

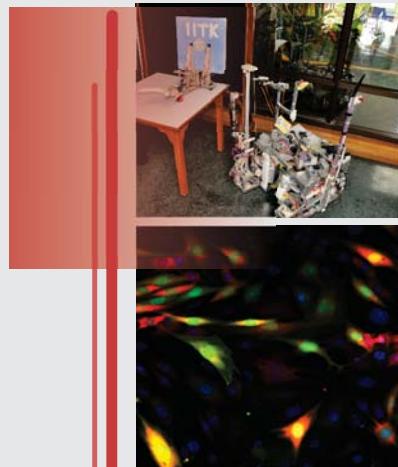
Volume 4, Issue 2

May 2016



# R&D Newsletter

## Indian Institute of Technology, Kanpur



## Technology Day



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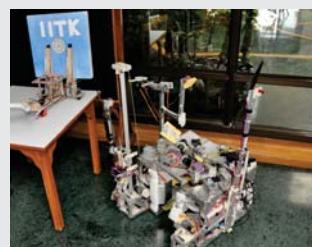
A vertical column of red-outlined letters spelling out "TECHNOLOGY DAY" in a stylized font, positioned on the right side of the page.



## Organization of Technology Day at IIT Kanpur

National Technology Day is a very special day which marks India's technological advancement. This day is commemorated to celebrate the anniversary of first of a series of successful nuclear tests (Pokhran-II), which was held on May 11, 1998. Apart from Pokhran nuclear test, the first indigenous aircraft 'Hansa-3' was test flown at Bangalore on this day. India also performed successful test firing of the Trishul missile on May 11.

On 11<sup>th</sup> May, 2016, IIT Kanpur organized the technology day at the Outreach auditorium. Former president of Atomic Energy Department and former director of the BARC, Dr. R. K. Sinha was the chief guest in this programme. On behalf of the Institute, Dean Research and Development, Prof. Amalendu Chandra welcomed all the participants. In his opening address, Director, Prof. Indranil Manna emphasized that in order to build the country, it is needed to expedite the growth of technology and innovation. Dr. R. K. Sinha delivered a very thoughtful speech on "Transforming Vision into reality through science and technology". In this occasion, Mr. Vishnu Agarwal from Technical Associates Limited, Lucknow (also former student of the institute) along with the CEO of HAL Accessories, Mr. Rajeev Kumar were invited as special speakers. Mr. Vishnu Agarwal delivered a talk on the True Economic Growth of technology and Innovation. Mr. Rajeev Kumar talked on Enabling Technology for Aircraft Manufacturing. In this occasion, the faculty and students of the institute arranged a great exhibition of the technologies currently being developed at the institute. A poster exhibition was organized at the Hall of Fame of Outreach auditorium, where an exhibition of products developed at IIT Kanpur was also displayed. In addition, SIDBI Innovation and incubation centre displayed information on New Start-Up endeavors.



# Advanced Materials

## Arsenic (As) Remediation in Water by Ni-Al-Fe Ternary Metal Oxide Adsorbents

Arsenic (As) is one of the carcinogenic elements which is normally found in natural aquifer and soil systems. Adsorption is considered to be one of the best arsenic remedial techniques from aqueous systems. In the present case a ternary metal oxide (Ni-Al-Fe) adsorbent has been analyzed for the arsenic (III and V) adsorption both in qualitative and quantitative methods.

### Novelty of the Technology

The present study is the first of it's kind to use 'Aluminum doped nickel ferrite' ternary metal oxide particles (i.e. Ni-Al-Fe) as an efficient arsenic adsorbent under different pH and different arsenic concentrations. The results reveal that the maximum adsorption capacity of Ni-Al-Fe adsorbent is around 114 and 103 mg g<sup>-1</sup> for As(III) and As(V) systems.

### Faculty Contact:

Prof. G. Anantharaman, Dept. of Chemistry  
Prof. J. Ramkumar, Dept. of Mechanical Engineering  
Prof. Kamal K. Kar, Dept. of Mechanical Engineering

### Industrial Usage

- Industries/organizations which use adsorbents based water purification and heavy metal remediation.
- Point of use (POU) systems for individual house hold purposes in remote locations of developing nations.

## Fabrication of Novel Cryomill for Synthesis of Ultra Pure Metals Nanoparticles

Design and fabrication of an automated cryomill, capable of preparing high pure free standing metal nanoparticles.

### Novelty of the Technology

- Avoid mixing cryogenic liquid with metal powder.
- Protect the milled powder from oxidation or nitridation by using inert atmosphere in the vial.
- Measurement and precise control of the temperature of the milling powder during ball milling.
- In-situ observation of the milling process so that the impact energy transferred to the powder can be estimated.

### Faculty Contact:

Prof. Krishanu Biswas, Dept. of Materials Science & Engineering

### Industrial Usage/Target Industry

Free standing or isolated nano-particles are important for their intrinsic properties and applications in device making. It is imperative to understand the synthesis of cryo milling of free standing nano-particles of controlled particle size.

# Micro Texturing on Metallic Surfaces through Electrochemical and Laser Micromachining

Electrochemical micromachining (ECMM) is a process involving anodic dissolution via atom by- atom removal of metal from the workpiece. It does not require application of mechanical cutting force on the workpiece so that minimal heat is generated due to electrochemical reaction, hence it is one of the most effective micromachining processes.

## Novelty of the Technology

- The ECMM technology for producing micro-dimple arrays and micro pillar arrays without using mask is unique and is being used for the first time.
- In laser surface texturing of biomedical implants improves the cell/tissue adhesion and growth, which too is novel.

## Faculty Contact:

Prof. V.K. Jain, Dept. of Mechanical Engineering  
Prof. J. Ramkumar, Dept. of Mechanical Engineering  
Prof. Kantes Balani, Dept. of Materials Science and Engineering

## Industrial Usage/Target Industry

Micro-textured surfaces enable new applications of engineered surfaces, in the areas of wettability, tribological characteristics and heat transfer.

Targeted industries: Aerospace and Space, Automobile industries, Shipyards, Defense, and Electronics industries.

# Process for Preparation of Superhydrophobic Coating

Successful deposition of hydrophobic coating on different substrate and making micron level pattern on substrate.

## Novelty of the Technology

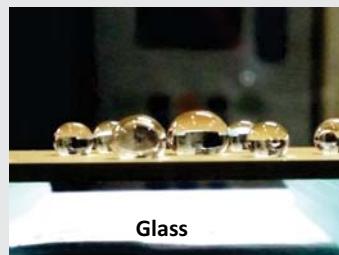
- The technology is suitable for various substrates.
- It does not involve use of harmful raw materials, e.g. organic solvents.
- No post-treatment or additional steps are required.
- Good mechanical interlocking (fibers are in entangled form).
- Porous conduit of liquid does not allow pressure build-up.
- Long life of coating (> 2 months).

## Faculty Contact:

Prof. Kantes Balani, Dept. of Materials Science & Engineering

## Industrial Usage/Target Industry

Anti corrosion coating, Oil water separation, Hydrophobic coating, Antibacterial coating (Its relevant industries)



# Energy

## Adaptive Intelligent Pipe Health Monitoring Robots for Fuel Transportation Systems

To develop indigenous gas pipe health monitoring system.

### Novelty of the Technology

- It is a Passive system (doesn't require any kind of external power source for its motion through the pipe).
- The robot has three different types of sensors (touch sensing, magnetic flux sensing and light sensing) for the detection and identification of damages.
- The robot can vary it's speed by increasing/decreasing drag through a mechanism at the Back-plate.
- The robot is designed to ensure anti rotatory motion for stable sensing.
- The robot is modular in nature. The units of this robots can be added or subtracted by the user depending upon the requirement of the user.

### Faculty Contact:

Prof. Bishakh Bhattacharya, Dept. of Mechanical Engineering

Prof. P.K. Panigrahi, Dept. of Mechanical Engineering

Prof. Nachiketa Tiwari, Dept. of Mechanical Engineering

### Industrial Usage/Target Industry

The robot can be used in various transport pipe lines such as Gas Pipe Lines, Oil Pipe Lines, Heat Pipes, Sewage Lines etc.

Another version of the robot can also be used for detection of collapse/accidents in mines and underground installations.



## Bicycle Mounted Solar Energy Harvesting Unit

This portable, multipurpose mobile storage system, integrated with a solar based electricity harvesting unit can be used for alternative source of electricity and can be mounted on small vehicles like bicycle, mopeds, cycle rickshaw and used while in transit.

### Novelty of the Technology

- Electrical power from solar energy on small vehicles.
- Foldable basket storage system with solar energy harvesting unit.
- Compact size, light weight, tough and durable.
- Recharging/ running low power electronic devices (cell phones, radio sets) and lightening system (LED bulbs).
- Can be used as vehicle mounted or stand-alone.
- Locking arrangement provides security.

### Faculty Contact:

Prof. Sameer Khandekar, Dept. of Mechanical Engineering

Prof. Bishakh Bhattacharya, Dept. of Mechanical Engineering

### Industrial Usage/Target Industry

It is extremely useful for rural as well as urban/semi-urban populace, especially for those using small vehicles and in shops.



# Development of Cost Efficient Electrochemical Workstation

It's a three electrode system which controls the kinetics / thermodynamics of electrochemical reactions by controlling the potential of particular electrode.

## Novelty of the Technology

- Efficient compact circuitry.
- Auto cut at limiting current.
- Digital signal processing.
- Run time noise reduction.
- Multiple current ranging.

## Industrial Usage/Target Industry

The system has its vast research application in the area of sensors, energy, electrocatalysis and Nanotech.

Target industries: Corrosion, Biochemical, Plating, Chlor Alkali.



## Faculty Contact:

Prof. Raj Ganesh S Pala, Dept. of Chemical Engineering

Prof. Sri Sivakumar, Dept. of Chemical Engineering

# High Efficiency Vertical Axis Wind Turbine

Disruptive vertical axis wind turbine design with variable amplitude dynamic blade pitching and Small wind energy for solar-wind hybrid system.

## Novelty of the Technology

- A novel solution for age old self-starting problem of Darrieus type turbines.
- Dynamic blade pitching with variable amplitude ensures high efficiency over wide range of wind speeds.
- Built-in aerodynamic braking mechanism for storm protection.
- Easily adapts to rapid changes in wind direction.
- Exploits unsteady aerodynamics for high efficiency.



## Industrial Usage/Target Industry

Target market for this technology: Rural non-electrified India, Business establishments, Hilly areas with abundant wind energy potential, but lack of round-the-clock power supply.

## Faculty Contact:

Prof. Abhishek,  
Dept. of Aerospace Engineering  
Prof. Abhijit Kushari,  
Dept. of Aerospace Engineering

# Lock-in Thermography for Solar Cell/Module Characterization +

The technology comprises of hardware for dark and illuminated LIT both and the software for analysis. It can be implemented for multi-crystalline and organic solar cell.

## Novelty of the Technology

- The technique can be used for internal defects characterization and for monitoring the degradation of solar cell.
- The technique is cost effective and suitable for field operation.



## Faculty Contact:

Prof. P.K. Panigrahi, Dept. of Mechanical Engineering

Prof. M. Katiyar, Dept. of Materials Science & Engineering

# Healthcare

## A Compact RF Sensor for Detection of Contamination Level in Various Fluids

In comparison with conventional waveguide based cavity technique, the resonant sensors based on planar technology, being explored for material characterization by different research groups, are easy to adapt and integrate with other components, are of lower cost and weight.

### Novelty of the Technology

The prototype RF planar sensor is novel in design, comparatively much cheaper, more than 100 times compact in size, and is very light weight as compared to its conventional counterparts, and typically detects a 2% contamination level present in the sample under test.

### Faculty Contact:

Prof. M.J. Akhtar, Dept. of Electrical Engineering

### Industrial Usage/Target Industry

- Pharmaceutical industry
- Petrochemical Industry
- Paper and Pulp Industry
- Food Safety and Standard Authority

## An Improved Two-Step Method for Extraction of Lipopolysaccharide with Enhanced Yield and Purity

A novel method for enhanced extraction and purification of LPS from both capsulated and non-capsulated Gram negative bacteria.

### Novelty of the Technology

- Newly developed TSE method results in significant achievement in yield
  - $13.28 \pm 0.82$  weight % for Sd1
  - $18.13 \pm 0.76$  weight % for StB
- It requires only extra 3.16 hours for a schedule that involves 5.76 days for HPE method.
- The novel enzymatic polishing process reduces the impurities of protein and nucleic acid (dsDNA/RNA) significantly.
- Applicable to both **capsulated & non-capsulated** Gram-negative bacteria.
- Cost-effective with high potential for scale-up (no requirement of sophisticated instruments).

### Industrial Usage/Target Industry

- LPS is used as:
- An adjuvant for vaccine development
  - A protective antigen for vaccine development
  - A pyrogen to induce fever
  - In animal cell culture experiment
  - An inflammatory molecule

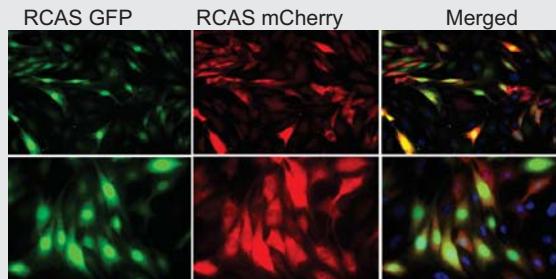
Target industry : Biotech/Pharma industry

### Faculty Contact:

Prof. Dhirendra S. Katti, Dept. of Biological Sciences & Bioengineering

# BRITER: A Highly Sensitive and Specific Cell-based Tool for Detecting Bmp Proteins

BRITER is a BMP responsive reporter cell line which can detect up to 10 ng Bmp protein in a sample.



TVA-BMSC is a very powerful cell line that can be used to study Bone, Cartilage, Fat and Neuron development. It is very difficult to make genetic changes in such cells. This mouse bone marrow stromal cells derived cell line may be stably transduced with avian retro-viruses to affect genetic changes. We have developed a protocol to synthesize joint cartilage in this cell line

## Novelty of the Technology

There are two specific aspects that make this cell line special:

- For Luciferase based reporters, till date, all groups use two different plasmid constructs. One to assay for the activity of interest and another to normalize variation in assay output due to non-specific parameters e.g. cell number. This technology has combined the two constructs into one.
- This technology has made stable integration of the construct in an osteoblast (BMP-responsive cell type) cell unlike a muscle precursor one.

## Industrial Usage/Target Industry

- Pharmaceutical industry
- Biotechnology industry
- Clinical diagnostics

## Faculty Contact:

Prof. Amitabha Bandyopadhyay,  
Dept. of Biological Sciences & Bioengineering

# Community Based Integrated Water Filter System for Clean Drinking Water

The integrated filter was developed and evaluated for removal of metallic as well as microbial contaminants at both lab and pilot scale.

## Novelty of the Technology



The preparation of new material for the above purpose is the main novelty in the presented work. The system is composed of material (biosand, polymers etc) that are easily available and cheap. Moreover, the designed filter contains various desired component as a single unit system i.e. appropriate pore size, porous surface roughness, interconnectivity and surface

charge, which are not commonly found in previously developed filters. The device is designed such that it may last long without compromising the capacity.

## Industrial Usage/Target Industry

The filtration technology is operationally simple and economic. The market for such filtration devices is very large both within the country and outside. The technology is being tested in field before it will be transferred to industry.

## Faculty Contact:

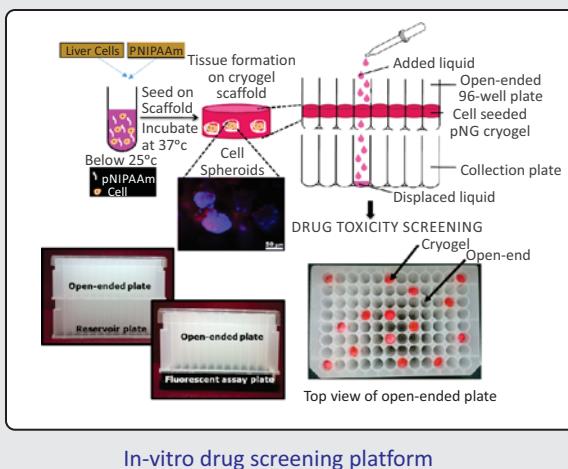
Prof. Ashok Kumar,  
Dept. of Biological Sciences & Bioengineering

# Drug Screening Platform Technology

The present invention mainly includes development of high throughput platform for drug screening and establishment of in-vivo drug screening platform.

## Novelty of the Technology

- The formation of PNIPAAm aided hepatospheres on a cryogel matrix.
- High throughput platform of polymeric cryogels in open-ended 96-well plate for drug screening.
- Minimal invasive method for in-vivo drug screening platform by establishing an ectopic liver in mice.



## Industrial Usage/Target Industry

- Industry can use in-vitro high throughput platform for screening various drugs.
- Industry can also use the technology for in-vivo drug screening of human specific disease such as Malaria, Dengue and HCV.
- The technology can be the interest of industry which deals with biomedical, biopharma, healthcare and many others involved in drug screening process.

## Faculty Contact:

Prof. Ashok Kumar,  
Dept. of Biological Sciences & Bioengineering

# MicroRNA-338-5p and MicroRNA-421 as Therapeutic Candidates for the Treatment and Diagnosis of SPINK1- Positive Cancers

The miRNA replacement therapy based predicament is novel and has immense clinical application for the treatment and diagnoses of SPINK1 positive cancer patients. This invention thus holds prospect for development of personalized medicine for SPINK1 positive cancer patients

## Novelty of the Technology

- The present invention for the first time demonstrates that miR-338-5p and miR-421 regulates SPINK1 expression post-transcriptionally.
- MiRNA replacement therapy using tumor suppressor miRNAs, miR-338-5p and miR-421 could be used as a potential therapeutic intervention to prevent SPINK1 mediated oncogenesis.
- Detecting expression levels of these microRNAs could be used as a potential diagnostic biomarkers for qualifying cancer patients, who will benefit by miRNA replacement therapy.
- miR-338-5p and miR-421 based replacement therapy could also be employed for other SPINK1 positive cancers such as Colorectal cancer, breast cancer, ovarian cancer and bladder cancer.

## Industrial Usage/Target Industry

Hemogram is basically made for health workers like ANM in rural areas who have to check hemoglobin for pregnant lady and anemia patients on regular basis. It can also be used anywhere as a home based hemoglobin checker.

## Faculty Contact:

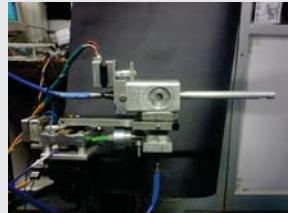
Prof. Bushra Ateeq,  
Dept. of Biological Sciences & Bioengineering

# Portable device for detection of cervical pre-cancer

Minimally invasive detection of cervical cancer at an early stage with in-house developed portable device based on polarized fluorescence.

## Novelty of the Technology

- Portable, cost effective, fast, accurate and minimally invasive.
- This can be used in normal room conditions and does not require any specific maintenance or laboratory facilities
- The device has the potential to become a part of the regular screening tools for in-vivo detection of cervical cancer in the clinic



## Industrial Usage/Target Industry

This device can be used for detection of precancer. The targeted industries are the medical community, associated industries, companies which supply medical equipment.

## Faculty Contact:

Prof. Asima Pradhan, Dept. of Physics

# Vein Visualisation Device

Provides visual contrast for the vein against the background tissue by relying on selective absorption.

## Novelty of the Technology

- Most vein devices use red light for such vein visual enhancement, where eye sensitivity is low. In this study, visual response has been optimised as well as both Oxy-, Deoxy- Haemoglobin absorption to achieve better performance
- Convenient hand-held, inexpensive device
- Ergonomically designed to aid intravenous drug delivery
- Reduced number of pricks required to locate the vein, from 3-4 pricks to just one

(Patent is under consideration with the patent office)

## Industrial Usage/Target Industry

Inexpensive life saving tool would be needed in all clinics, primary health care centres, hospitals both government and private

## Faculty Contact:

Prof. H Wanare, Dept. of Physics

# Low Cost Dental Chair

This research work primarily focuses on designing a low cost dental chair following the research findings, making the system more efficient and accessible to masses ( Patent pending)

## Industrial Usage/Target Industry

Dental equipment manufacturers in India

## Faculty Contact:

Prof. Shantanu Bhattacharya Dept. of Mechanical Engineering



# Information and Communication Technology

## Exploiting Dynamic Reuse Probability to Manage Shared Last-level Cache in CPU-GPU Heterogeneous Processors

In a single-chip CPU-GPU heterogeneous processor, efficient management of a shared on-chip resource, such as, last-level cache (LLC) is critical to the performance of both the CPU and the GPU. This work has proposed an LLC management policy which uses dynamic reuse probability of LLC blocks to decide their insertion and the promotion ages.

### Novelty of the Technology

- Estimate reuse probability of CPU and GPU blocks using a small working set sample (WSS) cache.
- Replacement in WSS cache happen only if stream is found to have low representation.
- To consider changing program phases, WSS cache is invalidated every 512K LLC read.
- Estimated probabilities are used by LLC policies.

### Faculty Contact:

Prof. Mainak Chaudhuri, Dept. of Computer Science & Engineering

## Resource Sharing for GPUs

Improving Graphics Processing Unit (GPU) performance by minimizing resource underutilization. Resource sharing addresses the following issues that occur with the current resource allocation scheme in GPUs:

- ◆ Resource underutilization
- ◆ Reduction in thread level parallelism (TLP)
- ◆ Potential reduction in throughput

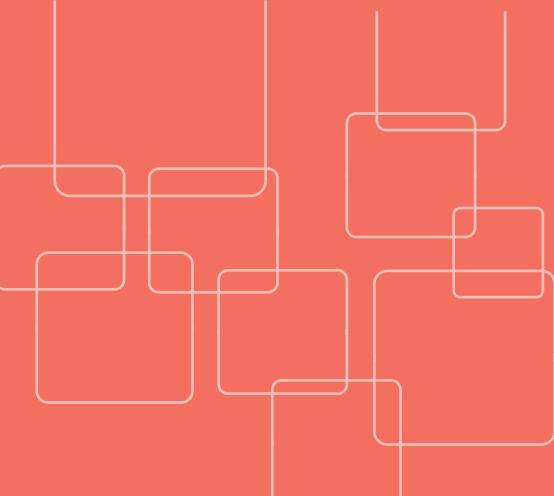
### Novelty of the Technology

- Increase the TLP by launching additional thread blocks in each SM
- Minimize the resource wastage by sharing resources with other resident thread blocks
- Propose optimizations to minimize long latencies further

### Industrial Usage/Target Industry

- It is useful to improve the throughput of state of the art GPUs
- The approach targets current NVIDIA GPUs

**Faculty Contact:** Prof. Amey Karkare, Dept. of Computer Science & Engineering



# Micro and Nano Technology

## Internal Nano-Polishing of Micro-Tubes using Magnetorheological Fluids

A method for cleaning of chemical deposition and polishing along the inner surface of non-ferromagnetic tubes

### Novelty of the Technology

- Square Pulse Train instead of Sinusoidal Signal Fast-fourier transform of this signal gives a dominating frequency.
- Tabletop Design: a simple table-top design and completely independent of use of other accessories.
- Conical Coil Magnetic Field Generation: Focused magnetic field using conical coils with an iron core.
- Introduction of Taylor-Bubble Flow in Ferro fluid Medium: increases the local shear rate.

### Faculty Contact:

Prof. Sameer Khandekar, Dept. of Mechanical Engineering

### Industrial Usage/Target Industry

- Enhanced ability for uniform polishing with high efficiency and mirror-like surface finishing. Applicable for catheters and tubes in biomedical devices
- Hollow tubes with small diameter in chemical and food processing industries: prone to corrosion and deposition along its inner walls
- Turbine spray nozzles, waveguides and hydraulic manifolds are components that require high-precision internal surface finish.

## Multiphoton 3-D laser Microwriter with a Sub-Nanosecond Laser

An inexpensive two-photon 3-D laser writing system as an alternative to femtosecond based laser writers with sub-micrometer resolution. It uses a sub-nano second laser and commercially available photo resist and enhancer materials

### Novelty of the Technology

This technology has unique capability that can be employed for fabrication of highly complex 3-D micro-structures with resolutions beyond diffraction limit.

### Faculty Contact:

Prof. S. Anantha Ramakrishna, Dept. of Physics

### Industry Usage/Target Industry

This system has potential applications in the field of Micro-optic and photonic devices, Microfluidic devices, Micro rapid prototyping, Life sciences, MEMS/NEMS and Data storage.

# Sensitive in situ Nano Thermometer using Femtosecond Optical Tweezers

This two-color experimental setup is a unique combination of a non-heating femtosecond trapping laser at 780 nm, coupled to a femtosecond infrared (IR) heating laser at 1560 nm, which precisely controls temperature as well as viscosity at focal volume of the trap center using low powers at high repetition rate.

## Novelty of the Technology

- Non-contact mode of operation to induce temperature change and detection at very short time scales in minute amounts of sample.
- A self-calibrating technique and biologically viable.
- Micro volume temperature as well as viscosity can be measured from changed values of corner frequency ( $f_c$ ) of the femtosecond optical trap.
- The technology is in the process of being implemented in biological samples.

## Faculty Contact:

Prof. Debabrata Goswami, Dept. of Chemistry

## Industrial Usage/Target Industry

This technology is being explored for use in photo-thermal therapy of cancer cells. This non-contact technology promises to be highly selective that is spatially confined to micro-volumes. Since only a few micro watts of power is sufficient to change the local temperature, high dosage exposure problems for biological samples is also minimal in this technology.

# Transportation

## 4WS4WD Electric Vehicle

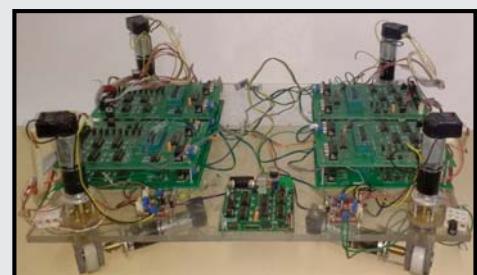
Advanced electric vehicle with all-wheel drive and zero turning radius capability.

## Novelty of the Technology

- The technology is not available commercially yet
- Some proofs-of-concept exist internationally
- Well-to-wheels efficiency of this vehicle is 27%, while that of conventional electric vehicle is 20%, and of internal combustion engine vehicles is 13 – 14%.

## Industrial Usage/Target Industry

This is useful wherever roads are narrow and provide limited maneuvering, such as cities, airports, harbors, malls, hospitals, campuses, and factories.



Studies underway at IITK on a laboratory-scale vehicle

## Faculty Contact:

Prof. Ramprasad Potluri,  
Dept. of Electrical Engineering

# UAV

## Modular Runway less UAS

### Novelty of the Technology

- Modularity
- Design optimization for hand launch operations
- Rapid Deployment and rapid wind up for minimum vulnerability

### Industrial Usage/Target Industry

- Remote area surveillance by on site deployment-Military /Defense
- Manpower reduction
- Disaster management

## UAV Avionics and Communication

### Novelty of the Technology

- Indigenous design and control logic
- Compatible with any type of Aerial vehicle
- Optional dual frequency for redundancy
- Configurable fail safe logics for high survivability and mission accomplishment

### Industrial Usage/Target Industry

- Aerial vehicles for surveillance, mapping and payload delivery.
- Aerial photography

## Ultra-Long Endurance UAV

### Novelty of the Technology

- Optimization between solar area and aerodynamics for long endurance
- Wing design optimization with respect to weight and area
- Selection of propulsion system for low current and high voltage
- Advanced composite materials for weight reduction.

### Industrial Usage/Target Industry

- Crop survey: estimation of production and yield forecast
- Mapping, Aerial surveillance, Aerial Surveying,
- Search and rescue
- Establishment of communication node

### Faculty Contact:

Prof. A.K. Ghosh, Dept. of Aerospace Engineering

Prof. Deepu Philip, Dept. of Industrial Management & Engineering



# Low Altitude Medium Endurance UAS

## Novelty of the Technology

- Aircraft Design for robustness.
- Propulsion optimization for long endurance.
- High payload capacity and available space for development and research.

## Faculty Contact:

Prof. A.K. Ghosh, Dept. of Aerospace Engineering  
Prof. Deepu Philip, Dept. of Industrial Management & Engineering  
Prof. Nischal Verma, Dept. of Electrical Engineering

## Industrial Usage/Target Industry

- Tactical Surveillance, Mapping, Object location/tracking-Military/Defense
- Crop Management, Yield Forecasting - Agriculture Industry
- Land Surveying, 3D mapping -Mining and Earth moving industry.
- Crowd management, Traffic Management, Surveillance - Homeland security



# NAAVIK Autopilot for UAS

## Novelty of the Technology

- NAAVIK: Navigation for Autonomous Aerial Vehicles by IIT Kanpur
- India's first multi-vehicle onboard autopilot software
- Tested and demonstrated on:
  - Fixed wing UAVs, electric and gasoline powered mini helicopters, conventional electric quadrotors, coaxial micro air vehicle, variable pitch quadrotor and flapping wing UAV.

## Faculty Contact:

Prof. Abhishek, Dept. of Aerospace Engineering  
Prof. Mangal Kothari, Dept. of Aerospace Engineering

## Industrial Usage/Target Industry

- Aviation and Aircraft Technology



# Bio-Mimicking Flapping Wing UAV

An autonomous 1.5 m wing span flying bird which will carry a small camera as the payload and will be able to record pictures for surveillance applications.

## Novelty of the Technology

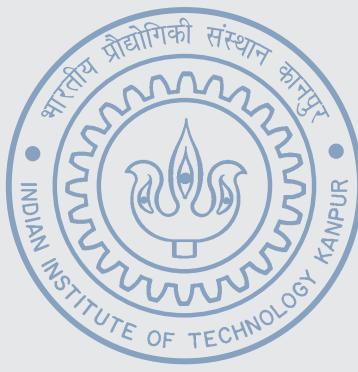
- Autonomous flapping wing UAV of 1.5m wing span with endurance of 60mins.
- Communication range of 2km along with a image capture and communication module on the airborne platform.
- A ground based module that receives the UAV data, processes it, registers the data against the map database.

## Industrial Usage/Target Industry

- Defence, Aerospace Industries

## Faculty Contact:

Prof. Debopam Das, Dept. of Aerospace Engineering



## Contact

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