

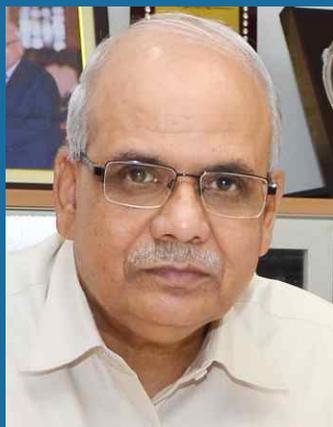


National Institute of Technology Kurukshetra

Research & Development Newsletter

Vol. 1 | Issue 1 | September 2017

From the Director



I am happy to learn that the inaugural issue of R & D newsletter of the Institute is being published. This is a good beginning, which I believe, will have long lasting impact and provide impetus to the research & development in the Institute.

The Institute has been continuously enhancing R & D activities at commendable pace. A good number of sponsored research projects have been awarded to the faculty by different funding agencies including, SERB- DST, DRDO, CSIR, IUAC, NCAER, ISRO, and SAC.

We have completely revised the course curriculum of all B.Tech. programmes to make it responsive to requirements of the industry. Laboratories of all the Departments are being equipped with state-of-the-art hardware and software tools. Initiatives have also been taken to develop centres of excellence in the areas of high performance computing, cyber security and energy studies.

Emphasis is being laid on multidisciplinary research in cutting edge areas. Ph.D. program is being restructured to undertake problems in conjunction with related industries and R & D organisations. We are making efforts to strengthen the Industry -Institute collaborations for extending our outreach at national and international levels.

I am sure this newsletter will prove to be an apt platform to showcase the research outcomes and outreach activities of both the faculty and students.

I appreciate the efforts of the Newsletter Team and convey my best wishes!

Dr. Satish Kumar

From Dean Research and Consultancy



Greetings from NIT Kurukshetra.

NIT Kurukshetra over the years has witnessed noteworthy growth in terms of scale, strength, and stature. In addition to introduction of innovative practices in teaching and learning processes, an array of initiatives have been launched in the area of research and development activities. These initiatives have yielded encouraging results in terms of award of the sponsored research projects from different funding agencies, and effective interface and collaborations with industries and R & D organisations. A ecosystem is being developed to engage UG students in research activities and connecting Ph.D. scholars with related R & D organisations, industries and laboratories.

We are pleased to present the inaugural issue of the R & D Newsletter highlighting research activities undertaken and accomplished during the academic session 2016-17. It focuses on sponsored research projects, Ph.D. degrees awarded, industry interface and tie-ups, and conferences organised.

I keenly look forward to receiving your feedback and suggestions to continuing to grow and diversify our R & D activities.

Prof. Brahmjit Singh

ABOUT NIT KURUKSHETRA



Vision

To be a role model in technical education and research,
responsive to global challenges

Mission

To impart quality technical education that develops
innovative professionals and entrepreneurs and
to undertake research that generates cutting edge technologies
and futuristic knowledge, focusing on the socio-economic needs.

National Institute of Technology Kurukshetra was established as Regional Engineering College in 1963 to impart technical education and provide research facilities in different disciplines of engineering and technology. With a humble beginning of 120 students in B.Sc. (Engg.) degree course of study, the Institute recognised as Institution of National Importance now boasts of running 7 B.Tech., 22 M.Tech., MBA, MCA and Ph.D. programmes in all major areas of engineering, technology, sciences, management and humanities. The academic fabric of the Institute consists of Departments, Schools and Centres.

Located in the land of Mahabharata-Kurukshetra, the Institute spreads over 300-acre lush green and environment friendly campus. Ours is a fully residential Institute with excellent on-campus accommodation facilities for students, faculty and staff. There are ten boys and four girls hostels with total capacity of over 5000 student residents.

NIT Kurukshetra is committed to fundamental and applied research in frontier areas of engineering, technology and science streams. Expanding list of sponsored research projects reflects its noteworthy position in cutting edge research.

Teaching and learning processes and research and development activities are supported by central facilities. The central library with state-of-the-art facilities houses a huge collection of over 1,90,000 documents. The library subscribes to over 4500 journals and online resources. The centre of computing and networking provides computing and networking infrastructure for information access to students, faculty and staff through a campus wide local area network with OFC backbone. Focussed attempts are made for the growth of the students by providing them with an array of extra- and co-curricular activities. State-of-the-art sports and games facilities including swimming pool, and technical and cultural clubs contribute to wholesome health and holistic development of the students.

During its exemplary journey of over five decades, NIT Kurukshetra has been successful in making remarkable strides in teaching, learning, research and outreach activities.



SPONSORED RESEARCH PROJECTS

Intelligent Real Time Situation Awareness and Decision Support System for Indian Defence

Sponsor: Defence Research & Development Organisation



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The project aims at developing an intelligent system with ontological framework to support military commanders in taking the best decisions in emergencies by providing them enhanced resource management assistance and situation awareness in real time. The outcome of this project is two-fold in that it delivers a resource manager and provides recommendations in case of emergency along with the justifications. The first deliverable is a comprehensive, modular and scientifically accurate semantic web portal which provides visualization (concept navigation like text output, hierarchical tree, network and instance navigation), query (abstract browsing based on user query), and keyword search. This ontology based resource manager for unconventional emergencies is an attempt to provide solution for representing knowledge base semantically and presenting it to the end user in a seamless manner. The second deliverable is an earthquake advisory system working in post disaster stage that helps its various users designated as experts in disaster management and local authorities in taking prompt decision in the state of various emergencies hence minimizing loss of life and property. The actions recommended by the decision support system are determined based on a hybrid case-based and rule-based reasoning.

While traditional, relational data warehousing and federation approaches can scale well and are effective for many core data storage and access requirements; such approaches often fail when facing the dynamic changes and the inherent complexity of data integration requirements. This is where semantic technology excels, as it builds on a common extensible data model (the Resource Description Framework, RDF), in which all data are represented in form of explicitly meaningful triples. The main advantage of using ontologies (RDF format) is the formalized semantics. This way the reasoner can facilitate all information like what, where, when, which mission; and automatically infer new statements without writing specific code.

Metal complexes modified nanoscale vesicles for therapeutic carbon monoxide delivery

Sponsor: Council of Scientific & Industrial Research (CSIR)



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Carbon monoxide (CO) is a promising candidate for several therapeutic applications. Many physiological effects are documented for controlled application of CO such as antiinflammatory agents, regulation of blood pressure, protecting against ischemia, septic shock and also hyperoxia. Since CO is an extremely toxic molecule volumetric dosing in therapeutic agents is very challenging. Thus CO-releasing molecules (CORMs) may solve this issue. In this research work we aim to develop biocompatible vesicles functionalized with metal carbonyl complexes and to measure the rates of CO release, complemented by IR and UV-vis spectroscopy. The CO releasing properties of vesicles compared with free metal carbonyl complexes.

Investigations on Hexaferrites to search strong magnetoelectric compounds at room temperature.

Sponsor: CSIR



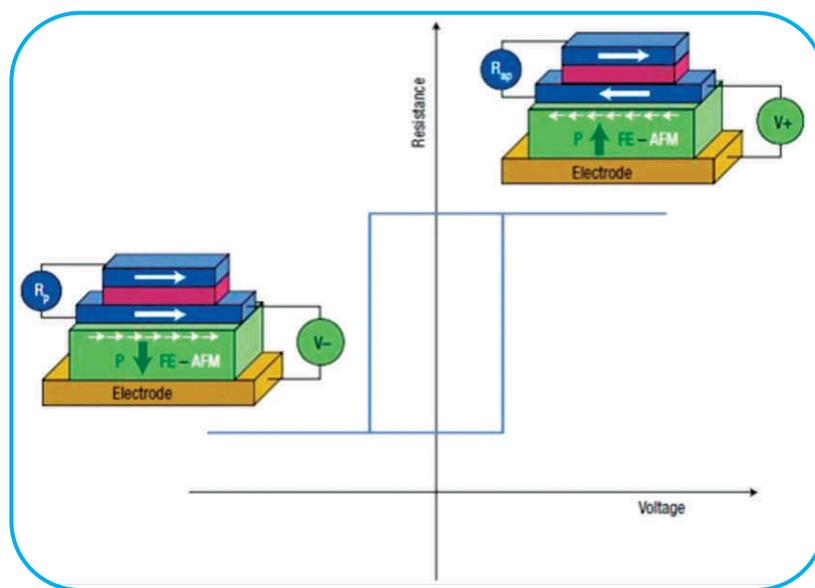
Dr. Anurag Gaur

Department of Physics

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The hexaferrites with helical spin order have been suggested as promising candidates for high temperature multiferroics. It was reported that some Y-type hexaferrites, such as $(\text{Ba,Sr})_2\text{Zn}_2\text{Fe}_{12}\text{O}_{22}$ and $\text{Ba}_2\text{Mg}_2\text{Fe}_{12}\text{O}_{22}$, can show magnetically induced ferroelectricity and pronounced magnetoelectric (ME) effects due to modifications of spiral magnetic structures by applying magnetic fields. Although the magnetic ordering temperatures of these Y-type hexaferrites are above room temperature, their ME effects are observable only below ~ 130 K. Subsequently, ME effects were also observed in Z-type, M-type, and U-type hexaferrites. Especially, the low field ME effect in a Z-type hexaferrite, $\text{Sr}_3\text{Co}_2\text{Fe}_{24}\text{O}_{41}$, happens at room temperature, representing a big step towards practical applications. M-type hexaferrites denoted as $\text{BaFe}_{12}\text{O}_{19}$ has also attracted a lot of attention because of their excellent magnetic properties and potential application in various fields including multi stage memory storage devices.

The hexaferrites have excellent magnetic properties at room temperature; however, they have weak dielectric properties. The dielectric properties can be improved by the substitution of suitable doping elements in these hexaferrites. These doping elements will reduce the conductivity by which dielectric constant will be improved. Therefore, maintaining a low conductivity will be a key property in improving the dielectric properties of hexaferrites and it will also result the large magnetoelectric coupling in these compounds at room temperature.



A possible MERAM element.

The present proposal aims to design a noble multiferroic compound in single phase with improved magnetoelectric coupling coefficient of the order of ~ 100 V/cm-Oe at room temperature, which makes them ready for technological applications. To design a new artificial multiferroic, we will adopt two distinct approaches. The first one deals with modifying the synthesis conditions for known hexaferrites such as M-type $[(\text{Ba,Sr})\text{Fe}_{12}\text{O}_{19}]$, Y-type $[(\text{Ba,Sr})_2\text{Me}_2\text{Fe}_{12}\text{O}_{22}]$, Z-type $[(\text{Ba,Sr})_3\text{Me}_2\text{Fe}_{24}\text{O}_{41}]$ (Me= transition metal ion) and second is related to doping of suitable elements (e.g., Cu, Mn, Dy etc.) to improve the ferroelectricity of these hexaferrites. The third is concerning to design the composites of hexaferrites with good ferroelectric substances, which results the coupling interaction between ferroelectric and magnetic substance and produce a large ME response at room temperature. After optimizing the best ME properties in bulk samples, we will grow the multilayer thin films of these compounds on various substrates for multi stage memory storage devices as planned in the Figure.

Synthesis of water soluble Cobalt complexes and their catalytic activities in aqueous and biphasic medium

Sponsor: Women Scientists Scheme, DST



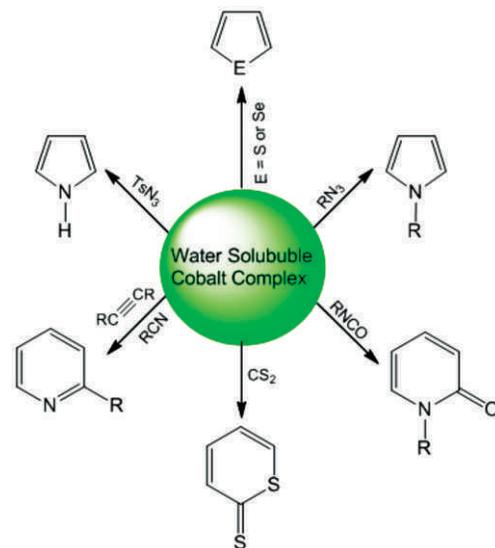
Ms. Anita Bhatia
Dr. M. Senthilkumar

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The main objective of this proposal is to synthesize some Co(I) complexes soluble in both organic and aqueous medium and use them as catalysts for the

[2+2+2] cyclotrimerization reactions in aqueous and biphasic medium. The proposal aims to:

- Identify versatile Co(I) catalysts soluble in both organic and aqueous media
- Allow catalysis under mild reaction conditions



Cobalt catalysed cycloaddition reactions in aqueous and biphasic medium

Classification and feature selection of AVIRIS-NG airborne hyperspectral data for crop cover mapping/urban mapping

Sponsor: Space Application Centre (ISRO), Ahmedabad



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Dr. Mantosh Biswas (Co-PI)

Department of Computer Engineering | Email: mantoshbiswas@nitkkr.ac.in

Classification of hyperspectral remote sensing images is one of the most commonly applied techniques used in remote sensing data processing. Classification effects a transformation from a physical measurement into a cartographic or thematic description of the earth's surface, for examples into terms such as forest, crops, urban area, water bodies, etc. Several approaches of classification of hyper spectral remote sensing imagery have been proposed with many successful applications. With the availability of high resolution remote sensing hyperspectral imagery over India, several new classification approaches requiring smaller training sample size can be used as an alternative to statistical and neural network based approaches. The present research proposal aims to investigate the performance of new classification algorithms in combination with feature selection for crop type discrimination and urban mapping using high resolution hyperspectral data.

During the study, appropriate classification algorithms such as relevance vector machines (RVM), support vector machines (SVM) and sparse extreme learning machines (SELM) shall be used and their performance will be judged for land cover/urban classification.

Various feature selection algorithms (filter, wrapper and embedded) will be compared to select appropriate combination of wavebands to be used by different classifiers with the used dataset. Based upon these investigations, a realistic model (feature selection plus classifier) will be developed for crop type discrimination and urban mapping from high resolution hyperspectral data over India. Such a model shall prove to be of immense potential to planners and administrators for different planning activities requiring land use/land cover information.

Detailed investigations on crystal and magnetic structures of frustrated double perovskites and their lanthanum composites

Sponsor: UGC-DAE-CSR



Dr. Avijit Kumar Paul

Department of Chemistry
Email: avijit.chem@gmail.com

Perovskite related compounds having the general formula ABO_3 , with diverse combinations of A (alkaline earth or rare earth metals) and B (transition metal or a smaller lanthanide) cations have become very exciting and continue to attract long term research attention due to their exciting structural and electronic properties. Unpaired d-electrons of transition metals introduce useful properties such as ferromagnetism, multiferroicity, colossal magnetoresistance, and magnetoimpedance. Substantial itinerant character of electrons and the presence of a magnetic moment of 4d and 5d elements more suitable for the B-substitution in the perovskites. At lower temperatures, long range ordering is observed when B site is substituted with mixture of transition elements. The observation of two-dimensional magnetic correlations and partial long-range magnetic ordering of geometrically frustrated Sr_2YRuO_6 have motivated us to further investigate the new ruthenium based compounds. Finding of new geometrically frustrated structures with peculiar magnetic behavior are quite fascinating materials for useful properties. Hence, our idea is to find out the detail structural and magnetic properties of new frustrated materials and finding their applicability in spintronic devices.

Defending Distributed Denial of Service (DDoS) Attacks using Dynamic Resource Ownership and Economic Incentive Based Solution

Sponsor: SERB-DST



Dr. B. B. Gupta

Department of Computer Engineering
Email: bbgupta@nitkkr.ac.in

In past two decades, Internet has revolutionized almost every facet of our lives. Government, commercial, and educational organizations depend on Internet to such an extent that day-to-day operations are significantly hindered when the network is "down". Almost all the important services such as banking, transportation, stock trade, medicine, education, etc are extended to Internet now. Unfortunately, at the same time, the prosperity of the Internet also attracts abusers and malicious attackers. Internet based attacks can be launched anywhere in the world, and unfortunately no Internet based service is immune to these attacks. These attacks lead to heavy financial losses, delays, and customer dissatisfaction. Trustworthiness and security of the Internet not only benefits on-line businesses, but is also an issue for national safety. Distributed denial-of-service (DDoS) attack is currently amongst the most problematic Internet security threats as it compromises most critical security requirement (i.e. availability). These attacks are critical as they aim at denying or degrading services for a legitimate user. The impact of DoS attacks can vary from minor inconvenience to users of a website, to serious financial losses for companies that rely on their on-line availability to do business.

Researchers have come up with more and more specific solutions to the DDoS problem. However, existing DDoS attack tools keep being improved and new attack techniques are developed. Therefore, cycle of attacking and defending is like a game. When someone finds a way to attack a system, someone else tries to defend against this attack. The attacker then tries harder to defeat the protections. It becomes a cycle that never seems to end. This motivates us to investigate efficient solutions to current and future DDoS attacks rather than to react with specific countermeasures. Hence, the objective of this project work is to provide dynamic resources ownership and economic incentive based solution to handle variety of DDoS attacks quickly and accurately to ensure reasonable performance of the network or system under attack.

CONFERENCES ORGANIZED

5th National Conference on Nanoscience and Instrumentation Technology

A two-day National Conference on "Nanoscience and Instrumentation Technology" during March 05-06, 2017 was organized by the Department of Physics. Dr. D.K. Aswal, Director, National Physical Laboratory, New Delhi, was the Chief Guest of the inaugural function of the conference. Dr. Aswal delivered a keynote lecture on the topic "Perspective on Science, Technology, Innovation and Entrepreneurship Policy." He highlighted the importance of nanomaterials in the context of technology and motivated the delegates to focus their research on implementation of the materials for the new applications. Experts from industry and academia delivered lectures on the topics related to the nanoscience and instrumentation technology. The conference included the broad areas of nano science and instrumentation like synthesis of nanomaterials, nano-electronics,

nano-magnetics, sensor and instrumentation, simulation and modeling and many more. The conference was conducted in six technical sessions including oral and poster presentations of more than 130 research papers. The delegates from 45 institutes including IITs, NITs, many other prestigious universities participated in the conference. The conference was organized by Dr. J.K. Quamara, Dr. Ashavani Kumar and Dr. R.P. Chauhan as coordinators.



National Conference on Recent Advances in Mechanical Engineering



A two-day National Conference on "Recent Advances in Mechanical Engineering" (NCRAME 2017) was inaugurated by Shri MSR Prasad, Director DRDL. Shri MSR Prasad, in his inaugural address talked about advanced technologies that are being adopted by DRDO to indigenously develop advanced weapons. Shri Rajiv Sachdeva, Director, Monarch Cylinder Liners Pvt. Ltd. was the Guest of Honor and keynote speaker of the function. He delivered a talk on "Past, present and future of the Indian automotive industry". Padma Shri Dr. Satish Kumar, Director NIT Kurukshetra, in his presidential address, identified four thrust areas in which the institute can collaborate with industry. These thrust areas were identified as tribology, renewable energy, biomechanics and automotives. Prof. Naveen Kumar, Mechanical Engineering Department, DTU, Delhi delivered a plenary talk on

"Renewable Diesel: Opportunities and Challenges for India. He depicted bright future for renewable diesel, use of which will also reduce harmful emissions and preserve our environment. One hundred twenty-six papers were presented in fourteen technical sessions on day one of the conference. Sixty-eight papers were presented on the second day of the conference i.e. on June 03, 2017. Two plenary talks were also delivered on the second day of the conference. The conference was organized by Dr. Gian Bhushan, Dr. Vinod Mittal as coordinators.

INDUSTRY COLLABORATION

NIT Kurukshetra has signed a special memorandum of understanding with Delta Power Solutions India. This industry collaboration has major focus on the engagement of students in design innovation spanning smart manufacturing and industry automation. The collaboration aims to connect the research efforts of the students with the industry which in turn shall enable them to translate research outcomes into real products. The MoU provides opportunity to our students to undergo training and get hands-on experience at the Delta Power Solutions and their R & D units. The students are offered 100% financial support and industry expertise by the company to translate their ideas into real life working models and products. This industry-institute collaboration provides a unique platform to NIT Kurukshetra for strengthening the delivery component of our R & D ecosystem.



STUDENT'S CORNER

A three-member students team from NIT Kurukshetra, participated in "India Innovation Challenge and Design Contest" organized by Texas Instruments, anchored by IIM Bangalore and funded by Department of Science and Technology (DST), and supported by "My Gov." and "Make in India" programmes. The team included Mukesh Prasad Agrawal from Electrical Engineering, Nishant Bundela and Naveen Rathi from Mechanical Engineering. This team developed "Smart Stick" for the blinds with the objective of helping them travel independently. This device houses various sensors and a microcontroller, which notifies the user about the obstacles in the path by vibration. 11,500 teams from 628 Engineering colleges of India took part in this contest. Round 1 was abstract submissions for an innovative business proposal. After round 1, 428 teams were shortlisted for quarterfinal round. On the basis of presentation and video of technical demonstration of the prototypes developed, 54 teams were selected for semifinal round. In semifinal round, shortlisted teams presented their idea in front of a panel of judges from IIM Bangalore. 30 teams qualified for the final round and were granted a project development fund of Rs. 5 Lakh. Each team was allotted mentors from IIM Bangalore and Texas Instruments for business and technical guidance respectively. In the final round, NIT Kurukshetra team bagged 16th position in this contest.



Ph.D. DEGREES AWARDED

Title of the Thesis

Name of Scholar

Supervisor/Co- Supervisor

ELECTRICAL ENGINEERING DEPARTMENT

| | | |
|--|-----------------------|--|
| Advanced Techniques for Feature Extraction from Satellite Images | Mr. Vikas Mittal | Dr. L. M. Saini Professor, Electrical Engineering NIT Kurukshetra |
| | | Dr. Dharmendra Singh Professor, Electronics & Comm. Engg. IIT Roorkee |
| Robustness Analysis & Control Design of Flexible AC Transmission (FACTS) Based Power Systems | Mr. Vijay Kumar Tayal | Dr. J. S. Lather Professor, Electrical Engineering NIT Kurukshetra |
| Design of Wind Turbine Emulator and Condition Monitoring | Ms. Himani | Dr.(Mrs.) Ratna Dahiya Professor, Electrical Engineering NIT Kurukshetra |
| Performance Prediction of Permanent-Split Capacitor-Run Single-Phase Induction Motor | Mr. Vijay Kumar | Dr. L. M. Saini Professor, Electrical Engineering NIT Kurukshetra |
| | | Dr. J. S. Saini Professor, Electrical Engineering DCRUST Murthal (Sonipat) |
| Modeling and Analysis of Soft Switching DC/DC Converters | Ms. Sudha Bansal | Dr. L. M. Saini Professor, Electrical Engineering NIT Kurukshetra |

MECHANICAL ENGINEERING DEPARTMENT

| | | |
|--|--------------------------|--|
| Quality Management in Supply Chain-Study of Select Issues | Mr. Ashwani Kumar Sharma | Dr. Dixit Garg Professor, Mechanical Engineering NIT Kurukshetra |
| | | Dr Ashish Agarwal Associate Professor, Mechanical Engg. IGNOU, Delhi |
| Performance Measurement of TQM Elements in Indian Auto Sector | Mr. Vineet Gupta | Dr. Dixit Garg Professor, Mechanical Engineering NIT Kurukshetra |
| | | Prof. Raj Kumar Director Galaxy Global Group of Institutions, Ambala |
| Some Six Sigma Imperatives for Capacity Waste Management in Indian Auto Sector: A Case Study | Mr. Rajeev Rathi | Dr. Dinesh Khanduja Professor, Mechanical Engineering NIT Kurukshetra |
| | | Dr. S K Sharma Professor (Retd.), Mechanical Engineering NIT Kurukshetra |

| Title of the Thesis | Name of Scholar | Supervisor/Co- Supervisor |
|--|------------------------|---|
| Experimental Investigation and Modeling of Machining Characteristics in Ultrasonic Machining of WC-Co Composite Material | Mr. Ravinder Kataria | Dr. Jatinder Kumar Asstt. Professor, Mechanical Engineering NIT Kurukshetra Dr. B.S. Pabla Professor, Mechanical Engineering NITTR, Chandigarh |
| Structural Analysis and Optimization of Parameters for Fatigue Life Enhancement of a Symmetrical Multi Leaf Spring | Mr. Vinkel Kumar Arora | Dr. Gian Bhushan Professor, Mechanical Engineering NIT Kurukshetra Dr. M. L. Aggarwal Professor, Mechanical Engineering YMCA University of Science & Technology Faridabad |
| Investigation and Modeling of Machining Characteristics in Rotary Ultrasonic Machining of Ceramics | Mr. Ravi Pratap Singh | Dr. Sandeep Singhal Associate Professor, Mechanical Engg. NIT Kurukshetra |
| A Procedural Approach for Design and Selection of Optimized Facility Layout for Manufacturing Industries | Mr. Parveen Sharma | Dr. Sandeep Singhal Associate Professor, Mechanical Engg. NIT Kurukshetra |
| Lean and Green manufacturing: Concept, Trends and Practices in Foundry Industry for Productivity Improvement | Mr. Suresh Prasad | Dr. Dinesh Khanduja Professor, Mechanical Engineering NIT Kurukshetra Dr. S. K. Sharma Professor (Retd.), Mechanical Engineering NIT Kurukshetra |

COMPUTER ENGINEERING DEPARTMENT

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|--|--------------------|--|
| Local Mutual Exclusion and its Variants in Mobile Adhoc Networks | Mr. Ashish Khanna | Dr. A. K. Singh Professor, Computer Engineering NIT Kurukshetra Dr. Abhishek Swaroop Professor, Computer Engineering Galgotia University, G Noida |
| Fuzzy Logic Driven Goal Oriented Requirements Elicitation Process | Mohd. Sadiq | Dr. S. K. Jain Professor, Computer Engineering NIT Kurukshetra |
| Measurement of Quality of Object Oriented Software Using Mining of Software Repositories | Mr. Anshu Parashar | Dr. J. K. Chhabra Professor, Computer Engineering NIT Kurukshetra |

ELECTRONICS AND COMMUNICATION ENGINEERING DEPARTMENT

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| Acoustic Analysis of Pathological Voice Signals and Their Classification | Ms. Saloni | Dr. R. K. Sharma Professor, Electronics & Comm. Engg. NIT Kurukshetra Dr. A. K. Gutpa Professor (Retd.), ECE, NIT Kurukshetra |
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| Title of the Thesis | Name of Scholar | Supervisor/Co- Supervisor |
|---|------------------------------|--|
| Run-time Power Management in Arithmetic Circuits using Ultra Fine-grained Power-gating | Mr. Ashish Jasuja | Dr. R. K. Sharma Professor, Electronics & Comm. Engg. NIT Kurukshetra |
| Improvement in Lifetime of Clustered Wireless Sensor Networks Using Load Balancing Approach | Ms. Vrinda Krishan Lal Gupta | Dr. Rajoo Pandey Professor, Elect. & Comm. Engg. NIT Kurukshetra |
| Design of Low Voltage High Performance Current Mirrors using Quasi-Floating Gate MOSFET | Mr. Nikhil Raj | Dr. A. K. Gupta Professor (Retd.), Elect. & Comm. Engg. NIT Kurukshetra Dr. Ashutosh Kumar Singh Professor, Computer Applications NIT Kurukshetra |
| Designing Near Perfect Reconstruction Two-Channel QMF Banks | Mr. Surendra Kumar Agrawal | Dr. O.P. Sahu Professor, Electronics & Comm. Engg. NIT Kurukshetra |

CIVIL ENGINEERING DEPARTMENT

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|--|-----------------------------|---|
| Scour Around Abutments: Prediction, Mechanism and Protection | Mr. Upain Kumar Bhatia | Dr. Baldev Setia Professor, Civil Engineering NIT Kurukshetra |
| Study of Sediment Extractor | Mr. Bhupendra Kishore Singh | Dr. K. K. Singh Professor, Civil Engineering NIT Kurukshetra Dr. N. K. Tiwari Professor, Civil Engineering NIT Kurukshetra |

CHEMISTRY DEPARTMENT

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|---|----------------|--|
| Synthesis and Characterization of some Macrocyclic Transition Metal Complexes of Biological Interest | Ms. Parveen | Dr. D. P. Singh Professor, Chemistry NIT Kurukshetra |
| Development of some Biomimetic Chelators and their Complexation Studies with Biologically Active Metal Ions | Mr. Amit Gupta | Dr. Minati Baral, Professor, Chemistry NIT Kurukshetra |

HUMANITIES & SOCIAL SCIENCES DEPARTMENT

| | | |
|---|-------------------|--|
| Purchase of Counterfeit Products: A Study of Consumer Behaviour | Mr. Saurabh Verma | Dr. Rajender Kumar Professor, Humanities & Social Sciences NIT Kurukshetra Dr. P.J. Philip Professor (Retd.), Humanities & Soc. Sc. NIT Kurukshetra |
| Protean and Boundaryless Career Orientation: A Study of It Professionals in NCR | Ms. Anshu Lochab | Dr. Kiran Mor Professor, Humanities & Social Sciences NIT Kurukshetra |

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