For First year B.Tech.)

This laboratory is equipped with sophisticated instruments. Presently, 40 students can individually perform experiments at a time.

The students are exposed to variety of experiments as listed below:

1. Centrifugal Force
2. Helmholtz Coils
3. Thermal Conductivity
4. LCR Circuit (Computer controlled measurements)
5. Kundt's Tube
6. Fresnel's Bi-prism

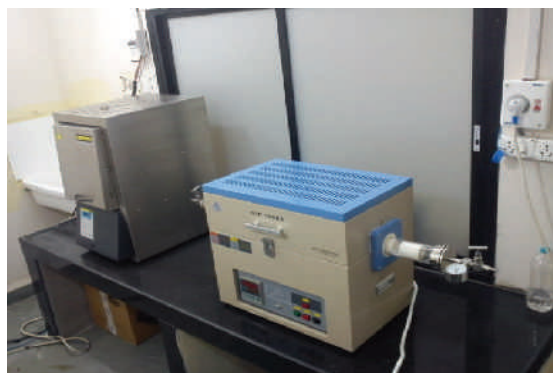


Undergraduate physics laboratory
for optics experiments



Undergraduate physics laboratory for
general experiments

(d) Details of Research Laboratories:



Synthesis laboratory (for solid state reaction) equipped with high temperature furnaces

7. Grating Spectrometer
8. Single Slit Diffraction
9. Hydrogen Spectrum
10. Specific Change of electron

This synthesis laboratory can be used for making polycrystalline bulk samples of different size. All the facilities for grinding, mixing, and heating, annealing in gas flow and fine cutting of the samples are available in the laboratory.

2. List of faculty members:

1. **Dr. Manavendra Nath Mahato, (Assistant Professor)**

Specialization: String Theory, Applications of Holographic Principle in QFT, Hydrodynamics and Condensed Matter

Research Interest: Currently, I am interested in finding solutions and their implications of relativistic hydro dynamical systems with anomalies and their interpretations for quantum field theories and gravity theories. Another project involves exploring semi-classical string dynamics in anti de Sitter background in the BMN (Berenstein Maldacena Nastase) limit.

Long Term Research Interest: My long term research interests include exploring properties of turbulent behavior, magneto-hydrodynamics, time dependent dynamic phenomena of black hole formation and accretion in various backgrounds. I would also like to interpret relevant or novel features thus obtained in terms of field theories and strongly correlated systems in condensed matter using gauge/gravity correspondence. I also intend to study the latter theory in various limits including finite rank of the gauge group.

2. Dr. Raghunath Sahoo, (Assistant Professor)

Specialization: Experimental and Phenomenology of Heavy Ion Collisions (Quark-Gluon Plasma)

Research Interests: Experimental Relativistic Heavy Ion Collisions (ALICE Experiment at Large Hadron Collider, CERN, Geneva), Phenomenology of Quark Gluon Plasma (QGP), related to global properties of the plasma, heavy flavor production and application of statistical thermal model to heavy ion physics.

Long Term Research Interests: FoCal (Forward Calorimeter) physics with ALICE upgrade plans, PANDA experiment at FAIR energies at GSI, Germany.

3. Dr. Sarika Jalan, (Assistant Professor)

Specialization: Nonlinear Dynamics

Research Interest: Analyzing biological systems under complex networks and random Matrix theory framework, particularly,

- (1) Establishing relations between spectral and modular properties of networks
- (2) Studying global map of human gene with focus on cancer disease
- (3) Gene co-expression networks of Zebrafish for diverse toxicogenomics perturbations

Long Term Research Interest:

- ♦ Spectral properties of directed networks
- ♦ Synchronization of coupled dynamics on networks and its application to neurosciences:

particularly exploring relations between network topology and synchronized clusters.

- ♦ Detection and role of delay in large extended systems
- ♦ Disease spreading, co-evolution and adaptation
- ♦ Cytoplasmic flows

Reviewer for Research Papers:

Physical Review Letters, Physical Review E, Chaos, Physics Letters A, IEEE Transactions on Circuits and Systems I, Modern Physics Letters B, Journal of Plant Physiology

4. Dr. Krushna Mavani, (Assistant Professor)

Specialization: Condensed Matter Physics and Terahertz Spectroscopy

Research Interest: Multiferroic thin film synthesis using pulsed laser deposition method. Study of multiferroic and composite materials for structural, magnetic and multiferroic properties.

Long Term Research Interest: Development of terahertz spectroscopic techniques and study strongly correlated electron oxide systems in form of thin films and single-crystals using terahertz spectroscopy. Explore possible correlations of low-energy dynamics and ultrafast dynamics with magnetic, electronic and structural (phonon) properties of the materials.

Reviewer of the following journals:

- ♦ Europhysics letters
- ♦ Journal of Applied Physics
- ♦ Solid State Physics
- ♦ Physica C
- ♦ MRS Bulletin by American Physical Society

5. Dr. Subhendu Rakshit, (Assistant Professor)

Specialization: High Energy Physics Phenomenology

Research Interests: Interested in the origin of mass and its study at the currently operational Large Hardron Collider. Neutrino experiments can shed light on the flavor problem and hence I am working on different neutrino mass models and measurement of neutrino mixing parameters in future experiments.

6. Dr. P. N. Puntambekar, (Visiting Professor)

Research Interest:

(i) Gas Lasers (ii) Frequency stabilized He-Ne lasers

- ◆ I2 stabilized He-Ne Lasers
- ◆ Frequency stabilized two mode He-Ne Lasers
- ◆ Cavity stabilized two mode lasers
- ◆ Zeeman stabilized laser

(iii) Dye Lasers (iv) Interferometry and Laser Applications

- ◆ Laser Interferometry
- ◆ Holographic interferometry
- ◆ Classical optical interferometry
- ◆ Thin films
- ◆ Optical information processing
- ◆ Nonlinear optics

7. Dr. Ankhi Roy, (Assistant Professor)

Specialization: Experimental Hadron Physics

Research Interests: Transition Form Factor of Different Mesons, Dalitz Decay of mesons, Rare Decays of light mesons, Reaction Dynamics, Physics with WASA-at-COSY.

Long Term Research Interest: Relativistic Heavy Ion Collisions (ALICE Experiment at LHC), Measurement of Nuclear properties with Strangeness degree of freedom and Nucleon Structure (PANDA Experiment at FAIR), Detector development of PANDA detector setup.

Publications:

a) Journal Papers

- 1) Probing the QGP phase boundary with Thermal Properties of Mesons. Raghunath Sahoo et al., International Journal of Modern Physics A (2011) (In press)
- 2) Constituent Quarks and Multi-strange baryon production in heavy ion collisions. Raghunath Sahoo, Nirbhay K. Behera and Basanta K. Nandi (Submitted to Phys. Rev. C)
- 3) Rapidity and transverse momentum dependence of inclusive J/psi production in pp collisions at $\sqrt{s} = 7$ TeV. K. Aamodt, Raghunath Sahoo et al. (ALICE Collaboration), Phys.Lett. B (2011) (In press)
- 4) Production of pions, kaons and protons in pp collisions at $\sqrt{s} = 900$ GeV with ALICE at the LHC, K.

- Aamodt, Raghunath Sahoo et al. (ALICE Collaboration), Eur.Phys.J. C71 (2011) 1655
- 5) Femtoscopy of pp collisions at $\sqrt{s} = 0.9$ and 7 TeV at the LHC with two pion Bose Einstein correlations K Aamodt , Raghunath Sahoo et al . (ALICE Collaboration) e,Print arXiv 1101.3665 [hep ex]
 - 6) Two pion Bose Einstein correlations in central Pb Pb collisions at $\sqrt{s_{NN}} = 2.76$ TeV K Aamodt , Raghunath Sahoo et al . (ALICE Collaboration) Phys Lett B696 (2011) 28-37
 - 7) Centrality dependence of the charged particle multiplicity density at mid rapidity in Pb Pb collisions at $\sqrt{s_{NN}} = 2.76$ TeV . K Aamodt , Raghunath Sahoo et al . (ALICE Collaboration) , Phys Rev Lett 106 (2011) 32301
 - 8) Suppression of Charged Particle Production at Large Transverse Momentum in Central Pb -Pb Collisions at $\sqrt{s_{NN}} = 2.76$ TeV . K Aamodt , Raghunath Sahoo et al . (ALICE Collaboration) Phys . Lett B696 (2011) 30 .
 - 9) Pion femtoscopy in p +p collisions at $\sqrt{s} = 200$ GeV , M M Aggarwal , Raghunath Sahoo et al . (STAR Collaboration) Phys Rev C83 (2011) 64905 .
 - 10) Hydrodynamics of R charged D1 branes J R David , M Mahato , S Thakur , S R Wadia , Journal of high energy Physics 1101 , (2011) 14 .
 - 11) Toward NS5 Branes on the Resolved Cone over $Y(p,q)$ E Caceras , M Mahato , J A Pando Zayas , V J G Rogers , Physical Review D83 (2011) 066008 .
 - 12) Spectral Properties of Directed Random Networks with Modular Structure , Sarika Jalan , Guimei Zhu , Baowen Li , Journal ref Physical Review E (2011) (in press)
 - 13) Photoproduction of mesons off the deuteron J Jaegle , A Roy , et al . Euro . Phys J A 47 (2011) 11
 - 14) Photoproduction of mesons on nuclei near the production threshold M Nanova , A Roy , et al . , Euro Phys J A47 (2011) 16
 - 15) Quasi free photoproduction of mesons off the deuteron J Jaegle , A Roy , et al . Euro Phys J A 47 (2011) 9
 - 16) Symbolic dynamics and synchronization of coupled map networks with multiple delays , Fatihcan M Atay , Sarika Jalan , Jürgen Jost, Journal-ref: Physics Letters A 375 (2010) 130-135

b) Conference Papers:

- 17) Transverse Energy Measurement in Au+Au collisions by STAR Experiment. Raghunath Sahoo (for STAR Collaboration), Indian Journal of Physics 85, 897 (2011).

Short summary on ongoing research work of Discipline:

Random Matrix Analysis of Complex Networks: We are working on the random matrix analysis of large scale complex networks (model networks as well as real world networks). Recent availability of real world networks data combining with the fast computers reveal that real world networks are not random and have some structure, organization and universality. Because of the complexities and the large structure of real systems, analysis and prediction of their behavior, on one hand is difficult and challenging, on the other hand underlying organization and universalities shown by these systems make these studies very interesting.

This was the short survey on the state of the art. The main question which we focus is following: "How do entities with complex organizational structure and function arise and develop." Following RMT, we introduce a new measure to study global properties of the networks. So far, most of the work in the field of the networks concentrated to study the distribution of eigenvalues of the adjacency matrices of underlying networks, we use distribution of eigenvalues fluctuations to analyze the amount of randomness in the network architecture

- ♦ **Synchronized clusters on Networks:** Complex systems have underlying structures that are described by networks or graphs. Evolution of coupled dynamical units on these networks shows fascinating phenomena of synchronization. The most interesting achievement of this research is identification of different mechanisms of cluster formation, namely self-organized and driven. Self-organization is, in general, a known mechanism for synchronization, but revelation of driven mechanism provides a new direction to the field.
- ♦ **Aim to explore the phenomena related to the origin of multiferroicity in thin film oxides.** The effect of strain on the multiferroic properties will be studied. Presently, many multiferroic and composite thin films are deposited on single-crystals using pulsed laser deposition method. These thin films are studied for the structural and magnetic properties using X-ray diffraction and temperature dependent magnetization measurements. Dielectric and/or ferroelectric measurements at low temperatures.
- ♦ **Abelian anomalies in relativistic hydrodynamical systems can lead to significant dissipative terms.** These terms can have implications for quark-gluon plasma as well as black hole accretion and formation problems. Our ongoing work includes analyzing various solutions in these situations and to explore their consequences. We are constructing some novel solutions of hydrodynamics in our research. In another related project, we have analyzed transport phenomena for a class of non conformal 2 dimensional theories with Einstein-Maxwell-dilaton action. Some of the results such as bulk viscosity remain same for our class of solutions. We are constructing supergravity solutions which arise in finite deformations of D1-D5 black brane solution. This will lead to a new class of gravity solutions dual to 2

dimensional non conformal field theories, elucidating any general behavior or universal phenomena of various transport coefficients involved. These we intend to further compare with some 2 dimensional strongly correlated condensed matter systems.

- ♦ Transition Form Factor of Different Mesons, Dalitz Decay of mesons, Rare Decays of light mesons, Reaction Dynamics, Physics with WASA-at-COSY, Detector development of PANDA detector setup.
- ♦ Experimental Relativistic Heavy Ion Collisions (ALICE Experiment at Large Hadron Collider, CERN, Geneva), Phenomenology of Quark Gluon Plasma (QGP) related to global properties of the plasma: quark participant-scaling of multi-strange hyperon production in heavy ion collisions, thermal properties of phi mesons and QCD equation of state; Heavy flavor production and application of statistical thermal model to heavy ion physics. Probing QCD matter using velocity of sound.

Research Projects:

Name of the project	PI/Co-PI	Collaborator	Budget Sanction	Over heads (Rs.)	Duration	Starting date	Funding agency	Project staff
Investigations on ferroelectric, magnetic and structural correlations in RMnO_3 (R=Rare earth ions) multiferroic thin films	Dr. Krushna R. Mavani	N/A	25 Lacs	4.2 Lacs	Three years	Release of fund awaited	DST, India	One JRF
Analysis of gene expression data of zebra-fish under random matrix theory and complex networks framework	Dr. Sarika Jalan		23 lacs		Three years	Release of fund awaited	DST, India	
Radiative Decays of the Omega Meson with WASA-at-COSY	Dr. Ankhi Roy (PI)	WASA-at-COSY	Euro 15,000	Euro 1498 (IIT Indore)	Euro 1498 (IIT Indore)	01.01.12	COSY-FFE, Germany	1 PhD student
ALICE Experiment at LHC	Dr. Raghunath Sahoo	ALICE	Awarited (1.5 cores)	20.08	2011-16		DAE-DST, India	
Proposal for Detector Development QCD studies with antiprotons at FAIR: Indian Contribution to PANDA	Dr. Ankhi Roy (Co-PI)	PANDA collaboration	25 lacs (IIT)	20% of the total budget of IITI		Release of fund awaited	DAE-DST, India	
Holographic ramifications of phase transitions in D brane configuration space	Dr. Manaven dra Nath Mahato	NA	awaiting				DST, India	
Development of Fiber Laser-Coupled Terahertz time domain Spectroscopy for studying Low-energy dynamics of Functional oxides.	Dr. Krushna Mavani	NA	Awaited (50 lacs)	6.5 lacs	Three years	NA	DRDO, India	

Individual summary of the project :**Investigations on ferroelectric, magnetic and structural correlations in RMnO₃ (R= Rare earth ions) multiferroic thin films:**

Recently RMnO₃ manganites are found to show magnetoelectric effect and multiferroicity due to complex magnetic ordering such as conical or cycloidal ordering of the spins. It is rare to find magnetoelectric effect, however, RMnO₃ manganites are magnetoelectric, i.e., they show magnetic control of electric properties. Many of RMnO₃ are hexagonal manganites, and hence cannot be synthesized easily with single phase structure. However, using pulsed laser deposition method, it is easy to stabilize the single phase in either orthorhombic or hexagonal structure. In this project, we aim to synthesize high quality thin films of RMnO₃ using pulsed laser deposition method and study the structural, magnetic and multiferroic properties. Also, we will study the effects of strain arising due to lattice mismatch between substrate material and thin film material.

Analysis of gene expression data of zebra-fish under random matrix theory and complex networks framework:

During millions of years of evolution, living organisms have developed sophisticated adaptive systems that are able to undergo homeostatic responses upon sensing a stimulus. These adaptive systems comprise integrated biological pathways whose functions are highly coordinated in respect to gene expression, protein activities, and metabolite levels. Advances in the omics technologies and systems biology have enabled the mapping and dissecting molecular components that build up these adaptive systems. It is important to understand molecular mechanism in these systems in response to diverse perturbations. Malfunctions and deregulation of these systems can lead to toxicity as well as diseases. Besides, identifying genes that are sensitive to these perturbations has its application in biomarker discovery for both environmental detection of pollutants and diagnostic purpose to monitor progression of a disease. Identification of genes that are significantly response to diverse perturbations leading to future development for chip that can be used for detection of pollutants and diagnosis of diseases. We analyze microarray data under the framework of complex networks and spectral theory.

Radiative Decays of the Omega Meson with WASA-at-COSY:

The Project is based on the production of ω mesons in pp and pd beam times with the WASA detector at COSY. Pilot experiments have been taking place in February and April, 2011. It is possible to investigate different charged and neutral decay modes of the ω mesons as the WASA detector setup can identify both charged as well as neutral particles. The main focus of the project is to study one of the

major decay channel of omega meson i.e. $\omega \rightarrow \pi^0 \gamma$. Information about the production reaction is available from the previous CELSIUS/WASA analysis and we should reproduce the same result with the present data set of pd and calculate the production cross-section from the pp data as well. This decay channel is crucial for the Dalitz decay $\omega \rightarrow e^+e^- \gamma$ due to the external conversion of the photon. This Dalitz decay is important to extract contributions to the electromagnetic transition form factor. We would like to further look into the decay $\omega \rightarrow \pi^0 \pi^0$ and C violating decay mode $\omega \rightarrow \pi^0 \eta$. We are interested to investigate one Dalitz decay channel $\omega \rightarrow e^+e^-$. The branching ratio of this decay channel is not quoted by the Particle Data Group.

ALICE Experiment at LHC:

The ALICE Experiment at CERN, Geneva is going in search of answers to fundamental questions, using the extraordinary tools provided by the LHC (Large Hadron Collider):

- ◆ What happens to matter when it is heated to 100,000 times the temperature at the center of the Sun?
- ◆ Why do protons and neutrons weigh 100 times more than the quarks they are made up of?
- ◆ Can the quarks inside the protons and neutrons be freed?

Quarks are bound together into protons and neutrons by a force known as the strong interaction, mediated by the exchange of force carrier particles called gluons. The strong interaction is also responsible for binding together the protons and neutrons inside atomic nuclei. Although much of the physics of strong interaction is, today, well understood, two very basic issues remain unresolved: the origin of confinement and the mechanism of the generation of mass. Both are thought to arise from the way the properties of the vacuum are modified by strong interaction.

In the nucleus-nucleus collisions at relativistic energies, we aim to produce a state of matter that might have existed after few microseconds of the creation of the universe by a process, popularly known as “Big Bang”. Progressive attempts have been made to address the above fundamental questions through this experiment. The ALICE experiment at the CERN-LHC is in the process of taking data with proton-proton and Pb-Pb collisions. ALICE will allow measuring the production of particles containing heavy flavor (charm and beauty) with the use of the TPC (Time Projection Chamber) and the Silicon detectors for micro-vertexing. Hard partons are predicted to lose energy during their propagation in QCD matter as a consequence of the interactions with the gluons in the medium. As energy loss would increase with increasing parton color-charge and decrease with increasing parton mass (“dead-cone effect”), a hierarchical pattern of larger energy loss for gluons relative to charm quarks and for charm quarks relative to beauty quarks is predicted. The observation of such pattern would provide an important insight in the properties of QCD at high-energy density. Depending on the initial

temperature of the system, low momentum heavy quarks may be thermalized and hadronize inside the medium via coalescence with another quark from the medium itself. The measurement of the relative abundances of charm hadrons species allows accessing the initial temperature and the degree of thermal equilibration of the partonic system. It's also conjectured by LO-QCD calculations that a loss in back-to-back azimuthal correlation of D^0 - D^0 bar would also reveal the early partonic thermalization.

Our activities from IIT-Indore will be focused on the analysis of ALICE data, in p-p and Pb-Pb collisions, to study the production of charm hadrons (D^0 , D^{*+} , D_s^+ and Λ_c^+), by reconstruction of hadronic decays, and of beauty hadrons (B mesons), by reconstruction of inclusive semi-electronic decays. Then we will measure the energy-loss-induced suppression of these particles in lead-on-lead relative to p-p, the coalescence-sensitive ratios of D_s^+/D^0 , D_s^+/D^{*+} , and Λ_c^+/D^0 , and the jet-like correlations of charm and beauty particles with other charged particles of the event. The strategies for the selection of samples of the aforementioned probes, while dedicated to each particular case, have a common baseline in the transverse momentum measurement and, mostly, in the accurate study for the identification of micro-vertexes (i.e. vertexes at distances from the interaction point as low as ~ 100 micron) or the measurement of the impact parameter associated to each charged track (distance of the point of the particle's trajectory closest to the interaction point).

We will be involved in the Indian PMD (Photon Multiplicity Detector) operation and data taking along with data analysis for the measurement of photon multiplicity and other characteristic phenomenon like flow and fluctuation. We will participate in the ALICE upgradation for the FOCAL (Forward Calorimeter), where many interesting physics issues could be addressed.

Proposal for Detector Development for QCD studies with antiprotons at FAIR : Indian Contribution to PANDA:

The Facility for Antiproton and Ion Research (FAIR) is a future project at GSI which will extend hadron physics studies up to the charm meson region using antiproton beams together with a state-of-the-art detector antiproton annihilation at Darmstadt (PANDA). The physics aim, in a broader sense, is to address the fundamental problems of hadron physics and aspects of quantum chromo-dynamics (QCD) at low energies. The project work in India will consist of several parts: R&D studies of silicon micro-strip detector, development of a scintillator hodoscope with silicon photomultiplier (SiPM) readout, studies of SiPM as photon counter and simulation studies of the detector design as well as physics case studies. Our activities at IIT Indore will focus on the studies of SiPM as a Photon counter.

Picture and List of Hi-tech facilities and a brief write-up :

Synthesis laboratory (solid state reaction) is developed which is equipped with high-temperature box furnace and a tube furnace. All the required facilities and chemicals for grinding, mixing, heating, cutting, annealing and synthesizing oxide materials are available in the lab along with the various type of gloves and masks for the protection during synthesis.

A low temperature cryogenic system with a water circulation system for cooling, is under installation. Quite soon it will start functioning. Followed by this, resistivity and ferroelectric measurement systems will be installed for low temperature measurements up to about 7 K. Work related to development of related facilities in cryogenic lab is under development.

The following is the list of equipments available in the Synthesis laboratory.

1. High temperature box furnace (1700°C)



Single zone split-tube furnace (1200°C)



3. Hydraulic press with (capacity of 15 tons)
4. Low-speed Diamond Saw
5. Closed cycle variable temperature cryogenic system for low temperature measurements and related equipments
6. System source meter instrument (multi-channel I-V test solution)
7. Hot plate

School of Engineering

School of Engineering, IIT Indore is currently situated at PACL campus, Mhow, Indore. There are three disciplines in the school of engineering namely:-

- ◆ Discipline of Computer Science and Engineering
- ◆ Discipline of Electrical Engineering
- ◆ Discipline of Mechanical Engineering

The report of all academic activities in these three disciplines is summarized in this document.

Discipline of Computer Science and Engineering

1. Degree program offered in the discipline:

- a. B.Tech. (Computer Science and Engineering)
- b. Ph.D.

2. Short Summary of the Degree Program:

- a. B.Tech. (Computer Science and Engineering): The summary of courses offered in all four year is listed below.

FIRST YEAR	
Theory	CS103 Computer Programming
Lab	CS153 Computer Programming Lab
SECOND YEAR	
Theory	CS201 Discrete Mathematical Structures CS202 Automata Theory and Logic CS203 Data Structures and Algorithms CS204 Design and Analysis of Algorithms CS205 Abstraction and Paradigms for Programming CS206 Logic Design CS208 Software Engineering
Lab	CS253 Data Structures and Algorithms Lab CS254 Design and Analysis of Algorithms Lab CS255 Abstraction and Paradigms for Programming Lab CS256 Logic Design Lab CS258 Software Engineering Lab CS262 Program Development and Software Design Lab-II

THIRD YEAR	
Theory	CS301 Data Base & Information Systems CS302 Computer Graphics and Visualization CS303 Operating Systems CS304 Artificial Intelligence CS305 Computer Architecture CS306 Computer Networks CS307 Optimization Algorithms and Techniques
Lab	CS308 Compiler Techniques CS351 Data Base & Information Systems Lab CS352 Computer Graphics and Visualization Lab CS353 Operating Systems Lab CS354 Artificial Intelligence Lab CS355 Computer Architecture Lab CS356 Computer Networks Lab CS357 Optimization Algorithms and Techniques Lab CS358 Compiler Techniques Lab CS391 Summer Internship (8-10 weeks duration after complete of the 6th semester)
FOURTH YEAR	
Theory	CS 401 Soft Computing CS 402 Parallel Computing Four Discipline Electives (Two electives per semester) will also be offered.
Lab	CS 391 Evaluation of Summer Internship CS 451 Soft Computing Lab CS 452 Parallel Computing Lab CS 491 B.Tech. Project (Stage 1) CS 492 B.Tech. Project (Stage 2)

Ph. D. Program : The summary of courses offered in the discipline for Ph. D. program

Theory	CS 701 Selected Topics in Advanced Algorithms CS 797/798 Seminar Course
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1) Details of teaching labs:

A. Currently total 18 Undergraduate Teaching lab courses for all four years are offered.

- B. Some of the labs are equipped and some are getting equipped with computers with latest configuration and all the required software's are procured.



Computer Lab at PACL campus



Computer Lab at PACL campus

2) FACULTY MEMBERS

a. Prof. N. S. Chaudhari (Professor):

Short Statement about Specialization: algorithms, game AI, Discrete Structures, Theoretical Computer Science, computational learning and soft computing

Long Term research interests: Distributed and parallel computing, Discrete Structures, optimization algorithms, theoretical computer science

Current Research Interests: Algorithms, Formal Languages, Automata and Computability, Discrete Structures, game AI, grammar learning, novel neural network models, networks

JOURNAL PAPERS:

1. INTERNATIONAL LEVEL

1. Narendra S. Chaudhari, and Jaya Thomas, "Hybrid Cryptosystem Based on 2-SAT & 3-SAT and the Implications of Polynomial Solvability of 3-SAT", In, International Journal of Computer Applications (IJCA): Special Issue on Evolution in Networks and Computer Communications, Vol. 2011, No. 2, pp.:01-06, New York, USA (Oct. 2011) (web-link: <http://www.ijcaonline.org/specialissues/encc/number2/3720-encc009>).
2. Rajkumar Jain and Narendra S. Chaudhari, "Representation of k-Cluster constraint as k-SAT in Social Networking", In, International Journal of Computer Applications (IJCA): Special Issue on Evolution

in Networks and Computer Communications, Vol. 2011, No.1, pp.:13-18, New York (USA) (Oct. 2011) (web-link: <http://www.ijcaonline.org/specialissues/encc/number1/3714-encc003>).

3. Neetesh Saxena and Narendra S. Chaudhari, "A Secure Digital Signature Approach for SMS Security", In, International Journal of Computer Applications (IJCA): Special issue on IP Multimedia Communications, Vol. 2011, No.1, pp. : 98-102, New York (USA) (October 2011) (web-link : <http://www.ijcaonline.org/specialissues/ipmc/number1/3758-ipmc022>).
4. Prakash C Sharma and Narendra S Chaudhari. Polynomial 3-SAT Encoding for K-Colorability of Graph. In, International Journal of Computer Applications (IJCA): Special Issue on Evolution in Networks and Computer Communications Vol.2011, No. 1, pp.:19-24, New York, USA (Oct. 2011) (web-link: <http://www.ijcaonline.org/specialissues/encc/number1/3715-encc004>)
5. Kshitij Pathak, Aruna Tiwari and Narendra S Chaudhari. "Computational Complexity of Association Rule Hiding Algorithms", In, International Journal of Computer Applications (IJCA): Special Issue on Evolution in Networks and Computer Communications Vol. 2011, No. 1, pp. : 39-43, New York, USA (Oct. 2011) (web-link: <http://www.ijcaonline.org/specialissues/encc/number1/3718-encc007>)
6. Li Shukai, Narendra S. Chaudhari, Manoranjan Dash, "Selecting useful features for personal credit risk analysis. International Journal of Business Information Systems (IJBIS) Vol. 6, No. 4, pp. 530-546 (Dec. 2010).

ii) JOURNAL PAPERS: NATIONAL LEVEL:

1. Narendra S. Chaudhari, "Improved polynomial algorithm for 3-SAT," " The Journal of the Indian Academy of Mathematics, Vol. 32, No. 1 (Oct. 2010) pp. 251-267.

Conference Papers:

i. CONFERENCE PAPERS: INTERNATIONAL LEVEL:

1. Narendra S. Chaudhari, "3-CNF Satisfiability in Polynomial Time," Accepted for presentation (as invited paper) in 5th Indian International Conference on Artificial Intelligence (IICAI-11), December 14-16, 2011, Siddaganga Institute of Technology (SIT), Tumkur, Bangalore, India (To appear in proceedings of the conference: 20 pages).

2. Anuradha Purohit, Aruna Tiwari, Narendra S Chaudhari, "Handling the problem of code bloating to enhance the performance of classifier designed using genetic programming," 5th Indian International Conference on Artificial Intelligence (IICAI-11), December 14-16, 2011, Siddaganga Institute of Technology (SIT), Tumkur, Bangalore, India.
3. Sapna Gulani, Pratibha Singh, Ajay Verma, Narendra S. Chaudhari, "An Intelligent Network for handwritten Devnagri Digit recognition using Structural features," 5th Indian International Conference on Artificial Intelligence (IICAI-11), December 14-16, 2011, Siddaganga Institute of Technology (SIT), Tumkur, Bangalore, India.
4. Juhisabharwal, Pratibha Singh, Ajay Verma, Narendra S. Chaudhari, "An Efficient method for the Devnagri handwritten vowel recognition," 5th Indian International Conference on Artificial Intelligence (IICAI-11), December 14-16, 2011, Siddaganga Institute of Technology (SIT), Tumkur, Bangalore, India.
5. Rajkumar Jain, Narendra S. Chaudhari, "Formulation of 3-Clustering as a 3-SAT Problem", 5th Indian International Conference on Artificial Intelligence (IICAI-11), December 14-16, 2011, Siddaganga Institute of Technology (SIT), Tumkur, Bangalore, India.
6. Jaya Thomas and Narendra S Chaudhari, "Two Approaches for Hamiltonian Circuit Problem using Satisfiability", 5th Indian International Conference on Artificial Intelligence (IICAI-11), December 14-16, 2011, Siddaganga Institute of Technology (SIT), Tumkur, Bangalore, India.
7. Narendra S. Chaudhari, "NP=P: Polynomial Solvability of 3-SAT", In, Proceedings, International Conference on Advances in Modelling, Optimization, and Computing (AMOC-2011), Indian Institute of Technology, Roorkee, Uttarakhand State, India (05-07 Dec. 2011).
8. Rajkumar Jain, Narendra S. Chaudhari, "Identification & Generation of Constraints in Social Network", International Conference "Emerging Trends in Networks & Computer Communications" (ETNCC) April 22-24, 2011, College of Technology & Engineering, Maharana Pratap University of Agri. & Tech, Udaipur, Rajasthan, India, Co-Sponsored by IEEE.
9. Jaya Thomas and Narendra S Chaudhari, "Polynomial Solvability of Satisfiability and its implication to hybrid cryptosystem security", IEEE International Conference "Emerging Trends in Networks & Computer Communications" (ETNCC) April 22-24, 2011, College of Technology & Engineering, Maharana Pratap University of Agri. & Tech, Udaipur, Rajasthan, India, Co-Sponsored by IEEE.
10. Prakash C. Sharma and Narendra S Chaudhari, "A Graph Colouring Approach for Channel

Assignment in Cellular Network through Propositional Satisfiability”, IEEE International Conference “Emerging Trends in Networks & Computer Communications” (ETNCC) April 22-24, 2011, College of Technology & Engineering, Maharana Pratap University of Agri. & Tech, Udaipur, Rajasthan, India, Co-Sponsored by IEEE.

11. Khitij Pathak, Aruna Tiwari and Narendra S. Chaudhari, “A Reduction of 3-SAT problem from optimal sanitization in Association Rule Hiding”, IEEE International Conference “Emerging Trends in Networks & Computer Communications” (ETNCC) April 22-24, 2011, College of Technology & Engineering, Maharana Pratap University of Agri. & Tech, Udaipur, Rajasthan, India, Co-Sponsored by IEEE.
12. Pratibha Singh, Ajay Verma, Narendra S. Chaudhari, “Performance analysis of flexible zone based features to classify Hindi numerals,” In, Proceedings of The 2011 International Conference on Network and Computer Science (ICNCS'11) Kanyakumari, Tamil Nadu State, India (8-10 April 2011) pp. V6-292-296.
13. Pratibha Singh, Ajay Verma, Narendra S. Chaudhari, “Performance evaluation of classifiers applying directional features for Devnagri numeral Recognition” In, Proceedings International Conference on Control, Robotics and Cybernetics (ICCRC'11) New Delhi, (Proceedings ISBN 97-1-4244-9709-6; IEEE Catalog Number: CFP1176M-PRT) (21-23 March 2011) pp. V2-242-245.
14. Narendra S. Chaudhari, P.R. Pal, and Swata Pawar, "Combinatorial Approach of Association Rule Mining in Software Engineering", In, Proceedings, International Conference on Software Engineering: CONSEG - 2011 (Ed. Anirban Basu, H.. Vishwakarma, T V Gopal), Bangalore, Karnataka State, Tata McGraw Hill Education Pvt Ltd, New Delhi (ISBN: 0-07-107816-9) (17-19 Feb. 2011) pp. 148-157.
15. Mahesh K. Panwar, Narendra S. Chaudhari, and Ravindra Patel, "Integration testing for Component-based System with UML and OCL", In, Proceedings, International Conference on Software Engineering: CONSEG - 2011 (Ed. Anirban Basu, H.. Vishwakarma, T V Gopal), Bangalore, Karnataka State, Tata McGraw Hill Education Pvt Ltd, New Delhi (ISBN: 0-07-107816-9) (17-19 Feb. 2011) pp. 213-222.
16. Pratibha Singh, Ajay Verma, Narendra S. Chaudhari “Classification of Hindi numeral using Fuzzy Zoning and SVM”, In, Proceedings of the International Conference on Advanced Computing and Communication Technologies (ACCT 2011), Rohtak, Haryana State, India. Publisher: RG Education Society (ISBN: 978-981-08-7932-7) (21-23 January 2011) pp. 259 - 262.

17. Narendra S. Chaudhari, Aruna Tiwari, and Jaya Thomas, "A Novel SVM Based Approach for Noisy Data Elimination," In, Proceedings, 11th International Conference on Control, Automation, robotics and Vision (ICARCV 2010), Grand Copthorne Waterfront Hotel, Singapore, (07-10 Dec, 2010) pp. 1760-1765.
18. Narendra S. Chaudhari, and Aruna Tiwari, "Binary Neural Network Classifier and it's Bound for the Number of Hidden Layer Neurons," In Proceedings, 11th International Conference on Control, Automation, robotics and Vision (ICARCV 2010), Grand Copthorne Waterfront Hotel, Singapore, (07-10 Dec, 2010) pp 2012-2017.
19. Arvind Singh Chandel, Aruna Tiwari and Narendra S. Chaudhari, " A Constructive Approach for Classification of Semi-Labeled data by Extending the BLTA Algorithm," 2010 International Conference on Computational Intelligence and Communication Systems (CICN 2010), Published by IEEE Computer Society, ISBN No:978-0-7695-4254-6/10, Bhopal, (26-28 Nov. 2010) pp. 588-590.
20. Sujata Negi, Aruna Tiwari and Narendra S. Chaudhari, "Optimization of Boolean expression based neural network learning by using Rough Set," 2nd International Conference on Information Technology and Business Intelligence (ITBI-10), Sponsored by IEEE Computational Intelligence Society, Institute of Management Technology (IMT), Nagpur, Proceedings ISBN No:978-81-7446-900-7, paper no. 52, (12-14 Nov. 2010)
21. Aruna Tiwari and Narendra S. Chaudhari, Satyam Saxena, Chetan Gurjar, "Design of Intelligent Tutoring System using Neural Fuzzy Learning Technique", 2nd International Conference on Information Technology and Business Intelligence (ITBI-10), Sponsored by IEEE Computational Intelligence Society, Institute of Management Technology (IMT), Nagpur, Proceedings ISBN No:978-81-7446-900-7, paper no. 58, (12-14 Nov. 2010).
22. Anuradha Purohit, Narendra S. Chaudhari, and Aruna Tiwari, "Construction of Classifier with Feature Selection based on Genetic Programming," 2010 IEEE World Congress on Evolutionary Computation (Computational Intelligence), Centre de Convencions Internacional de Barcelona, Barcelona, Spain, proceedings pp. 1-5 (18-23 July, 2010) Proceedings pp. 01-05.

ii. CONFERENCE PAPERS: NATIONAL LEVEL:

1. Narendra S. Chaudhari, "Polynomial Solvability of 3-SAT - Part I: Similarities and Differences of 2-SAT and 3-SAT," In, Proceedings, ETNCC 2011 Twenty Fifth National Convention of Computer

- Engineers and National Seminar, The Computer Engineering Division, The Institution of Engineers (India): Networked Home Systems and Services (Ed. D. Singh) Himanshu Publications - New Delhi (ISBN 978-81-7906-266-1) Udaipur, India (04-06 Feb. 2011) pp. 59-64.
2. Narendra S. Chaudhari, "Polynomial Solvability of 3-SAT - Part II: Algorithmic Formulations for 2-SAT," In, Proceedings, Twenty Fifth National Convention of Computer Engineers and National Seminar, The Computer Engineering Division, The Institution of Engineers (India): Networked Home Systems and Services (Ed. D. Singh) Himanshu Publications - New Delhi (ISBN 978-81-7906-266-1) Udaipur, India (04-06 Feb. 2011) pp. 65-70.
 3. Narendra S. Chaudhari, "Polynomial Solvability of 3-SAT - Part III: Polynomial Algorithm for 3-SAT," In, Proceedings, Twenty Fifth National Convention of Computer Engineers and National Seminar, The Computer Engineering Division, The Institution of Engineers (India): Networked Home Systems and Services (Ed. D. Singh) Himanshu Publications - New Delhi (ISBN 978-81-7906-266-1) Udaipur, India (04-06 Feb. 2011) pp. 71-76.
 4. Prakash C. Sharma, and Narendra S. Chaudhari, "Cellular Networks, k-Coloring, and 7 3-SAT - Part III: Polynomial Algorithm for 3-SAT," In, Proceedings, Twenty Fifth National Convention of Computer Engineers and National Seminar, The Computer Engineering Division, The Institution of Engineers (India): Networked Home Systems and Services (Ed. D. Singh) Himanshu Publications - New Delhi (ISBN 978-81-7906-266-1) Udaipur, India (04-06 Feb. 2011) pp. 57-58.
 5. Jaya Thomas, and Narendra S. Chaudhari, "Knapsack Cryptosystem and its Reduction to 3-CNF," In, Proceedings, Twenty Fifth National Convention of Computer Engineers and National Seminar, The Computer Engineering Division, The Institution of Engineers (India): Networked Home Systems and Services (Ed. D. Singh) Himanshu Publications - New Delhi (ISBN 978-81-7906-266-1) Udaipur, India (04-06 Feb. 2011) pp. 23-26.
 6. Rajkumar Jain, and Narendra S. Chaudhari, "Cluster Analysis in Social Networks and 2-CNF," In, Proceedings, Twenty Fifth National Convention of Computer Engineers and National Seminar, The Computer Engineering Division, The Institution of Engineers (India): Networked Home Systems and Services (Ed. D. Singh) Himanshu Publications - New Delhi (ISBN 978-81-7906-266-1) Udaipur, India (04-06 Feb. 2011) pp. 169-172.

Honorary Work:**i) Service to Academic Institutes (Current):**

- ◆ Member, Governing Board, Indian Institute of Technology, Indore (w.e.f. May, 2010).

- ◆ Member, Academic Council, Indian Institute of Technology, Indore (w.e.f. April, 2011).
- ◆ Member, Academic Council, Shri G.S. Institute of Technology and Science, Indore (w.e.f. April, 2010).
- ◆ Member - Advisory Council, ITM University (State University – M.P.), Gwalior (w.e.f. June, 2011). (Also participated as an expert for Curricula Design in the areas of Computer Science and Engineering, Information Technology and Computer Applications at ITM University, Gwalior on 21st May, 2011).
- ◆ Member – Advisory Committee (area: Computer Science & Engineering, Information Technology), IPS Institute of Technology & Engineering, Indore (w.e.f. June, 2011).
- ◆ Dean - Research and Development, Indian Institute of Technology, Indore (w.e.f. Sept., 2010).
- ◆ Member, Executive Board, Zeal Education, Indore (w.e.f. March, 2010).
- ◆ Member, Advisory Committee, Swami Vivekanand College of Engineering (SVCE), (ISO 9001:2008 Certified Institute), Indore (w.e.f. January, 2010).
- ◆ Member, Board of Studies (Subject: Computer Science and Engineering), Guru Ghasidas University (Central University), Bilaspur (Chhattisgarh).
- ◆ Member, Board of Studies (Subject: Computer Science and Applications), A.P. S. University, Rewa (M.P.).
- ◆ Member, Board of Studies (Subject: Computer Science and Applications), Samrat Ashok Technological Institute (SATI), Vidisha (M.P.) (also participated in the meeting for Curricula Design in the areas of Computer Science and Engineering, Information Technology, and Computer Applications at Samrat Ashok Technological Institute (SATI), Vidisha (M.P.) on 09th April, 2011).

ii) Service to Professional Societies:

- ◆ Chairman, Computer Society of India (CSI) – Indore Chapter (April 2010 to March 2011): Responsibility includes promotion and monitoring the chapter's overall direction, progress and the technical programs.
- ◆ Chairman, Computational Intelligence Society, IEEE Mumbai Branch (April 2010 to Dec 2011). First (founder) chairman, with responsibility to promote, monitor the chapter's overall direction, progress and the technical programs.
- ◆ Executive (and Founder) member - Indian Rough Set Society (founder team member with Founder Chairman of the society as Prof. Sankar Pal, Director, Indian Statistical Institute, Kolkata) (March, 2010 onwards)
- ◆ Convener – Accreditation committee, and Expert - DOEACC Society (An autonomous Scientific Society of Department of Information Technology, Ministry of Communications and Information Technology, Govt. of India).
- ◆ Judge for Information Technology Excellence Awards (award of Rs 1.0 Lacs for the software

company. group demonstrating the Excellence in Information Technology) - in The National Convention of Computer Society of India with theme: iGen, Hotel Taj End lands, Bandra, Mumbai, India from 25th Nov 2010 to 27th Nov 2010.

iii) Service to Editor/Associate Editor for International Journals:

- ♦ Editor-in-Chief, **International Journal of Computer Science and System Analysis** (ISSN no. 0973- 7448), Serials Publications, New Delhi, India.
- ♦ Editor-in-Chief, **International Journal of Electronics and Computer Engineering** (ISSN no. 0973- 4202), Serials Publications, New Delhi, India.
- ♦ Associate Editor: (i) International Journal of Computer Games Technology (IJCGT) (Hindawi Pub. Co. New York), (ii) Information Technology Journal (ITJ) (Asian Network for Scientific Information and Academic Journals: ANSINET).
- ♦ Member, Council of Editors: International Journal of Computer Science and Applications (IJCSA).
- ♦ Member, Advisory Board: Journal of Advances in Engineering Science Section C: Electrical Engineering, Electronics and Telecommunication Engg, Comptuer Engineering, and Information Technology. (ISSN 0973:9041) (Publ. by Sinhgad Technical Education Society, Pune, India).
- ♦ Member, Editorial Board: International Journal of Engineering Research and Industrial Applications (IJERIA), (Published by Ascent Publications, Airport Road, Pune, India).

Reviewer for Research Papers:

1. Reviewer for Journal Papers:

- ♦ Cognitive Computation (Publisher: Springer) in Oct. 2011
- ♦ Information Sciences (Publisher: Elsevier) in Dec 2010, March 2011, June 2011
- ♦ Journal of Intelligent Systems (JIS) (Publisher: De Gruyter), in July 2011
- ♦ Software Engineering: An International Journal, in June, 2011
- ♦ International Journal of Computer Game Technology, Hindawi Publishing, N.Y. U.S.A., in May, 2011

2. Reviewer for Conference Papers:

- ♦ Reviewer for several IEEE conference papers (major conferences: International Joint Conference on Neural Networks, IEEE International conference on Computational Intelligence, IEEE TENCON in 2010 and 2011).

Invited Lectures Delivered:

- ♦ Plenary Speaker (for International Conference on Advances in Modeling, Optimization and Computing (AMOC-2011) on the topic: NP=P: Polynomial Solvability of 3-SAT, to be organised by IIT Roorkee on December 5-7, 2011.
- ♦ Resource Person and Invited Speaker, UGC sponsored National Conference on “Emerging Technologies in Computer Science” (ETCS 2011) The Bhopal School of Social Science (B.S.S.S.), Bhopal (M.P.) Nov. 4th and 5th, 2011.
- ♦ Guest Speaker, Induction program for first year Engineering students of Priyatam Institute, Indore (delivered invited talk of one hour duration on the topic: What is Engineering), 18th Oct. 2011.
- ♦ Guest of Honour for the Inauguration ceremony event of Software Competition Peritus: Organized by Premier Biosoft Pvt. Ltd., Indore and Acropolis Group of Institutions, Indore, 13th Oct. 2011.
- ♦ Chief Guest, Inauguration ceremony for Staff Development Program (SDP) at Shail Group of Institutions, Indore, in collaboration with IBM (Noida, U.P.) in the areas of Career Education, 10th Oct. 2011.
- ♦ Invited Speaker for the 6th Biyani's International Conference: BICON-2011: “GenNext: the green engineering and digital era”; Organized by Biyani Group of Colleges, Jaipur, India on 22-24 Sept. 2011 (Topic: Green Engineering and Computationally Difficult Problems).
- ♦ Chief Guest for National Conference “Advancement in Computational Techniques & Applications (NCACTA 2011) Shri Vaishnav Institute of Management (SVIM), Indore on 18th June, 2011.
- ♦ Invited Speaker in the AICTE sponsored National Conference on Information Technology, Networking and Automation; Organized by Sagar Institute of Research, Technology and Sciences (SIRTS), Bhopal, India on 09-11 June 2011 (Topic: Advanced Computational Algorithms).
- ♦ Invited Speaker (for Plenary Session as Expert Lecture) for the 12th National Conference on Emerging Trends in Computing & Communication at Pioneer Institute of Professional Studies, Indore. Title of the talk: Trends in Advanced Algorithms, 06 May, 2011.
- ♦ Chief Guest for TechFest at Patel College of Science and Technology, Indore (30th April, 2011).
- ♦ Delivered an Expert Lecture (1 hour duration) in "International Conference on Emerging Trends in Networks and Computer Communications (ETNCC 2011), College of Technology and Engineering, Udaipur (India) 22-24 April 2011.
- ♦ Chief Guest for the inauguration of the event Armaggon-2011, Organized by Acropolis Institute of Technology and Research, Indore India on 14-16 April 2011 (Delivered the speech as a Chief Guest for this event).
- ♦ Invited Speaker for the National Conference on Recent Trends in Computational Intelligence at Central India Institute of Technology, Indore. Title of the talk: Trends in Computational Intelligence, 13 April, 2011.
- ♦ Delivered an invited talk (2 hours duration) in Government Engineering College (GEC), Jabalpur (Madhya Pradesh, India) on 19th March, 2011.
- ♦ Delivered an Expert Lecture (1.5 hours duration) in National Workshop on Algorithms,

Computation and Optimization" (NWACO 2011) organized by Shail Group of Institutions (SGI), Institute of Computer Application (IICA), Indore on 18 March, 2011 at IICA, Indore.

- ♦ Delivered an Expert Lecture (1 hour duration) in "International Conference on Emerging Trends in Soft-Computing and ICTs" (SCICT 2011) organized by Guru Ghasidas University, Bilaspur (Chattisgarh, India) from 16-17 March, 2011.
- ♦ Delivered an invited talk (2 hours duration) in Department of Mathematics, Guru Ghasidas University, Bilaspur (Chattisgarh, India) on 15th March, 2011 (Topic: Advances in Algorithms).
- ♦ Expert Speaker for the Workshop on Knowledge Mining, Security and Computer Systems, Organized by Lord Krishna College of Technology (LKCT), Indore (01-02 March, 2011) (talk on Computational Learning delivered on 01 March, 2011 from 11 am to 1 pm).
- ♦ Delivered an invited talk (1 hour duration) in the National Conference on Emerging Trends in Information Technology at Institute of Engineering and Science (IES), IPS Academy, Indore. Title of the talk: Emerging Trends in Algorithms, 24-25 February, 2011.
- ♦ Delivered an Expert Lecture (1 hour duration) in "Twenty Fifth National Convention of Computer Engineers and National Seminar: Networked Home Systems and Services" organized by The Institution of Engineers (India), Udaipur (Rajasthan, India) from 04-06 February, 2011.
- ♦ Delivered an Invited talk in - International Conference on Mathematics and Computer Science (ICMCS 2011), Loyola College, Chennai, India (Topic: Computational Learning using Fuzzy Similarity). (7-8 Jan. 2011).
- ♦ Delivered an invited talk (1 hour duration) in Department of Computer Engineering, Sardar Vallabhbhai National Institute of Technology (SV-NIT), Surat (Gujarat, India) on 27th Dec., 2010.
- ♦ Delivered an invited talk (2 hours duration) in Advanced Institute for Mathematics, Statistics and Computer Science (AIM-SCS), Hyderabad (Andhra Pradesh, India) on 09th Dec., 2010.
- ♦ Chief Guest for the event Tech-Knowledge 2010, Organized by Pioneer Institute of Professional Studies, Indore India on 30th Nov. 2010.
- ♦ Delivered an expert lecture (of 2 hour duration) on Grammatical Inference and Computational Learning in - (All India Council for Technical Education - AICTE, Govt of India - sponsored) National Seminar on Emerging Trends in Engineering Sciences Samrat Ashok Technological Institute (SATI), Vidisha (M.P.) India on 29th Nov. 2010.
- ♦ Delivered an expert lecture (of 1.5 hour duration) on Computationally Hard Problems and polynomial Algorithms for NP-Complete Problems in - (All India Council for Technical Education - AICTE, Government of India - sponsored) National Seminar on Emerging Trends in Information Technology Mediacaps Institute of Technology and Science, Indore (M.P.) India on 20th Nov. 2010.
- ♦ Guest of Honor for the event National Seminar for Technology Show-cases 2010, Organized by Acropolis Institute, Indore India on 18th Nov. 2010.
- ♦ Delivered an invited lecture (of 1.5 hrs duration) on Models of Computation and Design of Algorithms for hard problems and participated in the 5th National Conference on Emerging Trends

in Information Technology and Business Management (EITBM 2010), Vidya Pratishthan's Institute of Information Technology (VIIT), Baramati (M.S.) India, (09th Oct. 2010).

- ♦ Delivered an Address as a Chief Guest for the event Tech-Knowledge 2010, Organized by Pioneer Institute of Professional Studies, Indore India on 30th Nov. 2010.
- ♦ Delivered an expert lecture (of 2 hour duration) on Grammatical Inference and Computational Learning in - (All India Council for Technical Education - AICTE, Govt of India - sponsored) National Seminar on Emerging Trends in Engineering Sciences Samrat Ashok Technological Institute (SATI), Vidisha (M.P.) India on 29th Nov. 2010.
- ♦ Delivered an expert lecture (of 1.5 hour duration) on Computationally Hard Problems and polynomial Algorithms for NP-Complete Problems in - (All India Council for Technical Education - AICTE, Govt of India - sponsored) National Seminar on Emerging Trends in Information Technology Medicaps Institute of Technology and Science, Indore (M.P.) India on 20th Nov. 2010.
- ♦ Delivered an Address as a Guest of Honor for the event National Seminar for Technology Show-cases 2010, Organized by Acropolis Institute, Indore India on 18th Nov. 2010.
- ♦ Delivered an invited lecture (of 1.5 hrs duration) on Models of Computation and Design of Algorithms for hard problems and Participated in the 5th National Conference on Emerging Trends in Information Technology and Business Management (EITBM 2010), Vidya Pratishthan's Institute of Information Technology (VIIT), Baramati (M.S.) India, (09th Oct. 2010).
- ♦ Delivered an invited seminar talk (duration 2 hours) on the topic of Design of Algorithms for hard problems, at Department of Computer Science, University of Poona, Pune, India on 08th Oct. 2010.
- ♦ Delivered an expert lecture (of 1.5 hour duration) on computationally hard problems and Participated in - (All India Council for Technical Education - AICTE, Govt of India - sponsored) National Seminar on Emerging Trends in Engineering Sciences, Samrat Ashok Technological Institute (SATI), Vidisha (M.P.) India on 03rd Oct. 2010.
- ♦ Delivered an expert lecture (of 2 hour duration) on Computational Models Participated and participated in - Staff Development Program (SDP) at ITM Universe, Gwalior (M.P.) India on 18th Sept. 2010. Ø Delivered an Invited seminar talk (duration 2 hours) for ACM Allahabad Chapter, Allahabad, on the topic of Computational Learning, Indian Institute of Information Technology (IIIT) Allahabad, India on 11st Sept. 2010.
- ♦ Delivered an invited seminar talk (duration 2 hours) on the topic of Computationally hard problems, at Department of Computer Science and Engineering, Indian Institute of Technology (IIT) Guwahati, Guwahati, India on 03rd Sept. 2010.
- ♦ Delivered an invited seminar talk (duration 2 hours) on the topic of Algorithms for Satisfiability problems, at Department of Computer and Information Sciences (DCIS), University of Hyderabad, Hyderabad, India on 28th Aug. 2010.
- ♦ Invited Speaker and Chief Guest, Computer Society of India - Ujjain Chapter, Mahakal Institute of Technology and Management, Dewas Road, Ujjain (Also delivered Expert lecture on the topic of

Computational Models (16 July, 2010).

External Referee for Ph.D. Theses:

- ♦ External Referee for the Ph.D. Thesis titled: Optimization of Automated Test case design for unit testing of object-oriented software, Barkatullah Vishwavidyalaya, Bhopal (July, 2010).
- ♦ External Referee for the Ph.D. Thesis titled: Measurement of Software Quality and Processes, Guru Gobind Singh Indraprastha University, Kashmiri Gate, Delhi (January 2011).
- ♦ External Referee for the Ph.D. Thesis titled: A general purpose lossless data compression scheme with Improved compression ratio & decompression time & optimized for searching & retrieval of string randomly from large collection, (Candidate: Bhadade Umesh Shantilal), The Maharaja Sayajirao University of Baroda, Fatehgunj, Vadodara 390 002 (Gujarat), India (May 2011).
- ♦ External Referee for the Ph.D. Thesis titled: EPGA Based Algorithmic Accelerators, (Candidate: Shri Nitin P. Narkhede), Faculty of Engineering and Technology, Sant Tukdoji Maharaj Nagpur University, Nagpur (M.S.) (July 2011).
- ♦ External Referee for the Ph.D. Thesis titled: On-Chip interconnect for quality of service, (Candidate: Shri Vilas Namdeo Nitnaware), Faculty of Engineering and Technology, Sant Tukdoji Maharaj Nagpur University, Nagpur (M.S.) (Aug. 2011).

External Referee for Master of Engineering/Technology Theses:

- ♦ External Examiner for one M.E. These titled: Realization of Policy-based access control system in academic domain, at Institute of Engineering and Technology (IET), DAVV, Indore (August, 2011).
- ♦ External Examiner for two M.E. Theses titled: (1) Biometrics for human recognition, and, (2) Recognition of Facial expressions, at Shri G.S. Institute of Technology and Science (GSITS), Indore (Sept., 2011).
- ♦ External Examiner for two M.E. Theses titled: (1) Fuzzy sets and Principal Component and Independent Component Analysis, (2) Performance Analysis of Mobile Ad-hoc Networks, Rajiv Gandhi Technological University, Bhopal (July, 2011).
- ♦ External Examiner for M.E. Thesis titled: External Referee for the M.E. Thesis titled: Data Reduction, Sound Separation, and Sound Enhancement using Principal Component Analysis and Independent Component Analysis, Shri G.S. Institute of Technology and Science, Indore (Nov. 2010).
- ♦ External Referee for the M.E. Thesis titled: Formalizing Credit Scoring Problem based on Support Vector Machine, Institute of Engineering & Technology (IET), Devi Ahilya University (DAVV), Indore Indore (Aug. 2010).

Special Recognition/Awards:

- ◆ Fellow, Institution of Engineers (India), Kolkata, India (Fellowship conferred on 04th May, 2011).
- ◆ Visiting Professor, Prof CR Rao Institute of Advanced Mathematics, Statistics, and Computer Science (AIMSCS), University of Hyderabad, Hyderabad.
- ◆ Consultant, Bharat Heavy Electricals Ltd (BHEL) in the area of Soft Computing based fault prediction in transformers and power systems.
- ◆ Expert for Selection of Faculty members in the areas of Computer Science and Engineering in various Engineering Colleges at Indore, Bhopal, Ujjain, Gwalior, etc.
- ◆ Expert for Selection of Ph.D. Students in the areas of Computer Science and Engineering, Information Technology, and Communications Engineering at Indian Institute of Information Technology and Management (IIITM), Gwalior on 03-04 June, 2011.

Seminars/Workshops/Conferences Organized:

- ◆ Member, Organizing Committee, International Conference on Software Engineering: CONSEG-2012 (Sponsored by Computer Society of India, and IEEE) – planned in Oct. 2012.
- ◆ Co-organizer, Faculty Development Program (FDP) - for the Faculty members of Computer Engineering (29 Sept. 2011 to 01 Oct. 2011).
- ◆ Member, Program Committee, International Conference on Advances in Cloud Computing (ACC 2012) to be held on July 27-28, 2012 at Bangalore, Karnataka, India.
- ◆ Member, Advisory Board, International Conference title “Recent Trends in Application of Mechanical, Electrical, Electronics and Computer Communication” to be held on April 12th and 13th 2012 at Francis Xavier Engineering College Tirunelveli, Tamil Nadu State, India.
- ◆ Member, Program Committee, International Conference on Soft Computing and Problem Solving: (SoCProS 2011), December 16-18, 2011, Rourkee, U.P., India.
- ◆ Member, Program Committee, 5th Indian International Conference on Artificial Intelligence (IICAI-11), December 14-16, 2011, Siddaganga Institute of Technology (SIT), Tumkur, Bangalore, India.
- ◆ Member, Program Committee, World Congress on Information and Communication Technologies (WICT 2011), December 11-14, 2011, Kalina Campus, University of Mumbai, Mumbai, M.S., India.
- ◆ Member, Program Committee, International Conference on Computational Intelligence and Communication Networks (CICN 2011), October 07-09, 2011, Machine Intelligence Research (MIR) Lab, Gwalior, Madhya Pradesh, India.

b. Dr. Monalisa Sarma (Assistant Professor)**Specialization:** Software Engineering.**Current Research Plan:**

- ♦ **Model-based Testing:** Modern software are very complex and critical in nature and demands thorough testing to ensure robustness and reliability. To cope with this demand, my research proposal is to investigate model-based testing. In model-based testing, a number of issues are need to be addressed such as retrieving the testable information from design artifacts, modeling faults, minimization of test specifications without compromising the test coverage, and test data generation etc.
- ♦ **Biometric-Based Systems Security:** Of late, biometric-based systems security gaining importance due to their wide applicability in many applications. There are many issues to be dealt with while processing of biometric traits. Some of them are: dealing with noisy samples, large varieties of sample, temporariness in sample, large sample database etc. All these issues are to be addressed in order to ensure accurate and faster biometric-based authentication systems. In my research plan, I would like to investigate how to deal with noisy samples (say sensor-level noises, sample captured in uncontrolled environment, occluded samples etc.). False acceptance rate and rejection rate increases with temporal variations, even the variation of data from an individual to another. Some techniques (say fuzzy-or fuzzy-neuro based) to be developed to deal with such variations. Further, multi biometrics approach can be investigated. Next, to deal with large data, and multi biometric data, I would like to investigate for data indexing techniques leading to an accurate and faster biometric authentication system.

Reviewer for Research Papers

- ♦ International Journal of Communication Networks and Distributed Systems (IJCNDs) (Oct 2011).
- ♦ Reviewer of Information and Software Technology, Elsevier, Journal of Systems and Software, Elsevier, Journal of Software Engineering and Knowledge Engineering, World Scientific.

Invited Lectures Delivered

- ♦ Delivered a invited lecture in a Short Term Training Programme on “Application Areas To Data Structures” organized by IET – DAVV, Indore 2011.

Special Recognition/Awards

- ♦ Women Scientist Award (WOS-A), Department of Science and Technology (DST), Govt. of India, August, 2005.
- ♦ Fellowship to participate in Mathematics Training and Talent Search Programme (MT&TS), IIT Bombay, 1994.
- ♦ National Scholarship in recognition of high position secured in the list of meritorious candidates qualifying for awards from Assam in 1987.

Discipline of Electrical Engineering

1. Degree program offered in the discipline:

- A. B.Tech. (Electrical Engineering)
- B. Ph.D.

2. Short Summary of the Degree Program:

- A. B.Tech. (Electrical Engineering): The summary of courses offered in all four year is listed below.

FIRST YEAR	
Theory	EE104 Basic Electrical and Electronics Engineering
Lab	EE154 Basic Electrical and Electronics Engineering Lab
SECOND YEAR	
Theory	EE201 Network Theory EE202 Signals and Systems EE203 Electronic Devices EE204 Analog Circuits EE205 Introduction to Electrical Systems EE206 Electrical Machines and Power Electronics EE208 Digital Systems
Lab	EE253 Electronic Devices Lab EE254 Analog Circuits Lab EE256 Electrical Machines Lab EE258 Digital Systems Lab
THIRD YEAR	
Theory	EE301 Microprocessors EE302 Control Systems EE303 Probability and Random Processes EE304 Digital Signal Processing EE305 Electromagnetic Waves EE306 Digital Communications EE307 Communication Systems EE308 Power Systems EE309 Electrical Measurements and Instrumentation

Lab	EE351 Microprocessors Lab EE352 Control Systems Lab EE356 Communications Lab EE391 Summer Internship (8-10 weeks duration after completion of 6th semester)
FOURTH YEAR	
Theory	EE401 VLSI Systems and Technology EE403 Digital Systems Design Five Discipline Electives
Lab	EE391 Evaluation of Summer Internship EE453 Digital Systems Design Lab EE491 B. Tech. Project (Stage 1) EE492 B.Tech. Project (Stage 2)

B. Ph. D. Program : The summary of courses offered in the discipline for Ph. D. program

Theory	EE601 Power Electronics EE620 IC Fabrication Technology EE621 MOS Devices and Modelling EE622 Digital Circuit Design EE701 Time-Frequency Analysis EE722 Optoelectronics EE724 Advanced Micro-processes and Nanotechnology EE740 Speech Signal Processing EE797/798 Seminar Course
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3. Details of teaching labs:

- A. Currently total nine undergraduate teaching lab courses for all four years are offered.
- B. All the labs are equipped or getting equipped with the state of the art measuring and testing instruments and the experiments designed for these labs are contemporary.
- C. The labs are equipped with major test and measurement instruments like Digital Oscilloscopes, Analog Oscilloscopes, Function Generators, DC power supplies.

D. The images below show one of the electrical engineering labs. Like this, there are total three labs. The lab courses which are running in these labs are Basic Electrical and Electronics Engineering Lab, Electronic Devices Lab, Analog Circuits Lab, Digital Systems Lab and Microprocessors Lab.

E. The labs under development stage are communication lab, electrical machines and power electronics lab, control systems lab and digital design lab.



Electrical Engineering Lab



Electrical Engineering Lab

4. FACULTY MEMBERS

a. Dr. Ram Bilas Pachori

Specialization and Research Interest: Biomedical signal processing, modeling of nonstationary signals, time-frequency analysis, speech and image processing, signal processing for communications, and signal processing applications.

Publications:

Journals:

1. R.B. Pachori and D. Hewson, "Assessment of the effects of sensory perturbations using Fourier-Bessel expansion method for postural stability analysis", Journal of Intelligent Systems, vol. 20, issue 2, pp.167-186, August 2011.
2. R.B. Pachori and V. Bajaj, "Analysis of normal and epileptic seizure EEG signals using empirical mode decomposition", Computer Methods and Programs in Biomedicine, In press, 2011.
3. R.B. Pachori, J. Gadewadikar, and O. Kuljaca, "Classification of EEG signals based on empirical mode decomposition and Bayesian network application", Journal of the Mississippi Academy of Sciences, vol. 56, no. 1, pp. 101, January 2011.

Conferences

1. V. Bajaj and R.B. Pachori, "Application of the sample entropy for discrimination between seizure and seizure-free EEG signals", Proceedings 5th Indian International Conference on Artificial Intelligence, 14-16 December, 2011, Tumkur, India, Accepted for publication.
2. P. Jain and R.B. Pachori, "A new approach for glottal closure instants detection from speech signals", Proceedings 5th Indian International Conference on Artificial Intelligence, 14-16 December, 2011, Tumkur, India, Accepted for publication.
3. R.B. Pachori and D. Hewson, "Identification of time-varying effects of sensory perturbations for postural stability analysis", Proceedings 5th Indian International Conference on Artificial Intelligence, 14-16 December, 2011, Tumkur, India, Accepted for publication.

Book

- ♦ R.B. Pachori and P. Sircar, Nonstationary Signal Analysis: Methods based on Fourier-Bessel Representation, LAP LAMBERT Academic Publishing, Saarbrücken, Germany, 2010, ISBN: 9783-8433-8807-8.

Reviewer in Journals:

- ♦ Journal of Computational Science
- ♦ Journal of Visual Communication and Image Representation
- ♦ Neural Computing and Applications
- ♦ European Transactions on Telecommunications
- ♦ Applied Mathematics and Computation
- ♦ Measurement
- ♦ Signal Processing
- ♦ WSEAS Journal Transaction on Signal Processing

Reviewer in Conferences:

- ♦ IEEE Symposium on Industrial Electronics and Applications (ISIEA), October 03-06, 2010, Penang, Malaysia
- ♦ The First International conference on Power, Control and Embedded Systems (ICPCES), December 08-10, 2010, Chennai, India
- ♦ IEEE International Conference on Electronic Devices, Systems and Applications (ICEDSA), April 25-27, 2011, Kuala Lumpur, Malaysia
- ♦ National Conference on Communications (NCC), January 28-30, 2011, Bangalore, India
- ♦ International Conference on Logic, Information, Control and Computation (ICLIICC), February 25-26, 2011, Gandhigram, Tamil Nadu, India
- ♦ IEEE Symposium on Industrial Electronics and Applications (ISIEA), September 25-28, 2011,

Langkawi, Malaysia

- ♦ Indian International Conference on Artificial Intelligence (IICAI), December 14-16 2011, Tumkur, India

Editorial Board Member

- ♦ Journal of Intelligent Systems

Key Note Speaker

- ♦ National Conference on Recent Trends in Communication Engineering-2011, August 2011, Indore, India

Research Project

- ♦ Title: Analysis and classification of EEG signals based on nonlinear and nonstationary signal models.
Funding Agency: Department of Science & Technology (DST), (2011-2014), Approved,
PI: Dr. Ram Bilas Pachori

b. Dr. Amod C. Umarikar (Assistant Professor):

Specialization and Research Interest: Power Electronics, Modelling and Simulation of Engineering Systems using Bond Graphs, Application of Power Electronics in Renewable Energy Systems, Application of Z-source Inverters in Grid Connected Converters.

Honorary Work

Service to Academic Institutes (Current):

- ♦ Member, Academic Council, Indian Institute of Technology Indore (w.e.f. April, 2011).
- ♦ Member, Academic Board, Govt. College of Engineering Amravati, Maharashtra (w.e.f. Sep, 2011).
- ♦ Member – Electrical Works Committee, Indian Institute of Technology Indore (w.e.f. Sep, 2010).
- ♦ Head, School of Engineering Indian Institute of Technology, Indore (w.e.f. Oct., 2010).

Reviewer for Research Papers:

Reviewer for Journal Papers:

- ♦ International Journal of Power Electronics, Oct. 2010

Reviewer for Conference Papers:

- ♦ Reviewer for National Power Electronics Conference (NPEC), Dec. 2011.

External Referee for Ph.D. Theses:

- ♦ External Referee for the Ph.D. Thesis from Sant Gadge Baba University, Amravati (April, 2010, March 2011 and October 2011).

c. Dr. Abhinav Kranti (Assistant Professor)**Specialization and Research Interest:**

Semiconductor Devices: Physics, Simulation and Modeling,
Novel MOS devices in Bulk/SOI technology:

- ♦ Planar Single/Double Gate MOSFET
- ♦ Ultra Thin Body (UTB) and BOX (UTBB) MOSFETs
- ♦ Vertical FinFETs
- ♦ Surrounding/Nanowire MOSFETs

Junctionless Transistors

Circuit Design with nanoscale devices: SRAM, OTA, LNA

Bipolar Transistors: Thermal resistance optimization

AlGaIn/GaN HEMTs: Polarization dependent models

Publications:**International Conferences:**

- ♦ A. Kranti, J.-P. Raskin and G.A. Armstrong, "Source/Drain Engineered Ultra Low Power Analog/RF UTBB MOSFET", In Proc. IEEE International Conference on Ultimate Integration on Silicon (ULIS), Cork, Ireland, March 14-16, 2010, Digital Object Identifier: 10.1109/ULIS.2011.5757997.

Reviewer for following international journals:

- ♦ IEEE Electron Device Letters
- ♦ IEEE Trans. Electron Devices
- ♦ IEEE Microwave Theory and Techniques
- ♦ Microelectronics Reliability, Elsevier

- ♦ Microelectronics Journal, Elsevier
- ♦ Semiconductor Science and Technology, IOP
- ♦ Nanotechnology, IOP

International Collaboration:

- ♦ Prof. G. A. Armstrong, Queens University Belfast, UK
- ♦ Prof. J.-P. RASKIN, University Catholique de Louvain, Belgium

d. Dr. Santosh Vishwakarma
(Assistant Professor)

Specialization and Research Interest: Nanoscale Device and VLSI/ULSI Circuit Design Present interests are Nanoscale devices and Memory Design. Long term interests are in System Design.

Publications:**Journal:**

- ♦ S.K. Vishvakarma, V. Komal Kumar, A.K. Saxena, S. Dasgupta, "Modeling and Estimation of Edge Direct Tunneling Current for Nanoscale Metal Gate (Hf/AlN_x) Symmetric Double Gate MOSFET" Microelectronics Journal, Elsevier, volume 42, issue 5, pp. 688-692, May 2011.

Conference:

- ♦ Dheeraj Sharma, S. K. Vishvakarma, "Analytical Modeling of the Subthreshold Potential of Nanoscale GAA Rectangular Gate MOSFET", International Workshop on Physics of Semiconductor Devices (IWPSD), Dec. 2011, IIT Kanpur, India (Accepted).

Reviewer for Research Papers:**Reviewer for Journal Papers:**

- ♦ Microelectronics Journal, Elsevier,
- ♦ Solid State Electronics, Elsevier
- ♦ Computational and Theoretical Nanosciences

External Referee for Ph.D. Theses:

- ◆ Shobhit University, Merrut, UP

External Referee for Master of Engineering / Technology or M.Phil./M.S. Theses:

- ◆ Electronics and Instrumentation Engg, SGSITS, Indore
- ◆ Biomedical Dept, SGSITS, Indore
- ◆ IET, DAVV, Indore

Research Project:

- ◆ Title: Unified and Compact Analytical Modeling of Nanoscale Gate-All-Around Multigate MOSFETs.
- ◆ PI: Dr. Santosh Vishwakarma
- ◆ Collaborator: Prof. Tor. A. Fjeldly, University Graduate Center (UNIK), Kjeller, Norway.
- ◆ Funding Agency: DST, Approved in 2011.

e. Dr. Vipul Singh (Assistant Professor)**Specialization and Research Interests:**

Single electron Transistors, SET based circuits, Novel MOS devices in Bulk/SOI technology, Low frequency noises in MOSFETs, Organic electronic devices, viz. OLEDs, OSCs and OFETs, Thin film growth via PVD/ solution processed techniques, Novel sensors based on conducting polymers.

f. Dr. Shaibal Mukerjee (Assistant Professor)**Specialization and Research Interests:**

Semiconductor Thin Film Growth, Design, Fabrication and Characterization of Opto-Electronic Devices, Lasers, Photodetectors, Solar Cell, TCAD simulation, Broadband anti-reflection (BBAR) Coating for Lasers, Surface Passivation for Detectors, Nano Devices based on Si-Ge and ZnO

Publications:**Book Chapter:**

- ◆ Photonic bandgap defect structure based on IV-VI semiconductor: Lasing cavity without cleaving, Invited author of a chapter for the book, Optoelectronics: Systems, Uses and Efficiency, NOVA Publisher, 2011.

Research Project:

- ◆ Title: Design, fabrication and characterization of high-quality zinc oxide (ZnO) nanostructure-based nano-devices.
- ◆ PI: Dr. Shaibal Mukherjee
- ◆ Funding Agency: DST, Approved in 2011 for three years.
- ◆ Brief Description: The objectives of the present proposal are given as:
- ◆ Extend our understanding of ZnO nanostructures in such a way as to help developing the exploitable properties of this material, nanostructures and opto-electronic devices based on this material.
- ◆ The effect of growth temperature, deposition and etch/assisted source plasma power of ion-beam sputtering system on the growth of ZnO nanostructures would be conducted.
- ◆ Further, the growth of ZnO-based nanostructures would be accomplished on a few substrates such as sapphire, silicon and gallium nitride template layers.
- ◆ The investigator would grow nanostructures either with or without a catalyst like nickel or gold, to grow nanopillars and nanowires. A thorough study would be conducted for a compact model for light emitting device structure in the ultra-violet region of spectrum.
- ◆ Electrical, optical and morphological characterization of these nanostructures and devices made out of these would be undertaken consequently.

Research Projects:

Title	PI	Funding Agency	Status
Analysis and classification of EEG signals based on nonlinear and nonstationary signal models.	Dr. Ram Bilas Pachori	DST	Approved
Unified and Compact Analytical Modeling of Nanoscale Gate-All-Around Multigate MOSFETs	Dr. S. K. Vishwakarma	DST	Approved
Design, fabrication and characterization of high-quality zinc oxide (ZnO) nanostructure-based nano-devices	Dr. Shaibal Mukherjee	DST	Approved

Research Labs:**Hybrid Nanodevice Research Group Lab (HNRG Lab):****Group Members:****Faculty Members:**

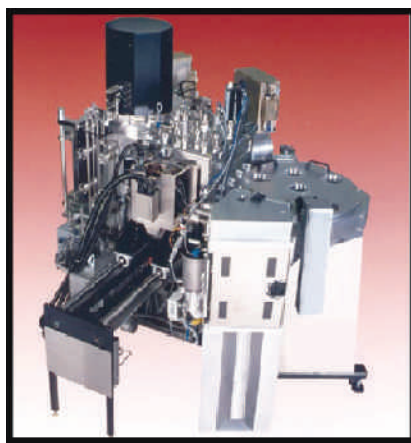
1. Dr. Shaibal Mukherjee
2. Dr. Vipul Singh
3. Dr. Abhinav Kranti

Student Members:

1. Saurabh Pandey
2. Shruti Verma
3. Anubha Bilgaiyan
4. Sushil Kumar Paandey
5. Kshitij Bhargava
6. Pragya Agar Palod
7. Mukta Parihar

Research Facilities @ HNRG**Experimental:**

- 1) Dual ion beam sputtering deposition (DIBSD) system from Elettrorava spa used to deposit:
 - ♦ Inorganic oxides/nitrides/dielectrics (SiO_2 , TiO_2 , Si_3N_4 , ZrO_2 , ITO, FTO, IZO etc.);
 - ♦ Metals (Au, Ti, Al, Pt etc.); Semiconductors (ZnO, Ge, GaN, PbTe, Si etc.)High quality growth at room/high temperature ($\sim 1000^\circ\text{C}$) and under UHV is possible.



DIBSD System.

2) Convection Oven (Mettmert Oven UNE 500):

Temperature range: Upto 300 °C

Volume : 108 L, Excellent fuzzy PID control with two integral timers running time 1 min to 999 h and 7-day-programme timer and triple thermal protection, fan speed control.



Convection Oven

3) Spin Coater (APEX Model SCU 2008C):

It is a single wafer system with a permanent EEPROM storage of programs to store multiple programs. It has the feature of vacuum substrate hold-down interlock with adjustable set point.



Spin Coater

3) De-ionized Water (Elix-10 from Millipore):

Remove particulates > 0.5 μm , ions, organics and bacteria, Conductivity upto 1 $\mu\text{S}/\text{cm}$, Flow-rate is 10 L/hr, Storage reservoir of 100 L capacity.



De-ionized Water

In Process:

1. Metal Evaporator
2. Solar Simulator
3. Tube furnace for annealing purpose

Test and Measuring Instruments:

- 1) **LCR meter** from Hioki (Hioki 3532): To measure: $|Z|$, $|Y|$, θ , R_p , $R_s(\text{ESR})$, G , X , B , C_p , C_s , L_p , L_s , $D(\tan \delta)$, Q , Source frequency: 42 Hz to 5 MHz (0.1 Hz to 1 KHz steps).



LCR Meter

- 2) **Dual-channel System Source Meter (Kethley Model 2612A):** To measure: I-V functional test and characterization of a wide range of devices such as BJT, FET, LED, VCSEL, Analog IC, RFIC etc.



Dual channel System Source Meter

In Process:

1. Photoluminescence Measurement set-up
2. Four-probe Hall Measurement set-up
3. Potentiostat-Galvanostat

Computational Tools:

1. SILVACO TCAD Package (device simulator, 2D and 3D simulation on MOSFET, BJT, OFET, LED, Quantum well, Laser, Solar Cell, TFT, OTFT, OLED etc.)

Discipline of Mechanical Engineering

1) Degree program offered in the discipline:

- A. B. Tech. (Mechanical Engineering)
- B. Ph. D.

2) Short Summary of the Degree Program:

- A. **B. Tech. (Mechanical Engineering):** The summary of courses offered in all four year is listed below.

FIRST YEAR	
Theory and Lab	ME153 Engineering Graphics ME154 Basic Manufacturing Techniques
SECOND YEAR	
Theory	ME201 Solid Mechanics ME203 Fluid Mechanics ME205 Materials Science ME202 Strength of Materials ME204 Fluid Machinery ME206 Thermodynamics ME208 Theory of Manufacturing Processes
Lab	ME251 Solid Mechanics Lab ME254 Fluid Mechanics and Machinery Lab ME257 Machine Drawing ME258 Manufacturing Processes Lab
THIRD YEAR	
Theory	ME301 Heat Transfer ME302 Applied Thermodynamics ME303 Kinematics and Dynamics of Machines ME304 Microprocessor and Automatic Control ME305 Machining Science and Metrology ME306 Machine Design-I ME307 Principles of Industrial Engineering ME308 Quality Management

Lab	ME351 Heat Transfer Lab ME352 Applied Thermodynamics Lab ME353 Kinematics and Dynamics of Machines Lab ME354 Microprocessor and Automatic Control Lab ME355 Machining Science and Metrology Lab ME391 Summer Internship 8-10 weeks duration after completion of 6th semester)
FOURTH YEAR	
Theory	ME 401 Machine Design-II Six Discipline Electives
Lab	ME491 B. Tech. Project (Stage 1) ME391 Evaluation of Summer Internship ME492 B. Tech. Project (Stage 2)

B. Ph. D. Program : The summary of courses offered in the discipline for Ph. D. program

Theory	ME601 Principles of Measurement ME603 Advanced Fluid Dynamics ME732 Finite Element Methods ME734 Composite Material ME736 Theory of Elasticity ME750 material Characterization Technique ME751 Advanced Machining Processes ME797/798 Seminar course
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1) Details of teaching labs:

A. Currently total TEN undergraduate teaching lab courses for all four years are offered.

Equipment list in Mechanical Engineering Undergraduate labs

1. List of Equipments available in the SOLID MECHANICS LAB (ME 251)

Sr. No.	Name of Equipment	Quantity
1	Universal Tensile Tester of 100 kN capacity	1
2	Pendulum Impact Tester	1
3	Fatigue Testing Machine	1
4	Creep Testing Machine	1
5	Universal Hardness (Brinell, Vicker, Rockwell) Tester	1
6	Torsion Tester of capacity 1000 Nm	1
7	Photo-elasticity unit	1
8	Strain Gauge Training Unit	1
9	Microhardness (Vicker/Knoop hardness) Testing Machine (Model VMH 002 from Walter UHI Germany)	1

2. List of Equipment in the Fluid Mechanics and Machinery Laboratory (ME 254)

Item No.	Apparatus Name and Brief Specification+	Quantity
1	Impact of Jet Purpose: To measure the force developed by a jet of water on plates of different configurations and compare with the theoretical values. visualization	1
2	Bernoulli's Theorem Demonstration Unit Purpose: For investigating and verifying the Bernoulli's law and it should be the capable of measuring the variation of static and total head along the tube.	1
3	Methods of Flow Measurement Purpose: Measurement of flow by using various flow measuring devices.	1
4	Determination of Fluid Friction in Pipe Flow Purpose: To evaluate the loss of pressure in pipes (major and minor losses); effect of flow velocity and the effects of laminar and turbulent flow regimes on the pressure loss.	1
5.	Wind Tunnel Purpose: An open wind tunnel for experiments in aerodynamics and determination of drag coefficients of various objects, measurement of lift and drag resistance on objects of different configurations.	1
6.	Flow over Weirs Purpose: To study the flow rate over a wire and compare with the theoretical values	1
7.	Orifice Discharge Purpose: To determine the coefficient of discharge, coefficient of velocity and compare with the theoretical values	1
8.	Boundary Layer Apparatus Purpose: To study the boundary layer flows over a flat plate for both laminar and turbulent flow conditions	1
9.	Centrifugal Pump Purpose: Performance characteristics of a centrifugal pump	1
10.	Pelton Turbine Purpose: To determine the performance characteristics of Pelton turbine.	1
11.	Francis Turbine Purpose: To determine the performance characteristics of Francis turbine.	1
12.	Kaplan Turbine Purpose: To determine the performance characteristics of Francis turbine.	1

3. List of Equipments ordered for Manufacturing Processes Lab (ME 258)

Name of the Machine	Purpose	Quantity
1. Plastic Parts Manufacturing Machine	Injection molding machine (Model Magna T25)	1
2. Arc Welding Equipment	Purpose: Demonstration of arc welding process to the UG students and making job on it.	2
3. Oxy-Acetylene Gas welding equipment	Purpose: Demonstration of gas welding process to the UG students and making job on it. Complete set of gas welding equipments including Blowpipes, Regulators, Small Cutting Machines, Nozzles and Tips etc.	2
4. Resistance Welding Equipment	Spot welding machine Purpose: Demonstration of spot resistance welding process to the UG students and making job on it.	1
5. Wire Drawing Machine	Purpose: Demonstration of wire drawing process to UG students Inlet wire diameter: 3-6 mm	1
6. Deep Drawing Machine	Purpose: Demonstration of deep drawing process to UG students 200 ton hydraulic press, Drawing dies for demonstration of deep drawn component.	1
7. Sheet Metal Forming Machine	Purpose: Demonstration of sheet roll bending operation to the UG students	1
8. Sheet Shearing Machine	Purpose: For shearing the sheet for subsequent sheet metal operations.	1
9. Foundry Instruction Set	Purpose: For the demonstration of (i) Sand casting experiments with three different patterns such as bell, anvil and anchor, etc. (ii) Making up a casting with cavity (pipe reduction) (iii) Centrifugal casting by producing a metal body in a rotating die	2 sets of each type
10. Foundry engineering equipments	MOULD STRENGTH TESTER: With Dial Indicator with Special Tip to Measure Compression Strength on direct Mould.	1 units of each item
11. Induction Furnace with required accessories	Purpose: For heating and melting low melting point materials such as aluminum, lead, etc. in the quantity of 5-15 kg for demonstrating the various casting processes and sintering operations to the UG students and for PG research purposes.	1

4. List of Equipments in the HEAT TRANSFER LAB (ME 351)

S. N.	Item and Technical specifications	Quantity
1	Computer controlled linear and radial heat conduction Unit Objectives: Demonstration of one dimensional heat transfer in linear and radial systems, Determination of temperature gradient at steady state at different boundary conditions.	1
2	Experimental setup for measuring thermal conductivity of building and insulating materials Objectives: Measurement of thermal conductivity of insulation and building materials using guarded one dimensional axial heat transfer technique.	1
3	Experimental setup for measuring thermal conductivity of liquids and gases Objectives: Measurement of thermal conductivity of liquids and gases.	1
4	Computer controlled extended surface heat transfer unit Objectives : To study the temperature distribution along the length of the fin, to compare its performance under natural and forced convection conditions	1
5	Computer controlled forced and free convection heat transfer unit Objectives: To demonstrate forced and free convection heat transfer, to measure temperature distribution in the heat exchanger, heat transfer rate, Nusselt number and heat transfer coefficient.	1
6	Computer controlled heat exchanger unit with tube in tube, extended tube, shell and tube, plate heat, extended plate and jacketed vessel with coil and stirrer heat exchangers Objectives: To demonstrate counter flow and parallel flow operations of heat exchanger and compare heat transfer rates , to measure heat transfer coefficient, and the effect of flow rates and temperatures difference on it. comparison of different types of heat exchangers	1
7	Computer controlled thermal radiation unit Objectives: To study Lamberts law, inverse square distance law and Kirchhoff's law and to measure Stefan Boltz man constant and emissivity.	1
8	Film and drop wise condensation unit Objectives: To visualise film and drop wise condensation and nucleate boiling, measurement of heat flux and surface heat transfer coefficient in both film wise and drop wise condensation.	1
9	Flow boiling demonstration unit Objectives: To demonstrate flow boiling process in steps like vapour generation and two phase flow with increasing vapour content. To demonstrate effect of air in condensation process.	1

5. List of Equipments available in the APPLIED THERMODYNAMICS LAB (ME352)

Sr. No.	Name of the Equipment	Quantity
1	Bomb Calorimeter	1
2	Bench Top Cooling Tower	1
3	Computer Controlled two stroke and four stroke compression ignition (CI) engine with exhaust gas analyzer	1
4	Computer Controlled two stroke and four stroke spark-ignition (SI) engine with exhaust gas analyzer	1
5	Air Conditioning Test-rig	1
6	Refrigeration Test-rig	1
7	Rankine Cycle Power Plant	1
8	Computer controlled centrifugal flow system	1
9	Computer controlled axial flow gas turbine	1
10	Cut section models of different kinds of boilers, gas turbines, compressors and other important equipments	

6. List of Equipments available in the KINEMATICS AND DYNAMICS OF MACHINE LAB (ME 353)

Item No.	Equipment Name	Quantity
1	Slider Crank Mechanism	1
2	Scotch Yoke Mechanism	1
3	Slotted Link Mechanism	1
4	Whitworth Quick Return Mechanism	1
5	Chain Mechanism	1
6	Geneva Stop Mechanism	1
7	Coupling Mechanism	1
8	Hook's Joint Mechanism	1
9	Cam and Follower Mechanism	1
10	Constant Velocity Joint Mechanism	1
11	Crank mechanism, without masses (1 of SET B)	1
12	Drum Brake System	1
13	Shoe, adjustable lining	1
14	Shoe, full lining	1
15	Plate Clutch	1
16	Disk Brake	1
17	Gearbox	1

18	Coupling, short	1
19	Coupling, universal jointed	1
20	Differential-Crownwheel and Pinion	1
21	Braking and Accelerating Forces Unit	1
22	Static and Dynamic Balancing Unit.	1
23	Epicyclic Gear Unit (1 element)	1

7. List of Equipments for Machining Science Lab. (ME 355)

Item # and Equipment Name	Quantity
1. Medium Size All Geared Lathe	8
2. Large Size Heavy Duty All Geared Lathe	2
3. All Geared Radial Drilling Machine	1
4. Bench Drilling Machines	2
5. Horizontal Milling Machine	2
6. Vertical Milling Machine	2
7. Gear Hobbing Machine	1
8. Slotter	1
9. CNC Turning Center	1
10. CNC Milling Center	1
11. CNC Electro Discharge Machine (EDM)	1
12. CNC Wire-EDM (WEDM) Machine	1
13. Surface Grinding Machine	1
14. Tool and Cutter grinder	1
15. Pedestal Grinder	3
16. Table Top Grinders	4

8. List of Equipments available in the METROLOGY LAB (ME 355)

Name of the Equipment	Quantity
1. Analog and Digital Vernier callipers	11
2. Height Measuring Instruments	2
3. Micrometers	6
4. Gages for Internal Measurement	3
5. Thread Micrometer	2
6. Slip gage or Johnsons gage block	One Set
7. Cast Iron Surface plates	2
8. Sine Bar	1
9. Three-wire thread measuring system	1
10. Hand-held perthometers	2
11. Contour measuring system	1
12. Form/Shape tolerances measuring system	1
13. Toolmaker's microscope	1

9. List of Equipments in Experimental Engineering Lab (IC211)

Details of the Equipment or Software (Number of Units) (Make and model)
1. Fundamentals of temperature measurement (02) (G.U.N.T. Germany: Catalogue No. WL202)
2. Method of Pressure Measurement (02) (G.U.N.T. Germany: Catalogue No. WL203)
3. Flow Rate Demonstration Unit (01) including 14 types of flow measurement systems i.e. Orifice, Venturi, Pitot, Electromagnetic, Helical rotary, Crump weir, Broad crested weir, Swinging flap, Shunt gapmeter, etc. type of flow meters (Wintech Edulab Systems, Spain)
4. Quanser QNET Mechatronic Sensor Board with NIELVIS II software (02) (National Instruments, USA)
5. LABView Software for virtual instrumentation experiments (National Instruments, USA)

10. FACULTY MEMBERS

i. Prof. N. K. Jain

(Associate Professor)

Areas of Interest: Advanced Machining Processes, Hybrid Machining Processes, Micro-machining and Nano-finishing Processes, Manufacturing Process Selection and Process Parameters Optimization, Application of Soft Computing Techniques to Manufacturing Processes

Current Research Interests: Hybrid Machining Processes, Micro-machining and Nano-finishing Processes, Manufacturing Process Selection and Process Parameters Optimization.

Papers in the Refereed International Journals

1. P. Shandilya, P. K. Jain, and **N. K. Jain**, (2011), Modelling and Analysis of Average Cutting Speed in WEDM of SiCp/6062 Al Metal Matrix Composite, **Manufacturing Technology Today**, 10 (4), April 2011, 18-26.
2. Pragya Shandilya, P. K. Jain, **N. K. Jain** (2011), Modeling and analysis of surface roughness in WEDC of SiCp/6061 Al MMC through response surface methodology, **Int. J. of Engineering Science and Technology**, Vol. 3(1) (Jan. 2011), pp 531-535.
(<http://www.ijest.info/issue.php?file=vol03issue01>)
3. P. Shandilya, **N. K. Jain**, and P.K. Jain (2011), "Experimental Studies on Wire Electric Discharge Cutting of SiCp/6061 Aluminum Metal Matrix Composites", **Key Engineering Materials**, 450 (2011), 173-176. (Publisher: Trans Tech Publications, Switzerland) (DOI:10.4028 / [www.scientific.net / KEM.450.173](http://www.scientific.net/KEM.450.173))
4. J. P. Misra, **N. K. Jain**, P. K. Jain (2010), "Investigations on Precision Finishing of Helical Gears by Electro Chemical Honing (ECH) Process", Proc. of IMechE, Part B: **J. of Engineering Manufacture**, 224 (12), Dec 2010, 1817-1830. (Publisher: Professional Engineering Publishing, UK). (DOI: 10.1243/09544054JEM1836)

2 (ii) Papers in the Refereed Conference Proceedings

1. Shandilya Pragya, Jain P. K., and **Jain N. K.** (2011), "Effect of machining parameters on MRR during wire electric discharge cutting of SiCp/6061 Al MMC", **22nd DAAAM International World Symposium, 23-26th November 2011, Vienna, Austria**,
2. Pragya Shandilya, P. K. Jain, and **N. K. Jain** (2011), "Selection of optimum parameters in wire electric discharge cutting (WEDC) of SiCp/6061 Al MMC", **5th International Conference on Advances in Mechanical Engg. (ICAME)**, SVNIT, Surat, June 6-8, 2011, pp 394-398
3. Pragya Shandilya, P.K. Jain, and **N. K. Jain** (2010), "Study on average cutting speed in WEDM of

SiCp/6061 Al MMC based on RSM", Proc. of **4th International Conference on Advances in Mechanical Engg.** (ICAME), SVNIT, Surat, Sep 23-25, 2010, pp 394-398.

4. Pragya Shandilya, **N. K. Jain**, and P. K. Jain (2010), "Experimental Studies on Wire Electric Discharge Cutting of SiCp/6061 Aluminum Metal Matrix Composites, Proc. of **3rd International Conference on Advanced Design and Manufacturing (ADM2010)**, 8-10 September 2010, Nottingham Trent University, Nottingham (UK).
5. Pragya Shandilya, P. K. Jain, and **N. K. Jain** (2010), "On Wire Breakage and Microstructure in WEDC of SiCp/6061 Aluminum Metal Matrix Composites", Proc. of **3rd International and 24th AIMTDR Conference**, 13-15 Dec. 2010, Andhra University, Visakhapatnam, India, pp 1089-1094 (Ed.).
6. Abhishek Das, **N.K. Jain**, A. Wanner, and V. Schulze (2010), "Effect of Coating Time and Electrode Polarity in Electro Discharge Coating of Al using TiC/Cu Green Compact Tool", Proc. of **3rd International and 24th AIMTDR Conference**, 13-15 Dec. 2010, Andhra University, Visakhapatnam, India, pp 527-530.
7. J. P. Misra, H. Singh, **N. K. Jain**, P. K. Jain (2010), "Effect of Electrolyte Composition and Temperature on Finishing of Spur Gears by Pulse Electrochemical Honing (PECH)", Proc. of **3rd International and 24th AIMTDR Conference**, 13-15 Dec. 2010, Andhra University, Visakhapatnam, India, pp 903-908.

3. DETAILS OF THE ON-GOING RESEARCH PROJECT

Title: Experimental Investigations and Performance Optimization of High-Precision Finishing of Gears by Electro Chemical Honing (ECH) Process

Funding Agency: CSIR New Delhi

Budget and duration: Rs. 18.76 Lacs (Three years from May 2009)

Co-PI: Prof. P. K. Jain (IIT Roorkee)

4. (IV) (A) Honorary Work

(i) Service to Academic Institutes

- ◆ **Dean, Academic Affairs** (6th Oct. 2010 onwards)
- ◆ **Member**, Board of Governors (**BOG**) of IIT Indore (April 2010 onwards)
- ◆ **Member**, Academic Council, IIT Indore (July 2011 onwards)
- ◆ **Coordinator**, IIT Indore Virtual Classroom (March 2010 onwards)
- ◆ **Member**, Library Committee (May 2010 onwards)
- ◆ **Convener**, UGAPEC (March 2010 to March 2011) & PGAPEC (May 2010 to March 2011)

(ii) Reviewer for Research Papers

- ◆ Reviewer, **Journal of Materials Processing Technology** (Elsevier, London)
- ◆ Reviewer, **International Journal of Machine Tools and Manufacture** (Elsevier, London)
- ◆ Reviewer, **Proc. IMechE, Part B: Journal of Engineering Manufacture** (Professional Engineering

Publishing, UK)

- ♦ Reviewer, **International Journal of Advanced Mfg Technology** (Springer-Verlag, London)
- ♦ Reviewer, **International Journal of Mfg Technology and Management** (Inderscience)
- ♦ Reviewer, **International Journal of Materials and Product Technology** (Inderscience)

(iii) Special Recognition/Awards

- ♦ Inclusion in **Marquis's Who's Who** for the year 2010.
- ♦ Felicitation by **Lion's Club Indore Unique** on the Teacher's Day (5th Sep. 2011)

5. DETAILS OF LAB DEVELOPMENT:

1. ME 355: Machining Science Lab
2. ME 355: Metrology Lab
3. ME 258: Manufacturing Process Lab
4. Gear Metrology Lab (Research Lab)

ii. Dr. Anand Parey

(Assistant Professor)

Specialization and Research Interest:

Specialization: Condition monitoring, Noise and Vibration Isolation, Fault diagnosis, Noise and vibration monitoring.

Long term research interest: Fault detection of Rotating Machines.

Current research interest: Fault detection of Gearbox.

Publications:

Conference papers:

- 1) Y Pandya and A Parey, "Fault detection of a two-stage gearbox with artificially induced gear crack using vibration monitoring", 5th Indian International Conference on Artificial Intelligence, December 14-16, 2011, Tumkur, India.

Reviewer for Research Papers:

Reviewer for Journal Papers:

- ♦ Journal of Sound and Vibration,
- ♦ IET Science, Measurement and Technology,
- ♦ Measurement

External Referee for Master of Engineering / Technology or M.Phil./M.S. theses:

- (i) A suspension system with and without oil, ME Thesis
- (ii) Mechanical Characterization of Ferrofluid, ME Thesis

iii. Dr. Ritunesh Kumar

(Assistant Professor)

Specialization and Research Interest: Desiccant Air-Conditioning Systems (Renewable Energy Based Air-Conditioning Systems)

Publications:**Book:**

- (i) R. Kumar, Stand Alone Liquid Desiccant Air-Conditioning Systems, LAP Lambert Academic Publishing, 2011, ISBN No. 9783844311747.

Reviewer**International journals:**

Flow-Through Boiling of Isopentane in Structured-Porous Fins: Effects of System Parameters, ASME Journal of Heat Transfer.

Invited Speaker: Course on "Engineering Graphics" Organized by RGPV University, Bhopal, India, March 2011.

Honorary Work:**Service to Academic Institutes (Current):**

- (i) Member, Hindi Committee, Indian Institute of Technology, Indore (May 2010).
- (ii) Co chaired a session on, Design & Analysis of Mechanical Systems using Optimization Techniques, The Institution of Engineers (India) in association with IET (DAVV) Indore.

iv. Dr. Santosh Kumar Sahu

(Assistant Professor)

Specialization and Research Interests:

Specialization: Thermal Engineering

Long Term research interests: Thermal hydraulics, Two-Phase Flows, Heat Transfer, Quenching heat transfer

Current Research Interests: Quenching heat transfer, Rarefied gas flows, Choked flows

Publications:**Journal:**

- (i) S.K. Sahu, P.K. Das, and S. Bhattacharyya, "An Experimental Investigation on the Quenching of a Hot Vertical Heater by Water Injection at High Flow Rate", Nuclear Engineering and Design, 240, pp. 1558-1568, 2010.

Honorary Work:**i) Service to Academic Institutes (Current):**

- ◆ Convener, PhD selection Committee(Mechanical Engineering), Indian Institute of Technology, Indore
- ◆ Member, School Post Graduate Committee, Indian Institute of Technology, Indore

ii) Service to Editor/Associate Editor for International Journals:

- ◆ Member, Editorial Board, ISRN Mechanical Engineering, Hindawai Publishing Corporation, USA

Reviewer for Journal Papers:

- ◆ Reviewer, Nuclear Engineering and Design (Elsevier, London)
- ◆ Reviewer, Thermal Sciences (Institute of Nuclear Sciences Vincha, Serbia)
- ◆ Reviewer, International Review of Chemical Engineering (Praise Worthy Prize Inc., USA)
- ◆ Reviewer, Journal of Renewable and Sustainable energy (American Institute of Physics (AIP), USA)
- ◆ Reviewer, Journal of Engineering, Science & Management Education, India

External Referee for Master of Engineering / Technology or M.Phil./M.S. Theses:

- ◆ External Examiner for five M Tech. Theses: Maulana Azad National Institute of Technology Bhopal, India

Special Recognition/Awards:

- ◆ IUSSTF Fellow, 2011; Indo US Science and Technology Forum, New Delhi, India
- ◆ Visiting Scholar, (September, 2011-January 2012) School of Nuclear Engineering, Purdue University, West Lafayette, 47906, USA,
- ◆ Inclusion in Marquis's Who's Who for the year 2011, 2012; 28th and 29th Edition, USA

v. Dr. Anil Kumar
(Assistant Professor)

Specialization and Research Interests:

Specialisation:

Thermal engineering is my area of specialisation, with special focus on heat and mass transfer aspects of energy conversion technologies for conventional and non convectional energy sources.

Current research interest:

Solid state hydrogen storage-Metal hydrides, Simulation and experimental analysis of metal hydride based engineering devices, Wet and solid absorption cooling.

Long term research interest:

Theoretical and experimental analysis of biomass and solar thermal energy conversion technologies. Development of Solar based absorption cooling and heating systems. Development of solar based water desalination systems.

Publications:

Journal

- (i) E. Anil Kumar, M. Prakash Maiya and S. Srinivasa Murthy, "Measurement and analysis of effective thermal conductivity of $\text{MmNi}_4.5\text{Al}_{0.5}$ hydride bed". Industrial and Engineering chemistry research (ACS Publications, Accepted, Available on line)

Conference

1. E. Anil Kumar, Vinod Kumar Sharma, Thermal conductivity of metal hydride beds. 3rd International conference on advanced Materials, December 13-16, 2011, PSG College of Technology, Coimbatore, India. (Accepted, to be presented).
2. E. Anil Kumar, Vinod Kumar Sharma, Characterisation of metal hydrides for hydrogen storage and metal hydride based engineering applications. International conference on Futuristic Trends in Materials & Energy Systems, December 29-30, 2011, VR Siddhartha Engineering College, Vijayawada, India. (Accepted, to be presented).

vi. Dr. Satyajeet Chatterjee
(Assistant Professor)

Specialization and Research Interests:**Specialization: Production Engineering****Long term research interest:** Laser surface technology**Current research interest:** Surface technology for hard, wear resistant coating with solid lubrication**Reviewer for Research Papers:** Advances in Materials Science and Engineering**vii. Dr. Bhupesh Lad**

(Assistant Professor)

Specialization and Research Interests:**Specialization: Industrial Engineering****Current research interest:** Reliability Engineering, maintenance management, condition based maintenance**Long term research interest:** Engineering asset management, operations management / Operations planning and control**Reviewer for Research Papers**

- ♦ Reviewer for International Journal of Production Research

Research Projects:

Title	PI	Funding Agency	Status
Experimental Investigations and Performance Optimization of High-Precision Finishing of Gears by Electro Chemical Honing (ECH) Process	Dr. Neelesh K. Jain	CSIR New Delhi	Approved and Running

Research Labs:

Equipments in research labs are listed below.

Machine Drawing	1. Auto CAD Software for 2D and 3D modelling (25 user licences) (Autodesk Inc. USA)	Drafting and modelling for various purposes including Rapid Product manufacturing
	2. Desktop computer of advanced graphic configuration (25) (Dell Computers: Optiplex 780)	Various computing purposes
Solid Mechanics Lab	1. Microhardness (Vicker/Knoop hardness) Testing Machine (Walter UHI Germany : VMH 002)	Research involving measurement and analysis of microhardness for metallography, tribology, metal powder, Thermal treatment, Ceramics related research
Manufacturing Processes Lab	1. Table top Integrated Multi-Process computer numerically controlled (CNC) Micro-Machining Centre capable of doing Micro-Turning, Micro-Milling, Micro-Drilling, Micro-ECM, Micro-EDD, Micro-Scanning EDM, Wire Electrode Dressing (WEDG) (Sinergy Nano Systems, India : Hyper 15E)	Carrying advanced conducting research on micromachining and nano-machining
	2. Rapid prototyping (RP) Machine based on 3D-Printing (3DP) concept (Strasys USA : UPrint Plus 3D Printer)	Research on various aspects of Rapid Product Manufacturing (RPM)
Kinematics and Dynamics of Machines Lab	1. Basic Driver train Diagnostics Simulator (01) (Spectra Quest Inc. USA : DDS2010)	Research on various aspects of condition monitoring and diagnostics
	2. Vibration Fundamentals Training System (01) (Spectra Quest Inc. USA : VFT)	Research on various aspects of mechanical vibrations and noise control

	3. Four-Channel Noise and Vibration Analyzer with single axis and tri-axis accelerometer (Aimil Ltd. India: OR34-FREQ 4)	
Machining Science and Metrology Lab	1. Optical Surface Metrology System Profiler (Veeco Asia Pvt Ltd, Singapore : NT9080)	Measurement of various parameters of surface texture (including surface roughness) produced during different manufacturing, finishing, and superfinishing processes and their analysis with an objective to improve the surface quality of different products and to improve their tribological properties.
	2. Vision 32 software for surface roughness data analysis and interpretation and interfacing of the hardware and user interface working for the profiler including Windows XP Professional (Veeco Asia Pvt Ltd, Singapore : NT9080)	

Images of various UG teaching and Research equipments



CAD Lab



Experimental Engineering lab



Gear Metrology Lab

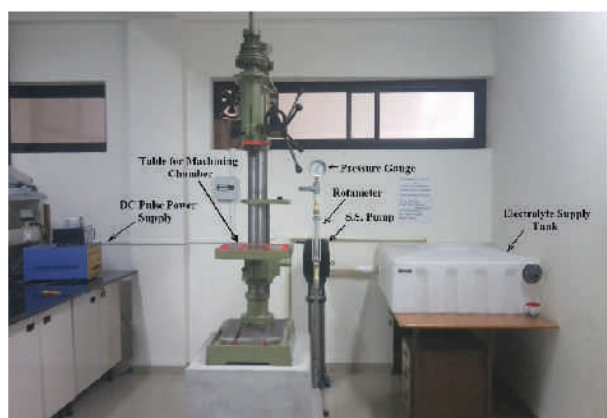
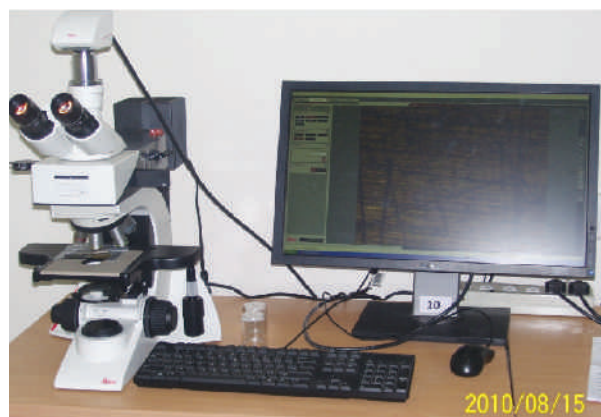


Gear Metrology Lab: Coordinate Measuring Machine (CMM)



Gear Metrology lab: Optical Profiler

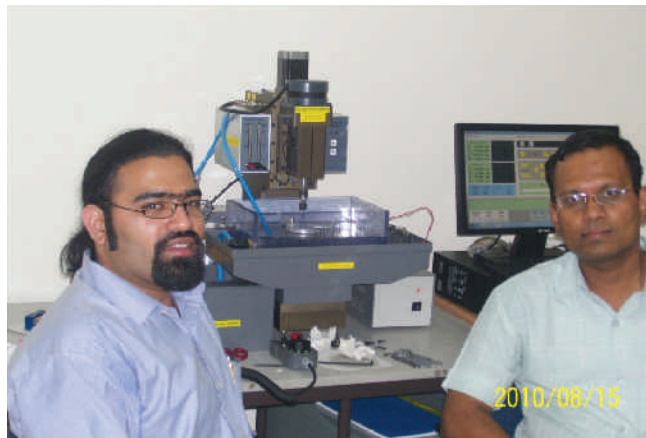
Gear metrology lab:
Optical Microscope



Electro Chemical Honing
Gears Setup

Metrology Lab: Contour
Analysis Machine





CNC Micromachining Center



Metrology: Shape Tolerance Machine



Gear Metrology lab: CMM



Gear Metrology Machine
(Prof. N. K. Jain with research scholars)

School of Humanities and Social Sciences

The School of Humanities and the Social Sciences is established as a part of the Institute with a view to apprise the technology students to an open-minded, socially responsible and better understanding of life. With growing peer pressure on individuals in society, the courses taught by the School also bring in the students the awareness on political economy, literature, international policy concerns. The learning on diverse range of areas in Philosophy, from science to human mind, impart development of newer possibilities to the students in growing as thinking individuals rather than a mere following of technology immersed life.

The school currently offers introductory and specialized courses for Undergraduate Programme as well as for its Doctoral Programme in Philosophy, English and Economics. The school will also include the disciplines of Sociology, Psychology and French language very soon. Currently there are six research scholars enrolled in the school for their doctoral degree. The School is also preparing to commence its two year MS programme with interdisciplinary approach.

For the Doctorate programme and for Undergraduate electives the school offers a wide range of research and teaching areas to choose from.

- ♦ The Economics discipline offers courses and research specializations in agricultural economics, environmental economics, international economics, innovations and property rights issues, development economics.
- ♦ The English discipline has specializations available in Indian Writing in English, Translation studies and Black Studies. The school is developing the modern well-equipped language laboratory to facilitate students in easy learning of listening, speaking and writing skills in English language.
- ♦ The Philosophy of Science and Ethics and Technology are areas where the discipline of Philosophy has a core competence and the discipline is actively seeking motivated young researchers to work in the field.
- ♦ The School is on its way to running an 80 hours course in French Language as a part of its foreign languages teaching curriculum. This course enable the students and scholars to take the Test of French Language administered by the Centre international d'étude pédagogiques. Currently, the School of Humanities and Social Sciences in association with the Central Library, IIT Indore and Alliance Francaise (Bhopal) is conducting these classes.

Courses of Study for B.Tech and PhD students:

The School of Humanities and Social Sciences offers following courses during the four years of all B Tech programmes:

Course Code	Course Name	Semester and Year
HS 107	English Literature	Autumn (1st Year)
HS 157	English Language Lab	Autumn (1st Year)
HS 108	Fundamentals of Economics	Spring (1st Year)
HS 201 /HS 203 / HS 205 /HS 207	Philosophy /Psychology /Sociology / French Language	Autumn (2nd Year)
HS xxx	Options currently offered: History of Early Cinema, International Economics, Appreciating Indian English Literature	Autumn (3rd Year)
HS 302 Institute Elective	Environmental Studies: Social Aspects HSS Courses#	Spring (3rd Year) Autumn (4th Year)

* Elective courses are offered by faculty members of various disciplines.

Faculty members will also offer courses as Institute Electives during the 7th semester of all B Tech programmes.

The students have to clear minimum 13.5 credits from the School of HSS with maximum of 16.5 credits if student choose HSS Course as Institute Elective in 4th year.

The School offers advanced masters level and doctoral level courses to its PhD scholars based on their research needs and the needs of undertaking interdisciplinary courses. The scholars can also choose to do courses from other schools during the first year as a part of their course work requirements.

Courses for PhD programme:

Course Code	Course Name	Semester
HS 601	Research Methods in Social Sciences	Autumn
HS 602	Fundamentals of Knowledge	Spring
HS 603	Epistemology	Autumn
HS 604	Ethics, Politics and Society	Spring
HS 606	Moral Philosophy	Spring
HS 623	Advanced Microeconomics	Autumn
HS 624	Econometrics I	Spring
HS 626	Environmental and Natural Resource Economics	Spring
HS 628	Institutional Economics	Spring
HS 797/ 798	Seminar Course	Autumn / Spring
Course Structure for PhD program in English		
HSS 741	Black Literary Cultures and the Slave Tradition	Autumn
HSS 743	Indian English Fiction	Autumn
HSS 745	Postcolonial Theory and Criticism	Autumn
HSS 742	Twentieth Century and the European Novel	Spring
HSS 744	South Asian Diaspora Literature	Spring
HSS 746	Translation Studies	Spring

Profile of faculty members at the School:

Currently the School has six faculty members teaching and undertaking research in the diverse areas of Philosophy, English and Economics. The faculty members are also actively involved in the institution building activities enthusiastically across various sections like, procurement of equipment and software for development of up-to-date research laboratories, participation in conferences, seminars and workshops internationally as well as across the country, students co-curricular activities, Institute newsletter, activities, warden-ship, inspiring students as faculty advisors, general administration by being involved actively in various institute level committees. The School is also anticipating to expand its strength of faculty members in Sociology, Psychology, French and other disciplines along with expansion into other areas in the existing disciplines.

i. Dr. Amarjeet Nayak

(Assistant Professor)

SpecializationIndian Writing in English, Postcolonial Studies
and Translation Studies**Long term research interests**

Marginalized Literatures and Postcolonial Studies

Current research interests

North-East Indian Literatures in English

Research work in pipeline

1. "An Exploration of Moral Conflicts in Mcbeth"

2. "What does it mean to be an untouchable?"

A Study of the Many Contours of Subjugation and 'independence' in Mulk Raj Anand's Untouchable"

ii. Dr. Joe Varghese Yeldho

(Assistant Professor)

Specialization

African American Fiction, Urban Narratives, Event Studies

Long term research interests

Pedagogy and Literary Protocols in Twenty First century texts.

Current research interests

Narrative and Urban Spaces

Research work in pipeline

Work on Civil Rights narratives and its impact on "Post Black" fiction.

iii. Dr. C. Bharath Kumar

(Assistant Professor)

Specialization

Social and Political Philosophy and Moral Philosophy.

Long term research interests

Contemporary Indian Philosophy

Current research interests

Nationalism, Multiculturalism, Citizenship

iv. Dr. C. Upendra

(Assistant Professor)

Specialization

Moral Philosophy

Current research interests

Philosophy and History of Ideas, Philosophical Foundations of Social Sciences

v. Dr. Ruchi Sharma

(Assistant Professor)

Specialization	The specialized areas include: intellectual property rights; innovation; technology transfer.
Long term research interests	I plan to work on the technological change in the developing countries using evolutionary theory.
Current research interests	The current focus is on the patent policy of India and its implications, foreign direct investment and research in academia.
Research work in pipeline	Working on the implications of the patent policy changes on the R&D of Indian industry (3 digit classification) from the time-period 1990-2010.

vi. Dr. Pritee Sharma
(Assistant Professor)

Specialization	Agricultural Policy, WTO and concerns of developing countries, Rural poverty
Long term research interests	Resource Economics
Current research interests	Climate change and agriculture, Subsidies in energy sector
Research Work in Pipeline	Working on research proposal on Food Security and Climate Change

Research Activity at the School during 2011

Research Project On-going:

1. Name of the Principal Investigator: Dr. Ruchi Sharma
"The Impact of Patent Policy on India's Innovativeness and Technology Transfer"
Agency: Indian Council for Social Science Research, New Delhi, India.
Budget Sanctioned: Rs. 3,94,525/-
Institute overhead amount: Rs. 29,707/-
Duration (start date-to likely date of completion): 15 march 2011 to 15 September, 2012
Project Staff employed: Aparna Sharma, Research Associate, 1 August, 2011. The task involves data processing from CMIE prowess database and report writing.
2. Name of the Principal Investigator: Dr. C. Upendra
"Explaining the Moral Compass: Away from the Dead End"
Agency: Indian Council of Philosophical Research, New Delhi, India.

Publications in Journals and Edited Book Volume(s):

Nayak, Amarjeet. "A Deconstructive Reading of Roger McGough's 'You and I'", *Apperception : A Journal of the department of English and Other Modern European Languages*, Visva-Bharati, Santiniketan, Vol. V, 2011. pp. 174-179.

Nayak, Amarjeet. "Discovering the Self through the Other: A Study of Cultural Encounters in Manoj Das's "The Crocodile's Lady" and Anurag Mathur's *The Inscrutable Americans*", *Parnassus: An Innovative Journal of Literary Criticism*, Vols. II / III, 2011. pp. 24-29.

Nayak, Amarjeet. "Role of Nature and Sources of Nature in Character and Story Development: A Study of Tennyson's "Mariana" and Defoe's *Moll Flanders*", *Samaj Bodh*, Vol. 1, No. 1, 2011. pp. 52-57.

C. Bharath Kumar, "The Problem of Nationalism: The Moral Dimension", *Jadavpur Journal of Philosophy*, Kolkata, January 2011, Vol. XX No.1.

C. Bharath Kumar, "The Texture of the Concept of Nationalism", *Wesleyan Journal of Research*, Bankura Christian College, 2011, Vol. 4, No. 1. (ISSN: 09751386).

C. Bharath Kumar, "The Strong Programme: A Brief Exploration", *Journal of Indian Council of Philosophical Research*, New Delhi, 2011. (forthcoming)

C. Bharath Kumar, "Civic Nationalism Vs Ethnic Nationalism", *Journal of Indian Council of Philosophical Research*, New Delhi, 2011. (forthcoming)

Nayak, Amarjeet. "Sweeping Generalizations and False Dichotomies: An Examination of the Insider-Outsider Dichotomy in Anjum Hasan's *Lunatic in My Head*", ed. Indu Swami. *Exploring North-East Indian Writings in English*, Vol. 2, New Delhi: Sarup Book Publishers, 2011 (forthcoming).

C. Bharath Kumar, Authored 8 Units on Gandhian Philosophy for the Indira Gandhi National Open University, New Delhi, Post-Graduate Programme in Philosophy, June 2011.

Seminars/ Conferences/Workshops

Nayak, Amarjeet. "Appropriating Matthew Arnold in the 21st Century Society: Evolving Roles of Religion, Science and Literature in Shaping a Culture", International Conference on Science, Technology and Society on 12-13 March, 2011 at Indore Christian College, Indore.

Nayak, Amarjeet. Participated in the XV National Workshop on “Critical Theory and History” at Forum on Contemporary Theory, Baroda, March 2–5, 2011.

Nayak, Amarjeet. Participated in the 4-week Theory – Praxis Course at OUCIP, Hyderabad co-organized by Forum on Contemporary Theory, Baroda, and OUCIP, Hyderabad.

Nayak, Amarjeet. A short story titled “The Face” selected for publication in the September, 2011 issue of Istanbul Literary Review (ISSN 1306–9314).

Joe Varghese Yeldho, “Urban Semantics and The Visual Economy in Toni Morrison’s Jazz,” Presented at Conference on Science, Technology and Society held on 12-13 March 2011 at ICC, Indore

Joe Varghese Yeldho. Participated in the XV National Workshop on “Critical Theory and History” at Forum on Contemporary Theory, Baroda, March 2–5, 2011.

C. Bharath Kumar, "Religious Conflict: A Gandhian Perspective" in the proceedings of a National Seminar on Conflict Resolution, Peace and Gandhi, Ed. Ranga Rao, Akansha Publications, New Delhi, October 2011.

C. Bharath Kumar, "Cultural Politics" as part of the IUAES (The International Union of Anthropological and Ethnological Sciences) Commission on Ethnic Relations sponsored panel ETHNICITY & CITIZENSHIP at a conference on 'Knowledge and Value in a Globalising World: Disentangling Dichotomies, Querying Unities' at Perth, Western Australia, 5-8 July 2011. (in absentia)

C. Bharath Kumar, "On Citizenship" at the 6th Global conference- Pluralism, Inclusion and Citizenship at 11-13 March 2011 in Prague, Czech Republic.

C. Bharath Kumar: Poster presentation on "Dialogue-Between and Within" for 2nd International Seminar on Peaceful Co-existence in Religions with focus on Basics of Ethics in Islam and Indian Religions organised by Al- Mustafa International University, India branch, New Delhi, 5-6 March 2011.

C. Bharath Kumar, "Religious Conflict: A Gandhian Perspective" at a Seminar on Conflict Resolution, Peace and Gandhi organised by Department of Philosophy, Andhra University, Visakhapatnam, 28th-29th March 2011.

C. Bharath Kumar, Chaired a session and presented a paper "Why (not) Non-Violence" at a Seminar on Philosophy and Ideology of Gandhi organised by Gandhian Studies Centre, Batala, Punjab, 26th February 2011.

Pritee Sharma, participated in the Advanced Studies Programme workshop on "Institutions and Development," organized by the Kiel Institute for World Economy, Kiel, Germany, during March 14-19, 2011.

Amarjeet Nayak is a member of the Editorial Board of Parnassus: An Innovative Journal of Literary Criticism (ISSN 0975-0266).

Membership of Professional Bodies

Dr. Amarjeet Nayak

- ◆ Member, Indian Association for Commonwealth Literature and Language Studies (IACLALS)
- ◆ Member, Indian Society for Commonwealth Studies (ISCS)
- ◆ Life Member, Forum on Contemporary Theory (FCT), Baroda
- ◆ Associate Member, Pegasus

Dr. Joe Varghese Yeldho

- ◆ Modern Languages Association of America

Dr. Pritee Sharma

- ◆ International Society of Ecological Economics
- ◆ The Indian Econometric Society of India
- ◆ The European Association of Environmental and Research Economists

Research Facilities:

The School is adding to its collection of electronic databases subscription which are very crucial for research in Social Sciences and increasing the collection of the classic and modern books and journals is mandatory for inspiring researchers in humanities disciplines. The School is also in the process of developing a Language Laboratory with latest equipment and sophisticated software which will be dedicated for easy learning of English and other foreign languages. The data analysis software programmes for economics are procured by the School.

Software Packages**Description**

1. STATA 11
generalized
more.
STATA is an integrated statistical package for data analysis, data management, and graphics. Stata 11 has features such as method of moments (GMM), competing-risks regression, state-space modelling, predictive margins, a Variables Manager, and
2. ArcView
ArcView is geographic information system (GIS) software for visualizing, managing, creating, and analyzing geospatial data.

Databases**Description**

1. CMIE Indian Harvest
in
The
series
Indian Harvest is a database of the wide variety of crops cultivated India. It provides detailed data on agricultural inputs and output. database is dis-aggregated upto the district level. And, the time-extends upto the 1970s.
2. CMIE State Analysis
comparisons and Services
State Analysis Service database is replete with data, analysis of Indian states.
3. CMIE India Trades
India Trades provides detailed data on India's foreign trade.
4. World Development
indicators Indicators
WDI is an internationally acknowledged database of **331** or **209 countries** from **1960 to 2008**.

Balance Sheet

INDIAN INSTITUTE OF TECHNOLOGY INDORE

CONSOLIDATED ACCOUNTS BALANCE-SHEET AS ON 31st MARCH 2011

(Amount in Rs.)

Sr. No.		LIABILITIES	Current Year 2010-11
1)	a)	Corpus/ Capital Fund and Liabilities Capital Fund	77,225,425
		Total of Sr. No. 1	77,225,425
2)	i)	Other Funds and adjustable Accounts Staff/Student Funds	428,500
	ii)	Other Adjustable Accounts	219,418
3)		Unutilised Grant in Aid	256,105,818
4)		Unutilised Grant from Other Organisations	1,993,445
5)		Other Liabilities	
	a)	Refundable Deposit	1,424,323
	b)	Sundry Creditors	23,633,451
		Grand Total	361,030,380
Sr. No.		ASSETS	Current Year 2010-11
		Fixed Assets	
1)		Land	1
2)		Equipment & Tools	38,676,922
3)		Furniture & Fixtures	18,221,529
4)		Library Books & Journals	6,592,717
5)		Motor Vehicle	6,277,879
6)		Computers	7,456,377
7)		Investments	
	a)	Fixed Deposits	212,000,000
8)		Current Assets, Loans, Advances etc.	
	a)	Accrued Interest	1,988,962
	b)	Advances	32,173,547
	c)	Sundry Debtors	
	d)	Security Deposit	118,720
	e)	Cash in hand and at Bank	22,749,252
	f)	Prepaid Expenses (E Journal Subscription)	14,774,473
		Grand Total	361,030,380

INDIAN INSTITUTE OF TECHNOLOGY INDORE
CONSOLIDATED ACCOUNTS
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st MARCH 2011

(Amount in Rs.)

Sr. No.	PARTICULARS	Current Year Up to 31.03.2011
1	INCOME	
	Grant-in-aid from Government of India	
a)	Non-Plan	
	Grant-in-aid released during the year -	
b)	Plan	
i)	Opening Balance b/f	212,597,662
ii)	Add: Grant-in-aid sanctioned during the year	191,500,000
iii)	Less: Amount utilised for Capital Expenditure	59,824,629
iv)	Less: Plan Grant c/f for Capital Expenditure 2011-12	256,105,818
	Total Sr. No.	188,167,216
2	Fees from Students	11,154,982
3	Other Receipts from Students	7,297,300
4	Other Income & Miscellaneous Receipt	403,974
5	Amount Received from JEE	131,152
6	Interest on Short Term Deposit	7,555,067
	GRAND TOTAL	114,709,691
	EXPENDITURE	
1	Pay & Allowance	32,756,791
2	Other Allowances	11,640,324
	SubTotal (1&2)	44,397,115
3	Administrative Expenses	
i)	General Expenses	3,623,956
ii)	Other Miscellaneous Expenses	32,266,280
	SubTotal (3)	35,890,236
4	Departmental Expenses	
i)	DOC/Consumables	12,311,582
ii)	DOC/Other Expenditure	142,384
iii)	Maintenance & Repairs to Equipment & Tools	650,150
	SubTotal (4)	13,104,116
5	Student Gymkhana Expenditure	603,288
6	Scholarship - UG	4,602,572
7	Mess Charges	5,350,376
8	Water & Electricity Charges	2,131,435
	Leave Salary Contribution	174,638
	Student Medical Aid	14,141
	Pension Contribution	105,671
	Institute Contribution to NPS	2,061,592
	Subscription to Library e-journals	6,274,511
	GRAND TOTAL	114,709,691